

Metrology.*

THE PUBLIC LANDS EXCEPTION.

BY SAMUEL S. GREELEY, C. E.

Reasons why "The Completion of the Survey of the Public Lands" should not be excepted from the operation of any bill which may be passed for the adoption of the metric system of weights and measures in the business of the United States.

In the various bills which have been introduced into Congress within the past eight years, providing for the use of the metric system in this country, the survey of the public lands has been specifically excepted. It seems to many persons that this has been done without sufficient reason and in partial ignorance of the facts.

In all the original surveys for the subdivision of the public lands into townships, and of these townships into sections, the Gunter's chain of sixty-six feet, with its decimals, is the unit. Each full section is, theoretically, eighty chains, or one mile, square. A full township is, theoretically, a square of thirty-six such sections. So long as these lands remain unsold, or are held by the purchasers in large tracts (in the original package, so to speak), it matters little in what terms their dimensions may be expressed.

But as population gathers at certain points, and the land is required for human habitation, towns and villages spring up. The sections must be subdivided into lots of convenient size for homes. Roads must be made, sewers and pipes for water and gas must be laid, and wires for electricity must be strung. On the lots houses must be built. All the materials for these various purposes—lumber, masonry, pipes, plaster, paint, glass, wire—are measured by the foot or its multiple, the yard. The architect must therefore draw his plans to a scale of feet, and he requires the surveyor who lays out the lot to give him its dimensions in feet

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and decimals thereof, or in feet and inches. The surveyor, who subdivides a section or a part thereof into house lots, anticipates all this, and measures its dimensions in feet, and marks upon his plat of the new village or town the size of the lots and the width of streets in feet. So, for that particular tract the original dimensions, given by the United States in chains, pass out of use. When the metric units come into general use all materials will be bought and sold by these units. Architects will draw their plans to a metric scale, and the surveyor will measure the sections by a metric chain, and will give metric dimensions to his lots and streets.

If the survey of public lands be excepted from the operation of a metric law, the United States deputy surveyors will continue to use the almost obsolete Gunter's chain, and will record the dimensions in terms of the chain. In order to adapt the land to use for towns and villages, the land must be remeasured by a metric chain, and all the United States dimensions must be translated into terms of meters. Would it not be a great saving of time and labor if the original survey of the land by the United States were made in the same units, which are to be applied later when the land becomes closely occupied? If the metric system is to be adopted for all other uses, should it not, *a fortiori*, be applied to land which is the basis and the foundation of all things?

The absurdities of our customary system of metrology and the advantages of the metric system have been abundantly set forth in the able reports of Congressional committees, and by many able writers; I need not rehearse them. I only urge that, if the metric system is to be brought into general use, public convenience demands that the survey of the public lands should not be excepted.

No doubt a strong objection to a change of unit from the Gunter's chain to the meter will be found in the "jogs" or breaks of continuity that will occur on the lines where the new method joins the old.

The nearest approach to the size of the present section of eighty chains would be the section whose sides are 1,600 meters long (5,249.4 feet). This is the section that is most likely to be adopted under the metric system. This is 30.6 feet less than the

side of the present normal section. Starting at the south line of a township in the old survey, the jog would increase with each section till, at the north line of the township, the jog would be six times 30.6 feet, or 183.6 feet; and it would increase in like ratio with each succeeding township.

This inconvenience would be felt only on the lines where the two systems meet. It might prove a reasonable, though not a fatal, objection, but for the imperfections and irregularities of the survey of public lands as actually made.

It is a matter of common knowledge among surveyors and land owners that the length of section lines in the earlier surveys, measured by modern methods and with the appliances of today, largely exceeds the length of the same lines as stated on the plats of the original survey. For instance, in T. 39 N., R. 13 E., adjoining Chicago, the average of seventeen east and west lines, carefully remeasured, exceeds the normal length of eighty chains by sixty-four feet. The average length of nineteen north and south line exceeds the normal length by forty-six feet. And similar, or greater, discrepancies are common throughout.

There can be no doubt that the public land surveys, as now executed, are far more carefully and skilfully done than were those of eighty years ago. The "Instructions of 1902," issued by the United States Commissioner of Public Lands to deputy surveyors, are ample evidence of that.

The ever present cause of irregularities and "jogs" in both old and new surveys is the convergence of meridians. Under existing laws, passed many years ago, townships must be figures bounded by meridians and parallels of latitude, and must be six miles square—a manifest impossibility. In order to meet and minimize this difficulty the instructions of the surveyor-general to his deputies provide that at every fourth township *i. e.*, every twenty-four miles, a parallel of latitude shall be run as a "correction line," upon which the tier of townships thence north shall be laid out the full width of six miles.

In Cook County, Illinois, such a correction line was run in the original survey of seventy years ago as the boundary between townships 41 and 42 north. On the north line of Hanover, T.

41 N., R. 9 E., for example, the jog, or offset, to the section lines running north vary from fourteen chains to 24.50 chains—or from 924 feet to 1,617 feet. This is from five to nine times the maximum jog in one township, caused by the difference between the present section and the metric section. These irregularities, caused by the spherical form of the earth, will continue, whatever standard of measurement be used. They will not be diminished by the continued use of the chain; they will not be increased by the use of the meter.

The meter and the hectare share with the Gunter's chain and its acre the great advantage of being decimal. The meter has the vastly greater advantage that, when adopted, it will be the common unit of measurement of all objects bought and sold by dimension. The farm, the garden, the house, and all that goes to the making of the house, will be measured and estimated by the one common standard. Nobody measures, or ever will measure, anything but land with a Gunter's chain. That instrument has had its day of usefulness and has served its purpose well. Now let it make way for a successor better fitted to serve present needs.

Nobody ever measured, or ever will measure, anything but land with a Gunter's chain, and it is fast passing out of use for that purpose. All surveys for railroads, canals, irrigation, and other public works, are made, not in chains and links, but in feet and decimals. After a continuous practice of fifty years as a land surveyor in Chicago and Cook County, I may say that I have not used, or even seen, a Gunter's chain for forty years. That instrument has had its day of usefulness, and has served its purpose well; now let it make way for a successor better fitted to answer present needs.

It may be urged that only a comparatively small part of the total area of the public domain is likely to be occupied by cities and villages. Much of it will be used for farming, grazing, forest, mines, etc., and vast tracts of mountain and desert land will remain long, perhaps forever, unoccupied. But even these vacant and apparently waste tracts can not escape the activities of man. They are part of a great whole, and the conditions of the whole must be studied and known, for the benefit of each part. Physical

conditions, geography and topography, must be learned; elevations and contours must be taken, rainfall determined, and other important problems must be solved.

When the metric system is adopted for all public uses, except for the survey of public lands, the civic and mining engineer, the meteorologist, the geologist, will make and record their measurements and observations in terms of the metre. Then the chains and links of the United States deputy surveyor must be reduced to the metric standard, just as in the case of land which is to be covered by a city or a village, and the same unnecessary labor must be spent.

This Government has lately bought the lands of the Friars in the Philippines. It is probable that there, as in other islands acquired from Spain, will be great public domains, for which some system of survey must be devised. Spain is a metric country; what better system could be found than the metric, which is already more or less familiar to people, who have lived under Spanish influence?

THE METRIC SYSTEM PSYCHOLOGICALLY CONSIDERED.

BY WILLIAM F. WHITE.

(Continued from page 459.)

It is of importance to the mind that all the denominations of any table be related to one another by the easiest possible scale. As the notation of numbers among all civilized peoples today is decimal, and seems certain to remain so, the decimal scale of weights and measures is the only one that can be defended psychologically.

It is also important that the units of different tables be related to one another in the easiest manner. The metric system alone meets this requirement.

Contrast the mental effort necessary to determine what part of a rod is five feet, with the ease of determining what part of a hektometer is five meters. The latter is seen at a glance to be