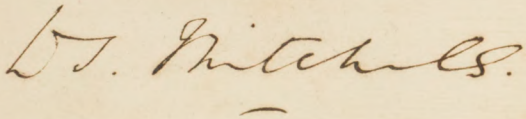
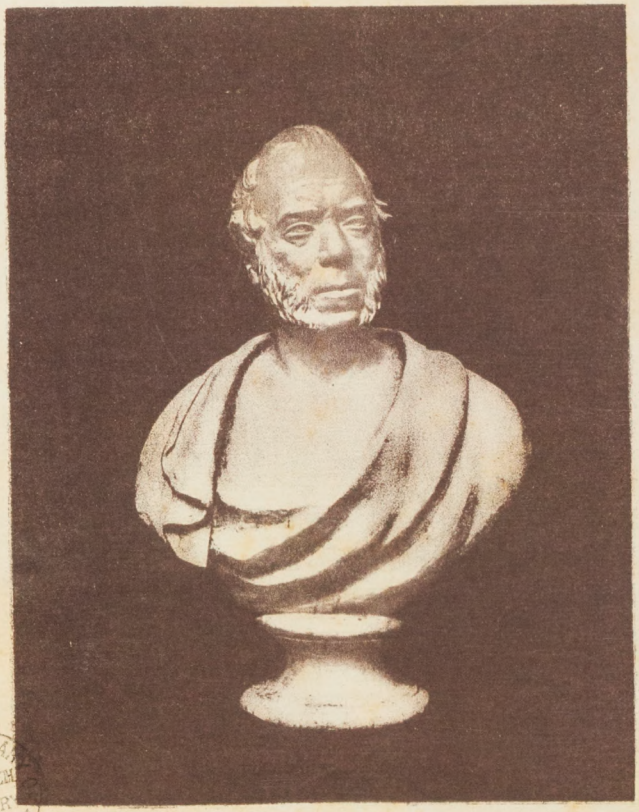
David Scott Mitchell.





Abrahams, Sculpt. Degotardi, Photo-lith.

Col. Sir Thomas Livingstone Mitchell, Kt. D.C.L.
&c. &c. &c.
Surveyor General of New South Wales.

THE

PUBLIC SURVEYS

OF

NEW SOUTH WALES.

Chiefly relating to the work of
~~By~~ Sir Thomas Mitchell

By Lord Audley

Sydney:

PRINTED BY J. DEGOTARDI, ROBIN HOOD LANE.

1866.

To his old friend
J. Hannaker Heaton
from
P.B. Mitchell
5 Albany St. Edinburgh.
2 Sept August 1856.

CONTENTS.

"It often happens that principles of science are long known, and even familiar, before society has confidence to apply them. But I may say for my Surveys of this Colony, that understanding the beauty, if not usefulness, of superior methods of precision, I have ever leaned to the side of practical utility."

SIR THOMAS MITCHELL.

ANYONE taking an interest in the Survey Department of New South Wales, and having time for the search, will find occasional notices of the first Surveyor-General, AUGUSTUS ALT, ESQ., and of his deputy, MR. CHARLES GRIMES, in the series of remarkable works that were published by the chief officers of the settlement within a few years after its establishment at Sydney in 1788. At that epoch there existed the greatest solicitude to learn anything of the new country discovered by CAPTAIN COOK, and of the progress made in LORD BATHURST'S great experiment. But public curiosity soon abated, and we now look back through the almost Cimmerian darkness that obscures the history of the surveys of this Colony for the next quarter of a century, and upon which more light may be thrown some day, by careful literary reference to official records, not omitting the very original pages of the Sydney Gazette. This is the period linked with humorous, though not unkindly traditions of 'JEMMY' MEEHAN, the trusty aid of more than one Governor; a general impression whimsically suggesting that he was a characteristic

specimen of the Irish *soogawn* or straw-rope surveyor, who has often no mean knowledge and skill in his profession, and is better known to some as the *bog*-surveyor. Be this as it may, Mr. James Meehan seems always to have had enough on his hands to prevent his troubling himself with new-fangled ideas of trigonometrical survey. A thought of the narrow limits of the settlement and a glance at the—as it then seemed—hopeless barrier of the Blue Mountains, would have driven such a notion out of his head, had it ever found entrance. The urgent need for farms even impressed upon him, like other conquerors, the advantage, sometimes, of a rapid march; without lingering to apply the 'careful chain,' or '*seize* his territory' by formal advances. The necessities of the times demanded a man of action, even of the rudest, and there is no question that the Colony is all the better at the present day, notwithstanding visions that have been raised of interminable litigation.

Next succeed in popular recollection the names of Mr. Oxley and of his deputy, Mr. Evans, well known for their exploratory expeditions in 1817-18, which were fitted out for the purpose of ascertaining the course of the River Lachlan (or *Kalara* of

the natives) and generally to prosecute the examination of the western interior of New South Wales. The former officer, if not the latter also, was in the Royal Navy, as were or had been, other members of the infant department now at length taking growth; and this fact is witnessed in the recurrence of a few technical expressions that show the early staff to have been more conversant with maritime than with land surveying.

It was as successor to Mr. Evans that Sir Thomas (then Major) Mitchell came to the Colony in 1827, with a commission to become the future Surveyor-General. The Major at that time was thirty-five years of age, and had already won a high reputation for varied service. Those who have not had the privilege of seeing the magnificent originals in the Quarter Master General's Department at home, may form some idea from the 'Atlas of Plans and Battles,' that he well merited his title of the 'Duke's famous draughtsman,' and the eulogium pronounced in the House of Commons by Mr. Goulburn, Chancellor of the Exchequer, 'that his military plans would ever remain a monument of the glory of England.'—Mr. Oxley being in delicate health and desirous of speedily

initiating his new deputy, Major MITCHELL took almost the entire conduct of the Survey Department, his first care being to arrange and catalogue the plans, which by that time had become numerous. The next step was to give geographical expression to these detached surveys by connecting and compiling them into a general map of the Colony, a task absolutely necessary in fulfilment of 'Royal Instruction' to divide the territory into counties by natural features. With such assistance as he could obtain, the Major in a short time accomplished a trigonometrical survey quite sufficient for this purpose and for many others,* the result being the publication in 1835 of his 'Map of the Nineteen Counties' in three sheets and engraved in the Colony on ship's copper by the late MR. CARMICHAEL. This work must ever be admired for its intrinsic merits and for the circumstances under which it was produced. In its formation no less than 900 plans were collated by the Major, and 'rendered down'; the available material, after this process, being reduced to the scale of the map with almost microscopic fidelity. Major MITCHELL also added

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* See Appendix *a*.

new matter, marking points, and expressing features not to be found in the detail surveys. In the latter respect, the 'Map of the Nineteen Counties' is stated, in a notice of it in the journal of the Royal Geographical Society for 1838, to represent 'better than any other they had seen, the great physical features that mark the face of the country'; though it is a question to this day, whether as an orographical map, of the same extent and by one hand, portions of it have ever been excelled, save by the Major's own plan and model of part of the Pyrenees. The scale of about 8 inch to a degree, though small, is as large as that thought worthy for the general map of some important countries, and could not have been conveniently exceeded in a general map of so great a territory as that of New South Wales, had the trigonometrical observations been extended as was originally proposed.

In respect to its merits the most favorable testimony has been given from time to time by competent judges in presence of very jealous scrutineers and in evidence before the Commissioners of inquiry in 1855, though notice was taken of one point where it differed from other compila-

tions, the error was not spoken of as accumulative or seriously detractive from its general correctness.

But to appreciate the character of the Map of the Nineteen Counties fully, we must know the state of things that existed in the British Isles up to a recent period in their history. The Royal Geographical Society tells us, in its volume for 1837, that 'the collation of routes, corrected here and there by observations for latitude and longitude, such, anterior to the commencement of the national map of England, known by the name of the Ordnance Map, begun in 1796, was the only method in use. There were errors in the position of some important points as the Lizard, to the amount of *seven miles*, and many of the best county maps exhibiting blunders of *three miles* in a distance of twenty!'

The following affords a yet better contrast. The scale of the Royal Instructions Map, as already stated, is about 8 inches to a degree, and the area of the nineteen counties *alone*, about 38,000 square miles, or nearly the size of Scotland. It was two years after the publication of

this map in a little known Colony with an ill reputation somewhat kept down by a distance of sixteen thousand miles from the parent state, that we find, in 1837, the 'Geographical Journal' thus lamenting the want of progress in the geography of the British Isles :—' No national map of Scotland exists, but the points of the great triangulation are established,*.....a small general map on the scale of 8 inches to a degree, by Mr. John Arrowsmith, almost finished, combines all that is accurately known of Scotland.' He must be very uninformed indeed of the merits of a distinguished geographer, who would for a moment doubt the *accuracy* of Mr. John Arrowsmith, but after what has been said of the maps of England, the *correctness* of this map of Scotland may be questioned. Observations on the south western coast by Mr. Galbraith discovered remarkable errors in position of most important points on the best charts. Some tracts, as the Mull of Cantire, were shewn to be out many miles in longitude on a most dangerous part of the coast, as appears, it is believed, in an outline diagram given in a prospectus of a

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* A mistake. Orders only had been issued for the continuation of the primary triangulation commenced in former years.

new Atlas, published about the period by the Messrs. Black of Edinburgh. The area too was underrated. This was stated so late as 1853, in the Literary and Scientific Register to be 30,059 square miles, whereas the Ordnance Survey is said to make it, in round numbers, to be 43,000 square miles to Ireland's 42,000.

The Nineteen Counties Map was completed in ten years after the date it was first called for and about seven after Major Mitchell's arrival in the Colony; but the benefit of the trigonometrical surveys necessary for it was felt soon after they were undertaken. The laying out of the Great Southern Road was commenced in 1828, a time when rewards were still offered for the most accessible ways into the Interior. The construction of that by the Victoria Pass and others followed and they were effected without the aid of the nicely contoured plans, that it would have been the height of folly for Major Mitchell to have expected in his time or in ours, though in a moderately undulating country like England where every rod of ground has its price, they can scarcely be too highly estimated. Moreover, experience in the discharge of duty showed that results did not always de-

pend on a clear perception of the scientific necessities. Thus in road-making strange disturbing elements were encountered: sometimes in pushing a road in the only way it was plain it should go, a sudden side wind would blow it into another direction altogether; causing some curious diversions though not new as a dynamical phenomenon; the same having been observed in other countries besides N. S. Wales.

Sir Thomas Mitchell in reviewing his own labors * at this period, states :—'The objects for which an accurate Map of New South Wales was chiefly required in 1827 were various and important. The locations of settlers were scattered across a very extensive territory, intersected by mountain ranges, rivers, and rocky ravines imperfectly known, but of which some knowledge was not more necessary to enable the immigrant to make a selection of his grant, than for the government to know the position thereof after it had been selected. For this purpose surveys, chiefly of rivers, had for some time been carried on; but although useful for the one purpose they were unconnected

* Evidence on Crown Lands, Sept., 1854.

with any general plan for the completion of a survey of the Colony, and consequently insufficient to determine the contents of the large tract of land remaining unlocated; still less were they sufficient to determine the extent of counties, hundreds and parishes, into which the whole Colony was required to be divided, and of which divisions such natural lines were to form the boundaries.'

'The arrangement of great roads across a country of such extent, and where the means at the disposal of Government for their formation were very considerable, was also an object of primary importance which could not be accomplished with certainty as to the comparitive merits of different lines and obstacles to be surmounted without a general survey thereof!'

'In order to carry out systematically the surveys of such natural features as were required for these and similar purposes, or in other words to form a map of the country, it was necessary to determine accurately the true relative position of the most conspicuous heights or objects and their distance from each other. This is in fact all the

trigonometrical survey I have attempted here, and although it is not to be compared with the celebrated scientific operations of the same description, carried on under more favorable circumstances, it is nevertheless sufficiently correct for all the purposes for which the (general) survey of this country is required.' * Indeed, Sir THOMAS MITCHELL attributed all the advance of this Colony since 1827, and more especially its most rapid advance in public works and complete measurement of farms, which characterises its history between 1827 and 1837, to the general survey commanded by the Royal Instructions of 1825.

Some notice must now be taken of the authority vested in the Surveyor-General at the period we are considering. Royal Instructions had been issued in 1825 to Governor DARLING, directing the appointment of three discreet and skilful persons to be Commissioners for the Survey and Valuation of tho Waste and Ungranted Lands of the Colony, and for their Division into Counties. The Chief Commissioner was to be the Surveyor-General for the time being, and, though long before the days of

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* See Appendix *b*, *c*.

'Free Selection,' in the modern acceptation of the phrase, it is not unlikely that a mature experience of its kind had dictated the insertion of the clause for adjustment of differences of opinion :—'You shall suspend the ultimate decision upon any such question until you shall have transmitted to Us, through one of Our principal Secretaries of State, a full statement and explanation of the question in discussion, and until you shall have received Our instructions for your guidance therein.' This would seem to have been a prudent provision, that while the power of the Surveyor-General was established as a desirable counterpoise, it should never be allowed the semblance of a factious opposition.

Having to determine the Western boundaries of the County of Argyle, Major Mitchell made his first excursion to 'the interior' in May 1828; and calling upon Mr. Oxley at his residence near Berrima, that gentleman, only a few days before his death, impressed upon his deputy the necessity of always looking to the Royal Instructions as his main support in the performance of what might prove disagreeable duties. Perhaps in conversing on the affairs of his department, Mr. Oxley fore-

saw the trouble that was impending, and that the Major, whose natural character and military habits little disposed him to yield, might be too unbending in his capacity of Chief Commissioner.

Be this as it may, soon after, in 1830, Major MITCHELL was informed by the Colonial Secretary that the office of Commissioners had ceased; and in 1833 a despatch was received from the Secretary of State for the Colonies, the Honorable Mr. STANLEY (now Lord DERBY) declaring '*The King's surprise and disappointment*' at the little apparent progress made in the Survey of the Colony, and in which the immediate location of the lands has been interfered with by the time devoted to a trigonometrical survey which it was evident was inferior in point of urgency to it.

Such a charge, *so* expressed, deeply stung Major MITCHELL who promptly and successfully met it by sending home his three sheet map dedicated to Mr. STANLEY, which arrived during the Secretaryship of Lord GLENELG who wrote a despatch highly approving of the Survey. But a wounded feeling remained to be healed (if it ever were completely so) and a spirited representation at a later period that 'the service of the Government should

not be a state of punishments without rewards,' probably quickened a bestowal of the well-earned distinction of knighthood.

Thus after many difficulties (the greatest *that*, as Stephenson said, of 'engineering *men*,') Sir THOMAS MITCHELL honorably attained another stage in his career and commenced a new era in the Survey Department by establishing a most useful map, founded neither on such route as those already noticed nor on the geodesic one implied by such vague terms as 'proper survey,' or 'trigonometrical survey as usually so understood,' and on which it is but fair to say Mr. STANLEY had been led to think his time had been misspent. It is true that in its compilation he had determined most of his points by construction, and fixed many of his lines by two sides and the included angle as convenience dictated. But such cases fall within rules of which there is no monopoly, and having taken every independent means of checking his work we may be disposed to concur with an eminent writer, who sums up an encomium on the official service of Major MITCHELL in these few but emphatic words:—'He has completed the first Trigonometrical Survey made of a British Colony.'

It is not the object here to give a list of Sir Thomas Mitchell's services apart from the subject of our title, * yet the topic of route surveys requires some notice of his explorations in the interior. More than one opulent man in the Colony of Victoria calls to grateful recollection the attractive pages that first lured him to the shores of 'Australia Felix'; and many others will yet live to dwell more at leisure on the picturesque and faithful descriptions that the pencil of the author so beautifully illustrated in his 'Tropical Australia,' published in 1848, and in which he first made known some of the choicest parts of the now flourishing Colony of Queensland.

Over this extreme range of about 17 degrees and centreing on Fort Bourke, were laid down *chained* routes, connected with the territorial survey and with the prominent features that were noted in the several journeys. No available means were neglected to make their delineation premanently useful; and to this day, explorers have little difficulty in finding the camps of 'the

* Even a short notice of those of old Officers of the Department had to be abandoned.

Major,' which are still welcome starting points, or as the French perhaps better phrase it, of *points de rèpere.* These facts testify to progresses more Roman in their character than indicated by Camp numerals that sometimes only figure upon paper.

In the expedition of 1845—46, eleven hundred and fifty miles were measured, and on recrossing his former path, on his return, Sir THOMAS MITCHELL was enabled to verify, by the situation of Mount Riddell, his previous surveys in 1831, which gave to that hill the same latitude, and but a small difference in longitude.

To those who, acknowledging the great results accomplished, may have a glimmering recollection that it was said 'he bore down difficulties by the strength of his equipment,' it is enough to notice, that the total cost of this last great expedition, extending over a period of more than twelve months, did not exceed fifteen hundred pounds.

If there be one entitled to the name, the only geodesic survey yet commenced in the Southern Hemisphere is thought to have been pursued, if not initiated, by Sir William Denison during his government of Tasmania, and who, from his attainments and professional knowledge as Captain of Engineers, was well qualified for such a work.

As the sister Colonies of Australia are not always well informed of the proceedings of each other, the first evidence of the progress of Sir William that attracted notice here, was an attempt, he is said to have made, to cast his *réseau* or net, across Bass's Straits.

Whether the advances for *concurrence* in such an operation were opened with the courteous salutes that, with or without lively flourishes, heralded the peaceful parade of English and French triangulators on similar occasions, is not known; but whatever they were they failed in their object,

having excited, it is said, feelings, that were far from condusive to philosophic amenity.

In such a case, it is not difficult to guess the impressions left on each side;—on the one a confirmed opinion of the utter insufficiency of mere '*reconnaissance*' surveys;—on the other, an ireful imagination depicting to itself a single barren triangle—a sort of monumental trivet—reposing in the midst of a small island, of which large portions, though cleared of the aborigines, were unpeopled and unsurveyed. *

But in seriously presenting such a picture, injustice would be done to eminent men. We are bound therefore to believe, that on his promotion to the Government of New South Wales, Sir William Denison brought with him no recollections of a fabulous nature, and that it was only a strong sense of duty, supporting active business habits, that instituted an early inquiry into the conduct of the several public offices. The love of science that influenced him, like a predecessor, Sir George Gipps, naturally caused him to take spe-

* See Appendix *d*.

cial interest in Sir THOMAS MITCHELL's department, even though close inspection might seem to confirm any unfavorable prepossessions that had possibly flowed through various channels.

It is to be remarked that Sir WILLIAM DENISON is reputed to have carefully studied every topic of importance connected with the sphere of his future government, and that he arrived in the Colony no novice. It was therefore not a little to the secret edification of a few behind the scenes, when they beheld the new state of things in the Survey Office, and that where Mr. STANLEY had formerly found Sir Thomas *too* trigonometrical, the new inquiry tended to doubt that he had been trigonometrical *at all.*

The episode of '*the King's surprise and disappointment*' had evidently been overlooked until too late. The inconvenience of renewing such a contest at the Colonial Office becoming plainly apparent, a strong desire must have arisen to have the whole question shelved.

It virtually was so by the unexpected death of Sir THOMAS MITCHELL towards the end of the year,

after a somewhat toilsome tour of inspection, on horseback, to Braidwood and the River Clyde. Like a good knight he died in harness, though he might long have retired with honor from the throng.

The event caused a profound and widely spread feeling of regret, but tempered with a reflection of the enduring works that were left. It is enough in this life for each to do his part; if it be only to add something to the general welfare. Whatever may have been their scientific differences, no one evinced a truer sense on the occasion than Sir William Denison, who was foremost in shewing respect to the memory of the departed.

'MATHEMATICAL SCIENCE,' says the marvellous Prince of Mirandola, 'does not bestow wisdom'; and Sir WILLIAM HAMILTON, in his 'Discourses on Philosophy,' observes, that when raised to an object of exclusive study, it even affords the greatest occasions of error.

With the utmost honesty of purpose, a mathematician may go wrong in the application of his favorite science, either in demanding a greater nicety than is consistent with a clear perception of the object in view, in relation to others, or in a vicious management of fractions.

Even in ordinary operations such as those of land-surveying, a want of common sense is sometimes perceptible. The 'Literary and Scientific Register' for 1853 well remarks, 'where it is not very usual to measure a distance nearer than within its thousandth part, or an angle from three to one minute, it is quite a useless labor to aim at greater accuracy in a numerical result. Why, for

example, should the length of a line be computed to the fourth or fifth place of decimals, when it must depend upon another line, whose accuracy cannot be ensured beyond the unit's place? Or why compute an angle to seconds, when the instrument employed does not insure the angle in the data beyond the nearest minute? These simply furnish so many proofs how easy it is for scientific men in their investigations to miss the point of real utility.'

In a geodesic survey, few know the real import of what they ask in proposing to measure—say, a base of five miles * to the *fraction of an inch;* or of the difficulties attendant on a repetition of the measurement after a lapse of time—at the same place, with the same instrument, and even same operators;—not to mention the still greater ones of measuring an equal base at a distant part of the earth, within the same limit of error under altered conditions.

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* About the length of the Hounslow base. That at Lough Milligan was extended by *angular* means two miles longer, with an *apparent*, possible error, on re-measurement not exceeding *two inches*, or 1 : 221,760. *One* in a quarter of a million, however, is no very great result upon *paper* while we find that '*one in a thousand*' is an excellent one on the *ground*.

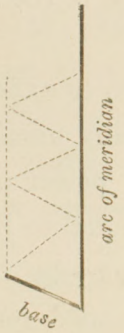
But we will suppose a knowledge of these difficulties, if not the power to cope with them. It must be further admitted that it is not necessary to express a base line of five miles by the number 316,800 (inches) to measure an arc, say of ten degrees, represented by the number 36,000 (seconds) and which can scarcely be determined to unity.

For example, the expression

1000	. angular units
1000	0. linear „

shews that *units* in the angular arc representing *tens* in the linear one, there is no obvious necessity for adding decimals to the latter ?

We may, in further illustration, suppose the arc of the meridian of 600 miles to be measured by an equilateral triangulation from a base of 6 miles.



Here it is manifest that the base will be repeated a hundred times in the arc, and the possible error of deficiency or excess will amount, if reported truly by the triangulation, to x x 100. Why then strive to make it appear that x does not exceed 1 inch or 100 *inches* in the whole, when the angular arc to be measured cannot be verified astronomically to say 100 or 200 *feet?* Common sense tells us that the base, measured to 1 *foot*, would have headed the proper programme, unless, regardless of expense, it were determined to eliminate all possible errors.

But we will presume our base to have been measured to the fraction of an inch, expressed by one or more figures in the decimal:—it by no means follows that our angular means will give corresponding results in the sides of the triangles forming the network of the arc.

It is in vain also to expect any reliable result from the means of any number of observations, unless the telescopic power of the instrument employed be at least equal to its angular one. Thus, in finding the vertex—by intersection of an equilateral triangle founded on a base of five miles,

measured to the 'fraction af an inch,' the optical means must enable us distinctly to peruse the divisions of an inch on a foot-rule, at the distance of the Lighthouse from Sydney. In ordinary surveying, practical men are content to read the comparatively coarse divisions of a foot on a levelling staff, at ten chains or a fortieth of the distance. It may, however, be instructive to consider how we are to find the angular equivalent of the fraction of an inch at five miles, when we have to seek it on a circle of one foot radius (not to say one of three and a half inches), including the dimensions and power of the telescope that such an intsrument should bear.

As no one, with his eyes open, can long persist in trying to make others believe, that he knows or does more than he can, without incurring in some quarter or other an imputation of charlatanism, so the interests of science can afford a frank admission, that the fair exhaustion of every resource of ingenuity in the processes we are treating, is for other objects than the ostensible one, of a sufficient degree of accuracy for the purposes of life.

Three legitimate ones present themselves: First, the proof of what has been done—or can be hoped

for—towards perfection in such a work, though the benefit may not be immediately apparent; second, the margin of improvement left in the construction and management of angular instruments; and third, the establishment of means for detecting any changes in the relative positions of points established, a question of interest to the geodosist and physical geographer.

In this last respect, we are greatly assisted to our purpose by a geodesic survey in connection with the measurement of an arc of the meridian: for, assuming a territorial network to consist of equilateral triangles with sides corresponding in accuracy with a base of five miles measured to 'the fraction of an inch,' on going over the angles we might expect to find them equal also:—yet, on actual observation, we should probably find them vary among themselves, either simply or in groups, and afford us much contemplation in determining instrumental imperfections with errors of observation, reduction, and calculation, on the one hand, and irregularities in the form and density of the earth, on the other; including the unknown allowance to be made for horizontal refraction, which is only called 'extraordinary,' because it seldom comes within the range of our present instruments.

In like manner, we might have commenced by supposing our network equi-angular; experience proving that except by accident, the sides would be anything but equi-multiples of five miles to the fraction of an inch, on actual measurement.

So far, the case may have been put in the simplest point of view; and its profound study in relation to the unsymmetrical spheroid we actually live upon, and triangulate under complicated conditions, is doubtless productive of results that are a gain to science and, remotely, to humanity. But it is delusive and impolitic to permit such a work out of its own province. To offer such a survey is to offer a stone to a hard working man who only asks land to grow bread for his children—when he and his opulent fellow-colonist can be granted their lands and secured in their boundaries by the sufficient means that ought to be quite within the reach of all survey departments.

Again, astronomers, without a shade of the ire proper to celestial minds, may sometimes be insensibly influenced by the national tinge of the glasses that they look through. For instance, to say that continental observers are coming round to the British practice of arriving at as many direct results as possible,* may be a desirable and gratifying fact. But to imply, that the beautiful system of repetition invented by Tobias Mayer, and practically exemplified by Borda in his reflecting circle, employed with such effect in the great survey of France, failed—because it did not act with all

* Mason and Dixon, in the last century, actually measured an arc of the meridian in Pennsylvania, and though triangulators hardly allow place to the result obtained, there was a great advance in accuracy over a similar measurement made in England by Norwood in 1635. Perhaps the time may come when this despised method may excite sufficient interest to be employed again in measuring an arc of 15 or 20 degrees in the flat regions of central Australia, and where if the feat is ever accomplished, of measuring a great arc in which many nations may join, the individual hardships will not require the perseverance, patience and fortitude displayed by those fanatical pilgrims in India, who have been known to take two years in devoutly measuring hundreds of miles to their goal, on the ground, with their naked bodies.

the correctness demanded by theory, is unjust, upon the mere ground that readings in one unbroken arc were not found as superior as they were supposed to be, over the mean of a number of independent observations. But a ready answer as to the practical value presents itself in the undeniable fact, that by the angular work performed with reflecting circles of small diameter, which at this day would be considered coarsely divided, the arc of the meridian was measured in France, that is still quoted as a model of its kind; and when we have frequent mention of the base of verification at Melun, and *not* of that at Romney Marsh, in the English survey, at a fraction of the distance from its primary. Space does not admit of reference to more refined modern measurements in the British surveys, nor does it to those in France, conducted by General Pelet and his colleagues of the Depôt de la Guerre.

But another instance may be given, in consequences arising from these surveys. Whatever emotions were excited by the French Revolution of 1789, the learned men of all civilized countries became fully alive to the great scientific reforms that were speedily initiated; while the national

system of weights and measures, established under the name of the '*Systeme mêtrique*,' drew great attention with, no doubt, much individual approbation. Its basis was not disapproved of in England; but to have referred our standard in any way to the *mêtre*, would have been to have favored a revolutionary emblem. This was the more obvious, when an early consequence of the adoption of the new system was the abolition of all local measures, which were even more numerous than they were with us. We therefore elected—to refer *our* unit of length, to a certain proportion of the length of the pendulum vibrating seconds in the latitude of London; though not disdaining to quote the French Commissioners, that the standard, if lost, might be recovered by the same means that were employed to create it.

But we did not prudently rest here: modern revisions having necessitated some corrections in the data by which the length of the French arc was determined. It was said, that the *mêtre* could no longer be exactly defined, and the superiority of our method was freely implied, whereas the fact was overlooked or blinked, that these corrections did not affect the metre in ordinary use, or in the

'*systeme usuel*,' but simply created for astronomical purposes, a small co-efficient that might be held constant until further notice.

Meanwhile, not only the bases, but the sides of triangles dependent upon them, always remain to be estimated in any linear measure of any nation, and by known proportions, the metre, if lost, can be readily recovered. On the other side, we opened ourselves to a recuperative argument. Having chosen to pass over a standard, dependent upon *space*, to choose one involving a consideration of *time* as well, our adepts seem now to feel, that irregularities in the figure and density of the earth render our *seconds* pendulum no longer available for the *parallel of latitude*, elsewhere than for the *locality*, of London. Perhaps we might have dealt frankly with ourselves, and concluded that commercially, and operatively, it did not much matter. But it seems not: we had measured geodetical bases to the 'fraction of an inch,' and our only refuge was to adopt the recommendation of the Commissioners appointed to inquire into the national weights and measures in 1841, who could devise no better plan, than the recommendation, that a 'proper' number of copies of the several standards be

distributed in convenient depositories throughout the United Kingdom; a proposition unobjectionable of its kind, though just as available in the 'early days' of the long armed King.

It might have been remembered, that if a pendulum beating seconds in London is *local*, *so* is the meridian of Paris; with this disadvantage, if it be one, that the length of the seconds pendulum can be found again, as it was said it could be before, whereas only a portion of the fourth of the great circle passing through the poles in the meridian of Paris could even be triangulated. It must therefore be supposed, that confidence had been lost by us in *any* repetition of the pendulum process, which indeed was very natural, if we felt that two independent Kater Committees (if we may so term them) could not produce standards of length which would separately verify the Lough Milligan base, to the former possible error of two inches in seven miles.

Howsoever they may be established, standards of length in modern times appear to be more than equal to the work they have to do—and in the astronomical data arrived at, not much dependence is to be placed in figures beyond a moderate extent.

The celebrated and indefatigable astronomer De La Jaults states that he had calculated some hundreds of eclipses and scarcely ever used any other than his own logarithmic tables, to five places of figures, contained in a small pocket volume.

Great discrepancies exist between the statements of great authorities, unless they are to be attributed to typographical errors, which will not be an admissable plea when their importance is considered.

Taking an ellipticity of $\frac{1}{300}$, Bessel deduces the equatorial diameter of the Earth to be 41847199·9966 feet * or 7925·606 miles, and

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Considering that more than one clever writer has almost overwhelmed us in trying to explain 'What is a Million,' the effects of a steady contemplation of the above prodigious number must vary on individual minds. Many persons, if not indifferent, would be stupified, others would swell with rising admiration, some would laugh in their sleeves; but they would be wrong. The fair explanation perhaps is that the figures (cyphers?) simply express an arithmetical result, and Mr. Airy's close agreement a similarity of processes. But in the character of a 'significant' result derived from a base of five miles measured to the fraction of an inch, no dependance can be had beyond the first five or six figures: all the rest might be held as naughts.

AIRY agrees with his result to within	200 *feet.*
In round numbers the result	MILES
gives the semi-diameter as.....	3,962
but ARAGO makes it.....	3,989
Difference.....	27

The last mentioned astronomer * takes the ellipticity $\frac{1}{306}$ and, in giving some of the measures, states that they are obtained mathematically from the moon's motion, with much more precision than they can be determined on the ground.

In whatever way these differences may be reconciled, enough of uncertainty exists to render astronomers anxious to institute additional measurements wherever practicable, though, considering the small portion of the globe that is not covered with water, there is not much expectation to be indulged that we shall make any considerable advance in this kind of re-search. Still we must always look forward; and we have been recently informed by no less an authority than the Astronomer Royal of England, that 'It is probable that

* Popular Lectures on Astronomy. Routledge, London.

the province of New South Wales, and the continent of Australia generally, may be the scene of important geodetic and hydrographic operations; either for the purpose of territorial survey of a high order, or for the scientific measures of arcs of meridian and arcs of parallel.'

Much might be written on the absurdity, to say no more, of assigning astronomically determined parallels and meridians, for territorial boundaries, unless for temporary reference.

A notable instance, in Australia, caused the expedition of 1839—40, ordered by Governor Sir George Gipps (R. E.), to *ascertain* the position of the 141st degree of east longitude, being *the boundary line* between New South Wales and South Australia.

This operation was entrusted by his Excellency to a late Admiralty surveyor, Mr. Tyers, assisted by Mr. Townsend of the Survey Department, New South Wales, and was effected as well as could be done with slender means.

Mr. Tyers' line commenced about a mile *west* of the mouth of the river Glenelg, and ended at Chowella, on the river Murray; the report of the

expedition being appended to a despatch sent home, and published in 'Papers respecting New South Wales,' ordered to be printed 1841; it also appeared in the form of a small pamphlet at Sydney.

Since the separation from New South Wales of the Port Phillip or Southern District, and its erection into the Colony of Victoria, there has been a fresh adjustment of the longitude in favor of South Australia. How, and by what authority, it is presumed official documents exist to show, as in the measurement by Mr. TYERS, which, like Portia's leaden casket, may yet yield the best choice that is open in the matter.

Little is to be learnt on this question from maps, scarcely two agreeing. Some give Mr. TYERS' line, others have apparently confounded the south end of his *trial* meridian, run and *marked* for some distance on the *east* side of the mouth of the river Glenelg, with his *adopted* one, about two miles distant, on the *west* side of that river. They therefore slope to Chowella. One of the latest published, gives a boundary that looks like Mr. TYERS' line run in the true meridian till it strikes the Murray *above* Chowella.

Besides these difficulties, other maps leave it open, whether the 141st meridian of east longitude is, or is not, the boundary between the two colonies south of its intersection with the river Glenelg. If not, that river comes 'cranking in' upon South Australian territory, with perhaps no commensurate advantage. While, in the other case, we have the mouth of a river belonging to Victoria, emptying itself into the sea, within the limits of another Colony.

As a practical problem, had the Astronomer Royal himself undertaken the task of solving it chronometrically, he would have been finely set, with the best assistance and appliances, to have certified the 141st meridian to 4 seconds of time, or 1 mile, from the prime meridian of Greenwich. While, had officers of engineers, and even astronomers, been duly consulted, they might, *in absence of natural boundaries*, * have felt it their duty to counsel the rejection of a time meridian, and urge

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* From the confluence of the river Darling with the Murray, though the country is generally flat, there appears to be a natural line of division through Lakes Albacutyd and Hindmarsh to the right bank of the river Glenelg, and so to the sea. Or, if an arbitrary *must* have been taken,

the adoption of a *local* one passing through some well defined geographical point, or at a stated distance from it. Had this been done, the 141st meridian would have been reduced to a convenient expression (if employed at all) to the chagrin of none except those who lay out lines and then fall down and worship them.

In the actual difficulty, the best chronometrical definitions leave not a *line*, but a band or *warp* of lines, forming hundreds of miles of debateable border land, to be fought over by rivals, neighbours, who may be disposed to 'cavil at the ninth part of a hair.' It may even now be a puzzle for 'uninstructed' outsiders to speculate, whether New South Wales, being interested in the prolongation of the 141st meridian north of Chowella, may not, some day, *reclaim the imperial line as originally marked by the* CAPTAIN-GENERAL, and, with her sisters, come to this high complexion.

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regardless of the natural drainage of the country and considerations connected with it, the meridian of Cape Northumberland might have done. But the true north-western boundary of Victoria seems to follow the course of the river Murray to the sea, though this is to digress from the immediate question.

VICT. 'Come, here's the map; shall we divide our right
According to our three-fold order ta'en?

S. AUST. 'See, how this river comes me cranking in.
I'll have the current in this place damm'd up;
And here shall run, in a new channel,
Fairly and evenly?

VICT. 'Yea.
But mark how he bears his course, and runs *me*.'

S. AUST. 'I will not have it altered!

N. S. W. 'Speak it in Welsh!

KING HEN. IV., PART IV., ACT III, SC. I.

In the original determination of the 141st meridian, though it was not *his* expedition, Sir THOMAS MITCHELL had the fairness to admit that the results of some of his observations combined with measurements made by surveyors of his department favored Mr. TYERS' line; which he always refused to reject until sufficient reasons were brought against it. Nevertheless it cannot be said that he adopted it; for, long after, he warned the Government of the danger of leaving the exterior boundaries of the Colony in a loose condition.

In his evidence before the Commissioners of Inquiry, 10th July, 1855, Sir THOMAS MITCHELL

says :—'In obtaining the longitudes that appear upon my map, as laid down by the methods before mentioned, I was content to date from the allowed meridian of Parramatta Observatory, without entering deeply into the question of the so-called absolute position of that line with reference to the meridian of Greenwich. At the time that I undertook the survey of this country, then including that, now called Victoria, there was no necessity for the rigorous determination of longitudes, to serve as lines of boundary between territories in this part of the world—a mode of proceeding more parliamentary than accurate, and which I should regard as altogether ridiculous, were it not pregnant with future mischief. The finest chronometers that ever came to this Colony have given but doubtful results.'

A late article in the '*Riverine Herald*,' coming under notice, while this little work is going through the press, shows the foresight that was exhibited, if we can suppose that the decision of the Captain-General was not really final. Whatever scientific uncertainty attached to the original measurement of part of the 141st meridian, the introduction lately of an additional element

into the question appears to have increased the uncertainty of two or three miles in longitude to more than ten times the quantity.

Yet, in one sense, the permanent adjustment seems current enough. From an early period to the time of Captain Fitzroy, with his twenty or thirty chronometers,* numerous observations must have prompted the statement that the longitude, provisionally adopted, of the Sydney Observatory is true to 4 seconds of time or 1 mile. Other observations for longitude have been made at Melbourne; and from the electric communication between the two capitals, it may be almost taken for granted that the Government Astronomers here and (if any) at Melbourne have long since discharged one of their first duties in determining the difference of their meridians.

Moreover, Proeschel's Map of New South Wales and Victoria indicates that electric telegraphic

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* In 1837, Captain Fitzroy, in an address from the President of the Royal Geographical Society, was publicly complimented on being the first circumnavigator who had carried a complete chronometric chain measurement from East to West round the Globe.

communication extends to the mouth of the river Glenelg. With a trial meridian in connection with the secondary ones above mentioned, a short chained measurement should give the 141st degree of east longitude, and if secondary meridians so far from the prime one be distrusted, the determination could be checked by observations of the moon and moon culminating stars according to two or three methods. That of STRUVE, without saying it is the best for Australia, was practised with great success in Russia, results being confidently given to 2 or 4 seconds of time; that is to half a mile or a mile of longitude. But there is no real need for all this nicety. Having found the sought for meridian, if a joint commission '*make it so*,' *then* would commence the duty of surveyors with sufficient knowledge of practical astronomy, to run the line to any convenient extent.

There remains another peaceful resource. A clause, it is believed, in the Constitution Acts of the several Australian Colonies, gives the power of adjusting inter-colonial boundaries. Will the Colonies interested in the case under notice, liberally agree, at this early stage of their existence, to return to the course that common sense at first

recommended, so soon as a sufficient knowledge of geographical features enabled them to adopt it ?

Though it is doubtful how far a surveyor may spare time for the culture of the natural sciences, attention to the subject of geographical nomenclature falls quite within his province, so far as intelligence and discernment should prevent the introductions of barbarisms on his plans.

In this Colony we have :—

1. Indigenous or ‘ native ’ names.
2. Those given by colonists of all classes and countries.
3. A particular set by coasters and fishermen.
4. Those bestowed by maritime surveyors, who believe themselves privileged to fill up all blanks left by Captain Cook.
5. Others by land surveyors who in the excercise of their own inventive faculty, or in their adoption of current names, often increase the confusion.
6. Some by men in authority, who are fond of calling places after their own names or those of their friends.

For want of any effective attempt to reduce these names to sound standards, they become more and more sophisticated, and render the compilations of correct and instructive 'Gazetteers' a matter of impossibility at present, in the present point of view. This, however, helps to prove, if it were requisite, that it is better to return to propriety than to wander further from it, though the step may have its difficulties. Something may be expected in time, from the better education of the people; but then only from a better hope of adherence to that which belongs as a specialty to a department of government. Already, members of the survey department have been instructed to adopt the native names of localities where elegible, but in all cases where artificial features have to be named, there can be no objection, but the contrary, to the employment of our own familiar appellations. No one wishes the names of 'Sydney,' or 'Pitt Street,' or 'George Street' to be altered. But one might demur to divisions of Australia named after the Muses, or, in the minor nomenclature of townships, to endless 'Milk,' 'Bread' and 'Butter' Streets, and similar series of names, which it is to be hoped, future Corporations will deal mercilessly with; it would in such cases save public time and

foster local attachment, if the wishes of the neighbourhood were consulted, without countenancing those capricious changes, that, on returning after long absence, often render it difficult to recognise the place of one's birth. Corporations too need little encouragement in their favourite pursuit of numbering and re-numbering streets.

A small volume of scraps might have been collected of the strange, and even repulsive, medleys of local names that have been given us in the course of years past, in the public press of this and the neighbouring colonies, and in works relating to them, as evidence of complaints, humourous or otherwise, that occasionally come to the surface. There is a considerable fund of information to be collected on this subject.

The Rev. Dr. Lang (whom nothing seems to escape in his multifarious labors) draws attention in one of his letters, to the odd name of 'Collector,' a post town on the south-western border of the County of Argyle. The name is evidently coupled with queer recollections of the 'customs,' for some people with a sort of dubious affection call it '*The old* Collector'! This place is really the

'Colegdar' of Major MITCHELL and the Coleictar of Captain P. P. KING; and if some resident would take the trouble before it is too late, the name will be found, most probably, descriptive of the locality, as we generally find in the names given by primitive races. As Ulladulla is no longer Holy Dollar, or 'Bodalla, Boat Alley' we may live to see *Collector* erased from the Post Office Directory. Having instanced a denaturalized native name, another of an opposite character is presented in 'Gabo Island,' well known from the Lighthouse erected on it. It is off the promontory, at the S. E. extremity of the Colony, called 'Cape Howe'; and, as is often the case where two languages are spoken, an aboriginal would be almost sure to give a '*white* fellow' the name 'belonging to *him*,'— that is, according to his own pronunciation in this case, '*Gabe Ho*.' So Gabo it is, and likely to remain to the end of the chapter; we even expect, in course of time, to hear of a *Cape* Gabo.

One more name may be adduced in favor of a work that is being performed in old countries,* and,

* In Ireland, ignorance and carelessness in the rendering of Celtic names greatly increased the prolixity of deeds by the introduction of endless aliases. The Ordnance Surveys have done much to remedy the evil.

to a certain extent, may be in this, when men take pleasure in that which is 'racy of the soil' as they ought to be acquainted with it.

There lies in Port Jackson an island known to the early authorities as 'Rock Island' or the 'Rocky Island,' perhaps from an overhanging rock at the south-western corner, as appears in an old pencil sketch. This island, given as one of the marks for anchoring in Neutral Harbour, was a convenient place of confinement for refractory prisoners at a period when the confusion incidental to the formation of a new settlement in the woods, and the untrusty characters of many of the public guardians, rendered it difficult to control a large body of men. So we are not at all surprised to find in Collins, a notice, of a prisoner having been placed there for a week on bread and water; this instance, or like ones, being probably the origin of a by-name, never once mentioned by writers of that period, though since made to rhyme with 'inch by inch cut,' in allusion to the process to which the island was afterwards subjected. It is believed that many years ago, long before the days of Admiral Fitzroy, a proposal was made to erect a 'Temple of the

Winds' on this once picturesque little island,* to shelter an observer furnished with a barometer and other apparatus, including signals to be hoisted for the warning of small craft in the harbour, on the approach of southerly 'bursters,' or on any portentous indications of a change in the weather. But previous to the erection of a costly, and as it seemed at the time, most important defence, the island had almost bodily disappeared and in its mutilated condition was made the subject of a sketch by the unfortunate, but accomplished W. A. Miles who wrote underneath :—

ISLAND CALLED BY CIVILIZED MAN, PINCH-GUT;
BUT BY THE UNTUTORED SAVAGE, MATTE-WAN-YE.

Twenty-eight years ago, a paper, entitled 'Considerations on the Political Geography and Geographical Nomenclature of Australia,' by Captain Vetch, Royal Engineers F. R. S., appeared in the 'Geographical Journal'; though it possesses little interest at this day, the title indicates a branch of inquiry

* The islands named 'Clarke,' 'Shark,' and 'Garden' are becoming rapidly denuded of their verdure, and when pleasure-seekers have reduced these woody spots to masses of barren rock, we may begin to speak of the *once* beautiful harbour of Port Jackson. It is depressing to reflect that people cannot learn or be made sensible, that there is only one kind of liberty worth having—*half* liberty, the liberty of acting well.

that is now much more followed. Those who wish to study it, cannot do better as a beginning, than read 'Words or Places' by the Rev. Isaac Taylor; on those who are so dull as to look upon mountains as obstructions, and are not 'familiar with forgotten years,' * or on those who think that '*Brummagem*' is as good as any other form of a well-known name, the subject is ill bestowed. But to some it is different—and the work mentioned, with kindred ones, may well form part of the technical library of a survey office.

The language of Mathematics is by no means as precise as it might be, in the expression of ideas, which, though sharp enough in themselves, sometimes become hazy through the medium of the terms that are employed, especially when the same ones are used by neighbouring nations in a different technical sense. This difficulty is met at the very outset in elementary arithmetic. We ought perhaps to say cyphers, and zeros or naughts, like the French '*chiffres et zéros*'; whereas in many of our treatises we are gravely told, that the art of cyphering derives its name from the manage-

* Wordsworth.

ment of the cyphers or *naughts* in conjunction with the *significant* figures; a *cypher* being a common expression for a man who makes no *figure*, a word used by the French and ourselves in other senses.

The same difficulty encounters us again in the following case :—

Geometry or earth measuring, is a useful art that preceded the embodiment of the principles on which it depends, and to which, in a wider sense, the term is now restricted. In English, a measurer of land is called a land-surveyor; in French, *arpenteur* : yet it France, the *arpenteurs* employed on the government surveys, are known by the more pretentious name of *géomètres*; a word that in an English ear sounds like geometrician, one who cultivates the *science* of geometry.

At a comparatively modern period, it has been found convenient to introduce the word geodesy. Geodesy signifies properly the measurement of land, that is, the art of land-surveying. The signification of this word has been extended to operations intended to make known the respective posi-

tions and distances of different points on the surface of the globe. Thus the operations which serve to determine the length of terrestial degrees, and those by which are established the main plot of geographical maps, are geodesic operations.*

Though there is no need to employ this word for the minor operations, it is so by some; for the Deputy Surveyor-General, Mr. ADAMS, in his late report, shows that in the neighbouring Colony of Victoria, they speak of a trigonometric and geodetic survey, using the word geodetic in a subordinate sense, when it is really the more comprehensive of the two.

It is now generally understood, or ought to be, that the term geodesic, or geodetic, is strictly limited to that higher and exhaustive kind of triangulation which is *solely* undertaken to measure an arc of meridian or parallel, and is extended no further in the particular region, than may be desirable to obtain data for determining the dimensions and form of the earth.

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* Memorial Topographique et Militaire.

It is true a high authority says, 'few bases have ever been measured solely for the determination of the value of an arc of the meridian, or of a parallel, but have formed at the same time the foundations of the survey of a country.'

The same authority (Colonel FROME of the Royal Engineers), in giving an account of 'geodesical operations connected with a trigonometrical survey' (that is with an ordinary territorial triangulation) observes, that the measurement of an arc of the meridian is perhaps the most difficult and the *most* important of geodesical operations.

The measurement in France by M. M. Mechain and Delambre of an arc of the meridian towards the end of last century, was instituted for the double object of determining the figure of the earth and some certain standard that might be for ever recognised by all nations as the unit of measurement. It was not in the progress of the necessary triangulation that the idea occurred, of connecting with it the observations made in the construction of Cassini's great national map of France; and it was not until a later period, that measures taken to connect the Observatories of London and Paris led

to the commencement of the Ordnance Map of England, since expanded into the Ordnance Survey of the British Isles.

Having begun with the '*more* important' (scientific) considerations, it was allowable, of course, to append financially and operatively, the '*less* (*?*) important' details, producing what is called a 'correct,' or 'proper,' trigonometrical survey.

In our conduct of such a one, the rule ever enjoined (and a very good rule it is) tells us, always to proceed from *whole* to *part;* though whether this means, always from the *more* important to the *less* so, remains to be examined.

It is allowed that a geodesic survey, in its severe guise of a 'correct trigonometrical survey' is the most complete that can be made, if it be sufficiently comprehensive and accurate in detail.

Being worthy of the reputation of a great nation, much interest would be displayed by all engaged until the primary, or perhaps the secondary, triangulation were completed, when the astronomers and their scientific friends would probably make

their bow, that is—take their leave, as would the officers of engineers of any standing, before the minor triangulation, not to say 'interior filling in,' or insertion of details, which in the south of England was mostly effected with the Kater's or prismatic compass, a convenient little instrument, which we are assured, however, should never be trusted in any *more important* part of the work.

From this point of view, we can endeavour to imagine the pride felt by The Corps in asserting, that the distance between a cottage at the Land's End in England, and one at John O'Groats' in Scotland, could probably be determined by their work to within a few yards.

Yet, looking with the eyes of a proprietor at the Land's End, this is pre-cise-ly the result that least concerns him, though the difference of a few feet or even inches between himself and a neighbour, might be the cause of anxiety to them both. But secured in his boundaries by a good local plan, and setting out on a tour to John O'Groats, it would be a matter of profound indifference to him, whether, in a distance of a few hundred miles, he was a mile more or less from the end of his journey.

Even in his own county of Cornwall, the seven miles of longitude before noticed, might little disturb him, save as it affected the average of wrecks upon his coast. In other respects, being well compacted with his neighbours in their own parish or municipality, he would be as little jostled or incommoded as the occupants of the several cabins of a ship would be, if they suddenly became apprised of an error of some miles in the latitude, when a degree more or less would make little difference.

In the Townland Survey of Ireland, executed upon the scale of six inches to a mile, or 1:10560, there was a marked improvement in laying down the interim details, in which 'sketching' was *almost* entirely superseded by chain measurement—as a proximate result this survey was made the basis of a general valuation of Ireland. Nevertheless for close statistical computation it is not equal, nor could it be expected to be for the cost, to good private surveys. The field work will not bear plotting on a larger scale, and the contents of some of the smaller inclosures cannot be estimated nearer than one-tenth of their area. Yet as we approach the *unit* of extent, the townland, the results become very accurate.

As for the English survey, it so little fulfilled some of the uses of a topographical map, that it was stated in the House of Commons, to bear no comparison with the Tithe commutation survey, that had to be undertaken under the able direction of Captain Dawson, R. E., in consequence of its deficiences.

Here, at last, we might expect the superior 'filling in,' for which the minor triangulation is always supposed to be ready. False economy, or poverty, may have left the panes of our lattice nearly vacant, but the frame is always there to receive the proper glass?

Nothing of the kind!—if we are to credit Mr. Baker, who tells us in pages 58-59 of his excellent little work on Surveying published in Weale's Serials, that even the '*six fundamental lines*' adopted by the Tithe Commissioners were not adhered to in all cases.

Mr. Baker gives an instance of a Parish Survey of his own 'setting aside the *universal* method put forth by the Tithe Commission authorities, who, however, did not insist on their methods being

adhered to, as they approved of the author's maps as of the first-class where their method was not adopted. But such was the obsequiousness, or ignorance, of the great majority of surveyors that, even in such incongruous cases as the one referred to, they persevered in the Tithe office rule, in some cases by joining together two, three or four trapeziums with their diagonals, and sometimes by making the surveys after their own methods, and then drawing on their maps, the system or groups of the systems in question, and making a field book to correspond thereto; they were thus at liberty to project lines in any direction they chose, without the trouble of measuring them; and many have exultingly confessed they did so, after their map had received the seal of the Tithe Commissioners; but how far (Mr. Baker gravely adds) 'such behaviour is to be commended, I leave the reader to judge.'

These persons, if not *éclairé* in the sense of M. Gence, as we shall see by and by, were certainly '*wide awake*' in their own. It is, however, fair to observe, that the general character of these surveys were remarkable for their correctness, and that the ordnance surveys which they supplemented, have

proved invaluable for purposes of internal communication.

The Tithe Parish Surveys, though some of them had base lines of ten miles in length, were in fact nothing more than improved estate surveys—and this enlightens us, how our fore-fathers managed to exist even before the 'Augustan age' of Queen Elizabeth, and long before the existence of County Maps with errors of three miles in twenty.

It may also be seen that there are moral considerations, not to be overlooked in the choice of agents under the very best devised system, and when, in colonial practice, surveyors *mete* * out lands as well as measure them.

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* 'Good measure and running over,' but not in the scriptural sense (Luke 6, 38). *Twenty links (or one-fifth) added to a chain with occasional slips,* effected wonders as some of the old estates will show.

The Scales now adopted by the ordnance authorities, and the details of their work comprising the 'interior filling in,' and the *minor triangulation*, are nearly all that can be desired; the degree of accuracy being limited to a question of cost, which has always been a stumbling block to the public. But this state has only been reached after many difficulties, including the often renewed 'Battle of the Scales,' which, like the renowned railway 'Battle of the Guages,' was for a long time severely contested.

In a scientific point of view, the art of Geodesy seems to have nearly reached its limits—at least in the mathematical knowledge required, as evidenced by the noble and almost exhaustive text book left to us by Puissant, and in a few other works scarcely less celebrated.

In practice, improvements will always take place, for instance M. Beuvieù in the 'Annales

forestières' for 1843, points out a new method of auxiliary triangulation, which is far preferable to the old one. In many cases—and in which we need not trouble ourselves about the triangles being well cmopacted—or rather we need not think about it at all, provided the points observed upon, are well fixed. The graphic mode of obtaining positions, by observation on three or more known points best situated for the purpose, without reference to the symmetrical system that cannot be established in new countries of which there are no maps—has been formed with advantage by Sir Thomas Mitchell in this Colony; and in America, on the western coast, amidst the country formerly traversed in his explorations by the gallant and scientific Fremont.

In modes of procedure, also, we are no longer bound to formal systems. These are no longer the days, when men in three cornered hats, square cut coats and high quartered shoes, stepped gravely forth, cane and snuff-box in hand, to direct a tedious process of triangulation across a kingdom, from a base to a base verification.

In the modern re-vision of the great territorial survey of France, it is believed that no less than

seven bases were employed and made the foundations of as many systems mutually proving each other. It has been found also, that the triangulation may precede the measurement of a base and its proportions be calculated from any assumed one. Moreover as a triangulation need never be repeated, when correctly done, according to a well *defined* degree of conventional accuracy, so the points belonging to it can be chosen and *recovered* independently of it.

Many years since, the destruction by tourists * of a cairn on the Coast of Scotland, was said to have cost the nation two thousand pounds for re-establishing the point it marked. This unfortunate event afforded excellent practice for officers of engineers, and there was a triumphant closure of work on one occasion, which, though after going all round the east coast, agreed to *eighteen inches*. It may be doubted whether, if the point belong to a primary triangulation, it would be likely to be

* Doubtless quite as mischievous as those, who have not left a vestige of the cairn, erected on George's Head in the harbour for Sir THOMAS MITCHELL by his son MURRAY and ALISTER M'LEAN of the Survey Department. Both died young. Both died deeply lamented. But the latter lived to be Surveyor-General.

recovered more nearly than to 5 or 10 feet by the original process, while it ought to have been promptly and easily so, to a foot or two, by measurements referred to it, or, in their absence, by the aid of local bench marks, at the fiftieth part of the expense named.

A geodesic survey, when employed as the basis of a territorial triangulation or not, should be rigidly confined to its own character. The slightest strains in the *reseau* or net work, would rapidly reduce it to an inferior rank; and as there is nothing perfect in this world, it is to be feared that some of the results we most plume ourselves on, will not bear a very close scrutiny.

The President of the Royal Geographical Society of London, in the anniversary address of May 27, 1839, thus expresses himself respecting the great survey of India :—

'Portions of this survey of India present instances of accuracy which are highly gratifying. Lieutenant Shortreed's survey, in several lines and points, falls in with the trigonometrical survey of the western coast by Major Jervis, depending upon

a distinct base line of 31,003 feet (10,334·3 yards) near Cushina, measured with iron rods 20 feet in length, by that officer and Captain Robinson of the Indian Navy.'

'The approximation of the results proceeding from two such distinct sources is surprisingly great, so much so that I cannot deny myself the gratification of quoting the following points from the official register of these operations.'

(Here follows a table of seven campared points.)

'Taking into consideration the nature of the country in which this work has been carried on, it must be admitted that the comparison of these results is highly satisfactory, as in two instances they agree within 12 and 18 inches respectively in distances of 14 and 18 miles: thus affording a gratifying proof of the attention of the officers who conducted the duties of the survey, and the correctness of the processes employed by them.

These two instances are as follows :—

	Shortreed Feet.	△	Jervis Feet.	Diff. △ Inches.
'Dhunvee to Salira	58,253·37	—92—	58,241·54	6 12'
'Mera to Lighthouse	143,723·75	—87—	143,742·5	66 18'

The differences of 12 and 18 *inches* in 14 and 18 *miles* are certainly four or five times greater than would be consistently approved of by those who work only with bases measured to the fraction of an inch, that is to 1 in 250,000 or 500,000 of unity. But, admitting these to be good results, what, must we imagine, would have been the dismay of the excellent president, had he discovered that his table should have given him *feet* instead of *inches*; yet there *is* a difference of nearly 12 *feet* in a distance of 11 miles in one case, and of nearly 19 *feet* in a distance of 20 miles in the other. This far transgresses geodesic limits; and the possible error of 1 in 5,000, though it may be small for the sides of a topographical triangulation, evidently shows, that the survey it belongs to, had better not depend upon arcs of the meridian, or bases of five or more miles measured to the fraction of an inch, to give it a ' proper ' character.

On instituting surveys in new countries, it seems inevitable that one must begin at the beginning, that is—one must obey the most pressing calls in an economic sense, especially when we have to explore our territory before we can seize it trigonometrically, that is to say in a permanent manner.

In this work, and in the laying out of farms, the compass has always proved an invaluable instrument despite all the objections urged against it.

Sir George Gipps, in a speech to the Legislative Council of New South Wales, in 1842, stated that 'nothing could be more unscientific than the manner in which surveys had hitherto been made; they were all made by compass, and not by theodolite, and it must be well known that everywhere there was a variation of the compass, and that variation itself varied in time.'

Sir Thomas Mitchell informs us, that His Excellency actually 'sent to England for a num-

ber of theodolites, which he opened at Government House, and was disposed to insist upon the use of, by survey upon the back angle principle; but when he considered the woody character of the country, and the convenience of the Magnet, he gave up the point, and said he was convinced of its utility.'

Even at the present day, in France, the very fount of geodesy, an important class of surveyors (*arpenteurs forestiers*) use the compass in their measurements of the valuable and extensive forest domains. M. Gence who has written perhaps the only special work that exists on practical surveying with the compass, speaks highly of its use in woody countries, points out that errors often arise from the ignorance, carelessness, or haste of the operator and not from the defects of the instrument, and states that, with a good compass, a surveyor who is intelligent and scrupulous (*éclairé et consciencieux*) may obtain as good results, not to say better, than with any other instrument.

In New South Wales there are greater difficulties in surveying with the compass, owing to different causes; one being local attraction, which is very baffling in some places. Still with due pre-

cautions, this method will always recommend itself in laying out new 'grants' and other work in the wild and broken 'bush.'

In many parts of the country, in running lines, the poor surveying 'devil' ought like Milton's Fiend

> O'er bog, or steep, through strait, rough, dense, or rare,
> With head, hands, wings, or feet pursue his way,
> And swim, or sink, or wade, or creep, or fly :—

and it is but a just tribute to a talented unassuming artist, ANGELO TORNAGHI, of this city, to mention that some day, it is understood, his atelier will produce a modification of the transit theodolite, in which both the solar and the magnetic meridians will be available, for comparison with each other or for working with separately. In this sunny clime the advantage may be great, should experience pronounce favorably. But delicate and complicated instruments are as bad in their way as geodetic surveys are in others. An excellent form of circumferenter first made by Mr. TORNAGHI for a gentleman of the survey department, is, it is believed, much approved of, and getting into general use throughout this and the neighbouring Colonies.

There is nothing like the circumferenter for general rough work, and it is a pity that surveyors will not take the trouble, of acquiring in a few days, the slight knowledge of practical astronomy that would enable them to find the actual variation of their needle, instead of ignorantly or indolently sticking to the traditional '*about* 10 *degrees easterly*.'

Sir THOMAS MITCHELL never could have hoped any practical good from his department, unless he had taken materials as he found them, including the 900 plans employed in the construction of his 'Three Sheet Map.' In compiling these, he had to assume that each he adopted gave *a trace* of a line of survey, irrespective of its magnetic position, and that it was sufficient to adjust these lines in relation to the true meridian, by his trigonometrical survey, avoiding details that these plans did not furnish, and which, on the scale of his map, might have been scarcely appreciable.

To attempt to refine the use of the compass, under an improved system, in the present day, would be, in many cases, to encounter the host of difficulties pointed out by Mr. ADAMS; a consideration of them plainly showing that some of the

corrections, if known, would require the aid of a magnetic chart, founded on a better survey than the one it was intended to make. Unless a surveyor had the power of knowing at each moment his actual variation taken in one quantity, he must be conscious that his needle agitated with every passing influence, produces lines more unstable in their curves than the ripples on a sandy shore.

Yet a surveyor, while disclaiming to be meteorologist, is quite justified in believing that an 'enlightened and scrupulous' observer may do a great deal with the compass. There are innumerable cases in which it can be used with advantage, when simplicity and rapidity of action are more desirable than great correctness. Thus (without pretending to assign any limit) when areas are allowable with 1 or 2 per cent. of error, lines need not be measured nearer than 1 in 200 or 100 *; nor magnetic bearings be sought to 3 minutes when a $\frac{1}{4}$ or $\frac{1}{2}$ of a degree fulfils the conditions, in stations of a moderate length.

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* In the evidence taken before the Commissioners of Inquiry, mention was made of errors sometimes to 5 per cent. ; but nothing of the '*good measuring, running over*' of a former page.

In all compass surveys, it is politic to establish a system of independent checks in fixing the corners of grants and principal points of traverses, by means of short lines from starting points, quite apart from the lines of the survey and usual marks; and as the corners of grants determine the rectilineal figures, no dependence should be placed on marked-tree lines, or fences replacing them, beyond their being general guides to the true direction, which should be described from *point* to *point*—so much more or less, in bearing and distance, as is done at present—and subject to future alignment, which should be no greater hardship than it is in the streets of towns where land is much more valuable. Actual encroachment of one grant on another, is a question of proprietorship that ought to be dealt with in the 'Lands Titles Office' without much difficulty.

One of the evils complained of in the present system of surveying, is the creation of 'overlaps,' attributed to the process of adding patch to patch, without the preliminary of a 'proper trigonometrical survey' and against which (we have seen how ineffectually in one instance) the minor triangulation is supposed to be a preventive. But too

much may be made of this; for in the compilation of County or Parish maps, where there are numerous isolated surveys, there is not much fear of overlaps up to a certain stage of progress. When they occur they are often only on paper, owing to errors in the length, and bearings of the section lines. Indeed it cannot be seen how they can happen upon the ground where there are sufficient marks to guide the surveyor, and regard is had to priority of survey. In actual practice this appears to be only a case of finding greater or less space than had been expected. A more serious source of errors of this kind would arise from delay in 'charting' surveys already made, and when the roughest pencil entry might prevent encroachment on apparently vacant land by surveyors who may be dependent on imperfect tracings. Nevertheless, much cannot be expected from 'charts' that assume one magnetic meridian for all surveys. It certainly does occur to mind among the ordinary difficulties that may be avoided or much lessened, one is that arising from the difference of compasses, without reference to the secular variation.* A surveyor following close

* Called 'proper' error, which is 'instrumental' or 'personal' as the term is applied.

upon the tracks of another, often observes this, and of late years a remedy has been attempted, in requiring a strict adjustment of surveyors' needles by a standard one in the Survey Office. But these needles rarely remain long in accordance with the standard: many, after they have been in use, alter considerably, as they will do, even in a state of rest; and this need be no matter of disappointment except to the meteorologist who is looking to the construction of a magnetic chart.* So long as he has a good, sensitive needle, a surveyor may be almost indifferent whether it agrees with that of another surveyor, or not. Being able, which he should be, to give the actual variation of the magnetic meridian of his own surveys, no difficulty should present itself in working to any other magnetic meridian, as he ought to do in adding new sections to old ones, and which he must, if it be

* If there existed an ordnance map on a sufficiently large scale to enable him to do so, would a meteorologist propose to make his lines of magnetic curvature so close as to shew the influence of every little patch of ferruginous sandstone in the County of Cumberland? If so, he would require endless thermometric *appliquées*. Some of the iron-stones, when strongly heated, make the needle 'fly again.' There is a great interest nevertheless existing on this subject, but what we want at present are *geological maps*, for the formation of which, that proposed in these pages should be sufficient.

intended to preserve the parallelism of the lines among themselves. Practically, many surveyors accomplish this by taking the bearing of one or other of the old lines. A better method is to take the bearing between two marked natural points which are, or used to be, introduced into the work, by many surveyors, to assist future compilation, though neglecting in most cases to note the hour of the day. Simply for this comparison, it is only necessary that the points should be well chosen. It is of no consequence that they should lie in the true meridian, or that one should be in the exact locality, provided it be within a reasonable distance of it. Nor is there any magic in arriving at the cardinal points. What is required, is, that the side-lines of the sections should be perpendicular to the general direction of the road or leading feature, as it is as easy and more precise to say North 40 W. than North-Westerly. Every competent surveyor, when it is left to his discretion, should be able to deal with these questions, and as a man of fair education, to introduce into his work all notices of the country he passes through, that may reasonably be claimed for the public information, 'knowledge is no burden'; at the same time, the less discursive in his aims, the more likely a surveyor is,

to succeed in the performance of his immediate duties, which, including the management of his party in the field, are quite enough to employ all his energy.

Notwithstanding what has been said and quoted in favor of the use of the compass in preliminary surveys in new countries, it must be allowed that for minute plans on a large scale, serving for permanent reference in question of property, and for the construction of County and Municipal maps, other modes should be adopted at an early opportunity.

When any part of the country becomes sufficiently opened by proclaimed and *cleared* roads, and the necessity arises in the progress of settlement, polygonal traverses, or 'surrounds,' should be made with the theodolite over circuits of convenient extent, and with reference to the true meridian, as well as to the angle the sides form among themselves. In the course of such surveys, the corners of grants could be easily fixed, and their distances from each other be computed without actually remeasuring the sectional lines, thus 'taken out of winding' and ready to test and be tested in the course of private surveys.

This method seems to present many advantages :—

1. The lines, being measured along roads, would be economised to the full extent, being the natural building lines of the Colony, out of townships, and so frequently referred to; for the increase of population would create a constantly augmenting number of milestones, boundary marks, public buildings and other artificial points for use.

2. Besides the usual proofs of the closure of a polygon, a connecting line to a suitable point within the figure (though not necessarily in the centre) at once converts it unto a group of triangles having a common vertex in that point, presenting a number of rays, one or more of which may be measured as an additional proof of the work; and others be made available in future surveys, as the land becomes clearer.

3. The exterior sides or bases of these triangles being made common to adjoining groups, there is not only an additional proof of the correctness of the survey, but overlaps are rendered impossible, each group being as compacted in itself as we have already imagined in the case of the Cornishman

and his neighbours, and as we may believe the City of Sydney to be now within the limits of its trigonometrical survey.

4. Such a survey carries its own bases and triangulation; for the distances between vertices, and the angles formed by any three of them can be readily calculated, and, under favorable circumstances, verified by direct measurement.

5. When the vertices are formed by conspicuous natural or artificial summits, then there is every advantage in choosing among them for a more or less close triangulation with or without an independent base.

6. It can be carried on simultaneously in every part of the Colony, without the primary triangulation that may follow it, when there is a better knowledge of natural points.

The parish surveys of the Tithe Commissioners in England were an extensive kind of estate surveys, and executed with the chain in measurements connected with base lines, some of them ten miles in length. This, the comparatively flat, clear

nature of the country permitted; but most parts of New South Wales would not favor such a mode of survey, nor ordnance 'chain' measurements between minor trigonometrical points, supposing they could be established.

It would be the same with the American system of surveying which is an admirable one and very eligible when we have hundreds or thousands of square miles of flat, fertile, well watered land to cut up into blocks, which in group do not sometimes close within *half a mile.* Those skilled in this system would no doubt do excellent work here, where the country is worth it and favorable to it. But they would require a clear field or *tabula rasa,* the normal scheme of survey peculiar to the Colony, rejecting artificial lines except for temporary use, or the alienation of lands over isolated areas.*

In county maps we appear to arrive at the useful limit of extent required in the combination of topographical details; not that we expect to hang maps of fifteen, twenty feet, or more, on our walls, but to have the power of making extracts

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* See Appendix *a*, *b*.

from any part, on whatever scale may be adopted; and if, on the principle already advocated, the exterior main lines of *each* county common to others in their respective triangulation be observed or computed.

The territorial unit in this country being the 'grant' or 'estate,' the Survey Department should not be held responsible to take up smaller measurements necessary to be noted in the Land Titles Office. If so, four inch maps would answer every reasonable purpose. Measurements to 1 in 1,000 are nearer than are needed or can be expected, in a multitude of cases, but we may assume this proportion as a limit; and as this is one of the exceptional cases in which they bestow more care upon the *frame* than upon the *picture*, triangles with sides true to 1,500 or 2,000 will be adequate to receive the work by that process of fitting, which after all, is only a question of degree between the geodetic and common surveyor. This limitation affords increased facility in the establishment of trigonometrical bases which may be founded on a traverse; for the most carefully rayed bases are nothing more. But with the same labour, and cost of time and money, there can be no objection, if desired, to a greater degree of

accuracy; and when we consider that the curvature of the earth in sixty or seventy miles does not affect a survey 1 in 15,000, or only a few feet in the distance from Sydney to Berrima, we have ample verge within the limits of a plain triangulation apart from the use of treacherous co-efficients, that like the edges of oversharp razors turn on their application to the disappointment of none but inveterate hair splitters.—Calling on memory after a long lapse of years, the writer remembers the glow of pleasure that he felt on reading in his Discourse on Natural Philosophy JOHN HERSCHEL'S remarks on '*cui bono*' people, yet it is well that such people exist. Truth being a crystal that has many sides and a thousand planes of cleavage. Some day or other, the people of New South Wales may desire to be treated to the luxury of an arc of the meridian. It is even now open to commence one with imperial resources for world wide purposes, and to none could the task be more worthily entrusted than to officers of the Royal Engineers. *But to graft such an operation upon any other essentials independently of it, is to invest the whole subject with a parasitical interest unworthy of its merits and of its dignity.*

The efficiency of a Survey Department depends as much upon the intelligent and active administration of its functions as upon the practice of any particular system of survey; and, though not responsible for the land policy of the day, such a department is sure to be embarrassed in a new colony by the struggles of contending interests.

Many years after delay in the measurement of *small farms* had been made one of the grounds of an unmerited censure, a crowd of starving, anxious immigrants beset Government House, Sydney. Perhaps the circumstances were exceptional and not fairly chargeable to the government. Yet, had the Survey Department been admittedly up to its work, it is interesting to conjecture whether anything would have prevented the affecting incident that subsequently inspired the sympathetic—indignant lines :—

THE AUSTRALIAN IMMIGRANTS OF 1843.

1.

'I saw deep woods and mountains high;
I breathed the balmy air;
I saw the plains luxuriant lie;
And blest a land so fair!

Where many fragrant blossoms wild
Regaled the humming bee,
And universal nature smil'd,—
No shelter was for me.'

2.

'I saw the land in idleness
Which might have been a home,
And wandered o'er it till distress
Forbade me more to roam.
Yet not a corner called I mine
Where I might build a nest,—
I have a wife and children nine,—
The infant at the breast.'

3.

'Happy indeed had been my lot
(I can both sow and reap)
Could I have owned a little cot,
Or had the care of sheep.—
But not for me that land so fair
Her rich abundance spread,—
All spoke the language of despair
And would not give us bread.'

4.

'On wife they frowned; on children more:
'Large Family'!—So, again,
We'll brave the wave, and leave the shore
That bloomed for us in vain.'—

For where the slave still digs for gold *
A ship her sails unfurl'd ;—
That family's fate remains untold
It is a damnéd world.†

Deeply thankful should we be, that times are altered. Yet there is another side of the picture that we are bound to look at, though it may not be offered or taken for much. Political economists may agree that while labor and capital should go hand in hand, the nature of circumstances often requires that one should precede the other.

In the magnificent Colony of New South Wales, population in proportion to the wants of the country is as necessary to its welfare as anywhere else. Nevertheless, the rapid introduction of the unskilled labor that may in other regions soon command a return from the soil does not seem desirable. Here, though there are rich lands capable of supporting a larger population than we can estimate, they are scattered over a surface that is to a great extent barren and useless. From the uncertainty of the seasons, also, agriculture is a pre-

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* South America. † Manfred.

carious occupation; though abundant returns are often yielded, and would be greater and more frequent under a better system of farming than can ever be expected from poor hand to mouth settlers, who have neither the aptitude for association that we admire in some races, nor the degree of education that would tend to make them provident.

While the United States of America appear to be the natural field for such immigrants, Australia for the most part seems to invite the capitalist, who, by embarking his means in the great mineral and other resources open to him, would not fail to create a demand for remunerative labor.

Independent of other vast unpeopled tracts, and the old countries that will yet regain the populations they have lost; * it is difficult to foretell the time when the Valley of the Mississippi will cease to invite the surplus population that is gladly received from every part of Europe. It is strange then that people should come sixteen thousand miles to this distant Colony when they would be better suited not far from their own shores:

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* See Appendix *d*.

nevertheless, apart from the misrepresentations of ignorance or design, people *will* join their relations and friends; though it is too much to expect that the machinery of good government is to work for them wherever they may choose to isolate themselves, almost beyond the bounds of law and order.* If the bonds of society are to be maintained some degree of wholesome restriction is necessary. It is the compression of the hoops that makes the cask to hold water; and the pressure from above that gives stability to the arch. But in absence of undeniable authority (and where shall we find it?) these questions are practically decided by the general sense, if not by the collective wisdom. Alison, in his essay on population, says 'there is something healthful to the human mind in the possession of a portion of the earth.' There is more in New South Wales than may ever be sought for. But judgment is required in the process of location; and indiscriminate settlement on the sea-coast is already doing injury to the future interests of the Colony, by the rapid destruction of some of the finest timber for naval and other purposes in the world.

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* See Appendix *f*.

It is a grateful reflection, however, that Divine Providence has established laws of compensation that repair our errors; and that in every community there are minds taking interest in the general welfare, however they may differ as to the means of advancing it. The general mass, even of intelligent educated people, are too much engrossed with their several pursuits to give much heed to public questions, and many a man who is for his own interests and those of his immediate descendants, is incapable, on the general behalf, of casting a thought beyond the corner of the street; or, if he do, he is not disinclined to believe with Sir Boyle Roche, that posterity can expect nothing at our hands, in that it has done nothing for us.

One fault of the colonists is an indifference to other countries except when it touches them in their pockets. It would be well if they were more alive to the opinions that are formed. But there is no occasion altogether to regret this. Prophecy is, sometimes, the cause of its own fulfilment; and they might have been long since precipitated into the Republic of Pirates that Sir James Macintosh, writing in 1807, predicted they would become.*

* See Appendix *e*.

Having endeavoured to show in the preceding pages facts that were desirable to be known in the history of the Survey Department from its origin to the transition period that, under the New Constitution, succeeded the death of Sir Thomas Mitchell, the last Surveyor-General appointed by the Imperial Government,—and having also touched on the methods of conducting territorial and other surveys,—some notice is now due to the present state of the department, at the same time taking a retrospective view.

Excepting in the necessary changes consequent on alterations in the Land Laws and Regulations, and the increase that has taken place in this department, now subordinated to that of the Minister for Lands, there is not much, apparently to note, of public interest during the last eleven years; and it is by no means a matter of astonishment that any enterprising reformer should find, in some respects, but a small advance since the days of Mr. James Meehan.

But experience proves the power of routine, even where improvements are admitted to be desirable. The head of a department, even when not driven from pillar to post between the government and the public, is soon made to feel that he is no Hercules, and that often he is but one of the wheels in a rumbling piece of mechanism. Sometimes, indeed, he may be driven to covet plenary powers under a mild despotism; but, if a sensible man controls his impatience, being content to watch opportunities and try and make way, if he can, through the series of wise compromises that are said ever to attend true progress.

In the department, as it was under Sir Thomas Mitchell, there was much to commend in the sagacity that kept to the only means at command. Sir Thomas had to accept his suveyors, as he had done the office plans, for better or for worse. Had he once insisted upon their abandoning the use of the compass in their work, or tried to force upon them the knowledge of practical astronomy sufficient to enable them to find the variation of their needles, he would have brought the work to a dead-lock, and been placed himself in a worse plight than he was supposed to be in, when attacked on the subject of *small farms*.

Mr. Brownrigg, a civil engineer and surveyor of much experience in Sydney, stated before the Commission of Inquiry in 1855, that he found the greatest difficulty in getting good surveyors to assist him. There were plenty who offered and professed proficiency, but who were utterly incompetent. If this was the case, after the discovery of gold in the Colony had given such a spur to enterprise and, connected with it, to increased demands for the measurement of land, we are inclined to credit the testimony, that it was difficult to induce good surveyors to come out to the Colony, and that when they did, it took a long time to accustom them to their new field of action and to the colonial practice of surveying.

Notwithstanding the difficulty of replacing them or of adding to their numbers, Sir Thomas Mitchell had some excellent surveyors, and looking to the actual efficiency of the Survey Department in his times, it must have been considerable, when in a space of twenty-seven years, the original nineteen counties had been extended to the number of *ninety-two*, which were laid out with the sites for one hundred and seventy Towns and Villages within an area open to selection, more extensive than thrice that of Great Britain and Ireland.

Respecting the general system of location, and of measurement, the following extract from Sir Thomas Mitchell's evidence before the Board of Inquiry will speak for itself:—

185. 'Have you been able to form any idea of the actual wants of the public, year by year?—What quantity of land in the year do you think the public would be satisfied with?'

'With a population increasing by immigration, it would be impossible to say, as there is a larger influx of immigrants at one time than at another; while the acquisition of the means of purchase, by gold digging, is also uncertain in amount.'

186. 'Has it ever been the principle of the Government, to keep the supply of land far in excess of the demand?'

'There has always been a wish, on my part, to do so; but that has never been possible from the rapidly increasing demand for land in isolated situations.'.....'Judging from the sort of letters we receive, I should say, that the public suppose they have a right to require us to measure lands in any part of the vast extent of country now surveyed, if they are applied for...'

187. 'Do you not think the system of isolated surveys most injurious and expensive to the country ?'

'It is expensive.'

188. 'And injurious ?'

'No; we want to see the land peopled.'*

189. 'Has it never been the object of the Government here, to measure off a large tract of land suitable for permanent occupation, and to have it open for selection to any new comer who may arrive in the Colony and desire to take up land ?'

'Yes; but that has been greatly overdone by attempting what is called a running survey over the whole country, which will never answer here. It has been at various times a plan entertained by different theorists, to divide the country into square miles, open to selection. Knowing myself that the country was only partially good, I have opposed such schemes; but it was, nevertheless, acted on by Sir George Gipps, while I was in England, to a very considerable extent in the North. Trees were marked to shew sides of square miles,

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* See Appendix *g*.

and the whole country divided into districts and parishes by those square miles. A surveyor brought an action against the Government afterwards for a considerable sum, for work thus performed and recovered it; but there is not, I believe, now, a single mark thus made that would serve to indicate any one of the divisions of the country, thus surveyed and divided at so great an expense. Indeed, the whole is included in some cattle run. Good land occurs only in isolated patches, and the Australian mode of surveying the country is adapted to its character, and will ever be found the best suited to its colonisation and the security of possession. No such system as may suit Ireland, or Canada, or New Zealand—or even South Australia, will answer here so well as what has grown into gigantic use from great practical experience. It has been the object of the government where land was unequivocally good along water frontage, to divide it, and offer it for sale; and we have a good deal in that state now. We have a hundred thousand acres open for sale in various localities.'

190. 'Has it ever been offered for sale?'

'Yes; it has been constantly advertised.'

191. 'And put up for sale?'

'Yes.'

192. 'Then that is saleable now, without being put up at auction?'

'Yes. A person may go to the Treasury and pay down his money for it, and take possession.'

Such was Sir Thomas Mitchell's statement, agreeing with the Commissioners in their report, as to the evils of detached measurements; but unlike them, looking upon the system as unavoidable. The Commissioners, on the other hand, recommended abandonment.

The system under which every appplication for the purchase of particular lands is entertained should be at once abandoned. It is evident that in so extensive a territory as New South Wales, it must be impossible to maintain a sufficient staff of surveyors to meet the demands of the public under this system, which seems to be founded on no law, but to have grown up by degrees, until every one imagines that he has a right to require, that any lands which he may point out, should be surveyed for sale, at whatever cost and inconvenience to the

department, and consequent detriment to the interests of the public.'

This system, in addition to its disadvantages with reference to the Survey Department, may occasion many social and political evils. It tends to promote an unnecessary dispersion of population, which should be rather checked than encouraged, for it leads, without any corresponding advantage, to increased difficulty and expense in maintaining the authority of the government, and the settlers in isolated situations are removed from the restraining influences of society, and their children are exposed to the danger of growing up in ignorance, and almost in barbarism. *

It should be considered the duty of the department to keep the supply of land, surveyed and ready for sale, as much as possible in excess of the demand; and in order to leave no excuse for desultory applications, care should be taken to survey lands in eligible situations, and of a quality suitable, as far as possible, to the purposes for which they are likely to be required.

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* See Appendix *f*.

The surveys being conducted methodically, the surveyor would be nearly always occupied in the actual measurement of lands, instead of moving about from place to place with his party and equipment, endeavouring in vain to satisfy the requirements of a pernicious and impracticable system.'

The Deputy Surveyor-General, Mr. JOHN THOMPSON, deposed before the same board, that practically no difficulties had ever arisen respecting boundaries from the secular variation of the compass : that is—official difficulties. Sometimes private ones arose, he believed; but that the methods adopted in dealing with them mostly led to satisfactory adjustments.

This statement follows out what was stated by Major MITCHELL twenty-one years before in testifying to the merits of the officer just named. In a report on his department in 1834, he says, 'There are none to whom I feel so much indebted for the present advanced state of the most essential business of the Survey Department as to Mr. JOHN THOMPSON, who, as chief draftsman of this office, has so arranged the numerous surveys, measurements, and graphic records of grants, as for

several years to supply materials for the voluminous correspondence that I have on such subjects, with the surveyors, the government, and the public. This gentleman's peculiar talents have been devoted with such advantage to the public service, that no mistakes have occurred as to the localities of grants however ancient, and that few or no disputes have originated respecting boundaries.'

The Commissioners of Inquiry, in their Report, state with reference to the Corresponding and Registry branch, that though the duties were of a very cumbrous and voluminous nature, which could not but lead to very considerable and unnecessary expense, they did not seem, by any means, to be confined to the Survey Department but to form part of *a general Whole*. They further state 'we must bear testimony to the admirable order in which the documentary records of the department appear to be kept, the perfection of the various registries by which prompt reference to and immediate information on any required points are ensured, and to the existence of method and arrangement in the conduct of this branch of the department.'

Such a deliberate opinion could not but have been gratifying to the responsible officers, and not least so to Mr. Henry Halloran, at the head of the corresponding and financial duties, and who, after lengthened service, has lately been promoted and is now Under-Secretary for the Colony. The names of this gentleman and of his predecessor, Mr. David Duncombe, are the only ones that occur in the same capacity during a long range of more than forty years.

There is one matter which would leave the reader with imperfect impressions, if passed over in silence.

The Commissioners of Inquiry of 1855, at the conclusion of their report, state :—'The alleged inefficiency of the department seems also in a great measure attributable to the want of that mutual good feeling and cordial co-operation between the Surveyor-General and his officers, without which it is impossible, under any system however excellent, that the duties of the department can be efficiently administered.'

These remarks seemed hardly called for under the 6th head of their commission, and perhaps

would not have been made, on out-door rumours, had not some quarrel about surveyors been elicited by them in the course of their inquiry.

After what has been related of the memorable campaign ending in an expression of '*The King's* surprise and disappointment,' it is not wonderful that a loyal old soldier should occasionally be subject to chronic fits of 'Governor,' and—though not belonging to the Vice-regal happy family—find himself, sometimes, anything but at home in his own office: but men will talk loudly sometimes if they fancy themselves in their own house, and even say things that they deeply regret; yet though persistent in a fend, he could hardly be called rancorous; for few men bore less real animosity than Sir Thomas Mitchell. Had his opponents known it, often a word would have disarmed him, and, if in the wrong, he ever sought to make amends if the opportunity was not cut off from him.

Sir George Gipps was by no means the bugbear that he seems to be made by the necessarily frequent mention of his name in connection with a department that he took so deep an interest in. *After all was over*, he paid a friendly visit to Sir

Thomas Mitchell in London. The 'Two Knights' *met again*, and the fact permits the revival of two amusing squibs that were fired in a warm contest.* They give an idea of the frequent by-battles, sometimes degenerating into 'free fights,' that attend the course of governments, and give but a faint one of the trouble they create at home, when we bear in mind the 'forty' colonial dependencies administered to, in the 'sleepy hollow' of Downing-street. Yes! a sleepy hollow, if it may be called so, that contains watchful eyes. Like the quiet studio of many an earnest physician, it holds the secrets of families until with every thing human they are buried by time.

In the difficulties encountered, nothing can be judged of from the size of a colony; for it is related that in the early establishment of one, a population of seventy-five persons, the governor included, comprised no less than three political parties. But this case is not so bad as another, told of the visit of a ship to Lord Howe's Island, not far off our coast, when two of the three families, living on that little spot, were found, if not at open

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* See Appendix.

war, as far as possible removed from each other. We can scarcely go farther than this, unless we suppose a man left to quarrel with himself, the best of all quarrels, when it leads, as we hope, to an eternal reconciliation.

Any further notice of the Survey Department must be fragmentary. Much might be said on the internal organization of the office and on the distribution of space for the work to be done. In a larger building on a better site more scope would be given; though not ensuring the excellent arrangements that were effected in the Ordnance Establishment at Dublin by Captain LARCOM,* or—at a later day—by another officer of engineers, Colonel JAMES, at Southampton. At the latter place, operations are conducted on a far larger scale, including, it may be called, a manufactory throwing off thousands of maps and plans, some in different styles of art. Sir HENRY JAMES'S work on photo-lithography and allied processes ought alone to make his name familiar wherever art is valued. Much might be learnt from the details, though belonging to a different system and worked

* Afterwards General Sir THOMAS LARCOMBE, Under Secretary for Ireland.

with a precision, that with feebler means we could only hope to slowly follow. Perhaps the time will come when photographic copies will prevent the bandying about of original documents that should never leave the office, not even to go to ‘ Lands.’

In reference to the improved organisation of the Survey Department that now seems necessary, something has resulted from Commissioners of Inquiry, but more would be learnt if officers of the department were occasionally consulted. Among them are always some who take an interest in the service and would be proud of the countenance of their superiors. But no one can be expected to forward the general interest to his own injury : if the official need not live, the man must, and also his family if he have one. The greater the subdivision of labor in a civilized community, the more men become educated to specialties, and should their occupation cease, they are not to be shook off with crustacean facility. A true reduction in the public service as far as expediency permit, is better effected by declining to fill or create useless appointments, than by cutting down salaries, or dismissing worthy servants who should be promoted or

translated, in preference to any new candidates for appointment, be their patronage what it may.

In the case of surveyors, their introduction from home seems to have been a failure, and points to a course of special training in connection with the department. Even natives take some time to become accustomed to the life, and the intimate knowledge of a district is not to be gained in a day, though when acquired, the advantage is so great that it represents a certain capital. Hence the desirability of a surveyor being employed, if possible, always in the same district. A true surveyor will always take interest in his own work, will best know how to pick it up and to combine it in general surveys. He will also have a wholesome dread of following after other surveyors who act upon the maxim '*that it will be all the same in a hundred years.*' It would be well for such to admit the possibility of its being otherwise to themselves, if they take the blackfellow's view that they may '*jump up*' again. In that case poetical justice would require that they should be employed on their own or similar work in expiation of former errors.

Like some other classes subject to vicissitudes, surveyors are not remarkable for providence; emerging occasionally from the solitude of the bush, they act foolishly as sailors do, and the possession of talent and education often tend only to increase the evil, through the stronger revulsion that takes place in the feelings.

A surveyor, in traversing the extensive and difficult tracts of country to be found in the colony, has not only to do his surveying but to maintain himself and party, under the most difficult circumstances and where it is not simply making a transit from one place to another. He may therefore be said, if he does his duty, to be in perpetual campaign. Still, to some, the life has its charms and would be followed with enthusiasm, if there were any assured hope of being able to retire with a modest competence in fifteen or twenty years. Though not overpaid, a surveyor on the staff should rather look to such a result, than to the increase of his salary; and the government should, acting *loco parentis*, encourage such an idea. Indeed the whole community is interested in the well ordering of this question, for its own interests and for those of the man. For in the words of

an English writer in the Civil Engineers' and Architects' Journal, 'those colonial surveyors are not civilisers but the pioneers of civilisation. They lead the forlorn hope. When they have made the breach practicable, others enter in and gather the spoil.'

A new period has arrived in the history of the Survey Department, and introduced by the increasing necessity of setting in order some of the work already done. Hitherto no difficulty to speak of has been experienced in relation to the boundaries of old grants. At least, little or none has been known to the Survey Office which does not profess to take up boundaries. It is also believed that, as yet, little has occurred elsewhere. But if the department is not to expire with the exhaustion of available surveys of waste lands, and is to be a fit coadjutor of the Lands Titles Office, new steps should be taken, and the commencement of new county surveys seems to be the first;—the next, in connection with them, a revision and extension of Sir Thomas Mitchell's trigonometrical survey with a view to assist in the formation of a *complete* general map of the territory of New South Wales as it now exists. It might be done, it is

conceived, at no great outlay, and would be additionally useful as an index to the choice of trigonometrical stations.

Should a triangulation of a superior order ever follow, the advantage of such a preliminary work would be felt, and the want of which, some time since, is said to have caused in Victoria the expenditure of *fifteen hundred pounds* in the establishment of *a single trigonometrical station;* that is a sum equal to the whole cost of Sir THOMAS MITCHELL'S expedition into Tropical Australia.

With an instinctive feeling, already the dread of impending change has caused some to take alarm. One class of persons fear that the proceeds of the scale of Crown Lands will cease to add largely to the revenue, and even become wholly absorbed in the expenses of survey. This would be bad enough; but—the idea of any part of the expenses of the Survey Department falling on any fund would be intolerable.

There appears to be no difficulty in finding an answer in this case. It is true that the Land sales have been at times very productive to the

revenue, and though the proceeds be subject to heavier deduction for the expenses of survey than some thought desirable, they have legitimately borne it. But the land itself, as portion of the *fixed capital* of the country, cannot be said to be a legitimate source of revenue in the process of changing hands.

The mice may be very comfortable in their cheese but in lapse of time they will eat themselves out. The greater their number and greed and waste, the sooner the catastrophe.

But though the land is sold, it still remains with the purchasers—the taxable material. Revenue or no revenue from land, the territorial surveys of a country have to be maintained. They are so at great but necessary cost in civilized countries that have not a foot of public land to sell, or if they have, do not sell it.

Another class of persons fear that they will be disturbed in the possession of their land; whether they dread defective surveys, or feel themselves in the wrong place it is immaterial to inquire, but it is the duty of the government to try and settle these difficulties in a lasting manner.

Taking certain districts in succession, as the necessity is most pressing, an act of the Legislature might make registration of title under Torrens Act compulsory, and in all cases, where it could be done, possessory title given to any portions of land that might be found encroachments on other grants. This would enable the Surveyor-General to declare in favor of such and such lines as representing the boundaries of the original grants as nearly as could be ascertained. In this useful work, he would receive and confer great assistance in acting in concert with the Registrar-General, as noticed elsewhere.

But thence forward, possessory titles should be discountenanced. They are so in the United States of America, unless something like good grounds are shown for the original acquisition of the property. It would be well if it were so in this country, for no good can be hoped in the moral progress of the people if they are left to be tempted to spoliation and waste.

There is an old political maxim to the effect, that it is for the interest of the state that every one conduct his affairs properly. It may also be

said that in the general interest it is the duty of government to act as public trustee in all cases that require it, under reasonable circumstances and with sufficient guarantees against abuse.

If this be allowed, it would become a source of revenue, and capital in Houses and Lands not allowed to be lessened in value through the neglect or disappearance of the owners (looking as if they were in chancery.) On the contrary, defenceless interests would be protected and in other cases much of the property would lapse to the state.

In Ireland the police were, and are, very useful in collecting statistical information. Perhaps they are so here, or may be hereafter. This is the pleasing and desirable aspect of their duties. Would there were no other, and that they were always hailed as friends and not as enemies.

Sometime after the discovery of gold in 1851, Sir Thomas Mitchell complained much of the time of his surveyors being taken up in the measurement of pastoral runs.

Sir George Gipps who first appointed Commissioners of Crown Lands, intended that these officers should be surveyors; but Sir Thomas Mitchell was not desirous they should be, unless placed under his direction as Surveyor-General. If they had been, how for such a union of duties would have consorted with the dignity of those who are looked upon as representing in no small degree the distant central authority, cannot be determined.

Nevertheless, Commissioners going their rounds have frequent opportunities of observing country, and, their other duties permitting, it might have been a happy alliance if they had joined to their other qualifications a sufficient knowledge of surveying for the construction of sketch maps of their

districts, and which would have been useful for some purposes. One was the gradual delineation of the boundaries of forfeited and vacated runs, and their adjustment, if desirable, more in conformity with natural features; enabling the government to give their incoming tenants better description of their lines.

In other cases, a little tact on the part of a commissioner, possessing a knowledge of surveying, might have prevented litigation.

Another use of such maps, would have been the assistance they might have given in striking out provisional county and other boundaries.

Some men have a special talent for these kinds of survey, which might have been a source of useful emulation to the commissioners and enabled them to give graphic proof that they had a better topographical acquaintance with their districts than can possibly be learnt in their travels from one head station to another.

A NOTICE of Public Surveys would be incomplete without reference to that most important institution, the 'Lands Titles Office,' whose cheerful, handsome, though small building adorns this city, and in its external promise of the excellent arrangements to be found within, contrasts in memory with ungainly structures, that in their irregular passages, lumbering presses, and mouldering contents, offered sordid types of material and moral decay.

Mr. TORRENS has aptly stated that the best public surveys in Great Britain take no note of the ever varying boundaries of private property. But it ought to be a quality of such surveys that they can be used for the purpose.

In the French communes, there is always in the 'Mairie,' or 'Municipal Chambers,' a local map on which all such changes are recorded, and consequently the right person can be rated for a

tenement '*Grand comme votre chapeau,*' or, as we say, 'as big as a dog kennel.'

Except that of the city of Sydney, there are at present no such plans in this Colony, and the authorities at the Lands Titles Office have to exercise a sagacious discretion in giving the 'illustrative sketches' (*Plans ?*) that they attach to their titles.

In this matter, the official surveyors ought to obtain the outlines of grants from their parent establishment, the Survey Office. In return, their measurements would test what they received, and furnish 'filling in' materials for any maps or plans that might be published both by authority and private enterprise.

This reciprocal intelligence would prevent the surveys from becoming obsolete, which they will assuredly do, if subjected to a course of endless fusions. It is imperatively necessary to preserve the boundary lines of grants in all cases; so that, if a proprietor hold a piece of ground at the junction of four sections, it should be considered a case of four titles, though shown in one deed.

Illustrative sketches are more than mere plans. If they are on a scale to admit of the length of the lines being written on them in *words* and not only in figures, they are deeds almost in themselves, and greatly shorten the body of the title.

The employment of some of the photographic processes, alluded to by the Deputy Surveyor-General, would be of the greatest advantage. Some years since, in a French lawsuit, a peasant astonished the Court by demanding the photograph of a document that it was impossible to show in evidence. 'The apparatus cannot lie' and the 'fairest' of 'attested' copies must ever yield in worth to the claims of a fac-simile.

Slight alterations in the size of photographic extracts do not alter their value, any more than does the smaller size of an engraving when it shrinks after being struck from the plate. If a scale be attached to an illustrative sketch, it is only affected, for all practical purposes, proportionally with the other lines, and if the quantities be written as well as figured, they will equally appear, obviating the necessity of any scales at all. But in some form they should appear on the plan;

for surveyors are in the practice of giving these particulars in *separate* '*descriptions*' for embodiment in the deeds. Where however a photographic extract could be taken from the general plan, say of a municipality, it might be sufficient. But in broaching these and other ideas on the topic of Public Surveys, the writer's main object will be attained if they afford matter for discussion.

Natural alarm has been taken here at the introduction of the new system of registering *titles* under what is familiary known as 'TORRENS ACT.' Yet there is much in the measure to reconcile the legal profession. Like every other species of property even 'real' estate resolves itself into a question of money, and whether in the shape of sale, purchase, or loan, the benefit to agents is one of commission. A temporary disadvantage may be felt, but it is confidently expected that it will be more than compensated by the greatly increased number of transactions consequent on the almost perfect security given, and the facility with which the mercantile community may make even land a temporary investment. Should this be so, many solicitors would be glad to save the office room taken up by multitudinous papers. They would

also have a sense of greater security. Some years since in London, one of the judges accidentally set fire to his chambers. In the destruction that followed, an eminent solicitor suffered a ruinous loss of deeds and documents of great value, belonging to himself and numerous clients.

Should we ever have judges in title, great powers should be given them. They should take their own means of arriving at a written decision, which might remain open to review until finally confirmed, chosen from men of character, and holding a position of great dignity, they should possess the almost unlimited confidence of the community. Nor should they be made to feel that virtue has no reward. It ought not to be expected that they should be indifferent to the ordinary motives that are allowed to have weight with other members of the community. On the contrary, true policy points out that every one in such a department should have one of the strongest of inducements for promptness and simplicity of action. In the sense of Guibert, only mistakes in policy are costly; a judicious outlay is economy. Or, in his own words, '*En politique, il n'y a que les erreurs qui coutent; mais les dépenses utiles sont économie.*'

ERRATA.

Page 10,	line 15,	*for*	comparitive	*read*	comparative.
„ 18,	„ 2,	„	condusive	„	conducive.
„ 25,	„ 13,	„	intsrument	„	instrument.
„ 26,	„ 7,	„	geodosist	„	geodesist.
„ 33,	„ 10,	„	admissable	„	admissible.
„ 51,	„ 13,	„	it	„	in.
„ 61,	„ 5,	„	cmopacted	„	compacted.
„ 76,	„ 12,	„	unto	„	into.
„ 93,	„ 13,	„	appplication	„	application.

APPENDIX.

a. In reference to some observations in the Governor's speech to the Legistative Council in 1842, Sir Thomas Mitchell thus explained in justice to himself and officers of his department, who had ably acquitted themselves :—

'So far from the surveys of the coasts not being attempted to be carried on by this Colony, they have been wholly completed by it, the results eagerly sought for and readily adopted by the Admiralty's surveying officers, and wisely, as being much more detailed and accurate than any, made by sea, could possibly be. The map of Commander Stokes just published, affords sufficient evidence of this, the very accurate work by Mr. Surveyor Townsend appearing thereon, between Cape Howe and Wilson's Promontory, including Port Albert.'

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b. In 1840 was published a Report by Captain Dawson, of the Royal Engineers, 'on Surveying considered with reference to New Zealand, and applicable to the Colonies generally.' It was transmitted as a text book for Surveyor-Generals of Colonies in Lord John Russell's Circular Letter of 14th January, 1841 ; and as it is now very scarce and never likely to be re-printed in its integrity, an abstract is here given of it.

'A trigonometrical survey may either precede or follow the location survey. In my opinion it should follow. The system of survey I have suggested, provides for the actual setting out upon the ground the limits of the sections for which a title is claimed ; and any probable error which could arise in setting out those limits, if moderate care were taken, could affect only in a trifling degree the contained quantities of land, and might

be amply compensated to the settler by a percentage allowance on the sections.....This appears to me to be a simpler and better method of meeting the evil which might arise from accidental causes than that which would be afforded by any attempt at a strictly accurate survey. A percentage allowance involves a present sacrifice of land. A trigonometrical survey calls for a heavy outlay of money; and it appears to me there can be no difficulty in choosing the alternative for an infant Colony.'

The following appear to be the 'ulterior objects' that Captain DAWSON had in view :—

'THE FUTURE TRIGONOMETRICAL OPERATION.'

'When at some future time it shall be deemed necessary to combine these several detached surveys of sections into one general map, showing the several groups in their true geographical positions, and tracing the intermediate lines of coast, lakes and rivers, and the lines of road which have been opened for communicating between the detached points of settlement, then will the necessity arise for the trigonometrical operation to which I have alluded, and then should it be undertaken: not with a view of detecting minute differences and irregularities in the sections individually, but to fix the groups in position, relatively to the principal geographical lines and features of the country, so as to show what land still remains to be laid out, and how the whole country may be divided, by natural lines, or otherwise, into counties, hundreds, parishes, &c. For this purpose a trigonometrical survey, such as has been effected by Sir THOMAS MITCHELL, in Sydney, will be fully sufficient, as shown by the result in its application there.'

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c. Extract of a Despatch, dated Santa Fe, September 14th, 1846, from W. H. EMORY, first Lieut. Corps Top. Engineers to Lieutenant J. W. ABERT, or in his absence to Lieutenant W. G. PECK, from a Narrative of a military tour, page 24.

....'With the limited number of instruments that can be placed in your hands, it is not expected that you will conduct the survey on strict geodetic principles, yet it is believed that sufficient precision can be attained to answer all the requirements of the military and civil service.'

'The country from Taos to Fra Cristobal contains nearly all the ground that is under cultivation, and nearly all that is worth cultivating; and for this whole distance it is open and bounded by high and conspicuous peaks, affording great facilities for conducting your operations. I have established the astronomical position of six points in this territory, viz: camp 42, at Vegas; camp 43, Vernal Springs, Santa Fe; camp 55, 1¼ miles south of the church of San Felippe; camp 49, at the Alameda; camp 51, at Peralta at the mill, and I shall establish two more, one at Taos, and the other at Socoro.'

'These points are quite sufficient, and will be the base of your operations; and upon them, you will form a trigonometric canvas. For this purpose the rule requiring every angle of the series to be greater than 30° may be wholly disregarded. And after having determined by triangulation the position of any three conspicous peaks, the position of any other points, which are in view of the three first named, may be determined by the problem of three points, as is practised in hydrographic surveys. Many such points will present themselves.'

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d. Where it was open to conclude that the author had drawn on his fancy, an article in the *Australasian*, *December 9th*, on 'OUR SALMON RIVER,' seems to shew that in this year of grace, 1866, the good people of Hobart Town in Tasmania are nearly as little acquainted with the sources of their fine river as they are with those of the White Nile; and that if any geodetic surveys supervened the labors of a local JEMMY MEEHAN, they certainly were never benefited by those of an intermediate Sir THOMAS:

..'The prince of Australian rivers for sustained beauty and grandeur is certainly our Derwent from its cradle to its grave. Its course is short, but ever changing; grand where it is not beautiful, and beautiful where not grand. It possesses all the attributes essential to great width, depth, rapidity, in one word, power.'

'Tasmania as all the world knows, is a land of mountains. The Australian Alps, after making their way across Bass's Straits, here tower up once more, and spread themselves in all directions before taking their final

plunge under the Southern Ocean. The mountains run up and down, and cross and re-cross in the wildest confusion, not unlike the Highlands of Scotland, and, like them, hold in their dark breast some splended lakes ; but the Scottish lakes are down in the valleys, while those of Tasmania are hung up among the clouds. Lake St. Clair, out of which the Derwent flows, the grandest and wildest of them all, is more than 3,000 feet above the sea. Though the island has been settled above sixty years, it is little more than twenty since this lake was discovered, and the region between it and the Western Ocean has been only systematically grouped in the last five by Mr. GOULD. It lies on the edge of a prodigious wilderness, with which no man living is really acquainted. Herdsmen, shepherds, hunters, fowlers, in the far-back times bushrangers, have traversed its borders ; but few, very few have been within its solemn precincts, and no one can be said to know it. This is a curious state of things in an island which has been colonized for sixty-three years, that such a *terra incognita* should exist, but it is only one of a dozen.'

This is pretty well for a compact little island, whose hundred and twenty miles of excellent macadamized road between Launceston and Hobart Town, that is from North to South, was praised long before the discovery of Lake St. Clair, for the facility with which it was rattled over in a few hours, in the good old English Coachy style. But we are not done yet. In 'Jottings about the Huon' shortly after, apparently by the same pen, it is stated that the noble stream has its head somewhere or other (where nobody exactly knows) in what we have dubbed 'NO-MAN'S-LAND.' 'Such is the western half of Tasmania, which, from the creation to the present time, has kept its dark secrets impenetrably to itself.'

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d. 'The deserts of Mesopotamia now so barren, were overloaded in ancient times with the riches of Nature ; and nothing but a renewed distribution of the Waters of the Euphrates is necessary to revive the productiveness of the soil ; and in all the plains of Persia, now for the most part deserted, traces of a system of irrigation are to be seen equal to the boasted works of the Milanese territory. Wherever water can be brought, the rocks of Catalonia are covered with magnificent harvests ; and even under

the rays of a vertical sun, the plains of Bengal are converted by the aid of irrigation, into fruitful and productive fields.—Alison, page 486.

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e. If something of this sort be not done, I venture to predict that Botany Bay, which must in spite of fate, speedily grow strong and populous, will in fifty years become the greatest nuisance on the face of the earth—an unmixed community of ruffians, who will shake off the yoke of England, and, placed at a distance which makes them inaccessible to conquest, will become a republic of pirates, the most formidable that ever roamed the seas. England, in rearing such a community, is preparing not only conquerors for India but enemies to herself and to all mankind.'

Sir James Macintosh Letter from Bombay in 1807.
(See 'Literary Gazette,' 1855.)

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f. 'Even civilized men, when transferred to a wide wilderness, where each has to work hard and isolatedly for the first requisites of life, soon show a retrogression to barbarism: witness the plains of Australia, as well as the backwoods of Canada and the prairies of Texas. Fixity of residence and thickening of population are perhaps the prime requisites for civilization; and hence it will be found that all civilization as yet known has taken place in *regions physically limited.*'—Vestiges, page 392.

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g. 'IMMIGRATION.—Until we can infuse into the mass of expatriated humanity some of the elements of aristocratic society, there is very little chance of our effectively guarding ourselves against the evils which we so greatly deplore. And here we see the great want of our colonial system. The Colonies are not attractive. The higher classes of society, in the present condition of things, will not betake themselves to Australia. Rank will not go to Australia. Capital will not go to Australia. Talent will not go to Australia. They would rather find standing room at home. Let us only hold out sufficient inducements to the higher classes of English society to expatriate themselves to our distant settlements, and instead of

a confused mass of poverty and crime going forth to pollute the Colonies, we shall have well-ordered assemblies, composed of different classes of society, all associated with one another, all recognising the different links in the chain of emigration, and all performing their several functions to the benefit of the entire body.' This will never take place until just laws are equally administered to Rich without pride—and Poor without envy; and then a mingling of angels would be necessary, indifferent whether they were masters or servants, save as they could serve God best.

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g. 'Dislike to be taught is a trait of the English character; insomuch that your true born Englishman positively refuses to learn anew of any one who can teach him at first hand, and will only learn of 'experience.' In a scientific matter he will not learn from the veriest Newton.—*Spectator, February 9th,* 1850.

THE TWO KNIGHTS.

———however, I have now learnt to say No.
Speech of Sir G. Gipps in Council.

Negat contrarius alter.

There was a knight in Paynim Land,
Vice-regal state had he:
And all the men that there did stand—
Must do him fealty.
There came to him an errant Knight,
'To the mountains let me go;
That there I might essay my might;'
But the other Knight said no!

Out spake the errant Knight again,
In higher tone and bolder:
'The Queen whose virgin hand did lay—
The Knighthood on my shoulder!
Said, still Australia's map is blank;
Untraced her rivers flow:
Be thine the achievement to explore—'
The other Knight said no!

Out spake a gallant Captain then,
And said, 'this Knight hath ta'en
The measure of many a battle field,
And storied ridge of Spain;
He's made for us of counties more
Than Ordnance map can shew;
Deign o'er his Triangles to pore,—'
But, the other Knight said no!

Then for the desert wilds prepared,
And tropic's burning ray;
The errant Knight led forth his steed,
And thus was heard to say:
'Give me twelve men, and hundreds ten
Of pounds, and I will go,
And ope a way to fair Cathay—'
The other Knight said no!

Since travel was denied, he chose
In Council Hall to sit,
And in the matters of the State,
To exercise his wit;
And whensoe'r he voted there—
To help the poor and low:
To right the wrong and curb the strong,
The other Knight said no!

'Since tent and field no laurels yield,
Nor Senate nor surveying;
My lance in chimney corner laid,
In stall my charger neighing;
I pray thee try thy courtesy—
To England let me go;'
But never courteous mote he be,
So the other Knight said no!

A woeful man then was that Knight,
And woeful are we all;
That we beneath the government—
Of such a churl should fall;
For if we ask him civilly,
The truncheon down to throw,
And the land to leave his loss to grieve—
He's sure to answer no.

A GOVERNOR'S GOD-SPEED.

SCENE—*Government House, Sydney.*

SIR T——— M——— I have sent for you
That I may tell you at this interview,
That what is wanted for your expedition
Shall be supplied to you on this condition,
That henceforth you in no way interfere
With your department, nor at all go near
Your Office. *Sir, I would leave matters there*
In order ere I go. I cannot spare
You Mr. Townsend longer with your party,
He must return forthwith. You have my hearty
Good wishes of success: and I can tell you,
And better fortune never yet befel you;—
(God knows I am glad of it myself) before
You can approach the Carpentarian shore,
My government of this Colony will be o'er.
Indeed! Sir. Yes; I have surmounted here
Difficulties greater than they may appear—
Your Excellency will excuse me when I say
No difficulty should lie in the way
Of Acts of Parliament. I am obliged to speak
In a set phrase to you—who do not seek
This house to enter but with formal mien,
Yet as we never, probably, again
May meet. *To this I cannot say Amen.*

I from my heart shall wish you a God-speed!
I thank Your Excellency, but I had need
Of some more gun-powder for which to day
You have refused the cash, and I must pay.
'Tis very strange, Sir T——— M——— you
Cannot be made to do as others do!
As of the family, to this house they come,
Give freely their advise, make it their home;
Unceremoniously. You are the chief
Of those who stand aloof. *Alas, how brief*
Must be advice to absolute. I want
A List—What's that? *A list, Sir.* Oh, I can't
See without glasses: (Puts them on.) Now in this I see
Six dozen pins, I think that dozens three
Were quite enough of pins. This list to me
Is quite superfluous, I've already said
Rather than that your journey be delayed,
The equipment shall be wholly left to you;
At leisure I shall look these items through.
To equip the party then I know not how
O'Reilly duns me for the powder now
Which has been bought. I cannot help it, you
May pay for it then—other articles too,
That seem to me not wanted, you shall pay for,
Especially all such as you delay for.
I do not understand then, the condition
On which—Mind this is not *my* expedition.
Your Excellency may then call it mine
Although two years ago the whole design,
Part of a general plan, I did submit
Myself of Public duties to acquit.
That might be so. *It was so, and I must also say*
That only with obstruction and delay
Have you met this half executed plan
Of fifteen years suspension,—any man

No matter who, might carry it out but me;
Sturt, Leichhardt. I think it should be done by sea,
Lord Stanley. *Better know great Nature's Laws.*
You by that reference gained a whole years pause
And lost the finest season that e'er was.
Annihilated my department then,
No duty left me but to go again
To the interior; I before you laid
My plan of exploration, and you said
Provided that the Council did reduce
The Estimates by so much you'd not refuse,
A thousand pounds or two—that promise made,
(Of reference home then not a word was said,)
Was by you broken when the Expenditure
Had been reduced—and when by vote made sure
Even of the money. You required permission
From home to send out such an expedition.
Before I go, Sir, I must now speak out;
My sense of wrong leaves me no room to doubt
That a bad feeling.—Good morning! *Oh,*
All others too are interrupted so,
With a good morning cutting their speech short!
Such the etiquette of this Vice-regal Court.
Officials domesticated here discharge
Their duties thus! Good morning, then Sir George.—
Exit, Sir T——— M———

Dudley