Measures Service. As this is the result of the thermometric studies pursued at the International Bureau for several years, it seems desirable to give it a wider publicity than is offered by the publications of that bureau alone, from which these statements have been collected by me.

The standard scale adopted is, by the wording of the resolution "the centigrade scale of the hydrogen thermometer, having for its fixed points the temperature of melting ice (0°) and that of steam (100°) of water boiling under a standard atmospheric pressure. The hydrogen being taken under a manometric pressure of 1 metre of mercury, i.e., $\frac{1000}{760} = 1.3158$ times the standard atmospheric pressure." The standard atmospheric pressure is that exerted by a column of mercury (density = 13.596) 760 millimetres long at 0° C., at the mean sea-level in latitude 45°. An increase of pressure of one atmosphere lowers the melting point of ice about 0°.008.

All the thermometers used at the bureau are made of the same kind of glass, the composition of which was found by chemical analysis to be —

	Stem.	Bulb.
Silica	71.45	71.52
Sulphuric acid (SO_3)	0.74	0.72
Chlorine	traces	traces
Aluminum	1.26	1.57
Peroxide of iron	0.29	0.22
Lime	14.52	14.55
Soda	11.17	10.81
Potassa	0.30	0.37
Magnesia	traces	traces
Protoxide of manganese	traces	traces
	99.73	99.76

The exclusive use of this glass has several advantages.

1. The changes of the zero point are relatively very small, and its depression due to increase of temperature is practically a rectilinear function of the latter within the limits — 10° + 100°.

2. The thermometers are comparable among themselves, and it was found practicable to establish a general formula for reducing their indications to the standard hydrogen scale. A table of corrections based on this formula is given below, but of course it is applicable only to thermometers of this kind of glass. The reduction of the indications of mercurial thermometers to a gas thermometer depends on the kind of gas used and on the glass of which the mercurial thermometer is composed.

T hydrogen = T mercury + correction.

T m	− 20°	− 10°	0	+ 10°	+ 20°	+ 30°	+ 40°
Corr.	+ 0°.172	+ 0°.073	0.000	− 0°.052	− 0°.085	− 0°.102	− 0.107

T m	+ 50°	+ 60°	+ 70°	+ 80°	+ 90°	+ 100°
Corr.	− 0°.103	− 0°.090	− 0°.072	− 0°.050	− 0°.026	0.000

O. H. TITTMANN.

Washington, D.C., July 27.

Turner's Explorations in Alaska.

IT is with no small degree of satisfaction that naturalists are regarding the publications that are appearing from time to time from the office of the Chief Signal Officer of the Army at Washington, referring, as we do more particularly, to the reports made under the auspices of that office by the Alaskan explorers. The last one of these, very recently issued, is now before us, and presents in an admirable manner the results accomplished in that region by Mr. Lucien M. Turner, during the years 1874 to 1881, who carried on his explorations there under the direction of the Chief Signal Officer, and in connection with the National Museum.

Issued in the usual Government form, this quarto volume of some 225 pages, with its twenty-six plates, makes a very handsome work. It has been entitled 'Contributions to the Natural History of Alaska,' and is the second of the series, — its author dividing its contents into six parts for treatment. Of these, Part I. presents a very short and concise general description of the regions explored, and we learn that Mr. Turner was at various times stationed at Saint Michael's, Unalashka, the islands of Saint Paul and Atkha, at Attu, and many other points of interest. Part II., occupying about forty pages of the work, is devoted to meteorological observations, and presents in a fairly-well digested manner, the author's labors in this direction, and it is needless to add that the data here collated are not only of interest but of great scientific value. In Parts III.–VI., inclusive, the plants, fishes, birds, and mammals are dealt with, and in a very thorough manner when we consider many of the difficulties the author was obliged to overcome. Perhaps the botany of the region gained the least at Mr. Turner's hands, and it consists simply of his field-notes, added to Rothrock's list of 1867, the author stating "in this connection that of all great difficulties the most troublesome was to preserve the plants after I had collected them. The constant moisture of the climate has frequently ruined my entire collection of a summer's work. All that remained after supposing the plants were sufficiently dried would be a mass of mould and dry edges of paper, this being apparently done in less than forty-eight hours' time."

A frog (*Rana sylvatica ?*) was the only reptile collected; and at Fort Yukon, just within the Arctic circle, this species is reported to be quite plentiful. Some excellent work was accomplished in ichthyology, and a number of species added, new to science, and several rare forms collected. Fourteen beautiful plates of fish are given, and one of a lamprey (*A. aureus*), and it would be not easy to overestimate the interesting and valuable field-notes here presented. Habits, uses, geographical ranges, and other matters, are treated with distinguished ability, and in this, much is due to the assistance of Dr. Bean of the Smithsonian Institution.

What we have just said in reference to the ichthyological part, applies with more than equal force to the work done in ornithology; and to state the fact that no less than ten elegantly colored plates of birds by Robert and John L. Ridgway are given, is equivalent to saying to ornithologists and others, who may not yet have seen the work, that a feast for their eyes is still before them. The whiskered auklet (*S. pygmæus*) is figured in full breeding plumage; Turner's ptarmigan, male and female, are both given; excellent figures of the Lapp and Hawk owls, and others of special interest. Through the published field-notes much has been added to our knowledge of the habits of many of these arctic bird forms.

No mammals, unfortunately, are figured, and this part of the report has evidently not received the attention it so justly deserves, and in speaking of Cooper's shrew, our author evidently confuses that diminutive insectivore with the rodents. The volume is completed by a very full and useful index, and Mr. Turner is to be congratulated, not only upon the appearance of his work, but upon the successful termination of his explorations and labors.

Another volume by the same author is promised soon by the Signal Office, also one from Mr. E. W. Nelson, upon the same region; and finally General Greely's own report upon the Lady Franklin Bay Expedition, which will be looked for with very general interest.

It is to be hoped that the government will appreciate more and more such works and the reports thereon, and be induced to aid and encourage them as much as possible.

R. W. SHUFELDT.

Fort Wingate, N.Mex., July 22.

The Use of the Microscope as a Practical Test for Oleomargarine.

THE act passed by Congress entitled "An Act defining butter, also imposing a tax upon and regulating the manufacture, sale, importation, and exportation of oleomargarine," approved August 2, 1886, commonly known as the 'oleomargarine law,' makes it the duty of the Commissioner of Internal Revenue to prescribe all needful regulations for carrying it into effect.

From the 1st of November, 1886, when the law first went into effect, to October, 1887, one hundred and thirty-one samples of substance supposed to be oleomargarine were submitted for the decision of the commissioner under sections 14 and 15 of this act, twenty-one of which proved on analysis to be oleomargarine, and one hundred and ten were found to be butter. Most of these latter were old and rancid. The very prevalent idea that rancidity is the most characteristic property of oleomargarine may account for the

large number of samples of rancid butter seized by the Internal Revenue officers. It seems hardly necessary to say that oleomargarine, owing to its containing a comparatively small amount of the volatile and easily decomposable glycerides, keeps in a 'sweet' condition for a much longer time than butter.

Any instrument that can be placed in the hands of those officers who are charged with the enforcement of the law, whereby they can readily distinguish between the natural and artificial product, would be very desirable.

The difference between fresh, genuine, unmelted butter and oleomargarine, which is always made in whole or in part of melted fats, can be readily and clearly detected by a microscope with the aid of polarized light, and with or without the use of a selenite plate to color the field of vision. It is true that genuine butters are sometimes accidentally melted, so that while the presence of melted fats is not a sure indication that the article is oleomargarine, their entire absence in the article found in the markets removed from the place of manufacture is a very strong indication that it is butter.

The use of the microscope for the purpose of observing the presence of melted fats in a fresh sample was first brought to the attention of chemists in 1873, in an article on butter, by Dr. I. Campbell Brown, from the 'Liverpool and Manchester Medical and Surgical Reports, 1873,' republished in the *Chemical News*, vol. 28, p. 1, July 4, 1873. Such inspection can be readily performed without previous preparation of the sample, and a large number of samples can be examined in a short time.

The expense of large instruments with the necessary attachments, as usually made for laboratories, rendered them unsuitable for use by local officers in the markets or stores in which butter and oleomargarine are sold. In December last I came across a convenient and cheap form of microscope, to which under my directions the proper polarizing attachments were added. Owing to delays of the manufacturers a sufficient number of the instruments was not secured till last April. These were placed in the hands of the collectors of internal revenue with full directions for use, etc.

The instrument consists, first, of a large bell-shaped base, having at its mouth a silvered mirror acted upon by a spring, and at its apex a tube fitted with a tightening ring; second, a draw-tube, working in the tube which forms the upper part of the base, containing a good Huyghenian eye-piece, and at its other end a ring to which the analyzer and objective, one-half inch, may be screwed; and, third, the polarizer, fitted with a small condensing lens, and provided with a milled head whereby it can be rotated, is attached, by suitable means, to the mouth of the base. For convenience in focusing, marks are placed on the draw-tube, giving the approximate focus for ordinary thickness of objects.

The instrument is carried in a small wooden box eight inches long by five inches wide and deep, containing a number of glass slides and covers, and having pasted on the inside of the box-cover photo-lithographs of a fresh sample of oleomargarine and of butterine viewed under polarized light, — 'butterine' being the trade name for the product consisting principally of lard with from ten to twenty-five per cent of creamery butter. The box is fitted with a handle.

A small portion of the fresh sample taken from the inside of the mass — to avoid crystals of salt and accidental melting of the outside of the sample — with the point of a penknife is placed on the middle of a glass slide and covered. The gentle pressure of the blunt end of a pencil spreads the sample out to make it sufficiently translucent. On looking through the instrument, at the prepared slide, held towards the direct light from a window, or a gas or lamp flame placed within a short distance, a sharp focus is quickly obtained, and on rotating the polarizer until the field is dark the presence of melted fats will be readily recognized by the bright white particles with which the whole field is illuminated. But where nothing is seen except the characteristic globules, the granular masses of curd, and the cubical crystals of salt, even when the polarizer is turned so that the field passes from the darkest to the lightest, the sample can at once be passed as genuine butter however rancid to the taste or smell it may be.

Boiled or 'ladle-packed' butter, made from old rancid butters, melted and churned with a small quantity of milk, and very rancid butter may sometimes be mistaken for oleomargarine, but by having a slide of oleomargarine or butterine ready for comparison, the difference is easily perceived. The hard fats, palmitin and stearin, exist in a state of solution in the globules of a fresh sample of butter and in the fats of living animals. Upon being melted and cooled these hard fats separate out in the form of acicular crystals which polarize light, owing to their being double-refracting bodies.

In the latter part of April I was instructed to proceed to Philadelphia and New York and assist the local revenue officers in the examination of samples of butter collected in those cities. This investigation was afterwards extended to other cities in May and June, and samples of all grades of butter handled by retail butter dealers were collected and examined, the object being to ascertain to what extent and by whom oleomargarine was sold without complying with the law.

The principal cities and towns in New York and Pennsylvania, and the cities of Baltimore, Washington, Hartford, and New Haven, were visited, and the samples examined by the revenue agents connected with those districts.

The method of procedure was generally as follows. On a certain day all the division deputy collectors in the city and vicinity in which the examination was to be made were detailed with instructions to visit the stores of all, if possible, retail dealers in butter, except those who had paid the special tax as dealers in oleomargarine, and to obtain a sample of each grade of butter dealt in. For this purpose each deputy was furnished with a wooden box, containing a gross of half-ounce specimen tubes, with the necessary number of gummed labels and blank forms for noting address, etc., of the dealers visited. At the end of the day the samples collected were brought to the office and placed in an ice-chest. From two to three days were devoted to this canvass. The samples were examined as soon as possible after they were received, and any specimen found showing the presence of melted fats was at once thoroughly investigated and the dealer's store visited and the goods detained, etc. Most of these cases proved on investigation that the so-called butter had been bought from a regular oleomargarine dealer or received direct from the factory.

The following table shows the number of samples of butters that have been examined in the different cities named and the number found to be oleomargarine.

Locality.	No. of Samples.	Representing Stock of Dealers.	Oleomargarine.
Philadelphia, Penn	656	288	2
Brooklyn, N.Y.	632	346	5
New York, N.Y	2998	1862	3
Jersey City, N.J	234	145	2
Newark, N.J	280	175	1
Paterson, N.J	122	64	7
Hoboken, N.J	84	49	0
Elizabeth, N.J	103	77	1
Boston, Mass.	1181	595	2
Lowell, Mass	59	19	4
Salem, Mass	57	28	0
Cincinnati, O.	651	424	6
Indianapolis, Ind	233	152	2
Chicago, Ill	719	346	2
Milwaukee, Wis	574	362	0
Baltimore, Md.	228	141	1
Washington, D.C.	149	89	0
Four towns, Conn	822	478	1
Eighteen towns, Penn	599	456	19
Eleven towns, N.Y.	596	426	0

EDGAR RICHARDS.

Washington, D.C., July 26.