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THE Scientific Journal & Surveyors' Magazine,

By J. L. P. O'HANLY, L. & E. Surveyor, Ottawa, C. W.

VOL. I.]

MARCH, 1867.

[NO. 1

PRICE \$4.00 PER ANNUM IN ADVANCE—SINGLE NUMBERS 40 CENTS.

BUSINESS NOTICE.

THE SCIENTIFIC JOURNAL AND SURVEYORS' MAGAZINE is published at Ottawa city on the first day of every month for four (\$4) dollars a year, payable strictly in advance; and half price to Surveying and Engineering students.

THE SCIENTIFIC JOURNAL AND SURVEYORS' MAGAZINE shall be exclusively devoted to the interests of the Surveying and Engineering professions in British North America; and shall discuss, examine and criticize all subjects affecting these interests—mental or material—except religious or political squabbles, dogmas or controversies, none of which shall ever have access to its pages.

THE SCIENTIFIC JOURNAL AND SURVEYORS' MAGAZINE shall form a record of all transactions connected with these pursuits, and a depository of information relating thereto; and consequently indispensable to Surveyors and Engineers.

THE SCIENTIFIC JOURNAL AND SURVEYORS' MAGAZINE shall labor to remove all legal disabilities that stand in the way of the social progress of Surveyors and Engineers. It shall labor to give Surveyors the sole control and management of their professional affairs, such as is now enjoyed by lawyers, doctors, &c. It shall labor to give Engineers a legal status with such privileges as are sought for Surveyors. It shall labor to secure for scientific men a system of practical education suitable to their callings, whereby their future may be alike advantageous to the public, an honor to the state and a credit to themselves. It shall labor to establish in this city, the capital of British America, a NATIONAL OBSERVATORY, where the rising generation may have the means of perfecting themselves in those studies so essential to their future

usefulness; and which is so difficult, if not impossible, to attain at present in the Provinces. It shall labor to give Surveyors and Engineers that preferment to which their education and training entitle them—to secure the patronage of the Crown Lands and Public Works Departments; and which should in the public interest exclusively belong to them.

THE SCIENTIFIC JOURNAL AND SURVEYORS' MAGAZINE shall advocate an entire change in the present expensive, uncertain and unsatisfactory mode of deciding questions of DISPUTED BOUNDARY; and establish in its stead a tribunal founded on a scientific knowledge of the issues involved; and shall labor assiduously to the accomplishment of this end.

Each number shall contain an article on PRACTICAL ASTRONOMY, so far as that science is necessary in surveying operations in Canada; and a monthly EPHEMERIS of the sun and some of the principal fixed stars (particularly Polaris) for determining Latitude, time and Azimuth, computed to the meridian 75° west of Greenwich and 45° N. Latitude, which is nearly the geographical position of Ottawa; and which from its central situation is mostly adapted for all Canada without interpolation.

Each number shall contain a students' department, consisting of useful remarks and practical hints to young surveyors.

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THE SCIENTIFIC JOURNAL AND SURVEYORS' MAGAZINE shall from time to time contain no-

tices of public works and surveys, and extracts from reports, as well as drawings of important Provincial works; and shall direct attention to such undertakings.

Especial interest will be taken in public surveys and Colonization Roads, with practical hints and suggestions on the best modes of conducting these important operations.

Particular attention will be given to verdicts and judicial decisions on questions of disputed boundary; and the conductor of the *Journal* earnestly hopes that correspondents will furnish full particulars of such cases, for nothing is of more importance to the surveyor than to be well posted in all such decisions, being the best guides in subsequent operations. And tho' the present tribunals are exceedingly faulty, yet so long as the system remains on the statute book, surveyors should learn its ways as well as possible.

To the foregoing and kindred subjects the best efforts of the *Journal* shall be directed. Its columns shall always be open to surveyors and engineers for the discussion of all those subjects we have indicated, or any other matter connected with these professions; and it is to be hoped that they will not neglect to avail themselves of the opportunity, and by their contributions render the *JOURNAL* respectable, useful and influential.

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The conductor of the *JOURNAL* respectfully requests that any gentleman receiving this (the first) number, who does not wish to subscribe, will please return it immediately to this office; and those gentleman who do not do so will be considered subscribers.

The conductor of the *JOURNAL* earnestly solicits the co-operation of all who wish the success of the enterprise; and trusts that they will interest themselves in its behalf. Any one sending us twelve (\$12) dollars will be entitled to four copies. We hope that a surveyor in each city and town in the Province will consent to act as agent for the *JOURNAL*.

Single copies, 40 cents.

OUR POSITION.

THE conductor of this journal, in the prospectus of a Treatise on Surveying, promised, among other things, that "a pamphlet shall accompany each number, purporting to be an examen of the laws regulating the practice of Land Surveying, and the admission of Land Surveyors in this Province, with suggestions for alterations and amendments; and a critical review of the conduct of Public Surveys under the supervision of the Crown Lands Department."

When we sat us down to redeem this, our solemn, pledge, we discovered that instead of the narrow limits of a pamphlet, our subject, to do it any justice would require volumes, and still be far from exhausted; and that, at most, we could barely glance at the topics indicated. So we have concluded to abandon this portion of our project, or rather to transfer it to a more spacious field and congenial soil. Not that we would be understood to imply that our first notion of a SURVEYORS' MAGAZINE originated thus. Far from

it, we have long been impressed with the necessity for such a publication, we have for years steadily advocated its establishment, we have been a firm believer in its advantages; and as our experience increases, we are the more convinced of the correctness of our opinions. In our musings we have frequently felt surprised, aye, and chagrined too, at the apathy displayed by Canadian Surveyors in a matter, which to us appeared so indispensable to their prosperity, so inseparably allied to their social progress, individually and collectively.

This indifference, when contrasted with the sagacious and enlightened polity of other learned professions, appears still more unaccountable. If you chance into a lawyer's office, the first thing on which your eye rests is the 'Law Journal,' if you turn into the doctor's dispensary, you are sure to find the 'Medical Journal' strewn about; nay, if in your rural wanderings you stroll into the farmer's sitting room, you will find it adorned with the instructive and beautifully illustrated 'Farmer's Journal.' It is our firm conviction that to this same law journal and kindred

publications is due much of the influence and social standing of the legal profession in Canada. For it is suggestive of unity of thought and community of interest, and is emblematic of a sure and enlightened method of directing action to its ulterior design—success. It is the type of progress, the soul and centre of organization, the offspring of a common interest, and may be compared to an itinerant preacher, from whose lips nought is heard but the doctrines of his class. At home it is the promoter of harmony, the disseminator of practical, useful knowledge, and the refiner of manners; and under its protecting aegis all its votaries find peace and prosperity. Nor is the 'Medical Journal' less important, less useful to its class.

It is a trite old saying, as well as a recognized and orthodox principle in social ethics, that "a man's affairs are best managed by himself"; and this principle, whether applied to individuals, classes, professions, states or communities, holds equally good. Indeed, it underlies the whole social fabric. Now, by a parity of reasoning, work done by deputy, (i.e.) by one having no interest in common with him whom he serves, is likely, nay sure, in the case of states or classes, to be *ill done*. The latter is the position of surveyors as a class in this country; and is best exemplified by contrast with other learned professions.

The law society, for example, are vested with ample corporate powers for the management of all matters of a professional character. They enact by-laws for the regulation of their tariffs, for the admission of members into their body. The control and management of their own affairs are in their own hands, they are the custodians of their own destiny—they are masters in their own house. There are many preferments exclusively set apart for them, and to which none other is eligible. The medical faculty have also similar privileges.

How different with surveyors. For, tho' the law imposes on them heavy burthens—tho' they must follow a long course of preparatory study in the most difficult, as well as the most exalted of all the sciences—mathematics—tho' they must undergo the expense of a preliminary examination—tho' they must serve a long apprenticeship—tho' they must pass thro' the ordeal of a final examination as a test of their theoretical and practical competency—tho' they must in conjunction with two securities enter into heavy recognizances with the state as a guarantee for the due and faithful performance of their professional duties—tho' before they can make the first move in the direction of earning, they must be provided with costly apparatus, consisting of field and office in-

struments, books, &c., which at a moderate estimate will cost \$400—tho' their avocation is at once the most toilsome and perilous of any class of our people—tho' at a comparatively early age, from the hardships, fatigues, privations and exposure incident to their calling, they are incapacitated from service—tho' they brave alike in summer and winter the rigour and inclemency of our variable climate—tho' lodged in a cotton tent when the mercury is frozen in the thermometer—tho' doomed to pass much of their time in the society of the very dregs of the population—tho' they have to undergo all the burthens and hardships we have enumerated, and twice as many untold, what do they receive in return? What reward for their toils? What succour in those days when they become unfit for service? Whilst the lawyer, the doctor and the notary are amply and properly recompensed for their services, the poor surveyor receives a paltry four (\$4) dollars per *diem*; and this not very unfrequently for very few of the 365. How is it that of all the learned professions, that of the surveyor is the most expensive and difficult to attain; and when acquired the most laborious and the worst remunerated?

To these important questions we can give but one reply, which is, that all this arises from the fact that surveyors have no voice in the management of their professional affairs; and foreign management is well compared to a "stepmother's breath." The merchant, the mechanic, the farmer or the laborer has as much control in the conduct of the affairs which govern surveyors as they have themselves. This, we think, is an anomaly—an evil which requires only to be exposed to be remedied.

For we cannot believe that the public require any sacrifices from surveyors any more than from any other class of the population. We are satisfied that they (the public) are as ready to recompense our class—to give them a fair value for their labor, as they are to the lawyer, the doctor or the notary. We are sure, as it is deemed necessary to the general interest to lay restrictions on surveyors and refuse them admittance except on certain onerous conditions, the public are willing to accord them protection and privileges commensurate with the obligations they impose; and if such immunities have not hitherto been conceded, it is entirely owing to the indifference of the surveyors as a class. For there is but one practical way known to our institutions for redressing grievances, and that is, to ask, to agitate, to appeal, to remonstrate. If a man fell into a pit, from which his own unaided efforts could not extricate him, would he not immediately have recourse to

shouting as the best way of attracting attention to his perilous situation; and if he were so foolish as to neglect such means, he might remain a long time in the pit before chance vouchsafed him a deliverer. So with surveyors, if they submit without a murmur—without a remonstrance, the public, if they at all think in the matter, very naturally conclude that there is nothing to complain of—nothing to redress.

We hope we are doing no violence to refined tastes when we remind our friends of the homely old proverb, "Union is strength;" and that it is as efficacious now as it was in the fabulous days of the bundle of sticks; nor of its twin-sister, "God helps those who help themselves." This is pre-eminently an age of progress; and it is clear as the noon-day sun, if surveyors do not keep pace with the times—if they do not avail themselves of the improvements taking place around them—if they do not imitate the successful policy of their neighbors—if they do not conform to the altered condition of things, they cannot wonder if they find themselves far behind in the march. Whilst every other class of our mixed society is partaking of a change for the better, marching steadily onward in the path of social amelioration, our class alone appear to retrograde, or, at best, to maintain an ignoble *statu quo*. For none will deny that the social position of the surveyor 20 years ago was far ahead of what it is to-day.

In continuing our comparison between surveyors and lawyers, we would ask the latter how would they like if the Finance Minister of this Province, by virtue of his office, was head of their corporation in Upper and Lower Canada; and further, if his power was absolute in all matters relative to the administration of their professional affairs, so that he could appoint merchants or farmers or mechanics to constitute the board whose office was to decide who were or were not competent to be admitted as lawyers, and all other matters belonging to their organization. We can fancy the reply such a query would justly elicit from the gentry of the long robe; and we doubt not that the Finance Minister who would presume on such functions once, would never repeat the folly. Again, how would the medical fraternity of Upper and Lower Canada like to have the Commissioner of Public Works, for example, by virtue of his office, the head of their affairs, the arbiter of their destiny?

Now, what we have been supposing in the cases of the lawyers and Doctors, is what actually takes place in the case of Surveyors. The Commissioner of Crown Lands, for the time being, is, *ex officio*, the head of the surveying profession in both sections of

the Province. He is the President of the only administrative or corporate functions with which Surveyors are endowed; and at his whim or pleasure can subvert the whole institution, for the Boards of Examiners, who examine and decide the eligibility of candidates to practice as Surveyors, hold their places during his pleasure, and can appoint thereto whomsoever he pleases. Nor is what we suppose a mere case of possibility, but an actual fact, for of the nine members, who at present constitute the Upper Canada Board of Examiners, five—a bare majority—are Upper Canada Surveyors. This would be less aggravating if a dearth of talent amongst Upper Canada Surveyors caused this exclusion. But we emphatically deny such a conclusion, though we must admit the inference is natural. In this particular Lower is far ahead of Upper Canada, for all the members, except the Commissioner, are Lower Canada Surveyors. Yet the Commissioner of Crown Lands, who wields such absolute power over the destiny of the Surveying profession, is no more fitted by education or training to be head of the Surveyors, than is the Finance Minister or the Commissioner of Public Works fit to be the Comptroller of the Legal or Medical professions. Nay, we believe, that in general, Finance Ministers know more of legal lore, if not of legal forms, than the Commissioner of Crown Lands knows of Surveying. We feel we are safe in saying that no Commissioner of Crown Lands, since the Union of these Provinces, knew the distinction between *altitude and azimuth*, between *theodolite and circumferentor*. We must not be understood as making any charges against Commissioners of Crown Lands, past or present, for it is an honor or obligation which, however unfairly, the law imposes on them; and we will here repeat, once for all, that whatever we may say in the discussion of this and kindred subjects, we wish it to be distinctly understood that our concern is not with individuals, however unavoidable from their connection with our subject it may be to mention individual names, that we are combating a system, of which the individuals are merely the agents.

That Surveyors could prosper under such baneful influences is simply impossible. Indeed, the wonder is that they have even maintained their present status under such adverse circumstances. At this stage two questions naturally suggest themselves:

1°. Should Surveyors occupy an equal position with the other learned professions?

2°. Are their services of such necessity and importance to the public well as to secure them a respectable competence?

If these two questions can be answered in the affirmative, it is manifest that if their services, coupled with industry and frugality, fail to secure them like advantages enjoyed by others similarly circumstanced, the fault must lay where we have indicated.

To the first question we will merely say that we have no fear that Surveyors, individually or collectively, in education and natural intelligence are equal, we will not say superior, to a like number of any other of the learned professions in this Province. The answer to the second has already been supplied by our Legislature, in the obligations which it has imposed on all persons seeking admission to our ranks; and all this having been done, as we have shewn, not in the interest of Surveyors as a class, it necessarily follows it was done in the interest of the public. For had it been done in the interest of Surveyors or at their dictation, it would have been accompanied with those other conditions without which it is not only worthless, but a burden to the Surveyor. And the reason is evident. Public men, in their anxiety to protect the general interest, never enquire into special claims, except at the solicitation of the interested parties, and then only on a conviction of the justice and reasonableness of their demands. So that if such concessions have been overlooked in the case of Surveyors, it is their own fault; it is owing to the absence of organization, owing to the want of a medium through which they could appeal to the public, and address it in the only manner they could have weight or influence—their collective capacity.

But though we withdrew these legislative reasons, whilst their repeal would not be *pro bono publico*, it would not diminish the importance of the Surveyor's services, though it might considerably affect his ability. If Surveyors in Europe, where land-marks have for ages been fixed, are held in such high repute, and figure so largely as their prominent men, how much more should they be esteemed in Canada, where, like ancient Egypt, their most important function is the establishing and defining of boundaries, and re-establishing those previously determined, and of whose existence not a vestige is often to be found except on parchment. In the competent and faithful discharge of such duty, every member of society has a deep interest.

For our own part, if the Legislature refused to accord Surveyors privileges commensurate with the obligations it has imposed, we would at once advocate unrestricted permissions for practice to such as wished, and efface all professional distinctions. Nay, we consider it to be a gross injustice to the

rising generation, who may from choice or accident embrace surveying, to continue existing obligations without equal protection. Should such a policy be inaugurated, we have no fear for the ultimate result. We know that a very few years' experience would restore our professional enactments with increased protection and privileges; and that our services would be better appreciated.

But here we have been presuming a thing in itself improbable—that the Legislature would refuse to concede a just and legitimate protection, and such as is enjoyed by all the other learned professions, if backed up by the united voices of the Surveyors of the Province. We fear no such contingency. We believe all we have to do is to ask, to specify our grievances, and point out a remedy; and that our petition will receive that attention which it merits. And if our grievances are thus long unredressed, it is mainly, if not wholly, owing to our own apathy, our want of union, the want of a means of holding intercourse one with another, to interchange ideas, to discuss subjects affecting us, and deliberate on the best means to be adopted to remedy them.

We alluded in a preceding paragraph to the monopoly of preferment enjoyed by the legal profession in some branches of the public service. They have the bench—the great goal of their ambition—the reward of professional diligence, and several minor appointments in the administration of justice to which none other can aspire. This eligibility for high offices, this chance of distinction, operates favorably in inciting to increased industry and study. Far be it from us to object to these and similar special privileges, believing such a policy results beneficially to the whole community. For, we conclude, such preferment originated in the superior fitness of a certain class to administer the duties of certain offices; and by which disposition the people are the gainers ultimately. It cannot be gainsaid that barristers by training and education are likely to make better judges than any other class, just as a blacksmith is likely to make better horse-shoes than a shoe maker or a carpenter.

But we complain that a system found so salutary and beneficial in the case of lawyers is not extended to other professions similarly circumstanced. If there is one class more than another, who can lay a well-founded claim to preferment, it is surveyors. As we have shown, they are subject to onerous legal obligations, their outfit very expensive, their vocation peculiarly toilsome, and in an especial manner subject to all the diseases certain to follow in the wake of exposure to our inclement seasons, so much so, that while yet

comparatively young they become unable to sustain the fatigues and toils of a bush life; and compelled to abandon the calling in which they spent their bloom and strength, with disease and infirmity, contracted in the service of their country, staring them in the face, with a scanty exchequer to cheer their declining days; when, we say, all these circumstances are fairly considered, no class of our population are better entitled to preferment if it can be given without detriment to the public good.

Then, if education, training, habit and experience are the best credentials to public preferment, the surveyor's claims to many branches of the public service stand pre-eminent, and cannot be ignored. Who so fit for Crown Land and Crown Timber Agents as surveyors? Who so fit for the location and supervision of public roads and other public works as surveyors? Who, again, so fit as surveyors for emigrant agents? Who so competent to administer the fisheries as surveyors? Yet though these situations are peculiarly the province of the surveyor, still he is overlooked. We say advisedly that it would be no greater anomaly to take an ordinary member of society, say of the mercantile class, and make him a Crown Timber Agent, than to take the same individual and make him Judge of the Queen's Bench; and he is as well qualified to discharge the duties of the one office as of the other. In the latter case it would simply be an intolerable outrage, whilst in the former it is the every day practice.

In the same manner surveyors, and surveyors only, should superintend the construction of colonization roads. For the primary qualification of such an office is long experience in "bush" life. Because in our rugged country, where the rocks are in many instances concealed by moss and the accumulated debris of the foliage of ages, no matter how carefully the road may be located by a surveyor (for now, we believe, it is admitted that surveyors should do the direct surveying) many important deviations have to be made from the route chalked out, which are entirely dependent upon the experience and judgment of the superintendent, and the excellence of the road will be in the direct ratio of his experience of bush life. So much so that if a renowned European engineer were transported into our forests to construct a road he would be bewildered; and sure to make a road, both very inferior and very expensive.

By this carelessness in the superintendence of Colonization Roads tens of thousands of dollars have been squandered in Upper and Lower Canada in making roads, some to

completion and others near completion, and then abandoning them as impracticable.

In consequence of the utterly wretched manner in which these works have been conducted, the prevalent belief among settlers on colonization roads is that the Government, giving the *road lots free*, selected the most barren, rocky tracts for the route, reserving the good land in the intermediate tracts for sale—a belief from which they are not easily dissuaded.

There are several other appointments such as Collectors of Customs and Inland Revenue, to which surveyors by education are well fitted, and are as eligible to most others as members of the community generally. Yet, strange to say, we seldom or ever hear of a surveyor's good luck in succeeding to any of them. We cannot attribute this apparent ostracism to any popular ill-will to our class, but rather to their own apathy.

The Crown Lands and Public Works Departments should be to the scientific professions what the bench is to the bar. All appointments in and connected with these two branches of the public service should exclusively belong to surveyors and engineers, because no other class are so competent to discharge the duties belonging to them with efficiency.

To redress these grievances, even to attain partial success, is a prize well worth competing for, and for whose accomplishment we should all be ready to make some sacrifice. We feel assured that within ourselves are contained the latent elements of victory if properly applied. We have the mechanical advantage on our side—the odds in our favor. Surveyors are the power, this little journal the lever, public opinion the fulcrum, and the grievances enumerated the weight to be removed; and with the power and the lever on our side we can remove any obstacle to our progress.

Nor is the present time for our undertaking inopportune. By all appearances we are on the eve of a great constitutional change in this Province, whether for good or evil none with certainty can predict, but we do our duty if we strive to make the most of it. Several, if not all, the departments will undergo change and re-organization—let us hope that in this change existing defects may be wholly eradicated. The Crown Lands will be subdivided, and we hope grounded on a better basis. Let it be the pleasing task of surveyors to point out a better system in that part, at least, of the Government machinery with whose working they are specially acquainted. This is a golden opportunity. Let us not be slow in availing ourselves of the advantages which, like a beacon, it holds forth. Let us then, one

and all, join vigorously, and success is beyond doubt.

It is with these objects, for these purposes this periodical has been ushered into existence. We wish the task of conducting it had devolved on more competent hands; but whatever may be our lot in connection with the enterprise, we sincerely hope that the JOURNAL may live and flourish, and that its career may be long and useful both to the public and those in whose especial interest it has been established; and if it once takes root, we look on such a result as inevitable, that it will become an institution in Canadian literature, and a necessity to its patrons. If it had once passed its infancy, there would be no fear for its future. This then is the season to succour, cherish and protect it, which is the duty, and should be the special business, of every one of those in whose interest it is undertaken. It requires the undivided support and active co-operation of every surveyor and engineer in Canada; and each should act as if its fate solely depended on his individual efforts.

For our own part we expect from it no special advantage, nothing but what it may bring to the common stock; and if any other would take it up and relieve us of the responsibility, so convinced are we of its usefulness, that we would freely contribute from our limited means towards its gratuitous support ten times the annual cost we have set it down at. To sustain a periodical of this character requires a great effort from every one interested. For it is not like an ordinary newspaper or magazine, which has patrons and readers in every class of society. This must exclusively depend on surveyors and engineers. Neither can it have the two great sources of newspaper vitality—advertisements and job work.

But for its support there are, at least four hundred surveyors in the Provinces, and if all these join with the unanimity which we expect, enough can be raised to pay the cost of publication, which is as much as we expect or desire from it. Woodcuts, lithographs, engravings and other illustrations, as well as mathematical tables and astronomical ephemeris add considerably to the cost.

When all this is considered, it will be found that we have set it down at the lowest possible figure to insure cost of publication. Judged by ordinary newspaper rates, the price of this, no doubt, would be excessive, but we have endeavoured to shew that such would not be a fair comparison. The *Law Journal*, and publications of that kind, will afford a better test. Now, though the *Law Journal* has a much wider circulation than we can reasonably expect for this Magazine,

though its matter entirely consists of ordinary newspaper type, without tables or illustrations, yet, notwithstanding all these odds as against us, we believe it is published at our price in monthly numbers of twenty-eight pages each, by which our friends will perceive that our charge is as moderate as can be.

We appeal to all Surveyors to come generously and unanimously to its support. We appeal to those who have retired, or are about to do so, from active service, either from age or infirmity, from having secured a competence, or having embraced other more remunerative or congenial pursuits, not to forget their own struggles, and to contribute their share in alleviating those of their successors, to do for the rising generation what they must have often wished their predecessors had achieved for them; and have the pleasing satisfaction, in life's decline, of being instrumental in the permanent improvement of their class.

To those who, like ourself, are still struggling in the race against odds, we would say, though you should curtail your ordinary expenses, the cause is worthy of some self-denial, contribute in the hope of a better future. Those in comparative affluence need no stimulant from us to incite them in so good a cause. To those who are well enough (*laissez faire*) and would be content to "let well enough alone," we would suggest, you, in particular, should be most assiduous, for you know not how long "well enough" may last: the millionaire of to-day may be the bankrupt of to-morrow. The young Surveyor has every strong inducement to be most generous, for if any good effected, he, at least, is sure to reap the benefit.

It is not surprising that Surveyors have hitherto almost exclusively engaged our attention; and that reference to the sister profession (Engineering), seems more like casual than studied. Yet this can scarcely be wondered at. The Surveyor has a legal *status* in this country, which the Civil Engineer has not; and if the latter are unrecognized on the statute book, they are likewise relieved of legal obligations. Besides, Surveyors being by far the most numerous, naturally claim a larger share of attention. And though in the future Surveying shall secure the largest meed, until its affairs are settled, Engineering shall not be neglected. It shall be our aim to unite both, not only in the bonds of fraternal friendship, but in the indissoluble ties of wedlock. We hope soon to see the Canadian Surveyor and Engineer occupying a position analogous to the Attorney and Barrister.

In conclusion, dear *confreres*, you have heard our say, you know our object. Our

future is now in your hands, life or death in your gift. If you say *yea*, this *Journal* will live and flourish, if *nay*, it is sure to perish. But whatever may be the result, we have performed our part, and will take your decision in good cheer. If we have thus appealed to you it is with no sinister motive. We would, however recommend each and every one, before coming to a final conclusion, to weigh well our arguments, and not to forget that perchance another such opportunity may not be afforded the present generation of surveyors. If you do this you perform your duty. Should your decision be adverse, this magazine must expire, for had we the inclination we have not the means of publishing it at our own expense; and then, as heretofore, your class will be unrepresented, a standing reproach to your education and intelligence, and a great impediment to your success in life.*

N. B.—We have to apologize for the appearance of this number, but being at best, only an introductory one, we crave the indulgence of our readers; and will endeavour in our next issue to compensate for the defects and omissions of this, as by that time all our arrangements will be in complete working order. Amongst other matter we expected to have several plates and cuts, but found they could not be ready in time for this number, a delay which would defer our birth for another month; and deprive you of our agreeable society and friendly counsel.

Hints to Students and Young Surveyors.

SURVEYING is the science which practically teaches how to measure the surface of the earth or any limited portion thereof, to enable us to find its area and construct a map or figure representing it on a plane surface. There are two kinds of surveying: *Plane* and *Geodetical*.

Plane Surveying is the art of measuring small portions of the earth's surface, considered as a plane or level surface; and may be subdivided into two parts: *Land* Surveying and *Engineering* Surveying.

Land Surveying shows how to measure, lay out and subdivide small tracts of land, as a farm, an estate, &c.

Engineering Surveying teaches how to lay out lines of roads, canals and railways, and to find the difference of level between any two points on the earth's surface.

Geodetical Surveying is the science which treats of the measurement of large tracts of the earth's surface, considered as a spheroid, and of measuring the length of a degree of

the meridian, by which the sphericity of the earth is practically determined.

Young friends, in order that you may be competent to discharge the duties of a surveyor creditably to yourselves, beneficially to your employer and honorably to the commonwealth, it is absolutely necessary that you should have a thorough and profound knowledge of geometry, plane and solid; of trigonometry, plane and spherical; of arithmetic, of Algebra, of analytical geometry and trigonometry, of the application of geometry and trigonometry to the measurement of heights, distances and surfaces, commonly called mensurations, of practical astronomy, as much, at least, as is sufficient to determine the latitude of your station, azimuth, by which the meridian is determined, and the local time at your station, with optics and magnetism as guides to know your instruments. The foregoing knowledge being absolutely necessary, we shall call primary.

There is besides this a secondary knowledge of many branches of physical science, such as geology, mineralogy and botany, which add not only materially to your usefulness, but largely increases your own pleasure in life.

Therefore, if you have not already acquired the branches which we have called primary, you should immediately set about studying them. We do not mean that you should again resume your scholastic education, but presuming that in school you have acquired an elementary knowledge of arithmetic, algebra and plane geometry, which if you have, your learning with a little diligence and perseverance, is adequate to the task of acquiring the rest; and that too in a much shorter time than you would be willing to believe us if we specified it. Do not tell us you have no time. We say you have, for we have seen as much accomplished at a camp fire as we have here set before you; and you cannot plead any such excuse for ignorance hereafter if you heed not our advice. We need not add, that some of the brightest luminaries in the galaxy of science have learned under circumstances as adverse, and some, too, far advanced in life, we, ourself, small as is our stock, have in the last six months, amidst the cares that beset and surround our station, acquired more mathematical knowledge than we imagined we could accomplish in many years.

We would, then, recommend if, as is not unfrequently the case, you have, since leaving school, neglected the study of geometry, to commence with that most important—the basis—of the exact sciences; because, without a sound, deep-laid knowledge of it, you will be wandering in the dark, rolling a stone uphill. For this purpose, Chambers' is a very

*We shall resume this subject in our next issue.

a hill. For this purpose Chambers' is a very cheap and good treatise. Every day spent in getting a thorough knowledge of geometry is two days gained in future progress.

To be Continued.

Management of the Public Lands.

THE administration of this Department should be to the surveyor what the administration of the law is to the bar, because a certain amount of special training and education is necessary to the efficient discharge of any service, whether of a public or private character—a principle observed in every walk of civilized life.

In this article we shall point out a few of the penalties which the people pay for an infraction of this fundamental law of society. The lands of the Province belong of right to the people, and like all common or public property, are committed to the care and management of the Government. It would be a needless waste of time were we to dwell on the importance of land generally, or to expatiate on the public domain of Canada particularly. Suffice it, therefore, to say that this interest has justly been considered so important as to have a member of the Cabinet specially detailed to conduct and administer its affairs. Had the legislature, which evinced so much zeal and solicitude in the guardianship of this trust, gone a little farther in imitation of a merchant, a builder or farmer, in quest of a clerk, a mechanic or ploughman, and decreed what class of the population should be entrusted with the management of the public lands, just as has been done in the cases of the law and Finance Departments, their work would have been complete and ample. It is much to be regretted that some such provision had not been made, and that political exigencies are paramount to fitness.

But if, in the nature of our institutions, competency combined with partizan fealty is, if not impossible, difficult of attainment, we would reasonably expect that the political head would be surrounded with persons, who by education and experience would be unmistakably qualified to guide, counsel and direct him in the management of this most important public trust. If Commissioners of Crown Lands must be selected for their ignorance of the affairs of the Department over which they are called on to preside—as ninety-nine per cent of them are—it would be fair to presume that the permanent officials would be chosen to prevent and counteract the mischiefs sure to follow from the incapacity of the chief. In the same manner, as if a draper, embarked in lumbering, with whose management he was wholly unacquainted,

would be certain to secure the services of an agent, whose knowledge of the business was undoubted; and did he neglect to do so, the consequences would be certain failure.

This, we confess, looks like arguing in a vicious circle, because, first we charge the commissioners with a want of the slightest knowledge of the duties they undertake to perform, and secondly, accuse them of want of discrimination in the efficiency or inefficiency of their subalterns, and want of discernment in making new appointments. Indeed to expect such results in the conduct of public affairs, however consistent with private management, would not only be unreasonable but puerile. But we would expect that the statute book in the multiplicity of its tomes would contain some safeguard, some guarantee against such a contingency—that it would prescribe what class of the people were particularly fitted for this duty. Neither would such an enactment be novel or unprecedented, nor an encroachment on the prerogative of the crown or natural rights of the individual.

Is "law" more important than "land"? We fancy only the lawyers will answer in the affirmative. Why then is the administration of the law so carefully guarded, whilst that of land is left to chance? It is because the majority of our legislators, the governing classes, the leaders and framers of public opinion, are unacquainted with the nature, character and peculiarities of our public domain. We confess whenever we approach this subject we feel embarrassed from a consciousness of the difficulty of making our meaning intelligible to those classes, and that any amount of writing without experience is insufficient to convey a comprehensive, satisfactory notion of this matter to those unacquainted with life in the backwoods of Canada. Indeed, the great majority of our city populations are as ignorant of Canadian "bush-life," as they are of life in Timbuctoo. To many this will sound strange and incredible. But we can safely appeal for confirmation of what we have here advanced, to the members for Russell, North Leeds, Essex and South Grenville, and to the hon. members for St. Clair, Rideau and Inkerman, as well as to lumbermen, &c., generally.

Whenever a person desires any information connected with land, a surveyor is instinctively uppermost in his mind, just as a tailor for a coat, a doctor for a pill, or a lawyer to defend his person or pocket. (?)

For he knows that these, each in his respective sphere, are best qualified to relieve his wants or gratify his curiosity. Why is this rule, so admirable in men's affairs generally, ignored in the management of our public

lands? Whence does the Commissioner of Crown Lands derive the knowledge so indispensable to the accomplishment of his duty? Is he surrounded by men who by education and experience are qualified to give him necessary information and reliable advice? We advisedly answer these questions in the negative. We have carefully scanned the official list of the Crown Lands Department, from the Commissioner down to the messengers, consisting of sixty-five souls, and of these we unhesitatingly say there are not half a-dozen who could possibly be capable of giving counsel based on practical knowledge. Probably not more than this number have ever set foot on our wild lands—the trust they are supposed to manage for the public good. Of course we do not consider that riding in a railway carriage to Barrie or Brantford or Sarnia or Riviere du Loup to hold a sale, or going to Manitowaning or Shebananing to make Indian treaties, or quell Indian mutinies, as adding to their information, they might as well be sailing on the Atlantic. And of the few who possess any knowledge of it, two are old—good men in their time, but their ideas like themselves are antiquated—far behind the time. With such counsellors it is not to be wondered at that all attempts of successive commissioners at good management and economy have signally failed, and that the Crown Lands Department has perversely continued a standing reproach to our institutions.

We see the consequence of their blunders and failures every day. We see it in abortive attempts to force settlement in districts wholly unfit for agricultural purposes at enormous public cost. We see these settlements languishing or entirely abandoned when the pine forests, in whose destruction they have been chiefly instrumental, are exhausted; and the only legacy they leave is the wanton waste of our timber—the devastation in a few hours of the crop of centuries' growth, and more precious than mines of gold. We see it in a reckless system of constructing colonization roads, which after spending thousands upon thousands of dollars on them, are abandoned as impracticable, to the great disappointment and injury of poor settlers, who were induced through the facilities of communication which they afforded to settle along them. We see it in the anomalous system of granting lands along these roads free, whilst the inaccessible lands in the interior are charged full price, and often exorbitant rates. We see it in the crude, undigested regulations alternately issued and abandoned, by which the manufacturers of our staple commerce—timberers—and settlers—the pioneers of our greatness—are kept in perpe-

tual conflict—two parties whose mutual interest it is to live in harmony, for each is essential to the success of the other; and by which the speculator only is benefitted. We see it in the abolition of the best system that has ever prevailed for the settlement of our wild lands—we mean respect for the rights and improvements of squatters, whose labor alone gives the land its value. We see it in the incongruous system of defining the boundaries of Timber Limits, and which though very expensive is only temporary. Had a different system been introduced, by which timber boundaries should agree with future subdivisions for settlement; and which as exploratory lines would determine and decide the tracts or portions fit for settlement, as well as those which prudence and economy should reserve and set apart for timber purposes. We see it in the descriptions of licences, which are in numerous instances so vague and ambiguous as to be scientifically meaningless, and could only be defined by the assumption that a superficies was meant—sure sources of vexatious and doubtful litigations by which men, whose all is embarked on the strength of their validity, are frequently ruined. We see it in official misrepresentations of the character of our wild lands, when the truth would answer better, for emigrants founding their hopes on these fabulous accounts of fertility are sure to turn away from our shores in disgust when they encounter the stern reality—the victims, as they suppose, of fraud and swindle. We see it in the careless disposal of large tracts of our lands to individuals and corporations, contrary to every sound principle of political economy.

Our position is appropriately illustrated by the absurd regulations recently issued relative to our rivers, by which, if persisted in to the letter, must soon annihilate one of our most important branches of native industry. Just fancy the complete extinction of our sawn lumber trade, in which an almost incalculable sum has been invested, in whose manufacture thousands of our population are annually employed at very remunerative wages, and through which millions of dollars find their way into home circulation, besides the large amount to the revenue for the sake of what? For the sake of protecting a few barbotres (mudpoors), in the taking of which not a dozen poor creatures drag out a miserable existence. If the lumber offal and refuse would have the supposed effect, nothing could be more humane to these poor wretches. If this is law, we presume it was hatched in the Crown Lands Department, and if not, it was their duty to have opposed its passage; and is of that class, which is better in the violation than observance.

Will any one suppose that if the management of the public domain were under the control of its proper custodians—surveyors—we could have such a record to chronicle. Most assuredly not, for surveyors of experience, however indifferent they might be about the public welfare, could not but be sensible of running great risk of coming to disgrace in the pursuit of such a policy; and this with their knowledge of what should be done would be a powerful incentive to follow a correct course. But the men at the head of affairs know not these things. They are not conscious of mismanagement, and, therefore, individually blameless. We believe, as far as their knowledge goes, that they honestly and faithfully discharge their duties; and hence are not morally responsible for the many defects of the Department they administer. With the individuals we find no fault. Did they refuse to accept these situations they would be more than human.

The public at this stage of our argument is anxious to learn what we propose to do with them, or if we recommend to cast them adrift after years spent in the service of their country. Far be it from us to recommend any such policy. In our opinion such a course would be unjust, ungenerous, cruel, and an ineffaceable blemish on national honor. But, under the new order about to be introduced, we would suggest to have them transferred to other branches of the public service more congenial to their capacity, and where their services would be really useful; and if none such can be found, we would unhesitatingly advise to pension them off—to pay them a competence for the remainder of their days for doing nothing, for we are convinced that every dollar so disbursed would be *ten* gained in good management and progress.

There is, however, one class which in our judgment should be excluded from the endowment list—we mean the offspring of these officials, a goodly number of which figure on the roll. Now we cannot for the life of us conceive on what principle, except *hereditary right*, that this practice of appointing the children to places in the departments in which their incompetent fathers occupy positions, nor can we imagine a greater outrage on public decency. We would, therefore, have these scions try their hands at living by their own exertions and industry, unless under the new *regime* we are going to perpetuate all the defects of the old.

We have shewn, if any one doubted the fact, that Commissioners of Crown Lands come to the administration of that Department with the least possible amount of fitness for the efficient, successful discharge of its important functions. Their tenure of office

is uncertain, even to a day, which makes them indifferent to acquire even the knowledge within their reach. They are consequently in the hands of their subordinates, and entirely at their mercy in administrative acts, they are afraid to move in any direction lest they might commit a *faux pas*, which not only might prove their own overthrow, but that of the party then in the ascendancy. How much the more necessary under these circumstances, that they should be surrounded with men on whose experience, education and training they could rely in the administration of the affairs of the Department.

To be continued.

Alphabetical List of Terms used in Surveying, Engineering and Architecture, from Brees' Glossary.



ABACUS, the crown member of the capital of a column. The columns used in classical architecture are usually formed with a square abacus, and they are formed so as to project over the volutes, and such parts, and cover them.

Abrevoir, or **Abrevoir** (in masonry), the interstice or joint between two stones of an arch, which is usually filled up with fine mortar or cement.

Abutment, a term much used in reference to any fixed points, from whence, or by which, any support or force is obtained; thus the extremities of a segmental arch are said to be supported on abutments, upon which it rests or abuts; the extremities of a bridge are also termed abutments. The abutments of large segmental arches are usually formed with radiated beds at the present time, which increases their strength considerably, by rendering the real rise of the arch greater.

Abutments, the buttings or boundaries of land.

Abutting Joint (in carpentry and joinery), a certain jointure of two pieces of wood, the fibres of one piece being perpendicular to the joint, or approaching thereto, and those of the other piece parallel to it.

Abstract, a list of articles and quantities arranged in a tabular form, and employed in the process of estimating artificers' work.

Acre, a measure of land amounting to—4 roods, or—160 square rods, poles or perches; or—10 square chains:—4840 square yards also form an acre.

Accouplement, a timber tie or brace.

Adhesion, the force acting on the surface of two separate bodies in contact with each other, which tends to bind them together, and which is proportionate to the number of touching points.

There are two kinds of adhesion: first, the

natural attraction existing between the surfaces of unconnected bodies, and which is said to be greater with two bodies of a similar nature than with two of a different kind, as the force which prevents the wheels of a locomotive engine from slipping on a road or railway—which is greatest when the road or rails are either quite dry or thoroughly wet, the surface then being most free from obstruction. When partially wet it is much reduced, as the wheels are more apt to catch up the dust. The adhesion of the wheels of the best modern locomotive engines to the rails, exclusive of the power to drive the engine itself, is supposed to be capable of overcoming a resistance equal to one-fifteenth part of the insistent weight of the engine upon a level plane, or one-tenth in fine weather, and one-twentieth in very bad weather; and that of locomotives working with vertical cylinders, to one-twentieth part of the weight pressing on the rails by the driving wheels; or, taking the friction as equal to $8\frac{1}{2}$ lb. per $\frac{1}{2}$ ton, or the 263rd part or the weight, a load equal to $\frac{263}{15}$ th or $\frac{263}{25}$ th of its weight respectively, or the weight acting upon the driving wheels. The wheels of railway locomotives are sometimes coupled, which nearly doubles or trebles the amount of adhesion, according to the make of the wheels. The degree of adhesion to the surface of an ordinary road is at least ten times greater than upon a railway, that of one wheel of a road locomotive being generally found sufficient; but in passing up a very steep hill another is sometimes fixed. The other description of adhesion is artificial thus the surfaces of some bodies are brought to adhere together by the use of glue and other tenacious substances. The adhesion between two flat pieces of glass or brass when smeared with grease and rubbed together, is very great.

Adit, Day Level, or Sough (in mining), a subterraneous gallery, or passage, extending from the lowest convenient point in a valley through a hill into a vein of metal, by which the water and minerals are conducted, and the miners sometimes enter and leave it. Adits are either walled or timbered where the soil is bad, and they do not always run in direct lines. The water of several pits is frequently received by one large adit, extending many miles in length. An air-shaft is also sometimes termed an adit.

Air-pump, an instrument employed in pneumatics for drawing the air out of a vessel, which is effected by a series of strokes acting upon the elasticity of the air.

Air-pump (in reference to the steam-engine) the pump employed in drawing off the condensed water from the condenser, com-

municating therewith by a pipe at the bottom; the air-pump and condenser are usually of similar capacity, each being equal to one-eighth of the contents of the cylinder.

Air-escape, a contrivance for passing the air from water-pipes, without allowing the escape of the water; the air would otherwise collect in the higher levels of pipes, and obstruct the passage of the water.

Air-gratings, small iron gratings built in walls, at the level of the floors, for the purpose of affording ventilation.

Air-valve (in reference to the boilers of steam-engines), a safety-valve fixed at the top of the boiler, and opening inwards, to prevent rupture from the pressure of the atmosphere upon the sides of the boiler, should a vacuum occur within from the steam becoming condensed, or partially so. The valve is kept shut by a counterweight placed at the end of a lever, in the usual manner. There have been instances of boilers becoming collapsed by the pressure of the air from without.

Air-vessel (as applied to pumps, &c.), a chamber containing air, attached to the ejection pipe of a pump, and communicating with the pipes through which the water flows. It is employed to obviate any irregularity in the supply of water, which it effects by its elastic force, the discharge is thereby rendered constant and uniform—for instance, when the water is introduced, the air within it becomes compressed, and acquires a corresponding degree of elastic force, which it exerts upon the water as it escapes up the pipes, by which a continuous stream is maintained in the rising main.

Ajutage, a tube fixed at the mouth of an hydraulic vessel for regulating the discharge of water.

Alcove, an ornamental seat in a garden; a summer-house, bower, &c.

Alto-relievo—in sculpture—the name applied to figures or ornaments when wholly projected from a flat surface; if partially standing out it is called demi-relievo, and if it be very slight bas-relievo.

Amulet, another name for a fillet. Amulets, however, are generally situated either over or under large mouldings.

Anchor and Collar, or Gate Hinges (sometimes called Collar and Clamp), the hinges employed in hanging lock-gates, &c.

The anchor is usually let into the stone coping, and turned down into it at each end, and well run with lead. The collar is made to fit the hooping on the top of the quoin-post; and is wedged up to the anchor as may be required, by means of keys.

Ancree, a sort of ornamental console applied on each side of a door to support the

cornice, &c.; they are also sometimes to be found on the key-stone of arches, but are usually called trusses at the present time.

Angle Bar—in joinery—an upright bar, situated at the meeting of two of the faces of a polygonal window, as a bow window. The word angle is also annexed in a similar manner to many other parts of a building when occurring in an angular situation—as angle bracket, angle rafter, angle rib, angle chimney, &c.

Angle Irons, the pieces employed to join the angles of iron framework, as boilers, &c., being riveted to the side pieces. It is at present considered much safer to bend the plates of boilers carefully at the corners, in preference to using angle irons.

Angles—in joinery. The angles of wood work require to be secured together, either by tongues or rebates, as well as nails or screws.

Angle Staff, the strips of wood occurring in the inside of buildings upon the exterior vertical angles, and employed to protect the plastering. Angle staffs are of two kinds—viz., square staffs and round staffs, called also angle beads, the former being mostly employed when the walls are papered over, or otherwise covered, and the latter when the angles are seen.

Angle Bead, or **Staff Bead**, a description of Angle Staff. Angle beads are made flush with the finished surface of the plastering on each return, and are therefore serviceable in floating the plaster; they are secured to the bond plugging or wood bricks fixed in the walls by the help of nails. Angle beads are sometimes made to show double each way, forming a triple bead, although they are not employed in superior apartments; but the plaster is well gauged, and brought to an aris, a thin copper angle bar being sometimes fitted in to preserve it from accidental fracture.

In the case of an arched recess the wooden angle beads are fixed to the jambs, the bead only being continued round the head in plaster; hence they should always be separated by an impost in good work, whereby the joint is concealed.

Angle Ties, or **Braces**, the name applied to any framing when situated on the inner side of an angle, for the purpose of tying the work together; thus, there are angle ties to secure wall plates at the several angles of a building, &c.

Angle of Repose—sometimes called the angle of Friction—the utmost inclination at which a carriage will stand at rest upon a road or railway, and when upon the least increase of slope it is put in motion by the gravity of its weight; it consequently occurs when the

gravity of the load and friction upon the road are equal.

The angle of repose varies according to the amount of friction; taking the friction at 9 lbs. per ton makes it 1 in 250, or about 21 feet per mile, which is generally considered the angle of repose upon a railway; and taking it at $8\frac{1}{2}$ lbs. per ton, gives it at 1 in $263\frac{1}{2}$, or 20 feet per mile.

The angle of repose, upon a turnpike road with a good description of carriage, is about 1 in 40, supposing the road to be perfectly hard.

The natural angle, at which the soil of a cutting or embankment will stand without slipping immediately after teaming, is also called the angle of repose.

Angle of Traction, the angle formed by the inclination of the traces with the surface of the roadway.

Animal Power, also called **Animate Power**, the power exerted by an animal in accomplishing any purpose. The power of an animal is greatest when standing still. It will, consequently, support a greater load than it can carry. Upon commencing motion its power is lessened, and it continues to decrease in proportion to the velocity of its motion. A speed may at length be attained at which it cannot carry any load, the whole of its strength being required to keep up its velocity. It has been stated, that an animal can produce the greatest effect in a given time when moving at one-third of its greatest velocity unloaded, the load being four-ninths of that which it can just move.

As the mechanical effect of an animal is according to the speed of its velocity and the weight of the load, it may, consequently be ascertained by multiplying them together. Most authorities rate 1 horse equal to 5 men; some state it at 6, and others at 7.

A belief that locomotives would soon compete with horses on common roads, possessed the scientific world a few years ago, but it is not so general at present. The superiority of steam engines over horses upon railways, is, however, self-evident; yet, as it is necessary for the trains upon a railway to start at certain fixed periods, whether they have full loads or not, they consequently become expensive with light ones.

The expense of conveying goods by horses at 2 $\frac{1}{2}$ miles an hour, is about the same as by locomotives at 12 miles; therefore where speed is of no consequence, horses may be preferable, as a horse railway can be executed for a much less sum than a locomotive line. There are some railways in the north of England where horses still continue to be used.

The following statement of the dynamical effect of human and horse power severally

applied to walking, wheel-cranes, crabs, cranes, pile-driving engines, horse-runs, &c., for raising different materials, was drawn up by Mr. George Rennie, C. E.:

MANUAL LABOR.

Building Materials.

- lbs.
- 1stly. One man, in sixty-seven journeys, raised a weight of 16,342 lbs. (including his own weight), to the height of 30 feet in ten hours, equal to a weight of..... 817
raised 1 foot per minute.
- 2ndly. One man, in forty-seven journeys, raised a weight of 11,374 lbs. (including his own weight), to the height of 50 feet in ten hours, equal to a weight of.... 974.8
raised 1 foot high per minute.
- Ordinary Cranes, from experiments made at the West India Docks.*
- 3rdly. The power of six men applied to a crane is capable of raising 224,000 lbs., 15 feet high, in eight hours, equal to a weight of..... 1166.6
raised 1 foot high per minute per one man.
- 4thly. The power of six men applied to a crane is capable of raising a weight of 262,080 lbs., 12 feet high, in eight hours, equal to a weight of..... 1092
raised 1 foot high per minute per man.
- N. B.—The friction of these cranes varied by experiment, from $\frac{1}{16}$ th to $\frac{1}{4}$ th of the absolute weight.
- Ordinary Cranes, from Experiments made at the West India Docks.*
- 5thly. By the walking wheel-crane, worked by six men, a weight of 787,920 lbs. was raised 7 feet in eight hours, equal to..... 1915
raised 1 foot high per minute by one man.
- 6thly. Again, by the walking-wheel crane, worked also by six men, a weight of 911,680 lbs. was raised 8 feet in eleven hours, equal to.. . 1841
raised 1 foot high per minute by one man.
- 7thly. By two crabs, worked by six men each, a weight of 728,000 lbs. was raised to a height of 16 feet in eight hours, equal to... 2012
raised 1 foot high per minute by one man.

HORSE POWER.

- 8thly. The dynamical effect of 1-horse power applied to a pile-driving engine, was found to be equal to a weight of 42,536 lbs., raised 1 foot high in thirty-five seconds, or a weight of 36,459
raised 1 foot per minute per horse.
- 9thly. Again, the power of a horse applied to working runs, or raising earthwork up a run, or inclined plane, the base of which was 60 feet, and the vertical height 40 feet, was equal to a resistance of 410 lb. travelling through a space 72 feet in one minute, which is equal to..... 14,760
raised 1 foot high per horse power per minute; a result very inferior to the last, arising from the inconstant nature of the work.

Antæ, or Antæ Pilaster, a certain description of pilaster attached to a wall.

Aperture, an opening formed in a wall or partition to receive a door or window, or to afford a recess. The sides of an aperture are called jambs, and the bottom the sill; the top is called the head, whether it be arched or level. Apertures are of other shapes besides square, as circular, oval, &c.

Apron, a term applied to the lower part of anything, as to the lower part of a window next the room, also the timber platform at the entrance to a lock against which the gates shut.

Apron—in Plumbing.

Apron Lining, the boarding covering the apron piece.

Apron Piece, or Pitching Piece, a piece of timber used in the construction of wooden staircases, for supporting the carriage pieces, or rough strings. The apron piece is placed in a horizontal direction at the end of the joists forming the landing, and is firmly wedged into the walls at either ends.

Aqueduct, a term applied generally, either to a series of arches over a valley, or to a tunnel through the earth, when either expedient is used for the conveyance of a body of water.

The ancient Roman aqueducts, some of which remain at the present time, were constructed at a great expense, consisting very frequently of several tiers of arches, supporting the water way, which was intended for the supply of the several public fountains baths, &c. The supply of water to Rome was considerably greater than the present supply of London, and that of Paris is much

less than the latter. The Lune Aqueduct, in Lancashire, on the Lancaster Canal, by Mr. Rennie, and the Chirk Aqueduct, in Denbighshire, on the Ellsmere Canal, by Mr. Telford, are among the most celebrated aqueducts of modern times. The water ways of modern canal aqueducts are usually formed of plates of cast iron rivetted together. The ancient aqueducts were not used as canals for the purpose of navigation, as those of the present time, but for the conveyance of water for the use of the people.

Arch, a certain arrangement of over-lapping wedge-shaped stones or bricks, commencing usually from two fixed points or abutments, the beds radiating and meeting in the centre, thereby forming an equilibrium upon the removal of the wooden mould upon which the arch is turned.

Arches are of various shapes.

The abreuvoirs or joints of all arches should be perpendicular to the surface of the soffits.

The top of an arch is called the extrados or back, and the under side the intrados or soffit; the line from which they commence is called the springing line, and the first arch-stone on each side the springers or reins, which rests on the imposts or abutments. The extreme width between the stringers is called the span of the arch, and the rise of the curve in the centre the versed sine. The highest portion of the arch is called the vertex or crown, and the centre course of voussoirs the key-course.

The side portions of all arches extending from the crown to the springing are termed haunches or flanks, and all arches require to be well sustained by backing carried up to the haunches. The walls built on the haunches are called spandrel-walls; and it is customary to carry up spandrel-walls with small arches turned over between them, termed relieving arches, upon the backing of arches of great span, for the purpose of preventing any irregular pressure of earth upon the same. Arches are also either cylindrical or groined, the former being an elongation of the same curve throughout its length; and where intersected by other arches cutting across it transversely the point of junction is termed a groin, such being described as groined arches.

An arch equally balanced in all its parts, is called an arch of equilibrium, which is of similar strength throughout, or not more inclined to fracture in one point than in another.

It is found sufficient in practice, if the arch of equilibrium be comprised within the voussoirs, without forming the extrados and intra-

dos of the necessary form to constitute the same.

The construction of brick arches should approximate as closely as possible to those of stone. In the common mode of building them the innermost courses of bricks are laid very close, and pieces of tile or slate are filled in the outer parts of the joints; the bricks are in other instances laid in separate rings, which system remedies the want of key in the former, but is defective from the want of connexion between each ring; it is therefore best to employ built voussoirs, by which the key is maintained throughout the whole thickness of the arch. This plan may be said to unite the advantages of each of the former methods; and it was somewhat followed in the construction of the arches of the Blackwall Railway.

Brick arches of very great span have been erected; those over the Thames at Maidenhead, on the Great Western Railway, are each 128 feet span, and 24 feet 3 inches rise, and are the largest yet built: they are turned in cement. The building of brick arches in cement doubly strengthens them; yet as the remainder of the erection is generally carried up in mortar, an unequal settlement naturally follows, and consequent fracture, unless a proper provision be made for the same.

Elliptical arches are therefore not unfrequently turned in mortar, from the springing to the haunches, and the remainder finished in cement; the arch is therefore enabled to accommodate itself at the mortar joints to any pressure it may receive from the spandrels, or from any sinking of the abutments, which it may do without impairing the strength or effect. Sometimes only a small portion only of the centre of an arch is turned in cement; in other cases, a course of stone is carried along the haunches of an elliptical arch to strengthen it. There are some segmental arches on the Blackwall Railway, built of brick, with a span of 86 feet, and a rise of 16 feet, which are turned in cement, in old English bond, (the usual method of turning arches being in half-brick rings) there are three courses of bricks taken through the whole thickness of the arch (4 feet 3 inches) upon each side, their lower beds and cross-joints being laid in mortar, also the three courses next the springing of the arch.

Some engineers consider it a good plan to lay in the lower courses of the bricks dry, and grout them together, as it gives the bricks a more equable strain.

In reference to railway arches, it may be stated, that the general size of the arches for occupation bridges over the London and Birmingham Railway is 30 feet in width and 17 feet in height to the crown; elliptic arches

being adopted, having a rise of 9 feet, and the arches under the railway are made 15 feet wide, and of various heights, according to that of the embankment. The extreme height of Temple Bar, London, is 17 feet 9 inches, which is not sufficient for some of the waggons to pass under. Arches are sometimes formed of iron, also of wood.

(To be Continued.)

Notice of New Books.

We understand that Charles P. F. Baillarge, Esq., of Quebec, P. L. Surveyor, Civil Engineer and Architect, has recently published a treatise on Plane and Solid Geometry, and Plane and Spherical Trigonometry, which we hope to be able to review in our next issue. We believe that this is the first book of a scientific character published by a Canadian author. We are pleased to have to chronicle this progress; and particularly so, as the honour belongs to one of our own class.

We have no doubt that this book will merit the patronage of scientific men, for having emanated from the pen of that distinguished scholar is a good guarantee of its excellence. We hope such enterprizes will meet with the success they merit. It has for a long time been a just cause of regret that this Province, so fruitful in most other things, has produced few if any scientific authors; and now that this reproach is being wiped out, it would be a lasting shame to the country if they did not extend adequate encouragement to the authors. We sincerely hope that Mr. Baillarge will reap the just reward of his enterprize; and we heartily congratulate him on his success.

We would direct the attention of surveyors, engineers, architects, &c., visiting the metropolis, who may require to purchase stationery, drawing instruments and materials, to the card of Hope & Co., to be found in another column. We can speak from experience of the excellent quality of their goods, and believe the establishment to be second to none in the Province, both as respects quality, price and variety. We know that it is superfluous to say a word to surveyors residing in this vicinity, for we know it to be their favorite mart. Give them a call.

AN OMISSION.—Greek letters and characters being not generally in use in ordinary printing offices, we had to order them from a distance for our Tables, and not having arrived in time we have been compelled to go to press without them, using in their place ordinary type.

Disputed Boundaries.

BOUNDARY is the outside or limit of any body, or that which divides one limited or definite space from another. The boundaries of solids are surfaces, and of surfaces lines. One portion of the earth's surface is distinguished from another by its boundaries. Of these there are two kinds, *natural* and *artificial*.

Natural boundaries are those barriers or divisions erected by nature to distinguish one portion of the globe from another, as seas, rivers, lakes, mountains, &c.; and usually form the limits of countries.

Artificial boundaries are imaginary lines or arbitrary marks, such as walls, fences, ditches, &c.; and generally employed to distinguish the property of one individual from another; or they consist of mathematical descriptions by which such marks or monuments may be established as would enable any one member of the community to discern his property, and set it apart from all the rest.

Boundary, then, is the basis of private rights in real estate—a fundamental law of society, without which special or individual rights to certain tracts of land could not exist; and is coeval and contemporaneous with modern civilization, whilst the want of boundaries is peculiarly characteristic of savage nations.

It is true that the land within the limits of any state might be arbitrarily and irregularly parcelled out or distributed amongst the inhabitants, either by might or choice as was customary in ancient times. But experience has shewn that such a system would not only be not desirable but, exceedingly inconvenient, and almost impracticable in a country like Canada, covered with an unexplored forest. Then, as the rights of individuals to real estate is contingent on its boundaries, it is of the first importance to the whole population both individually and collectively, that original boundaries should be properly established by competent authority. It is with this object that the legislature has provided that persons entrusted with this duty should be well versed in science—it is for this purpose that onerous obligations and severe restrictions have been imposed on the Canadian surveyor, and that his education must be more extensive, if really qualified, than is necessary in any of the other learned professions. The Government perform the original subdivision by which data are furnished to fix any definite portion or parcel of land. It is scarcely necessary to add that such allotment should only be entrusted to the first talent in the country, as well for the future stability and security of property, as the only means of

ascertaining knowledge of the geography of the country. Tho' important this service, truth compels us to observe that this rule is not very rigidly adhered to. For it is manifest that if in the first parcelling out of the land the quantities were accurately determined, the chances for future disputes would be considerably diminished. Such disputes generally originate in the perishable character of the marks or monuments employed in the original subdivision. It is a fact patent to every one that our courts, term after term, teem with vexatious litigations on disputed boundaries; and that many an honest, industrious man has lost his all—the fruits of years of toil and struggling, in such contentions. But as from the nature of our country such disputes will sometimes arise in spite of all human caution and foresight, it is, therefore, absolutely necessary that such disputes should be decided by competent tribunals, wherein justice should not be administered in ignorance, but on unerring, scientific principles; and it is to this object we wish specially to direct public attention in this article.

Now in Canada there can be but one way of establishing boundaries, or re-establishing those which have been obliterated; and that way is by astronomy. But tho' we are limited to one mode, that mode is *infallible*, and all others are fallible, uncertain and imperfect, and if ever correct only by accident. Of course our reasoning implies that none unacquainted with astronomy can establish boundaries, and as they cannot establish them without this knowledge, *a priori*, they cannot pronounce intelligibly whether they are correct or not. But to acquire this knowledge, even partially, its possessor must be familiar with the principal branches of mathematics, and must be furnished with good and sufficient instruments to reduce this knowledge to practice, for without these helps his theory would be practically unavailing. When a dispute arises is this mode—the only possible one for adjusting it—resorted to? On the contrary, instead of applying to those who only could settle the difficulty, they rush to lawyers, as ignorant of the issues involved as the disputants, and a law-suit begotten in ignorance is instituted; and from thence to the termination every act in the legal drama is a ridiculous farce—a disgrace to the age and civilization of which we are so proud.

We will not follow the processes, the journeys hither and thither, alternately from the court-house to the lawyers' respective offices, but shall without further ceremony usher on the stage the crowning scene of this burlesque on justice. Truly justice must be blind, or she would never permit her immaculate name to be tarnished by such proceedings.

The curtain rises, and what do we behold? We see twelve men selected as it were at random from the crowd, being put thro' the immoral farce of, what!—of solemnly swearing that they will perform an act, which for them is simply impossible—swearing that they will decide scientific issues, of which they know as much as they do of the inhabitants of the moon. Besides the losses it entails, or may any day entail on any one of us, see the moral effect. What respect can the persons so drilled have for the solemnity of an oath. Next, lest there would be any chance of their seeing a scintillation of reason, all the succeeding ceremony is admirably calculated or rather perhaps specially instituted, to confuse and bewilder them. A surveyor is put in the box, and from the badgering which he gets from the lawyer, he appears to the jury and the public more in the character of a partizan on one side or the other, than an arbiter, his scientific operations being quite irrespective of either. When the whole institution is founded in ignorance, every question asked by the lawyers is quite irrelevant to the subject at issue, and on the surveyor retiring from the box, all interested are as ignorant of the matter at issue as they were before he ascended to it. Now if any light could be shed on such a tribunal it would be by the surveyor making a report, giving a detailed specific account of every operation; and then such further explanations of any points not clearly understood, as would make the matter intelligible to the court.

Now we ask—and we hope the press will hearken to our reason, and aid in removing this incubus from the statute book: Can anything be more absurd than to select twelve men to decide—admitting our legal competency—whether our theodolite is one fit for making observations and acquiring data, without which it would be impossible to solve our problem—that our theodolite was in perfect adjustment at the time of our observation, without which it would be valueless—to declare that we ascertained our latitude correctly, without which we could not determine azimuth, and without azimuth could not establish the meridian of our station; and without establishing the meridian, could not draw a line on any definite or given course. How this is possible—how this is tolerated, with such important interests at stake, we cannot comprehend. We know, in all our experience, of only one thing rivalling this system in absurdity; and that is—granting a patent by our Government for the trisection of a plane rectilinear angle by the geometry of the straight line and circle!

It is easy to comprehend how twelve jury

men are properly qualified to decide on sworn oral testimony on the guilt or innocence of the commission of a crime, or the signing of a written instrument of promise, power, bargain, sale or contract. This ability to perform is quite rational and intelligible; and the founders of this excellent institution (trial by jury) merit not only gratitude, but our admiration and reverence. These we have enumerated are its legitimate functions, and those for which it has been formed, but by diverting it from its real object, we not only pervert it, but run great risk of bringing it into disrepute.

Well, it will be said that tho' the jury are as we have described, yet the judge will direct them aright and they will be guided in their decision by his "charge" or counsel. Well, if we had this guarantee there would not be so much to complain of. But we must emphatically deny the existence of such a safeguard. We entirely deny the assumption that the judge—and we say it with all deference to the bench—is competent to decide such issues; and that five cases out of ten, at least, he is as ignorant of the scientific issues as the jury or the lawyer. Nor can this be wondered at. In fact it would be a just cause of surprise were it otherwise. For judges are not selected for scientific knowledge, and were we to admit for argument sake, that they were possessed of the theoretical knowledge, that alone would be totally inadequate. But there is no reason to suppose that a judge is a better mathematician or astronomer than a merchant or mechanic, nay, a farmer. Tho' a slight knowledge of geometry may be required in the *curriculum* for barristers, yet such knowledge is not necessary to attain to the first eminence in their profession, for which, we believe, they are chosen as judges. The lawyer's necessary education is exceedingly simple and limited, consisting of reading and writing, and sufficient arithmetic to compute simple interest. And if the great commentator and jurist, Blackstone, only knew what we have indicated, it was quite compatible that he would attain to as much eminence as if he knew the *principia* and *calculus*, as well as all the living and dead languages ever spoken. All the other acquirements of a lawyer are learning the legal forms and studying the authorities and reports of decisions, for which the education we have referred to is quite adequate. Therefore, we repeat, it is not to be wondered at that judges are not qualified to direct in such issues. And from the well known probity and honor characteristic of our judges, both in Upper and Lower Canada, we are convinced that they will not demur to our argument; nor have we other

object than pointing out a grievance and suggesting a remedy; and in our sphere endeavoring to contribute our little share of usefulness to the general stock.

In view of this accumulated ignorance, is it wonderful that verdicts are so frequently at variance with justice—that litigations, when such hope is held to the dishonest, are so numerous, and that many of our farmers—innocent victims of our tribunals—are, if not hopelessly ruined, at least, driven to great want and destitution. It is on this account that we feel we would be doing a good service to the country if instrumental in remedying this evil.

But to continue the farce to its denouement the jury retire bewildered, stupified, with as much knowledge of what they are going to adjudicate on as if they were going to propound a new theory of the universe at variance with the laws of gravitation. How then do they come to a decision? Difficult to answer the mode of reasoning, but the conclusion must be mere conjecture or chance. We believe the *modus operandi* is sometimes in this manner, if by any chance, which most frequently happens thro' the subtlety and legal acumen of the lawyer, a surveyor gets a verdict in any case of notoriety, and thereby acquires celebrity, the verdict, whether right or wrong, is likely to be on the side that he espouses. So that to aggravate this evil a highly educated and competent surveyor has often less chance than one known, in the manner we have pointed out, to the jury, tho' perhaps much less competent. Surely such a system needs only to be uncovered to be overthrown. And we would earnestly recommend it to the consideration of the Government.

Hence, having endeavored to expose the rottenness of this system, we shall now attempt the task of proposing a remedy, lest we might have the *Journal* open to the revolutionary charge of tearing down without any ability to construct. (We may here add that we do not propose to meddle or interfere with the present mode of quieting titles, that is foreign to our object, for we believe the present tribunals are the proper ones for that purpose). We would propose that an entirely new tribunal be instituted, to be called a Boundary Court, somewhat resembling the Court of Chancery, having its headquarters where you will, and to be composed of say three surveyors (eminent for their professional acquirements) and a barrister to decide and direct in all points of law. That these surveyors would make circuit for the hearing of evidence, as is now done by the court referred to. That at each county town the county or district judge would be associate to

direct the evidence on legal points that may arise. That before such tribunal every surveyor should file a full and complete report of all his operations of what kind soever, and that the court, if it desires, could examine the instruments with which he made the survey, or in any other manner test his competency for the accurate performance of that service. Tho' we have specified this, we know it would be seldom or never necessary, for a competent surveyor on the bench could very quickly discern whether the operation was properly performed or not.

Then this evidence would be examined and adjudicated on in chambers before the whole court; and if found that the operations were either incomplete or incorrect, the court should have power to appoint a surveyor of whose ability it was assured.

By this means you would have decisions in accordance with scientific, unerring principles, and soon, instead of lawsuits of this kind being increasing by *multiples*, it would be by *submultiples*.

Now as the best means of unmasking this system is by facts, and as the experience is very scattered and divided amongst all surveyors, we earnestly hope that every surveyor from time to time will supply us with his experience, that we may accumulate such a pile of testimony as will strangle this monster in his lair.

'Tho' faulty and imperfect is the Lower Canada system of deciding questions of this class, yet, were it not for its tardiness, it is manifold preferable to the Upper Canada practice.

We must not be understood as wishing to disparage the standing or character of the legal profession in the discussion of this and kindred subjects. By no means: we know that to every civilized nation its legal profession is at once an honor and ornament; and in its ranks are to be found some of the most celebrated men of ancient or modern times.

In our next issue we shall commence, what we may reasonably characterize as a *cause celebre* of this kind, in which the conductor of this journal, in conjunction with two other surveyors, made a verification survey; and we think that it was one of the most extraordinary cases of disputed boundary that ever came before a Canadian Court. In its discussion we shall avoid names, as we think it entirely unnecessary to a full understanding of our subject. Nor do we think that our correspondents should give names except absolutely necessary to an understanding of the subject, and when they do, we shall exercise our own editorial responsibility in suppressing them when practicable. For all such subjects should be discussed in a friendly

manner, with only one object in view, the public good.

We shall also in our next issue in this connection strive to remove a great popular fallacy, which is that "surveyors themselves differ," or if we cannot accomplish so much, to give an intelligible reason for it.

TO SURVEYORS, ENGINEERS, &c.

PROSPECTUS OF A TREATISE ON SURVEYING.

To be published on the 1st of May, 1867, a Treatise on Surveying, specially adapted to Canadian practice. It shall consist of three parts:

PART I—Shall treat of Plane or Land Surveying PART II—Of Engineering Surveying, and PART III—Of Geodetical Surveying.

The Mathematical Tables shall be found very comprehensive; and containing all those required for the three branches, together with Tables by the subscriber on Engineering Surveying, never before published, and which alone are worth the whole cost of the book.

The want of a work of this kind has been long felt by the Canadian practitioner, English and American authors being usually limited to Plane Surveying, and consequently falling far short of our requirements, whilst their tables are very incomplete and wholly inadequate. To supply these defects and omissions, and to procure for the Canadian Surveyor a text book embracing all the departments of his profession, is the object of the proposed work; and the undersigned reasonably expects that 16 years' practice in the forests of Canada, with a fair share of Mathematical training, render him not unfit for the successful accomplishment of his undertaking.

A pamphlet (free to subscribers) shall accompany each number, purporting to be an examen of the laws regulating the practice of Land Surveying, and the admission of Land Surveyors in this Province, with suggestions for alterations and amendments; and a critical review of the conduct of Public Surveys under the supervision of the Crown Lands Department.

It is scarcely necessary to add that the cost of publishing a scientific book of this character is very considerable; and that very few unaided would undertake it. With a view, therefore, to insure the immediate expense of publication, early application by circular will be made to all Canadian Surveyors and Engineers, to subscribe for, at least, one copy (\$6). It is to be hoped that they will respond

liberally, and encourage native talent and enterprise. It is with this object that the prospectus has been issued so long in advance.

If sufficient encouragement is given the work will be published at the appointed time; and if unequal to what is promised, no subscriber will be held liable.

Your obedient servant,

J. L. P. O'HANLY,

P. L. S. & C. E.

Ottawa, 26th October, 1866.

With reference to the above, we are in a position to state that circulars have been addressed to over four hundred persons, chiefly surveyors; and we regret to state that sufficient encouragement has not hitherto been offered to warrant the publication of the work at the specified time. This, in our opinion, is almost entirely attributable to neglect on the part of those addressed. For, we know that every surveyor must have, at least, one treatise on surveying; and, moreover, we have not seen yet a single work on that subject adequate to the requirements of the Canadian practitioner, the defect having to be supplied by some other works on practical mathematics. It is to remedy this inconvenience that the proposed work has been undertaken; and we are convinced, from the nature of the addition and improvements it is intended to contain, that no surveyor would cavil at the cost.

To adapt the work to theodolite surveying it is proposed to compute the "Traverse Table" to every minute of the quadrant. The work shall also contain all the astronomical and mathematical tables necessary in Canadian practice. It shall also contain a series of original tables, prepared expressly by the author on engineering surveying, for laying out curves, and for laying out cutting and embankments, and calculating their contents. The addition in tables alone will be worth the entire cost of the work.

We know that in a matter of this kind it is customary, and we might add, necessary, to make a personal canvass for subscribers. But our friends will remember that such a canvass, where only one class, thinly scattered over the Province, can be applied to for support, is simply impossible. We would, therefore, add, if surveyors desire that the work shall be published at the appointed time they must contribute at once.

The author returns his sincere thanks to those who have subscribed, not only for their liberal support, but for their many expressions of approval and encouragement to cheer him on in his difficult undertaking, for to have one's efforts in doing good appreciated is a true source of pleasure.

The author in his connection with this matter has experienced but one instance of discourteous treatment, his circular having been returned with letter postage to pay; and the subjoined note written on the back:

(Copy.)

I have long since retired from the "non-paying profession," and disposed of the most of my instruments.

(Signed,)

M. C. SCHOFIELD.

This was gratuitous, unlooked for information, in which the author had no special interest, and to which his circular or prospectus had no reference. The circular, like all others outside this city, was prepaid; and if Mr. Schofield did not wish to subscribe he could have cast it into the flames or the waste basket.

Astronomical Department.



ASTRONOMY is the science which, as its name indicates, treats of the *astra* or stars. The renowned astronomer, Sir John F. W. Herschel, defines this science thus: "The magnitudes, distances, arrangement and motion of the great bodies which make up the visible universe, their constitution and physical condition, so far as they can be known to us, with their mutual influences and actions on each other, so far as they can be traced by the effect produced, form the assemblage of objects to which the attention of the astronomer is directed.

The same author speaking of the sublimity of this science and the difficulty of acquiring a thorough knowledge of it, in his own incomparable style thus delivers himself: "Admission to its sanctuary (astronomy) and to the privileges and feelings of a votary is only to be gained by one means—a sound and sufficient knowledge of mathematics, the great instrument of all exact inquiry, without which no man can ever make such advances in this or any other of the higher departments of science, as can entitle him to form an independent opinion on any subject of discussion within their range."

Tho' few, if any, Canadian surveyors can expect to reach that perfection in astronomy which, according to this great authority, would entitle them to the privileges of a votary—tho' such an opportunity is as yet denied the Canadian student, yet it is absolutely necessary for every Canadian surveyor to have a certain knowledge of practical astronomy; and without which he cannot legally or adequately perform the most essential duties of his important calling.

Tho' it is not our intention to write a treatise on astronomy (a task for which we are

far from competent) yet, we think that we cannot devote a few pages of each number of this magazine to better purpose than directing our readers' attention to the application of practical astronomy to Canadian surveying; and with that object we shall commence with the definitions and explanation of technical expressions used in that science. Tho' we are well aware that this beginning to most of our readers is quite superfluous, yet if one only of our class should unfortunately lack this fundamental knowledge of his profession; and by this means it would be imparted, and a taste for the further pursuit of this science implanted, we feel that this journal would not have failed in its mission, and that the design of its promoter would not be barren in useful results.

DEFINITIONS.

Of the heavenly bodies there are two classes, Fixed and Erratic.

Fixed Stars are those which maintain the same relative position one to another.*

Erratic Stars are those which are continually changing their places amongst the fixed; and divided into three classes, Planets, Satellites and Comets.

The Celestial Sphere is the concave sphere of the heavens, on whose apparent surface the heavenly bodies are situate,

The Axis of the celestial sphere is an imaginary line passing through the earth's centre, and produced to the region of the stars, around which all the heavens seem to revolve, and is the production of the earth's polar axis.

The extremities of the celestial axis are called the Poles of the heavens, the one towards the north, the North Pole, and that towards the south, the South Pole.

The Equinoctial or Celestial Equator is a great circle, which divides the celestial sphere into two equal parts, called the Northern and Southern hemispheres of the heavens; and being the earth's equator extended to the starry firmament; and therefore is the great circle to whose plane the celestial axis is perpendicular.

The Ecliptic is a great circle of the celestial sphere, in whose plane the sun performs its apparent annual revolution around the earth (the earth really around the sun), being the earth's orbit extended to the region of the stars. The ecliptic intersects the equinoctial in two points, called the Equinoxes, that one in which the sun moves from the south to the north of the equinoctial, the Vernal Equinox; and that in which it moves to the south the Autumnal; and called equi-

noxes because the day and night are equal at these periods all over the earth.

The plane of the ecliptic makes with that of the equinoctial an angle of $23^{\circ} 27' 15''$, called the Obliquity of the Ecliptic, being a variable, and the measure of the sun's greatest declination, north or south.

The Zodiac is a zone of the heavens, extending about 8 degrees on either side of the ecliptic. It is divided into twelve equal parts, called signs, each sign containing 30° .

The first six lie on the north side of the equinoctial, and are called Northern signs, and the other six on the south, called Southern signs.

The vernal equinox is called the First Point of Aries.

The two points in the ecliptic distant a quadrant from either equinox are called Solstices; that on the north of the equinoctial the Summer Solstice, and that on the south the Winter Solstice.

The zodiac is important in astronomy as being that belt of the heavens in which all the members of the solar system, except the asteroids, are situate.

The Horizon is commonly understood to be the circle which binds the view of the spectator at any point on the earth's surface (i.e.) where the earth and sky appear to meet. This we have been describing is called in astronomy the Visible Horizon; and is the base of a cone touching the earth's surface all round, and having the eye of the observer for the vertex. Besides this there are two other kinds of horizon, called the sensible and rational.

The Sensible Horizon is a plane tangent to the earth's surface at any point thereon, or a plane perpendicular to the direction of the plummet.

The Rational Horizon is a plane conceived to pass through the earth's centre parallel to the sensible horizon, produced to the sphere of the stars.

The Zenith is that point in the heaven's vertically over any spectator's head on its surface, and the Nadir vertically under his feet; therefore the zenith and nadir are the poles of the rational horizon, for they are the extremities of that axis of the celestial sphere perpendicular to the plane of that horizon.

Vertical Circles are great circles passing through the poles of the rational horizon, or through the zenith and nadir. That which passes through the east and west points of the horizon is called the Prime Vertical.

The Meridian of any place on the earth's surface is the section of a plane passing thro' that place, the earth's centre and the poles of its axis; and this plane conceived extend-

*In a strict sense modern research has shown that there is nothing fixed in the universe.

ed to the region of the stars is called a celestial Meridian.

A Celestial Meridian is therefore that great circle of the sphere which passes thro the zenith and nadir of any spectator and the poles of the celestial sphere. The common section of the planes of the sensible horizon and the celestial meridian is called a Meridian Line, that extremity towards the north pole of the heavens is called the North Point or true north, and the other the South. The quadrants of the horizon on either side of the north and south points are called East and West, that which, looking towards the north, is to the right hand side is the east, and that to the left the west, and north, south, east and west are called the Four Cardinal Points of the horizon, the meridian line in angular measurement being zero.

Azimuth is the angular distance of a heavenly body east or west, as the case may be, of the north or south point of the horizon, according as the spectator is in the northern or southern hemisphere of the earth; and is the inclination of the plane of a vertical circle passing thro' the object with the spectator's celestial meridian, whose measure is the arc of the horizon contained between the vertical and the meridian line.

Amplitude is the inclination of a vertical plane passing through a heavenly body with the prime vertical; and its measure is the arc of the horizon between that and the prime vertical.

NOTE.—The amplitude of a body is taken when it appears on the horizon: and consequently of no practical utility to the surveyor.

The Altitude of a heavenly body is its angular distance from the rational horizon, measured on an arc of a vertical circle passing through it. When the body is on the observer's meridian it is called a meridian altitude and the body in that position is said to culminate or transit. The observed altitude is the angle indicated by the instrument; the apparent altitude when corrected for instrumental error, and reduced to the centre if it be the sun, moon or planets; and true altitude when corrected for refraction and parallax.

The zenith distance of any heavenly body is the complement of its altitude.

The Latitude of any place on the earth's surface is its angular distance from the equator, measured on the terrestrial meridian passing through it; and is reckoned north or south according as the station is north or south of the equator.†

The longitude of any place on the earth's surface is the inclination of its meridian to some other meridian assumed to be zero; and its measure is the arc of the equator intercepted between them. The meridian called zero, mostly used by English speaking astronomers' is that of the Royal Observatory of Greenwich, near London, England, and the station is said to be in east or west longitude according as it is east or west of that meridian. Most civilized nations make that meridian passing through each's metropolis, its first meridian. Then, in time, the meridian of Ottawa will be the first of our rising nation.

†This definition is not strictly correct, because of the spheroidal figure of the earth, and more correctly is equal to the altitude of the elevated pole of the heavens.

TABLE 6.

STARS OF THE FIRST AND SECOND MAGNITUDES FAVORABLE FOR OBSERVATIONS OF THEIR MERIDIAN ALTITUDES FOR MARCH.

Star's Name.	Mag.	Declination.	Culmination.	Merid'n Altitude for Latitude 45° N.
				° ' "
		° ' "	h m s	° ' "
<i>A</i> Canis Majoris (Sirius).....	1—2	16 32 32.0 S	8 1 52.6	28 27 28.0
<i>A</i> Canis Minoris (Procyon)...	1	5 33 33.3 N	8 54 47.0	50 33 33.3
<i>B</i> Geminorum (Pollux).....	1—2	28 20 30.8 N	8 59 36.5	73 20 30.8
<i>A</i> Hydrae.....	2	8 5 17.7 S	10 43 12.4	36 54 42.3
<i>A</i> Leonis (Regulus).....	1—2	12 36 43.8 N	11 23 18.9	57 36 43.8
<i>B</i> Leonis.....	2	15 18 43.3 N	13 4 1.5	60 18 43.3
<i>A</i> Virginis (Spica).....	1	10 28 3.8 S	14 39 41.7	34 31 56.2
<i>A</i> Bootes (Arcturus).....	1	19 52 23.7 N	15 29 57.3	64 52 23.7
<i>B</i> Ursa Minoris.....	2	74 41 41.1 N	16 11 21.9	60 18 18.9
<i>B</i> Librae.....	2	8 53 24.8 S	19 30 2.8	36 6 35.2

TABLE 3.

POLARIS.

AZIMUTH AT GREATEST ELONGATION.					Mean Interval between Upper Transit and greatest Elongation.
Latitude N.	Day of Month.				
	1	11	21	32	
°	° ' "	"	"	"	h m s
42	1 52 44.9	48.4	52.4	57.2	5 54 0.0
43	1 54 34.0	37.6	41.7	46.5	53 49.2
44	1 56 28.9	32.3	36.7	41.5	53 38.2
45	1 58 30.0	33.5	37.7	42.8	53 26.6
46	2 0 37.3	41.1	45.4	50.5	53 14.8
47	2 2 51.7	55.6	3' 0.0	5.1	53 2.3
48	2 5 13.6	17.5	21.9	27.2	52 49.7

TABLE 5.

Latitude N.	<i>A URSA MAJORIS.</i>				Mean Interval between Upper Transit and Greatest Elongation.	<i>B URSA MINORIS.</i>				Mean interval between Upper Transit and Greatest Elongation.
	AZIMUTH.					AZIMUTH.				
	Day of Month.					Day of Month.				
	1		32			21		32		
°	° ' "	° ' "	h m s	° ' "	° ' "	h m s				
42	38 27 53.6	38 27 49.5	4 7 20.7	20 48 14.3	20 48 10.8	5 2 7.0				
43	39 12 9.3	39 12 3.1	4 2 59.4	21 9 18.9	21 9 15.4	5 0 2.5				
44	39 59 14.7	39 59 8.8	3 58 26.4	21 31 33.7	21 31 30.1	4 57 53.6				
45	40 49 26.2	40 49 21.7	3 53 41.6	21 55 3.0	21 55 0.0	4 55 39.9				
46	41 43 1.2	41 42 55.1	3 48 41.1	22 19 52.4	22 19 48.7	4 53 21.1				
47	42 40 20.6	42 40 15.8	3 43 25.6	23 46 7.8	22 46 5.9	4 50 56.5				
48	43 41 47.7	43 41 42.7	3 36 53.6	23 13 55.4	23 13 51.5	4 48 26.3				
Pol'r	27 31 59.4	27 31 56.7		15 18 15.0	15 18 12.5					
Dis.										

TABLE 1.

MEAN NOON,
CALCULATED FOR THE MERIDIAN OF 75° WEST.

Day of month.	THE SUN'S.		Equation of time to be subtract- from mean time.
	Apparent Declination.	Semi- diameter.	
	° ' "	'	m s
		16	
1 S.	7 33 59.1	10.2	12 34.5
2	7 11 7.5	10.0	12 22.4
3	6 48 10.2	9.7	12 9.8
4	6 25 7.0	9.5	11 56.9
5	6 1 58.7	9.2	11 43.2
6	5 38 45.4	9.0	11 29.4
7	5 15 27.4	8.7	11 15.0
8	4 52 5.8	8.4	11 0.4
9	4 28 39.6	8.2	10 45.2
10	4 5 10.5	7.9	10 29.7
11	3 41 38.4	7.7	10 14.0
12	3 18 3.8	7.4	9 57.4
13	2 54 27.0	7.2	9 41.3
14	2 30 48.5	6.9	9 24.5
15	2 7 8.4	6.6	9 7.5
16	1 43 27.3	6.4	8 50.2
17	1 19 45.5	6.1	8 32.7
18	0 56 3.3	5.8	8 15.0
19	0 32 21.3	5.6	7 57.1
20	0 8 39.5	5.3	7 39.0
21 N.	0 15 1.6	5.0	7 20.5
22	0 38 41.7	4.7	7 2.5
23	1 2 20.5	4.5	6 44.1
24	1 25 57.6	4.2	6 25.7
25	1 49 32.6	3.9	6 7.2
26	2 13 5.3	3.6	5 48.7
27	2 36 35.1	3.3	5 30.3
28	3 0 2.0	3.0	5 11.8
29	3 23 25.3	2.8	4 53.4
30	3 46 44.9	2.5	4 35.0
31	4 10 0.4	2.2	4 16.8

TABLE 2.

MEAN TIME,
CALCULATED FOR LAT. 45° N. & LONG. 75° W.

POLARIS,		
Polar Distances.	Azimuth.	Upper Transit.
1° 23' "	1° 58' "	h m s
46.9	30.0	2 33 30.7
47.1	30.1	2 29 34.2
47.3	30.4	2 25 37.8
47.6	30.8	2 21 41.4
47.8	31.1	2 17 44.9
48.1	31.5	2 13 48.5
48.4	31.9	2 9 52.1
48.7	32.4	2 5 55.8
49.0	32.8	2 1 59.4
49.2	33.1	1 58 3.1
49.5	33.5	1 54 6.7
49.8	34.0	1 50 10.4
50.1	34.4	1 46 14.2
50.4	34.8	1 42 17.9
50.7	35.2	1 38 21.6
51.0	35.6	1 34 25.4
51.3	36.0	1 30 29.1
51.6	36.5	1 26 32.9
51.9	37.0	1 22 36.7
52.2	37.4	1 18 40.5
52.5	37.7	1 14 44.4
52.8	38.2	1 10 48.2
53.1	38.6	1 6 52.1
53.4	39.0	1 2 56.0
53.8	39.6	0 58 59.9
54.1	40.0	0 55 3.8
54.4	40.4	0 51 7.7
54.8	41.0	0 47 11.7
55.1	41.4	0 43 15.6
55.4	41.9	0 39 19.6
55.7	42.3	0 35 23.6

TABLE 4.

MEAN TIME OF UPPER TRANSIT
OF 2 CIRCUMPOLAR STARS,
FOR LONGITUDE 75° WEST.

Day.	A Ursa Majoris.	B Ursa Minoris.
	h m s	h m s
	10	14
21	60 22.2	55 58.9
22	56 25.1	52 2.8
23	52 30.3	48 6.0
24	48 34.4	44 11.1
25	44 38.5	40 15.2
26	40 42.1	36 18.8
27	36 46.6	32 23.3
28	32 50.7	28 27.4
29	28 54.8	24 31.5
30	24 58.9	20 35.6
31	21 3.2	16 39.9

Obliquity of the Elliptic on the 1st of March, 23° 27' 14".81.

In March there will be two eclipses :—

On the 5th, a partial eclipse of the sun, invisible in Canada.

On the morning of the 20th a partial eclipse of the moon, visible in Canada.

First contact with the penumbra, h m s

March 20..... 1 2 24

First contact with the umbra. 2 13 6

Middle of eclipse..... 3 45 54

Last contact with the shadow.. 5 18 42

“ “ Penumbra 6 29 24

Mean civil time at Ottawa.

Magnitude of the eclipse (moon's diameter=1) 0.803.

The first contact with the shadow occurs at 142° from the northernmost point of the moon's limb towards the east

The last contact at 107° towards the west; in each case for direct image.

For Montreal add 8m 38s; for Quebec, 18m 5s; for Toronto subtract 14m 35s; for Hamilton, 16m 35s; for London, 22m 10s, and for Sarnia, 26m 55s.

Phases of the moon (mean civil time at Ottawa.)

	h m s	
March 6th, New Moon.....	4 35 6,	A.M.
“ 13th, First Quarter... 3 44 12,		“
“ 20th, Full Moon..... 3 52 12,		“
“ 10th, Last Quarter.... 2 43 0,		“
“ 12th, Moon's Perigee.. 6 0 0,		P.M.
“ 26th, Moon's Apogee. 11 0 0,		“

Explanation of Astronomical Tables.

Table 1 contains the sun's declination, semidiameter and equation of time, reduced to the meridian of 75° W. of Greenwich for every day of March at mean noon. The semidiameter and equation of time will answer for any part of Canada; and the declination for any other meridian will be determined with sufficient accuracy for surveying purposes, by reckoning for every degree of Longitude a change of declination of 4": if the declination is increasing, adding if west, and subtracting if east; and if diminishing, adding if east, and subtracting if west. Thus: What will be the declination of the sun at mean noon on the 10th of March in Longitude 79° and 71° 30' W, respectively,—
The tabular declination..... 4° 5' 10".5
Change of declination for 4°... 0 0 16.0

Declination required..... 4 4 54.5

Tabular declination..... 4 5 10.5

Change of declination for 3° 30' 0 0 14

Declination required..... 4 5 24.5

The semidiameter is used for reducing an observation of the sun's limb to the centre; and the equation of time for changing mean time or time by a correct clock into apparent time or time by the true sun, to be used as directed at the head of the column.

Thus,—suppose the time found by an observation of the sun on the second of March is 2h 10m 45s, P. M., what should be the time by the clock:—

Apparent time. 2h 10m 45s.0

Equation of time on 2nd.... 0 12 22.4

Time by watch... 2 23 7.4

Table 2 contains the Polar distance, azimuth of the greatest elongations and mean time of upper transit, of A Ursa Minoris (Polaris) for every day of the month, computed for 45° N. latitude and 75° W. longitude. The time of transit for any other meridian will be found sufficiently accurate by adding 0s.7 for every degree to the east, and subtracting to the west. The succeeding lower transit is found by adding 11h 58m 2s.045 to the time in the table.

Table 3 contains the azimuth of Polaris at its greatest elongations for the several degrees of latitude in the first column for every tenth day of the month, and the mean interval from upper transit to greatest elongation. The azimuth for any intermediate day or latitude

can be found by interpolation, as an inspection of the table will show they differ by very small quantities.

The column mean interval, &c., is used in conjunction with table 2, to find the time of greatest elongations, subtracting the quantities for eastern and adding for western.

Example, At latitude 46° N., on the 4th of March, when will Polaris attain its greatest eastern and western elongations,—

	h	m	s.
Mean time of transit 4th March.	2	21	41.4*
Interval for 46°.....	5	53	14.8

Civil time, A. M., of Eastern elongation.....	8	28	26.6
Civil time, P. M., of Western elongation.....	8	14	56.2

The eastern elongation being in the day time, the western is used for determining the azimuth.

Table 4 contains the mean time of upper transit of two circumpolar stars for the last 11 days of the month.

Table 5 contains the azimuths on the 21st and 32nd (1st April) days of the month for the above stars, and interval between their upper transits and greatest elongations; and at the foot their polar distances.

We have added these two stars, A Ursa Majoris and B Ursa Minoris, because towards the end of the month both elongations of Polaris take place in daylight. They are both well known stars, both of the second magnitude, the former being the brightest in the pointers of the great bear or plough, and the latter in the little bear.

Example 1.—Find the times of the greatest elongations of A Ursa Majoris and B Ursa Minoris, on the 25th of March in 44° N. latitude.

	h	m	s
Mean time of transit of A Ursa Majoris on 25th.....	10	44	38.5
Interval between U. T. and elongation.....	3	58	26.4

Mean time of eastern elongation.....	6	46	12.1
Mean time of Western elongation.....	14	43	4.9

Or 2h 43m 4s.9, A. M., on the 26th.

The eastern is in daylight.

*The time of Transit is astronomical time, or P. M. civil time.

	h	m	s
Mean time of B Ursa Minoris' transit.....	14	40	15.2
Interval to elongation.....	4	57	53.6

Mean time of Eastern elongation.....	9	42	21.6
Mean time of Western elongation.....	19	38	8.8

The western elongation is in daylight.

To find their azimuths on the same day.

	°	'	"
Azimuth of A Ursa Majoris on 21st for 44°..	39	59	14.7
Difference for 11 days 5".9, then for 4 days.....	0	0	2.1

Azimuth on 25th..... 39 59 12.6

Azimuth of B Ursa Minoris on 21st.....	21	31	33.7
Difference for 11 days 3".6, then for 4.....	0	0	1.3

Azimuth on 25th 21 31 32.4

Table 6 contains 10 stars, all of the first and second magnitudes, favorable for observation in this month. Having their mean time of culmination for the first day of the month, and their meridian altitude for latitude 45° N., they can easily be found. To find an approximate time of transit for any other day of the month, multiply the number of days elapsed by four minutes, and subtract the product from the tabular number, the remainder will be the time of culmination.

Example.—When will Regulus culminate on the 18th of March:—

	h	m	s
Regulus culminates on the 1st at	11	23	13.9
No. of days elapsed—15 multiplied by 4.....	1	0	0.0

Time of transit (nearly). 10 23 18.9

The Association of Provincial Land Surveyors and Institute of Civil Engineers and Architects.

We hope in our next issue to be able to announce that the next meeting of the above association for the election of officers and other important business connected with that corporation will take place at an early day in this city. We would suggest to the worthy President and Executive that, in our opinion, some time about the 14th of May would be a very suitable season for this meeting. While on this subject we may add that in our next issue we shall endeavour to give the synopsis of a Bill to amend the laws regulating the admission and practice of Land Surveyors, to be submitted to the association at its next meeting.

LIST OF UPPER CANADA SURVEYORS.

NAMES.	RESIDENCE.	NAMES.	RESIDENCE.
Abrey, Geo. B.	Milton.	Campbell, Alex	Napanee.
Aylsworth, Chas. F.	Madoc.	Carrall, Peter	Hamilton.
Aylsworth, Wm R	Tamworth.	Callaghan, Patrick	Etobicoke, Hum. P O.
Allan James	Renfrew.	Clapp, Gilbert S	Napanee.
Burwell, Lewis	Brantford.	Carroll, Wm	Seneca.
Benson, Sam'l Manson	Belleville.	Conger, John O	Picton.
Bower Thomas T	Seeley's Bay.	Cromwell, Joseph M O	Perth.
Burrows, Thomas	Kingston.	Caddy, Edward C	Cobourg.
Bruce, George	Osnabruck.	Creswicke, H, sr	Barrie.
Ball, Jesse P	Houghton, Vien. P O.	Cheesman, Thomas	Brantford.
Bruce, John S	Cornwall.	Clementini, V C	Peterborough.
Blyth, Thomas A	Hamilton.	Clementini, T B	"
Burke, Wm	Norwood, Asphodel.	Chadwick, F J	Guelph.
Ball, George A	Houghton, Vien. P O.	Cooper, T W	"
Bartley, Onesiphorus	Sandwich.	Carroll, Cyrus	Wroxeter.
Bridgland, James W	Ottawa.	Chandler, Libert	Goderich.
Booth, Norman	Preston.	Caddy, C F	Seymour Township.
Browne, John O	Toronto.	Cambie, H J	Toronto.
Black, James, jr	Ayr, P O.	Creswicke, H, jr	Barrie.
Brown, David R	Osnabruck.	Carre, Henry	Stirling.
Bristow, Arthur	Paisley.	Cooke, R P	Kingston.
Burchill, John	Mirrickville.	Chapman, C F	Prescott.
Brown, J Smith	Matilda.	Caddy, J St V	Hamilton.
Boulton, William	Hamilton.	Campbell, D G	Mitchell Village.
Bay, Andrew	Clinton, P O.	Dennison, John	Goderich.
Brady, Crosbie	Lindsay.	Dennehy, Thos J	Lindsay.
Burke, J Wm	Elora.	DeCew, Edmund	Cayuga.
Brown, R C P	Cobourg.	Dennis, J S	Weston.
Beatty, Walter	Perth.	Deans, W H	Lindsay.
Brodie, Samuel	Ingersoll.	Deane, M	"
Boulton, Henry C	Exeter.	Donnelly, P S	Moore Township.
Boulton, Arthur	Newmarket.	Davies, C L	London.
Brownjohn, T C	Grimsby T.	Donovan, T	Meaford.
Burns, Robert T	Lindsay.	Dobbie, T W	St. Thomas.
Bell, Wm	Pembroke.	Drennan, Wm	Peterborough.
Berryman, Edgar	St. Catherines.	DeCew, John	Cayuga.
Burnet, Peter	Orilla.	Daintry, John	Cobourg.
Baldwin, Fred A	Ottawa.	Davidson, Alex	Arkona, War. Tp.
Burns, Thos	Chatbam.	Doupe Jos	St. Mary's.
Bellairs, W G	Toronto.	Donnelly, R H	Hamilton.
Brady, James	Lindsay.	Dyas, T W	London.
Byrne, Thos	Kingston.	Emerson, John	Roslin.
Bolger, Francis	Elora.	Ellis, W H	Enniskillen.
Battersby, L C	Guelph.	Esten, J H	Newmarket.
Baikie, J D	Dunnville.	Evans, J D	Toronto.
Bolton, Lewis	Lastowell Village.	Edwards, Geo	Clarence Tp.
Bolger, T O	Peterborough.	Fairfield, W J	Bath.
Bell, Andrew	Almonte.	Fell, Zenas	Merrittville.
Bray, Edgar	Oakville.	Fell, C K	Pelham.
Chewett, Jas G	Toronto.	Fell, J W	Chippawa.
Campbell, Wm	Burritt's Rapids.	Fraser, Charles	Port Bruce.
Cleaver, Jas	Nelson.		

LIST OF UPPER CANADA SURVEYORS.—(Continued.)

NAME.	RESIDENCE.	NAME.	RESIDENCE.
Fleming, Sandford	Toronto.	Jones, J H	Sarnia.
Fox, Edwd	Ottawa.	Kirkpatrick, J	Hamilton.
Eitzgerald, J W	Peterborough.	Kelly, Thos	Castlemore P O.
Fleming, John	Collingwood.	Keating, John W	Chatham.
Francis, J J	Corunna.	Kerr, R W	Hamilton.
Featherstone, Thos	Milton.	Keefer, Thomas C	Ottawa.
Fowle, Albert	Orillia.	Kirk, Joseph	Stratford.
Frost G H	Smith's Falls.	Kerr, F	Guelph.
Foster, F L	Windsor.	Kirkpatrick, G B	Ottawa.
Fornari, C C	Chatham.	Kehned, L	Acton.
Gibbs, Thos F	Adolphustown.	Lynn, R	Meaford.
Galbraith, Wm	Brock, Manilla P O.	Liddy, G P	Strathroy.
Grant, John	Mitchell.	Lilly, Henry	Lyo P O.
Gibson, Jas A	Willowdale, York Tp.	Lowe, H	Nanticoke.
Gilmour, Robt	Paisley.	Lowe, N. E.	"
Gardner, Peter	Paris.	Livingston, T C	Ingersoll.
Gossage, Brooks W	Toronto.	Lough, Matthew	Port Hope.
Grain, Wm	Fergus.	Lawe, Henry	Dunnville.
Gibson, Peter S	Willowdale, York Tp.	Lapenotiere, W H L	Weedstock.
Gibson, Geo	Woodville, Eldon Tp.	Lumsden, H D	Woodville Vil.
Gore, W S	Rice Lake.	Lynch, F H	Staunton.
Gardiner, Edward	St. Catherines.	Malcolm, E	Oakland.
Gaviller, Maurice	Bond Head Village.	Misner, J	Welland Port.
Hall, James	Peterborough.	McDonald, J	Goderich.
Hanvey, Danl	St. Thomas.	McMillan, W	London.
Hawkins, Wm	Toronto	McCleary, W	London.
Hamilton, James	London.	McDonell, J R	Williamstown.
Howard, John G	Toronto.	McNab, A	Owen Sound.
Haslett, John J	Belleville.	Morris, John	Perth.
Hamilton, Robt	L'Orignal.	McLaren, Peter	Riceville,
Horse, Henry H	Ottawa.	McPhillips, G	Richmond Hill.
Haskins, Wm	Hamilton.	Maxwell, J	Paris.
Hobson, Jos	Berlin.	McCallum, J, jr	Uxbridge.
Herrick, T W	Toronto.	Molesworth, T N	Brantford.
Howitt, Alfred	Stratford.	McIntosh, J	Freelton P O.
Hallen, S W	Newmarket.	Mercer, W	Simcoe.
Hughes, Thos	Napanee.	McCallum, F C	Beaverton.
Hamlin, L B	Penetangore.	McLeod, H A F	Belleville.
Herman R W	Listowell.	Miles, E	Weston.
Hawkins, Wm	Southampton.	McFadden, M	Mornington Tp.
Hanning, Clement G	Bowmanville.	Morison, W	Willowdale, York Tp.
Hart, M	Brantford.	Malcolm, Sherman	Rondeau.
Harris, John	Kemptville.	Macdougall, A H	Peterborough
Ivory, Patrick	Newcastle.	Murdock, W	Omeme.
Irwin, J M	Port Hope.	McKenna, J J	Brampton-
Jones, Francis	Kemptville.	McGuin, S O	Sydenham.
Jones, E R	Sarnia.	McGrigor, J M	St. Mary's.
Jones, A	Chatham.	Murphy, F	Mount Forest.
James, Silas	Newton Brook.	Molloy, John	Arthur Vil.
Johnston, jr, G B	Moore Tp.	Miles, C F	Weston.
		McDonnell, A	Chatham.

LIST OF UPPER CANADA SURVEYORS.—(Continued.)

NAME.	RESIDENCE.	NAME.	RESIDENCE.
McPhillips, W	Richmond Hill.	Savigny, H P	Toronto.
Magrath, Bolton	Aylmer Vil.	Smith, W	Innerkip.
McGeorge, W G	Blenheim Vil.	Slater, J D	Ottawa.
McGee, J J	Mount Forest.	Stewart, G A	Port Hope.
Marshall, James	Carleton Place.	Simpson, A W	Guelph.
Nash, T W	Kingston.	Staunton, F H L	Southampton.
Northcote, H	Toronto.	Sanders, Wm	Barrie.
Niven, A	St. Mary's.	Sproat, A	Southampton.
Newman, R M	Elora.	Scott, A B	Campbell's Corners.
O'Mara, John	Newbury.	Spry, Wm	Owen Sound.
O'Keefe, D C	Hamilton.	Sproat, Chas	Toronto.
Oliver, John	Toronto.	Seager, E, jr	Vaughan Tp.
O'Beirne, Patk	Grimsby.	Smith, H	New Hamburg.
Pollock, James	Galt.	Simpson, G A	Picton.
Passmore, F F	Toronto.	Scane, Thos	Ridgetown.
Perry, A B	Violet.	Tidey, J A	Norwichville.
Peters, S	London.	Tracey, W	Williamsburgh.
Perceval W	Stella.	Tully, John	Toronto.
Prince, S R	Sault Ste. Marie.	Thomson, A C	Orillia.
Perry, N F	Violet.	Turner, W R	Durham.
Rankin, Chas	Sydenham.	Unwin, Chas	Toronto.
Richey, J	Perth.	Ussher, E R	Bowmanville.
Ross, R	Barrie.	Vidal, A	Sarnia.
Reid, John	Peterborough.	Vansitart, J P	Ingersoll.
Rankin, A	Sandwich.	West, J	Spencerville.
Richey, J	Packenham.	Wilkinson, J A	Sandwich.
Robinson, Wm	London.	Walsh, R	Lloydtown.
Rath, Wm	Mitchell.	Walsh, T W	Simcoe.
Rombough, W R	Durham.	White, H	Toronto.
Rubidge, T S	Brockville.	Wilkinson, A	Sandwich.
Rykert, G Z	St. Catherines.	Wonham, W G	Ingersoll.
Robinson, O	Brantford.	Wallbridge, W	Newcastle.
Ralph, Wm	London Tp.	Winter, H	Wallaceburg.
Rankin, C E	Picton	Wood, H O	Ottawa.
Robertson, R G M	Port Hope.	Weatherald, T	Goderich.
Robertson A C	Goderich.	Wheelock, C J	Orangeville.
Reid, J H	Colborne.	Wilson, H	Mount Forest.
Rombough, M B	Centreville.	Wall, H	Dunnville.
Russell, L A	Ottawa.	Webb, A C.	Brighton.
Roberts, C E	Hull, C E.	Williamson, A E	Toronto.
Robinson, G	Paisley.	Wadsworth, V B	Toronto.
Redden, F W.	Southampton.	Williams, D	Trenton.
Swallowell, Anthony	Ottawa.	Warren, J	Lucknow.
Springer, Benjamin	Delaware.	Wilson, A	Toronto.
Strange, H	Rockwood.	Yarnold, W E	Prince Albert P O
Smiley, W	Woodstock.		
Schofield, Milton C	Berlin.		
Shier, John	Whitby.		
Salter, A P	Chatham.		

LIST OF LOWER CANADA SURVEYORS.

NAMES.	RESIDENCE.	NAMES.	RESIDENCE.
Archambault, Chas	Chateauguay.	Edwards, W	Hemmingford.
Arcand, J O	St Michel	Edwards, John	Township Franklin.
Allstone, T	Berthier.		
Allbright, G N	St Andrews.	Fere, Emery	St Eustache.
Austin, W A	Ottawa.	Fournier, C F	St Jean Port Joli
Arcand, Louis	Three Rivers	Fournier, E S	
Arcand, Leon	Three Rivers.	Fitch, J C	Godmanchester.
Addie, James	Ascot, St Francis	Falls Hugh	Richmond.
		Forbes, C F H	
Barbeau, Jean		Farnan, F	Bolton, C of Brome.
Bouchette, Jos	Ottawa.	Fournier, J P	St. Thomas,
Bochet, A	Ste. Anne la Perade.	Fessenden, C	Montreal.
Brunet, F N		Fortin, J A	
Belanger, Elie			
Blanchard, L P R	St Hyacinthe.	Gamache, Jos	Cap St Ignace.
Blaklock, G W	Ottawa.	Garon, G	Riviere Ouelle.
Barrett, Wm	Beauharnois.	Geoffries, D H	St. Bridget.
Bignell, Jno	Lake St Francis.	Guern, T	Montreal.
Barthelet, G	Montreal.	Gagnon, A	Somerset.
Baillarge, C P F	Quebec.	Gilmour, R	Montebello.
Baillarge, G F	Montreal.	Griffin, P	Ottawa.
Bertrand, L A	Isle Verte	Graddon, W U	Quebec.
Bouchette, C J	Aylmer.	Gronin, G	Rimouski.
Belanger, F	St Thomas en bas	Gagnon, E	Quebec.
Bradley, A	Rimouski	Gauvreau, L P	"
Brabazon, S L	Portage du Fort.	Gaudet, J F	Three Rivers.
Belanger, J	Rimouski.		
Belanger, C A	St Anselme.	Henderson, W	Frampton.
Beaudry, J U A	Montreal.	Hall, H G	Leeds.
Boisvert, Fabien	Becancour.	Holmes, J	Huntly.
Breen, Thomas	L'Islet.	Hamel, A A	Quebec.
Barnard, James	Three Rivers.	Hayden, R S L	William Henry.
		Hamel, F V	Quebec.
Corey, Lindal, the 1st	Stanbridge.	Hudson, T B	Bouchette Tp.
Corey, Lindal, the 2nd	"	Harkin, E J	Three Rivers.
Cleeve, F C	Richmond.	Holwell, W J S	Quebec.
Casgrain, P A E	L'Islet.	Hamilton, A	Hull.
Chrevrotiere, A H T C	Deschambault.	Harwood, H S	Montreal
Cleveland, Henry C		Henderson, E D	Frampton.
Demers, J Bte	St Michel.	Johnson, H	St Thomas, Ronville.
Duberger, J Bte	Malbaie, Saguenay.	Johnston, J	Hull.
Daly, Patrick	Drummondville.		
Dorion, P N	"	Knight, W H	Quebec.
Dunlevie, G G	Ottawa.		
Dery, I P	St Raymond.	Lambert, P	Etchemin.
Dube, O A	Ste Anne de la Pocat.	Laurier, C	St. Lin.
Desrochers, Vital	St Paschal de Kamour.	Legendre, J B	Gentilly.
Duchesanay, A J	Sto Marie, Beauce.	Legendre, H	Three Rivers.
Duberger, G	Chicoutimi.	Livingstone, D	Huntingdon Vil.
Doucet, A J	Isle Verte.	Lefrancois, N	Ange Gardien.
Duberger, E	Chicoutimi.	Larue, A	Quebec.
Desmeules, J C	Malbaie.	Legendre, F F	N D de la Victoire.
Dorval, U	L'Assomption.	Lemay dit Poudrier, F	Somerset.
Duberger, T L	Chicoutimi.	Leduc, E	St Andre Avelin.
Dumais, P II	Labarre.	Lemoine, L D	Ottawa.
Duval, J N	St Jean Port Joli.	Laviolatte, G	St. Jerome.
Dion, C A	St Francois.	Lefrancois, N V	Ange Gardien.
D'Arteuil, Lewis		Legendre, E H	Maria, Bonaventure.

LIST OF LOWER CANADA SURVEYORS.—(Continued.)

NAMES.	RESIDENCE.	NAMES.	RESIDENCE.
Larue, E F X	Pointe aux Trembls.	Russell, A J	Ottawa.
Laporte, J	Lavaltrie.	Ross, A	Frampton.
LeBel, L H	Ste Flavie.	Russell, A	Ottawa.
Legendre, F	St Joseph, Beauce.	Regnaud, F T V	Montreal.
LeBoutillier, G	Perce, Cy Gaspé.	Richard, J B	Gentilly.
Lefrancois, P O	Ange Gardien.	Rielle, J	Laprairie.
Lippe, A G	L'Assomption.	Roy, C F	Ste Anne la Focatiere.
Lavergne, P E	St Francois, R du Sud.	Roney, Jas	Aylmer.
Lloyd, G A	Glen Lloyd.	Rauscher, R	Buckingham.
LeBer, H	Montreal.	Rixford, G P	Stambridge.
Lucas, S B	Richmond.	Stevenson, A	Rouville.
Morin, P L	Ottawa.	Slattery, Jas	Montreal.
McFarlane, J	Montreal.	Sheppard, C C	Wendover.
Mackenzie, W H	Montreal.	St. Pierre, J E	Riviere du Loup.
Mitchell, M	Waterloo.	Sewell, A	Quebec.
Martin, J W	Berthier, en haut.	Sullivan, J	St. Catherine.
McArthur, Jas	Aylmer.	Sheppard, H C	Quebec.
Moffat, Jas	Chelsea.	Savage, Jos	Montreal.
Murison, P	Quebec.	Symmes, H C	Three Rivers.
Michaud, C E.	St Andre.	Tetu, F	St. Thomas, en bas.
Montgomery, G	Quebec.	Tremblay, J	St Paul's Bay.
McConville, P E	Jolietville.	Tremblay, P A	Chicoutimi.
Neilson, S	Quebec.	Tremblay, O	St Paul's Bay.
Ostell, J	Montreal.	Temple, E B	Quebec.
O'Neil, J F	Megantic.	Tetu, F A	St Thomas.
Oughtred, R	Ascot.	Towle, C E	Leonoxville.
O'Dwyer, W W	Abbottsford.	Tetu, R	St Thomas.
O'Brien, S	Ottawa.	Tremblay, P	Baie St Paul.
Proulx, J P	St Francois.	Verret, Geo	Quebec
Pennoyer, J	Sherbrooke.	Webster, D	Stanstead.
Perrault, H M	Montreal.	Walkem, C	Montreal.
Painchaud, E A	Gaspé Basin.	Wallace, A	Quebec.
Pozer, G R	St George.	Weekes, G	Montreal.
Pelletier, S	Warwick.	Ware, W	St Andrews.
Proulx, P A	St Francois.	Wells, A	Granby.
Parent, L E H	Quebec.	Wells, Alex	
Paris, O	Montreal.	Wurtele, A S C	River David, Yamaska.
Quinn J W	Ste Marie, La Beauce.	Wells, D W	Farnham, Cy Brome.
Quinn, T C	Lachute.	Whitcher, A H	Sherbrooke.
Quinn, F P	Rawdon.	White, Jos	Pembroke.

LIST OF SURVEYORS COMMISSIONED BOTH FOR UPPER AND LOWER CANADA.

NAMES.	RESIDENCE.	NAMES.	RESIDENCE.
Austin, G F	Ottawa.	McLatchie, John	Templeton, C E.
Bell, Robert	Ottawa.	Newman, John	Aylmer, C E
Cattanach, Angus	Lancaster, Dal Mills.	Napier, W H E	Three Rivers. C E
Devine, Thos	Ottawa.	O'Hanly, J L P	Ottawa.
Driscoll, A	Aylmer, C E	Robertson, John	Fitzroy Harbor.
Evans, S T A	Pembroke.	Sinclair, Duncan	Ottawa.
Fletcher, E T	Ottawa.	Snow, J A	Hull, C E.
Forrest, A G	Ottawa.	Sinclair, Donald	Ottawa.
Johnstone, Quintin	Brantford	Sparks, R	Ottawa.
Kingsford, Wm	Toronto, G T	Thistle, W R	Ottawa.
Lindsay, John	Quebec.	Wagner, Wm	Montreal.
McNaughton, J	Charlottenburg, Glen.	Tache, E E	Ottawa.
McConnell, Wm	N Plan tagenet.		

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For the examination of candidates for admission to practice as Land Surveyors in Upper Canada:

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The respective boards meet in Toronto and Quebec on the first Mouday of the months of January, April, July and October, both for the examination of candidates to practice Land Surveying, and of examining students who wish to be apprenticed to Land Surveying.

The above lists comprise all the surveyors in the Province as far as we have been able to ascertain. Some may have been recently admitted, others may have migrated from Canada; some may have gone to that "bourne from which none return," and others remaining in Canada may have changed their residences. Surveyors receiving this number will confer a very great favor by examining this list; and if they find any errors, correcting us at their earliest convenience. We would specially request the Secretaries of the Upper and Lower Canada Boards to do so and furnish us with a correct list.

In future issues we shall only publish the names of those surveyors who take the *Journal*; in order that our readers may know those who are anxious for the promotion of the general welfare and the progress of the profession.

We would also feel obliged to our friends if they would forward us the names of students who wish to subscribe for the *Scientific Journal and Surveyors' Magazine*.

J. L. P. O'HANLY,

LAND AND

ENGINEERING SURVEYOR,

FOR

UPPER & LOWER CANADA,

Land, Departmental

AND

PARLIAMENTARY AGENT

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