HOW FAR A LIGHT MAY BE SEEN UNDER WATER.

MR. EDOUARD SARASIN recently made an interesting report of the experiments of the committee of the physical society of Geneva, in regard to the transparency of the water of the lake. The auxiliary society of Geneva generously gave the committee twenty-five hundred francs to aid in the researches; and Messrs. Soret, Sarasin, C. de Candolle, H. Fol, A. Rilliet, Ch. Soret, Plantamour, and R. Pictet took part. Three candles in a lantern (the flame being fed by a continuous current of air) are visible, at a depth of thirty metres, in the pure water of the lake. An electric light was distinctly seen in the water at the foot of the hydraulic machine of Geneva at a depth of thirty-three metres. A few centimetres more caused the clear image to disappear, which was replaced by diffuse light, faintly perceptible at sixty-seven metres. Messrs. Sarasin and Soret noticed a very characteristic absorption ray in the spectrum of light which had traversed a certain layer of water. This ray had been seen before, but former publications had not attracted the attention of physicists. The recent observations confirmed the fact, and completed the data already obtained. This ray is in the red, near *B*. The same physicists have also undertaken experiments upon the transparency of water when agitated with insoluble substances, such as the chloride of silver, etc. They find that the distance of clear vision varies very little with the increase of the brilliancy of the luminous body and its absolute dimensions. Assisted by Dr. Marcet, the committee has made photographic experiments in the deep portions of the lake. Down to two hundred and fifty metres they find the effect of light on the sensitive plates; but this depth seems to be, at least for the plates now in use, the extreme limit of action of the sun's light. Below this point the lake is a vast, dark chamber.

THE MERIDIAN CONFERENCE.[1]

AT the meeting on Wednesday, the 22d, the work of the conference was finished so far as the transaction of new business is concerned. Gen. Strachey withdrew his resolution for ten-minute meridians for local time, and the conference then proceeded to pass a resolution reciting and affirming its action upon the seven resolutions already adopted. These, as finally determined upon, are as follows: —

1. "That it is the opinion of this congress that it is desirable to adopt a single prime meridian for all nations, in place of the multiplicity of initial meridians which now exist."

2. "That the conference proposes to the governments here represented the adoption of the meridian passing through the centre of the transit instrument at the observatory of Greenwich, as the initial meridian for longitude."

3. "That from this meridian, longitude shall be counted in two directions up to 180°, east longitude being plus, and west longitude minus."

4. "That the conference proposes the adoption of a universal day for all purposes for which it may be found convenient, and which shall not interfere with the use of local or other standard time, where desirable."

5. "That this universal day is to be a mean solar day; is to begin for all the world at the moment of mean midnight of the initial meridian, coinciding with the beginning of the civil day and date of that meridian; and is to be counted from zero up to twenty-four hours."

6. "That the conference expresses the hope, that, as soon as may be practicable, the astronomical and nautical days will be arranged everywhere to begin at mean midnight."

7. "That the conference expresses the hope that the technical studies intended to regulate and extend the application of the decimal system to angular measure, and to that of time, shall be resumed, so as to permit the extension of this application to all cases where it presents real advantage."

A final resolution was then passed, reading as follows: —

"That a copy of the resolutions passed by this conference shall be communicated to the government of the United States, at whose instance, and within whose territory, the conference has been convened."

With a hearty vote of thanks to the government for the facilities offered, to the president, Admiral Rodgers, for his impartiality and courtesy, and to the secretaries for their faithful work, and with a suitable response by the president, the conference adjourned, subject to the call of the latter, for the purpose only of verifying the protocols of the proceedings.

The phraseology of the seventh resolution is somewhat peculiar; and the word 'resumed' looks very much like a mistake in translating 'résumer,' as the resolution was introduced by the French delegates.

[1] Concluded from p. 406.

THE RESOURCES OF THE UNITED STATES.

THE seventh quarto volume of the Tenth census, containing the tables of valuation, taxation, and public indebtedness, must be regarded as the most exact, and one of the most valuable, yet issued. It is largely historical in its treatment of the subject, which allows an exact historical statement more readily than most of the subjects of these volumes; and it thus presents a view of the finances of the United States for a century, which must be of great interest to all economists. There is also much information of a political and personal nature contained in the history of the foreign loans made by the United States and by individual states, including some description of the repudiated debts of Pennsylvania, Missis-

sippi, and other states. The early loans made through Dr. Franklin, John Adams, etc., in France and Holland, from 1776 to 1795, are dwelt upon minutely; and the transactions of Beaumarchais, the financier, author, and publisher, are related at some length. Statistically, the presentation of debt, aggregate wealth, and taxation, is more complete by far than was ever made before for the United States; and, when these statistics are viewed in the perspective of past history, they confirm the wonderful economic resources of a democratic republic like ours. They show that no amount of debt hitherto imposed has prevented the country from increasing rapidly in wealth and financial power, although there are local debts which may remain unpaid for a long time; and that the aggregate debt of the country is now fast decreasing, while the aggregate wealth is gaining more rapidly than ever. That such should be the case so soon after the most costly and desolating civil war known to modern history, is remarkable; but there can be no other interpretation of the figures presented in this volume.

In round numbers, the aggregate wealth of the United States in 1880, was, by careful estimate, $43,600,000,000, of which not quite $17,000,000,000 was that year assessed for taxation. This is between two and three times as much as was the aggregate wealth in 1860, which did not much exceed $16,000,000,000, or less than the taxed valuation of 1880. The aggregate debt of the country in 1880 was a little less than $3,000,000,000, or between six and seven per cent of the estimated wealth. Of this debt, the national government was responsible for $1,942,000,000; the separate states, counties, cities, etc., for $1,048,000,000. This was the *net* indebtedness, which had in 1880 been decreasing for some years, and has since diminished by at least $400,000,000 in the aggregate; so that we probably shall enter the year 1885 with a net debt of about $2,500,000,000, while our population has increased from 50,000,000 in 1880 to 58,000,000, and our wealth to at least $50,000,000,000. The taxation for state and local purposes upon the valuation of 1880 was about $302,000,000, while the national expenditure drawn from imposts and excise was not far from the same sum. This would be an aggregate taxation of less than fourteen dollars a thousand, which is considerably less than they are taxed in Massachusetts, where even the state and municipal taxes often amount to more than that. The *per capita* distribution of local taxation in different sections of the country is curious; being highest in California ($14.60), in Nevada ($14), and in Massachusetts ($13.64), while in the two Carolinas it is only about $1.50, and in Alabama $1.63. Of course this high *per capita* tax implies great wealth in the community and consequently the richest states have the largest percentage of local taxation, considered with regard to the individual tax-payers. Thus Massachusetts, with an assessed valuation of nearly $1,585,000,000, and a population of less than 1,800,000, in 1880, raised that year nearly $24,500,000 of local tax, besides what she paid into the national treasury; while Texas, with a population nearly as great as that of Massachusetts, but with a valuation of property less than a third part as large, raised by taxation only $4,568,716, or less than a fifth of the Massachusetts taxation. Yet the Texans probably feel their light taxes more than the people of Massachusetts feel their heavy burdens.

For a similar reason the debt of a state is often, perhaps almost always, largest where property most abounds to pay the debt with. This does not hold true of all the southern states, some of which have incurred great debts that bear no proportion to the property of the tax-payers. Thus Louisiana, with a population of 940,000, and an estimated wealth of $422,000,000, had a debt of $42,866,000; while Wisconsin, with a population of 1,316,000, and wealth estimated at $969,000,000, had only $11,876,000 of debt. Virginia's estimated wealth was, in 1880, $693,000,000, and Connecticut's, $852,000,000; yet the latter had only $22,000,000 of debt, while Virginia had $42,000,000. In these statistics we include both the state debt, and the debts of counties, cities, etc., within each state; and we give the net indebtedness after allowing for sinking-funds, etc. The three states of largest estimated wealth (New York, Pennsylvania, and Massachusetts) had then the largest debts, — New York, $218,723,000; Pennsylvania, $106,133,000; and Massachusetts, $91,284,000. These amounts seem vast, and are so; yet Massachusetts had $30 of wealth for every dollar of debt, New York $35, and Pennsylvania more than $50. It is curious to observe, however, to what a great and varying extent this wealth escapes taxation; for, while more than half of Massachusetts's property (57 %) is taxed, only a little more than one-third is taxed in New York (34.8 %), and in Pennsylvania less than one-third (31.2%). The New-England states generally tax property more closely than the other states, the

percentage of taxed property rising in Rhode Island to 60, though it falls in Connecticut to 38.4, and in Vermont to 30. In Vermont, also, the tax is very small (only $1,745,000); while New Hampshire, with scarcely more population, raised $2,698,000 by taxation, and Rhode Island, with 56,000 less people, raised $2,603,000. The estimated wealth of Rhode Island, however, was $420,000,000, while that of Vermont was but $289,000,000, and that of New Hampshire, $328,000,000.

The mode of exhibiting property, debt, taxation, etc., by pyramidal diagrams, — the largest states at the bottom, and so on, upward, — is a very effective one to the eye, far more so than the map-form of making such statistics impressive. A map, and an arrangement of divided disks and parallelograms, are also used to illustrate the ownership of the national debt, etc. These devices are a novel and increasing feature of statistical reports, and are doubtless useful to the general and casual reader; but scientific inquirers must be warned against making too much of them. Statistics themselves, in their most exact form, are apt to mislead as soon as comparisons are attempted; for then a multitude of qualifying circumstances come into view, or, if not seen, make the result of the comparison deceptive. To make these statistics still less exact by reducing them to the pictorial form, introduces a new element of error. The investigator must therefore be prepared to see these general views become dissolving views, as he extends his inquiry into the real facts, which the best collected statistics do but disguise with a thicker or thinner veil of imperfect classification.

THE ABORIGINES OF CHILE.

Los aborijenes de Chile. Por JOSE TORIBIO MEDINA. Testo i láminas. Santiago, *Imprenta Gutenberg*, 1882. 427 p. 4°.

THE original sources on which we must depend for a knowledge of the ethnology of Chile are difficult of access, and Señor Medina has performed a meritorious work in collecting them in this volume. Nor is it a mere compilation. To a very full description of the Araucanian Indians he adds a discussion of the archeological relics of that country, such as up to the present we might have sought in vain. Some of his conclusions will be read with interest.

Although no unequivocal signs of quaternary man have been found in Chile, Medina mentions two or three discoveries of stone implements at great depths, one of which, as figured, has every appearance of a genuine quaternary celt. As is well known, in the contiguous territory of the Pampas, Ameghino has described undoubted and abundant human remains from quaternary deposits. At any rate, the state of preservation of the remains in the graves of the Araucanians seems to leave no doubt that they were relatively a late immigration. To the antecedent population the author attributes the curious petroglyphs which are not uncommon on the Chilian rocks. His effort, however, to make it appear that this earlier people was of a more civilized type, cannot be said to be successful.

Appended to the text are two hundred and fifty-two lithographs of archeologic finds. They include articles in stone, copper, silver, bronze, and pottery. Those in stone present some forms which are not at all, or not often, found with us. Such are the rounded and polished sling-stones,— a weapon popular in South America, but scarcely known in the northern continent. Stone implements for net-making are another curiosity. They are of the shape and size of a cigar, with grooves around each end. Perforated circular stones, about three inches in diameter, are extremely common, and, the author thinks, were used principally to add weight to agricultural implements, — a quite improbable theory. Both the stone implements and the pottery present markedly different degrees of technical skill. This the author explains chronologically, attributing the ruder to a much more ancient date; but the opinion that they merely represent different degrees of contemporary skill is equally probable.

Shell-heaps are numerous along the Chilian coast, some of them six metres in height; but mounds, earthworks, or walls are not described. No fresh information is furnished on the Araucanian language, and this part of the volume has slight value. The history of the Incarial conquest is detailed at length; but the influence of the Incarial culture on the southern tribes, which was very widely felt, is not allowed its proper prominence.

NOTES AND NEWS.

THE Chesapeake zoölogical laboratory of the Johns Hopkins university was stationed this year at Beaufort, N.C., and was open from June 1 to Sept. 19. Owing to the illness of the director, it was most of the time under the charge of Prof. H. W. Conn. The embryology of echinoderms, annelids, and medusae, formed the principal studies. Dr. Brooks nearly completed his monograph of the medusae of Beaufort, and studied the embryology of Eutimia, besides