was and is that the method as well as the number of representatives last approved by Congress should be prescribed and that view was adopted by the committee.

It is this decision which is distasteful to Professor Huntington. After the census of 1910 improved methods of dealing with the apportionment problem were laid before the committee on the census by Dr. J. A. Hill and by me. The committee approved my proposal and based the apportionment law of 1911 upon it. In 1921 Professor Huntington improved upon Dr. Hill's method and urged this method of equal proportions, as it was then called, upon Congress. It was considered and approved by the advisory committee to the director of the census but neither Congress nor a committee of Congress has endorsed it. In 1927 and 1928, when the committee on the census held hearings on the bill for ministerial apportionment, each method was advocated and the committee decided to follow congressional precedents in the matter. In my opinion the prescription of a novel method would have increased the obstacles to the bill, obstacles which I regret to say have proved insurmountable, the bill having been defeated in the House May 18th by a vote of 164 in favor and 186 opposed.

Perhaps the main difference between Professor Huntington and me is over the nature of the problem. He treats it as a statistical or "purely mathematical" question which mathematicians and statisticians are to solve, while Congress should accept their solution. I regard it as a political problem in which the scholar should attempt first to find what end the constitution or Congress aims at and then devise or improve a method by which Congress may accomplish that end. The function of mathematicians in the problem is not to choose among ends but merely to determine how some primary end of apportionment can best be secured.

Upon this main difference another depends. Professor Huntington thinks I owe it to the world of scholars to defend my heterodox opinions by publishing them "in some regular journal." My main purpose, however, has been to help Congress out of a dilemma and I am not interested in justifying my course in so doing to my academic colleagues. If any reader wishes to obtain the material for an independent judgment about my position and arguments and the validity of Professor Huntington's criticisms of both he can best do so by asking the Chairman of the House Committee on the Census, Honorable E. Hart Fenn, for a copy of the Committee Hearings of February, 1927, and February, 1928.

One of the main objections to the method of equal proportions is that to the non-mathematician in Congress or out it is almost unintelligible. The comments upon that method made by two scholars who at my request read the hearings before the census committee, including testimony and memoranda by Dr. J. A. Hill, Professor A. A. Young and Professor E. V. Huntington, may be cited in support of this claim. The late James Parker Hall, dean of the University of Chicago Law School, wrote about the method of major fractions: "It is much easier to explain (to any one but a society of mathematicians)." A distinguished teacher of political science in one of our leading universities wrote: "I read very carefully Professor Huntington's explanation of the method of equal proportions contained in the hearings. I confess my inability to comprehend it." In the congressional debate on the bill just defeated the leader of the opposition to it and the senior Democratic member on the Census Committee said: "I presume the mathematicians know what they are talking about. Nobody on the committee knew whether they were right or not."

WALTER F. WILLCOX

CORNELL UNIVERSITY

TRANSPLANTATION OF THE EUROPEAN OYSTER

It is well known that the accidental introduction of the Portuguese oyster (*O. angulata*) into Arcachon Bay in France has led to the establishment there of a great breeding-ground and immense production of this oyster on beds which were formerly occupied only by the European oyster (*O. edulis*).[1] Portuguese oysters, which do not occur naturally on English oyster-beds, are also grown and well fattened on these beds on a commercial scale after transplantation of the young from Portugal or France. There is, therefore, evidence that this kind of oyster will live and thrive in situations other than those in which it occurs naturally, and there is every reason to believe that other kinds of oysters can be transplanted—with circumspection—to obtain similar results. The European oyster is generally regarded as a superior article of food to the American oyster, and for that reason should be of greater commercial value. There are indeed physiological reasons for believing that *O. edulis* fattened on the West Atlantic Coast would compare favorably with the best American shell-fish. The object of this note is to suggest that the European oyster especially may be expected to breed and flourish in the beds in the northern states and in Canada on the Atlantic coast and that the transplantation of this species should not be a difficult matter.

[1] M. Dantan, *Comptes Rendus Acad. des Sci.*, Feb. 2, 1914, Paris.

In reviewing the characters of the dominant species of oysters throughout the world it has been shown that two distinct types may be recognized. Type I consists at present of *O. virginica-elongata,* the American and Canadian oyster; *O. angulata,* the Portuguese oyster; *O. cucullata,* an oyster of world-wide distribution in tropical and subtropical regions.

Type II consists at present of *O. edulis,* the European oyster; *O. lurida,* the British Columbian oyster; *O. angasi,* the south Australian mud-oyster.

The oysters of Type I flourish in tropical or subtropical regions; have small eggs, which are thrown directly into the water, and are either male or female.

The oysters of Type II, on the other hand, flourish in temperate regions; have large eggs, which are incubated inside the shell until developed into a free-swimming larva, and the individuals are hermaphrodite.

Now the oysters of Type II occur, in the northern hemisphere, on the west coast of Europe and the west coast of North America, but not on the Atlantic coast of North America. In the southern hemisphere this type occurs in the south of Australia and the south of New Zealand. Why, then, is a dominant member of this type absent from the Atlantic coast of America?[2] It seems highly improbable that there can be any other answer to this question than could be supplied by geological changes, if sufficient knowledge were available. There is every reason to believe that the biological conditions in the estuaries in the middle part of the Atlantic coast of North America would be eminently favorable to the European oyster. The reverse of this has been proved[3] in the case of the American slipper-limpet, which was introduced on American oysters into the Thames estuary in England and has flourished there exceedingly well. It is equally probable that both the European and British Columbian oysters would also thrive on the Atlantic coast, and quite probably increase at a great rate on the warmer beds.

In these days of rapid transport it should be possible to relay oysters from Europe or British Columbia to the American or Canadian Atlantic beds within a few days and with no greater mortality than occurs on relaying from one European bed to another. Any scheme of transplanting, however, ought to be well thought out and should aim at relaying a maximum number of individuals in a small area in secluded estuaries where there is a minimum tidal current.

J. H. ORTON

MARINE BIOLOGICAL LABORATORY,
THE HOE, PLYMOUTH

[2] J. S. Gutsell in SCIENCE, LXIV, No. 1662, 1926, describes a small species of this type from Beaufort, N. C.

[3] J. H. Orton, *Proc. Roy. Soc.*, B, Vol. 81, 1909.

THE BOILING-POINT AND THE LATENT HEAT OF VAPORIZATION OF WATER

THE teaching of loose concepts in physics in the high schools and colleges may lead to the acquisition of incorrect habits of thinking. Many text-books of physics leave the student with the impression that the boiling-point and latent heat of vaporization of water are immutable constants. The concept of the boiling-point of water being 100° C. is drilled so deeply in the mind of the student that it becomes exceedingly difficult later to uproot this idea. Invariably, when the boiling-point of water is mentioned, the student thinks of 100° C. or 212° F. and a latent heat of 540 calories per gram; that water exists as such only below 100° C., and only as steam above this temperature. Neither is it sufficiently impressed on the student that the latent heat of vaporization is not a constant, but a variable which is a function of the vaporization temperature.

Illustrative of the looseness found in the statement of calorimetric problems is the following one taken from a standard text-book. "How much steam at 150° C. must be added to 1 kg of ice at −10° C. to give nothing but water at 0° C.?" Since no pressure is stated, presumably the student is to assume a boiling-point of 100° C.

Another well-known text-book makes the following statement in explaining the determination of the latent heat of vaporization of water: "In condensing, its latent heat of vaporization is given up and the condensed water is cooled from 100° to the final temperature of the calorimeter." Apparently the figures 100 represent a sacred number.

In a third text-book it is stated that "brine must be raised above 100° C. to boil." As if pure water can not be made to boil above 100° C. or that it must boil at 100° C.! What must the student think of his physics text-book when he observes water above 100° C. being fed to the boiler of a power-plant?

In a fourth text the author after carefully showing that the boiling-point and latent heat of vaporization are variables rather than constants, then proceeds to give an illustrative problem of an experimental determination of the latent heat of vaporization, and without stating any pressure, tacitly assumes that the boiling-point is 212° F.

In a fifth text the following usual problem is given: "How much heat would be required to change 10 grams of ice at −10° C. to steam at 110°? Assume a specific heat of steam at constant pressure equal to 0.5." To solve this problem the student takes for granted that the boiling-point is 100° C., and that the steam has been heated from 100 to 110. Soon he arrives at such a habit of thinking that no problem in saturated or superheated steam can be solved unless that mystic number 100 is introduced into the prob-