

# SCIENCE

EDITORIAL COMMITTEE: S. NEWCOMB, Mathematics; R. S. WOODWARD, Mechanics; E. C. PICKERING, Astronomy; T. C. MENDENHALL, Physics; R. H. THURSTON, Engineering; IRA REMSEN, Chemistry; J. LE CONTE, Geology; W. M. DAVIS, Physiography; O. C. MARSH, Paleontology; W. K. BROOKS, C. HART MERRIAM, Zoology; S. H. SCUDDER, Entomology; N. L. BRITTON, Botany; HENRY F. OSBORN, General Biology; H. P. BOWDITCH, Physiology; J. S. BILLINGS, Hygiene; J. McKEEN CATTELL, Psychology; DANIEL G. BRINTON, J. W. POWELL, Anthropology.

FRIDAY, MARCH 26, 1897.

## CONTENTS:

<i>The Forest Reservation Policy:</i> B. E. FERNOW....	489
<i>Experiments upon Metabolism in the Human Body, under the Direction of the United States Department of Agriculture.....</i>	493
<i>An Induction Coil Method for X-Rays:</i> CHARLES L. NORTON, RALPH R. LAWRENCE.....	496
<i>The New York State Science Teachers' Association (II.), including Addresses by Ralph S. Tarr and Richard E. Dodge:</i> FRANKLIN W. BARROWS..	498
<i>Current Notes on Physiography:—</i> <i>Tennessee Valley Region, Alabama; The Preglacial Kanawha Again; Stages of Appalachian Erosion; Baltzer on the Diluvial Aar Glacier:</i> W. M. DAVIS.....	507
<i>Current Notes on Meteorology:—</i> <i>The Teaching of Climatology in Medical Schools: Sunstroke Weather of August, 1896; Deforestation and Rainfall:</i> R. DEC. WARD.....	508
<i>Current Notes on Anthropology:—</i> <i>The European 'Quaternary' Man; The African Dwarfs:</i> D. G. BRINTON.....	509
<i>Scientific Notes and News:—</i> <i>A Bill for the Suppression of Science, Literature and Art; General.....</i>	510
<i>University and Educational News.....</i>	514
<i>Discussion and Correspondence:—</i> <i>The Former Extension of Ice in Greenland:</i> R. S. TARR, T. C. CHAMBERLIN. <i>History of Elementary Mathematics:</i> FLORIAN CAJORI.....	515
<i>Scientific Literature:—</i> <i>Creighton's Microscopic Researches on the Formative Property of Glycogen:</i> R. H. CHITTENDEN. <i>Barnes' Analytical Keys to the Genera and Species of North American Mosses:</i> GEO. F. ATKINSON..	517
<i>Scientific Journals:—</i> <i>Journal of Geology:</i> H. F. B. <i>American Chemical Journal:</i> J. ELLIOTT GILPIN. <i>The Astrophysical Journal.....</i>	519
<i>Societies and Academies:—</i> <i>Torrey Botanical Club:</i> EDWARD S. BURGESS.	

*Science Club of the University of Wisconsin.* W. S. MARSHALL. *The Academy of Science of St. Louis:* WM. TRELEASE. *Science Club of Northwestern University:* THOMAS F. HOLGATE..... 523  
*New Books.....* 524

MSS. intended for publication and books, etc., intended for review should be sent to the responsible editor, Prof. J. McKeen Cattell, Garrison-on-Hudson, N. Y.

## THE FOREST RESERVATION POLICY.

ON March 3, 1891, the Congress of the United States enacted into law a new and important policy, namely, that the government should own and hold in perpetuity certain lands other than those needed for its immediate purposes or those set aside for parks.

This departure from the accepted policy of the past, according to which the public domain is held by the government only until it can be disposed of to actual settlers, was based upon the perception that a forest cover on slopes and mountains must be maintained to regulate the flow of streams, to prevent erosion and thereby to maintain favorable conditions in the plains below.

Enormous devastation of the public timber by theft and fire has gone on for decades, through absence of any care and through lack of any rational system in the manner of permitting the utilization of the wood material by the resident population. For the last 25 years every Secretary of the Interior, every Commissioner of the General Land Office, has pointed out this deplorable condition and has asked for legisla-

tive relief. Bill after bill has been introduced for the protection of the public timber, but most of these never found consideration even in the committees, much less on the floor of the two Houses of Congress.

#### HISTORY OF FOREST RESERVATIONS.

In 1887 the then Secretary of the American Forestry Association formulated and had introduced into the 50th Congress an elaborate bill (afterwards in modified form known as the 'Paddock Bill,' 52d Cong., Senate 3,235) providing for the withdrawal of all timber lands on the public domain from entry or other disposal, setting the same aside as public forest reservations, and instituting a fully organized service in the Department of the Interior to take care of such forest reserves, protecting them against fire and theft, regulating their occupancy by prospectors, miners and herders, and permitting the cutting and sale of the timber under a system of licenses and under application of rational forestry methods.

Of this radical yet reasonable legislation all that could be obtained was the enactment of a brief clause, inserted at the last hour of the 51st Congress into 'An Act to repeal Timber-culture laws and for other purposes.' The credit for securing this recognition belongs to the then Secretary of the Interior, Hon. John W. Noble. This clause, approved March, 1891 (Public—No. 162, Sec. 24), by which the important policy of forest reservations was established, reads as follows :

That the President of the United States may from time to time set apart and reserve in any State or Territory having public land bearing forests, in any part of the public lands, wholly or in part covered with timber or undergrowth, whether of commercial value or not, as public reservations, and the President shall, by public proclamation, declare the establishment of such reservations and the limits thereof.

Under this law seventeen forest reservations were made, sixteen by President Harrison, largely at the end of his admin-

istration, and one by President Cleveland, on September 28, 1893. The estimated area of these is 17,500,000 acres. In some cases these were asked by petition and were investigated by the General Land Office; in others they were announced without previous public notice. In the absence of specific legislation the Secretaries of the Interior construed the reservation of these lands as a withdrawal not only from sale and entry, but from all use whatsoever, the Department being powerless to protect or utilize the same. *This was never the intention of the projectors of the forest reservations.*

As a result, strong opposition has grown up in the States where these large areas had been withdrawn from use. Although petitions for a number of other reservations had been prepared, the advocates of the reservation policy have not considered it wise to extend the reservations until the needed legislation could be had providing for their rational use and administration.

When it became apparent that the original bill (the Paddock bill), although most desirable was too elaborate to be considered by Congress, a short bill, leaving the detail of framing rules of occupancy and use to the Secretary of the Interior, was prepared. This has become known as the McRae Bill (53d and 54th Congress, H. R. 119), Hon. Thos. C. McRae, Chairman of the Committee on Public Lands of the 53d Congress, having with great interest forwarded the same. This bill, with amendments, was passed by the House of Representatives in December, 1895, and almost the same bill, with further amendments was passed by the Senate, but failed to become law. During the second session of the 54th Congress the McRae Bill (H. R. 119), again modified, was again passed by the House, but remained unreported from the Committee on Forest Reservation in the Senate, while a bill, essentially the

same, was reported from that committee but remained on the calender without action.

In the fall of 1895, finding that the arguments for legislation did not procure its enactment, the Secretary of the Interior was induced by the Executive Committee of the Forestry Assciation to call upon the National Academy of Science for an expression of advice as to the need and methods of a proper administration of the public timber lands, in order to secure the weight of authority of that body to the proposition. The Academy, as customary, appointed a committee, asked an appropriation of \$25,000 for the purpose of field examination, and members of this committee visited the regions where public timber lands are situated. As a result of this journey a report was made to Hon. D. R. Francis, Secretary of the Interior, advising the reservation of some 20,000,000 acres. On February 22d President Cleveland, following the suggestion of Mr. Francis, proclaimed the reservations asked for.

This sudden withdrawal from use of such a vast area, some of which was occupied by mining and lumbering industries dependent upon wood supplies, created strenuous opposition in the Senate and led to the adoption of a clause in the Sundry Civil Appropriation Bill at once restoring these reservations to the public domain. The House members of the Conference Committee, however, succeeded in substituting an amendment by which practically the main provisions of the McRae Bill were incorporated, namely, empowering the Secretary of the Interior to regulate their use and occupancy by miners, herders, etc., and for the sale of timber as needed under proper forestry regulations. This amendment failed of acceptance, except that part which empowers the President to restore all or parts of the reservations. The bill did not become a law, not being signed by the President.

#### REASONS FOR THE ESTABLISHMENT OF FOREST RESERVATIONS.

The forest and brush cover of the mountains in the country west of the 100th meridian occupies a small proportion of the total area, probably not more than 35 per cent. The timber of useful kinds occupies hardly 15 per cent. of the whole. The distribution and character of this growth is extremely variable, from the chapparal and stunted growth of southern California and the open pine, cedar and spruce of the lower Rocky Mountains to the magnificent world-famed giants of the Sierras and the dense unmatched forest growth of the Cascade and Coast Ranges in northern California, Oregon and Washington. Corresponding to the difference in distribution and development of forest growth, the climate, especially with reference to moisture conditions, varies. The northwestern portion of the Pacific coast has an abundance of rainfall and high relative humidity; the southern portions and lower Rocky Mountains are more or less arid. In either section a forest cover of the higher elevations and slopes is needful; in the one case to hold back the snow and rain waters from inundating agricultural lands below; in the other case to preserve the scanty water supply by impeding evaporation. In both cases the wood supply needs careful husbanding, for, in the absence of something better, even the poor material of the southern areas is needed for domestic uses. The magnificent timber of the Northwest, most wastefully lumbered and shipped away while the home consumption is limited, will ere long be needed at home and should be cut with due regard to the future and to reproduction.

The attempts of the government to protect its own property have been ineffectual and futile. The laws enacted in 1878 appear to make legal a systematic plundering of this property. Hundreds of square miles have been absolutely destroyed by un-

checked forest fires. Thousands of acres of valuable timber have been appropriated without any equivalent to the Treasury and without even an attempt at settlement as contemplated under the law. There are no provisions now on the statutes under which any citizen can obtain wood from the public domain by purchase, except that on the Pacific coast a man may buy 160 acres of it at \$2.50 per acre for his own personal use only. A mining company needing timber must either steal, buy stolen timber, or obtain it by circumvention or perversion of the law—at least of its intention, if not its wording. Large mill establishments, able and willing to pay, are forced to cut logs on government land free of charge under a permit system, which was invented for the single settler, the pioneer, whose right to help himself to what he needed was thereby established. Hundreds and thousands of men have been induced to perjure themselves, in order that a lumbering company might acquire sufficient acreage from which to supply itself with timber.

Not only has this baneful legislation led to the destruction of millions of dollars worth of forest growth, but it has prevented any reasonable administration of the public timber domain, and has tended to lower the moral plane of otherwise estimable citizens with regard to their respect of public property.

"The community has become demoralized with reference to this question, for it is forced to steal one of the necessities of life. The paramount and absolute necessity to obtain timber for use overrides all considerations. To the miner and settler the use of timber from local supplies is as absolutely necessary as the use of water and air, and no plan of management which fails to recognize this necessity can hope to be successful."

The proposed forest laws are designed to remedy this condition of antagonism be-

tween the population and the administration, which is vainly trying to enforce unreasonable laws. Reservation is the first step; regulation of the use of the timber the second; perpetuation of a valuable resource for coming generations the object.

The program of those urging this policy is as follows:

1. Withdraw from sale or entry all lands not fit or needed for agriculture, and constitute as objects of special care by the government the lands at the headwaters of streams and on mountain slopes in general.

2. Permit prospecting, mining and other occupation under such regulations as to prevent unnecessary waste, and cut and sell the timber under such methods as to secure perpetuation and renewal of the forest growth.

3. Provide for protection against fire, theft and unlawful occupancy.

4. Respect all existing vested rights, and arrange an exchange, if necessary, for private lands included in reservations; finally, restore to the public domain for entry all lands which are found within the reservations fit for agriculture.

5. The rational management of these forest areas for the benefit of the future as well as of the present and for all interested without destruction.

These are the business-like propositions embodied in the so-called Paddock Bill, and the same underlie the less elaborate McRae Bill, passed by the House of Representatives in the first session of last Congress, and also underlie the clause which the House tried to incorporate in the Sundry Civil Bill of the second session of the 54th Congress. The interests of the miner, the lumberman, the settler, of every citizen in the present and in the future, is to be taken care of in these forest reservations.

There is one industry, and one only, that finds no consideration in this policy. It is that of the sheep herder. Not that his

business is considered illegitimate as such, but, carried on as it has been, it is incompatible with all the other interests which the forest may subserve. Roaming through the woods, from township to township, from county to county, from State to State, the herds not only destroy the herbage and young trees and seedlings, but the irresponsible herder burns over the pasture, kills the underbrush and young growth that may have sprung up. This treatment, added to the trampling of the soil by the sharp hoofs of the sheep, finally changes the surface so that no seed can germinate, and natural reproduction is prevented and the forest is doomed to destruction. Just as the proverbial incompatibility of the goat and the garden, so the growing of wool and wood on the same ground is incompatible.

Some of the provisions of the bills as passed by the House do not meet the approval of the Executive Committee of the American Forestry Association; nevertheless the main principle underlying, namely, the recognition of the legal status of the forest-reservation policy and of the necessity of their rational management, make it desirable to have this legislation enacted, with the expectation of amending its faulty provisions later.

It is hoped that the 55th Congress will fully recognize the wisdom of upholding the forest reservation policy, and will enact the legislation necessary to make the reservations useful to the fullest extent.

B. F. FERNOW,  
*Chairman Executive Committee,  
American Forestry Association.*

**EXPERIMENTS UPON METABOLISM IN THE  
HUMAN BODY, UNDER THE DIRECTION  
OF THE UNITED STATES DEPART-  
MENT OF AGRICULTURE.**

THE Department of Agriculture has received and is about to publish the details

of the experiments on the nutrition of man, the brief reports of which have lately excited so much interest in different parts of the country. These experiments are carried out under the auspices of the Department of Agriculture, at Wesleyan University, in Connecticut, in cooperation with the Storrs' Experiment Station. They belong to a series of inquiries upon the economy of food and nutrition which are being prosecuted in cooperation with universities, college settlements and benevolent associations in different parts of the country. The special objects and methods of the experiments in Connecticut are referred to by Professor Atwater, special agent of the department in charge of nutrition investigations, as follows:

"Research upon nutrition has brought us to the point where the study of the application of the laws of the conservation of matter and of energy in the living organism are essential. For this purpose a respiration calorimeter is being devised. This is an apparatus in which an animal or a man may be placed for a number of hours or days, and the amounts and composition of the excreta, solid, liquid and gaseous; the amounts and composition of the food and drink and inhaled air; the potential energy of the materials taken into the body and given off from it; the quantity of heat radiated from the body, and the mechanical equivalent of the muscular work done, are all to be measured."

This apparatus includes a so-called respiration chamber. This is practically a box with copper lining. It is 7 feet long, 4 feet wide and 6½ feet high, large enough for a man to live in. It is provided with glass doors, through which the subject enters; and with a chair, table and cot bed. A current of air sufficient for ventilation passes through the box. Arrangements are made for passing in the food and drink and removing the excretory products. The food, drink and excretory products are all carefully weighed, measured and subjected to chemical analysis. The ventilating current of air is measured and analyzed. In this way it is possible to learn just what ma-