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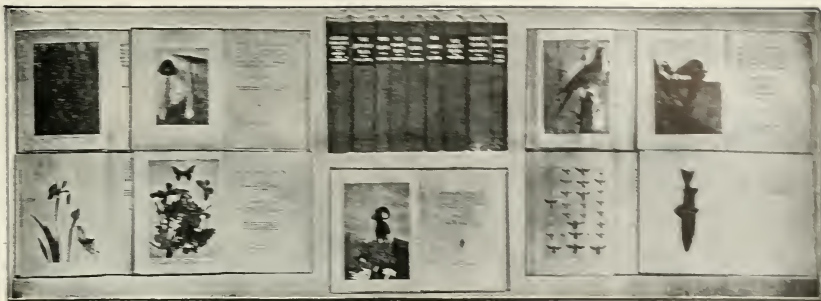
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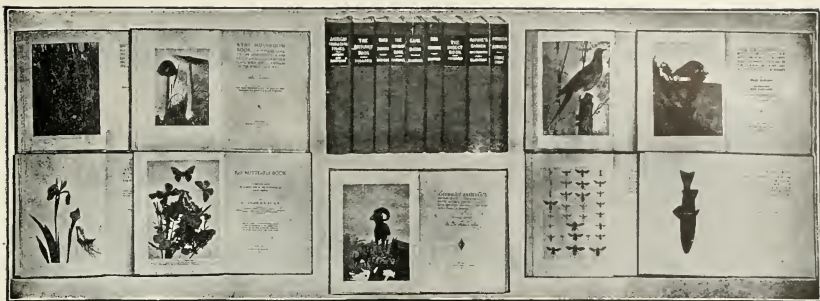
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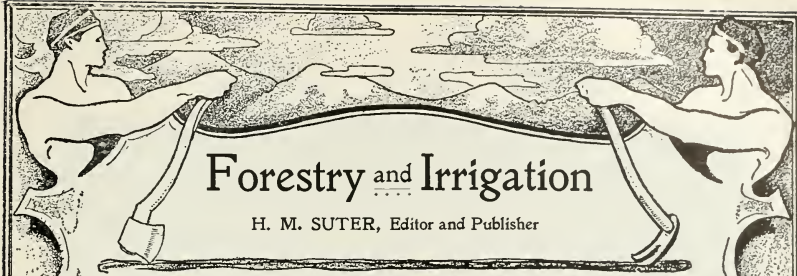
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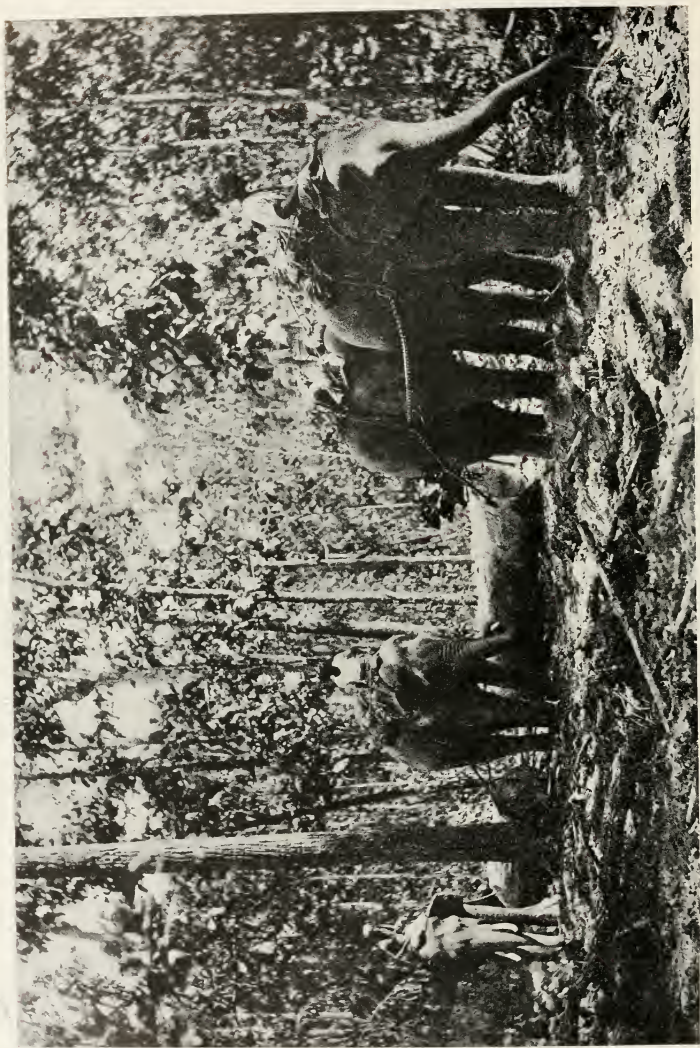
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ELEPHANTS SKIDDING TEAK LOGS IN THE FORESTS OF BURMA. (SEE PAGE 139.)

Forestry and Irrigation.

VOL. IX.

MARCH, 1903.

No. 3.

NEWS AND NOTES.

State Irrigation Laws. Many persons have become imbued with the idea that a number of amendments must be made in the irrigation legislation of the various states and territories in order to obtain the benefits of the Reclamation Service of the Federal Government. As a result, the convening of most of the legislatures in the arid and semi-arid regions has given opportunity for the introduction of a large amount of proposed irrigation legislation. Unfortunately, most of this matter has been very hastily prepared, so that if enacted in its original form it would simply add to the difficulties of the situation. Most of these bills will be amended, however; but as the sessions of the legislatures are short, and all legislation is necessarily hurried, it is doubtful if they will be greatly improved by any changes that may be made.

There will no doubt be some beneficial legislation on this subject, but there is great danger that whatever is done will require change after an experience of two years with it. It is, therefore, likely that much of the legislation which may be passed will not meet the situation and in fact make the amendments that may be found necessary after careful consideration of the relations between the state and the government in connection with the reclamation work, more difficult than if no such amendment had been made.

Undoubtedly, the better plan in all cases would have been the appointment of a commission of men thoroughly familiar with irrigation both from the legal and practical side, to give the questions thorough consideration and to report at the next meeting of the legislatures, which, in most cases, will

be two years hence. During that time this commission could give the differing conditions in various parts of their states careful consideration, and could also have the benefit of definite conclusions that may be reached by the men charged with the supervision of the work of the Reclamation Service. As a result of such a policy, the legislatures would each have presented to them, two years hence, a well-digested statute thoroughly designed to meet the conditions as found after careful study and practical experience in the relations between the state and the Federal Government.

In the next two years, it is not likely that any serious complications would arise between the states and the government on account of the provisions of the state statutes.

The following statement shows the matters which have been under consideration in the various states and territories so far as we have been informed:

California.—A complete code of irrigation laws has been under consideration. It is extremely voluminous and is in strong contrast with the very brief laws which have heretofore been in effect upon the subject of irrigation and water rights. There has been a heated controversy as to its merits. On the one hand it is claimed that the law will entirely unsettle the status of water rights which have been adjudicated at great cost. On the other hand, it is claimed that the new code will admit of the settlement of controversies in every part of the state which, it is claimed, have interfered seriously with the development of the industries of the state. From present advices it seems probable that it will not be passed.

Colorado.—There has been before the legislature a bill intended to authorize the State Canal Commission (which has had charge of the development of the project for carrying the water of the Gunnison River by means of a canal or tunnel into the valley of the Uncompahgre River) to turn over its material and everything relating to the project to the Reclamation Service of the Federal Government. There has also been some legislation under consideration for the amendment of the district irrigation law.

Idaho.—A rather comprehensive amendment of the state irrigation law has been passed.

Montana.—A complete code has been proposed for the government of the water-right question.

Nevada.—A bill for the establishment of the office of State Engineer and for general cooperation of the state authorities with the Reclamation Service has been passed.

New Mexico.—A complete code of water-right laws was placed before the legislature.

Oregon.—A comprehensive amendment was proposed to the state law governing proceedings under the Carey act.

Washington.—A general water-right law was proposed and taken under consideration.

Utah.—A general codification of water right laws is under consideration.

An outline of the course is given below.

Course in Trees and Forestry.—Two consecutive hours of recitation three times a week for a year.

Prerequisite, one year's work in botany.

Method—Field work throughout the year; lectures; microscopic work on anatomy of woods.

Outline of Course.—Study of trees with special reference to silvicultural characteristics, range, etc.; forest flora of the Merriam life zones; factors of forest production and distribution; value of standing forests in general; value of American forests and forest reserves; danger to forests, with field work on different phases of the subject; anatomy and physiology of woody plants; value of American woods; the timber industry; national and state forest policy; the great forests of the world; forest policy abroad; silvicultural work in reproduction of forests, tree planting, and seed sowing.

The facilities afforded by the extensive grounds of Wellesley College for the study of trees are greatly increased by the nearness of the Hunnewell estate, the Arnold arboretum, the Boston park system, as well as by good typical Cedar swamps, Oak barrens, and well-grown deciduous forests in the vicinity.

Forestry at Wellesley. Wellesley is the first woman's college in the country to introduce a course in forestry. The course is not designed to prepare women for the profession of forestry, but to acquaint them with the nature of forest problems in the United States. The benefit of the course is proved by the fact that the graduates who took this course in college are now in every case doing something to awaken interest in forestry and to bring about a clearer knowledge of its practical character. Dr. Grace E. Cooley, who has charge of the work, has already an established reputation as a botanist. She has recently made a special study of forestry with particular reference to such phases as may be useful to a woman.

Saving the Water. Orchardists in the Santa Clara Valley, at the head of San Francisco Bay, near San José, California, have heretofore made but scant use of the floodwaters of the winter rains, which would carry soil from the mountain sides with much waste of water and rich earth and a consequent choking of the commercial channels at Alviso, the bay outlet for San José, and surrounding country. Last summer dams were built across the Los Gatos and Guadalupi streams, in the foothills of the Santa Cruz Mountains and, in spite of the heavy rains of this season, little or no water from these creeks has yet passed into the bay. All of the water, which would otherwise have been wasted, with the sediment carried down from the hillsides, has been

deposited in the orchards on the west side of the valley.

There have been few contentions among the orchardists as to whom the water belonged, and, in the main, the differences have been settled by arbitration. The product of the orchards will be greatly increased.



Lumber Dealers' En-dorse Forestry. The fourteenth annual meeting of the Michigan Retail Lumber Dealers' Association, held at Detroit, Mich., February 3 and 4, devoted considerable attention to forestry, questions of forest work and management playing an important part in the proceedings. Charles W. Garfield, chairman of the Forestry Commission of Michigan, addressed the delegates, calling attention to the rapid diminution of timber supplies and pointing out the necessity of conservation. He pointed out that in Michigan there are large areas belonging to the state which are now unfit for agriculture and are a source of expense to the state. These areas, he said, could and should be planted to forest and they would then become a source of income, and the forest growth would make the adjoining land better fitted for agriculture. R. T. Fisher, of the Bureau of Forestry, U. S. Department of Agriculture, gave a talk on reforestation and the methods of treatment for stands of timber. He made graphic diagrams illustrating the measures used to get best results from a given area and kind of forest.

Edwin A. Wildey, another member of the Forestry Commission of Michigan, spoke of the connection between forests and the watersheds, making it plain that the even and constant flow of streams depended on trees at their headwaters and along their courses, and that the indiscriminate destruction of the woods would seriously impair the volume and value of water power, which is of great importance to the material interests of the state.

At the close of the meeting the following resolution was adopted:

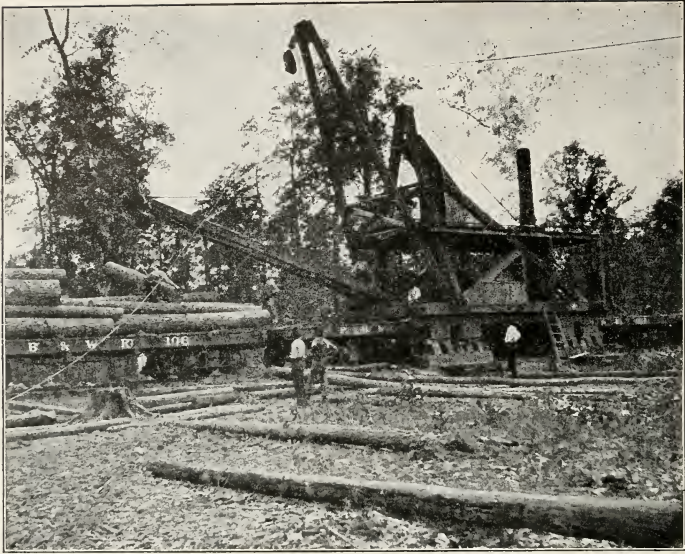
Whereas the Michigan Retail Lumber Dealers' Association assembled in annual

convention from year to year is more and more deeply impressed with the fact that our timber areas which give us our raw material are being rapidly depleted, and no attempt is being made either to husband our resources or replace by any method the rapidly diminishing forests, we appreciate the difficulties attending any attempt to interest private capital in growing forests because of the long-deferred dividends arising from such investments; we see greater promise in awakening activity on the part of the state in this tremendously important enterprise: Therefore be it

Resolved, That we extend to the Michigan Forestry Commission our cordial and active assistance in its worthy endeavor to secure the necessary legislation which has for its object the development of a rational and effective system of forestry on the vast areas of lands belonging to the state which are not adapted to successful agriculture, and pledge the commission that we will bring to bear all the influence we can control to impress our representatives at Lansing with the importance of this matter and the necessity of immediate action.



Forestry at the University of Michigan. Among the new and practical courses now being given at the University of Michigan is that of forestry. The course is technical in character, and open only to graduate students. It properly requires six years, including the four years undergraduate work, although it may be possible to complete it in five. Thus far, some twenty-three students have decided to take up the work. Arrangements for a laboratory are being made in West Hall. Material for the practical study of the scientific and commercial sides of forestry is being gathered, and will be grown in the university's new botanical gardens. The H. M. Loud Sons Company has kindly extended the privileges of its lumber camps about Oscoda, Mich., and permanent arrangements for field work will soon be made. Charles A. Davis, instructor in forestry, has been working all summer in and about the



A STEAM SKIDDER IN USE BY THE SAWYER & AUSTIN LUMBER CO., PINE BLUFF, ARK.

state, studying especially the local conditions. Thus far, an oak tree, new to Michigan and not previously listed, has been discovered. Two courses of instruction are being given this year. One is a synoptical review of the science and the other is a course treating of the laws controlling the development of trees and forests and their application in methods of improving, treating, and reproducing forest crops. Other courses that have been planned are: A study of trees and shrubs, their identification, structure, development, relationship, distribution, and uses; forest mensuration.

New Irrigation Company.

The Union Rice and Irrigation Company, with an authorized capital of \$6,000,000, has been incorporated at Trenton, N. J. The capital stock is divided into shares of \$5 each, and the list of its incorporators includes seventy-five persons, nearly all of whom reside in New Orleans, Baton

Rouge, and other Louisiana cities and towns. The objects of the company are numerous and include growing and dealing in rice, oats, grain of all kinds, and the manufacturing of the grains into various staples; also the construction and operation of irrigation plants.

Irrigation Returns.

In connection with the present interests in the development of irrigation in the West, the following facts noted from a paper recently issued by the United States Geological Survey on the "Development and Application of Water Near San Bernardino, Colton, and Riverside, California," by J. B. Lippincott, resident hydrographer for the State of California, will be of interest as showing what may be done by means of irrigation and also the limits of its possibilities.

In the eleven years prior to 1898 there were shipped from Riverside nearly 7,000,000 boxes of oranges, which at fair figures means an average income of

\$1,000,000 a year. With the present condition of the orchards an income twice as large may be expected. During the season 1897-'98 4,000 car-loads of citrus fruits were shipped from Riverside, while in 1899 the annual yield was said to be one-third of the entire output of the state. Previous to the application of water this section was a poor sheep pasture, worth hardly 75 cents an acre.

With regard to individual profits, a man should average 10 per cent on his investment at the end of fifteen years; but if the conditions are modified by a lack of water supply, destructive frosts, or low grade of trees, the profits may be much reduced. It costs in the neighborhood of \$900 an acre to get a citrus orchard in bearing condition, including land, water, and interest on the investment. Under favorable conditions a ten-year-old orchard should produce \$200 gross and \$100 net per acre. When all conditions are satisfactory it takes five or more years of hard, patient, and

intelligent work to place an orchard on a paying basis; so it will readily be seen that it is not a poor man's business, but is subject to the stern laws of the survival of the fittest, as are other lines of enterprise. When, however, success comes, life in this region is ideal—a country life in a pleasant land among golden fruit and cultivated neighbors, with most of the conveniences of the city.

Children Protest.

The school children of Berkeley, California, the seat of the State University, recently sent a letter to the President protesting against the indiscriminate destruction of young timber by the lumber companies of California. The letter was referred by the President to the Department of the Interior. It is in the form of a petition headed by Alexis Labourdette and signed by more than 300 children, who have evidently



CONNECTION BETWEEN TUNNEL AND FLUME OF SANTA ANA CANAL, CALIFORNIA.

been inspired by a proper appreciation of the forest growth of the mountains of the state, so important to its irrigation and other interests.

Game on Forest Reserves. The United States Senate has already passed the Perkins bill for the protection of wild animals, birds, and fish in the forest reserves. The bill authorizes the President to set aside areas in the forest reserves as breeding places for game, and prohibits hunting, trapping, and fishing within these areas.

That such a measure is needed was pointed out in the January issue of *FORESTRY AND IRRIGATION*, in speaking of the newly consolidated Teton-Yellowstone-Absaroka Reserves, where the "work on these reserves is almost entirely patrol work, the protection of game receiving particular attention. Being a wild section of country, in which large numbers of elk and deer (also some moose, coming from the National Park) find a winter range, this district has for years been a favorite haunt of poachers, elk-tooth hunters, etc., and the protection at last accorded these animals by a proper enforcement of laws is a timely improvement."

But more than a mere enforcement of game laws is needed, and some measure should be taken to offset conditions reported from these reserves under date of February 17. At that time 10,000 elk were starving. Snow seven feet deep covered their feeding ground and temperatures as low as forty below zero added to their sufferings. News of the critical condition of the elk herds reached Superintendent A. A. Anderson, who was in New York, and he at once ordered that a temporary supply of wild hay, at his own expense, be distributed as soon as possible at convenient points by the force of thirty rangers.

To Study Desert Growths. Frederick V. Coville, chief of the Division of Botany, U. S. Department of Agriculture, and Dr. D. T. MacDougal, assistant director of the New York Botanical Garden, have re-

cently left Washington for a general survey of the arid regions lying between the Pecos River, Texas, and the Pacific Ocean, southern California. The survey is for the purpose of fixing upon a site for the newly projected desert botanical laboratory which is to be established by the Carnegie Institution in order to carry on special researches into the life-history and physiology of desert plants. The Carnegie Institution has appropriated \$8,000 for the first year's expenses. Mr. Coville and Dr. MacDougal have been appointed as an advisory board, having practically entire charge of the whole matter. It was announced recently by Dr. MacDougal that Dr. W. A. Cannon, assistant in the laboratories of the New York Botanical Garden, had been appointed, upon the nomination of the advisory board, resident investigator in charge of the desert laboratory. Dr. Cannon will enter upon his new duties as soon as the laboratory is built and equipped. It is expected that it will be in working order by September 1 next.

The trip of the advisory board, which is considered an errand of much importance, will probably occupy about six weeks. Both members of the board have made extensive explorations in these arid regions within the last ten years, and this expedition is made especially to visit areas which they have not examined before. Mr. Coville is well known for his work in the famous Death Valley region of California in connection with the government expedition to that place in 1891. He and Dr. MacDougal expect to visit Death Valley in the course of this trip.

Toronto University and Forestry. Toronto University, the State university of the Province of Ontario, is realizing the importance of the subject of forestry. President Loudon has pointed out that the Crown forests of Canada exceed those of the United States and Russia put together. The Senate of the University has provided a curriculum for a course in forestry, and at its last meeting the Alumni Association, believing that the scientific

study of the subject was of the utmost importance to the prosperity of the province, passed a resolution which was sent to the Premier and the Minister of Education, and which urged that the government give effect to the state provision authorizing a School of Forestry at the earliest possible date.

A Lesson from Algeria.

Experts from the Department of Agriculture recently visited Biskra, Algeria, on the northern border of the Sahara Desert, in order to investigate the possibilities of Date Palm culture in the United States, to

in the rainy season frosts are known and it is cold and disagreeable. Wood for fuel "is scarce and high-priced. The limbs of trees are cut carefully and twigs, leaves, and branches sedulously preserved."

Pressed Asbestos Instead of Wood.

Charles T. Yerkes, who has recently returned from London, where he is installing four underground tube railways, tells of the methods he will employ in making the system fireproof. Apropos of this and of the many suggested substitutes for wood, he says:



MEASURING SPRUCE LOGS IN THE ADIRONDACKS.

make soil analyses, to study irrigation methods and alkali-resistant growths. Now a member of the American Forestry Association, writing from Biskra, points a moral for the necessity of avoiding waste in American forest harvesting, in telling of the "immense efforts and expense to preserve the Palm trees and a few Acacias. There are said to be 200,000 Palms in this oasis, and they appear to be very flourishing, but the growth is wholly due to irrigation." In the hot months the thermometer records 127° Fahrenheit at Biskra, but

"I believe that no underground railway should be run without fireproof cars. All of our rolling stock will be absolutely fireproof. The cars will be constructed of steel, pressed asbestos, and fireproofed wood, but as little wood as possible. The pressed asbestos will very closely resemble wood. It may be treated like wood, so that one may have asbestos oak, mahogany, ebony, or what not. The ties will be non-inflammable. I do not intend to have any holocausts on our roads. The tubes will all be of wrought iron."

Vallombrosa Forest Fire.

A news dispatch via Florence and London tells of a destructive fire in the forest of Vallombrosa, Italy. This forest is world-famed not as the seat of the Royal Italian Forestry Institute, but from an oft-quoted line of Milton, "as thick as autumnal leaves that strew the brooks in Vallombrosa." This statement has caused much critical comment among poetasters, as the trees are mainly Silver Fir and Spruce, which have not a deciduous autumnal fall. A fire here so serious as to destroy the Villa Medici, as reported, is a severe blow to Italy, whose denuded mountain tops are a source of poverty. The impairment of such a fine example as this forest, planted in mediæval ages by the Benedictine monks, is greatly to be regretted.

Popularity of Redwood.

New uses are being found for California Redwood, which is more and more proving itself a remarkably useful tree. The Niagara Falls Power Company recently decided to employ it as a sheathing for its tunnels, thus displacing the steel sheathing at present in use. Rust and the grit contained in the muddy water passing through these tunnels are playing havoc with the steel casing, grinding it away rapidly. It has been discovered by experiment that Redwood is of more permanent value in the tunnels, as it is soon covered with slime which protects it from the wearing action of the muddy water. On the strength of this discovery an order for 3,000,000 feet of Redwood lumber has been given by an agent of the Niagara Company in San Francisco.

Redwood has been found useful in the construction of the big pipes used for the conveyance of water to many of the electric power-houses in the northern part of California, and in the construction of siphons for irrigation waters. These pipes are built up and banded. They cost no more than metal pipes, are more durable, and are more easily carried around the sharp curves sometimes followed by these great water lines.

Redwood will outlive other woods when kept constantly moist. While it is not non-combustible, which quality some enthusiasts have erroneously ascribed to it, it burns much more slowly than other timbers used for building purposes, as it contains no highly inflammable oil or resin. The discarded stumps of Redwoods felled for their lumber many years since have lately come into favor for the manufacture of furniture and the interior decorations of buildings, the curled grain and burls making beautiful figures, and the wood itself taking on a fine polish. Just at present California Redwood is coming into increasing demand in the eastern states, because of the variety of uses to which it can be profitably put.

A Great Canal for Idaho.

Contracts have just been awarded at Salt Lake City, Utah, for the construction of two-thirds of the 61-mile irrigation canal of the Twin Falls Land and Water Company of Idaho. When completed this canal should irrigate 270,000 acres of land, now of little value, in the Snake River Valley. In connection with the project it is proposed to construct a dam 900 feet long and 60 feet high across the Snake River at Twin Falls, which backs the river up about three miles. It is stated that work will be under way within a month, and an attempt will be made to have some irrigation in connection with the enterprise in operation for the beginning of the growing season of 1904. The amount involved in the enterprise will approximate \$1,000,000.

A Giant Pine Tree.

A Pine tree recently felled in Ontonagon county, Michigan, on the upper peninsula, excels in size any cut there in a number of years. It was seven feet in diameter at the butt, sound clear through, and over 150 feet tall. Seven sixteen-foot logs have been cut from it, the small end of the last log measuring twenty-six inches in diameter. The tree scales about 11,000 feet and is worth about \$150.



HON. PARIS GIBSON.

MR. GIBSON, as one of the Senators from Montana, has taken an active and prominent part in all matters pertaining to the public lands; and has been especially interested in the attempts made to preserve these for the use of settlers. He has seen in his own state the rapid diminution of the public land, and the steady acquisition of this by corporations engaged in the sheep and cattle business, and has noted with alarm the tendency to shut out settlers and convert the land which might be utilized for homes into vast estates owned by non-residents.

Senator Gibson is a native of Maine, and graduate of Bowdoin College. He was a member of the Maine Legislature in 1854, and went from there to Minnesota, where he built the first flour mill in Minneapolis. With the settlement of that country he continued westward into Montana, settling in Fort Benton in 1879. In 1882 his attention was attracted to the wonderful falls on the Missouri River, and he at once took steps to found the city of Great Falls, being known as the father of that prosperous municipality. He has watched the growth and development of mining, stock-raising, and other industries in Montana, and has become thoroughly imbued with the belief that the permanent prosperity of the state rests on the increase of homes rather than in the number of cattle, or pounds of precious metal taken away.

FORESTRY FOR SOUTHERN NEW ENGLAND WOODLOTS.

BY

R. T. FISHER,

BUREAU OF FORESTRY.

THE sort of forestry which is applicable to southern New England is governed, first of all, by the character and condition of the forest. Taking the region as a whole, it is covered with an immature growth of mixed hardwoods, in which, as in eastern and western Massachusetts, respectively, there is some White Pine and Spruce. Few stands are more than 60 years old, and fully 75 per cent are of sprout origin, having come up after the clear cuttings which have hitherto prevailed. In these cuttings stumps were commonly left high and ragged, and fire frequently followed the choppers. The succeeding growth, developing without care and often subject to further visitations from fire, became much inferior to the previous generation. Comparatively worthless species, like Gray Birch, Poplar, and Pine Cherry, took possession of much ground before occupied by more valuable trees. The growing sprouts were so thick that they forced each other to become crooked, and their attachment to a high and decaying stump often infected them with a fungous disease. As they grew on, unthinned, the dying and suppressed individuals choked the forest, so that not only the growth, but the reproduction, was retarded.

Similar evils are to be found in the few older stands from which scattering trees or patches of trees have from time to time been cut out. More often than not it was the thriest trees and the best species that were cut, when poorer specimens would have served equally well, and, as no pains were taken to spare seedling growth already on the ground, the number of poor individuals and less valuable species has been stead-

ily increasing without any compensating quickening of the reproduction. Thus, broadly speaking, these forests are in need either of improvement cuttings, which shall stimulate their growth and encourage the more valuable trees, or of reproduction cuttings, which shall start a much needed crop of seedlings.

To meet these needs, and to enable forest-owners to meet them in some degree unaided, has been the aim of recent field-work on the part of the Bureau of Forestry. In response to applications for assistance, some twenty-five tracts in the region specified were visited and examined, and a scheme of treatment was advised for each. This scheme or working plan, simply stated, consisted in just as many of the needed silvicultural measures as were worth while to the owner; hence the degree of treatment possible depended very largely on the general purpose for which the forest was held and its situation with regard to market, labor, and transportation. An absentee owner, whose woodlot is merely an uncertain asset, too remote to be looked after in person, could obviously do little more than sell it on the stump to a local buyer and allow it to be cut as the buyer wished. On the other hand, a water company, whose forest land is chiefly useful to protect the slopes draining into its reservoirs, cannot afford to leave it neglected, and in such a case careful management, even if it merely pays for itself, is a necessary undertaking. For farmers, and other owners who count upon using or selling a certain amount of wood from their woodland, forestry is equally important and often more immediately profitable. The cost of proper harvesting for resident owners is but little greater than

that of ordinary methods, and the improvement in the productiveness and value of the land much more than makes up for the slight sacrifice of profit. Experience has shown that in most cases where it will pay to cut at all, it will pay to cut scientifically. This is for the first operation. In the long run the conservative treatment is certainly the more paying.

The points essential to forestry are that the forest as a forest (either for the production of wood or the ornament and protection of the ground) should have a permanent value to its owner, and that some sort of intelligent supervision should be possible. In a region like New England, where there is nearly everywhere a demand for firewood and small timber, the difficulty is not to dispose of the product, but to make sure that it is properly taken out. The necessity of selecting some trees and leaving others appears to the average chopper foolish and troublesome, and long habit has caused him to consider the seedling and sapling growth, which is the nucleus of succeeding generations, merely "brush," and to clear it out as such, partly to make chopping easier and partly because it is the custom. That these short-sighted methods are not necessary for profitable cutting has been abundantly proved on a number of well-managed woodlots. On one large tract where extensive thinnings are being made according to a scheme advised by the Bureau of Forestry, the chopping is costing no more than it did when the wood was cut without method. The only additional elements of cost are the marking of trees to be cut, the necessary supervision, and the fact that it takes more area than before to yield a cord of wood. On smaller tracts, when the owner himself shares or superintends the woods work, these elements are reduced to practically nothing. Practice and the ability to tell one tree from another, and seedlings from "brush," make discriminating cutting far easier than the inexperienced seem to think. What is chiefly required for the success of forestry in these accessible hardwood forests is knowledge of the results to be desired and the ways of bringing them

about. In other words, either the man who does the work or the man who superintends it should know the trees and the general principles of improvement and reproduction cuttings.

This knowledge the Bureau of Forestry intends to furnish to the woodlot owner in a forthcoming bulletin, which is to embody in simple, untechnical form the important rules and considerations for the treatment of woodlands. The material, which has been gathered and worked up in collaboration with Professor H. S. Graves, Director of the Yale Forest School, describes cuttings already successfully applied to actual stands in New England, and its chief usefulness lies in the graphic description of thirty special cases taken from various localities, so as to represent typical forest conditions throughout the region. In each of these cases the stand was sketched in the woods as it would be seen from the edge of a slashing. The trees were drawn only in outline, but the shapes of the crowns and their relative positions, as well as the relations of the stems, were all diagrammatically shown. The name of each species was printed on the crown, and any serious defect, such as a dead top, the girdling of borers, or unsoundness, was conventionally represented. In the finished diagrams there will thus be depicted a sample strip of each sort of stand, roughly reproducing the actual problem on the ground. The diagrams are classified according to the sort of cuttings they are to illustrate, whether for reproduction or improvement, and the trees which require to be cut in each are marked with a heavy line. The reasons why these trees are cut and the results to follow are briefly explained in a subjoined paragraph. In this way it is hoped to make clear, with practically no technical discussion, how the main principles are applied in practice. The question whether or not any given measure would pay for itself could, of course, only be treated in general, since the situation varied greatly from place to place. In most cases an owner could decide this for himself. The main purpose of the bulletin is to show how the woods are to be cut.

SUGAR IRRIGATION IN HAWAII.

PROBABLY THE MOST EXPENSIVE SYSTEM
IN EXISTENCE, BUT THE COST IS JUSTI-
FIED BY THE INCREASED PRODUCTIVITY.

BY

BRISTOW ADAMS.

IN any consideration of irrigation in Hawaii the unique local conditions must be understood thoroughly before the methods in use seem to be justified. On these islands the usual methods of dam and ditch are not in favor for the greater part of the irrigated areas, pumps taking their place and performing most of the work done in producing the phenomenal yields of sugar cane.

The physiographic contours and the geologic formations of the islands require special treatment from the standpoint of the irrigator. The islands are of volcanic origin, with high mountain peaks, formed by successive eruptions, the more recent flows of lava overlapping the older ones in the form of irregular benches, accompanied by fissures which extend to practically unknown depths. The surface slopes, except near the sea-level, are abrupt, and the many fissures and folds form effectual checks to long transmissions of water except by expensive flumes and pipe lines. Moreover, these fissures and crevices prevent the collection of water and divert streams to underground courses through which they find their way to the sea. The mountain ranges divide the islands into northeast and southwest slopes, irregular and abrupt, but terminating near the sea in tablelands and plateaus capable of a high degree of cultivation.

The climatic conditions of these two slopes differ greatly. The prevailing moisture-laden trade-winds from the northeast cause a heavy precipitation as they strike the windward slopes of the mountains, the annual rainfall in some instances amounting to 250 inches. This causes an abundance of fresh water, which, however, adds to the roughness

of the slopes and plateaus by washing out great gullies and ravines; these do not end in large streams which flow to the sea, as the water sinks through crevices to subterranean passages. Also, his excessive rainfall leaches out the soil, carrying off its most valuable constituents. A climatic disadvantage is found in the fact that the rainy season is also the cool season of minimum growth, when the crops cannot take full advantage of the rainfall.

The annual rainfall on the other slope of the mountain is much less and does not exceed 20 or 30 inches, according to the elevation of the land. This is not sufficient to mature crops without the help of irrigation, although the soil is exceedingly rich. A large amount of water is required on account of the slopes, which serve to carry off the rainfall, and the fissures, which take up great quantities of it. The soil on the less watered portions is much richer than that on the northeast slope, on account of the relative lack of the leaching process and the relative absence of crops, resulting from less rain. This follows the generic truth that regions of small rainfall are generally of great natural fertility, as, for example, the once arid tracts of the irrigated Punjab of India, the Nile basin, and the areas which are now being brought under cultivation in the western United States.

Under these conditions it is interesting to learn how irrigation has so developed the resources of the islands to the point where such immense crops of sugar are raised,—the yield per acre exceeding that of any other region of the globe. There are many difficulties to be surmounted, and success has attended only the use of large capital and

titanic methods. The use of streams is confined simply to the headwaters, and then chiefly on the slope where the heavy rainfall exists. There irrigation finds its best use in preventing a check in growth during the months which are short of rain. In a few instances the waters of this slope have been diverted around spurs of the mountains to the drier side of the ridge.

The difficulties connected with this method in such exceedingly rough country makes the undertaking almost impracticable. Some conception of them may be gained from the following description of an engineering feat on the island of Maui, taken from a recent census report:

"A canal was dug along the slopes of the great crater Haleakala, and a large stream of water was brought 22 miles and distributed through laterals. Along the route of the canal scores of gulches and canyons are crossed and a dozen or more high ridges are penetrated by tunnels, some of them nearly half a mile in length. One of the gulches, on the side of a vast crater, is 350 feet deep and nearly a quarter of a mile wide, with perpendicular sides. The pipe lines used in crossing it were not placed on trestles, but the less expensive and more stable method was followed, of dropping them into the gulch, thus forming an inverted siphon, which proved a success from the start."

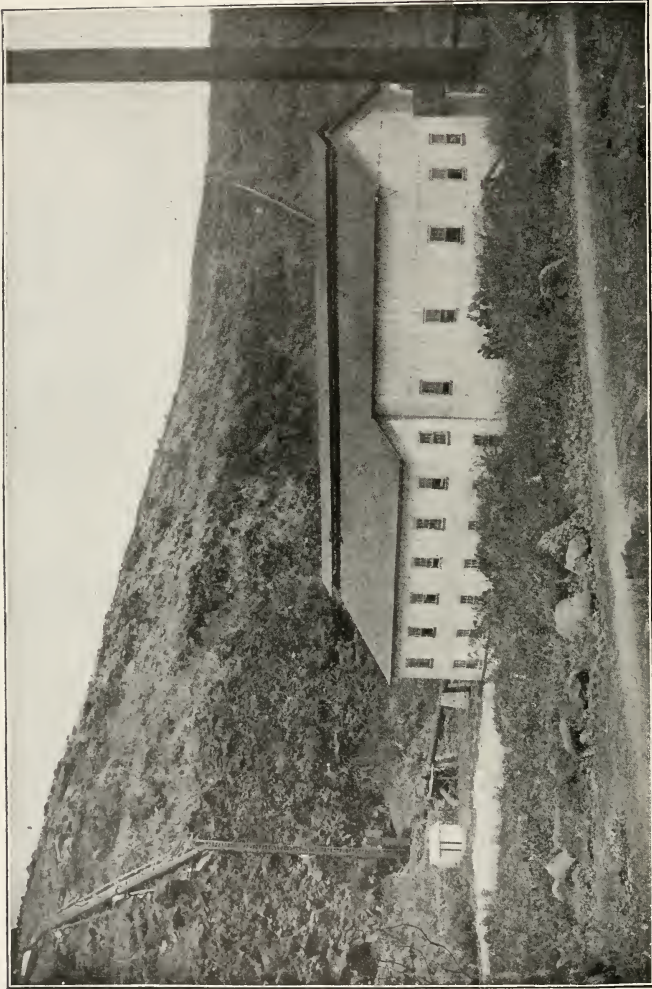
The waters which find their way to the sea through underground channels, and which appear at some points in the form of springs, discharge themselves into the ocean apparently beneath a ledge of rock at a depth of from 300 to 800 feet below sea-level, as is shown by the depth of wells required to reach them.

It seems evident, therefore, that this supply of fresh water lies in the form of a sheet of "sweet" water over the denser salt water beneath it, being constantly replenished and held at this level by the supply from the rains on the mountains. When too large supplies are drawn from these deep wells the water becomes somewhat brackish, and salt in injurious quantities is sometimes pumped on the land in exceptionally dry

seasons. When wells are sunk through the cap rock which confines the water supply, the water rises to the sea-level or a little above it, and to higher levels further back from the coast. To supply this water to the plantations, pumping plants of an expensive nature are absolutely necessary. A number of types are in use driven by equally varied types of engines. The multi-valvular and automatic valve pumps are most in favor, though centrifugal and direct-acting plunger pumps are used.

The Island of Oahu, the most productive of the entire group, has five of the most progressively managed plantations, and these alone produce one-fifth of all the sugar that comes from the Hawaiian group. These all use underground waters for their irrigation supply. The Oahu plantation, according to the 1902 report of the irrigation investigations, U. S. Department of Agriculture, has 4,950 acres of irrigated land and produces an average yield of ten tons of sugar per acre. The greater part of this plantation lies above 200 feet above the sea-level, extending from this to an elevation of 750 feet. Forty 12-inch wells of an average depth of more than 440 feet, and varying from 350 to more than 800 feet, supply the water, and eight pumping stations, with a daily capacity of 64,230,000 gallons, lift it from sea-level, to which it rises in the wells. The approximate cost of the stations already completed on this plantation was \$711,000, and the entire system when completed will cost \$1,000,000. One plant of 10,250,000 gallons capacity delivers water to a level of 370 feet and costs \$175 per day to operate. Another of 8,000,000 gallons capacity raises water 150 feet and costs \$75 per day; another of the same capacity, but delivering to an elevation of 650 feet, costs \$225 per day. The two unfinished stations will elevate the water 750 feet.

Ewa plantation, adjoining Oahu on the west, is of particular interest because its fields produce more sugar to the acre than any other in the world, and its irrigating waters are obtained entirely from coast artesian supply, which becomes at times rather brackish. That these two



Courtesy U. S. Department of Agriculture.

A PUMPING STATION, SHOWING PIPE LINE GOING UP OVER THE HILL.

facts should obtain together is proof that such waters used with judgment and good drainage are not deleterious. It may be said, however, that the Ewa supply, when not overdrawn, remains comparatively sweet. The lifts on this plantation do not exceed 250 feet, and the cost of the pumping system for maintenance during 1901 was \$35.72 per acre.

The pumping plants of the Hawaiian Commercial and Sugar Company on the Island of Maui show as great a variety of types as can be found on the islands. The engines used vary from the old-style poppet valve to the compound condensing Corliss and triple-expansion types. The pumps used are the centrifugal, direct-acting plunger, automatic, and multi-valvular types. The boilers which generate the steam vary over a wide range of makes, from the most simple to the most complicated and improved. Coal is the fuel used generally throughout the islands for these pumping stations, and its cost averages about \$10 or a little less per ton.

Perhaps the most interesting of all the pumping works are those on the Kihei plantation, adjoining the Hawaiian Sugar Company on the south. Here numerous wells have been sunk and extensive shafts and channels have been constructed to develop a liberal flow of water. At one of the stations the capacity of the pumps is 17,560,000 gallons in 24 hours, and they were installed at an expense of \$258,000.

On the borderland of the wet and dry portions of the Island of Maui is the Haiku plantation, whose elevation varies from 300 to over 1,200 feet. The rainfall in this region materially assists irrigation, and the headwaters of the river on the far or wet side of the mountain have with great difficulty been diverted in canals to the fields on the more fertile slope. Nevertheless, the plantation authorities have installed two pumps of a combined capacity of 9,500,000 gallons to assist in the irrigation of the lower levels and as a security against a possible deficiency in the canal supply. These pumps raise the water to land 250 to 450 feet above the sea-level.

The development of this system of

pumping shows a new use for this class of machinery in a field to which it is peculiarly adapted. Many irrigators look upon such plants as expensive luxuries, and with reason, unless there is a commensurate return for the large amounts which must be invested.

Exhaustive experiments at the island station maintained by the Hawaiian Sugar Planters' Association show that certain well-established principles must be kept in view in the irrigation of the cane. More than two-thirds of the sugar produced is by means of irrigation. In the favorable, unirrigated areas about 125,000 tons were produced in 1900. On the leeward side of the islands dependence on natural rainfall supplies is impracticable, as experiments show that areas depending on rainfall alone produce only 1,600 pounds of sugar per acre, while those treated with irrigation in addition to the same rainfall made 24,755 pounds to the acre, a difference in favor of irrigation of 23,155 pounds. It can be seen from these figures how such expensive systems of irrigation can be made to pay.

The greatest faults to be overcome in Hawaiian irrigation are those which result from over-irrigation. In the first place, the mistake is sometimes made of irrigating the sugar-cane seed too freely, thereby excluding the oxygen of the air from the seeds and making germination imperfect, and souring the soil. During the first months of the growth, this fault of too much water, if persisted in, will seriously affect the productiveness of the crop. Moreover, all water used in excess of the need soaks away and is lost, and this must be guarded against with the water supply at hand for irrigation purposes in Hawaii. As soon as the artesian supply is too much drawn upon, the water becomes brackish, and salt is injurious, especially in those areas where an alkaline condition of the soil already exists. In draining through the soil, moreover, the water carries off many soil constituents upon which plant-life depends for food. With alkaline soils nothing but perfect under-drainage will make irrigation a success, particularly where brackish waters have to be used. Enough water to leach out



Courtesy U. S. Department of Agriculture

THE DIFFERENCE BETWEEN IRRIGATED AND UNIRRIGATED SUGAR CANE AT THE HAWAIIAN AGRICULTURAL EXPERIMENT STATION.

the alkaline matter will also take away soluble soil elements. An insufficient quantity of water, or even a quantity not more than the soil can hold and the plant make use of, will bring the salts to the surface by an upward capillary movement, and conditions of the most unfavorable nature will be brought about and the crop ruined. Soil constituents in such areas should be studied and those soluble elements which are carried off by the leaching process, which will keep down the salts, must be restored to the soil or it will soon become sterile.

Thus it will be seen that while irri-

gation is the making of the sugar industry of Hawaii, and that irrigated areas are being constantly extended, only the most scientific treatment will give good results, and ignorance of needs and conditions will be a factor to retard full development of the wonderful sugar properties which the islands possess. Special local conditions must be considered in each instance, and with a limited water supply tapped by many wells, as this is, economy of application, prevention of waste, and care to forestall over-irrigation will be the only method by which perfect success can possibly be assured.



TURPENTINE ORCHARDING.

A NEW AND MORE PRODUCTIVE METHOD HAS BEEN DEVISED BY DR. HERTY, OF THE BUREAU OF FORESTRY.

THE Bureau of Forestry will shortly issue a bulletin describing a new method of working southern pines for turpentine. This method is intended to replace the present wasteful and injurious system of boxing. As the bulletin cannot be published in time to reach turpentine operators before the present season's work begins, a circular has been issued in advance for the purpose of giving operators an opportunity to install the new system, and thus avoid the loss in quantity and quality of products consequent upon another year of work with the old system of boxing.

The forthcoming bulletin will deal with the turpentine industry in general and with the economies that the new system makes possible. Here brief mention only can be made of the principal features of the system. Important among these is the production of 23 per cent more turpentine than by boxing and the yield of only the higher grades of resin. The cost of the new equipment can easily be paid for from the extra returns of the first season, and there will also be an additional margin of profit. Moreover, since there is no box cutting under the new system, the least possible damage is done the trees; shallow chipping only is necessary.

For the season of 1902 the production of spirits of turpentine by the old system of boxing amounted to 600,000 barrels, valued at \$13,200,000. The production of rosin was 2,100,000 barrels, valued at \$4,200,000. The total value of the crop was thus \$17,400,000. Had the new method been applied to the same area of timber, the production of spirits of turpentine would have been 1,050,000 barrels, amounting in value to \$23,100,000. The production of resin would have been 4,675,000 barrels, worth at current prices \$7,350,000. The total value of this product would have been \$30,450,000. This increased yield by the new

system represents a net loss to the southern naval stores industry of \$13,000,000 from boxing in one season.

It is important to note here also that the ordinary labor used for all boxing operations readily adapts itself without extra cost or training to the working of the new system.

This system was devised by Dr. Charles H. Herty, an expert in the Bureau of Forestry, and under his supervision received a thoroughly practical test at Ocilla, Ga., during the season of 1902. Its essential features are as follows:

1. An earthen cup of the same capacity as the standard box is used to catch the crude turpentine. At the top of the cup there is a stout rim, with a half-inch hole, by which the cup is suspended from a nail driven into the tree (Fig. 1).

2. Two thin galvanized sheet-iron gutters convey the resin into the cup. These gutters are each 2 inches wide and from 6 to 12 inches long, and are bent lengthwise through the middle at an angle of about 120°, thus forming an angled trough (Fig. 3).

INSTALLING THE EQUIPMENT.

This system can be applied to trees previously boxed as well as to unboxed timber. In placing the equipment on unboxed timber, two flat faces are provided by means of cornering axes, a right-handed and a left-handed man working together. The first strokes with the ax are the same as in cornering the box. Next, by upward strokes of the ax, enough of the bark and sapwood is removed to form flat faces one-half as high as the distance between their outer edges. In this way the two men prepare a double face, corresponding in width with that of the box which would have been cut in such a tree.

Two inclined converging incisions are then made, one across each flat face, for the reception of the two sheet-iron

gutters. The incisions are made by a right-handed and left-handed workman, each with a broadax, having a straight-edged blade 12 inches wide. The men work on opposite sides of the tree; each man directs the head of his broadax somewhat downward, and with one stroke makes an inclined gash about one-fourth of an inch deep across the flat face on his side of the tree. The incisions are made slightly deeper at their lower ends. The gash on one side should be made about an inch lower

the lower gutter should pass beyond the angle about one and one-half inches, thus forming a spout to convey the resin from both gutters into the cup below (Fig. 1).

In hanging the cup, care should be taken to drive the nail (a common 6-penny wire nail) at a sharp downward incline, and deep enough to leave only about three-fourths of an inch exposed. The nail is driven on the same side of the tree with the upper gutter, so that the cup when hung shall not be more

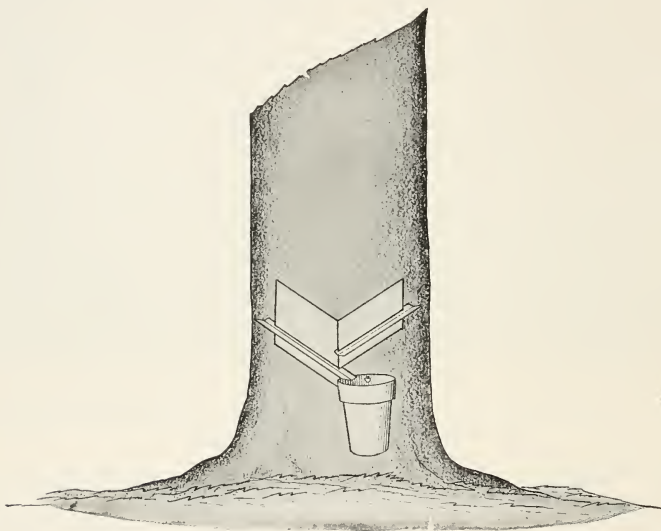


FIG. 1.—SHOWING THE POSITION OF CUP AND GUTTERS.

than on the other, but both should be so placed that there will be a space about 3 inches wide above them for the passage of the hack in the later chipping of the faces. Into the incisions thus made the galvanized iron gutters are firmly inserted, either by pressing one edge upward into the cut, or, better, by slipping the gutter endwise into the upper end of the cut and pushing it downward into place (Fig. 1). The lower end of the upper gutter is brought to, and then forced down one-fourth of an inch beyond, the angle where the two faces meet; while the inner end of

than half an inch below the end of the spout of the lower gutter, and the nail shall be as far as possible from the dripping resin. This point is of great importance, for when the cups are filled with rain water, the fresh resin, lighter than water, at first forms a floating disc on the surface. As more resin drops on this, the disc enlarges until it touches and becomes anchored to the wall of the cup. If the cup is properly placed, this point of contact will be well away from the nail-hole, which will consequently not be clogged by the resin. As more resin drops upon

this floating disc, the growing weight will shift the center of gravity and cause the viscous mass to sink lower along the side of the cup nearest the spout; at the same time, the water level will rise until the nail-hole permits an overflow. Thus each fresh drop of resin will force out a drop of water, while, as the water does not rise to the top of the cup, no resin is floated over the edge. After the streak has practically ceased running, the water above prevents the

the resin must flow over a long dry face to reach the box. On the higher faces the workmen with the broadaxes change sides, the blow being then delivered by an overhand stroke.

The installation, in detail, is as follows:

On Virgin or Unboxed Timber.— Three pairs of workmen (right and left handed), with cornering axes, lead the squad, cutting the flat faces for the gutters. These are followed by a right-

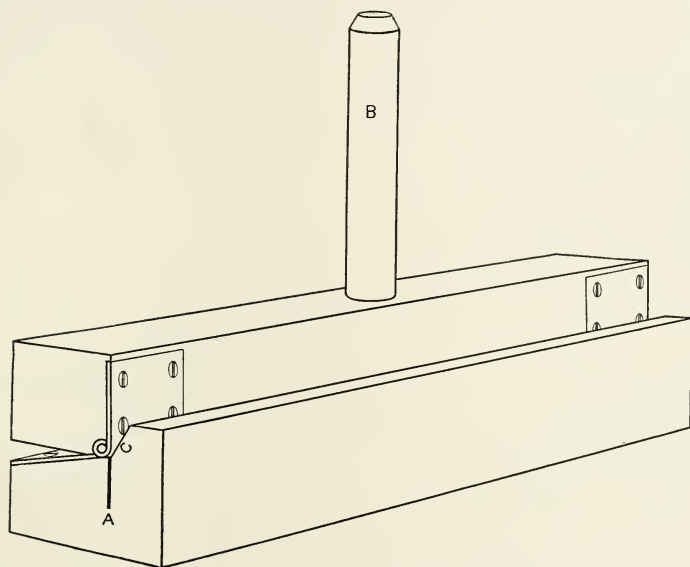


FIG. 2.—A DEVICE FOR BENDING GUTTERS (ONE-THIRD ACTUAL SIZE).

resin in the cup from losing its spirits of turpentine by evaporation.

Where the equipment is to be placed on trees which have previously been worked under the box system, it is unnecessary to provide the flat faces described, as the surface left by the chipping of the previous season answers the same purpose. One of the chief advantages of the new method is that the cup and gutters are placed each season immediately below the streak, thereby insuring a yield greater in quantity and of better quality than is possible where

handed and a left-handed laborer, who make the incisions with broadaxes for the gutters. These eight men work back and forth across the drift in narrow lines, and are followed by eight others, who quickly insert the gutters before the incisions begin to close, drive the nails, and hang the cups. In order that no time be lost, the cups should be distributed to each tree by a boy following closely after the axmen. In making the incisions with the broadax, care should be taken that the head of the ax is turned down only slightly, otherwise the inner

half of the gutter may have too much slope, and upon the formation of the scrape in it the resin from a fresh chipping will run over the outer edge and be wasted. Two men are usually able to cut about 3,000 faces per day.

Two inspectors, one for the ax-work and one for the gutter-work, are required. Tallying the faces is unnecessary, as an accurate record of these can be kept from the number of crates of cups used.

On Boxed Timber.—The six laborers with the cornering axes are unnecessary in applying this system to boxed timber, as the chipping of the previous season furnishes the required flat faces. The remainder of the work is therefore the same as on virgin or unboxed timber.

Whether the cup system is applied to virgin or to boxed timber, the best labor available should be assigned to the axes. If that work is well done, there will be no difficulty with the rest.

The following descriptions give in detail the essential features of the cups and gutters required by the new system:

CUPS.

The cups used are of clay and are similar to flower pots. The form recommended is shown in Fig. 1, and has the following dimensions:

	Inches.
Top.....diameter inside..	5½
Bottom.....diameter inside..	3½
Depth.....	7
Rim.....depth..	2

The bottom should be oval inside and flat outside and the side walls one-fourth of an inch thick. A nail-hole half an inch in diameter should be placed half an inch from the top of the rim. This cup has the same capacity as the standard box.

GUTTERS.

On account of the variable size of trees, and consequently of the width of the faces, it is best to purchase the gutter iron in long strips 2 inches wide, which can be subsequently cut into the desired lengths. For this purpose a pair of No. 8 tinner's snips can be used, but care should be taken to avoid turn-

ing the corner of the iron where the cut is first made. One thousand and eighty-six pounds of No. 29 or 2,050 pounds of No. 28 gage galvanized sheet iron will furnish gutters for one crop of 10,500 cups. The gutters commonly needed range from 6 to 12 inches long. After the iron is cut to the proper lengths, it is necessary to bend each piece to an angle of about 120° along its full length (Fig. 3). No expensive apparatus is needed for this bending; a simple wooden machine (Fig. 2), costing about 50 cents to make, is sufficient. In operating this device the flat piece of gutter iron is dropped into the narrow slit (A), and the handle (B) is pulled forward until the motion is stopped by the beveled edge (C). The bent gutter is then removed. A few minutes' practice enables a boy to bend from 20 to 25 gutters per minute.

Gutter Boxes.—The gutters (6 to 12 inches long) are carried by the guttermen in boxes made with sloping sides and partitioned for the different lengths.

Placing the Gutters.—The following precautions should be carefully observed in placing the gutters:

(1.) The gutter must pass into the wood throughout the whole width of the face, otherwise there will be a leakage of resin behind it.

(2.) The upper and lower gutters must be at least 1 inch apart at their inner ends on the angle of the faces, so that there shall be no choking by the accumulated scrape.

(3.) The inner end of the upper gutter should come to the angle at the middle of the faces and project not more than one-quarter of an inch beyond it.

(4.) It is absolutely essential to the successful working of the apparatus that the lower gutter form a spout by extending about 1½ inches beyond the angle at the middle of the faces.

(5.) Both gutters must be pushed deep into the wood at the angle of the faces.

TOOLS.

Cornering Ax.—This ax, common on all turpentine places, is the best tool for cutting the flat faces for the gutters on virgin timber.

Broadax.—Two broadaxes, with blades 12 inches wide with straight edges, are to be set on short straight handles, one for a right-handed and one for a left-handed man.

On virgin timber a stock broadax, single-beveled, is used. On boxed timber a double-beveled broadax is preferable.

Claw Hatchet.—This is the only tool required by the gutterman. It may be used in driving the gutter in case it sticks in the incisions, and answers also for driving the nails upon which the cups are hung and for the removal of bark, etc., in order to hang the cups properly.

OPERATING WITH THE EQUIPMENT.

Chipping.—This operation is precisely the same as in boxed timber. The upper

into the cup. The cup is then removed from the nail and the resin is cut from the walls by a circular movement of the knife and emptied into the bucket.

Cost of Equipment for One Crop.

Cups (10,500) at 1¼ cents each	\$131.25
Gutter strips (1,086 pounds galvanized iron, No. 29 gage, cut in 2-inch widths)	103.27
Cutting and shaping gutters	4.00
Nails (6-penny wire)	1.05
Freight charges (estimated)	30.00
Labor at trees	80.00
Total	\$349.57

The prices given are those at which responsible firms will at present furnish the material required. If the cups be placed on boxed timber the item of labor may be reduced to \$30, as the chipping

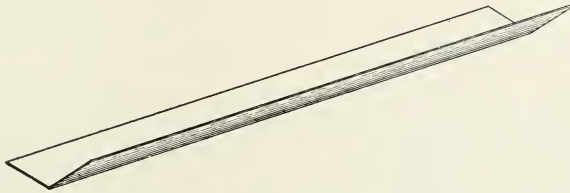


FIG. 3.—SHOWING FORM OF GUTTER (ONE-THIRD ACTUAL SIZE).

gutter is placed about 3 inches below the chipping surface, thus giving abundant space for the passage of the hack.

Pulling.—Here again no change whatever is made in the usual practice on boxed timber; the puller passes easily between the gutter and the streak.

Dipping.—The tool used for dipping the cups is a steel blade 8 inches long, 2 inches wide at the lower end, and 4 inches at the upper end. This may be made from an old saw and fastened to a wooden handle extending a little over the upper end of the blade. Where the cups have oval bottoms, the lower end of the dipping knife should be rounded to fit them.

In dipping, the accumulated scrape is first loosened from the gutters by means of this dipping knife and pushed down

of the previous season furnishes, without further labor, the flat surfaces for the gutters, which slide more readily into the incisions on old faces than into those on freshly exposed sapwood. The estimated freight charges are based upon a material reduction in freight rates recently offered by the principal railroads in the turpentine belt.

In addition to the instructions given in the circular just issued, the Bureau of Forestry offers to all operators, without charge, the assistance of Dr. Charles H. Herty, who will personally direct in the field the installment of the new method. Applications for assistance should be directed to the Forester, Bureau of Forestry, U. S. Department of Agriculture, Washington, D. C.

FORESTRY AND MAPLE SUGAR INDUSTRY.

BY

COLONEL WILLIAM F. FOX,

SUPERINTENDENT OF STATE FORESTS OF NEW YORK.

FORESTRY is a business in which people seek to harvest the product of woodlands by intelligent, conservative methods. It looks to the future as well as the present, and the best forestry is that which provides for future and permanent revenues as well as present needs. This is true whether the forest be large or small, a government reserve or farmer's woodlot, the pine lands of a lumberman or the maple orchard of a sugar-maker. In each case the true forester is the one who trusts to coming years for the vindication of his methods, who not only harvests his crop, but plants another one, and who is content that others shall reap where he has sown.

In this country people are apt to think of forestry as only another name for lumbering, and of forest products as merely including logs and pulpwood; but forestry recognizes not only these main products, but takes into consideration also what are termed by-products. In some European forests the revenue from the by-products exceeds that obtained from logs or timber. In Switzerland there is a planted forest which yields the largest annual revenue of any woodlands in Europe. The revenue is permanent also, as much so as the yearly interest on a government bond; but 50 per cent of the income and over 50 per cent of the cuttings represent material other than saw-logs or timber.

In America, where there is little or no sale for fuel wood, the by-products are of less importance. Yet there are places where they form no small part of the profits derived from the management of woodlands, as, for instance, the tar and turpentine obtained from the southern pineries, the tanning material from the hemlock and oak forests of Pennsylvania, the wood alcohol, acetate of lime,

and charcoal from the Catskill woodlands, the Christmas trees from the Maine woods, and the sugar from the Vermont maples.

Some people may not think of maple sugar as one of our forest products, although it belongs to that class, as much so as logs, bark, or turpentine. The maple groves, sugar bushes, or orchards, as they are variously called, may not suggest forests; but when a man taps from one to three thousand trees, as is done by some, his land must include a substantial forest, although it may not be a wilderness. The largest sugar bush in the State of New York is in St. Lawrence county, situated in the heart of the great Adirondack forest. The owner tapped forty thousand trees last spring, and hung out over fifty thousand buckets. His tract includes twenty thousand acres, and he considers the sugar making as the most important part of his forest work.

Then, again, the commercial and industrial magnitude of this branch of forestry is little understood. The forests of the northern states yield annually over 51,000,000 pounds of maple sugar and 3,000,000 gallons of syrup. Of the granulated sugar made in the United States, over 17 per cent is obtained from our woodlands.

The main question is How far are the principles of modern forestry applicable to this industry? Is it practicable to maintain the output of your maple woods, and, at the same time, render them more productive and profitable? What silvicultural work can be undertaken with a view to transmitting the property to your successors, unimpaired in value and capable of yielding a permanent revenue? With failing orchards and an increasing demand for the product, what can be accomplished in the

way of artificial plantations? I am aware that the practical, successful sugar maker does not bother himself much with such problems. But these questions must arise in time. Why not give some attention to them now? To carry out these suggestions will cost time and some money. But will not the capital be well invested?

To answer these questions properly would require a long discussion of details and technical work. I am sure, however, that each operator in this industry, with the knowledge gained by his practical experience, can work out these problems successfully if he will only give them serious, thoughtful attention.

An important feature of this industry is that it can be carried on at a season of the year when the farmers, who include nearly all the sugar makers, have some spare time which they can thus utilize to good advantage. Now, let some of this spare time be employed in the improve-

ment of your maple woods, in work which will result in due time in an increased production per acre. This does not involve the expenditure of money or the purchase of more land. Where the trees are dying or falling, cut them down and fill their places with young transplanted saplings. If the trees now standing are scattered and few to the acre, set out young trees until the land is covered with as many as the soil will sustain and nourish properly, leaving no more openings than are necessary for your teams and gathering sleighs to travel easily and quickly. The underbrush should not be cut, nor trees of other species thinned out to any great extent, as this growth is necessary to preserve certain soil conditions upon which the vigor of the producing trees is dependent; neither should sheep nor cattle be allowed within the woods if the maple seedlings and saplings are to be protected. Where grazing is permitted the little seedlings are devoured,



TAPPING SUGAR MAPLES.

the winter winds and frosts of the saplings are avoided, and the large trees suffer even the roughest conditions of the ground beneath their branches.

In many of the old sugar lands, however, it may not be necessary to do any planting for the desired object may be attained by cultivating and fostering a growth of the more promising species which are standing in the undergrowth. I was talking recently with a sugar maker from Delaware County in the State of New York, whose sugar woods have been killed by insects, but the insects did not injure the young trees, and so the owner is to replant the woods to restore his ruined property by a careful cultivation of selected saplings, and therefore save the expense of replanting. In the restoration of a sugar land by the skillful treatment of the young trees, a farmer has an opportunity to practice one of the most important branches of scientific forestry. When a sugarmaker or lumberman travels through the planted forests in Europe he is surprised to see how many trees there are in the acre as compared with the wild, uncultivated woods of this country. In any sugar woods the soil will flourish and sustain a much larger number of trees than are standing there now, and where the trees stand close together there certainly will be more money made and less labor needed in gathering sap than in one where they are widely scattered.

Forestry among other things means forest preservation and the protection of woodlands from insect blights, fires, and other destructive agencies. It may be well to consider here how far the principles of forestry are applicable to the protection of sugar woods. As regards the insects, which a few years ago wrought such havoc in the forest and maple orchards of Vermont, I am frank to say that foresters everywhere have met with little success in controlling their ravages. In our towns and along our highways in New York the state entomologist and his assistants have succeeded in saving shade trees which have been attacked and in getting the soil under partial control. This was accomplished by spraying the trees and by gathering the cocoons and eggs of de-

structive insects. But where a forest is attacked the destruction is so widespread that the extermination of these pests would require an expenditure of more money, possibly many times the value of the timber and land. This was demonstrated in Massachusetts, where the state authorities have already expended within a few years several hundred thousand dollars in controlling the ravages of the gypsy moth. There is one favorable feature, however, in this matter, that in two or three years the insects disappear as mysteriously as they come, long intervals intervening before their reappearance. I think there is good reason in the claim made by some ornithologists that the outbreak of these pests is largely due to the destruction of our insectivorous birds, which every year are ruthlessly slaughtered by the thousands to furnish material for millinery establishments.

The loss from forest fire is one that can be largely controlled and minimized by judicious forest work. Nearly every one has doubtless had experience in fighting woodland fires and needs no information as to the best methods to be employed. But organization and systematic methods are essential in attacking a forest fire, and so I would commend the admirable system which the State of New York has evolved for the protection of its woodlands from fire—a system which is based upon seventeen years of practical experience, during which the law has been amended from time to time in order to better perfect its practical working. Under that law we have in each forest town an official who is known as the fire warden. It devolves upon him whenever the smoke of a forest fire is seen to warn out promptly a posse of men to go to the place as quickly as possible and use every means to extinguish or control the fire. In order to guard against delay and insure prompt service, each town is divided into districts of suitable size, in which the town fire warden appoints a deputy with the same powers as his own. The men's wages and other expenses incurred in this work are paid by the town, which receives in turn a rebate of one-half from the state.



THE CATHARACTS RIVER, VERMONT, 1908.

Thousands of printed placards containing rules and regulations for the use of fire in the woods, and cautioning people against carelessness in this respect, are annually posted by the fire wardens throughout our forests. These printed notices, which are seen and read by every one, have done much to educate the people as to the danger of fire from carelessness. There is no more important work devolving upon the forester than the prevention of this evil, and so I am pleased to report that, owing to the practical system established by the State of New York, the fires in the Adirondack and Catskill forests during the last two years have been less in number and area than ever before. When I say number I ought to add that there were one hundred or more incipient fires, but that each one was extinguished promptly before any damage was done.

I am aware that plantations of Sugar Maples have not been undertaken to any extent. If a man has no sugar woods and wants to get into the business, he naturally prefers to buy a tract of standing trees rather than plant one; the sugarmaker who owns an orchard is generally contented with it and sees no

need of another. It takes many years for trees to grow, and so the question of time has a deterrent effect. Still, a young or middle-aged man can plant a sugar orchard and, under the ordinary life expectancy, live to enjoy its fruits for many years; and the other man, by planting, can make a good investment for their children. A plantation of saplings will become productive and profitable in twenty years, and it will prove to be a good investment in timber land and, even if the trees are never tapped.

There are three species of Maple in Vermont, the leading state in the maple-sugar industry, not including the two bush maples, which do not attain a size that would entitle them to be called trees. The three species referred to are the Sugar Tree, known also as the Hard or Black Maple, and the two soft maples, one of which is called White or Silver Maple while the other is known as the Red or Swamp Maple. The Black Maple, which exceeds all others as a producer, is only a variety of the Hard Maple, and so I include it with that species. The White Maple is the fastest grower of any native species in the New England or Middle States, whether hard woods or soft woods; but the two

the tender buds and twigs of the saplings are cropped, and the large trees suffer from the trampled condition of the ground beneath their branches.

In many of the old sugar places, however, it may not be necessary to do any planting, for the desired object may be attained by cultivating and fostering a growth of the more promising saplings which are standing in the underbrush. I was talking recently with a sugar maker from Delaware county, in the State of New York, whose sugar woods have been killed by insects; but the insects did not injure the young trees, and so the owner, as he tells me, proposes to restore his orchard by a careful cultivation of selected saplings, and thereby save the expense of replanting. In the restoration of a sugar bush by the skillful treatment of the young trees, a farmer has an opportunity to practice one of the most important branches of scientific forestry. When a sugarmaker or lumberman travels through the planted forests in Europe he is surprised to see how many trees there are to the acre as compared with the wild, uncultivated woods of this country. In any sugar woods the soil will nourish and sustain a much larger number of trees than are standing there now, and where the trees stand close together there certainly will be more money made and less labor needed in gathering sap than in one where they are widely scattered.

Forestry, among other things, means forest preservation and the protection of woodlands from insect blight, fires, and other destructive agencies. It may be well to consider here how far the principles of forestry are applicable to the protection of sugar woods. As regards the insects, which a few years ago wrought such havoc in the forests and maple orchards of Vermont, I am frank to say that foresters everywhere have met with little success in controlling their ravages. In our towns and along our highways in New York the state entomologist and his assistants have succeeded in saving shade trees which have been attacked and in getting the evil under partial control. This was accomplished by spraying the trees and by gathering the cocoons and eggs of de-

structive insects; but where a forest is attacked the devastation is so widespread that the extermination of these pests would require an expenditure of money exceeding many times the value of the timber and land. This was demonstrated in Massachusetts, where the state authorities have already expended within a few years several hundred thousand dollars in controlling the ravages of the gypsy moth. There is one favorable feature, however, in this matter, that in two or three years the insects disappear as mysteriously as they come, long intervals intervening before their reappearance. I think there is good reason in the claim made by some ornithologists, that the outbreak of these pests is largely due to the destruction of our insectivorous birds, which every year are ruthlessly slaughtered by the thousand to furnish material for millinery establishments.

The loss from forest fire is one that can be largely controlled and minimized by judicious forest work. Nearly every one has doubtless had experience in fighting woodland fires, and needs no information as to the best methods to be employed; but organization and systematic methods are essential in attacking a forest fire; and so I would commend the admirable system which the State of New York has evolved for the protection of its woodlands from fire—a system which is based upon seventeen years of practical experience, during which the law has been amended from time to time in order to better perfect its practical working. Under that law we have in each forest town an official who is known as the fire warden. It devolves upon him whenever the smoke of a forest fire is seen to warn out promptly a posse of men, go to the place as quickly as possible, and use every means to extinguish or control the fire. In order to guard against delay and insure prompt service, each town is divided into districts of suitable size, in which the town fire warden appoints a deputy with the same powers as his own. The men's wages and other expenses incurred in this work are paid by the town, which receives in turn a rebate of one-half from the state.



THE GATHERING TANK, WYOMING COUNTY, PA.

Thousands of printed placards containing rules and regulations for the use of fire in the woods, and cautioning people against carelessness in this respect, are annually posted by the fire wardens throughout our forests. These printed notices, which are seen and read by every one, have done much to educate the people as to the danger of fire from carelessness. There is no more important work devolving upon the forester than the prevention of this evil, and so I am pleased to report that, owing to the practical system established by the State of New York, the fires in the Adirondack and Catskill forests during the last two years have been less in number and area than ever before. When I say number, I ought to add that there were one hundred or more incipient fires, but that each one was extinguished promptly before any damage was done.

I am aware that plantations of Sugar Maples have not been undertaken to any extent. If a man has no sugar woods and wants to go into the business, he naturally prefers to buy a tract of standing trees rather than plant one; the sugarmaker who owns an orchard is generally contented with it, and feels no

need of another. It takes many years for trees to grow, and so this question of time has a deterrent effect. Still, a young or middle-aged man can plant a sugar orchard and, under the ordinary life expectation, live to enjoy its profits for many years; and the older men, by planting, can make a good investment for their children. A plantation of sapplings will become productive and profitable in twenty years, and it will prove to be a good investment as timber land also, even if the trees are never tapped.

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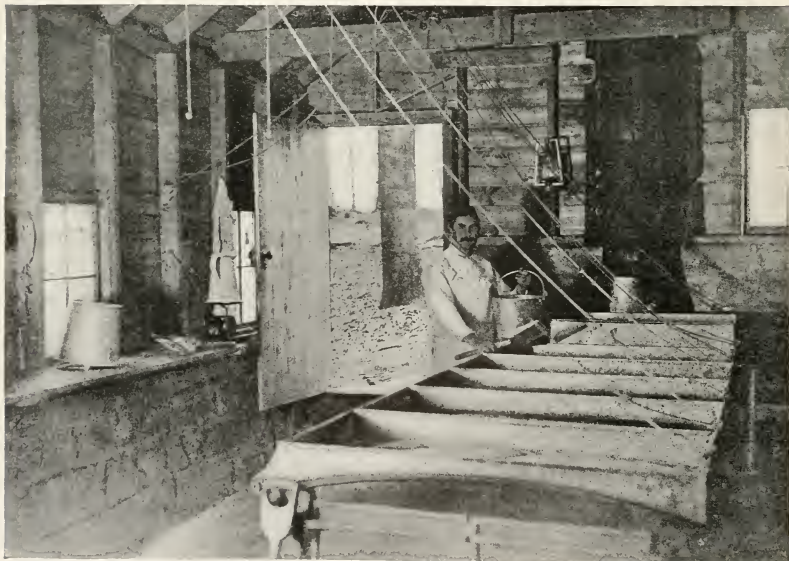
soft maples produce an inferior article of sugar. There is another tree, an allied species, the one known as the Ash-leaved Maple, Box Elder, or Negundo, from which sugar can be made, and which has been planted to some extent in Canada on account of its rapid growth; but it is inferior in both the quantity and quality of its product. Hence, in making a plantation the selection of trees should be confined to the Hard Maple.

By setting out the young plants 20 feet apart there would be 550 trees on five acres, or 1,100 trees on ten acres. The trees would do well even if planted closer, and there would still be ample room for the driveways necessary for the team and gathering tub. The saplings having been set out, the underbrush should be allowed to grow for a few years, in order that the falling leaves may enrich the soil and retain the moisture needed for a rapid and thrifty growth.

In making a plantation for timber trees, White Pine, for instance, the

skillful forester sets his young seedlings closer, beginning with spaces of four feet, or 2,700 plants to the acre, and making thinnings from time to time. But, whatever thinnings may be made, the forester always seeks to preserve a somewhat crowded condition, so that the trees will shed their lower limbs and thereby make timber as free from knots as possible; also to force the trees to take on height at first instead of diameter, and to secure a tall, slightly tapering shaft with a small crown.

But in starting a plantation of maples for sugar-making a different object is to be obtained, and a different method should be pursued. The trees must be wider apart, and such crowded conditions must be avoided. Thinning will not be necessary. A large, leafy crown, with wide-spreading branches, and a shorter, thicker tree trunk is desirable. The greater leaf surface will require a larger flow of sap, and the greater diameter of the tree trunk will permit more sap spouts if needed. Right here some scientist may suggest that leaves do not



EVAPORATING MAPLE SAP IN A SUGAR SHED.

make sap, but that sap makes leaves. Very well; the one cannot do without the other; a tree with few leaves will have little sap, and a dead one none at all.

It is well to bear in mind that a maple plantation may in time become more valuable for lumber than for sugar, and so the lower limbs should be pruned with reference to obtaining a tree that will furnish at least three good, sound logs. An ideal maple grove would be one in which the trees have straight, thrifty trunks, clear of limbs for about 38 feet, and at the same time have a large, leafy top that will induce a full flow of sap.

Now, it is no answer to this timber proposition to point to the large area of maple forests in Vermont and the small demand for that kind of lumber, for the valuable grade of timber which can be grown in a planted forest is far different from the inferior growth seen in wild, uncultivated woods. Still, some fine timber trees are found here and there among the latter, and there is a brisk demand for the first-class maple lumber which such trees will make. With the increasing wealth of the country and erection of a better class of dwellings, there is a large sale everywhere for hardwood flooring, for which purpose Maple answers better than any other tree. Throughout the Catskill forests, in New York, selected maples are cut and the choice logs taken to mills, where they are manufactured into roller stock. These logs, when delivered at the nearest railroad station, command a high price per lineal foot, the timber in the log bringing more money per thousand feet than is paid for clear-stuff pine. In the Adirondacks there are men who go through the woods, picking out the best maple trees, paying well for the same, and splitting the logs into square bolts that are shipped to the factories which make shoe lasts. Straight, clear maple logs command a good figure also at the chair and furniture factories, and there are several other industries I might name which pay a high price for lumber from this species. The extensive furniture industry at Grand Rapids, Michigan, and

other places in that state is based largely on the timber product of the neighboring maple forests. Most of our woodlands contain few trees of the character necessary to supply this demand, but in a planted forest, rightly cultivated and managed, all, or nearly all, of the trees would yield this high-priced grade of material; so it is well in planning the future of a maple plantation to take into consideration this question of timber as well as sugar, and adopt silvicultural methods adapted to that end.

The amount of land required for a plantation should form no objection, especially as on most farms there are 5 or 10 acre lots that are available for hardly any other purpose. Some of the best producing maples stand on bare, rocky hillsides, the trees on that class of land seeming to be more valuable for sugar making than those on low ground.

The period which must elapse before the trees would become productive is a question hard to answer. But whether it takes twenty or twenty-five years, the profit of the investment seems to be unquestionable.

Of course there are some who will regard such a proposition as merely a pretty theory, and something that is not to be considered seriously. But I would respectfully call their attention to the fact that tree planting for forest purposes has passed the theoretical stage, and that the practicability and profit of such work has been fairly demonstrated. In New England there are several plantations of White Pine made by men who are living today and are now selling timber from their lands, deriving an income which amply repays them for all expenditures of time and money, including interest. In our Western States the treeless plains have been covered at many places by large areas of standing timber. In the State of New York the forest commission has already commenced the work of reforesting its waste lands and raising timber trees from seedlings.

Throughout the Catskill counties of New York the maple woods and sugar trees have been killed by an insect borer. Far and wide throughout that region, in great belts 80 miles long or more, the



THE OLD-FASHIONED "SUGAR BUSH," WITH ITS PRIMITIVE METHODS.

maple forests along the hillsides are red and sear as if they had been swept by a forest fire. In Delaware county, the great sugar-producing district of the state, the sugar bushes have nearly all been destroyed by this uncontrollable scourge. And now the farmers of that region are face to face with the question whether they will plant new sugar woods or go out of business.

Thus far I have said nothing about raising maple trees from seed, for such work is not necessary where the surrounding forests are filled with thrifty saplings, large and small. At the same time any one will find it an interesting, and, doubtless, a profitable experiment; for trees grown from seedlings are generally more thrifty and are faster growers than transplanted saplings. An ordinary garden bed, say 4 feet by 16, is sufficient for the purpose. Care should be taken to obtain seeds

from the very best specimens of maples; for like produces like in the vegetable as well as in the animal world. Grapes are not of thistles, nor figs of thorns. If through carelessness the seeds come from crooked, dwarfed or diseased trees the crop will be apt to be the same; but if the seeds are collected from tall, straight, and healthy specimens the young seedlings will inherit these characteristics, and, with the additional advantage derived from careful culture, will develop into trees of ideal proportions and great productivity. Having gathered the seeds, plant them in rows the same as is done with beets or radishes. A framework of lath covered thinly with brush or straw will suffice to protect the tender sprouts from the hot rays of the sun or from frost; and the rows can then be thinned out until the seedlings are of sufficient size for transplanting.

LUMBERING WITH ELEPHANTS IN BURMA.

ORIENTAL METHODS WHICH WILL PROVE INTERESTING TO LUMBERMEN OF THE UNITED STATES.

BY

LESLIE HARRISON.

AMERICA presents varied scenes and contrasting methods in its lumbering industries, and while modern invention makes use of endless cables and improved log tramways, there can be found in identical camps with these the most primitive power of skids and steers. Even more than most persons realize, the use of these slow animals is still adhered to, and the yoke of oxen is in requisition from the Maine woods to the redwood forests of California. The sole use of the ox in a lumber camp, however, is that of the draft animal.

In Burma the animal generally used in lumbering operations is the elephant. While "my lord, the elephant," solves in an unique way the transportation problem—always a vexatious one in lumbering operations—he does more than that. The stolid and slow-moving ox can haul a load from one place to another, but the load has to be made ready for him in the first place, and after it has arrived at its destination it has to be unloaded. The elephant takes care of all of these operations. Not only is he a draft animal, but in some instances,



GETTING TEAK LOGS OUT OF A JAM IN A CREEK.



UNLOADING A TEAK LOG. AFTER BEING USED AS A DRAFT ANIMAL THE ELEPHANT PERFORMS THE "HAND" LABOR.



ELEPHANTS PUSHING STRANDED LOGS INTO DEEP WATER.



ARRANGING TEAK IN A LUMBER YARD.

“At a word from his driver he picks up a timber.”

at a word from his driver, he picks up a timber, carries it to the designated point, and then not only deposits it where it belongs, but does so with precision and comparative ease, accomplishing a result almost impossible by hand labor and with less expenditure of time than would be required by a steam crane. In most cases an elephant driver, or *mahout*, is required for each elephant, but human labor is so cheap as not to be a factor in the expense. The elephant furnishes the labor which is paid for, and the driver is looked upon as a necessary, though not altogether desirable concomitant, as the native helper is not as much to be relied upon as his big charge. Opium and the strong brews of native roots work on human frailty, but the elephant has no desire for these. In many big lumbering operations, the elephants are seemingly “told” what they are to do in the morning and in some degree left to carry on the work during the day according to their own devices. Very

remarkable are the stories told of their sagacity. One of these stories, vouched for as true, concerns lumbering, and tells of an elephant that was about to pick up a log just as the great gong, which signalled the close of the day's work, was sounded. To the surprise of the *mahout*, the log, only a little larger than others which had been carried, proved too heavy for the elephant to lift from the ground. Another elephant was requisitioned, but the two together failed to make any headway with the heavy timber, and the attempt was given up. In the morning the first elephant went immediately to the timber, lifted it with apparent ease, and carried it to the required resting place.

The lumber handled by these beasts is, however, exceedingly heavy. Most of it is teak, familiar to Americans in the form of black, quaintly carved furniture, of a weight and hardness which suggests ebony. Much of it, when handled by the elephants, is thoroughly water soaked. In Rudyard Kipling's

poem, "Mandalay," which exploits some of the charms of the capital of Upper Burma, he speaks of

"Elephants a-pilin' teak,
In the sludgy, squidgy creek."

In a story, "Moti Guj," he tells how an elephant of that name was ordered to work for a period of several days, during which time the *mahout* was to be away. Before leaving, the driver tapped the big elephant's foot a number of times agreeing with the specified number of days which the beast was to work while he was gone. True to these instructions, Moti Guj worked peaceably and with ardor until the set time was up. At the expiration of the driver's leave the elephant refused to work, and threats, force, and cajolery were un-

availing to compel him to keep at his tasks until the recalcitrant *mahout* should return. When *mahout* and elephant were at last reunited, however, all traces of stubbornness and bad temper disappeared from Moti Guj, and he resumed his tasks with an evident willingness. There are many other passages where Kipling renders tribute to the sagacity of the elephant, for whose intelligence the novelist has respect.

Through the courtesy of Mr. R. C. Wroughton, Officiating Inspector General of Forests to the Government of India, FORESTRY AND IRRIGATION has obtained permission to reproduce the photographs used to illustrate this article. They show just how the lumber is handled and give a definite idea of how useful the giant beasts are.

POSSIBLE IRRIGATION PROJECTS.

NOTES FROM THE RECLAMATION SURVEY BEING CARRIED ON BY THE UNITED STATES GEOLOGICAL SURVEY.

SINCE the passage of the National Irrigation Act of June, 1902, a comprehensive survey of the arid regions of the West has been carried on by the United States Geological Survey, with a view of determining the most feasible projects for development. It has been the intention of the officials in charge from the very first to examine with the greatest care those streams which seem to afford the greatest natural advantages for the storage of large bodies of water. Some of the more interesting work carried on during the past season is described in the following notes from the work of the Geological Survey:

Water for Central Washington.

An examination has recently been made, by F. C. Calkins, of the Hydrographic Branch of the United States Geological Survey, of the possibilities of increasing the water supply of portions of central Washington. Kittitas Valley is one of the areas in which irri-

gation is already extensively practiced by water drawn from the Yakima River and its tributaries. Plans have matured for the construction of ditches from the Upper Yakima which will materially extend the irrigated area to the east and southeast in the near future.

Attention was also given to a strip of desert land just east of the Columbia River, now used as a stock ranch, and also to a portion of the great wheat-growing region adjoining it on the north and east which extends northward into the Big Bend of the Columbia and eastward beyond the Idaho boundary. As the district has an arid climate, and its eastern portion is practically without surface streams, the object of the examination was to determine the practicability of sinking deep wells as a means of obtaining water, and especially to determine whether artesian flows could be found. Irrigation from the Columbia, except to a limited extent on its lowest terraces, appears to be impracti-

cable because of the depth and steepness of the sides of the canyon through which the river flows.

East of the Columbia the investigation included Crab Creek, the only perennial stream traversing the region, but its waters were found to be no more than sufficient for the irrigation of its own bottom.

In the wheat lands, where all crops are raised by dry farming and where water for stock and domestic uses was formerly brought from springs, sometimes at great distances, the possibility of increasing the present number of deep wells was carefully considered.

The information gathered this season indicates that a supply of water sufficient for present needs can be obtained by deep drilling throughout the region examined, at depths of from 40 to 675 feet. While there are no flowing artesian wells, the deep waters are found to be under pressure, and it is believed that in certain of the lower wells along the Northern Pacific Railroad an artesian flow could be obtained by proper casing.

It does not seem that any considerable portion of the wheat lands can be irrigated from deep wells, or that water from this source for irrigation can be found in sufficient quantities in the uncultivated land east of the Columbia, though it is believed that in this section deep wells for stock-watering purposes may be profitably sunk at some points.

Arid Land Reclamation in California.

The greatest opportunity for the reclamation of arid lands in California, and perhaps in the entire southwest, has been found to lie in the utilization of the waters of the Colorado River on its adjacent lands in California and Southern Arizona. As a result of an investigation along this river, made in January, 1902, by the Geological Survey, the extent of the alluvial bottom land between Camp Mohave and Yuma was found to be from 400,000 to 500,000 acres. Extended surveys were begun November 1, last, to determine the area and quality of these bottom lands, the possibility of diverting water to them, and the probable expense of their reclamation. To this end a hydro-

graphic survey of the region was begun, including the gaging of the river, the location of canal lines, soil analysis, and the determination of silt and evaporation; and a topographic map of the lands upon which distribution systems may be considered was made. This map, on which the topographic features are clearly and accurately shown, will be of great value in assisting engineers to locate the main canal lines, and is essential to a comprehensive knowledge of the river as a whole. About one hundred men are engaged in these investigations for the Survey, Mr. E. T. Perkins being in charge of the engineering field work, Mr. E. C. Barnard in charge of the topographic mapping, and Mr. J. B. Lippincott, resident hydrographer for California, consulting engineer on investigations.

The demands for irrigation in the Colorado Valley are urgent. The average rainfall at Camp Mohave is only 5.99 inches per annum, and at Yuma it is 3.06 inches per annum, while the temperatures are such as to provide twelve growing months in the year. The Colorado River derives its principal source of water supply from the melting snow on the high mountains of Utah, Colorado, and Wyoming. It reaches the stage of maximum flow, approximately 50,000 cubic feet per second, in the months of May and June, when the demand for irrigation is normally the highest; its minimum flow—about 4,000 cubic feet per second—occurs in the months of January and February, at the time of least demand. The opportunities for storage on this stream are very great.

The silts of the river are difficult to handle in canals, but the fertilizing properties which they have are such that lands irrigated with these muddy waters will never require further fertilization.

Mr. R. H. Forbes, of the Agricultural Experiment Station at Tucson, Arizona, who has made a study of the silt in the Colorado River, has pointed out that this stream resembles the Nile in many particulars. Like the great river of Egypt, the Colorado is subject to an annual summer rise sufficient to

overflow the extensive areas of its borders and delta lands. These high waters are rich in fertilizing sediments, are exceptionally free from alkaline salts, and come at an opportune time for irrigation. Mr. Forbes maintains that when the Colorado is understood and utilized as successfully as the greater and better-known Egyptian stream, it will be recognized as the American Nile—the creator of a new country for the irrigator, the mother of an occidental Egypt.

Search for Underground Waters.

A new division, to be known as the division of hydrology, has recently been organized in the hydrographic branch of the Geological Survey. The work of this division will include the gathering and filing of well records of all kinds, the study of artesian and other problems relating to underground waters, and the investigation of the stratigraphy of the water-bearing and associated rocks. In addition to the gathering of statistics relating to the flow, cost, etc., of the wells, it is hoped in the future to give especial attention to the geologic features which govern or which are related in any way to the supply of water.

The division will be subdivided into two sections, the eastern and the western, the first embracing the Gulf and Mississippi River states and the states to the east, and the second embracing the remaining ("reclamation") states and territories, or those having public lands. The charge of each section has been assigned to a geologist, the western section to Mr. N. H. Darton, and the eastern to Mr. M. L. Fuller. The office details are in charge of Mr. Fuller.

The sections will be further subdivided so that each state or group of adjacent states shall constitute a district in which the work of collecting data and of investigating the problems relating to underground water will be in charge of a geologist employed for the purpose.

In the western section it is expected that the study of the geologic structure will be followed by the sinking of wells by the Survey, the aim being to test

such of the arid or semi-arid regions as appear to present conditions favorable for artesian water, with a view to their ultimate development for agricultural purposes.

Investigations on the North Platte River, Wyoming.

Preliminary to the commencement of actual construction of systems of irrigation under the Reclamation Act of 1902, a thorough knowledge is being acquired by the Geological Survey of those streams in Wyoming which seem to afford the greatest natural advantages for impounding large bodies of water where it may be available for the irrigation of agricultural tracts. A reconnaissance survey has just been completed by A. J. Parshall, Resident Hydrographer of the Survey for Wyoming, extending more than 400 miles along the North Platte River from a point where it breaks through the mountains near the southern boundary of the state. The survey also included many of its tributaries.

The information thus gained will be of great value in determining the plans that will finally be adopted in conserving and applying the flood waters of a stream now going to waste and capable of reclaiming more land than is at present being irrigated in the state.

Reclamation Possibilities of Nevada Deserts.

Under the direction of Mr. L. H. Taylor, resident hydrographer of the Geological Survey at Reno, Nevada, 13 new stream-gaging stations have been established in Nevada and eastern California. Three of these are on Walker River and branches, one on Carson River, six on Truckee River and tributaries, and four on the Humboldt and its tributaries. The run-off data from these and the other eight gaging stations on these streams, when they cover a period sufficiently long to include the two extremes of run-off, will be of great value in determining the irrigation possibilities and designing the works on each. A dozen rain gages are to be located at characteristic places in this section. These, with the eleven

already in use there, will, with the aid of the run-off data, render ascertainable the ratio of precipitation to run-off, and thus enable engineers to compute, from rainfall records, the run-off from adjacent auxiliary water-sheds. Evaporation from the surface and fluctuations of the surface level of some of the larger lakes are being measured, and losses incident to storage of large bodies of water and losses from small bodies of running water are to be studied. During the last season Mr. Taylor has been assisted by Prof. E. C. Murphy, of Cornell University.

One of the most important agricultural problems in western Nevada is the reclamation of the Carson River Valley. This portion of the state joins the desert country of the Basin Ranges, but the waters of the Carson River and its tributaries permit of irrigation and save it from being wholly unproductive. During the spring and early summer the river is swollen by melting snows

on the Sierra Nevadas, but later in the season its volume becomes insignificant, and no extensive reclamation through irrigation is possible at its low-water stages. Within the last few months, however, it has become apparent, through investigations made by the Geological Survey, that with the proper conservation of the wasted winter and spring flow by the construction of storage reservoirs, it would be possible to obtain enough water to irrigate not less than 120,000 acres of land now lying arid, besides materially increasing the reliability of the supply for lands already under cultivation. With this amount of land reclaimed for farming purposes, it is estimated that an increase in property values in the section reclaimed would amount to several million dollars. The estimated cost of this storage is less than seven dollars for each acre which can be irrigated, or about \$800,000 for the total acreage reclaimed.

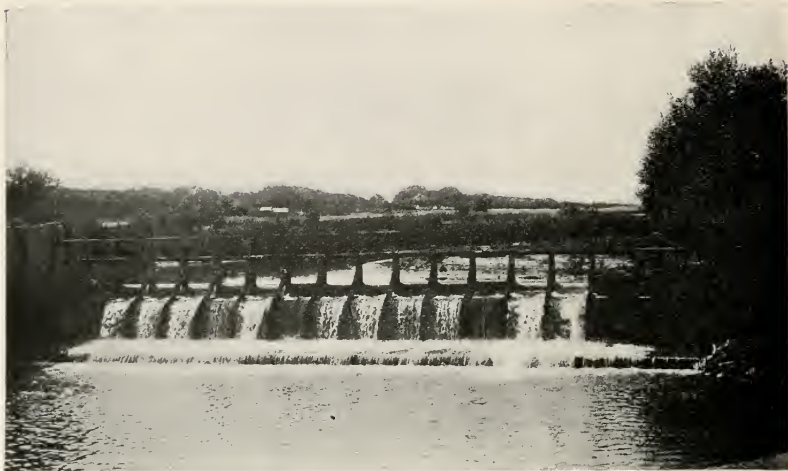
PRIVATE IRRIGATION WORKS.

PROJECTS WHICH GIVE PRACTICAL DEMONSTRATIONS OF SUCCESS FROM DEVELOPMENTS ACTUALLY COMPLETED.

WHILE the United States Government is devoting the energies of several of its commissions and bureaus, with their corps of trained experts, to the study of the irrigation problem, there are many private companies which are doing practical work of great value, not only in the development of irrigable lands but in the practical demonstration which they furnish of the possibilities of irrigation. It cannot be gainsaid that the knowledge of actual results is convincing as to the benefits to follow the application of needed water to naturally fertile soils; and, in the campaign for the extension of irrigation, examples are cogent arguments. It is with something of this thought that FORESTRY AND IRRIGATION presents some of the salient features of successful private irrigation enterprises.

Felix Irrigation Company.

The Felix Irrigation Company, at Roswell, New Mexico, has a canal 25 miles in length, which is now irrigating about 6,000 acres of land, and is capable of irrigating more. Being fed by springs and the overflow of artesian wells, as well as by a river, it can hardly run dry. The land under irrigation is principally planted in alfalfa, which produces four crops of hay per year, yielding about one ton per acre for the first three crops, and a little less for the fourth. This, together with Kafir and Egyptian corn—excellent feeds—is used for fattening cattle and hogs on a large scale. On the Felix ranch, under the canal system, there are 1,000 acres of alfalfa, which cut last year about 4,000 tons. Owing to the nature of the land, it can be handled very economically. Not many years ago the country watered



HEAD OF THE CANAL OF THE FELIX IRRIGATION COMPANY. WASTE WATER FLOWING OVER DAM.

by the Felix canal was arid prairie. In twenty years irrigation has increased the value of the land around Roswell from \$1.25 to \$125 per acre—exactly 100 times—and this fact is attested by a recent sale where land was sold at the latter figure which was originally entered as homestead.

There is an irrigated apple orchard covering 700 acres, with about 5,500 trees. The trees are from five to six years old, and in 1901 yielded about 20,000 bushels; thirty car-loads of this fruit were shipped to Chicago. Last year the crop was much larger, and yielded about 100,000 boxes. The orchard is not irrigated by the canal which supplies the alfalfa ranch, but from flowing springs and artesian wells. Altogether, about 7,000 acres should be reclaimed by irrigation, supplied by the Felix Company, which owns merely the canals, not the ranches mentioned.

The Yakima Valley Canal Company.

The Yakima Valley Canal Company, of North Yakima, Washington, serves 3,000 acres of land and delivers one cubic foot of water per second, meas-

ured over a Cippoletti weir, upon each 134 acres. The land served is located on what is known as Nob Hill, immediately adjoining North Yakima, and overlooking the entire valley.

Prices range from \$100 per acre to \$800 per acre, actual sales having been made at the latter figure. Gross returns on land in fruit are sometimes as high as \$400 per acre annually, and returns of \$125 and \$150 per acre in potatoes are not unusual. Returns on alfalfa and timothy hay vary from \$25 to \$50 per acre. The Canal Company recently decided to enlarge its service and supply 1,200 acres of new land, extending its main canal some six miles.

The old canal carried 32 cubic feet per second, and deductions are made for seepage and evaporation of 30 per cent, which, as stated, leaves to the laterals one cubic foot per second per 134 acres. The canal is being enlarged to a carrying capacity of 75 cubic feet per second, and after deducting 30 per cent for losses, this will leave a net delivery of one cubic foot per second to each 80 acres.

The work necessitated by this in-

crease of service is under the supervision of Mr. Alfred Bannister, of San Francisco, who is on the ground and carrying on the operations.

The water was shut off October 1, and all flumes and earth work widened. Flumes were treated with two coats of asphaltum. All earth work in gravel was cemented with Portland cement and treated with asphaltum to prevent seepage. The old canal passed around the noted Painted Rocks on a trestle 90 feet high. Thence the water was discharged into a redwood barrel inverted siphon 32 inches in diameter and crossed Cowiche Canyon, 900 feet, under 100-foot pressure. The plans are to discard the trestle and construct a 500-foot tunnel through the Painted Rocks, cementing and asphaltum it throughout, and to build another siphon 2 inches larger in diameter alongside the old one. Both are the work of the Excelsior Pipe Works of San Francisco.

The water along the entire line of the canal is measured to the consumer over Cippoletti weirs in cubic feet and fractions thereof. These weirs were installed by Sydney Arnold, resident

Government Hydrographer, and are generally considered the most accurate and satisfactory of the known methods of water measurement.

The largest weir on the Yakima Company's canal is 48 inches long and serves about 700 acres.

For service the company's charges are as follows: A water right under the canal costs \$30 per acre and has heretofore been subject to annual maintenance averaging \$1 per acre per year, but owing to the cost of improvements, this fee will be \$1.50 per acre for the next few years.

The Wyoming Development Company.

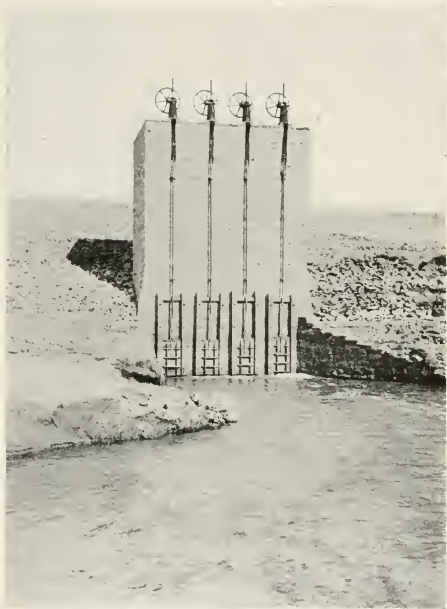
The Wyoming Development Company of Wheatland, which supplies the water for the prosperous Wheatland colony, takes its water from the Sybille and Laramie rivers. The former stream runs parallel with the land from the southwest to the northwest corner, and the latter practically bounds it on the north.

The company has constructed three canals. The first, or No. 1, is 34 miles in length, has a width of 25 feet on the



INVERTED SIPHON OF THE YAKIMA VALLEY CANAL COMPANY, NORTH YAKIMA, WASHINGTON.

bottom, and a depth of 4 feet at its head-gate. It has a carrying capacity of 427.56 cubic feet of water per second. No. 2 is 22 miles in length and has a width of 22 feet on the bottom, a depth of $3\frac{1}{2}$ feet at its headgate, and a carrying capacity of 340.67 cubic feet of water per second. No. 3 is 12 miles long, 15 feet wide on the bottom, and carries 300 cubic feet of water per second.



DISCHARGING GATES AT UPPER END OF CULVERTS,
NO. 2 RESERVOIR, WYOMING DEVELOP-
MENT COMPANY.

Until it reaches the heads of the canals the water flows through natural channels and loses little by seepage or evaporation. It is used immediately after being turned into the canals. Canal No. 2 has no break from its head-gate to its terminus, except the gates along its line, which are used for the distribution of water to its laterals. On canals 1 and 3 breaks occur by reason of dry streams or gulches.

A tunnel three-fifths of a mile in length and 7 by 8 feet in diameter, with a fall of 2 feet in 100 for the first 400 feet, and 1 foot in 100 for the remainder of its length, has been cut through solid rock. This conveys the water from the Laramie River to Blue Grass Creek, which flows into the Sybille River. From that stream the canals above mentioned have been constructed along the higher levels of the land. Lateral and sublateral ditches leading from the main canals distribute the water over the entire area.

As at present completed, the system of irrigation furnishes a sufficient quantity of water for the successful growing of crops on about 60,000 acres of land.

To reinforce and fully fortify against drouth in any season, in 1896 water was turned into a natural reservoir, which has a shore line of between seven and eight miles. The construction of a dam was completed lately for another natural reservoir adjoining the Laramie River above the tunnel of the company. This reservoir is now being filled with water. It, with the other resources of the company, will furnish sufficient water to irrigate 120,000 acres.

This reservoir will be among the largest in the world. It is 8 miles in length, averaging $2\frac{1}{2}$ miles in width and about 35 feet at its greatest depth, averaging 18 feet. It will cover about 7,000 acres of land, have a shore-line of about 35 miles, and will carry about 120,000 acre-feet of water.

This reservoir will make water abundant for all land under ditches of the Wyoming Development Company during every growing month of the year. It will make the destruction of crops by drouth a practical impossibility.

The company has other available reservoir sites on its lands which can be utilized, but they are hardly necessary, considering the capacity of the reservoirs now completed.

The primary rights to the water of the streams under which the system is

constructed, by the laws of the state and the decision of the courts, belong to the Wyoming Development Company. These are transferred to the farmers as the lands are sold or occupied. There can be no monopoly of the water or lands, as the purchaser owns both, they being inseparable.

From 20 to 50 bushels of wheat may be raised to the acre; about the same amount of barley and oats; onions,

100 to 400 bushels; alfalfa averages from 3 to 5 tons; two and sometimes three cuttings are made during the season. The potato crops are good. Success can be attained on the lands in the growth of small fruits, and orchards should be extremely profitable. Apple trees are not yet old enough, however, to show definite results, though trees are healthy and free from blight. The land is favorable for sugar-beet culture.

AN INTERESTING FORESTAL OPERATION.

A PROFITABLE CUTTING OF INSECT-KILLED TIMBER WHICH WILL SERVE THE DOUBLE PURPOSE OF SAVING LUMBER AND REDUCING THE RAVAGES OF BARK BEETLES.

BY

AUSTIN CARY,

FORESTER FOR BERLIN MILLS COMPANY.

I HAVE recently closed, on the part of the Berlin Mills Company, a logging contract that may interest readers of FORESTRY AND IRRIGATION, as it illustrates in a clear way a class of operations that foresters might sometimes inject into lumbering to great advantage. The contract provides for the cutting and hauling of several hundred thousand feet of dry timber killed during the last few years by insects.

For more than fifteen years past the Spruce on the headwaters of the Androscoggin has been suffering a good deal from the ravages of bark beetles. Some large tracts have lost more than half their standing timber, though until five years ago the cause of the loss was not clearly known, and no measures were taken to save the dead timber or check the spread of the trouble. Since that time, however, several owners of large tracts have been on their guard. Professor A. D. Hopkins was requested to make an examination, and his visit resulted in Bulletin No. 28, "Insect Enemies of the Spruce in the Northeast," Division of Entomology, U. S. Department of Agriculture.

For my own employers the areas likely

to be damaged by insects have been carefully watched, and, as far as practicable, logging operations have been carried on in the regions that for this cause and others most needed cutting. The timber involved in the present contract stands on the west side of Parmachene Lake. Three years ago careful examination disclosed about 100,000 feet of dry timber standing in three bunches. To-day the dead timber is three times that amount, and the colonies of living beetles are large and active. It was evident that extensive damage was to be expected here unless it could be checked, and the extent of injury which might be counted on was clearly shown by the increasing destruction wrought in the immediate vicinity.

Of course, it would have been easy to turn a big logging concern into the locality and by an extensive cut make sure of getting out the dry and infected timber. That was not desirable, however, for several reasons, chief among which was the desire to preserve the appearance of the lake shores for the benefit of the Parmachene Club, whose main establishment, Camp Caribou, stands on an island in the center of the

lake. On the other hand, we could not, without large proportional expense, take out the dry timber alone, as we found that no contractor would undertake to do this. Enough timber to make the expense of camp and road building moderate in proportion, and liberty to cut enough green timber standing with the dry so that the work would not differ greatly from that to which loggers and workmen are accustomed, seemed to be necessary from the point of view both of the logger and of the owner of the land.

So my task in getting the work done was, first, to find a man who was not afraid to undertake a job slightly different from those to which he had been accustomed and who could be depended on to maintain thorough control of a crew; and, second, to mark out the work so that it could be done at moderate expense and yet accomplish the object of the operation. To the latter end a good deal of hunting was necessary to find all the trees that were infested, but still green, trees which because of their menace to the surrounding woods in

the future, it was far more desirable to get out than the dry timber. This was not so hard, however, as might be thought, for the infested timber as a rule stands in bunches, showing that the swarms of young beetles as they leave one tree that has been killed to attack others, apparently do not fly far. The trees to be cut were designated by spotting, and the contractor agreed to cut by the marks. As a further inducement to thorough work, we agreed not to discount the timber for sap rot, but if mainly sound to scale it as green timber.

To accomplish our purpose fully three things are essential: First, the forestal operation of saving the dry timber and putting the infested trees into the water where the insects inhabiting them would be killed; second, preservation of the scenery for the benefit of the sportsmen who enjoy the country; third, so to plan an operation that the owners could get a fair stumpage out of the timber we had to cut. It looks now as if we had secured our ends with reasonable success.

FORESTRY AND IRRIGATION IN CONGRESS

BILLS, RESOLUTIONS, AND OTHER NATIONAL LEGISLATIVE ACTS RELATING TO FORESTRY, IRRIGATION, AND THE DISPOSAL OF THE PUBLIC LANDS, CHRONOLOGICALLY ARRANGED.

THE legislative acts concerning forestry and irrigation for the period beginning with February, when our last record closed, and ending February 20, were comparatively unimportant. The bill granting the Central Arizona Railway Company the right of way through the San Francisco Mountains Forest Reserve, practically identical with the one vetoed by the President at the last session, passed both houses and went to the White House for approval. At the time of going to press the bill had not been signed, though the ten-day period of consideration had not yet lapsed. Petitions for the repeal of the desert land law and the commutation clause of the homestead act continue to pour in

from labor organizations of every state, showing a definite campaign through these bodies. More than fifty of these found place in the *Congressional Record* for the period covered by this recapitulation. A memorial from sundry citizens of Latah county, Idaho, remonstrated against the repeal. The bill to open one-half of the Colville Indian Reservation, in Washington, to homestead settlement became a law.

February 2.

Senator Burrows presented a petition of the Aspinwall Manufacturing Company of Jackson, Mich., praying for the enactment of legislation to appropriate the receipts from the sale or dis-

posal of public lands in certain states and territories to the construction of irrigation works for the reclamation of arid lands, which was referred to the Committee on Irrigation and Reclamation of Arid Lands.

Senator Platt, from the Committee on Printing, reported a resolution for the further printing of 15,000 copies of the Woodsman's Handbook (Bulletin No. 36, Bureau of Forestry, Department of Agriculture), to be distributed as follows: 5,000 copies for the use of the Senate; 5,000 for the House of Representatives, and 5,000 copies for the Department of Agriculture; and the same was referred to the House of Representatives, where it was referred to the House Committee on Printing.

Senator Teller introduced a bill (S. 7227) permitting the town of Montrose, Colo., to enter 160 acres of land for reservoir and water purposes. Referred to the Committee on the Public Lands.

In the House of Representatives, Mr. Bates moved to suspend the rules to consider a bill (H. R. 15008) providing for the better separation and utilization of public and private lands within the limits of railroad land grants in the arid region, with amendments. The motion was lost.

Senate bill No. 6339, providing for the confirmation of certain forest lieu selections made under the act approved June 4, 1897, was referred to the Committee on Public Lands of the House.

February 3.

The Senate having under consideration the Statehood Bill, as on several other dates, considerable discussion was evoked regarding the possibilities of forestry and irrigation in the proposed states.

A petition of Camp 4251, Modern Woodmen of America, of Villard, Minnesota, praying for the enactment of legislation providing for improved economy of the forest resources of the country, was referred to the Committee on the Public Lands.

February 4.

The bill (S. 6968) granting the Central Arizona Railway Company a right of way for railroad purposes through

the San Francisco Mountains Forest Reserve, in Arizona, was passed by the Senate without amendment.

The bill (H. R. 159) providing for free homesteads on the public lands for actual and *bona fide* settlers in the north half of the Colville Indian Reservation, Washington, and reserving the public lands for that purpose, also passed the Senate without amendment.

The bill (H. R. 12098) entitled "An act extending the homestead laws and providing for a right of way for railroads in the district of Alaska," was considered by the Senate in Committee of the Whole. After a number of amendments and corrections, the bill went over for future consideration.

In the House the bill (S. 6968) granting the Central Arizona Railway Company a right of way for railroad purposes through the San Francisco Mountains Forest Reserve, Arizona, was referred to the Committee on the Public Lands.

The bill (H. R. 159) providing for free homesteads for actual and *bona fide* settlers in the north half of the Colville Indian Reservation, Washington, and reserving the public lands for that purpose, having passed the Senate and the House, became ready for Executive action.

February 6.

The bill (H. R. 159) providing for free homesteads on the public lands for actual and *bona fide* settlers in the north half of the Colville Indian Reservation, State of Washington, was presented to the President of the United States for his signature.

The House of Representatives received resolutions from the National Live Stock Association favoring a public-land commission, and protesting against the passage of House bill 15008, called the "land exchange" bill, and favoring the preservation of pasturage on the public domain.

Mr. Eddy, from the Committee on the Public Lands, to whom was referred the bill (H. R. 11652), an amendment to the United States Statutes at Large, entitled "An act to authorize the President of the United States to cause certain lands

The bill is still pending for leave for printing proof and passage for all final steps under the Government law by members of the Canada Forestry Commission for a further period, since leave was granted from the Senate and referred by the Committee on the Public Lands. The committee reported the same without amendment and with a report (H. R. 2702), both of which were referred to the House Calendar.

A joint resolution of the United States Legislature relating to the same and further act, was referred to the Committee on the Public Lands.

February 12.

A message from the Senate on the House amendments thereto has passed the bill (H. R. 2702), entitled "An act to amend section 2 of the act of Congress of May 14, 1874, entitled 'An act extending the territorial limit and providing the right of way for railroads in the District of Alaska'."

A bill was introduced by Mr. Lacey (H. R. 2703), to consolidate the Department of the Interior, the Department of Agriculture, and the Department of the Public Lands.

A joint resolution of the Department of Forestry, relating to the complete investigation of the Department of Agriculture, was referred to the Committee on Agriculture.

February 13.

A message from the Senate that the House amendments thereto are disagreed with the amendments of the Senate (H. R. 2702), which were referred to the Committee on Congress, and the bill was referred to the Committee on the Public Lands. The bill is still pending for leave for printing proof and passage for all final steps under the Government law by members of the Canada Forestry Commission for a further period, since leave was granted from the Senate and referred by the Committee on the Public Lands.

Senator Parker introduced a national plan of the Committee on Forestry, and the House amendments thereto were referred to the Committee on the Public Lands. The bill is still pending for leave for printing proof and passage for all final steps under the Government law by members of the Canada Forestry Commission for a further period, since leave was granted from the Senate and referred by the Committee on the Public Lands.

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heretofore withdrawn from market for reservoir purposes to be restored to the public domain, subject to entry under the homestead law, with certain restrictions," reported the same without amendment, accompanied by a report (No. 3659); which said bill and report were referred to the Committee of the Whole House on the state of the Union.

February 7.

A bill (S. 7288) extending the time for making proof and payment for all lands taken under the desert-land laws by the members of the Colorado Coöperative Colony for a further period of three years was referred to the Committee on the Public Lands.

A bill (S. 6689) to protect from trespass the public lands of the United States and the wild animals and game thereon, which does not propose to interfere with local game laws, was introduced by Senator Perkins, and passed.

A bill (S. 7123) providing for the further protection of the public forest reserves by giving wardens power to arrest persons found violating any laws and regulations of the reserves was introduced by Senator Depew, and passed.

In the House, Mr. Lacey, from the Committee on Indian Affairs, to which was referred the bill (H. R. 16280) to open for settlement 505,000 acres of land in the Kiowa, Comanche, and Apache Indian reservations in Oklahoma, reported the same with amendment, accompanied by a report (No. 3661). Referred to the Committee of the Whole House on the state of the Union.

February 9.

Senator Foster, of Washington, submitted an amendment proposing to appropriate \$21,000 for the management, protection, and improvement of Mount Rainier National Park, Washington, and the same was referred to the Committee on Forest Reservations and the Protection of Game.

In the House of Representatives, a bill (H. R. 17327) providing for the sale of public lands belonging to the United States, and situated on the Mississippi River and Grand Pass, was referred to the Committee on the Public Lands.

A message from the President announced that he had signed the bill (H. R. 159) providing for free homesteads in the north half of the Colville Indian Reservation.

February 10.

A joint resolution was presented to the Senate from the Legislature of Wyoming, relative to irrigation investigations by the United States Department of Agriculture, and praying for their continuance, was referred to the Committee on Agriculture and Forestry.

Senator Heitfeld reported without amendment and with a report the bill (S. 7288) extending the time for making proof and payment for all lands taken under the desert-land laws by members of the Colorado Coöperative Colony for a further period of three years. The bill was passed.

Senator Burton, from the Committee on Forest Reservations and the Protection of Game, submitted a favorable report on the amendment to appropriate \$21,000 for the management, protection, and improvement of Mount Rainier National Park, in Washington. Referred to the Committee on Appropriations.

The bill (H. R. 16731) referred to the Committee on the Public Lands, which permits the town of Montrose, Colo., to enter 160 acres of land for reservoir and water purposes, passed the Senate.

Senator Warren introduced a joint resolution (S. R. 167) providing for a careful inquiry and report respecting the present operation of certain public-land laws. Referred to the Committee on the Public Lands.

In the House a petition of the Bone-steel Commercial Club, of Gregory county, S. Dak., for the opening of the reservation land in Gregory county for homestead settlement, was referred to the Committee on the Public Lands.

February 11.

Mr. Mondell offered an amendment to the appropriation of \$130,000 made for the Geological Survey for the purpose of surveying lands within forest reservations, stating that the General Land Office alone should have the preparation of these surveys. The amendment was lost.

The act (S. 7288) increasing the time for making proof and payment for all lands taken under the desert-land law by members of the Colorado Coöperative Colony for a further period of three years was received from the Senate and referred to the Committee on the Public Lands. This committee reported the same without amendment, and with a report (No. 3704), both of which were referred to the House Calendar.

A joint resolution of the Idaho State Legislature, relating to the stone and timber act, was referred to the Committee on the Public Lands.

February 12.

A message from the Senate to the House announced that it had passed the bill (H. R. 12098) entitled "An act to amend section 1 of the act of Congress of May 14, 1898, entitled "An act extending the homestead laws and providing the right of way for railroads in the district of Alaska."

A bill was introduced by Mr. Lacey (H. R. 17393) to authorize registers and receivers of United States land offices to furnish transcripts of their records to individuals. Referred to the Committee on the Public Lands.

A joint resolution of the legislature of Wyoming, indorsing the irrigation investigations of the Department of Agriculture, was referred to the Committee on Agriculture.

February 16.

A message to the Senate from the House announced that it had disagreed with the amendments of the Senate to the bill (H. R. 12098) to amend section 1 of the act of Congress approved May 14, 1898, entitled "An act to extend the homestead laws and provide for a right of way for railroads in the district of Alaska." A conference was asked.

Senator Foraker introduced a memorial from the Chamber of Commerce, Honolulu, Hawaii, remonstrating against the enactment of legislation providing for the extension of the land laws of the United States to that territory; which was referred to the Committee on the Pacific Islands and Porto Rico.

The bill (H. R. 14511) authorizing the relinquishment to the United States

of claims and patented lands within the national parks in the State of California and permitting the settlers and owners thereof to secure other lands outside of said parks, in accordance with section 24 of the act of Congress approved March 3, 1891, was reported from the Committee on the Public Lands, to which it had been referred, with amendments thereto and a report.

The House of Representatives passed the bill (S. 7288) extending the time for making proof and payment for all lands taken under the desert-land laws by members of the Colorado Coöperative Colony for a further period of three years.

The bill (H. R. 15985) to confirm certain forest lieu selections made under the act approved June 4, 1897, and the bill (S. 6968) granting to the Central Arizona Railway the right of way through the San Francisco Mountains Forest Reserve also passed.

A bill (H. R. 16280) authorizing the opening for settlement of 505,000 acres of land in the Kiowa, Comanche, and Apache Indian reservations in Oklahoma Territory failed to pass.

The bill (S. 6290), with a report (No. 3620) on the same, was referred to the Committee of the Whole House on the state of the Union by the Committee on the Public Lands. The bill is to extend the provisions of section 2455 of the Revised Statutes of the United States as amended by an act of February 26, 1895, relating to public lands.

Resolutions in support of the bill (H. R. 17103) permitting the payment of the value of public lands to persons entitled to make entry upon such lands in certain cases were received from three Grand Army posts in Michigan, and referred to the Committee on the Public Lands.

The bill (H. R. 15985) to confirm certain forest lieu selections made under the act approved June 4, 1897, having passed the House, went to the Senate, and was there referred to the Committee on the Public Lands.

A memorial of E. B. Voorhees, director of the New Jersey Agricultural Experiment Stations, New Brunswick, N. J., to the Senate, remonstrating

against a reduction of the appropriation for irrigation investigations, was referred to the Committee on Irrigation and the Reclamation of Arid Lands.

February 18.

Senator Clark, of Wyoming, from the Committee on the Public Lands, to whom was referred the bill (S. 7247) for the relief of certain homestead settlers in the State of Alabama, on lands which have been recovered, or which may hereafter be recovered, in the courts by the grantees of certain railroad companies of that state, reported it without amendment.

Mr. Wilcox presented to the House the petitions of 606 voters of Honolulu, Hawaii, praying for the enactment of a law to provide Hawaiian citizens with homesteads from the public lands in Hawaii. Referred to the Committee on the Territories.

February 19.

A petition was presented to the Senate from the house of representatives of the State of Missouri, praying for the establishment of a national park in the famous Ha-Ha-Tonka region, in Camden county, Missouri. Referred to the Committee on the Public Lands.

Mr. Stephens, of Texas, introduced in the House of Representatives a bill (H. R. 17470) to open for settlement 505,000 acres in the Kiowa, Comanche, and Apache Indian Reservations. Referred to the Committee on Indian Affairs.

Petitions in support of the bill (H. R. 17103) permitting the payment of the value of public lands to persons entitled to make entry upon such lands in certain cases were received from two G. A. R. posts in Michigan. Referred to the Committee on the Public Lands.

February 20.

The bill (S. 6968) granting the Central Arizona Railway the right of way through the San Francisco Mountains Forest Reserve was presented to the President for signature. The Speaker of the House also signed the bill (S. 7288) extending the time for making proof and payment for all lands taken under the desert-land laws by the members of the Colorado Coöperative Colony

for a further period of three years, making it ready for Executive action.

Mr. Miller introduced a bill (H. R. 17483) providing for the better separation and utilization of public and private lands within the limits of railroad land grants in the arid and semi-arid regions of the State of Kansas. Referred to the Committee on the Public Lands.

Mr. Hamilton presented a resolution from Hill Post, No. 159, G. A. R., of Middleville, Mich., in support of the bill (H. R. 17103) permitting the payment of the value of public lands to persons entitled to make entry upon such lands in certain cases.

STANDING COMMITTEES OF THE HOUSE.

Agriculture. — Messrs. Wadsworth, Henry of Connecticut, Connell, Wright, Haugen, Dahle, Scott, Haskins, Henry C. Smith, Graff, Williams of Mississippi, Lamb, Cooney, Gordon, Allen of Kentucky, Neville, and Flynn.

Public Lands. — Messrs. Lacey, Eddy, Mondell, Miller, Jones of Washington, Esch, Moody of Oregon, Needham, Martin, Tompkins of New York, Fordney, Shafroth, Kleberg, Griffith, Brundidge, Lassiter, Burnett, and Flynn.

Irrigation of Arid Lands. — Messrs. Reeder, Mondell, Sutherland, Tirrell, Brandegge, Dwight, Newlands, Neville, Underwood, and Bellamy.

STANDING COMMITTEES OF THE SENATE.

Agriculture and Forestry. — Messrs. Proctor, Hansbrough, Warren, Foster of Washington, Dolliver, Quarles, Quay, Bate, Money, Heitfeld, and Simmons.

Forest Reservations and the Protection of Game. — Messrs. Burton, Depew, Perkins, Clark of Wyoming, Pritchard, Kearns, Kittredge, Morgan, Tillman, Gibson, and Simmons.

Irrigation and the Reclamation of Arid Lands. — Messrs. Simon, Warren, Stewart, Quarles, Bard, Quay, Kearns, Dietrich, Harris, Heitfeld, Bailey, Patterson, and Gibson.

Public Lands. — Messrs. Hansbrough, Nelson, Clark of Wyoming, Bard, Kearns, Gamble, Burton, Dietrich, Berry, McEnery, Heitfeld, McLaurin of Mississippi, and Gibson.

THE DATE PALM IN AMERICA.

RESULTS OF THE ATTEMPTS TO PROPAGATE THIS TREE FOR COMMERCIAL PURPOSES IN THE SOUTHWEST.

IN 1899 the United States Department of Agriculture, in cooperation with the Arizona University Agricultural Experiment Station, started a Date Palm orchard at Tempe, Arizona. Plants were brought from Egypt, Algeria, Arabia, and Beluchistan, and though the experiment at first seemed to fall far short of success, there is now sufficient promise and prosperity in the planting to warrant a continued interest and a further study. The first failures were due for the most part to a lack of knowledge of comparative conditions in America and the Old World regions, where the Date Palm grows to its highest perfection.

The attempt to propagate this palm in the arid regions of the southwest, where adverse soil conditions are to be met, even where there was an abundance of water, grew out of the need of alkali-resistant growths. The Date Palm furnishes, in its native areas, a successful alkali-resistant crop. Unfortunately, first plantings were made without sufficient data as to climatic conditions and soil analyses; moreover, the long transportation from Asia and Africa to Arizona were a cogent factor against immediate results, and plants had but little opportunity to regain strength after their long journey before an adverse condition in the new habitat was likely to prove fatal.

The first importation, August 3, 1899, comprised six medium-sized suckers, rooted in tubs of earth, and were consigned to the Tempe orchard from Algiers, via Washington. These were planted in sub-irrigated ground and were watered at irregular intervals. They had second-rate care, and died after giving only temporary signs of growth. Sixteen small suckers from a male tree near the proposed orchard were also planted that year, but these again had insufficient care, due to inconvenient ar-

rangements, and died soon after, probably because of a lack of water in the beginning. The next year 100 native-grown seedlings were transplanted at Tempe, from Alhambra, Ariz. In transportation they had been balled in dry soil, and were soaked three days in ditch water before being planted, April 30, 1900. These were irrigated, but not quite as often as they should have been. The frosts of the two succeeding winters, 1901-02 and 1902-03, cut them back severely. At the end of last summer, although the plants were small, 64 had survived. In July, 1900, 445 suckers came from Algiers, via New York and New Orleans. Some of these were sent to Berkeley and Pomona, Cal., a few to Phoenix, Ariz., but most of them, 384, went to the Tempe orchard. These were frosted the next winter and many gave no evidence of growth until the hot weather of August and September, 1901. These were given the best of care in watering, and the frost of 1902 did but little damage. Three-fourths of this shipment may be considered as now established, including 23 of the 26 varieties imported. The *Rhars* and *Deglet Noor* varieties were the most numerous of this shipment, and 17 of the former and one of the latter bore small crops of fruit only two years after transplanting. The *Rhars* can possibly be grown in a cooler locality than the Salt River Valley, but the *Deglet Noor* requires a long, hot season to develop its fruit. In May, 1901, eighteen suckers were received from Lower Egypt, and a year later, although five were growing and might be considered established, the rest had died. The reason for this high percentage of loss was not apparent, as the plants had received excellent care. It was probably a case of too great difference in soil or climate conditions not understood. In October of this year 35 fair-sized

trees came from Egypt in tubs of earth and spent the winter in a green-house at Tucson. They had suffered from the fourteen days' trip from New York to Tucson, but in September, 1902, all but three seemed certain to live. A shipment of 212 suckers from Arabia and Beluchistan was received in June, 1902, but it is impossible to say at this time how many will survive.

There are now growing about 550 imported trees and 60 local seedlings. There has been no appearance of the worst enemy of the tree, the Date Palm scale, owing to careful and successful fumigation, and it has been shown that the pest is easily manageable and should give but little trouble.

As a commercial venture it must be admitted that certain elements of risk must be considered. So far the suitability of various districts for the most valuable varieties of the Old World palms is not known. Unfortunately temperature and soil records required for accurate comparisons between the old and new habitat have not been made thoroughly, although the data obtained during the past summer in Algeria and Egypt by Mr. T. H. Kearney, of the Bureau of Plant Industry, and Mr. Thomas H. Means, of the Bureau of Soils, U. S. Department of Agriculture, should prove of great value.

Commercial conditions in America must enter largely into the considerations of profit. The Kabyles and Bedouins, for instance, depend on the dates only slightly sweet as a staple article of food, and growers probably realize greater profits from these than from the exceedingly sweet dates used as confections in America. So that a home market for the latter kind only is open to the American grower, unless the less sweet varieties become an article of common diet.

Date palms need plenty of water, but having that, they should grow well on much of the alkaline soil of New Mexico, Arizona, and southern California. They come into bearing early and produce fruit for forty, fifty, and perhaps even one hundred years. Therefore shrewd judgment should be used in planting for future commercial needs.

In conclusion it must be stated that there is, for many reasons, great risk in importing trees and suckers, and at this time it seems that home-planted seedlings and native suckers should prove most profitable. While the industry is still in its most incipient stages, there are grounds for belief that the Date Palm can find congenial conditions in America, and that its growth may add an important agricultural industry to certain localities.

MOTIONS OF UNDERGROUND WATERS.

INTERESTING FACTS ABOUT WATER BENEATH THE GROUND, ITS MEASUREMENT AND USES.

PROF. CHARLES S. SCHLICHTER, in a paper published by the U. S. Geological Survey, says that the amount of water within the crust of the earth is enormous, amounting to 565,000,000,000,000 cubic yards. This estimate is based upon the supposition that the average depth which waters can penetrate beneath the surface is 6 miles below the land and 5 miles below the ocean floor. This vast accumulation, if placed upon the earth, would cover its entire surface to a uniform depth of from

3,000 to 3,500 feet. Under the influence of gravitation the water is generally in motion, and the object of Professor Schlichter's paper is to describe the rate and manner of its overflow and the laws governing the same. Experiments have shown that not only do sands and gravels possess porosity, but rocks presumably solid and compact may be traversed by water. Even so hard a rock as granite, selected for the sarcophagus of the tomb of General Grant on account of its great strength, shows a porosity of 0.23

per cent. The most productive water-bearing rocks, however, are found to be the porous sandstones, and in some cases limestones, whose inner texture has been chemically dissolved.

The popular idea of underground waters is derived from the rivers of copious discharge found in the Mammoth and other caves; but this idea is erroneous, as such streams, though of great local importance, are comparatively rare. The great mass of ground water slowly percolates through sand and gravel deposits, sandstone, and other porous material under a wide extent of territory. Though its motion carries it but a fraction of a mile in a year, this ground water is so widespread and often so accessible as to be of the greatest economic importance.

The knowledge of the underflow that exists beneath the gravel of all river valleys has been taken advantage of in arid sections of the West, where the running dry of streams deprives irrigators of their water supply. By excavating to bed rock in river gravels and building an impervious barrier across the channel, these underground waters are saved in sufficient quantities to be of great value to the farmer. A notable subsurface dam of this kind has been constructed on the Pacoima Creek, California, to furnish water for irrigation and domestic use.

Deep zones of flow are a most important feature of the movements of underground waters, and open up an interesting field for investigation. The wonderful artesian basin of North Dakota and South Dakota, which has proved such an important factor in the economic development of these states, forms one of the illustrations used by Professor

Schlichter in the explanation of deep-seated underflows.

A cross-section of this part of the country clearly shows the interesting fact that the water which comes to the surface in the gushing wells of the Dakotas travels underground all the way from the Black Hills and Rocky Mountain slopes, in the water-bearing strata known as the Dakota sandstone. Another illustration of extensive basins due to deep underground flows is found in Wisconsin, where an extensive area of water-bearing rocks, nearly 1,000 feet thick, conducts water of singular purity under large areas of the state.

It must be borne in mind that there is a limit to the amount of water which can be drawn from an artesian basin, and that there is no such thing as an inexhaustible underground supply. The gradual failure of the wells which supply the city of Denver clearly illustrates this fact. So great a demand was made upon this basin between the years 1884 and 1890 that it has been estimated that, if all the wells were now plugged, the water-bearing strata of the basin would require forty years to recover the saturated conditions which existed when the first well was sunk.

The study of underground water in its relation to the effective water supply of the country is one of the most important departments of the work of the United States Geological Survey. It is carried on in the arid regions, where water for irrigation is of the greatest value; in the middle west, where grazing and successful farming largely depend on it, and in the east, where an unpolluted supply for domestic and municipal use is yearly becoming a more serious problem.

RECENT PUBLICATIONS

The Forests of Upper India and Their Inhabitants.

By THOMAS W. WEBBER, late Forest Surveyor for the Northwest Provinces and Deputy Conservator of Forests in the Central Provinces and Gorakhpur. Published by Edwin Arnold, London, and Longmans, Green and Co., New York.

The book is an account of the author's life in

the hills of India, and relates to a period of years shortly after the great mutiny in 1857. It describes briefly the forests of the Northwest and Central Provinces, but is confined mostly to a description of the people and animals which inhabit these regions. It is remarked in the preface that in those days the knowledge of forestry, from a French or German

standpoint, was of less importance than the ability to swear roundly in Hindoostani, use a rifle and hunting knife to advantage, and successfully endure the hardships of a treacherous climate.

The book opens with a delightful description of the Himalayas, and recounts in detail a trip from the plains up through the foothills to the snow peaks and borders of Tibet. The life of these sacred mountains is set forth in such an attractive way that the reader is carried along with the party, and seems to live among the Blue Pines, Deodars, and Spruces of the rocky slopes. He is introduced to the little, lean, and wiry hillmen, with their Gurkha knives and copper kettles, and to their wives at work in the fields, where from time to time a tiger appears and carries them off to the jungle. Sambur, cheetal, bears, mountain goats, and tigers are followed and hunted down, and a short journey into Tibet is described, where a mimic clash takes place with the diminutive soldiers from the holy land of Lhassa. A touch of romance and excitement runs through the whole.

The author was engaged in making a forest survey and maps of the mountain regions, and descriptions were made as to the character and distribution of the forest stand. The merchantable trees were divided into classes according to diameters, and surveys were run through the forest according to the well-known "strip" method. The last chapter contains an outline of forestry in Germany (where the author received his education) and remarks as to the urgent need of more rational forest management in Great Britain and her colonial possessions. A map is appended, showing the forest cover of the regions described.

The book contains but little relating to scientific forestry, although it is an excellent description of the life of an Indian forester, and gives one a most interesting glimpse of nature in this corner of the world.

F. E. OLMSTED.

Annual Report of the Board of Regents of the Smithsonian Institution for the year ending June 30, 1901. Pp. 782. Illustrated.

One of the functions of the Smithsonian Institution, at Washington, is the diffusion of knowledge in language—"understood of the people;" so that, while most of its works are intended primarily for the specialist, there is an exception made by the Secretary in publishing an Appendix to the Report of the Board of Regents, which is in fact an annual summary of the most interesting events of the scientific year, prepared for that large body of the public which does not care for professional memoirs, but has a general interest in such matters.

This popular volume for 1901 is before us. It contains fifty articles, many of them illustrated, nearly all prepared by masters of the respective subjects, telling in clear and interesting language of the latest progress in all the principal branches of knowledge.

A short sketch of the history and the work of the Smithsonian Institution begins with a

paragraph from President Roosevelt's first message to Congress, in which he calls attention to the Institution's functions and its present needs. The paper further states that the Smithsonian Institution, which is composed of the President and his Cabinet, and the Vice-President and Chief Justice of the United States, has a remarkable organization for the administration of funds for the promotion of science. Its activities could be still further increased if it had greater means at its absolute disposal; while those who are thinking of giving for some special scientific object may yet find the Regents, on account of the peculiarly disinterested position they hold, the best counsellors in suggesting the channel into which gifts for public purposes might be directed, even should they not see their way clear to accepting such donations for the Institution itself.

"Bodies Smaller than Atoms" is the title of an interesting paper, and as we read "The Laws of Nature," "The Greatest Flying Creature," and "The Fire Walk Ceremony at Tahiti," we are reminded of the wide range of subjects included in the Report. Wireless telegraphy, transatlantic telephoning, and the telephonograph are discussed by experts in electrical progress. Attention ought also to be called to papers on utilization of the sun's energy, the Bogosloff volcanoes of Alaska, the Children's Room at the Smithsonian, the submarine boat, a new African animal, pictures by prehistoric cave-dwellers in France, automobile races, the terrible lizards that once lived in America, and Mr. Thompson Seton's paper on the National Zoological Park at Washington. Articles of special interest to readers of FORESTRY AND IRRIGATION are "Forest Destruction," by Gifford Pinchot and C. Hart Merriam, and "Irrigation," by F. H. Newell.

The whole volume has been called "the best popular scientific annual published in the world."

The Smithsonian Reports are distributed by the Institution to libraries throughout the world; they may be had by purchase at cost from the Superintendent of Documents, Washington, D. C., and may also generally be obtained free of charge from the applicant's Member of Congress.

Report of the Agricultural Experiment Station of the University of California. Part II, for the years 1898-1901, being a part of the report of the regents of the university. Pp. 409. Illustrated. State Printing Office, Sacramento, 1902.

This report epitomizes the work of the agricultural school of the University of California for three years and covers a great many subjects of interest to ranchers of the state. The largest number of papers on any one line of work are devoted to the questions of soils in relation to irrigation and drainage to offset the injurious effects of alkali. One of the best papers is that by E. W. Hilgard, head of the experiment station at the university, on "Irrigation, Cultivation, and Hardpan." It abounds

in good sense, and could be read with profit by any one who is thinking of taking up any of the attractive offers of orchard lands in California. The whole report brings out clearly that California conditions are so different from those of the East, that beaten lines of agricultural experiment cannot be followed, but that the work undertaken, to be effective, must deal directly with the local problems. The report has followed the latter method and has considerable value on that account.

The Shrubs of Wyoming. By ELIAS E. NELSON. Bulletin No. 54 of the Wyoming Experiment Station, Laramie, Wyo. Pp. 48. Illustrated.

This bulletin follows very naturally in a series on the plant life of Wyoming, after bulletins 38 and 40, which were, respectively, "Cultivated Shade and Forest Trees of Wyoming" and "The Trees of Wyoming and How to Know Them." It has interest and value and its style proves that its author is thoroughly in sympathy with the subject. The value of the shrubs is treated from two viewpoints—esthetic and economic. Their use for ornament is shown, and it is pointed out that they conserve the water, prevent washing out of the stream banks and soils, form valuable forage for stock, and in some cases furnish edible fruits. Many are recommended for ornamental planting, and it is suggested that the domestication and improvement of some would be desirable from an economic standpoint, and would afford an engaging and pleasurable pursuit to any one interested in the problems of horticulture.

PUBLISHER'S NOTES.

John D. Morris & Company, of Philadelphia, publishers of "Modern Eloquence," have attractively presented an inherently valuable set of books, and one which is unique among recent publications. The editorial work was under the direct personal supervision of the late Thomas B. Reed, whose public career gave him every opportunity to know and judge the best examples of the subject which he has ably treated. The work is published in ten volumes and is exhaustive in its scope. The mechanical excellence of the volumes leaves nothing to be desired, typography and binding being in the best taste, making a library set of attractive value. Full information concerning this set may be obtained of the publishers by filling out the corner blank of the advertisement of "Modern Eloquence" in this issue of FORESTRY AND IRRIGATION.

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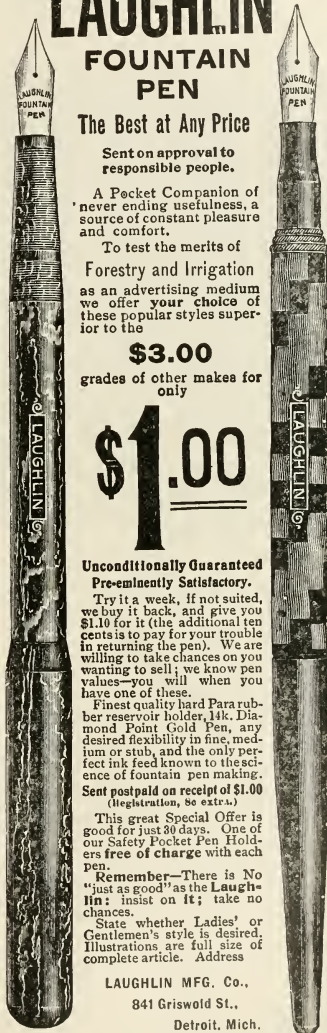
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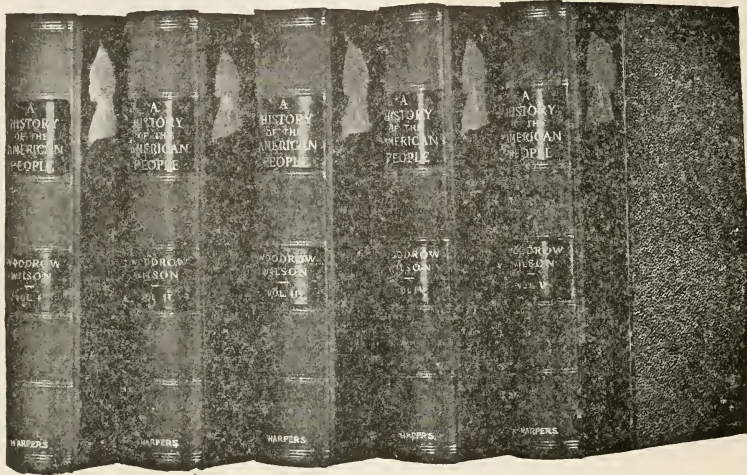
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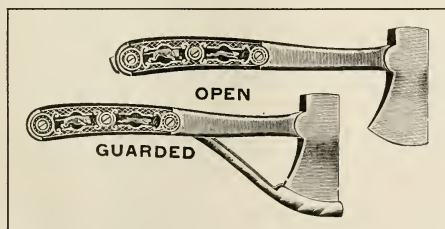
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Swift down the heavenly way ;
It lacked but little of vesper bells,
A mournful chime that sadly tells
The death of one more toilsome day.

The prairie broad—a winding trail,
Near which the summer blossoms grew ;
A man—a relic of his race,
With whiskers hanging from his face,
Through which the winds of evening blew.

Sore and weary, struggling onward,
Night o'ertook him on his way,
So with little thought of morrow,
Gone all care and bitter sorrow,
See, he sleeps midst fragrant hay.

Again the day ; the tramp awakes,
And notes the ditch stream's rapid flow ;
With clothes hung high on "hickory limb"
He plunges in to take a swim,
Which he hadn't had since years ago.

Forth from his bath he gaily steps,
From head to foot now irrigated ;
The hot sun sheds its genial rays,
The sprouts shoot forth in many ways ;
To wear strange garments he is fated.

Alfalfa blossoms spring to life,
Sunflowers mark his dripping locks,
And reaching from his very feet
To where his neck and whiskers meet
Are waving blooms of holly-hocks.

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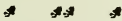
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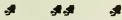
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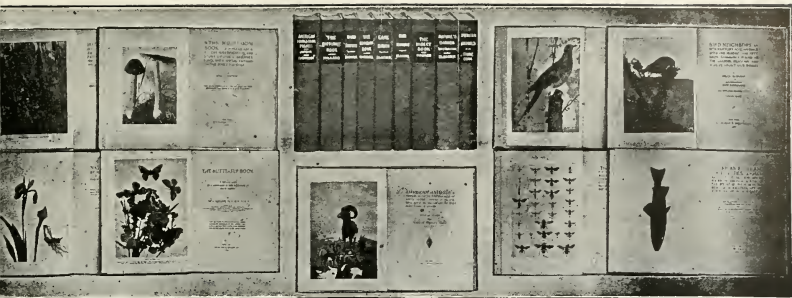
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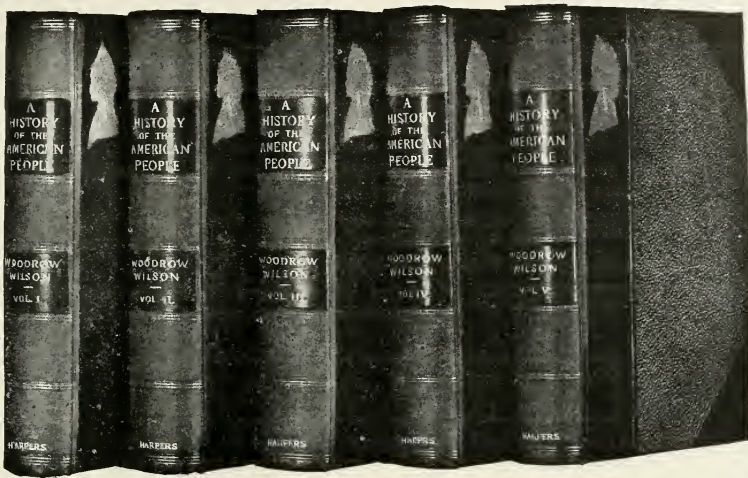
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2. The preservation and development of our national resources by the construction of storage reservoirs by the Federal Government for flood protection, and to save for use in aid of navigation and irrigation the flood waters which now run to waste and cause overflow and destruction.
3. The construction by the Federal Government of storage reservoirs and irrigation works wherever necessary to furnish water for the reclamation and settlement of the arid public lands.
4. The preservation of the forests and reforestation of denuded forest areas as sources of water supply, the conservation of existing supplies by approved methods of irrigation and distribution, and the increase of the water resources of the arid region by the investigation and development of underground supplies.
5. The adoption of a harmonious system of irrigation laws in all the arid and semi-arid states and territories under which the right to the use of water for irrigation shall vest in the user and become appurtenant to the land irrigated, and beneficial use be the basis and the measure and limit of the right.
6. The holding of an annual Irrigation Congress, and the dissemination by public meetings and through the press of information regarding irrigation, and the reclamation and settlement of the arid public domain, and the possibilities of better agriculture through irrigation and intensive farming, and the need for agricultural education and training, and the creation of rural homes as national safeguards, and the encouragement of rural settlement as a remedy for the social and political evils threatened by the congestion of population in large cities.

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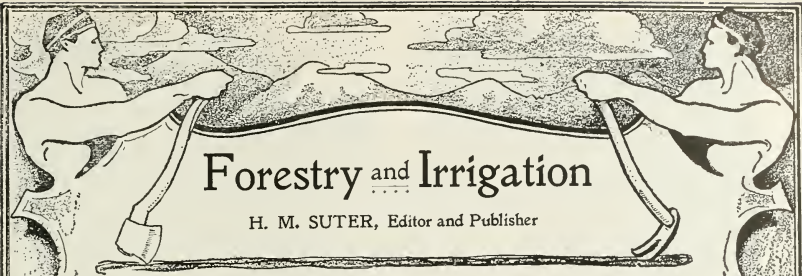
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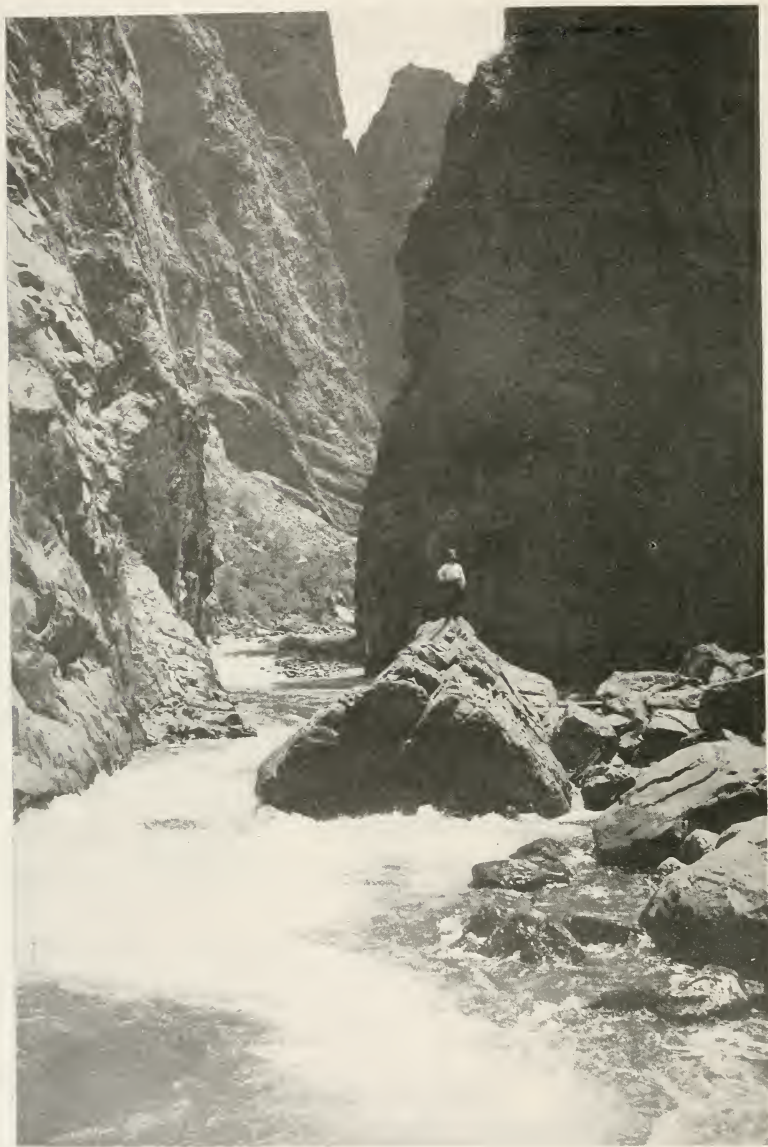
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Forestry and Irrigation.

VOL. IX.

APRIL, 1903.

No. 4.

NEWS AND NOTES.

A Noteworthy Tendency.

If any one doubts the force of the movement for a better policy in regard to the handling of our forests, the contents of this number of FORESTRY AND IRRIGATION should go a long way toward dispelling such doubts. President Roosevelt, long known as an advocate of forestry, who has given both forestry and irrigation prominent mention in several of his messages to Congress, showed plainer than ever his deep interest when on the evening of March 26 he addressed a meeting of the Society of American Foresters at Washington, D. C.

A reading of his address as printed elsewhere in this number will not only show the President's deep interest in forestry, but it will put the whole subject in a new and convincing light to many people. It contains a strong platform, not only for foresters, but the people of the country generally. It points to the importance of the profession of forestry, and warns the public of the need for intelligent use of our remaining forest resources.

In addition, this number contains an excellent address on "The Forester and the Lumberman," by Mr. Gifford Pinchot, Forester, U. S. Department of Agriculture, delivered at the banquet of the National Wholesale Lumber Dealers' Association, recently held in Washington. The theme of this address is the close relations that must exist between the lumberman and the forester if forestry is to reach its greatest use and the lumber industry is to be perpetuated. The interest this address aroused among the lumbermen shows the tendency of those men to give the question of forestry a fair trial.

Still another significant sign of the tendency of lumbermen to adopt forestry shown at the same meeting of lumber dealers was the excellent report of the Association's Committee on Forestry, which contains so much of value that it is reprinted in full elsewhere in this number.

Forestry is a good business proposition, as President Roosevelt and Mr. Pinchot so aptly stated in their addresses. What is more to the point, those men whose business is bound up in the forests, the lumbermen, are coming to see this. With general adoption of the principles of forestry by the lumbermen, the forest problems of the country will be near solution.



A. F. A. Directors Meet.

At a recent meeting of the Board of Directors of the American Forestry Association, held in Washington, a number of matters of interest to the Association at large were discussed. An active program for the remainder of the year is being thoroughly outlined, and a vigorous campaign will now be made both for increasing the membership of the Association and to further the purposes for which it stands.

Mr. F. H. Newell, who has for several years past been corresponding secretary, requested that his resignation be accepted, owing to press of work in connection with the Reclamation Service of the Government, of which he is the chief engineer. The Board selected Mr. E. A. Bowers to fill the vacancy. Mr. Bowers has been a member of the Board of Directors for several years, and has long been deeply interested in forestry, and especially in the work of the Amer-

ican Forestry Association. He was Assistant Commissioner of the General Land Office during the second Cleveland administration; is a lawyer of decided ability, and in general is especially well qualified for the work, and the Association is exceedingly fortunate in securing Mr. Bowers' services as secretary.

Mr. Whittlesey resigned as recording secretary, and it was decided by the Directors that it was hardly worth while to divide the duties of a corresponding and recording secretary between two men, and it was therefore decided that this work should be combined under Mr. Bowers' direction.

The Board appointed an executive committee consisting of Mr. Gifford Pinchot, Mr. E. A. Bowers, Mr. Geo. P. Whittlesey, and Prof. Henry S. Graves. The directors further decided to hold five stated board meetings during the year as follows: On the second Tuesday in March and May, the last Tuesday in October, the Tuesday before the second Wednesday in December, and the Thursday after the second Wednesday in December.

The matter of settling upon a city in which to hold the Association's summer meeting was taken up at this meeting. The secretary presented invitations from several cities, and after discussion it was decided to hold the next summer meeting at Minneapolis, Minn., some time in August, the exact date to be determined later.



Forest Reserve Policy.

The following statement respecting the present and future policy of the present administration relating to the establishment and control of forest reservations was recently made by Commissioner Richards, of the General Land Office:

"The President's purpose and desire is to protect and preserve the remaining forests upon public lands from the devastation and destruction which has been the fate of those in large portions of the Appalachian Mountains and in other forested sections of the country. In doing this a supply of timber will be preserved for future needs, and natural

sources of water supply will be so protected as to prevent flooding of the streams during the springtime and the melting of the snows, and to insure water for irrigation and other purposes during the dry season. The establishment and proper maintenance of forest reserves is indispensable to any extensive reclamation or cultivation of lands in the arid region under the recent act of Congress which appropriates for that purpose the proceeds of the sales of public lands.

"It is and has been the President's consistent policy to encourage the actual settlement of the country by home-builders in every way, to see that actual settlers within the forest reserves are accorded every reasonable protection, and that those living within the immediate vicinity of these reserves, who are dependent upon the reserves for grazing areas for cattle and horses and for necessary timber for building and fuel, are accorded access to the reserves for these purposes under such reasonable restrictions as will prevent waste and destruction. It has been so conclusively demonstrated that uncontrolled sheep grazing within forest reserves is injurious to the forest growth and to the natural water cover that the great migratory flocks of sheep are necessarily kept out of the reserves; but even this policy is pursued with cautious attention to the prevention of injury to those engaged in sheep-raising. The preservation of wild game, such as moose, elk, and deer, which is only a minor feature of the control of the forest reserves, is authorized by an act of Congress, which directs that those employed in the forestry service shall in all practical ways aid in the enforcement of the game and fish laws of the state or territory in which the forest reserve is located. The law of the state or territory upon this subject is to be the sole guide of these officers. The United States has interposed no law of its own, and the administration has given no directions to its forest officers other than that the local laws, whatever they may be, shall be enforced. In some of the western states and territories, notably Wyoming, the government forest rangers are by the laws of

the state made assistant game wardens of the state.

"The work of establishing and maintaining forest reserves will have such a vast and beneficial influence in the settlement and development of the western states and territories that it must be controlled by a fixed policy, to which matters of minor or temporary concern must give way for the general and permanent public good. The one guiding purpose of the administration in dealing with forestry, with pasturage, with irrigation, with the land generally, is to help and make easy the path of the home-builder, the small ranchman, or tiller of the soil, and not to let the land be exploited and skinned by those who have no permanent interest therein, and who do not build homes or remain as actual residents."



Appropriations for 1903-1904.

The Bureau of Forestry receives for the fiscal year of 1903-1904 an appropriation of \$350,000, an increase of \$59,000 over that for the present year. The Division of Forest Reserves, Department of the Interior, gets an appropriation of \$375,000, an increase of \$75,000 over last year.

The Division of Irrigation Investigations of the Department of Agriculture will get \$65,000 to continue its work during the coming year, the same amount as during the present year.



Profits of Irrigation in the East.

The rise in prices of agricultural lands in the last few years has made it necessary that farmers should get the largest possible return from their lands, and has created a general interest in whatever will help to that end. One of the aids now being considered is irrigation. In the East it is not, as in the West, absolutely necessary for the raising of any crops, but, like fertilizing or thorough cultivation, is a means of increasing the returns from land. The whole question is whether it will pay. The report of the irrigation investigations of the Department of Agriculture for the year 1901 gives

some valuable data on this question. The report covers experiments in Missouri, Wisconsin, and New Jersey.

A series of experiments extending over several years at the Wisconsin Experiment Station at Madison show a marked increase in yields of farm crops. The average increase in the yield of clover hay on irrigated land over that from unirrigated land has been 2.5 tons per acre; the average increase in yield of corn has been 26.95 bushels per acre, and potatoes show a gain of 83.9 bushels per acre. The annual cost of irrigation at Madison has been \$6.68 per acre, not including any interest on the investment, but including all extra labor. At current prices, this leaves a net profit from irrigation of about \$20 per acre on hay, \$11 per acre on corn, and \$73 per acre on potatoes. The conditions of soil and climate at Madison do not differ from those of the Middle West generally, and the results given above show that where water can be obtained without too large an outlay, irrigation as a part of intensive farming is very profitable.

Another series of experiments was begun for testing the effect of irrigation and fertilization on sandy soils, such as are common in large sections of Michigan, Wisconsin, and Minnesota. These lands are poor in plant food, and retain so little moisture that all attempts to farm them have failed. The experiments included the supplying of both manure and water. Manure alone was of little use, as there was not water enough to make the plant food available. Water alone produced good results, but the application of both gave the best results. The cost of irrigation was \$6.70 per acre, and the net gain from irrigation was as follows: Potatoes, \$30 per acre; corn, \$1 per acre; watermelons, \$58 per acre; muskmelons, \$45 per acre. From these experiments it seems that with special crops irrigation of the sandy lands is profitable, but the increase in yield of corn is not enough to justify the expense of securing a water supply.

In New Jersey water has been used on small fruits and vegetables, and the added returns due to irrigation vary a

great deal with the seasons. Some years no irrigation is needed, in others all crops need it, but in most years some crops are helped by it. Professor Voorhees, who has charge of this work, reports that, in his opinion, irrigation where tried has paid well. Pumping from streams or wells is the most common way of getting water for fruit and garden irrigation. Small plants, furnishing water enough for from five to ten acres, including pump and engine, cost from \$200 to \$500.



University of Michigan. On March 5 the Regents of the University of Michigan selected Professor Filibert Roth, of the Bureau of Forestry and formerly chief of the Division of Forest Reserves, Department of the Interior, to fill the chair of forestry in the University. With the assistance of Mr. C. A. Davis, Professor Roth will inaugurate a regular course in forestry with the opening of the next college year. As planned at present, it will be a two-year post-graduate course leading to the degree of Master of Science in Forestry.

The University and the State of Michigan are to be congratulated on this step, for few of the states offer a better field for effective work in forestry than Michigan. It is one of the older states, and although possessing an unusually well cultivated and prosperous farming community, it has, nevertheless, like a number of others, large forest districts where the soil conditions and climate will always restrict and discourage efforts at agriculture. Of the 36,000,000 acres included in the area of the state, fully one-half is located in what may be termed the forest counties, including the 10,000,000 acres of the Northern Peninsula. Of these forest counties, full 90 per cent is not even settled but is land still in the hands of lumbermen, speculators, and the state and federal governments.

After years of effort to get rid of the large tracts of tax-title lands, the state is beginning to pursue the right policy and follow the wise example set by the states of New York and Pennsylvania,

in reserving these lands, which can only be made useful to the people of the country if managed by a permanent body and preferably by the state or nation itself.

In addition to this wise change of policy on the part of the state, there is a general awakening among all classes of land-owners. Nearly all people begin to see the simple truth, that no county or town, and usually not even a single quarter-section of land is all tillable land, but that there is everywhere land which is better left to forest.

A school of forestry at the state university should go a long way toward arousing the people to a full appreciation of the forest needs of the state. In Professor Roth the University of Michigan has secured a man of wide experience as a forester. He is one of their own graduates; was for several years in the faculty of the New York State College of Forestry, and above all, he has an intimate knowledge of the forest conditions of Michigan. With the forest school in such hands, and an excellent state forest commission composed of men thoroughly alive to the situation, it would seem that an unusually good start has been made in Michigan.



Forestry in Canada. The annual meeting of the Canadian Forestry Association was held at Ottawa in March. For the first time the association elected a practical lumberman to the presidency, Mr. Hiram Robinson, of Hawkesbury, Ontario, being chosen.

The complete list of officers elected is as follows: Patron, the Earl of Minto, Governor-General of Canada; Honorary President, William Little, Montreal; President, Hiram Robinson, Hawkesbury; Vice-President, Aubrey White, Deputy Commissioner of Crown Lands for Ontario, Toronto; Secretary, E. Stewart, Dominion Superintendent of Forestry, Ottawa; Assistant Secretary and Treasurer, R. H. Campbell, Department of Interior, Ottawa; Directors, William Saunders, Director of Experimental Farms, Ottawa; J. R. Booth, Ottawa; Prof. John Macoun, Ottawa;

Thos. Southworth, Director of Forestry for Ontario, Toronto; C. Jackson Booth, Ottawa; John Bertram, Chief of Forest Rangers for Ontario, Toronto; E. G. Joly de Lotbiniere, Quebec.

The association will meet next year in Toronto, in order to generalize interest in its work.

Two of the most important subjects discussed were those of forest fires and the establishment of an educational course in forestry. In connection with the former, a resolution was adopted, calling on the Dominion and Provincial governments to increase the number of fire rangers, explore and survey existing tracts of timber in order to ascertain their extent and value, and determine which are suitable for agriculture and which are not. The resolution also calls on the governments to exercise more care and caution in the placing of settlers, so as to keep them out of timber country unsuited for agriculture, and where their land-clearing and scrub-burning operations have been and will continue to be a source of great danger to the valuable timber on all sides.



New Chief of Forest Reserves. As noted in the February number of FORESTRY AND IRRIGATION, Professor Filibert Roth resigned his position as chief of the Division of Forest Reserves in the General Land Office. His place has since been filled by the selection of Mr. Hiram H. Jones.

Mr. Jones has had a long experience in the Land Office, his term of service there being about 21 years. He first organized the Division of Forest Reserves, and has been actively connected with it ever since. He was at one time assistant chief of the Special Service Division, and has been principal examiner of contests and land claims, as well as assistant chief of the Division of Forest Reserves.

From his long connection with the service Mr. Jones has gained a wide knowledge of the matters that come before the Land Office, and he should make a successful chief of a division which is of decided importance to the country at large.

Forest Experiment Station.

The Bureau of Forestry of the U. S. Department of Agriculture has established a permanent forest experiment station at the University of California. Dr. W. K. Hatt, recently called from the chair of applied science in Purdue University to serve as civil engineer in the Bureau of Forestry, has gone from Washington to organize the station. The resources of the civil engineering laboratory of the university have been placed at his disposal. A civil engineer who will go from Washington to take charge of the work, and his student assistants, will be continuously engaged hereafter in commercial and scientific investigations as to California woods. San Francisco lumber dealers have offered to supply all the timber needed. Laboratory investigations will be conducted as to the strength of various California timbers, the effects on timbers of wet and dry weather, of heat and cold, elasticity and durability, preservative methods, ways of seasoning, and the like. The results secured at this station will be made available for general use by publication as bulletins of the Bureau of Forestry.



State Irrigation Laws.

The legislatures of most of the states and territories of the arid region have now adjourned, but there is not much definite information available here as to what has been accomplished during the session in regard to irrigation matters, except in a few cases. A statement has been prepared by states, showing the information now at hand concerning the results of the various sessions.

California.—The general code of irrigation laws usually spoken of as the Works bill was not passed. The bill known as the Curtin bill was passed by both houses after vigorous discussion, and at last advices was in the hands of the governor. It provides that whenever the supply of water of individuals or corporations who are engaged in the business of furnishing water shall become insufficient to meet the demands of customers, the supply shall be prorated in proportion to the quantity previously

furnished them, the reduction being on a uniform basis among all of the customers. An act has been passed and approved by the governor providing for the dissolution of irrigation districts, the district irrigation laws having failed to provide any method for dissolving the corporations formed under it. An act has also been approved providing for cooperation with the Federal Government in several lines of work and making appropriations as follows: With the Director of the U. S. Geological Survey, for the purpose of making topographic maps, \$20,000; for the purpose of gaging streams, surveying reservoir sites and canal locations for the conservation and utilization of the flood or storm waters of the state, \$15,000; with the Chief of the Bureau of Forestry, for the purpose of studying the forest resources of the state and their proper conservation, with a view to stimulating a proper state forest policy, \$15,000; with the Director of the Office of Experiment Stations, for the purpose of ascertaining the best methods of distributing and using water, \$10,000. These sums are provided to be used in connection with an equal amount to be furnished by the bureaus of the Federal Government as specified.

Colorado.—A bill was passed authorizing the State Canal Commission, having in charge the project for carrying the water of the Gunnison River by means of a canal or tunnel into the valley of the Uncompahgre River, to turn over its material and other matter relating to the project to the Reclamation Service of the Federal Government. As the Secretary of the Interior has within the last few days authorized the Reclamation Service to proceed with its investigations, with a view to the construction of the Gunnison tunnel, as explained in another part of this issue, it is probable that the state material will be turned over to the Federal Government in pursuance of this statute.

Idaho.—A law has been passed providing for the control and regulation of water-right appropriations by the state engineer. A very elaborate system is provided for by this act, under which the state engineer is required to pass

upon intended appropriations of water when the application is first made; then, when it is claimed that the diversion works have been completed, he is to examine them on the ground and to issue his certificate of approval if found satisfactory, and, finally, when the water has been used for irrigation, he is to make further examination in order to decide whether the waters are used in accordance with original application, and, if so, to issue a license for the water right to the extent that the same has been completed in accordance with the state law.

Nevada.—A bill for the establishment of the office of state engineer and for general cooperation of the state authorities with the Reclamation Service of the Federal Government has been passed.

Utah.—A new set of irrigation laws was enacted at the recent session of the legislature.

Wyoming.—Three measures relating to irrigation were passed by the Wyoming legislature. One relates to the duties of water division superintendents, while a second provides that all reservoirs hereafter constructed shall be carried to completion under the supervision of a deputy state engineer. Still another bill passed relates to the adjudication of rights along tributary and main streams.

The following comment on the second of these laws, reprinted here from the *Wyoming Industrial Journal*, is interesting from the fact that provisional orders regarding the pushing of the Sweetwater project in central Wyoming were included in the recent instructions of the Secretary of the Interior to the Reclamation Service:

“It has been discovered that a law enacted by the Wyoming legislature, recently adjourned, will have much to do with the proposed government construction of reservoirs in this state. Indeed, it is held by some authorities who have been acquainted with the full provisions of the law that the state engineer of Wyoming will have supervision and that the General Government cannot construct reservoirs in this state until the state engineer has been consulted in the matter.

“The laws already in force in Wyo-

ming hold the state engineer responsible for the safety of those living on streams below reservoirs. He is obliged to examine plans for the dams needed in these structures and should visit the work during the time operations are in progress. Owing to the increased interest in reservoir work and the impossibility of the state engineer visiting all of the sites, a bill was introduced in the legislature providing that all persons constructing dams above a certain height, already prescribed by law, should employ an engineer, who should also act as a deputy of the state engineer, and to whom instructions shall be issued should such be necessary.

"This departure upon the part of the state will insure good construction and put the state engineer in a position where he will be willing to shoulder the responsibility.

"It has been a matter of some surprise that the measure has become a law without bringing forth criticism or comment from those who do not understand

or appreciate its provisions. It is held by those best informed that government construction will thus be under state control, and must be carried on the same way as other enterprises which come under the supervision of the state engineer."



**As Others
See Us.**

An article in the February number of the *Indian Forester* on "Progress in the United States" opens with the following paragraph:

"How is it that the States have made more moral progress in forestry as a cause in ten years than India has done or will do in a century? There are various reasons, but the fundamental one is that the President, Congress, and an increasing section of the people *mean* forestry, whereas in India the progress of the department has been a continual struggle with the people, and often with the local authorities. The other important reason is that the people there are educated to conviction."

THE IMPORTANCE OF PRACTICAL FORESTRY.*

A CLEAR AND CONCISE STATEMENT OF THE VALUE
AND AIMS OF SCIENTIFIC FORESTRY AND THE
GREAT WORK BEFORE AMERICAN FORESTERS.

BY

PRESIDENT THEODORE ROOSEVELT.

I HAVE felt that this evening the meeting was of such a character as to not merely warrant, but to require, that I should break through my custom of not going out to make speeches of this sort, for I believe that there is no body of men who have it in their power today to do a greater service to the country than those engaged in the scientific study of and practical application of approved methods of forestry for the preservation of our woods in the

United States; and I am glad to see here this evening not only the officials, including the head of the Department of Agriculture, but those, like ex-Governor Richards, most concerned in carrying out the policy of the Department of the Interior, for the forest policy of any country must be an essential part of its land policy.

And now, first and foremost, you can never afford to forget for one moment what is the object of the forest policy.

*An address delivered before the Society of American Foresters, at Washington, D. C., Thursday evening, March 26, 1903.

Primarily that object is not to preserve the forests because they are beautiful, though that is good in itself; not to preserve them because they are refuges for the wild creatures of the wilderness, though that, too, is good in itself; but the primary object of the forest policy, as of the land policy, of the United States is the making of prosperous homes. It is part of the traditional policy of home-making of our country. Every other consideration comes as secondary. The whole effort of the government in dealing with the forests must be directed to this end, keeping in view the fact that it is not only necessary to start the homes as prosperous, but to keep them so. That is where the forests have got to be kept. You can start a prosperous home by destroying the forest, but you don't keep it prosperous.

And you are going to be able to make that policy permanently the policy of the country only in so far as you are able to make the people at large, and above all the people concretely interested in the results in the different localities, appreciative of what it means. Give them a full recognition of its value, and make them earnest and zealous adherents of it—keep that in mind, too.

In a government such as ours, it is out of the question to impose a policy like this from without. The policy as a permanent policy can come only from the intelligent conviction of the people themselves that it is wise and useful—nay, indispensable. We are going to decide in the long run whether we will keep or not keep the forests of the Rocky Mountains, accordingly as we are able to make the people of the states around the mountains, in their neighborhood, hearty believers in the policy of forest preservation.

That is the only way in which, permanently, this policy can be made a success. In other words, you have got to convince the people of the truth, and it is the truth, that the success of home-makers depends in the long run upon the wisdom with which the nation takes care of its forests. Now, that seems a strong statement. It is none too strong. There are small sections of this country,

as of every country, where what is done with the woodland makes no difference; but over the great extent of the country the ultimate well being of the home-maker is going to depend in a very large part upon the intelligent use made of the forests.

Now, in other words, you yourselves have got to keep this practical object before your mind. You have got to remember that a forest which contributes nothing to the wealth, progress, or safety of the country is of no interest to the government, and should be of little to the forester.

Your attention must be directed not to the preservation of the forests as an end of itself, but as a means for preserving and increasing the prosperity of the nation.

"Forestry is the preservation of forests by wise use," to quote a phrase I used in my first message to Congress, and keep before your minds that definition, that forestry is the preservation of forests by wise use; not by abbreviating the use, but by making the forest of use to the settler, the rancher, the miner, the man who lives in the neighborhood, and, indirectly, the man who may live hundreds of miles off down the course of some great river, which has had its rise among the forest-bearing mountains.

The forest problem is in many ways the most vital internal problem of the United States. The more closely this statement is examined, the more evident its truth becomes. In the arid region of the West, agricultural prosperity depends first of all upon the available water supply. Forest protection alone can maintain the stream flow necessary for irrigation in the West, and can prevent the great and destructive floods so ruinous to communities farther down the same streams that head in the arid regions.

The relation between the forest and the whole mineral industry is an extremely intimate one, for, as every man who has had experience in the West knows, mines cannot be developed without timber, usually not without timber close at hand. In many regions throughout the arid country ore is more abundant than wood, and this means that if

the ore is of low grade, the transportation of timber from any distance being out of the question, the use of the mine is extremely limited by the amount of timber available close at hand.

The very existence of lumbering, of course—and lumbering is the fourth great industry of the United States—depends upon the success of your work, of our work as a nation, in putting practical forestry into effective operation.

As it is with mining and lumbering, so it is in only a less degree with transportation, manufactures, commerce in general. The relation of all of these industries is of the most intimate and dependent kind to forestry.

It is a matter for congratulation that so many of these great industries are now waking up to this fact, the railroads especially, managed as they are by men who are obliged to look ahead; who are obliged by the very nature of their profession to possess a keen insight into the future, have awakened to a clearer realization of the vast importance of economical use both of timber and of forests.

Even the grazing industry, as it is carried out in the great West, which might at first sight appear to have little reference to forestry, is nevertheless closely related to it, because great areas of winter range, ranges available and good for winter grazing, would be absolutely useless without the summer range in the mountains where the forest reserves lie.

As all of you know, the forest resources of our country are already seriously depleted. They can be renewed and maintained only by your coöperation, by the coöperation of the forester with the lumberman, with the practical man of business in all his types, but above all, with the practical man of business whose profession is lumbering. And the most striking and encouraging fact in the forest situation is that lumbermen are realizing that practical lumbering and practical forestry are allies, not enemies, and that the future of each depends upon the other. The resolutions passed at the last meeting of the representatives of the lumber interests, which

occurred here in Washington, were a striking proof of this fact, and a most encouraging feature of the present situation. As long as we could not make the men concerned in the great lumber industry realize that the foresters were endeavoring to work in their interest, and not against them, the headway that could be made was but small, and we will be able to work effectively and bring about important results of a permanent character largely in proportion as we are able to convince those men, the men at the head of that great profession, of that great business, of the practical wisdom of what the foresters of the United States are seeking to accomplish.

The last analysis, the attitude of the lumberman toward your work, will be the chief factor in the success or failure of that work. In other words, gentlemen, I cannot too often say to you—as, indeed, it cannot be too often said to any body of men of high ideals and good scientific training who are endeavoring to accomplish work of worth for the country—that they must keep their ideals and yet seek to realize them in practical ways.

The United States is exhausting its forest supplies far more rapidly than they are being produced. The situation is grave, and there is only one remedy. That remedy is the introduction of practical forestry on a large scale, and of course that is impossible without trained men—men trained in the closet and by actual field-work under practical conditions.

You have created a new profession—a profession of the highest importance, a profession of the highest usefulness toward the state; and you are in honor bound to yourselves and to the people to make that profession stand as high as any other—as the profession of law; as the profession of medicine; as any other profession most intimately connected with our highest and finest development as a nation. You are engaged in pioneer work in a calling whose opportunities for public service are very great. Treat the calling seriously. Remember how much it means for the country as a whole. Remember that if you do your work in a crude fashion,

if you only half learn your profession, you discredit it as well as yourselves. Give yourselves every chance, by thorough and generous preparation and by acquiring, not only a thorough knowledge, not only the knowledge that goes deep, but a wide outlook over all the questions on which you have to touch. The profession which you have adopted is one which touches the Republic on almost every side—political, social, industrial, commercial—and to rise to its level you will need a wide acquaintance with the general life of the nation and a view-point both broad and high. Any profession which makes you deal with your fellow-men at large makes it necessary that if you are to succeed you should understand what those fellow-men are, and not merely what they are thought to be by people who live in the closet or the parlor. You have got to know who the men are with whom you are to work, how they feel, how far you can go, when you have to stop, when it is both safe and necessary to push on. You have got to know all of those things if you are going to do work of the highest value.

I believe that the foresters of the United States will create a more effective system of forestry than we have yet seen. If not, gentlemen, if you do not, I will feel that you have fallen behind your brethren in other callings, and I do not believe that you will fall behind them. Nowhere else is the development of a country more closely bound up with the creation and execution of a judicious forest policy. This is, of course, especially true of the West, but it is true of the East also. Fortunately, in the West we have been able, relative to the growth of the country, to begin at an earlier day, so that we have been able to establish great forest reserves in the Rocky Mountains, instead of having to wait and attempt to get Congress to pay a very large sum for their creation, as we are now endeavoring to do in the Southern Appalachians.

In the administration of the national forest reserves, in the introduction of conservative lumbering on the timber tract of the lumberman and the wood-

lot of the farmer, in the practical solution of forest problems which affect well nigh every industry and every activity of the nation, the members of this Society have an unexampled field before them. You have a heavy responsibility. Every man that does serious work—work worth doing—has on him a heavy responsibility. You have a heavy responsibility, for upon the development of your work the development of forestry in the United States and the protection of the industries which depend upon it will largely rest.

You have made a good beginning, and I congratulate you upon it. Not only is a sound national forest policy coming rapidly into being, but the lumbermen of the country are proving their interest in forestry by practicing it.

Twenty years ago a meeting such as this to-night would have been impossible, and the desires we here express would have been treated as having no possible relation to practical life. We have reached a point where American foresters, trained in American forest schools, are attacking American forest problems with success. That is the way to meet the larger work you have before you. It will be a difficult work, which, again, is true of almost any work worth doing; it will be a difficult work, and all the more so because precedents are lacking. It will demand training, steadiness, devotion, and *esprit de corps*, fealty to the body of which you are members, a desire to keep the ideals of that body high. The more harmoniously you work with each other, the better and more effective your work will be; and a condition precedent upon your usefulness to the body politic, as a whole, is the way in which you are able to instill your own ideals into the mass of your fellow-men with whom you come in contact, and at the same time to show your ability to work in a practical fashion with them, to convince them that this is a business matter. It will be for them to cooperate with you to convince the public of that, and above all, so to convince the people of the neighborhoods in which you work, and especially the lumbermen and the others who make their life trades dealing with the forests.



DR. BERNHARD E. FERNOW,

DIRECTOR OF THE NEW YORK STATE COLLEGE OF FORESTRY.

DR. BERNHARD E. FERNOW, director of the New York State College of Forestry since 1898, was born at Inowraclaw, Posen, Prussia, on January 7, 1851. His education was obtained first at the gymnasium at Bromberg, and then at the Forest Academy of Muenden, and finally at the University of Königsberg, Germany. He came to the United States in 1876, and engaged in business, but later was made chief of the Division of Forestry, U. S. Department of Agriculture, in 1886, a position which he filled until 1898. In addition to his forest work, he was a constant promoter of all biological investigations leading to a broader understanding of the principles of forestry. In 1883 he was elected secretary of the American Forestry Association, and later also held the position of chairman of the Executive Committee, and finally first vice-president of that organization, an office which he still holds. For a time he was also editor of the *Forester*, its official organ. The degree of Doctor of Laws was conferred on Dr. Fernow by the University of Wisconsin in 1897.

Dr. Fernow was the first of those now actively engaged in forest work to take up the question in the United States. From the beginning he has been an active participant in the general forest movement, and his work throughout has been characterized by vigor. The New York State College of Forestry has prospered under his direction, and its graduates are found in the service of the national and state governments, private individuals, and lumber companies.

Dr. Fernow, in addition to his work at the College of Forestry, has lectured on forest subjects in both the United States and Canada. He is a pleasing and convincing speaker, a deep thinker, and ready debater. He has written much on forest matters, and his recently published book, "Economics of Forestry," is a notable contribution to the literature of the subject.



DR. CARL ALVIN SCHENCK,

DIRECTOR OF THE BILTMORE FOREST SCHOOL.

DR. CARL ALVIN SCHENCK is widely known as the forester to the Biltmore estate, in North Carolina. He was born March 25, 1868, at Darmstadt, in Hesse; attended the high school and polytechnic institute in his native town; studied a year at the University of Tübingen, and in 1888 entered for the prescribed course in forestry at the University of Giessen. From that institution he was graduated in 1891, and immediately entered upon the military service which every able-bodied German is obliged to perform. In 1894, after some further study, he passed the state examination and was appointed *Forstassessor*, or assistant-in-forestry to the government of Hesse-Darmstadt. In 1895 he obtained the degree of Doctor of Philosophy from the University of Giessen.

Dr. Schenck's energy and quick perception of all that relates to his profession recommended him to Sir Dietrich Brandis, the German forester, to whom is due the great credit of establishing systematic forestry in British India. It was natural, therefore, that when Mr. Vanderbilt asked Sir Dietrich to recommend a man to manage his forest estate in North Carolina, the latter proposed his young friend Schenck. In this way Germany lost a good forester and the United States gained one.

Since taking up his work at Biltmore, in 1895, Dr. Schenck has shown his ability to adapt his German training and German point of view to American forest conditions; he has broadened himself and so improved the forest under his charge that it is to-day the most conspicuous example of successful forest management in this country. In addition to all the work attendant upon this task, Dr. Schenck, with Mr. Vanderbilt's concurrence, established a school for foresters in 1898. The course of study is practical as well as theoretical, and aims to give a young man, in one year, a comprehensive idea of the objects and methods of the forester. In this the school is unique; its success is an indication of Dr. Schenck's idea of the present need in that direction.



PROFESSOR HENRY SOLON GRAVES,

DIRECTOR OF THE YALE FOREST SCHOOL.

PROFESSOR HENRY SOLON GRAVES, who has conducted the Yale Forest School in an able manner from its beginning, was born at Marietta, Ohio, May 3, 1871. He prepared for college at Phillips Academy, Andover, Mass., and graduated from Yale University in 1892. The following year he spent teaching at King's School, Stamford, Conn., during which time he also began the study of forestry. Having decided to take up forestry as a profession, he spent a year at Harvard, and then went to Germany, where he studied forestry at the University of Munich. He first took up active forest work in the United States in 1895 with Mr. Gifford Pinchot, then a consulting forester. Professor Graves engaged in work in the Adirondacks, and soon made himself an authority on forest matters pertaining to that region.

In the fall of 1898 he became assistant chief of the Division of Forestry, U. S. Department of Agriculture, a position in which he showed ability of a high order. In 1900 Mr. Graves left the Division of Forestry to become director of the Yale Forest School.

In the brief time that has elapsed since then, the school has shown remarkable progress under his direction, and is graduating annually carefully trained foresters. Professor Graves' work at the Yale Forest School has more than kept pace with the high promise shown in his early efforts. He is a tireless worker, and combines with enthusiasm for his profession an unusually intimate knowledge of the forest conditions and problems of the United States.

Professor Graves has contributed a number of writings on forest subjects. Among these may be mentioned "The White Pine," written in collaboration with Mr. Gifford Pinchot; "Practical Forestry in the Adirondacks," and the "Woodsmen's Handbook," which is one of the most useful of American forest publications.

THE FORESTER AND THE LUMBERMAN.*

THE FUTURE OF THE LUMBER INDUSTRY AND THE SUCCESS OF FORESTRY IN A GREAT MEASURE DEPEND ON HEARTY COÖPERATION BETWEEN THEM.

BY

GIFFORD PINCHOT,

FORESTER, U. S. DEPARTMENT OF AGRICULTURE.

IT is interesting that great movements, like that for forest preservation, run in cycles; and very curious that this forest movement, into the culmination of which we are just entering, began with the landing of the first settlers on the Atlantic coast. They came from a country where forests had long been protected, where the value of woods was known, and as soon as they landed on the shores of this country, with nearly three thousand miles of forest in front of them, one of the first things they did was to pass laws to regulate the size of timber to be cut for cordwood, and to preserve the pine trees fit to make masts for ships. Then came the great spread of our pioneers all over the West, the movement of which, especially in the years immediately following the civil war, carried railroad building throughout our country to a point never reached anywhere before. The old feeling of friendliness toward the forest died out because there was no apparent justification for it, and then began the greatest era of forest destruction man has ever seen. That era is now approaching its culmination and end in the United States.

When persons interested in forestry first began to advocate forest preservation in the United States, they were far in advance of the economic situation. They began by calling the lumberman a vandal, and pointing the finger of reproach at what they called his greed, not seeing that the lumberman is a business man like other business men, engaged in as honorable a calling, and

swayed by the same motives as they. We understand now that forestry is a business, and that it will be applied only when it is worth while from a business point of view. The early friends of the forest advocated the introduction of German methods in this country, and proposed measures that every lumberman knew were absolutely impossible. They directed their attention to the replacing of the forests that had already been destroyed, while we think first of all of keeping the forests from being destroyed when the ripe timber is cut.

In the first place, forestry is simply the application of knowledge and common sense to the problem of forest preservation. It is a way of protecting and perpetuating the lumber industry, and without it that industry cannot be protected or long endure. It is a way of securing a new crop on cut-over land. It is treating the forest as a crop producer and not as a mine. When you dig the mineral out of a mine, it is gone for good; when you take the timber out of a forest in a simple, common-sense way of practical forestry, you get results in the second crop.

It is all based on the primary question, Will it pay? If forestry will not pay, then it is of absolutely no use talking to you, or to any other body of American business men, about the application of forestry. We must show first that forestry will pay. Suppose one of you gentlemen, who owns an area of forest land, made to the Bureau of Forestry a request for practical assistance on the ground in handling this land, in accord-

* Address delivered at the eleventh annual meeting of the National Wholesale Lumber Dealers Association, Washington D. C., March 5, 1903.

ance with a printed offer we have made. You would want to know what timber there is now on your land, what your land will produce under certain definite methods of management, what those methods are, and whether the result at the end of a given number of years will pay taxes and interest and a profit on the investment. All these things the Bureau would help you to ascertain. Let us take a single acre of spruce as an illustration. We should find out how many 5-inch spruce, how many 6-inch, how many 7, 8, and so on up, there are on this acre. We should find that the average spruce tree grows say an inch in diameter in seven years. We might then decide to recommend to you to cut all trees 11 inches and over in diameter. You would then get, say 2,500 feet to the acre. You will have a definite number of 8, 9, and 10-inch trees left. In seven years these trees will have grown one inch; in twenty-one years, an 8-inch tree will have grown to 11 inches. You know how many trees there are of each size, how many are likely to die, and approximately what the price of spruce is going to be at that time, figuring on the present basis. Then you have the proposition reduced to a simple mathematical calculation. Lumbermen in the Adirondacks find that it pays. There you have the essence of the whole thing.

As I said, this is a business matter. The time has come when it is worth your while to look into it, for many of the great lumber concerns throughout the United States are taking up forestry.

The point I want to make is that this is a simple, common-sense proposition which must rest for its acceptance upon your business sense. You know far better than I do the conditions of the forests of the country as to supply and demand. The White Pine industry in the Northwestern States reached its culmination about 1890, and has been sliding down hill ever since, and lumbermen have been moving to the West and South. There has been a very great stimulus to the production of southern pine. In the extreme West the production has often been equaled by the waste from fire. It has been estimated that

in western Washington 20 per cent of the original stand has been cut and 22 per cent, or 46,000,000,000 feet, has been burned—a dead loss absolutely to everybody. The introduction of practical forestry means the use of timber instead of its destruction by fire or by unintelligent lumbering.

I have no interest whatever in the protection of the forest *per se*. Unless it serves some useful purpose, a standing forest appeals to me not at all (except from the merely æsthetic side). I want it distinctly understood that forest protection is to the forester a means, not an end, as the President said so well in his message of 1901. If a forest is of no use, then it is useless. Forest preservation is not a fad, but a tool. The lumber industry holds a vast place in the upbuilding of our country, and if it has done harm in one direction, it has done enormous good in another; but we are reaching a point now where progress in production can no longer be fed for any length of time by the use of new species as the substitutes for the old, as the Hemlock succeeded White Pine in Pennsylvania. We have now to look squarely in the face the question whether or not the lumber industry is to be preserved. I need not tell a gathering such as this how vital to the interests of the country a timber supply is. We know something from practical experience what a coal famine is. We shall not learn for many years what a wood famine is, but we are enormously overcutting the production of our forests. East of the Mississippi we have just about half of the area of timber lands that we had when the country was settled.

The only thing which can be relied upon to protect your industry and the enormous interests which depend upon it is forestry. We must consider from now on that the forest is a crop; that methods of renewing it are just as vital to you, who are interested in cutting it down, as to those who are interested in building it up. You have got to eliminate, as we foresters have already eliminated, the differences in the points of view between lumbermen and foresters. It is one of the great delights of my work

to find that you understand, as we do, that the lumberman is much nearer the forester and the forester the lumberman than either is to any other class. You are the axe that does the work; we are the helve that serves to give it direction. If we cannot work with you, who own already more than 50,000 square miles of timber—if we cannot work with you in preserving that timber and keeping it productive, then we shall not work effectively for the preservation of the forests of the United States. If we cannot work with you, if our position does not commend itself to you, and if we cannot have your support, then truly we shall need help. We can attend to the forests of the government or of the states to some extent without your aid, but first or last the great bulk of the forest lands of the United States will pass through the hands of the lumbermen, and upon their attitude will depend the huge interests of this country in the protection of its timber supply.

I have been asked, in addition to these remarks about forestry, to say a word or two concerning forest conditions in the Philippines. I was fortunate enough to make a six weeks' trip through the islands. I found a great area of productive forests, most of it in admirable condition for lumbering and easily accessible. The demand for lumber in the islands is so great that there is a very large importation from the Pacific Coast, because the Philippine lumbermen are not able to supply it. I found not only timbers of great value for cabinet wood, but others equally valuable for construction purposes, including some of the best ship-building timbers in the world. There is Narra, which is like Mahogany, and Ebony and Camagon, which correspond with *Lignum Vitæ*, and another like Rosewood, and so on. A very large proportion of these woods sink in the water when they are green, so that a regular method of logging is to drag these logs down into the sea at low tide and let them lie there until the lighter can come along and pick them up.

There will be a very great opportunity for lumbering in the islands as soon as the conditions of the country will permit it. At present the millmen who are there are unable to get as much timber as the supply demands, partly because of the death of the water buffalo, the only draft animal for logging, 90 per cent of which are dead of the rinderpest. When these conditions shall be remedied and the water buffalo are replaced; when the Filipinos have learned to work, as they will readily learn under the instruction of the Americans, there is going to be an enormous expansion of the lumber trade in the islands, and, in my judgment, it is going to coincide with the introduction of wire-rope machinery.

All the cutting of timber that goes on in the Philippine government forests is carried out under the regulations of the insular Bureau of Forestry, and nearly all the forest there belongs to the government. We are going to have in the islands one of the most productive forest regions of the globe, both for our own markets and for all the markets of the east, all of it conserved by practical forestry. It is the finest opportunity for practical forestry that I have ever had anything to do with.

As a man sees what the Americans are doing out there in the islands, he cannot help being prouder and prouder of being an American, of belonging to a nation that is dealing with a problem so enormous and difficult in so thoroughly fine a way. I have tramped through the woods out there with the soldiers; I have followed the trails they had to travel; have been bitten by the same leeches; have slept on the same ground, eaten the same "grub," and know something of the hardships they have had to endure without a whimper, and I have come back with the perfectly definite conviction that the thing to be wondered at is not that an occasional soldier went wrong and committed an act of cruelty, but that so little of it was done under so great provocation.

A STEP FORWARD IN NATIONAL IRRIGATION.

FIVE PROJECTS APPROVED BY THE SECRETARY OF THE INTERIOR—EFFORTS OF RECLAMATION SURVEY WILL BE CONCENTRATED ON THESE—OTHER IRRIGATION VENTURES BEING WORKED UP IN ALL THE STATES AND TERRITORIES AFFECTED BY THE IRRIGATION LAW.

ON March 14, Secretary Hitchcock, of the Department of the Interior, on the recommendation of the Director of the Geological Survey, granted authority for the acquisition of necessary property and rights of way preliminary to the construction of irrigation works in five localities under authority of the reclamation act approved June 17, 1902. The construction remains subject to the feasibility of obtaining the necessary rights and the adjustment of private claims in such a manner as to comply with the provisions of the act. The five projects referred to are as follows:

Wyoming—Sweetwater dam.

Montana—Milk River project.

Colorado—Gunnison tunnel.

Nevada—Truckee project.

Arizona—Salt River reservoir.

These projects are estimated to cost \$7,000,000, and will provide for the irrigation of 600,000 acres of arid land; and in addition thereto the Gray Bull reservoir project in Wyoming is to be taken up immediately.

The authority granted relates to the projects upon which examinations have been made in sufficient detail to justify estimates and cost of results. Several others in other states are well advanced as regards investigation, and it is expected that further recommendations can be made after the close of the coming field season. The efforts of the Reclamation Survey will be concentrated on the above five projects as far as can be done without detriment to examinations of other proposed irrigation works.

The Secretary has also authorized the expenditure during the present calendar year of \$450,000 upon surveys, borings for foundations, and other examinations, which will be carried on in all of the states and territories included within the provisions of the national irrigation law.

THE SWEETWATER DAM.

This project provides for the building of a dam on the Sweetwater River at a place known as Devil's Gap, which is about 60 miles west of the town of Casper, at the terminus of the Fremont, Elkhorn & Missouri Valley Railroad. The Sweetwater River receives the drainage of the central portion of Wyoming, and the waters stored in this reservoir would be of great value in the development of the lands of the North Platte region. The accompanying illustration shows the pass in the mountains where the dam is to be constructed.

The site of the proposed dam was first examined by Capt. Hiram M. Chittenden, who reported favorably on it. When it was found that the reservoir capacity was sufficient, river measurements were begun and the questions of water supply and the cost of a dam are now under consideration. A careful examination of the entire region included in the project was begun last summer under the direction of W. W. Schlecht. The work will be pushed as rapidly as possible, and it is hoped to have a complete report on the site at an early date.

THE MILK RIVER PROJECT.

One of the most interesting of the projects sanctioned by the Secretary of the Interior is that of the Milk River scheme in northern Montana.

This provides for the building of a dam at the outlet of St. Mary's Lake to hold back the flood waters. The water will then be conducted by a canal (shown in the accompanying illustration) across the gravel ridges which divide the eastern and western drainage basins to the south fork of Milk River. From here the river goes into Canada

for a short distance, then returns to the United States.

The plan finally provides for the use of this water to irrigate the great bodies of public land in northern Montana, between the Milk and Missouri Rivers. In round numbers the amount of land that can be reclaimed by this venture is about 200,000 acres.

To show fully the conditions in this region some description of the topography is necessary. Where the Rocky Mountains cross Montana west of the center, just south of the boundary be-

small amount of water obtained from local rainfall on the high plains.

The most important of the lakes near the international boundary line are at the head of St. Mary's River. This stream, collecting the mountain drainage, flows north into Hudson Bay.

For many years the people of Montana have wanted to use this waste water, conducting it from the outlet of St. Mary's Lake eastward across the rolling divide to the lands on the Great Plains. Preliminary examinations have shown this to be feasible.



DEVILS GAP, WYOMING; PROPOSED RESERVOIR SITE OF SWEETWATER PROJECT.

tween the United States and Canada, there are a number of snow-capped peaks, from which a number of streams issue, flowing eastward to the foot of the mountains, where their course is checked by great glacial deposits of gravel and débris. Lakes have been formed, and the rivers which once may have flowed east across the plains are turned north. The result of this is that the channels extending far to the east receive none of the water from the high peaks, but must be content with the

The greater part of the water that flows from the rolling country east of the mountains gathers in channels which form the Milk River. This stream flows northeast across the line into Canada, continues in a course parallel to the boundary, then returns to Montana, and finally flows into the Missouri River. The Milk River in Montana is flanked by a broad valley, consisting of gently rolling country, well adapted to irrigation. The water supply of the river for irrigating this valuable land is in-

sufficient, owing to lack of high mountain areas at its headwaters. The intention of this project is to connect the headwaters of this river with the mountain areas. The turning of the excess waters from St. Mary's Lake easterly into the head of Milk River is considered a comparatively simple matter, as the divide is low and can be crossed by a gravity canal. The great problem, however, lies in the complications which are brought about by the presence of the international boundary.

The question which naturally arises and the one which is giving the Reclamation Survey the most trouble is whether the water should be used as near as possible to the point where it is obtained for irrigation of the high lands, or whether it would not be better employed if taken down further east to a lower altitude. It is a further question that if taken farther east that it should be allowed to flow down Milk River through Canada, or if it is possible to carry it at a reasonable cost in canals south of the international boundary line? The matter is further complicated by the question that if the water flows down Milk River will not

the Canadians make use of it before it can again enter the United States?

The examination of the St. Mary's Lake and River was begun in 1900 by the Geological Survey, with Gerard H. Matthes in charge of the work. It was soon found that a diversion canal could be carried over the divide to the headwaters of Milk River. Cyrus C. Babb continued this work in the summer of 1901, and paid especial attention to obtaining facts regarding the cost of a canal south of the international boundary line. Mr. Babb found that such a canal was impracticable, owing to the fact that it would have to be built for fully 250 miles, the cost of which would be \$4,000,000 or more.

At this point the whole matter was resolved into the three following courses: First, to carry the water from St. Mary's Lake to the north and south fork of Milk River, allowing it to run through Canada to the lower Milk River valley in Montana; second, applying the water to lands as far west as possible, thus irrigating the eastern section of the Blackfeet Indian Reservation on the east; third, carry water from the head of St. Mary's River across both the north and south forks of Milk River to Cut-



MILK RIVER PROJECT—SKETCH OF PROPOSED DAM AND CANAL AT THE OUTLET OF ST. MARY'S LAKE, MONTANA.



THE UNCOMPAHGRE VALLEY, COLORADO, LOOKING EAST; SHOWS LANDS THAT MAY BE RECLAIMED BY GUNNISON PROJECT.

bank Creek, down which it will flow to Marias River for 100 miles or more; take it out of the Marias River by a canal to Big Sandy Creek, a tributary of Milk River.

An examination of the Milk River in Canada to ascertain if the water could be taken out of that river on its course through Canada was made. It was found that there was but little chance of the water being diverted from the river in Canada, and the first project therefore remains the most feasible.

Briefly, the Milk River project provides for the building of a low storage dam about three-fourths of a mile below the present outlet of St. Mary's Lake. This dam will have a maximum elevation of 50 feet above the bottom of the river, and will form a reservoir with a capacity of 250,000 acre-feet.

The canal to conduct the water from the reservoir to Milk River will be 30 feet wide at the bottom and will carry water to a depth of ten feet, and it is supposed that in a canal of these dimensions the mean discharge at its head will be 1,380 second feet. From the

dam the canal will be continued down the east bank of the river a distance of seven miles, then turn eastward through Spider Lake Gap. It will then continue in a northeasterly direction 27.4 miles to the North Fork of Milk River. The water will be carried across this stream by means of an inverted siphon. Seven miles beyond the North Fork the canal will pass through McLeod Gap. From this point it is continued to the South Fork of Milk River, making a total length of 43.8 miles.

THE GUNNISON RIVER TUNNEL.

One of the most important of the projects, and certainly the most interesting from an engineering standpoint, is the scheme for the diversion of the waters of the Gunnison River into the Uncompahgre Valley, in southwestern Colorado. In order to accomplish this it will be necessary to build a dam in the Black Canyon (see frontispiece) of the Gunnison and cut a tunnel through the ridge at the side of the canyon for a distance of six miles. When completed this tunnel and accompanying

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years, is almost at a standstill, owing to drouth and the inability of private enterprise to store sufficient water for present needs. Thus not only is the present prosperity of the valley threatened, but future development is rendered practically impossible. The climate of this region is especially adapted to the raising of diversified crops, and with a steady water supply would become one of the richest agricultural districts of the United States.

The accompanying illustrations will give some idea of the dam and reservoir sites.

E FARM WOODLOT IN MICHIGAN.

BY

F. G. MILLER,

BUREAU OF FORESTRY.

PORTION OF LAKE TAHOE.

Michigan State Census re- for 1894, 42 per cent of the of the state, or 15,296,078 classified as farm lands, di- 178,081 farms, each contain- age of 85.9 acres. Nineteen the total farm area, or an aver- 5 acres per farm, is in wood- ginning at the southern limits e, the average woodlot occu- cent of the average farm in ur tiers of counties, and stead- es as you pass northward till rthern peninsula 57 per cent rage farm is in forest.

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the southern, counties where 89 per cent of the total area is already in farm lands, and where, as stated, but 14 per cent of this farm area is occupied by woods, the danger line in the clearing of the forest lands has already been reached.

The southern portion of Michigan is essentially an agricultural region. Authorities contend that the highest interests of agriculture are subserved when from one-fourth to one-third of the land is in forest. Since practically all of the forest area of the southern counties is contained within the farm lands, it will be seen that the timber land has already been reduced below even the one-fourth limit, and is steadily decreasing, as a comparison of the census returns for consecutive decades conclusively shows.

Again, it must be added that large quantities of the best timber are harvested from these farm woodlots every year. The total value of the forest products on the farms of Michigan in 1899 was \$7,530,369. These products include firewood, fence posts, railroad ties, bark, telegraph and telephone poles, lumber, etc.; but do not refer to the products of



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dam the canal will be continued on the east bank of the river a distance of seven miles, then turn eastward to Spider Lake Gap. It will then continue in a northeasterly direction 10 miles to the North Fork of Milk River. The water will be carried down stream by means of an inverted siphon. Seven miles beyond the North Fork a canal will pass through the North Fork. From this point it is continued to the South Fork of Milk River, a total length of 43.8 miles.

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The question of water storage in the Salt River valley has been given close consideration by the Reclamation Service, and Mr. P. Davis, Principal Engineer, has recently made a special study of the subject.

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the Michigan State Census returns for 1894, 42 per cent of the area of the state, or 15,296,078 acres are classified as farm lands, divided into 178,081 farms, each containing an average of 85.9 acres. Nineteen per cent of the total farm area, or an average of 16.5 acres per farm, is in woodlots. Beginning at the southern limits of the state, the average woodlot occupies 10 per cent of the average farm in the southern tier of counties, and steadily increases as you pass northward till in the northern peninsula 57 per cent of the average farm is in forest.

In the northern part of the state, the farm land occupies only from 10 to 20 per cent of the total area in the northern counties of the southern peninsula, and less than 5 per cent in the northern peninsula, and where, too, so large a percentage of the farms is still in timber, the question of further clearing the land for agricultural purposes is simply one of expediency. It would be highly desirable to clear off and put under cultivation whatever forest lands still remain there that would yield greater returns for agricultural purposes than they are now able to remain in timber; but in

the southern, counties where 89 per cent of the total area is already in farm lands, and where, as stated, but 14 per cent of this farm area is occupied by woods, the danger line in the clearing of the forest lands has already been reached.

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Again, it must be added that large quantities of the best timber are harvested from these farm woodlots every year. The total value of the forest products on the farms of Michigan in 1899 was \$7,530,369. These products include firewood, fence posts, railroad ties, bark, telegraph and telephone poles, lumber, etc.; but do not refer to the products of

tracts where lumbering or wood-chopping is the principal business, but only to that which the farmers cut in connection with their ordinary farming operations. That this is a source of no mean income to the farmers of the state may be seen from the fact that the value of all the orchard products for Michigan in 1899 was but \$3,675,845, or less than one-half the income derived from the woodlots.

Not only is the wooded area in southern Michigan steadily decreasing, and that which is left rapidly being culled of its best timber, but the farm woodlot is almost universally pasture ground for all kinds of live stock. Natural reproduction is thus rendered impossible. Usually, whatever undergrowth there may have been has been killed out, the forest floor has been destroyed, and the larger trees that are left are either dying or will die before they reach maturity. Generally speaking, then, these woodlots are in a state of decline, and it is only a question of a few years when many of them will have been destroyed entirely. If the woodlot area is to be maintained, it will be necessary to establish new centers of supply by actual planting, and wherever at all feasible to put the old woodlots under rational management.

It is argued that forests modify the climate and make it more equable; that they conserve the water supply and regulate its distribution; that they beautify the landscape, etc., all of which is eminently true; but any or all of these arguments will not lead to extensive individual planting unless it can also be shown that forest planting will pay in money returns. Commercial profits, then, must be made the basis for establishing forest plantations.

That the growing of trees for profit will pay has already been sufficiently demonstrated to leave one in no doubt. Some plantations in the middle West have yielded better returns than have been realized from agricultural crops in the same regions.

For example, measurements made in a ten-year-old plantation of Hardy Catalpa at Hutchinson, Kansas, showed a net value of \$197.55 per acre, or a

yearly net income per acre of \$19.75. A grove of Red Juniper near Menlo, Iowa, eighteen years old, showed an average total acreage value of \$184.96, or a net annual value per acre of \$12.27. A plantation of Black Walnut eighteen years old showed an acreage value of \$171.84, or a yearly net income per acre of \$9.54. Many other examples equally favorable could be cited. The estimates given are based upon actual measurements and prices as they were about two years ago, allowance being made for rental on the land and all expenses incurred in establishing and maintaining the plantations, compound interest at the current rates being allowed from the time the expenditures were made.

The demand for such material as can be grown in the farm woodlot is universally increasing, and prices are steadily appreciating. Fence posts that could be bought in the middle West ten years ago at from 8 to 12 cents apiece are now selling at from 10 to 20 cents each. Telephone and telegraph poles have advanced 50 per cent in the past twenty years, and railroad ties 25 per cent in the same time.

A phase of forest planting that has had but little attention hitherto, but one which is now coming into notice, is the matter of growing wood for paper pulp. The large and increasing demand for pulp wood makes this question one of special interest, and the feeling is growing that planting poplar for pulp is going to pay.

It is not expected that the artificial woodlots established on the farms will be large. However, nearly every farm has some waste land—perhaps only one acre, perhaps several—which, for one reason or another, is not fit for agriculture. It may be practically non-productive as it is; yet, if planted to trees, could be made to yield good returns. Then, too, a small portion of every farm about the farm buildings should be devoted to timber which shall serve as a shelter belt and wind-break. Such a grove, well established and carefully maintained, is not only a source of revenue in the products it furnishes and the protection it affords,

but it gives and adds beauty to the home. If in the four southern counties in Michigan, where a demand for tree planting must be conceded, an average of four acres to each farm were planted in trees, the forest area would be extended by a half a million acres.

Of even greater importance to Michigan farmers at the present time than the artificially established plantation is the natural woodlot so prevalent throughout the state. Often this lot is situated about the farm buildings, but more frequently it is to be found on some more remote portion of the farm, and has been left because the ground is wet, or is rough and stony, or for some other reason is not available for farming purposes. The fact that this land is non-agricultural is the very reason why it should be kept in forest. As has been pointed out, these lots have furnished large quantities of valuable material, and have otherwise been of great service to the farms in the past; but since their area is constantly diminishing, and the quantity of timber deteriorating, they must be built up and improved or their economic value will be lost.

In this connection I wish to speak of a system of woodlot management now being conducted by Mr. S. W. Rutherford at Laurelton, Union county, Pennsylvania. I refer to this example because it is one with which I chance to be familiar, and for the reason that I believe much that Mr. Rutherford is doing to be capable of quite general application. He has several farms, each of which carries from 10 to 20 per cent of its area in timber. The species represented are those common to Pennsylvania, with White and Pitch Pine and Chestnut predominating. Of course these lots have all been cut over at least once, some of them two or three times. However, they are not pastured, are protected from fire; hence reproduction is quite fair, often fully adequate. But

the young growth is irregularly distributed, being overcrowded in places, and very sparse in others.

Mr. Rutherford's plan of improving these lots includes—

1. The removal of all dead or dying, crooked, diseased, and otherwise unlikely trees, leaving only straight, sound specimens of the more desirable species.

2. The thinning out of thickets of younger trees wherever they are so crowded as to retard the growth of one another. Often several sprouts have sprung up from a single stump, as in the case of Chestnut. All can not make trees; hence all but two or three of the larger and more likely sprouts are removed. Again, where two trees are growing side by side, so close as to hinder the growth of each other, the more inferior tree is cut down.

3. Judicious trimming of the trees left standing as far as practicable, so as to insure straight, clear boles. The work of making these improvement cuttings is done as the farm help has the leisure, and the material removed not only pays for the labor involved, but in some instances actually yields a net profit.

4. The underplanting of all vacant and thin spots with some valuable tree, usually White Pine. For the most part, Mr. Rutherford uses wild stock collected from his own premises. Here and there throughout his groves, in situations favorable to the germination of seed, are thousands of seedlings, and the thinnings furnish the stock for underplanting. This work, too, can often be done at odd times, when, on account of weather conditions, little else is doing on the farm, thus reducing the expense of planting to a minimum.

The result of such management is not only a woodlot normally stocked with species of the greatest usefulness and that will bring maximum returns, but the value of the entire farm has been enhanced.



FARMING BELOW SEA LEVEL.

RECLAIMING THE SALT DESERT OF SOUTHERN CALIFORNIA BY IRRIGATION FROM THE COLORADO RIVER.

BY

BRISTOW ADAMS.

THE Colorado River, lately styled "the Nile of the West," is being looked upon as the key to unlock the treasures stored in the immensely fertile lands which lie along its course. It is predicted freely that with its aid the "desert will blossom like the rose," and a new agricultural empire will be added in California to excel all the wealth and beauty of the garden area around Los Angeles.

Yet the conditions in this newly exploited area are peculiar. The Colorado River, in common with streams having a certain period of high annual flow and carrying a large quantity of solid material, has in the course of time built its banks higher than the surrounding country near its mouth, and, in forming this delta of material carried in its course to the Gulf of California, has built from bars to barriers; so that it has actually cut off a portion of the Gulf, from which the water has since evaporated, leaving a basin lower than the land at the mouth of the river, and at the point of greatest depression about 280 feet below sea level. At this point, approximately at Salton, a small station on the Southern Pacific Railway, no agricultural operations are possible, for the land is practically all salt, paradoxical as it may sound, and the salt is plowed up, piled in heaps, and shoveled directly on the cars. As recently as 1891 this area was covered with water by a sudden changing of the course of the Colorado by the self-damming process at its mouth, and the water backed up to form what was known in the newspapers as the "Salton Sea." In spite of the heralding of another great lake for the United States, this water disappeared after several months, and it is said that a recurrence of such in-

undation is impossible under the control of the Colorado by recent irrigation works.

While some of the lands for the proposed farming are forty feet above sea level, certain areas are as much as 265 feet below, the town of Imperial, the "metropolis" of the area, being a little more than 70 feet below. Thus we have the unusual phenomenon of a large and growing community who "live, move, and have their being" below the level of the Pacific and the Gulf of California and with much less thought and worry, though many times lower, than the dwellers behind the dikes of Holland or the levees of the Mississippi.

The marvelous promises for this new land of plenty must be taken, however, with the proverbial grain of salt; and literally and fittingly so in the present instance. It is freely claimed, and particularly by those pecuniarily interested in the exploitation of the Imperial settlements, that everything desirable in California agriculture is here to be obtained. Water and soil are there in abundance and each contains elements of remarkable fertility. The desired results will surely follow, if the land is farmed right. But in this case, as in every other, the "if" is the hinge on which the gate of destiny swings, and unless the "if" is watched carefully, the destiny of the country will swing contrary to the hopes and aspirations of many.

In the first place, let us look at the water supply, granting that water is the prime requisite toward future reclamation. Of its abundance there is, and can be, no doubt. Measurements made by the United States Government show that at its lowest stage the Colorado river carries enough water to irrigate



Courtesy Bureau of Soils, U. S. Department of Agriculture

SMALL DUNES ON THE WIND-SWEPT DESERT.

8,000,000 acres, and it is estimated that not more than 3,000,000 acres are so situated as to be available for irrigation by the usual gravity method of canal. The Imperial area is that part of the Colorado desert lying about 60 miles west of Yuma, Arizona, 115 miles east of San Diego, California, and lying wholly within San Diego county. Ever since the first surveys of the desert in 1854 it has been thought feasible to bring the water of the Colorado to the desert lands, and in 1891 actual work was begun on a system to irrigate lands in Mexico; but the project failed, owing to the financial crisis of 1893. In 1900 the California Development Company was incorporated in the State of New Jersey, and under the system of Imperial Canal Companies is now carrying on development operations. This is done by the sale of water to the irri-

gation companies at the national boundary line, these companies being made up of land-owners who have purchased stock from the California Development Company.

The heading for the main canal, where the water is taken from the Colorado, is $7\frac{1}{2}$ miles below Yuma, on the California side of the river. The water is carried from this point to the dry bed of the Salton River (renamed "Carter" by the company), a distance of 8 miles. This river flowed away from the sea to the Salton sink, and the natural channel is used for 60 miles through a 100,000-acre tract in Mexico owned by the California Development Company. Near the international line the water is diverted into a 60-foot-bottom canal, with a capacity of 25,000 inches, or 5,000 second feet, and this in turn is divided into two parallel 30-foot canals, one to

be used while the other is being cleaned, for it must be understood that the Colorado carries a great deal of sediment, which adds to the fertility where its waters are used, but which is a source of expense in canal construction, as it rapidly fills in excavations where the current cannot keep the matter in suspension. Water was first brought on the ground in June, 1901, and since that time development has been rapid. The present year, 1903, will see the first of actual demonstrations of what may be expected of full crops grown by this irrigation.

Passing over the question of climate with the simple statement that it is that of the semi-tropical desert, with very slight rainfall, high summer temperature, and only slight frosts in winter, the next consideration is that of the land—its conformation and constituents.

The region between the Salton and New Rivers is considered the best part of the delta country. Much of this is sandy, covered with dunes and hummocks from 3 to 15 feet high. Unless this land is leveled, it cannot be successfully brought under irrigation, and such leveling will prove too expensive for the prospective homesteader unless the proposed railroad lines enter this region and bring all the land to higher values. Around Mesquite Lake, about three miles northeast of Imperial, the land is badly gullied; but with these exceptions the desert is very level, with an accommodating slope which makes the problem of applying water extremely simple. There are a number of beach lines, some of them very distinct, in this area below sea level, showing that the basin has been partially refilled at times with water which has remained long enough



Courtesy Bureau of Soils, U. S. Department of Agriculture

BLUFFS ON NEW RIVER 40 FEET HIGH, AT A POINT ABOUT 80 FEET BELOW SEA-LEVEL.
NEW RIVER CHANNEL RISES ABOVE SEA-LEVEL, AND DISAPPEARS AT 280 FEET BELOW.

difference with which the nation, until recently, viewed the destruction of its forests, the progress made in developing a national system of forestry, since effecting a change of policy, has been equally remarkable. Few appreciate the strides made in this direction.

Historically speaking, our national system saw its inception in 1890, in the creation of the three parks in the State of California known as the Sequoia, Yosemite, and General Grant National Parks. The establishment of these parks for the preservation of the big trees in those localities marked the first recognition on the part of the government of an obligation resting upon it for action along a line which has since developed into our present forest reservation system. As such, it was of an importance out of all proportion to the direct objects to be served by the parks, representing, in fact, what might be termed the opening wedge in the work of inaugurating a national forest policy. It was not, strictly speaking, legislation along the lines of forestry, but it led the way to that speedily. The following year saw the enactment of the first federal forest law, which conferred authority upon the President to establish forest reservations. From a historical standpoint, therefore, the origin of the movement for these parks has, in the

to form a beach. This was presumably fresh water, as amply attested by the abundance of fresh-water shells found all over the area.

The soils themselves present the most difficult problem of all. Water is plentiful, as has already been pointed out, and topography makes its application a simple matter. The bottom of this basin is actual, absolute salt deposited in thick layers. It will naturally be supposed from the geologic history of these soils that they will all contain salts in large quantities. Naturally, too, there will be found considerable uniformity in the soil, practically all having been formed from sediments carried by the Colorado. In some places sand has been mixed with this sediment, making a loamy soil, and in the dune area there is sand alone. The management of these soils would be

Meadows, my friend said, 'Where are all those wonderful flower gardens you write me so much about?' And I had to confess—woe's me!—that uncountable sheep had eaten and trampled them out of existence. Then he said, 'Can't something be done to restore and preserve so wonderful a region as this? Surely the people of California are not going to allow these magnificent forests, on which the welfare of the whole state depends, to be destroyed?' Then a national park was proposed, and I was requested to write some articles about the region to help call attention to it, while the *Century* was freely used for the same purpose, and every friend that could be found was called on to write or speak a good word for it. The California Academy of Sciences became interested and began to work, and so did the State University. Even the soulless Southern Pacific Railroad Company, never counted on for anything good, helped nobly in pushing the bill for this park through Congress. Mr. Stow in particular charged our members in Congress that, whatever they neglected, they must see that the bill for a national park around Yosemite Valley went through, and in a little over a year from the time of our first talk beside that Tuolumne camp-fire the bill organizing the park passed Congress, and a troop of cavalry was guarding it."

simple enough were such management not complicated by that dread of the irrigator, alkali. The sand areas are freest from this, and the loams contain the most. Briefly, the alkali conditions are these: by popular assumption alkali soil is that which contains a harmful accumulation of salts. This accumulation may be to some degree offset by alkali-resistant growths, chief among which is the date palm, whose cultural possibilities are beginning to be learned in our Southwest. Also it must be remembered that the presence of lime will enable plant life to withstand a higher percentage of alkali, and in this particular the area under consideration is fortunate, as gypsum (sulphate of lime) and carbonate of lime are present. The shells left by sea and river contribute to this lime constituent. Some areas show no alkali at present, but it has

be used while the other is being cleaned, for it must be understood that the Colorado carries a great deal of sediment, which adds to the fertility where its waters are used, but which is a source of expense in canal construction, as it rapidly fills in excavations where the current cannot keep the matter in suspension. Water was first brought on the ground in June, 1901, and since that time development has been rapid. The present year, 1903, will see the first of actual demonstrations of what may be expected of full crops grown by this irrigation.

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Yet this part of the Southwest is, after all is said, a land of wonderful la-

projects, success will attend the proper admixture of soil, water, and brains.

PROGRESS IN NATIONAL FORESTRY.

BY

J. S. PEYTON,

DIVISION OF FOREST RESERVES, DEPARTMENT OF THE INTERIOR.

THE whole history of the public timber policy in the United States might be written in the two words "deforestation" and "reservation"—a century of the former offset with a decade of the latter. With a nation developing with a whirlwind of impetuosity, our first century's history respecting one

of our great natural resources, timber, has been written in fires and devastation—a record which may well astonish the world, for among most enlightened nations the relation of the forest to the development of the nation is recognized in its true significance.

Astounding, however, as was the in-

difference with which the nation, until recently, viewed the destruction of its forests, the progress made in developing a national system of forestry, since effecting a change of policy, has been equally remarkable. Few appreciate the strides made in this direction.

Historically speaking, our national system saw its inception in 1890, in the creation of the three parks in the State of California known as the Sequoia, Yosemite, and General Grant National Parks. The establishment of these parks for the preservation of the big trees in those localities marked the first recognition on the part of the government of an obligation resting upon it for action along a line which has since developed into our present forest reservation system. As such, it was of an importance out of all proportion to the direct objects to be served by the parks, representing, in fact, what might be termed the opening wedge in the work of inaugurating a national forest policy. It was not, strictly speaking, legislation along the lines of forestry, but it led the way to that speedily. The following year saw the enactment of the first federal forest law, which conferred authority upon the President to establish forest reservations. From a historical standpoint, therefore, the origin of the movement for these parks has, in the light of subsequent events, been clothed with much interest, and the account given in 1896 by the noted scientist, John Muir, regarding the inception of the idea which resulted in the Yosemite Park is of value as chronicling a first step in what has since developed into a national policy. In an address made that year before the Sierra Club of San Francisco, California, Mr. Muir said:

"The Yosemite National Park was made October 1, 1890. For many years I had been crying in the wilderness, 'Save the forests!' But, so far as I know, nothing effective was done in the matter until shortly before the park was organized. In the summer of 1889 I took one of the editors of the *Century Magazine* out for a walk in Yosemite and in the woods and boulder-choked canyons around it, and when we were camped one day at the Big Tuolumne

Meadows, my friend said, 'Where are all those wonderful flower gardens you write me so much about?' And I had to confess—woe's me!—that uncountable sheep had eaten and trampled them out of existence. Then he said, 'Can't something be done to restore and preserve so wonderful a region as this? Surely the people of California are not going to allow these magnificent forests, on which the welfare of the whole state depends, to be destroyed?' Then a national park was proposed, and I was requested to write some articles about the region to help call attention to it, while the *Century* was freely used for the same purpose, and every friend that could be found was called on to write or speak a good word for it. The California Academy of Sciences became interested and began to work, and so did the State University. Even the soulless Southern Pacific Railroad Company, never counted on for anything good, helped nobly in pushing the bill for this park through Congress. Mr. Stow in particular charged our members in Congress that, whatever they neglected, they must see that the bill for a national park around Yosemite Valley went through, and in a little over a year from the time of our first talk beside that Tuolumne camp-fire the bill organizing the park passed Congress, and a troop of cavalry was guarding it."

The good work of securing legislation authorizing the establishment of forest reservations resulted speedily in the creation of a number of reserves throughout the West, covering important watersheds; but, owing to the lack of legislation for their administration, for six years these reserves stood as a reproach to the nation rather than a credit. It was, accordingly, not until the passage, in 1897, of a forest administration law, and the provision, the following year, of an appropriation for the equipment of a field force, that the government may be said to have fairly entered upon the work of inaugurating a national forest policy. The history, therefore, of practical work along such lines begins with the summer of 1898, when the first working force was thrown into the field. Since then results have been in propor-

tion to the pent-up forces of a movement which had suffered a century's delay. When Congress finally awoke to action in this matter, the public was found back of the movement, and consequently *results* have followed.

Prof. William Russell Dudley, of Stanford University, California, in addressing the Sierra Club, in 1896, regarding the forest reservations in existence at that date—seventeen in number, embracing 17,000,000 of acres—had occasion to deplore the lamentable contrast between Germany and America in respect to forestry. He pointed to the fact that, while Germany had forest schools and trained foresters who saw to the protection and rational use of her forests, we had no such schools, no trained foresters, and no efficient system for the protection of our forest wealth from fire. To remedy these conditions he urged the immediate withdrawal of all public forest lands from sale and entry; the survey of it by experts, to determine what portions should be permanently reserved; its protection by the United States Army until foresters should be trained; the establishment of forest schools, and the giving of instruction in the principles of forestry at West Point.

Note the advance made since that date. Today, less than six years since the first appropriation for this service became available, official reports by both the Interior and Agricultural Departments show that nearly every condition suggested by Professor Dudley is already being met.

In the year just closed, the area of reserved land has been increased to over sixty millions of acres, embraced in fifty-four reservations, while at least twenty-five millions of additional acres have been placed in a state of temporary reservation, with a view to the creation of yet further reserves. A graded forest service, numbering as many as five hundred men during the danger or fire season, is patrolling and administering the affairs of the reserves, one chief result of whose presence is seen in the fact that forest fires are now so well kept in check in government reserves that the local press in various quarters

has had occasion to call attention to the efficiency of the service.

In connection with issuing free-use timber permits to a reasonable extent a system of timber sales has been established which, in results already attained, has demonstrated the feasibility of making our public forests return a large revenue to the government instead of, as at present, costing yearly an appropriation for their protection. The forests are being improved by cleaning out the dead and down trees and selling the mature timber; and a practical and scientific system of forestry is guaranteeing the development of the younger timber while securing efficient protection from fire; to which may be added the fact that a marked decrease in respect to depredations upon public timber has followed as the direct result of providing legitimate methods of procuring needed timber supplies. The reforestation of denuded areas has been undertaken in various reserves with good results, and the further experimental work of afforesting treeless regions has also been recently entered upon, two reserves having been established for this work in the sand-hills of Nebraska, where experiments by the Department of Agriculture, pursued during the past ten years, had demonstrated the practicability of artificial forestation. Grazing within the reserves—an important matter in connection with the great wool and other industries of the West—is being regulated, and under recent appropriations, aggregating over eight hundred thousand dollars, and which are yearly renewed, the U. S. Geological Survey is engaged in surveying and permanently establishing the boundaries of the reserves.

In the Department of Agriculture an even more important change has been effected in the expansion of the division having charge of scientific forestry into a Bureau of Forestry, with a greatly increased appropriation for the conduct of business. This has resulted in a corresponding expansion in its field of operations, as seen in the extensive working plans which it is engaged in preparing

for both government and state reserves, and also for timbered areas owned by

tion along another line—that of the closely related subject of irri-

DUCTION.

BY

W. F. HUBBARD,

BUREAU OF FORESTRY.

ABOUT a hundred years ago German foresters and economic writers began to predict a fuel famine. Coal had not come into use, and the rapid increase of population and the corresponding demand for wood seemed to point to an exhaustion of the fuel supply. From this period dates the great extent of beech forest which is to be found in middle and southern Germany. The question of fuel has long since been solved by coal, and, as the demand for beech is now less than the supply, the most recent forest policy has, to a limited extent, advised the change to better management and most important step, representing an altogether new departure in the work, is seen in the recent action by the legislatures of certain of the South Atlantic states in signifying their willingness to yield to the general government the jurisdiction over an extensive area in the Appalachian region, which it is proposed to set apart as a great forest reserve under the name of the Appalachian Forest Reserve.

The greatest outreach, however, on the part of the government is seen in its forest work in the Philippines, where its recently established bureau of forestry, during its first fiscal year, produced in revenue from forest products nearly \$200,000 (Mexican), an amount which has since been greatly increased.

In Porto Rico, also, the government is now preparing to work along similar lines.

All of which is a gratifying record of progress made in the short space of five years.

Now, however, development upon a far larger and more comprehensive scale, as regards the government's work, has been made imperative by recent legisla-

In the autumn, before cutting, while the trees are still standing, the ground is strewn with acorns, which are worked in very superficially with mattocks. About 150 pounds of acorns are used per acre, at a cost of \$1.50 per hundred, while the labor costs about \$4 per acre. This makes a total cost of about \$6.25 per acre, a rather high figure for Germany, but one justified by the high prices prevailing in that region.

After the acorns have been scattered and worked in, the forest is cut clean. The lumbering still further works the seed into the ground and thoroughly est reservations has been of the world, as far as it has gone; but as a leading factor in a great national scheme of irrigation, which has in contemplation the reclamation of over 60,000,000 acres of arid lands, it is manifestly inadequate; and plainly so, for the reason that it abandons the great mass of our forest lands to waste and destruction. These unreserved lands, which are largely western mountain lands, are taken no account of—they remain, to all intents and purposes, waste lands—from which the forest cover is rapidly being swept through the ravages of fire and in the interest of private gain and speculation. It needs no argument to prove the utter inadequacy of any such forest system. Whatever may have been the results in the past, the larger work which is now upon us requires larger methods; and it is hoped Congress will complete its legislation in this direction without delay. The matter, in its relation to irrigation, is so vital to the issue that it neither brooks of delay nor of half-way measures, if the future of both forestry and irrigation is to keep pace with the progress thus far made.

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In connection with issuing free-use timber permits to a reasonable extent a system of timber sales has been established which, in results already attained, has demonstrated the feasibility of making our public forests return a large revenue to the government instead of, as at present, costing yearly an appropriation for their protection. The forests are being improved by cleaning out the dead and down trees and selling the mature timber; and a practical and scientific system of forestry is guaranteeing the development of the younger timber while securing efficient protection from fire; to which may be added the fact that a marked decrease in respect to depredations upon public timber has followed as the direct result of providing legitimate method of procuring needed timber supplies. The reforestation of denuded areas has been undertaken in various reserves with good results, and the further ex-



FIG. 2.—REPRODUCTION OF OAK AND BIRCH—FIRST YEAR.

A GERMAN METHOD OF OAK REPRODUCTION.

BY

W. F. HUBBARD,

BUREAU OF FORESTRY.

ABOUT a hundred years ago German foresters and economic writers began to predict a fuel famine. Coal had not come into use, and the rapid increase of population and the corresponding demand for wood seemed to point to an exhaustion of the fuel supply. From this period dates the great extent of beech forest which is to be found in middle and southern Germany. The question of fuel has long since been solved by coal, and, as the demand for beech is now less than the supply, the most recent forest policy has, to a limited extent, advised the change to better-paying species.

In the neighborhood of Karlsruhe, Baden, a very ingenious method has been employed to replace the old beech forest with oak, a wood for which there is a heavy demand in the local market. The system is here described, not because of its applicability to American conditions, but rather to give a concrete example of the high technique of scientific forestry when the market and labor conditions render it practicable. At the same time it may offer suggestions to the owners of woodlots in the neighborhood of a good market. There are many old open coppice forests in New England which might be seeded in some such manner to valuable species, possibly oak and hickory. Let it be quite clearly understood, however, that the following system can act only as a very general suggestion:

The Forest Revier of Durlach lies mostly in the rolling, somewhat steep foothills of the Black Forest to the southeast of Karlsruhe. A large part of the stand is beech of the character shown in Fig. 1. A regular area of this forest is being annually cut and put to oak in the following manner:

In the autumn, before cutting, while the trees are still standing, the ground is strewn with acorns, which are worked in very superficially with mattocks. About 150 pounds of acorns are used per acre, at a cost of \$1.50 per hundred, while the labor costs about \$4 per acre. This makes a total cost of about \$6.25 per acre, a rather high figure for Germany, but one justified by the high prices prevailing in that region.

After the acorns have been scattered and worked in, the forest is cut clean. The lumbering still further works the seed into the ground and thoroughly breaks up the surface of the soil, giving the acorns a better chance for germination. In the succeeding year the ground will be heavily covered with a germination of oak and birch (Fig. 2). This latter species comes in of its own accord and needs no encouragement and support. It acts as an excellent nurse, growing faster than the oak and completely sheltering it from frost and sudden evaporation. This is found quite sufficient and does away with any intricate system of cuttings and provision for shelter wood. The only danger to the young growth at this time is that of suppression by the sprouts from the old stumps. Beech, however, does not sprout excessively, and as the forests are constantly patrolled, it is an easy matter to lop off the heads of such sprouts as seem dangerous. This constant supervision by the rangers is not considered a cost factor in any particular area of forest. They get their regular wages and are continually on their special beat. As there is a ranger to about every thousand acres in this district, it is wonderful what a single man can do in this capacity.

By the time the seedlings are six years



FIG. 3.—THE STAND AFTER SIX YEARS.



FIG. 4.—METHOD OF PRUNING.



FIG. 5.—THE STAND IN TWELVE YEARS. THE SAPLINGS PRUNED STRAIGHT.



FIG. 6.—AN UNPRUNED STAND ON SAME GROUND.

old they form a complete cover and are very dense. At this time the stand is cleared, the bad specimens topped, dead ones taken out, and the fire-burns removed. From this period the oaks have complete possession of the ground and commence a vigorous struggle for light (Fig. 3). They are thus forced very rapidly in height growth, but as they show a tendency to branch and fork even under such circumstances, some artificial means must be resorted to if straight boles are to be produced. This is accomplished by continually pruning off the side limbs and towing the leading shoot into supremacy (Fig. 4). As the forest thins, pass through them

territory they grow a tree here and there with next-to-nothing vigilance. This is often done, they going to and from other work, and the same duty of patrolling their base. The results are extremely good, and large stands of young poles may be seen, each an average of a young ft. Figures 5 and 6 illustrate the results of such a brace and artificial growth.

The trees in Fig. 5 are ready for the first thinning, and when they reach the age of about 75 years, the whole will be underplanted with beech or spruce to produce as well as the oak alone after that on beeches open-crowned and lets a fine straight

LUMBERMEN FAVOR FORESTRY.

REPORT OF A COMMITTEE ON FORESTRY AT THE
ELEVENTH ANNUAL MEETING OF THE NATIONAL
WHOLESALE LUMBER DEALERS' ASSOCIATION.

THAT there is a deep and growing interest in forestry among the lumbermen of the United States is apparent to any one who has followed the trend of affairs during the past five years. This was shown in a striking manner at the recent convention of the National Wholesale Lumber Dealers' Association, held in Washington, D. C. The reading of the report of the Committee on Forestry was received with a generous amount of applause, and strong endorsements of its recommendations were made by prominent members of the association who addressed the convention.

This report shows such careful study of leading forest problems and contains such timely recommendations that it is reprinted here in full.

REPORT OF COMMITTEE ON FORESTRY.

TO THE PRESIDENT AND MEMBERS:
The Committee on Forestry has given close attention during the past year to the relations between the United States Government in its several branches and the interests which are peculiarly the concern of our association, and, after

long and careful consideration, it ventures to make the following report and recommendations.

The committee has worked at the outset with the courtesy in dealing with forest matters, due to the distribution of forest work among three different departments of the government, namely, the General Land Office, which administers the national forest reserves; the United States Geological Survey, which is charged with the duty of making the maps, describing the forests, suggesting changes in boundaries and establishing permanent boundaries; and the Bureau of Forestry of the Department of Agriculture, which is charged with all matters of professional forestry. One of the main interests of the latter has been the promotion of private forestry among private owners, not some of the members of this association and outside lumbermen owning some aggregate more than 2,000,000 acres of land have of a personal nature sought the cooperation of the Bureau of Forestry in the arrangement and development of their lands. It is not the duty of your committee to criticise the work that is done under any address, three depart-

ments. No body of men could be found, for instance, than those working under the United States Geological Survey for the work that it has done, but in the nature of the case this work is temporary. The General Land Office is under the Department of the Interior, and its work could properly be done by the Bureau of Forestry, which is under the Department of Agriculture. All the trained foresters in the employment of the States, and practically all those in the country, are attached to the Department of Agriculture, while the administration of the forest reserves is carried on without the direct participation of any of these trained men. Without going too deeply into the discussion, the following may be briefly stated as reasons why the transfer of all federal forest work to the Department of Agriculture should be made:

In the first place the Department of Agriculture has already a very important field of forest work for farmers and others in the introduction of practical forestry on private forest lands. This is a permanent part of this department, and could not be transferred. The interests of private owners have already been alluded to, but may be added that the amount of forests in farms alone is about four times as great as the whole area of the federal forest reserves. It is not contemplated that the question of titles, patents, and ownership should be transferred from the General Land Office. It remains only to be added that the Commission of the General Land Office, the Secretary of the Interior, the Secretary of Agriculture, and the President of the United States concur in the wisdom of its proposed transfer. The national forest reserves are almost wholly on big land, and their importance to the prosperity of the West grows out of their relations to irrigation, manufacturing and to other interests depending on regular water supply; to the production of wood, not only for lumber, but for ties and fuel charcoal and other wood products; also for the protection of the other to birds and flocks for grazing; and, finally and most important of all, their retarding

the melting of the snows and woodlands that come from heavy rains.

TIMBER TESTING

Second, the committee earnestly urges adequate appropriations by Congress for the work of timber testing. The importance of this work can hardly be exaggerated. It is of vital moment that the comparative strength of timbers of different sorts should be definitely known by architects and engineers. The absence of this knowledge may cause undue waste or undue parsimony in the use of timber. In the nature of the case the process is expensive, since many examples of each sort of timber to be tested must be assembled, and the testing destroys the value of the timber subjected to it. Further, the reports of any timber test should have the sanction of a department of the United States Government in order that they may have validity and universal acceptance. Some of this work has already been done; but as new woods are coming into the market, they should be properly tested and classified with reference to their endurance and fitness for various timber purposes. The committee urges upon the members of this association to bring this matter to the attention of members of Congress.

A TIMBER CENSUS

Third, The committee recommends a census of standing commercial timber in the United States. Notwithstanding the estimates put forth from time to time, it is known by the initiated that there is at present no reliable knowledge of the timber supply. If, for instance, the conclusions of the census of 1880 had been valid, the entire stock of White Pine in the United States would have been out of existence in 1905, while now, twelve years subsequent to that date, there has been a production in three states of over five thousand million feet. There is an explanation for this great discrepancy, in that no timber trees with a diameter of less than twelve inches were counted in the census referred to, and the growth accumulating on the trees was left out of considera-

old they form a complete cover and are very dense. At this time the stand is cleaned, the bad specimens topped, dead ones taken out, and the birches removed. From this period the oaks have complete possession of the ground and commence a vigorous struggle for light (Fig. 3.) They are thus forced very rapidly in height growth, but as they show a tendency to branch and fork even under such circumstances, some artificial means must be resorted to if straight boles are to be produced. This is accomplished by continually pruning off the side limbs and forcing the leading shoot into supremacy (Fig. 4). As the forest rangers pass through their

territory they prune a tree here and there with never ceasing vigilance. This is often done when going to and from other work or in the mere duty of patrolling their beats. The results are extremely good, and large stands of young poles may be seen, each as straight as a young fir. Figures 5 and 6 illustrate the results of such a heavy stand and continual pruning.

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ments. No better body of men could be found, for instance, than those working under the United States Geological Survey for the work that it has done; but in the nature of the case this work is temporary. The General Land Office is under the Department of the Interior, and its work could properly be done by the Bureau of Forestry, which is under the Department of Agriculture. All the trained foresters in the employment of the United States, and practically all those in the country, are attached to the Department of Agriculture, while the administration of the forest reserves is carried on without the direct participation of any of these trained men. Without going too deeply into the discussion, the following may be briefly stated as reasons why the transfer of all federal forest work to the Department of Agriculture should be made:

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the melting of the snows and washouts that come from heavy rains.

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tion; but, nevertheless, it is a fair illustration of the difficulty surrounding the subject and the lack of definite knowledge which there is upon it. The estimates made are too general to be made the basis of commercial investment, and, in the second place, they cover only a fraction of territory. There is no railroad engineer who is not anxious about the question of ties, and no definite and reliable information is forthcoming. The unreliable census of 1880 referred to above is practically the only one that there ever has been, no attempt having been made in the eleventh or twelfth census to collect timber statistics, and nothing of importance having been accomplished before 1880. The committee unreservedly recommends to the members of this association that this matter be impressed upon members of Congress. It is believed that the complete census, including its tabulation and the printing and distribution of the proper maps, etc., can be accomplished for about \$250,000.

APPALACHIAN FOREST RESERVE.

Fourth. There is now pending before Congress the question of an appropriation of \$10,000,000 for the establishment of a forest reserve in the Southern Appalachian Mountains. It is not the intention of your committee to repeat here, except in the briefest way, the arguments for this appropriation. The matter has been much discussed. It was made the subject of a special message to the Senate and House of Representatives by President Roosevelt, December 19, 1901, and the subject has been so much discussed that it may be assumed that members of this association are familiar with it. The proposition, briefly, is to reserve a large tract in the States of Tennessee, North Carolina, South Carolina, and Georgia, and possibly some in Alabama and Virginia. The Secretary of Agriculture, in his report which was transmitted by the President to Congress, calls attention to the fact that this region embraces the highest peaks and largest mountain masses east of the Rockies; that upon these mountains descends the heaviest rainfall of the United States, except that of the

North Pacific coast; that if this soil—which is, generally speaking, thin and easily washed away—is once denuded of its forest and swept by heavy rains, the rivers and harbors will become choked with the detritus washed down from the mountain fields. Besides these considerations, the rivers which arise in these mountains flow into or along every state from Ohio to the Gulf, and from the Atlantic to the Mississippi. Enormous agricultural and navigation interests, and water-power interests as well, are dependent upon these rivers. The heaviest and most beautiful hardwood forests of the continent are upon these mountains, and for economic reasons their preservation is imperative. The reservation, moreover, is vital to the agricultural interests of the South, the loss in a single year being more than the entire purchase price of the entire tract proposed to be reserved. The President's message to Congress contains the following:

“Wise forest protection does not mean the withdrawal of forest resources, whether of wood, water, or grass, from contributing their full share to the welfare of the people; but, on the contrary, gives the assurance of larger and more certain supplies. The fundamental idea of forestry is the perpetuation of forests by use. Forest protection is not an end of itself; it is a means to increase and maintain the resources of our country and the industries which depend upon them. The preservation of our forests is an imperative business necessity. We have come to see clearly that whatever destroys the forests, except to make way for agriculture, threatens our well-being.”

To sum up, the committee urges that the forest interests of the government shall be concentrated in the Bureau of Forestry, Department of Agriculture, except the question of land titles; it recommends adequate appropriations for testing timbers; it urges a timber census of the United States, and the passage of the pending bill in favor of the Southern Appalachian Forest Reserve.

GEORGE P. SAWYER.
ROBERT C. LIPPINCOTT.
FRANK H. GOODYEAR.

EFFECT OF WESTERN DEVELOPMENT ON THE EAST.

RECLAMATION OF THE ARID LANDS OF THE WEST WILL STIMULATE EASTERN MANUFACTURING INDUSTRIES, AND THUS INCREASE THE DEMAND FOR EASTERN FARM PRODUCTS.

BY

GUY ELLIOT MITCHELL,

EDITOR THE NATIONAL HOMEMAKER.

IS the development of the West desirable from the standpoint of the eastern farmer?

A recent trip, of some three months' duration, through the arid states gave the writer many convincing proofs of the statement which has often been made that government irrigation and reclamation will not and cannot in any degree work injury to eastern farming classes, and that, on the contrary, it can only prove a distinct benefit to them.

The bald statement that there are possibly 100,000,000 acres of rich land in the arid region awaiting only the application of water to make it fabulously productive, and that under federal irrigation this land will be thrown open to settlement, might of itself reasonably confuse and alarm the farmers of the Mississippi Valley and of the Atlantic States. It would not be singular if they should fear destructive competition from the products of such a great area of highly productive land, while the opening to settlement of the great number of new farms would tend to decrease present farm values. But one needs only to travel through the West to see that such fears are groundless, and that no harm to the eastern farmer need ever be expected from the arid region.

NO FLOODING OF THE MARKET.

In the first place, with the utmost expedition and the greatest activity possible on the part of the government and all sorts of private enterprise, it will be many years before 100,000,000, or even 50,000,000, acres are reclaimed through irrigation. Hydrographic engineers and others best informed of the conditions

believe that the irrigation development of the West will be doing wonders if it even keeps pace with our natural increase in population. The building of great dams for the creation of storage reservoirs and the large main-line canals, necessary to utilize for irrigation the vast wealth of the waste waters which are now annually lost in the Gulf and the Pacific, are works of great magnitude, requiring the most careful and substantial construction, which cannot be accomplished in a day or a year. It will never be the policy of the government, any more than it will be that of private enterprise, to construct works of this kind any faster than there is actual demand for them by settlers and homemakers; so that the eastern farmer need never fear ruinous competition by the throwing open to settlement of additional western lands. Moreover, the conditions under which these lands will be opened will be far different from those surrounding the settlement of our Northwestern States under the homestead law. In Kansas, Nebraska, Minnesota, the Dakotas, and other states the government offered free hundreds of millions of acres of fine farming lands under such conditions that settlers could go upon them and immediately commence the growing of wheat and corn, the aggregate yields of which were enormous. The soil was very fertile and the rainfall copious, and all that was required was industry to produce marvelous results.

IRRIGATED LANDS ARE DIFFERENT.

The lands to be irrigated in the arid regions are of a different class. The

process of reclamation will be expensive, and it is proposed that the farmers who take up these lands shall pay the cost of the irrigation construction. This feature makes the proposition a vastly different one from the foregoing. There need be no fear either that any other policy will ever obtain in the West for the reason that the money returned to the government will be wanted for use in reclaiming additional lands. Every western interest would at once oppose any legislative attempt that might be made to allow settlers to have this land and water privilege without paying for the latter.

LANDS TOO VALUABLE FOR GENERAL CROPS.

And this leads up to the second phase of the question. The lands will be too valuable to be used for the growing of such general crops as wheat and corn, which might compete with the products of the eastern farmers. They will be planted in fruits and other crops which will be more profitable, as is done today under western irrigation. Moreover, the long and expensive railroad haul across the Rockies prohibits eastern shipment of such general crops. Only those things which allow for a large profit can be so shipped.

The only crop to which any great acreage is devoted is the forage crop—the cultivation of alfalfa. This is grown all over the West, to which region it seems peculiarly adapted. On it cattle and sheep are raised and fattened for the eastern markets. Its yield in the southwest is enormous—five, six, seven, and even eight cuttings are made annually, each one equal to a heavy crop of clover, to which plant the alfalfa is a first cousin.

THE DEMAND OF THE ORIENT.

There is also an urgent demand in the unlimited markets of the Orient for every pound of food products which the Western States can raise above what they need for their own consumption. California is the most highly developed of the states using irrigation, and yet last year there was shipped into that state over the Southern Pacific and the

Santa Fé Railroads alone 62,000,000 pounds of livestock, 48,000,000 pounds of livestock products, and 14,000,000 pounds of poultry, a total of 124,000,000, showing that there is likely to be many a day before the arid states produce sufficient of certain staple products for their own consumption. It pays them better to follow a more intensive line of farming. It might be thought that a farmer who could raise 100 bushels* of wheat per acre would be satisfied with such a yield. There are farms in the Yakima Valley, Washington, where a greater yield has been and can be produced, and yet the farmers do not think of raising wheat, because fruits are much more profitable.

A THOUSAND CAR-LOADS OF FANCY FRUITS.

California sends East every year one thousand car-loads of oranges, lemons, dried apricots, prunes, raisins, wines, etc., and the placing of these products upon the eastern markets is not a disadvantage to any eastern interest. In fact it can be worked out as a distinct, although indirect, benefit to every eastern farmer. These products are purchased largely by the wealthy class. Their money is sent to the coast, but it does not remain there. It comes back East again immediately to pay for the cotton and woolen manufactures, the shoes, the hats, and everything else that men and women wear; for the machines, the tools, the barbed wire, and every manufactured article in general use on the farm and ranch; to pay for the thousand and one things which the East sends to the Pacific coast.

STIMULUS TO EASTERN MANUFACTURING.

Now, what is the result of this? This western demand for eastern goods stimulates every line of eastern manufacture, and eastern factories are thus kept busy, and hundreds of thousands of men and women receive employment in these factories. They furnish an active home market for the products of

*The average yield of wheat in the United States is something over 12 bushels per acre.

eastern agriculture. As long as there is prosperity in agriculture and horticulture in the Western States, there will be a tremendous demand upon eastern factories, and while this is the case the eastern farmer will receive his share of the benefit.

Nor does it seem probable that the factories of the East and South will find the market in the arid states for only a limited time. The traveler through the West is not impressed with the manufacturing possibilities of that region on any great scale. Fuel oil is becoming quite a factor in supplying power in southern California, and there is no question but that development of electrical power from the torrents in the western mountains will play an important part in the development of the

West; but nevertheless nature seems to have been more lavish along the Atlantic coast in this respect, and the great coal-fields of the Allegheny Mountain system are wanting along the Pacific coast.

The probability is that the West will very largely draw upon the East for all time to come for a large proportion of manufactured articles in general use. Certainly for many decades to come our eastern manufacturers will have an unrivaled and greedy market for their goods in our Western States, a market which will constantly and enormously expand as the reclamation of the western lands is accomplished through national irrigation and great areas are divided up into small and productive farms and orchards.

RECENT FOREST LEGISLATION.

NOTES ON THE WORK OF CONGRESS
AND THE STATES DURING THE WINTER.

DURING the winter a number of measures on forest subjects were introduced in Congress and in the legislatures of several of the states. Owing to shortness of the session and great press of business, no measures of importance were passed by Congress. It is interesting, however, to note that among the bills introduced there were four touching on the administration of the forest reserves. One was a bill giving the President power to set aside any part of a forest reserve as a game refuge. Another gave all persons employed in forest reserves and national parks the power to arrest trespassers or persons setting fire to timber or violating any of the laws governing the forest reserves and national parks. A third bill provided for the selling of the timber and other materials and for the leasing of lands in the reserves. This law was drawn in order to provide power to cover the question of leasing for grazing and other purposes. The fourth law in connection with the reserves provided for the export of reserve timber beyond the

boundary of the states in which the reserve was located, in cases where deemed advisable by the Secretary of the Interior.

A matter for general regret is the failure of Congress to act on the bill to purchase lands for a national forest reserve in the Southern Appalachian Mountains. This measure passed the Senate on June 24, 1902, but consideration in the House was prevented owing to the adjournment of Congress. Every effort was made by the friends of the bill to have it brought up at the recent session, but they were unsuccessful. There is but little doubt that the bill if brought to a vote would have passed. The fight for this reserve must be made all over again, and the friends of the movement should lose no opportunity to create a favorable sentiment for it. The Southern Appalachian Forest Reserve is a project of importance to the people of the whole country, and they must see to it that Congress gives the matter favorable consideration at its next session.

New Hampshire.—A joint resolution was passed by the New Hampshire Legislature, and signed by the governor, which provides for a forest examination of the White Mountain region. The Forest Commission, according to the terms of this resolution, are authorized to procure, upon terms to be approved by the governor and council, the general examination of the forest lands of the White Mountain region. It also provides that this examination shall be made by the Bureau of Forestry, whose report shall be made before the next session of the general court. The sum of \$5,000 is appropriated for the work.

Another joint resolution passed by the New Hampshire Legislature favors the establishment of a national forest reserve in the White Mountain region. This resolution was brought about by the fact that certain permanent and summer residents of the state had taken steps during the past winter to memorialize Congress for the establishment of such a reserve in the White Mountains. The resolution gives the United States Government permission to acquire by purchase, gift, or condemnation such lands in the state as in the opinion of the Federal Government may be needed for the establishment of a national forest reserve in the White Mountains.

A third joint resolution provided for a nursery for the growth and distribution of forest seedling trees within the state at cost. This passed the House but failed in the Senate.

Indiana.—A bill to create a state forest reservation was passed by the legislature just adjourned and has been signed by the governor. Another bill amends two sections of the old forest law, one amendment being that whereas the old law required that one member of the State Board of Forestry be taken "from the woodworkers of the state, who is a mechanic actively employed at his trade," the new law requires that one member be "from the membership of the Hardwood Lumber Dealers' Association of Indiana," and the member who before was taken from the State Forest Association is hereafter to be one actively engaged in farming."

The members of the board are to get a salary of \$100 a year and mileage to the meetings. Present members are to serve out their four years' term. The secretary received an increase in salary from \$1,200 to \$1,800 a year.

The reservation law authorizes the State Board of Forestry to purchase 2,000 acres of land for a state forest reservation and state nurseries. The land may be located in any county or counties and shall not exceed in cost \$8 an acre. Money derived from the sale of timber, mining, or in any other way is to be paid into the state treasury. The sum of \$1.50 an acre annually is appropriated for maintenance.

California.—An act recently passed by the legislature of California and signed by the governor appropriates \$65,000 for coöperation with the Federal Government in several lines of work. Of this amount, \$15,000 is to be spent at the direction of the chief of the Bureau of Forestry for the purpose of studying the forest resources of the state, with a view to the preparation of a proper forest policy. The appropriation for this purpose was made with the understanding that a like amount would be spent by the Federal Government.

Owing to the severe forest fires of last September, in which about \$12,000,000 worth of timber and other property was destroyed in the states of Oregon and Washington, the question of establishing a patrol system has been widely discussed there. As a result, the legislatures of both states have considered bills looking to the suppression of forest fires.

Washington.—A very comprehensive fire law has just been passed by both houses, and will, it is understood, be signed by the governor. It provides:

1. That the State Land Commissioner shall be *ex officio* forest fire warden.
2. That the county commissioners of the various counties shall be *ex officio* deputy forest fire wardens.
3. That all road supervisors or commissioners shall be *ex officio* forest patrolmen in their respective road districts.
4. That all state land cruisers shall be *ex officio* forest patrolmen at large.

The law further provides that timber cruisers and others in the employ of

corporations or private individuals may be vested with the duties of patrolmen at large at the discretion of county wardens.

The fire laws are to be posted throughout the state annually not later than May. A close season is to be determined, during which time no one will be permitted to burn slashings without first obtaining permission in writing from the county board.

Persons who shall on any land within the state set and leave any fire that spreads and does damage are liable to a fine of not less than \$10 or more than \$500. Fires set maliciously are punishable by a fine of from \$20 to \$1,000 and imprisonment from one month to one year.

From June to October all locomotives and logging engines must carry spark-arresters. Failure to do this is punishable by a fine of from \$10 to \$50 a day for each engine so operated.

Oregon.—A fire law was brought before the Oregon legislature at its recent session and promptly passed by large majorities in both houses. Much to the surprise of every one interested, the governor vetoed the measure. The reason given was that it was too loosely drawn in regard to expenditures.

In addition to the foregoing list of bills, measures are pending in the legislatures of several other states, the final outcome of which will be noted in the May number of FORESTRY AND IRRIGATION.

RECENT PUBLICATIONS.

The Birds of North and Middle America. By ROBERT RIDGWAY. Bulletin of the United States National Museum, No. 50, parts I and II. Pp. 715 and 834. Illustrated by outline drawings of type specimens.

In all of the recent mass of alleged natural history lately and justly scored by John Burroughs, it is actually refreshing to come across a work of value, as this is; for, although the volumes present only technical detail in the baldest manner, they show that earnest scientists are gathering and presenting facts even while literary unnaturalists revel in fictional fancies. The first part was published in 1901, after twenty years of careful preparation of details, with minute measurements of every type specimen available. Some conception of the magnitude of this task may be gained from the knowledge that every species and subspecies of bird found on the continent of North America have been included, from the Arctic districts to the lower end of the Isthmus of Panama, together with those of the West Indies and other islands of the Caribbean Sea and the Galapagos Archipelago. Every collection of value in North and Middle America has been drawn upon, and introduced and naturalized species have been described as well as accidental or casual visitors. It can easily be seen, then, that the work is stupendous in scope, and that the author has spared no pains or labor to make it as complete and satisfactory as such a work can be made. It will always be an authority. At least eight volumes will be required to complete the work, and they cannot be finished more rapidly than two each year, and this would be an impossibility if the drudgery had not already been gone through, in long years of labor, leaving only the com-

pilation and editing to do, and in several of the volumes this part of the work is well advanced. The third volume will go to press some time during the present year.

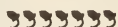
Eighth Annual Report of the New York Forest, Fish, and Game Commission. For the year ending September 30, 1902. Pp. 164. Illustrated from photographs.

In this publication the commission calls especial attention to the fact that the state is getting value received and interest for every dollar spent in the protection of forests, fish, and game. A pardonable pride is taken in the work done in protecting the forests from fire, and the result is shown in the practical immunity which the state forests have had in the past year from this scourge. The improvement in line and net fishing has been noteworthy, and the increase in the number of deer taken is an evidence of the wisdom of existing protective game laws.

Suggested legislation proposes to put a stop for a time at least to fishing through the ice, to the spring shooting of all birds for all time, and for five years to the shooting of the black bear in the Adirondacks.

More than three-fourths of the report is devoted to forest work, mainly as exemplified in the Adirondacks, with an exhaustive paper on the commercial culture of improved varieties of chestnuts, by Ernest A. Sterling. The game and fisheries reports, while more brief, present much of interest, the former on the restocking of the Adirondack region with elk and moose, while the latter shows valuable returns on the investments made in establishing fish hatcheries and the protection afforded the shell-fish industry.

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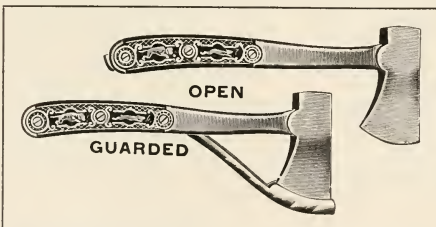
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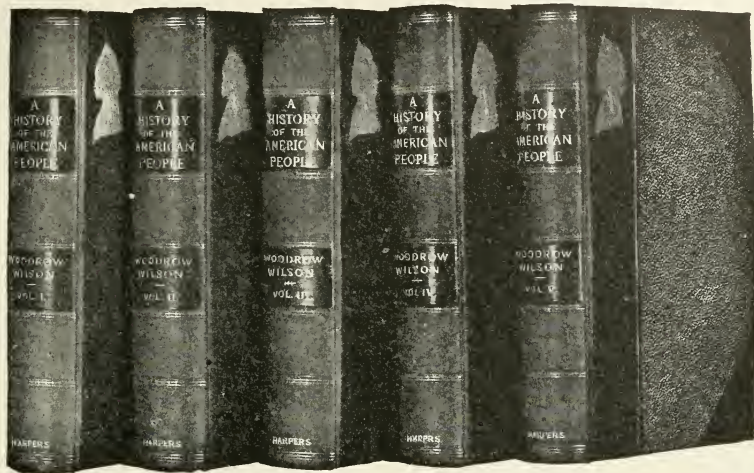
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The objects of the Association, as set forth in its Constitution, are as follows:

1. The adoption by the Federal Government of a permanent policy for the reclamation and settlement of the public domain, under which all the remaining public lands shall be held and administered as a trust for the benefit of the whole people of the United States, and no grants of the title to any of the public lands shall ever hereafter be made to any but actual settlers and homebuilders on the land.
2. The preservation and development of our national resources by the construction of storage reservoirs by the Federal Government for flood protection, and to save for use in aid of navigation and irrigation the flood waters which now run to waste and cause overflow and destruction.
3. The construction by the Federal Government of storage reservoirs and irrigation works wherever necessary to furnish water for the reclamation and settlement of the arid public lands.
4. The preservation of the forests and reforestation of denuded forest areas as sources of water supply, the conservation of existing supplies by approved methods of irrigation and distribution, and the increase of the water resources of the arid region by the investigation and development of underground supplies.
5. The adoption of a harmonious system of irrigation laws in all the arid and semi-arid states and territories under which the right to the use of water for irrigation shall vest in the user and become appurtenant to the land irrigated, and beneficial use be the basis and the measure and limit of the right.
6. The holding of an annual Irrigation Congress, and the dissemination by public meetings and through the press of information regarding irrigation, and the reclamation and settlement of the arid public domain, and the possibilities of better agriculture through irrigation and intensive farming, and the need for agricultural education and training, and the creation of rural homes as national safeguards, and the encouragement of rural settlement as a remedy for the social and political evils threatened by the congestion of population in large cities.

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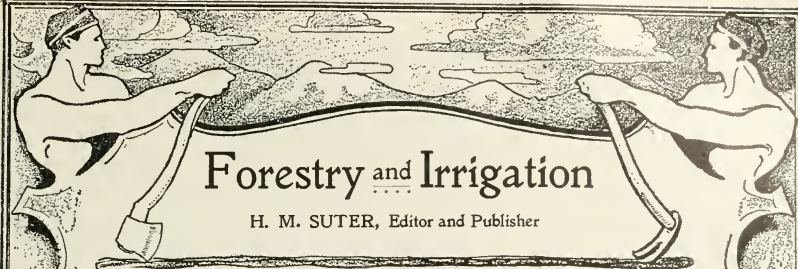
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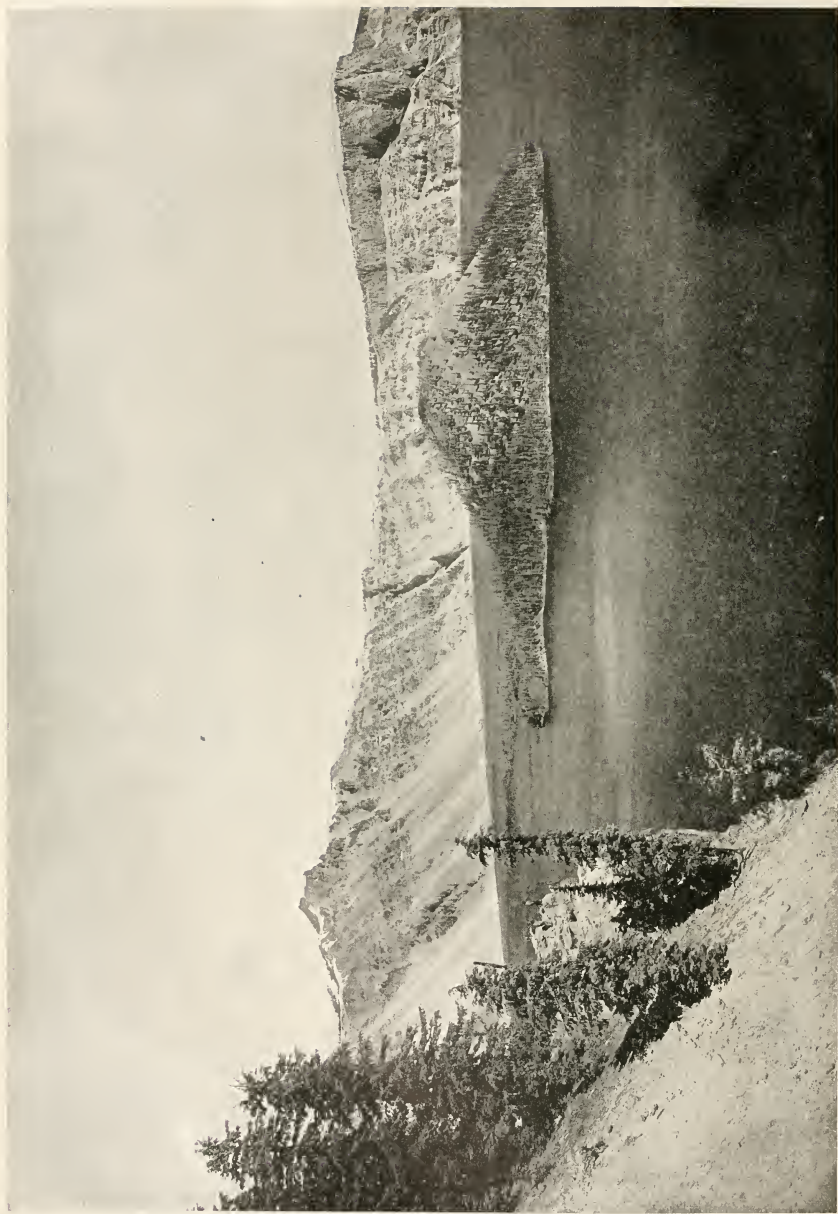
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NEWS AND NOTES.

Important Action by Secretary of Interior.

The action of the Secretary of the Interior, described more fully on another page, in regard to the Salt River Valley

Water-Users Association, is one of the most important steps taken in the interpretation and practical application of the reclamation law. It furnishes a precedent for other communities and allows organizations to be formed with a greater definiteness of purpose than has hitherto been possible. The most essential points are the recognition of the necessity of the formation of such organizations and of the fact that the Secretary will deal with the associations rather than attempt to adjust matters individually with hundreds or thousands of small land-owners.

The second important point settled is that the Secretary will require good security from the individuals benefited through the association in such a form as to insure prompt payment to the government without conflict or delay. Nothing could be more destructive to the working out of the purpose of the law than to compel the Secretary of the Interior to collect small amounts from innumerable individuals.

Equality of rights are also assured by this action of the Secretary, as he points out clearly that he expects that the ordinary cost of distribution and maintenance will be assessed against all of the lands, and that a favored few will not be exempt from their share of the expenses.



Society of American Foresters.

On Thursday evening, April 30, the Society of American Foresters held its last open meeting for the season of 1902-1903 with an

illustrated address by Prof. Filibert Roth on the "Present Possibilities of Forest Work in Michigan." The series of open meetings during the past winter was the third annual arranged by the Society and in many ways the most valuable. The subjects discussed were unusually timely and the list of speakers a notable one. President Roosevelt honored the Society of American Foresters by addressing it, as noted in the April number of FORESTRY AND IRRIGATION. Other speakers of special note were Mr. Gifford Pinchot, who described forest conditions in the Philippine Islands as he found them on his recent trip to the archipelago; also Mr. F. H. Newell, who discussed the "National Irrigation Act and its Relation to Forestry."

The Society of American Foresters, since its organization at Washington, D. C., November 30, 1900, has become one of the leading factors in advancing forestry in the United States.

The objects of the Society, as set forth in its constitution, are "to further the cause of forestry in America by fostering a spirit of comradeship among American foresters, by creating opportunities for a free interchange of views upon technical and allied forest subjects, and by the dissemination of a knowledge of the purpose and achievements of practical forestry."

The society has unusual opportunities for carrying out its objects from the fact that its headquarters are in Washington, where the larger portion of the professional foresters of the country are located, owing to their connection with the government service.

During the winter season the Society holds weekly meetings, a majority of which are open and to which guests are invited. At each of these meetings

there is a paper or address by some member or guest of the society on some timely topic in connection with forest work. In addition, there is open discussion of the question under consideration. Members and guests present are permitted and encouraged to question the speaker in order to bring out all possible information on the topic before the meeting. The multitude of forest problems confronting American foresters, and the only recent adoption of forestry to any extent, makes this association of ideas and experiences of great mutual benefit. These meetings of the Society of American Foresters afford young foresters unusual opportunities to get in touch with the leading thought and achievements in their profession.

Membership in the Society of American Foresters is divided into three classes: active, associate, and honorary. Active members are chosen only from the ranks of professional foresters; associate members are selected from those gentlemen, not professional foresters, who have rendered notable service to the cause of forestry; honorary members are chosen from professional foresters whose fields of work lie outside of the United States and its possessions.

The membership of the Society of American Foresters includes the following persons:

Active members.—Gifford Pinchot, Forester, U. S. Department of Agriculture; Prof. Henry S. Graves, Director, Yale Forest School; H. B. Ayres, U. S. Geological Survey; Dr. C. A. Schenck, Director, Biltmore Forest School; Dr. B. E. Fernow, Director, New York State College of Forestry; Dr. J. T. Rothrock, Forest Commissioner of Pennsylvania; Dr. John Gifford, New York State College of Forestry; Prof. James W. Toumey, Yale Forest School; E. M. Griffith, Bureau of Forestry, Philippine Islands; and Filibert Roth, Overton W. Price, Wm. L. Hall, Ralph S. Hosmer, Thos. H. Sherrard, F. E. Olmstead, Geo. B. Sudworth, Edward T. Allen, John Foley, Henry Grinnell, G. Fred. Schwarz, H. J. Tompkins, all in the Bureau of Forestry.

Associate Members.—Hon. James Wilson, Secretary of Agriculture; President Roosevelt; Col. William F. Fox, Superintendent of State Forests of New York; Gen. C. C. Andrews, Chief Fire Warden of Minnesota; F. H. Newell, Chief Engineer, Reclamation Service; Henry Gannett, Geographer, U. S. Geological Survey; Arnold Hague, U. S. Geological Survey; Hon. Chas. D. Walcott, Director of U. S. Geological Survey; Frederick V. Coville, Botanist, U. S. Department of Agriculture; Prof. J. A. Holmes, State Geologist of North Carolina; Otto Luebkert, Bureau of Forestry; Geo. P. Whittlesey; Hon. Frank S. Black, ex-Governor of New York; Ex-President Grover Cleveland; Dr. W. Seward Webb; Hon. Wm. C. Whitney; Dr. B. L. Wiggins, Vice-Chancellor of University of the South; J. W. Pinchot; Geo. W. Vanderbilt; Dr. N. H. Egleston; Hon. Willock Noble; Prof. Wm. H. Brewer, Yale University; Hon. D. R. Francis; Prof. Wm. R. Dudley, Leland Stanford University; Capt. Geo. P. Ahern, Chief of Forestry Bureau, Manila, P. I.; Dr. C. Hart Merriam, Chief of Biological Survey, U. S. Department of Agriculture; Prof. V. M. Spalding, University of Michigan; Dr. Charles E. Bessey, University of Nebraska; Hon. Robert W. Furnas, ex-Governor of Nebraska; Prof. Chas. S. Sargent; Prof. J. G. Jack; Judge John B. Waldo; Prof. C. E. Faxon; Hon. E. A. Hitchcock, Secretary of the Interior; Dr. Wolcott Gibbs; Dr. Morris K. Jesup.

Ex-President Benjamin Harrison, Hon. J. Sterling Morton, and Dr. Charles Mohr were also associate members of the Society of American Foresters.



**Colorado
Agricultural
College.**

Professor L. G. Carpenter, of the Department of Civil and Irrigation Engineering of Colorado Agricultural College and Director of the State Experiment Station at Ft. Collins, has been granted a temporary

leave of absence in order to act as State Engineer of Colorado, a position which includes lines of work much the same as have been carried on in connection with the work of the experiment station. In the meantime Professor Carpenter will retain his connection with the experiment station and have supervisory control of the Department of Civil and Irrigation Engineering at the college.

The Colorado Agricultural College will soon erect a building for the Department of Civil and Irrigation Engineering. This building will include also the offices of the experiment station during 1903-'04. An appropriation for this purpose of \$40,000 has been made by the Colorado State Legislature.



Forest Work Western Kansas north
in Kansas. of the Arkansas River
and west of a line drawn

from Osborne through Russell to Larned, will receive the attention of the Bureau of Forestry this summer. A study of the tree growth of that region will begin this month under the direction of R. S. Kellogg, of Russell, Kans., an agent for the Bureau, and will be continued until fall. In this part of the state the timber penetrates the prairies by way of the river bottoms, clinging closely to these moist lands and advancing only occasionally to the uplands.

The Bureau will study the tendency of the trees and shrubs along the water-courses to increase and spread, especially when protected from fire and stock, and will determine what species are best adapted to planting on those uplands that contain no natural growth.

In many places along the streams where fire and stock have been excluded for ten or fifteen years are found thrifty young Cottonwoods, White Elms, Box-elders, and other species which are slowly invading the great plains.

The low rainfall of western Kansas is not alone responsible for the scarcity of timber. The Pine Ridge country of Nebraska grows forests with only 16 inches of rain a year, while the treeless regions of western Kansas

have a precipitation of 16 to 20 inches. Failures in tree planting, aside from natural causes, such as high winds and intense sunlight, are due chiefly to a lack of care in planting and cultivating and a lack of knowledge of what kinds of trees to plant.

Such failures have not been without some value—they have given a fairly good knowledge of what to and what not to plant, and of the methods that are successful and those that are not. It is partly to increase this knowledge that the Bureau has undertaken its study of the tree growth of the state. Timber, fuel, posts, and firewood may be grown in the prairie regions; that fact is established. But the plantations, to be successful, must be composed of the right species, planted in the right way on the right kind of land, and cared for in the right manner.



Death of an With the recent prema-
Oregon ture death of Mr. A. J.
Forester. Johnson, Oregon loses
a man who had done
much to increase interest in and to promote the cause of forestry in the state. He died at the city of Portland, Oregon, April 10, of pneumonia, at the age of forty-nine.

Mr. Johnson was a native of Sweden, and came to the United States in 1872, settling first in California and later at Astoria, Oregon, where for the last twenty years he has conducted a prosperous forest nursery business, dealing particularly with the Pacific Slope forest trees, shrubs, and other plants.

His wide and practical knowledge of the forest trees of Oregon and of adjacent states early brought him into prominence in state forest exhibition work. His most important work of this kind was the collection and installation of Oregon's forest exhibit at the World's Columbian Exposition, Chicago; Pan-American Exposition, Buffalo, and at the South Carolina Interstate and West Indian Exposition, held at Charleston. The excellence of these displays of Oregon's immense timber resources was due to Mr. Johnson's thorough knowledge

of the forests of the state and to his untiring energy in bringing together desirable material. During the present year he was planning to collect specimens for the Lewis and Clarke Centennial Exposition, to be held at Portland, Oregon, in 1905. It is probable also that had he lived he would have been largely concerned in the preparation of the Oregon State forest exhibit to be installed at the World's Fair, St. Louis, in 1904.

Mr. Johnson's exhaustive contributions of field-notes and other data from which the United States Geological Survey recently compiled a map and description of Oregon forests is a most important work, which he completed as an expert in the employ of the above department. Nearly three years of arduous field travel and study were consumed in this investigation, the results of which are of the greatest prac-

tical value both to foresters and to lumbermen.

Mr. Johnson was widely and very favorably known in Oregon, and he was always keenly alive to furthering the forest and agricultural interests of his state. He has made himself most helpful to many travelers and explorers who under his guidance have studied the forest and other plants of Oregon.

He was a self-made man, whose frank, genial manner won for him many friends to grieve at his passing.



Business Men Favor the Home-seeker. The National Business League, with headquarters at Chicago, have printed for distribution copies of resolutions, unanimously adopted by them, recommending an early repeal of the desert land law, the commutation clause of the homestead



Photo reproduced through courtesy of Mr. F. O. McGehee.

SCENE IN AN OLD FIELD GROWN UP IN PINE, NEAR PINE BLUFF, ARKANSAS. THIS FIELD WAS CULTIVATED IN 1877, AND THE LARGEST TREES ARE NOW ABOUT 16 INCHES IN DIAMETER; RESULT OF KEEPING OUT FIRE.

law, and the timber and stone act. These circulars are headed "Homes for the homeless, lands for the landless." The resolutions follow:

"*Whereas*, For the reclamation, through irrigation, of the arid regions of the West by the United States Government, for the purpose of providing small tillable farms for settlers and home-builders only, and for the consequent enlargement of the agricultural, industrial, and commercial interests of the country, the national irrigation law was enacted June 17, 1902; and

"*Whereas*, Through the provisions of certain preëxisting national laws, the spirit and purpose of the aforesaid national irrigation law cannot be properly fulfilled, as indicated in President Roosevelt's second message to the Congress of the United States, December 2, 1902, as follows:

"So far as they are available for agriculture, and to whatever extent they may be reclaimed under the national irrigation law, the remaining public lands should be held rigidly for the home-builder, the settler who lives on his land, and for no one else. In their actual use the desert land law, the timber and stone law, and the commutation clause of the homestead law have been so perverted from the intention with which they were enacted as to permit the acquisition of large areas of the public domain for other than actual settlers and the consequent prevention of settlement."

"Therefore be it

"*Resolved*, That the National Business League, through its standing committees, hereby respectfully requests the early repeal of the desert land law, the commutation clause of the homestead law, and the timber and stone law, for the purpose of removing all legislation in conflict with, or perversion of, the best interests of the home-seeker and for forest preservation in connection with the aforesaid public lands; and be it further

"*Resolved*, That copies of this resolution be sent to each member of the Senate and the House of Representatives at Washington, to all manufacturers, commercial organizations, and

prominent business firms throughout the country."

South Africa and Forestry.

The different provinces of South Africa are making rapid advances in forest work on account of the need of conservation of resources and, at this time, as a direct result of the active interest of Lord Milner in the subject. He is one of the foremost foresters among Englishmen, and, curiously, Cecil Rhodes was the reverse. Natal has appointed a permanent conservator of forests, and Mr. E. Hutchins, in charge of the South African work, has lately returned from a tour in the Transvaal and Rhodesia, during which he noted material progress. He was formerly in the Indian Forest Service, but has been connected with the same class of work in South Africa since 1891.

He is at present trying to get a man from India to take charge of the Transvaal Forest Department, in order to put that province on a secure basis in the work. Rhodesia is taking up forestry. The Island of Mauritius has borrowed \$500,000 for the forest work there. The Cape government railways have appropriated \$50,000 as the first installment of \$250,000 for plantations to grow sleepers, which are now being imported from Australia. The executors of the Rhodes estate have asked Mr. Hutchins for a working plan for the historical Groote Schur forests, and will spend \$50,000 to put them in order.

New Irrigation Ventures.

Projects involving extensive irrigation improvements in three western states have lately been inaugurated. Most of these are in California and Wyoming, and several are of considerable importance. One transaction involving \$500,000 and 30,000 acres of ground is the result of a merging of the interests of the Artesian Water Company, the Santa Monica Water Company, the Water Company of Sawtelle, and a number of individuals, all in the neighborhood of Los Angeles, California. The purpose is to furnish water for irrigation and domestic pur-

poses to all of the Pacific coast area from Los Angeles to the sea, including the supplying of city water to Santa Monica and Playa del Rey.

Another California venture provides for what is termed the most extensive irrigation canal project in the State of California, contracts having been let for the completion of a canal which will extend from the northern boundary of Glenn county to the southern border of Colusa, watering one of the richest sections of the state, through a distance of 85 miles. Press reports say that Elwood Mead has pronounced it the best irrigation project in the state. Twelve years ago \$700,000 were invested and 60 miles of canal were completed, but the financial distress of 1894 involved the company, and work was abandoned. Now it is predicted that water will be turned into the canal from the Sacramento River June 4, and will be carried on a 60-foot bottom at the rate of 3,000 cubic feet per second. About 4,500 acres on the big Glenn ranch have been bought up by the company, which proposes to break up such large tracts into small holdings. Business men of San Francisco, Colusa, Willows, Fresno, and Los Angeles, forming the Central Canal and Irrigation Company, are back of the enterprise.

The Butte County Canal Company, in the same state, will divert the waters of the Feather River to cover 180,000 acres in Butte county in the neighborhood of Oroville, Biggs, Gridley, and Liveoak. Articles of incorporation for the company have been filed, and plans look toward a 15-mile main canal, with 6-foot bottom and a combined length of nearly 200 miles in main and lateral ditches. It is promised that the rate per acre for water will be the lowest in the state.

No less than six irrigation projects are getting under way in Wyoming, some of them of considerable importance. The Boulder Creek Canal Company, in Fremont county, intends to reclaim by irrigation 7,000 acres of land with water from Boulder Creek, about 20 miles north of New Fork. The Encampment-Platte Valley Ditch Company has been organized at Saratoga, Wyo., to construct a 9-mile canal from the

Encampment River to cover 1,100 acres of land on the west side of the Platte. Omaha (Nebr.) capital is being interested in a plan for a large canal to take water from the Big Horn River, 50 miles south of Basin City, Wyo. It is proposed to cover all the land known as Gooseberry Flat, comprising many thousands of acres of fertile soil. The Big Horn Canal Company has built its main canal from the Big Horn River to Fifteen-mile Creek, a distance of 15 miles. Here a tunnel will be necessary before further progress can be made. All of the land under the present ditch has been filed upon by a colony from Indiana. The Wiley Ditch Company, which takes its water from the Grey Bull River, has just had a suit, on account of alleged shortage of supply, decided in its favor, and the farmers along its ditches are promised an abundance of water for all purposes during the coming season.

The Big Horn Basin Development Company will reclaim 250,000 acres of land in the neighborhood of Guernsey under the provisions of the Carey act, and will construct a canal 80 miles long, with a storage reservoir to hold 20,000,000,000 cubic feet of water.

Contracts have been let for damming the Snake River in Idaho at a point 65 miles above Shoshone Falls and building 65 miles of canal on the south and 24 miles on the north side of the river, not including laterals, which will irrigate 340,000 acres under the new government irrigation law. The dam will cost \$400,000 and the main canals \$2,500,000. The latter will be 80 feet wide at the bottom, 160 feet at the top, and will carry 10 feet of water, raised 40 feet from the river.



Lumber Manufacturers Endorse Forestry.

Last month FORESTRY AND IRRIGATION recorded the meeting of the National Wholesale Lumber Dealers' Association at the national capital, and more recently the annual session of the National Lumber Manufacturers' Association was held in Washington on April 20 and 21. A warm interest in forest

work was displayed and an address by Gifford Pinchot, Forester of the U. S. Department of Agriculture, was enthusiastically received and followed by an interesting discussion. The attitude displayed was one fully in favor of forestry, and a special committee on forestry drew up the following report, which was unanimously adopted by the Association:

"We recognize the wisdom of our government in establishing the Bureau of Forestry, and commend to all lumbermen a careful consideration of the efforts now being made in the interest of preserving and caring for our future timber supply. We pledge our earnest coöperation in every practical plan for the better handling of our forest properties, and urge our membership to labor with their respective state governments for enactment of such laws as will tend to the fullest encouragement of all practical reforestation effort.

"We most heartily endorse the great work sought to be done by our national government in the Appalachian districts, and believe a careful study of the plans under way there will greatly enthuse all who seek knowledge of means for bequeathing to posterity some of the rich blessings so freely bestowed upon our own generation.

"We hereby endorse our hearty appreciation of the great interest the President of the United States has manifested in all questions relating to our industry, and extend to the Bureau of Forestry our thanks for its efforts in our behalf, and especially to its efficient head, Mr. Gifford Pinchot, for his address and the many courtesies he has so graciously bestowed."

IRA CARLEY, *Chairman.*
J. A. FREEMAN.
C. C. YAWKEY.

The delegates to the convention visited the Bureau of Forestry, at the invitation of Mr. Pinchot.

Tree Planting in Alabama. A planting plan has recently been prepared by the Bureau of Forestry for 1,800 acres of land in Cullman county, Alabama, owned by Emil Ahl-

richs, and valued at from \$1.25 to \$3 per acre. The planting will be done in several different localities in Cullman county. Work will begin as soon as growth ceases next fall, and will continue through the winter, except in freezing weather. The first season's work will include the planting of forest-collected Loblolly Pine seedlings on a tract of 160 acres of open woods. Two hundred and eighty acres will be planted with Chestnut and White and Post Oak. A seed bed will be prepared for the raising of Loblolly Pine for a tract of 640 acres, as it is not considered advisable to use much stock collected from the forest.

The point upon which all this planting is based is that while immense quantities of Loblolly Pine are being cut, there is little or no reproduction, due chiefly to annual fires set to improve the pasture. Mr. Ahlrichs will have a fire-patrol system, and will also treat a tract of 640 acres to improve the natural reproduction by the prevention of fires.

Labor may be obtained at \$15 per month; hence the work can be done at very small cost. It is calculated that the planting will cost only from \$2 to \$3 per acre.

Loblolly Pine is to be planted for the production of construction lumber, Chestnut for posts and telegraph poles, and Oak for railroad ties.

Forestry in New Mexico. William L. Hall, Chief of the Division of Forest

Extension of the Bureau of Forestry, has just returned from a trip to New Mexico, made at the request of J. J. and H. J. Hagerman, principal members of the South Spring Ranch and Cattle Company, which owns a big ranch near Roswell, in the Pecos River Valley, one of the richest and best irrigated regions in the territory. The company wants to raise trees on a part of its irrigated lands, both for fence posts and for shade and ornamental purposes. Mr. Hall made a planting plan for 450 acres. The trees to be planted for fence posts will be Hardy Catalpa; those to be planted for shade and ornament will be hardwoods, such as Black

Walnut, Pecan, Green Ash, Basswood, Horse Chestnut, White Elm, and Sycamore.

There is no timber in this part of New Mexico except the Cottonwoods that have been planted there. Fence posts of Sabine Cedar from the canyons of western Texas are shipped in, and cost 15 to 20 cents apiece.

While in New Mexico Mr. Hall made a preliminary examination of 200,000 acres of cut-over timber land owned by William H. Bartlett, of Chicago. The land lies on the east slope of the Rocky Mountains, in New Mexico, about 50 miles southwest of Trinidad, and touches the Colorado line. The land once bore a good growth of Yellow Pine, but the timber has been or soon will be nearly all cut. Mr. Bartlett wants to grow timber on it again, not only for the production of lumber, but that it may serve as a private forest and game preserve.



Forest Fires. Already the reports of forest fires are beginning to appear in the daily press of the country, and it seems that the deep snows of winter are hardly melted before fires gain headway in the woods and begin their careers of damage and disaster. Michigan and Pennsylvania have suffered severe loss, and a town in Wisconsin has been destroyed.

Pennsylvania.—The worst forest fires in the history of western Pennsylvania were reported as burning fiercely April 30, as we go to press. They are in the vicinity of Bradford, and more than \$1,000,000 worth of property is reported as destroyed. At Watsonville the town was hemmed in on all sides, and the last message from there before the telephone wires came down was that there was no avenue of escape, and that the people and place were doomed. The people of Simpson were rescued by a special train, but lost everything. The oil wells in the neighborhood added to the fierceness of the flames, and it is feared that there was some loss of life. The town of Mount Jewett was saved by heroic efforts, though some buildings were lost, and a number of lumber camps and chemical factories are in

ashes. It is not known how the fire started, but the woods have been burning for a week, being kept under control by fire-fighters until a southeast gale fanned the embers into a torrent of flame that carried everything before it.

Michigan.—News received at Houghton, April 28, reported that serious danger was threatened by forest fires on the Michigan peninsula, in the neighborhood of Ontonagon and Mass City. The woods are dry, as there has been but little rain, and at the time the magazine goes to press a more serious fire than that which destroyed Ontonagon in 1896 is threatened. The flames started from bush fires.

Wisconsin.—Dispatches from Ashland, dated April 28, report the destruction of the little town of Kimball, rendering most of the inhabitants homeless and destitute. Bayfield was seriously threatened, and forest fires, fanned by a gale, are raging in the vicinity of Ashland.



Prizes for Essays on Iowa Trees.

By the generosity of friends, the Iowa Park and Forestry Association makes the following announcement of prizes offered to residents of Iowa who may be interested in the work which it is the purpose of the organization to promote:

1. The Robert Douglas prize of \$25, to be paid to the person presenting the best account of the native forest trees of the state, their present distribution and condition.

2. A not-yet-named prize of \$25, to be paid for the best essay on "Trees for Iowa Farms."

3. A similar prize of \$25, to be paid for the best paper on the subject, "The Ornamentation of School Grounds, both in City and Country."

4. A prize of two years' membership in the Iowa Park and Forestry Association to each high school in Iowa, to be awarded to the member of the senior class presenting at commencement the best essay on the theme, "What Can We Do to Make More Beautiful Our Own Town?"

These prizes will all be awarded at the next session of the Association, in December. Instead of single prizes of \$25 each in the first three cases, first and second prizes may be given of \$15 and \$10 respectively. The prizes may be paid in cash or in trees ready for planting.

Papers must be submitted to the secretary of the Association prior to November 30, 1903.

For further particulars address Thos. H. Macbride, President Iowa Park and Forestry Association, Iowa City, Iowa; L. H. Pammel, Secretary, Ames, Iowa.

Reclamation Service in North Dakota.

The engineers of the United States Geological Survey are rapidly taking the field in order to continue field work in the various irrigation projects authorized by the irrigation law of June 17, 1902.

North Dakota is one of the states included within the provisions of the law, and as it has at present a considerable fund at its disposal for the construction of works, plans have been made to take up active field work in the immediate future. A number of engineers began work in the state on the first of April, studying the general topography and investigating any irrigation projects that may come to their attention. If the preliminary examination warrants taking action, field parties will be organized and active survey work prosecuted in order to obtain data for estimates of cost. If these estimates show that any particular project is feasible—that is, that the water supply is adequate—that there is a sufficient area of land available for irrigation, and that the cost of bringing water to it is reasonable, recommendations for construction will be submitted to the Secretary of the Interior for his approval.

The present investigations will be largely confined to the western part of the state and will consist of examinations for the diversion of the main Missouri River, although they will also include examinations of its tributaries in the northern and southern parts of the state.

Forestry at Michigan Agricultural College.

The work of the Department of Forestry at Michigan Agricultural College, which began with the current college year, has progressed favorably. A four-year course has been adopted by the faculty, and two seniors and three juniors are taking the special work in forestry this year, while 31 agricultural students took the elementary work during the winter term.

The equipment of the Department of Forestry is already of such a nature that students have decidedly good advantages for making a general study of the science of forestry. Special office and class-rooms have been provided. For demonstration purposes the Michigan Agricultural College is fortunate in having 3,000 acres of virgin forest in Oscoda county and nearly 200 acres of woodlots on the college farm. Three acres near the campus have been assigned for use as a forest nursery. The college campus contains over 600 native and introduced species of trees and shrubs, exclusive of an arboretum containing 1,200 trees, mainly of native species.

It is planned to convert, as fast as practicable, one tract of 55.5 acres into an arboretum.

Notes on Reclamation Service.

Mr. Arthur P. Davis, principal engineer of the Government Reclamation Service, is making a trip through the Pecos Valley, N. Mex., in order to look up possible irrigation projects for the consideration of the national government. He will also visit Arizona.

Mr. Morris Bien, of the Geological Survey, is now on a trip through the West, in order to consider the matter of land titles in connection with the irrigation projects recently sanctioned by the Secretary of the Interior. Mr. Bien will visit Salt Lake City, Reno, Nev., San Francisco, Portland, and several points in Montana.

Mr. Charles H. Fitch, one of the leading engineers of the Reclamation Service, has returned from Arizona, where he spent six weeks in inspecting the

work of government field parties along the Colorado River.

Resolutions on The Colorado Forestry Death of Association, at a recent William N. meeting in Denver, Byers. passed the following resolutions on the death of

Mr. William N. Byers, president of the organization :

We, the officers and Executive Committee of the Colorado State Forestry Association, hereby desire to express our feeling of bereavement in the death of William N. Byers, President of this Association.

In view of the fact that this Association was organized with William N. Byers in the chair; that he has been constantly associated with it from its inception, in 1884, till the present period; that he has ever been an effective factor in its activity, and its President much of the time; that he was greatly endeared to it, ever endeavoring to make it beneficial to the people of the State; and also in view of a further fact :

That as a private citizen his love of silviculture led him to collect and plant in the grounds of his home no less than thirty-five different kinds and varieties of deciduous trees, foreign to the Rocky Mountains, thus doing more than any other one person in Colorado to demonstrate the adaptability of our climate to practical forestry; therefore be it

Resolved, That the cause of forestry and our mountain forests have lost an intelligent and loving friend; that this Association has lost an earnest advocate and wise leader—one who laid broad foundations and built well; one who sowed seeds of wisdom for future harvests—and though we unite our sorrow with the public grief and a stricken family, yet we rejoice in the nobility of one who has builded along every avenue of progress in the history of our city and state; the nobility of one whose footprints are seen in every walk for the betterment of our every-day life; and be it

Further resolved, That these proceedings be spread upon the records of the Association and a copy thereof sent to

the family of the deceased, and also that copies be supplied the daily press of Denver, the American Forestry Association, Washington, D. C., and the International Society of Arboriculture, Chicago.

(Signed) W. G. M. STONE,
Vice-President.

JABEZ NORMAN,
Secretary.

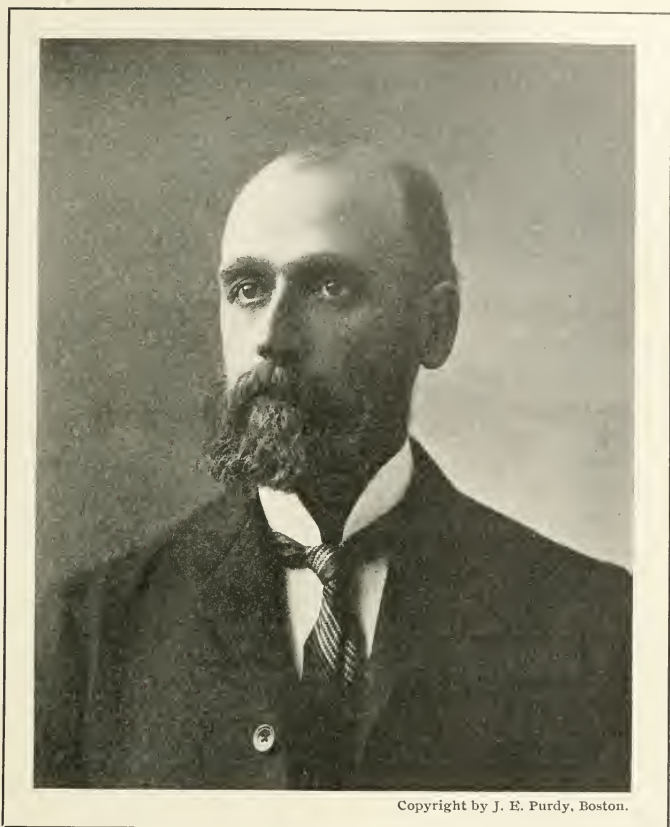
A. L. FELLOWS,
HENRY MICHELSEN,
HELEN L. GRENFELL,
C. E. WANTLAND,
PLATT ROGERS,
Executive Committee.

Pollution of Irrigation Canals. A new phase of injurious pollution which has developed in connection with some of the irrigating canals near Greeley, Weld county, Colorado, and which threatens to become somewhat serious unless soon controlled, has been forced upon the attention of the hydrographers of the United States Geological Survey.

In the Greeley district there are several large beet-sugar factories which discharge the refuse of thousands of tons of beets daily into the streams and ditches of the neighborhood. This refuse, in the form of a light gray pasty substance, renders the water entirely unfit for household and farm uses, and covers the land flooded by it with a malodorous deposit. It is likely that the matter will soon be made the subject of investigation in the hope of disposing of this refuse in a manner equally satisfactory to the manufacturer of the beet sugar and to the farmer.

It may prove to be a fact that the waste material from the beets can be utilized as a fertilizer and so become a valuable asset to the factories and a benefit instead of a nuisance to the farmers

The Greeley irrigation district, founded largely through the influence of Horace Greeley, is one of the first irrigation enterprises developed by our people in the West. The district has been very successful, and is now a large and growing community.



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FREDERICK HAYNES NEWELL,

CHIEF ENGINEER UNITED STATES RECLAMATION SERVICE.

FREDERICK HAYNES NEWELL, Chief Engineer of the Government Reclamation Service, was born at Bradford, Penna., March 5, 1862. His education was received first at Needham, Mass., and later at the Massachusetts Institute of Technology, from which he graduated as a mining engineer and geologist in 1885.

Next he engaged in mining in Colorado; later was an assistant in the Ohio Geological Survey, and also did miscellaneous engineering work in Pennsylvania and Virginia, finally joining the staff of the U. S. Geological Survey, where in 1888 he became Chief Hydrographer. In addition to his work at the Geological Survey, he was secretary of the National Geographic Society, 1892-'93 and 1897-'99. He was also secretary of the American Forestry Association from 1895 until March, 1903, a position in which he rendered valuable service in advancing the cause of forest protection.

Mr. Newell began his work under Major John Wesley Powell, the pioneer of the national irrigation movement, and he has been actively identified with it for fifteen years. During this time he has made a most exhaustive study of the water resources, not only of the arid region, but of the entire country, and is to-day the recognized authority on questions relating to water supply. To the investigations made under his direction much of the advance in irrigation in the United States is due.

It is a matter for congratulation that in the carrying out of the provisions of the National Irrigation Act of June, 1902, the actual supervision of the building of the great irrigation works falls into the hands of such a capable engineer. Mr. Newell has an intimate knowledge of the arid regions of the United States, and through years of study and investigation he is better prepared than any man in the country to locate and direct the building of great storage reservoirs. Mr. Newell has considered the problem not only from an engineering standpoint, but has also made a deep study of its economic and sociologic features. In addition to his great skill as an engineer, Mr. Newell possesses a keen insight into business matters, and the people are assured a careful and wise administration of the reclamation work.

Mr. Newell has rendered valuable service through his writings on irrigation subjects. His annual reports on the hydrographic work of the Geological Survey have been of great value. More directly connected with irrigation has been the series of Water Supply and Irrigation Papers, prepared under his direction. These touch the question of irrigation and water supply from every side, the results of experiments by the most capable engineers of the Geological Survey. His most recent publication, "Irrigation in the United States," is the book of authority on general irrigation matters in this country.

THE OUTLOOK OF THE TIMBER SUPPLY IN THE UNITED STATES.*

BY

DR. B. E. FERNOW,

DIRECTOR NEW YORK STATE COLLEGE OF FORESTRY.

PART II.

IN the first paper we have seen that the United States will have to rely for its timber supply upon its own resources and whatever its neighbor, Canada, can spare.

If, as we shall see further on, it is difficult to estimate our own home resources, it is still more difficult, with so vast and largely unsettled a country as Canada. Yet a mere knowledge of physical geography and of the relation of plant production to climate suffices to discredit the extravagant claims sometimes made regarding the natural timber supplies of that country.

The statistician of the Department of Agriculture, at Ottawa, making a report on the "Forest Wealth of Canada," in 1895, sums up the conclusions based on a more or less exhaustive inquiry as follows:

1. The first quality pine has nearly disappeared.
2. Of second quality pine there is a considerable supply.
3. Of other timber woods there is a large supply.

4. We are within measurable distance of the time when, with the exception of spruce, as to wood, and British Columbia, as to provinces, Canada shall cease to be a wood-exporting country.

As the statistician had, before the inquiry, held rather different views regarding the situation, it is not likely that these deductions are radical.

As to the spruce supply, it may be stated that an immense area to the northward and westward, as far as Alaska, contains this class of timber, but, as is to be expected from soil and climate, it occurs mostly in scattered open groves of inferior development, and, while most important for home consumption, unfit for export and use in the arts, being in that respect largely on a par with our own Alaskan possessions.

In fact, in the eastern provinces the true timber-producing area is bounded toward the north by the Height of Land. Beyond this natural limit there are only along water-courses and in limited areas stands which are capable of furnishing lumber trees; the rest is possibly pulp-

* Reprinted through the courtesy of the *Forestry Quarterly*.

wood, which, as the drainage is northward, away from market, will for a long time remain unavailable.

Canada, with a scanty population, less than six million at present, a country whose climate and soil are largely fit only for timber growing, the round 300 million acres of actual or potential timber land in the eastern provinces could be made to supply a considerable amount for export beyond home consumption. But the same inattention to caring systematically for the reproduction and protection of the timber crop which is characteristic with us prevails in Canada for the present.

Moreover, Canada can at any time close the door to further exports. Indeed, there is now a movement in that direction. It has been ordered that all logs cut on Crown lands shall be sawed within the Dominion, and a strong effort will presently be made to stop the export of pulp logs from the Dominion. At present this is mainly intended to prevent the raw materials from being exported, instead of the manufactured product; but if at any time the reduction of supplies makes it desirable, such restrictions can easily be further extended. We must, therefore, rely mainly on our own stores, and on our own efforts at home to secure the supplies for the future.

We shall now have to find some answer to the other set of questions, which concern themselves with the chances for the supply of these demands from home sources.

First, as to the amount of virgin timber still untouched and ready for use, we have really no knowledge, and only conjectures are possible. Yet a not quite unreasonable guess as to the probabilities is possible, if we have some knowledge of the forest area in different sections of the country, and the usual average stand per acre, and gather other indications leading to a probability calculation.

The writer a few years ago ventured such a calculation, having canvassed the situation from many points of view, and came to a statement of 2,300 billion feet, B. M., still available, of which 1,400 billion was supposed to be coniferous material. Although the census com-

piler is at great pains to show some of the details of this calculation wrong and below the truth, he comes finally to the conclusion that the reported total amount of timber held by lumbermen, namely, 215,550 million feet, is "probably somewhat more than one-tenth the amount now standing in the country," practically the writer's figure or less; and adding up the statements made regarding the standing timber of coniferous material, only 1,100 billion feet are found by the census compiler, as the following tabulation of his statements shows:

Species.	Billion feet, B. M.	
	Standing.	Owned by lumbermen.
Southern Pine.....	300	46.5
White Pine.....	50	16.4
Hemlock.....	100	6.8
Spruce (eastern).....	50	8.6
Cypress.....	65	6.6
Red Fir.....	300	23.8
Western Pine.....	125	24.6
Redwood.....	75	14.3
Sugar Pine.....	25	3.9
Hardwoods (one-half oak).....	?	30.0

The difference of the two estimates would appear to lie mainly in the distribution of these supplies, the writer accrediting the Eastern States with less, the Pacific coast with a larger supply.

The distribution of supplies is of considerable importance commercially, for it influences the location of manufacture and the cost of transportation to market. With the decrease of supplies in one region, a shifting of centers of production takes place in another region.

The census brings an interesting map showing the present distribution of the lumber industry. The most intense concentration of this manufacture is found in the northern section of Michigan, Wisconsin, and Minnesota; in the middle west of New York and Pennsylvania; in Maine and New Hampshire, and on the Pacific coast in Washington, and on a small territory in Oregon along the Columbia River, while the centers

of intensive production in the Southern States are more widely scattered with reference to shipping ports along the coast and Mississippi River.

There are also tabulations showing by geographical subdivisions the relative positions of the different territories as contributors to the timber product and the changes that have taken place in this relative position, as far as the defective census figures indicate. At least the general tendency of this change in the four principal sections may be seen in this tabulation of the percentage of total lumber production contributed by them:

Years.	Northeastern States.	Lake States.	Southern States.	Pacific States.
1850...	54.5	6.4	13.8	3.9
1860...	36.2	13.6	16.5	6.2
1870...	36.8	24.4	9.4	3.6
1880...	24.8	33.4	11.9	3.5
1890...	18.4	36.3	15.9	7.3
1900...	16.0	27.4	25.2	9.6

As supplies gave out, the Northeastern States reduced their cut; as railroad development increased, the Lake States increased their cut until, in 1890, the highest mark was reached and the decline began; the Southern States then increased their cut in proportion. These changes in location are interesting and significant, but for our purpose of forecasting the future, we are concerned only with the supplies as a whole.

Since, owing to change in the standard of the commercial log, owing to closer utilization and to more careful exploitation and manufacture, supplies usually hold out longer than anticipated, it will be perfectly safe to accept the writer's higher estimate, and yet find the situation unsatisfactory. For even if we double this estimate, it is apparent that with a cut of forty billion feet, increasing at the rate of at least 5 per cent per annum, we do not have 30 years' supply of old stock in sight, a serious enough situation to make desirable a more serious, statesmanlike, and businesslike consideration of the forestry problem than it has received hitherto.

We admit that both the census compiler and the writer are mainly guessing at the amount of standing timber, but there are enough data at the basis of these guesses to render them worthy of consideration.

The census brings the information that the stumpage on the lumberman's holdings averages 6,700 feet, B. M., per acre, or in the Eastern States an average of somewhat less than 5,000 feet, and somewhat less than 25,000 feet in the Pacific States. The compiler comments correctly that "the average stand of timber per acre, being that of selected tracts owned by lumbermen is, of course, higher than the average of the country or state."

For the purpose of a possibility—not any more probability—calculation we may assume that the entire forest area of the United States at one time, say only fifty years ago, contained this average stand. With such extravagant assumptions we may be justified in assuming the area involved as 500 million acres, the potential timber area determined by the writer, rather than the 700 million acres claimed by the U. S. Chief Geographer, in which all waste land is included, we would then find a total original stand of 3,350 billion feet. Assuming again that the consumption of 40 billion at present has grown to that amount by only a 3 per cent rate (instead of the more likely 5 per cent) from the original figure, then we would have had a total aggregate cut during the 50 years of round 1,115 billion feet, and if the increasing rate of consumption continued, the balance would be used up in less than 35 years.

The 250 million acres of farms cut out from the forest, mostly wastefully logged and largely burned in log-rolling bees, may be assumed to have furnished the requirements of the preceding period.

These probability calculations merely show that our guesses at the amount of standing timber are not entirely unreasonable, and they certainly lend color to the assertion that unless very radical changes in use and exploitation take place, our virgin supplies will certainly be used up within less than a genera-

tion. But, to be sure, according to the Chief Geographer, "timber growth in the United States is certainly renewing itself much faster than it is being consumed."

The certainty in this respect it would be even more difficult to establish than regarding the standing timber, but a probability calculation is here also possible by borrowing some figures from the experience of a country where timber production is a well-established business and accurate statistics are available.

In German state forest administrations, comprising some 10 million acres under good management, the production of timberwood (over 3 inch) has constantly increased in response to this management, until now it may be stated in the large average, with a rotation of about 100 years, as 43 cubic feet per acre per year, of which 50 per cent, or round 22 cubic feet, are saw-log and bolt size material. These figures must be reduced by 15 to 25 per cent if private and corporation forests are also brought into consideration.

Hence, if we were to assume that in the unmanaged wild woods of the United States a production of 40 cubic feet of useful wood and 15 cubic feet fit to supply saw material takes place, we would indeed be beyond reasonable expectation, especially since fire ravages thousands of acres annually, and the young growth at least is destroyed on them.

Again ruling out the waste and brush lands, which either by nature or by ill-treatment have become incapable of producing any valuable timber growth, the area on which such growth might take place may be set down as not to exceed 500 million acres. With such assumption the new growth would represent 7.5 billion cubic feet of log material—about our present annual consumption.

Any one who is at all familiar with the condition of the timbered forest areas of the United States will readily agree that not one-half the assumed production takes place over this vast area. In the untouched woods the natural decay offsets the accretion, while on the culled area, both in the old and young growth, the larger portion of the after-growth is of weed trees—not valuable timber.

Another way of approximating the possibilities—not probabilities—is to assume the reported stumpage on the lumberman's holdings, namely, round 5,000 feet, B. M., per acre in the eastern United States, as representing the average capacity over the whole forest area. Nature has taken hundreds of years to produce this; but, assuming the same stand left to nature could be secured in 100 years, then the average accretion per acre and year would be 50 feet, B. M. This would not suffice to supply as much as three-quarters of our present annual requirements of lumberwood. And how far are our premises below the probabilities?

Not that under good forestry practice even a better average could not be obtained, for the 50 feet, B. M., represent about 10 cubic feet, forest-grown material, while the German practice produces at least over 16 feet of saw material per acre per annum. In exceptional cases on selected small areas as much as 90 cubic feet of saw material has been attained.

But we have so far no forestry practice, no silviculture, no systematic reproduction. Not even protection of nature's crop against the annually recurring fires exists. And these fires, while they may not destroy or even seriously damage the old crop, as in many cases and conditions they do not, they kill with absolute certainty all the young crop, and there is so far but little hope that they will soon be stopped. What incentive can there be for private interest in spending money or foregoing immediate revenue for a crop which is so readily lost?

We may as well wake up to the realization that our efforts to secure a more rational treatment of our forest resources and apply forestry in their management are not too early, but rather too late; that they are by no means sufficient; that serious trouble and inconvenience are in store for us in the not too distant future; that the blind indifference and the dallying or amateurish playing with the problem by legislatures and officials is fatal.

We can, then, summarize the situation, which justifies the urgent need of

the foresters' art in the United States, from the point of view of supplies, as follows:

(1) The consumption of forest supplies, larger than in any other country in the world, promises not only to increase with the natural increase of the population, but in excess of this increase *per capita*, similar to that of other civilized, industrial nations, annually at a rate of not less than 3 to 5 per cent.

(2) The most sanguine estimate of timber standing predicates an exhaustion of supplies in less than 30 years if this rate of consumption continues, and of the most important coniferous supplies in a very much shorter time.

(3) The conditions for continued imports from our neighbor, Canada, prac-

tically the only country having accessible supplies such as we need, are not reassuring and may not be expected to lengthen natural supplies appreciably.

(4) The reproduction of new supplies on the existing forest area could under proper management be made to supply the legitimate requirements for a long time; but fires destroy the young growth over large areas, and where production is allowed to develop, in the mixed forest at least, owing to the culling processes which remove the valuable kinds and leave the weed trees, these latter reproduce in preference.

(5) The attempts at systematic silviculture—that is, the growing of new crops—are so far infinitesimal, compared with the needs.

THE AMERICAN INDIAN AND IRRIGATION.

WORK BEGUN BY BUREAU OF INDIAN AFFAIRS
TWENTY YEARS AGO HAVING GOOD EFFECT
IN ADVANCING CIVILIZATION OF THE INDIAN.

ILLUSTRATIONS FROM PHOTOGRAPHS BY GEORGE BUTLER AND WALTER B. HILL, OF THE BUREAU OF INDIAN AFFAIRS.

THERE are many who have a vague conception of the Indians and know there are such within the confines of our country; but few have concrete knowledge of them, either tribally or individually, and still fewer know, or can realize, the labor and effort that has been and is being expanded to advance to a better life and make worthy citizens of these wards of the government.

When the Indian, turned from his old-time occupations of the hunt, intertribal wars, and the like, was forced to protect himself from the invasion of the foreigners, many of whom were not of the better and more considerate element, the government found it incumbent to overcome, collect, and hold on, reservations set aside for the purpose the different Indian tribes; thus advancing as humanely as possible the progress of civilization, while minimizing wars between invader and invaded that were as replete with horrors as the

mind of savage and Christian could make them.

Having curtailed their liberty, restricted their territory of occupation, which was often distant from their old haunts, and imposed a new mode of life, the self-created guardian found it incumbent to issue rations, clothing, and other supplies to mitigate physical suffering threatening the Indians in their new environment. Thus, of necessity, was inaugurated this factor in the intricate Indian policy, that has done more than all else to retard and suppress the development and advancement of these peoples.

While there seemed no alternative course, it would appear that the issuance of rations and annuities was contemplated to continue only so long as the urgency of the case demanded. It was to be discontinued just so soon as the Indian became adapted to the new order of things and could, with governmental aid at first, become self-support-

ing, independent, and equal to the demands of the new life.

It must be remembered that the numerous tribes of Indians, scattered from the Atlantic seaboard westward to the Pacific Ocean and from Mexico to the Canadian line, speak different languages, hold and are governed by religious, civic, political, and social laws and customs that differ as widely as do their languages, excepting possibly the law of hospitality. Thus it will be understood how a comparison of the tribes, one with another, would be about as

reservations within the arid and semi-arid region of the country where most of them are.

Irrigation is no new matter with those Indians in the southwest where crops were raised by irrigation long before the advent of the Spaniard. The relics of reservoirs and canals, large and small, built and used by the people of the cliffs, the pueblos, and plains houses, are still largely in evidence as to one source of their subsistence. Some of these old works are still in successful use, and others of more recent construction by



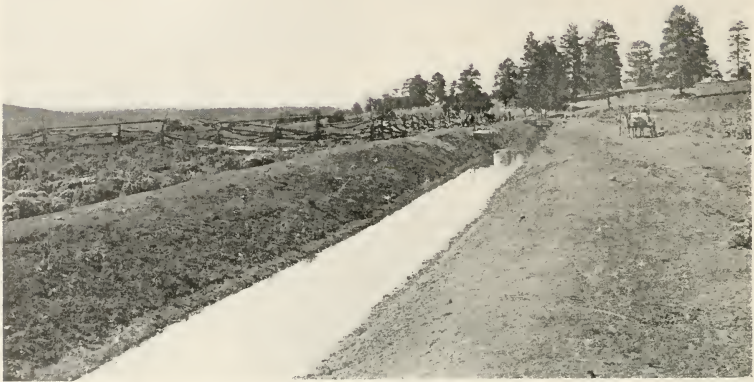
AN APACHE DWELLING OF A TYPE NOW FAST DISAPPEARING, FORT APACHE RESERVATION, ARIZONA. THESE INDIANS ARE BEING BENEFITED BY GOVERNMENT IRRIGATION.

futile as an effort to measure with the same yard stick an African, a Chittaman, and an Eskimo. And also it can be seen how impossible it would be to devise a policy that would be applicable to all.

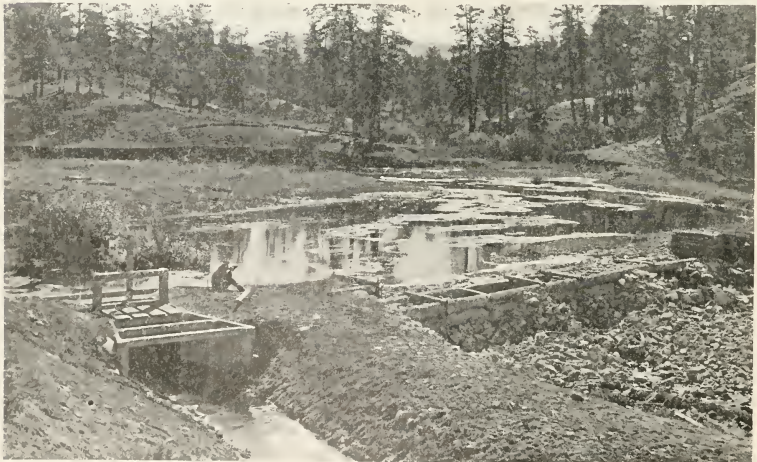
There has long been evidenced a desire to induce the Indians to give up the old nomadic camp-life of forest and plain and turn to agricultural pursuits that would entail permanent dwellings and tend to self-support. Therefore irrigation has been considered as a means of affording farms for those Indians on

the Indians of the past and present generations are also large factors in the life of these people. It was but a matter of course, then, that the government should as long ago as the sixties, if not before, consider a policy already formulated and in force.

Just so soon as the conditions were favorable and the demand for farms or small cultivable areas has been made by the Indian with apparent good faith, the government has endeavored to extend aid in the building of the necessary ditches. Sometimes no pecuniary as-



IRRIGATION FOR THE NAVAJOS, WHEATFIELDS CREEK DITCH, ARIZONA. THIS CANAL WAS BUILT BY INDIANS.



HEADWORKS OF WHEATFIELDS CREEK DITCH, BUILT BY NAVAJOS UNDER GOVERNMENT SUPERVISION.

sistance could be given, and in many cases the Indians took matters in their own hands, building ditches to the best of their ability; some proving successes, others failures.

It was as difficult in the early days as now to secure money appropriations for an unknown project. This, in conjunction with the few and modest demands made for irrigation systems on Indian reservations at that time, may account for the slow though steady growth of a policy that has been proven wise without having to its discredit any big or costly experimental blunders.

During later years the further encroachment of the whites, the increasing aridity, the gradual doing away with the baneful ration system, the commendable allotting of lands in severalty, the progress and advancement of the Indian through natural and educational channels, and his awakening to a fuller realization of the new conditions, coupled with a natural desire for existence and welfare, are all tending to increase his demands for arable lands, for homes, for a chance to become self-supporting and independent. Urgent pleas are coming now from all the reservations within the arid region, and they call for irrigation works of greater magnitude than were formerly thought of. To carry them out will necessitate expenditures in excess of amounts that have heretofore been appropriated, since the limitatious and restrictions are such that the Indians cannot undertake the work unaided. To make a success of it a plan of procedure will have to be elaborated from the methods of the past.

In the old days, when the need for an irrigation ditch was apparent and its utility reasonably assured, usually the government agent urged the Indians to construct it, detailing to their assistance any of his available employés, and aiding them in whatsoever manner he could. Sometimes an increased ration or an extra article of issue was the incentive to labor; in some cases a small daily wage was paid, while in the non-ration tribes an issue of food was nearly always responded to.

Sometimes a little money could be had to pay for the running of a level line by

some local surveyor, if such could be found in the region. Often the grade or fall of the ditch was determined by a carpenters' level and a long, straight-edged plank, by a wooden triangle and a plumb bob, or by digging or plowing a small furrow for a short distance and running water into the little channel.

While most of these early ditches were crude makeshifts, resembling the little *acequias* of the Mexicans, they have served their purpose and done good work.

In later years both individual and communal farming among the Indians have greatly increased, and the demands for more and larger arable tracts has necessitated the undertaking of larger, better, and more permanent irrigation works. When a meritorious case is presented a local engineer is sometimes secured to make an examination and report on the scheme. If it is found feasible, he may be continued on the work to direct it to completion, or one of the superintendents of irrigation, in the employ of the Bureau of Indian Affairs of the Department of the Interior for such work, may be assigned to it.

While the object is to give the Indian productive farming land, it has been the custom, with very few exceptions, to employ him in every way possible on the work. The idea is to give him manual training, to teach him to build and care for a ditch, to create a market for his labor, and make him work for a daily wage, even though he be paid to work for his own advantage. Under such a system it has been possible to do most of the work with Indian labor, and only such material as the reservation could not furnish has been bought, and such skilled labor as the Indian could not do has been hired. As a rule the Indian has proved an apt and willing pupil, doing as good and as much work as white employés in like occupations, and is reliable and trustworthy.

In some instances money has been secured for the construction of these irrigation systems by small annual appropriations for the past few years, or by special appropriation to some particular scheme, or by tribal sanction for the application of their own funds.



CROW INDIANS AT WORK WITH SCRAPER TEAMS, BIGHORN CANAL, MONTANA.



Photo by D. S. Cole, Hot Springs, S. D.
HEADGATE AND PART OF CANAL, BIGHORN RIVER, MONTANA. THIS CANAL ON THE CROW
RESERVATION IS THE LARGEST AND MOST IMPORTANT OF THE INDIAN
IRRIGATION WORKS NOW UNDER WAY.



A SNOW PICTURE OF RESERVOIR NO. 2, FORT LEWIS INDIAN SCHOOL, COLORADO; BUILT BY INDIAN LABOR, UNDER DIRECTION OF WHITE MEN.



IRRIGATED FIELD UNDER INDIAN DITCH, SHOSHONE RESERVATION, DUCK VALLEY, WYOMING; AGENCY AND SCHOOL, BUILDINGS IN THE BACKGROUND.

In this last way was made possible the undertaking on the Crow Reservation in Montana of the largest, best planned and executed irrigation system that we have among our Indians. The last and largest ditch of this system, the Big Horn Canal, is now nearing completion. It has a bottom width of 30 feet at the head, banks to safely carry about 7 feet of water, a length of 35 miles, and is capable of irrigating about 35,000 acres of excellent land.

There are quite a number of smaller ditches built during recent years that are constructed according to modern and approved methods, and which are doing considerable good. Still other and larger systems are now under consideration. That these are and will be profitable to both the Indians and the government is well proven, for it gives the Indians occupation and a source of livelihood during construction that warrants the abolition of the ration system for those engaged. By the time the ditch is completed they have had a training that prepares them for the cultivation of their little farms, and it is reasonable now to expect them to labor for existence.

As to the policy of irrigation being one of the greatest factors for education and civilization of the American Indian there can be no question. The building of irrigation works on a reservation, bringing land otherwise barren and profitless under the most favorable conditions for agriculture, affords an opportunity of inestimable value to the tribe to become independent, an offer they are quick to take advantage of. Government control and direction of the works cannot, however, be withdrawn for years, or until such time as the Indian is advanced sufficiently to intelligently cooperate for the best development of communal works, to place reliable and capable members of his own tribe in charge of the canals, and to subserve personal interest to the good of the whole.

Indian irrigation is therefore a problem that is yearly growing to larger proportions, demanding more money, more work, and greater care in the inception, construction, and subsequent control of the different projects; and only by its aid, in conjunction with the allotment of lands, can we hope for our red brother's evolution to worthy citizenship.

CRATER LAKE NATIONAL PARK.

A DESCRIPTION OF THE REGION AND OF THE SHEET
OF WATER WHICH FORMS ITS CHIEF ATTRACTION.

BY

J. MAYNE BALTIMORE.

THE Crater Lake area, the subject of this article, records in titanic strokes the graphic story of the rise and fall of a wonderful volcano, leaving behind it one of the natural wonders of the world.

The actual history of Crater Lake as known to man dates back only a comparatively few years. Twenty years ago the general public was unaware of its existence and the first official recognition came in 1885, when it was proposed as the center of a national

park; no law was passed, though President Cleveland set aside by proclamation ten townships in the region, which were later included in the Cascade Range Forest Reserve. From that time interest languished except for sporadic outbursts of enthusiasm at the accounts of some hardy explorer, until the Mazamas, the well-known mountaineering club of Portland, Oregon, took an interest in the lake, and in the summer of 1896 held their annual meeting on its rim, and named the



EAST PALISADE OF ROUND TOP, CRATER LAKE. THIS GIVES AN EXCELLENT IDEA OF THE PRECIPITOUS SHORES.



WIZARD ISLAND, LOOKING FROM THE ROUGH LAVA FIELD OF ITS WESTERN SLOPE TOWARD THE CINDER CONE.

mountain which once rose on the site of the lake after their organization. In many ways the mountain, no longer in existence as such, is worthy of greater consideration than the lake itself, and Mount Mazama, whose name appears in no atlas, has been provocative of widespread scientific interest and discussion.

Crater Lake has long been an object of interest to the Mazamas, who in 1896 explored the whole area now included in the Park, an area remarkable for a score of wonders even without the lake which gives the name and crowning feature. Union Peak and Mount Thielsen, culminating volcanic points of the Cascade Range, are remarkable themselves; there are wonderful canyons through beds of brilliantly colored lavas, creeks and cascades of great beauty, vast timber belts, and plateaus and valleys containing grassy meadows of a greenness almost unimaginable. In the midst of these wonders, like a jewel of great price, is set the sapphire clearness of the lake, a gem in its perfection.

Yet it must not be supposed that the lake is small. It is apt to appear so from the bigness of its surroundings, but in reality it has a surface of more than 20 square miles, being roughly circular; its widest diameter is $6\frac{1}{4}$ miles and the narrowest about $4\frac{1}{4}$. This shows it to be larger than any of the Saranac Lakes, in the Adirondacks, or Lake Drummond of the Dismal Swamp, in Virginia. Its wonderful characteristics are its precipitous sides, rising in sheer cliffs in most places from 1,200 to 2,000 feet from the surface of the water, though at some points the slopes are less abrupt. Yet at no point will a stone started at the top of the rim be apt to stop before it plunges into the water below, carrying with it a miniature landslide from the talus slopes. Near the west shore of Wizard Island a volcanic cone rises 845 feet above the surface of the water and contains a well-defined crater 250 feet in diameter and 80 feet deep.

The walls of the lake are as precipitous below the water line as above, and descend to a depth of at least 2,000 feet,

proving it the deepest fresh water on the Western Hemisphere. Where all the water comes from is a mystery. The precipitation and the streams from melting snow which empty into it from the very limited drainage area cannot account for so much water, and the temperature records seem to prove that there is no subterranean inflow. There is a fluctuation of about four feet between the recorded high and low water marks of the lake, the rising of the water being in some measure affected by the banks of snow which drift over the precipitous rim in the winter. Most of the lowering of the water level can be accounted for by evaporation, but a certain amount must escape by percolation, though it must be at some distance and through tortuous channels, as there is no water in the immediate vicinity which issues from the ground with greater force than that of an ordinary spring. A direct outlet would jet forth with considerable violence from the great pressure. The animal life of the lake is represented by minute crustaceans, the most numerous of which is *Daphnia pulex pulicaria*. There are a few trout artificially introduced from Klamath Lake.

Mere words of description are, however, cold and inadequate. The lake has a beauty and grandeur all its own, inspiring an enchanting spell of wonder, which to be realized can only come from a visit to its borders and long looks over its clear blue waters. The shores are most brilliantly colored lavas, slags, and tuffs, their many hues glorified and magnified in long kaleidoscopic reflections on the rippling surface of the lake.

But marvelous as the lake itself is, there is another and perhaps greater feeling of wonder when the imagination contemplates the changes which must have taken place in the past to produce the spectacle of the present. Mount Mazama, although existing only as a name today, was at one period a peak which outrivaled any others of the Cascade range. Its history is not a matter of conjecture, but one which has been read with painstaking care by government scientists from the unmistakable geologic evidences everywhere present. From a short distance away the mountain



A BIRDS'-EYE VIEW OF CRATER LAKE, FROM A RELIEF MAP.



MOUNT MAZAMA RESTORED. FROM A DRAWING OF IT AS IT MIGHT APPEAR.

which holds the lake appears to be a comparatively level table-land, containing irregular heights rising from the serrated peaks of the crest of the Cascade Mountains. Its outer slopes, with well-marked lava-flows and glaciated canyons, conforms in general appearance to that of Mount Shasta, across the border in California, with the exception that Shasta rises through even slopes from a comparatively low base, while Mazama rises among mountains approximating a height of 8,000 feet. At this height the diameter of Shasta and Mazama are about the same, and it is fair to suppose that above this point the latter peak rose at least as high and probably higher than California's grandest mountain. On a conservative estimate no less than 17 cubic miles of material above the present rim of the lake remains to be accounted for. Two theories have been advanced; one, that the mountain, at some mighty convulsion, literally blew its head off, leaving the hole which the water now fills. This theory is apparently borne out by the wide area over which pumice and ashes have been thrown, certainly from this now extinct volcano, and at the time of a great eruption. The second theory, and, on the whole, the more tenable one, is that the depression was produced by a subsidence of the top of the mountain. The principal argument against the first theory is that the sides of the lake are not torn to fragments as they certainly would have been had such an explosion taken place, and there are generally not sufficient evidences in the surrounding country that such a monstrous cataclysm could have taken place. The theory that the top of the mountain collapsed is borne out by the fact that some of the lava flows of the rim are bent backward into the depression and are so broken off that it seems probable that the sinking took place while they were yet in a molten state. Subsequent activity built up the volcanic cone of Wizard Island in the great caldera which was left. A contractile cooling

can not account for the loss of so great a mass of matter, nor has there been found any vent below the level of the bottom of the lake, where there has been an escape of volcanic material which would compensate for the mass of the top of the mountain. But the fact that the mountain once existed is sufficiently established by the configuration of the slopes, although the material which once rose majestically in the air to a height of more than 14,000 feet has not been altogether accounted for.

Such, in brief, are the principal facts connected with Crater Lake and its origin. Although difficult of access at present, the shortest route calling for some 80 miles of hard staging after leaving the railroad at Ashland, Oregon, the region is destined some day to become a well-known and often-visited "public park or pleasure ground for the people of the United States," according to the words of the act of May 22, 1902, establishing it. The area embraced within the park limits amounts to 249 square miles. Even without the lake it would present a wonderful field, not only for the tourist, pleasure-seeker, or sight-seer, but for the scientist, whether interested in the flora and fauna of the region or the geological or mineralogical aspects. No embargo will be placed on such visitors, and everything will be done for their convenience and comfort. But the Secretary of the Interior, in connection with the Secretary of War, will prevent all wanton depredation, and game and fish will be rigidly preserved. Special care will be taken to prevent forest fires, and this should render the region immune from what has lately proved to be the most destructive scourge of the forests of the Northwest. This latter precaution against wanton depredation of the forests will help to preserve a wonderful forest of Sugar Pine, in the midst of a belt of timber which is known the world over.



A MEDICAL AND SURGICAL OUTFIT FOR FORESTERS.

BY

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NEW YORK STATE COLLEGE OF FORESTRY.

THE ordinary medical and surgical emergency outfits, as prepared by drug houses for parties living in regions far away from physicians and drug stores, are for several reasons unsatisfactory for the forester. Many of these outfits contain drugs of doubtful medicinal value. Some contain drugs which should never be placed in the hands of others than regular physicians. Others lack the common but efficient household remedies with which men of ordinary intelligence and experience are familiar. Many contain drugs which are never used, and none familiar to the writer seem especially fitted to the needs of men living for several weeks in remote districts.

In cases of illness it is, of course, always proper to call in a physician; but the backwoods doctor is often so far behind the times that one is safer without his services. In cases of light illness a doctor is very often an unnecessary expense.

Whether doctors are available or not, it is nothing short of criminal negligence to send a party into the woods for a considerable stay without an emergency outfit.

A careful, intelligent member of the party should be given sole charge of the emergency kit. He should administer medicines and order more when one or more articles are exhausted. This should be done at once, because the most useful articles are the ones first exhausted. Many expeditions have with good intentions started out with complete emergency outfits, but which, owing to lack of replenishment and care, soon became useless impediments.

It should always be borne in mind that to the sick and wounded *first aid* is the important aid. Serious illness

and even death may be averted by doing the proper thing at the proper time. This aid is often slight and of such a nature that a thoughtful, intelligent person can give it as well as an experienced physician.

I have had charge of an emergency outfit for several years. This has undergone and is still undergoing change. A lot of medicines recommended by doctors whom I have consulted have been discarded and only those are carried which I have found most useful. Other persons might prefer other kinds, for in matters of this nature there is ample room for diversity of opinion. I have been frequently asked for a list of the materials in my chest. I give it below for the benefit of those in need of such an outfit.

I. A pocket Cyclopaedia of Medicine and Surgery, by Gould and Pyle.

II.* Quinine, 2 gr. pills. For malaria, fever, cold, and general tonic. As a general tonic and preventive against malaria, one after each meal.

III. Anti-malaria. Quin. sulph., $1\frac{1}{2}$ gr.; acid arsen., $\frac{1}{32}$ gr.; powd. capsicum, $\frac{1}{2}$ gr. Two every three hours for chronic and acute malaria.

IV. Oil of citronella. Since malarial fevers are transmitted by mosquitoes the damage of infection is much reduced and comfort secured by the free use of this oil on face and hands. The genuine should be used, and not cheap, ineffective substitutes.

V. A. S. and B. pills for chronic constipation. Aloin, $\frac{1}{4}$ gr.; strych. sulph., $\frac{1}{16}$ gr.; ext. belladonna, $\frac{1}{8}$ gr.; ipecac powd., $\frac{1}{8}$ gr. Two tablets at night for torpid liver and as a laxative in chronic constipation.

VI. Excellent laxative. Ext. cascara sag., 1 gr.; ext. nux vom., $\frac{1}{8}$ gr., ext. belladonna, $\frac{1}{8}$ gr.; ipecac powd., $\frac{1}{8}$ gr.; podophyllin, $\frac{1}{8}$ gr. One to three at night.

VII. Calomel, $\frac{1}{4}$ grain. One every two hours until cathartic action is produced, followed by seidlitz powder or epsom salts, for biliousness and torpid liver.

* These doses are for adults only.

VIII. Seidlitz powder.

IX. Epsom salts.

X. Sun cholera mixture. Tr. opium, 3 min.; tr. rhubarb, 5 min.; tr. capsicum, 5 min.; spt. peppermint, 5 min.; spt. camphor, 5 min. Indicated in diarrhoea attended with profuse watery discharges and prostration. One to two every three or four hours or as needed.

XI. Calomel and capsicum comp. for diarrhoea with cramps. Calomel, $\frac{1}{8}$ gr.; morph. sulph., $\frac{1}{16}$ gr.; powd. capsicum, $\frac{1}{16}$ gr.; powd. ipecac, $\frac{1}{32}$ gr.; camphor, $\frac{1}{16}$ gr. One every hour or two as necessary.

XII. Lime-water tablets. For acidity and nausea. In the mixture known as carron oil (a lotion of linseed oil and lime water), excellent for burns and scalds.

XIII. Phenacetine, 1 gr., five at a dose, repeated as necessary, for neuralgia, rheumatism, and headache. Excellent in headache and neuralgia in combination with caffeine.

XIV. Cold in the head. Camphor, $\frac{1}{4}$ gr.; quin. sulph., $\frac{1}{4}$ gr.; morphine sulph., $\frac{1}{32}$ gr.; atropine sulph., $\frac{1}{2000}$ gr.; ext. glycyrrhiz, $\frac{1}{2}$ gr. One to two every half hour or so.

XV. Liniment tablets. Camphor, capsicum, ext. belladonna aa, 6 $\frac{1}{2}$ grs. Dissolve one tablet in one oz. alcohol.

XVI. Brown mixture comp. for coughs and colds. Ext. licorice, $\frac{1}{32}$ gr.; camphor, $\frac{1}{32}$ gr.; acid benzoic, $\frac{1}{60}$ gr.; oil anise, $\frac{1}{30}$ min.; opium powd., $\frac{1}{30}$ gr.; tartar emetic, $\frac{1}{120}$ gr. Dissolve one in the mouth every half hour, stopping as the symptoms lessen and the cough becomes free.

XVII. Olive oil.

XVIII. Camphor.

XIX. Leadwater and laudanum tablets. One tablet to one oz. of water. For sprains, bruises, and poison due to sumac.

XX. Carbolized vaseline. For all kinds of skin abrasions and wounds.

XXI. Sulphur and ichthyol ointment for skin diseases and all parasitic skin affections.

XXII. Blue ointment (poison). For chronic ulceration and animal parasitic affections of the skin. Excellent for the prevention of rust on fire-arms.

XXIII. Zinc ointment. For skin diseases and chronic sores.

XXIV. Potass. permanganate, 2 grs. Antidote to morphia. Useful when locally applied in bites of poisonous snakes and insects.

XXV. Corrosive sublimate. One tablet to one pint of water makes a solution of 1:1000. Valuable germicide. Tablets should be colored green and stamped with the word "poison"

XXVI. Formalin. A 40% aqueous solution of the gas formaldehyde. A powerful disinfectant and deodorant. Weak solutions (0.5%) may be used as gargles and mouth washes and stronger ones (2½%) as lotions for skin diseases. Formaldehyde is manufactured from wood alcohol.

XXVII. Aristol, a valuable antiseptic pow-

der, combination of iodine and the oil of thyme; free from disagreeable odor; excellent dusting powder for ulcers, wounds, and skin diseases; with vaseline as a base, excellent for the poison due to sumac.

XXVIII. Iodoform, an antiseptic powder commonly used on wounds, ulcers, and skin diseases; possesses a disagreeable odor.

XXIX. Iodine, used locally in the form of tincture for sprains, bruises, chronic rheumatism, etc.; used only locally in the form of tincture or ointment; applied as a paint with a camel-hair brush.

XXX. Anaesthetic. Camphor, $\frac{1}{4}$ gr.; morphine mur., $\frac{1}{32}$ gr.; oil cajeput, $\frac{1}{24}$ min. One every hour for relief of pain and diarrhoea. The oil of cajeput is distilled from the leaves of the fever tree of the East Indies. The scientific name of this tree is *Melaleuca leucadendron*.

XXXI. Trional, 5 grs. to produce sleep.

XXXII. Brandy, difficult to keep in stock.

XXXIII. Alcohol.

XXXIV. Ammonia.

XXXV. Turpentine.

XXXVI. Glycerine.

XXXVII. Linseed oil.

XXXVIII. Ground mustard for plasters.

XXXIX. Ground flaxseed for poultices.

XL. Castor oil.

XLI. Surgical outfit and sundries: Cheese cloth and red flannel for bandages; absorbent cotton; 2 certified fever thermometers; surgeons' soap; scalpels and tweezers; needles and ligatures; metric glass graduated; ½ doz. pipettes; ½ doz. assorted camel-hair pencils adhesive plaster; mustard leaves; bauge scissors; small glass syringes; one hot-water bag; one fountain syringe for enemas; one rubber bandage; one pair thin leather anklets.

It is interesting to note that two of the most important drugs in the above list, quinine and camphor, are tropical forest products.

Instructions in reference to the use of these medicines may be found in Gould's Pocket Medical and Surgical Dictionary.

The cost of the outfit depends, of course, upon the amount needed, which depends in turn upon the size of the party. Of some of the drugs only small quantities are needed. Phenacetine, aristol, and trional are expensive. The other drugs recommended are comparatively cheap. As near as can be easily estimated, \$20 will purchase an outfit sufficient for a party of considerable size for one season.

GENERAL PRACTICE OF IRRIGATION IN THE UNITED STATES.

APPLICATION OF WATER TO FARM CROPS COMING INTO USE IN ALL PARTS OF THE COUNTRY.

BY

LESLIE HARRISON.

WHILE the idea of irrigation farming is associated in the minds of most persons with the arid and semi-arid regions of the West and Southwest, it must not be supposed that such operations are by any means confined solely to those parts of the United States. It is true that a large portion of the territory of this country lying west of the 100th meridian is within the arid region and agriculture must there be carried on by irrigation; and the great fertility of the soil in connection with the scientific application of water permits an intensive farming whose returns far exceed those of the ordinary "dry farming," where agriculturists have to depend on what has been facetiously termed "the old-fashioned rain method." Yet granting this fact of greater returns, and granting also the fact that the irrigation problems now most urgently before the country relate for the greater part to the reclaiming of arid America, it must still be admitted that there is a large and constantly increasing field for the practice of irrigation in the eastern and what are known as the humid sections of the country.

The last census shows that irrigation is used in practically every state of the Union, from Maine and Florida on the east coast to Washington and southern California on the west. In the East the greatest advantage, except perhaps in the cultivation of a few intensive market crops, lies in the use of irrigation to save crops at critical moments of their growth when a prolonged drouth threatens a complete destruction. Often in such cases comparatively inexpensive works will save a great deal of

money and prevent crop failures and total losses.

Another reason why the West and the West only is considered the province for irrigation comes from the fact that while many eastern farmers irrigate their land, they do not seem to consider or name it as such, although any artificial application of water comes under this head. It can thus be seen that there would be some difficulty in getting at the details of irrigation in the East, where a farmer who digs a trench for the application of water to a plot of strawberries or celery does not in his own mind formulate the thought that he is doing exactly the same thing which marks as distinctive the agriculture of his brother farmer of the West. He realizes, nevertheless, the great value of such application of water, and the wonder is that with such realization, following an experience with a certain small crop, he does not increase the practice to cover greater areas of land.

In Maine the area under irrigation is small, and the water is for the most part pumped from wells. The cost of the irrigation system in use in 1899 was \$127.65 per acre, and the value of the irrigated crops was \$150.29.

Massachusetts' irrigated truck farms are fairly well known, and it is said that the first irrigation ditch in America constructed by whites was in the neighborhood of Boston. The cost of irrigation was \$109.55 and the value of products was \$241.24 per acre. One farmer reported an income of \$11,000 from four acres, part of it being under glass.

Connecticut has four times as much land under irrigation as all the rest of



Courtesy Department of Agriculture.
DIFFERENCE IN YIELD OF POTATOES ON IRRIGATED AND UNIRRIGATED LAND, WISCONSIN.

the New England States have, the cost of the plants averaging about \$35 per acre irrigated.

Rhode Island has some irrigation systems, with a cost of about \$75 per acre.

New Jersey shares with Massachusetts in the general reputation of having the most valuable irrigation properties of the states of the Atlantic seaboard. At a cost of \$36 per acre for irrigation, the crops under such cultivation yield \$126 per acre, and land under irrigating is valued at \$155 an acre. New York's average cost per acre for irrigation is \$35.54, and the value of the product is \$95. Some crops on irrigated lands in this state are valued at \$260 an acre. In Pennsylvania, where irrigation in some form has been practiced for at least 100 years, the acreage principally watered lies in the southeastern part of the state, with hay as the principal crop, with a value of 23.64 per acre. It must be admitted that with a system involving any considerable expense, the irrigation of this crop in the east does not give adequate returns, especially as compared to the results obtained in the irrigation of small fruits and garden truck.

The states just south of Mason and Dixon's line have but lately taken up the possibilities of irrigation, and those who have tried report that there has been a great deal of prejudice to overcome among neighbors and others out of sympathy with "new-fangled" ways. Yet in spite of this and other drawbacks there have been encouraging reports of the results of irrigation in Virginia, most of the advantage coming from the ability to save a crop in time of drouth. Irrigation on tidal streams in the Carolinas has been in use for some time. Georgia planters have taken up irrigation under much the same conditions that prevail in Virginia, and considerable success has followed the installation of plants. On 400 acres near Rome, Ga., valuable crops have been saved by timely application of water, and the practical demonstration of the value accruing in such a case will likely be followed by extensive additions to the works now completed. Irrigation does

not occupy a very important place in the agricultural development of Alabama, but the acreage devoted to the growing of early vegetables for northern markets is increasing and the product from such irrigated land is valued at \$121 per acre, with an installation cost of \$60.

When we come to Florida we find irrigation on an extensive scale and playing a relatively important part in the productivity of the land. Indeed, in 1899, Florida ranked first in acreage irrigated, cost of plants, and value of crops raised among all the states of the humid area. The usual cost of irrigating plants for general crops is about \$50 an acre, and although the policy of artificially supplying water dates only from 1888, the results have been so uniformly satisfactory that the number of irrigators has increased steadily year by year. When the "freeze" of 1894-'95 brought failure to many orange growers, and the increasing risk from this source became apparent, many farmers turned their attention to raising early fruits and vegetables for the northern markets, and this gave another impetus to irrigation. The water supply is drawn from a comparatively high artesian water table, which seems to underlie the entire state, and in many cases there is no cost whatever for pumping. The most expensive systems in the state irrigate 250 acres of tobacco at a cost of \$145 per acre, raising a crop worth \$365. Of the Atlantic states Florida is the only one whose irrigated areas are counted in thousands of acres. The average cost for plants is \$101.52 per acre and the value of products \$303.95.

Louisiana, another state in the humid belt, at present rivals Florida through the recent growth of the rice industry, due mainly to irrigation. It is claimed that during the past year more money was spent in this state on irrigating canals and other works than in any other in the country. The acreage in this state and eastern Texas in irrigated rice amounts to nearly 200,000. For a long time "Providence" rice was the only kind grown, "Providence" being another name for rain; but it was not always a profitable crop, and irrigation



Courtesy Department of Agriculture.
IRRIGATING STRAWBERRIES; PIPE FOR CARRYING WATER SHOWN IN FRONT OF PICTURE.

was adopted to completely insure good returns. With comparatively low costs and easy lifts for the pumps used to raise the water from streams and wells, this region has proved extremely profitable for irrigation, and large amounts of capital have been invested.

Missouri, Michigan, and Wisconsin, all within the humid region, are more and more using irrigation for vegetables and small fruits, and chief among these products are strawberries and potatoes, the yields being enormously increased, both in quality and quantity. In the case of strawberries in Missouri, in an exceptionally bad season, many old plants died without sending out runners, but in all cases it was found that irrigated plants developed strong crowns, thus ensuring crops for the ensuing year. The effect of serious drouth on fruit trees and nursery stock was largely offset by irrigation, and the serious check, from which many trees do not fully recover for several years, was avoided.

The great distance from eastern to western Texas brings us well into the arid region of the country, and, as we have said, the greatest irrigation interests of the country center about the

newer states of this area. For a long time there was some difficulty in overcoming a natural fear on the part of the eastern farmer lest the opening up of these marvelously fertile regions by the application of the needed water should tend to lower the values of his own farm products. But it has been ably pointed out by Secretary Wilson and others, that the greater development of the West means a consequent development of many lines of industry, and an industrial expansion which will create home markets for the goods of the eastern cultivator with demands far in excess of those which he had known before. The eastern manufacturing interests, receiving an impetus from the needs of the growing West, will employ more men to turn out their products, and these men will have to be supplied with foodstuffs, which come from neighboring farms. Also experience has demonstrated that the rancher of California does not and cannot supply the staples furnished by the eastern farmer, but merely supplements them. Through this knowledge the East has come to look upon the arid land reclamation as the best and surest policy of expansion for the country to enter upon.

CONSERVATIVE LUMBERING IN TENNESSEE.

DESCRIPTION OF THE SUCCESSFUL APPLICATION OF
PRACTICAL FOREST METHODS ON THE DOMAIN OF
THE UNIVERSITY OF THE SOUTH, SEWANEE, TENN.

THE result of the first application of practical forest methods in the cutting of timber in Tennessee is contained in Bulletin 39 of the Bureau of Forestry, recently published.

The Bureau of Forestry in 1900 undertook the management of the forest at Sewanee, Tenn., owned by the University of the South. The forest had been misused for many years and was steadily declining in value; but the financial condition of the university prevented any expenditure on its improvement and demanded that it be

made to yield immediate returns. In spite of these disadvantages a plan of management was devised and applied which has been profitable and has left the forest in good condition after lumbering.

The lands of the University of the South, in and around Sewanee, Franklin county, Tenn., comprise about 7,255 acres, 6,655 acres of which are timberlands. About 5,500 acres lie on the top of a spur of the Cumberland plateau, lined by sandstone escarpments of varying height, from the base of which coves

slope into the valleys below. The elevation of the land is from 800 to 1,900 feet above sea-level.

Two types of forest grow at Sewanee, one confined to the plateau, the other to the coves. Although \$3,000 for all of the timber was considered a fair offer by the university in 1899, yet under the plan of management of the Bureau of Forestry the university made in 1900-1901 a net profit out of its cove timber alone of about \$1,500 and the following year of about \$1,200. The forest on the plateau had been burned and grazed so long that its improvement in quality and composition was the urgent problem. A plan of treatment was made whereby the labor expended on the improvement of the plateau forest would be paid by the returns it would yield. Although the work of improvement done on the plateau was required to be self-supporting only, it yielded a net profit of about \$500.

Four more years of lumbering remain to be done, and for three years at least there is an assured annual profit of \$1,500, or half of what the university was formerly willing to accept for all of

the timber. In a word, timber formerly valued at \$3,000 will have been made to yield a profit of about \$7,000.

The high profits were made possible through the careful planning of the lumbering in order to prevent waste and to secure the largest returns from the merchantable trees. In the cutting provision was made that the land should again produce valuable timber.

The working plan for the Sewanee forest does not furnish such specific instructions for the management of timber lands of a similar kind that it can be applied to them without modification and expert assistance. It illustrates, however, what may be done with such timber lands; and especially does it emphasize that lumbering and forestry may be practiced together in the South, as elsewhere, with profit.

The work of preparing the working plan for the Sewanee forest was carried on under the direction of John Foley, field assistant in the Bureau of Forestry.

A logging contract for the coves was made, which required that the following rules be observed:

1. Only marked trees shall be cut.



VIEW OF A COVE ON DOMAIN OF UNIVERSITY OF THE SOUTH, AT SEWANEE, TENN.



DRUM FOR DRAWING LOGS FROM COVE TO THE PLATEAU, SEWANEE.



CHUTE USED FOR BRINGING LOGS UP TO PLATEAU, SEWANEE.



LOGS FROM SEWANEE FOREST AT THE SAWMILL.

2. All marked trees shall be cut, unless a reason satisfactory to the inspector is given for leaving them.

3. Except in the case of hollow or dote, no stumps higher than one foot above the ground shall be cut.

4. Care shall be taken not to injure young growth while felling, cutting, or hauling the timber.

5. As much as possible of each tree shall be cut into logs two inches longer than the lengths called for by the mill.

6. The logs shall be well butted and hauled to the mill.

7. Every effort shall be made to extinguish any fire which may be seen.

A separate contract was made with the same man for logging the plateau, containing the same rules, with this additional rule, that "such White Oak and Chestnut Oak trees and parts of trees that will not yield sawlogs shall be cut into as many railroad ties as possible."

The University of the South, in lumbering its tract along conservative lines, has set other owners of Tennessee timber lands an excellent example. This, the first example of the application of practical forestry in the handling of Tennessee woodlands, has certainly been successful enough to induce other owners of timber lands to consider the matter. It is notable that since the start of this work plans have been requested from the Bureau of Forestry for the management of several other and larger timber tracts in eastern Tennessee.

There are likely in the United States other tracts of timber owned by the land-grant colleges that could be made to produce increased annual revenues if managed along the lines in force at the University of the South. In this the University of the South has set an example that land-grant educational institutions might consider with profit.

TONTO RESERVOIR PRACTICALLY ASSURED.

AGREEMENT LIKELY TO BE MADE SOON BETWEEN FEDERAL GOVERNMENT AND ASSOCIATION OF PROPERTY OWNERS OF SALT RIVER VALLEY THAT WILL INSURE COMPLETION OF GREAT IRRIGATION PROJECT.

A MEETING held at Phoenix, Arizona, on Saturday, April 19, gives assurance that the early beginning of work on the Tonto Reservoir, near that city, is probable. This is one of the five reclamation projects which recently received the approval of the Secretary of the Interior.

Through Mr. Chas. D. Walcott, Director of the Geological Survey, the Secretary of the Interior announced officially at this meeting the position of the government toward the people of the Salt River Valley.

Mr. Walcott stated that he was officially authorized to inform the citizens of the Salt River Valley:

First. That the Secretary of the Interior has granted authority to the Director of the Geological Survey for the acquisition of the necessary property, rights of way, etc., preliminary to the construction of irrigation works on the Salt River, Arizona, under authority of the reclamation act, approved June 17, 1902. The construction remains subject to the feasibility of obtaining the necessary rights, and the adjustment of private claims in such a manner as to comply with the provisions of the act.

Second. That in response to inquiries from a citizen of the Salt River Valley the Secretary of the Interior has decided:

A. That the Secretary of the Interior can, under the law, deal with an organization in receiving payments from individuals who have contracted for water rights under the terms of the reclamation act.

B. It is not necessary or advisable at the present time to determine upon a general form of organization to be taken as a basis in organizing every reservoir district.

C. The particular form of organization for the Salt River Valley may be modified in the future as necessities may

require, but for the present the form already adopted is considered sufficient.

D. It is probably possible in completing the details of distribution to make arrangements whereby the owners of vested water rights may be benefited. Such details, however, are not essential for present consideration, and may safely be left for initiation by the local organization of water users. Their united opinion upon the matter should have weight in the final determination.

In regard to the case of Salt River Valley, where there are several thousand owners of small tracts who desire to be supplied with water under the terms of the law, and in other similar cases, it is clearly essential, to insure unity of purpose and to secure the best results, that such owners unite in an organization which will act as the agent for the individuals.

It is also essential that such organization as a whole guarantee that the payments be made, and that the strongest possible security be given the government for the faithful performance of contracts which may be made.

Third. That the department has considered the appeal of the minority of the Salt River Valley Water Storage Conference Committee, and decided that any interposition on the part of the department would appear to be unnecessary and tend rather to delay and complicate affairs and would not result to advantage in the execution of the law.

Relating to the plan of organization of the Salt River Valley Water Users' Association, the following are its main provisions:

Each share of stock gives:

1st. Right of its proportion of all water available for distribution by the association.

2d. Right to have that water carried to the land to which the share is appurtenant.

3d. A perpetual right to the use of that water on that land.

4th. All these rights and the share itself are made perpetually appurtenant to the land.

Thus establishing united ownership of land and water.

Distributing System.—The distributing system to its outermost lateral must be under the control of one organization of water-users that is responsible to the Secretary of the Interior as long as the government retains any interest in the works constructed by it.

Assessments.—Assessments for the ordinary cost of operations, maintenance, and repairs should be equally assessed against all the lands under the distributing system. Any attempt to assess on the basis of proportional benefits would lead to endless confusion, litigation, and dissatisfaction. The land near the head of a canal should pay per acre the same as that at the end of the last lateral.

The safety and well-being of the entire system is of equal interest to all land-owners. Public interest of the community should be maintained as against the selfish claims of the more favorably situated land-owners.

Assessments for local benefits should be assessed against those benefited, but general benefits should be assessed against all lands alike. An attempt to make "equitable" assessments for general purposes would lead to confusion, litigation, and dissatisfaction.

Security for Repayment to Government.—The government retains title to all public lands under any irrigation system built by it until all payments are made, *i. e.*, has the title to the land. The same security should be maintained on all private lands until the last payment is made for cost of construction, operation, and maintenance.

As the government cannot well take a lien on the land, it must deal with some organization that has such a lien and control the action of that organization by the government control of the water supply going to it.

This can only be accomplished by the organization of the water users under the system into an association through which they can act as a unit in dealing

with the government. The government will deal with the individual in issuing to each person a water right and patent to his land, if not before obtained, but each individual will agree with the government that the association will act as his agent in the payment to the government of the moneys due from him, and that a delivery of his share of the reservoir water to the association shall be deemed a delivery of it to him.

It is felt that the articles of association of the Salt River Water Users' Association will carry the above plan into effect in a manner satisfactory to the Department of the Interior.

The modifications proposed by the minority would, if adopted, weaken the security of the government through the association, and would make the administration of the distributing system complex and impracticable. They would also seriously limit the power of the government to enforce its rules and regulations through the association.

It is provided in the articles of incorporation that they are subject to the rules and regulations of the government concerning the storage, diversion, delivery, application, or use of any water stored, developed, or delivered to the association.

This assures the water user that he will receive his due share of the water, no matter whether near the headgates or at the end of the outermost branch of the distributing system.

He is protected by the right of appeal to the government if its rules and regulations are not carried out by the association. Under the present system a water user might subscribe for a reservoir right, but if he was located under one of the several independent canals, he could not be assured of its delivery.

The Tonto Dam project for storing water to be used in the Salt River valley appears to be entirely practicable. The work of construction will be begun as soon as the water users of the valley organize in such form as to give the necessary assurance to the Department that the cost of the Tonto dam and necessary improvements will be returned to the government as provided for in the Irrigation Act, approved June 17, 1902.

IRRIGATION OF LIMA BEANS.

CHIEF CROP OF VENTURA COUNTY, CALIFORNIA.
SUGAR BEET CULTURE HAS BEEN INTRODUCED—
WATER IS PLENTIFUL, AND CAN BE EASILY APPLIED.

THE valley of the Santa Clara River, with the city of Ventura at its Pacific Ocean outlet, extends to the northeast through an opening in the Santa Paula Mountains to the Mojave desert. This gives rise to peculiar conditions. As might be expected, with a desert at one end and a seashore at the other, the soil is generally sandy, and with the silts carried by the river, its fertility is assured. The valley has peculiar climatic conditions. In the summer months when a California sun beats down upon the desert, raising the temperature there to extreme heights, and when this heated air rises according to inviolable physical laws, the Santa Clara Valley acts as the draft door of a furnace, allowing the cool, moisture-laden winds of the ocean to sweep in, bearing fogs during the summer and rain clouds in winter. The precipitation amounts to an average of 16 inches a year, and the valley is exceptionally well supplied with streams, which are either torrents or dry arroyos, according to the season. The wind at the delta end of the valley, with its drifting sands, would do much damage were it not for wind-breaks of eucalyptus trees.

Under these peculiar conditions it was only natural that a crop to fit them should be evolved, and the bean represents the survival of the fittest. Agriculture was first begun, with the exception of the little tilling of native Americans, in 1782 with the establishment of the mission San Buena Ventura. The cultivated lands were for a long time in the immediate vicinity of the mission buildings, and later the wider areas of the valley, now fertile fields, were cattle ranges, most of the land being under Mexican grants. About the centennial year the lands were subdivided for cultivation and the usual differences of opinion between cattlemen and farmers arose, with bitter encounters in and out

of court, until the increasing value of the lands for agricultural purposes drove the *vagüero* out, just as he had gradually been ousted during the homestead development of the West. The Mexican grants were for the most part confirmed, the status of ownership settled, and titles cleared. From that time the development of the valley has been consistent, if not rapid.

To tell a Ventura County man that he "doesn't know beans" might be almost an insult, and would certainly display an ignorance of the crop that has made Ventura famous. A comparatively small area in beans in its southwestern part gives California an enviable place among the states which produce this article of diet. With an annual yield of about 30,000,000 pounds in this area, California ranks third, yielding to New York and Michigan.

Wheat, barley, and corn were the first crops tried, but the general foggy weather, causing rust, settled the fate of the first of these three. Other localities could do as well or better with corn and barley, and, since specialization seems the keynote of California agriculture, the ranchers of Ventura county cast about for some other crop suitable to their fields, and decided on the lima bean. For a long time they were hampered by poor shipping facilities. Finally wharves were built, and the coming of the railroad gave direct communication with the eastern markets. From 1886 the cultivation of the bean supplanted all other agriculture in the valley, and there was considerable alarm on the score of overproduction; but beans would keep indefinitely, and there was no disastrous effect, except one year when more than 50,000,000 pounds were produced when marketing facilities were very poor. This was a number of years ago, and there has been no return of the condition.



Courtesy Bureau of Soils, U. S. Dept. of Agriculture

A FIELD OF LIMA BEANS THE PRINCIPAL CROP OF THE VALLEY.

The cultivation of the lima bean is very simple. In the first place, there is little attention paid to rotation of crops, as beans, like all legumes, seem not only to take but little from the soil, but to actually enrich it; and there are some fields near Ventura on which beans have been planted for more than twenty consecutive years without any appreciable deterioration of the soil, and in some cases an improvement is averred by the owner.

The crop is removed from the fields in the fall and cultivation begins at once. The earth is worked to a depth of 10 or 12 inches and the clods pulverized with disc harrows and rollers, and with a special harrow which "chisels" the soil. In some cases the land is not plowed at all from year to year, but is kept cultivated, and "chiseled" before

planting. The beans are put in the ground in May with a special machine, which plants four rows at a time. This comparatively late planting is done in order to get the seed into the ground after the last rain of the wet season, for two reasons: in the first place, it is easier to work the ground to prevent the escape of moisture before the crop is planted; and, secondly, if the rain has packed the surface of the soil after the bean has been planted, when the root sprout pushes the bean through the surface to start the plant above ground, it is unable to penetrate the crust formed, the planting has been of little value, and in most cases has to be done over again.

After the plant is above ground it is cultivated two or three times to prevent the growth of weeds, and for this an

ordinary two-horse riding cultivator is used. The shovels are so made that they pass only slightly beneath the surface, cutting off the weeds, but not exposing the moist earth to the sun. No poles are used and the plants spread out to form a compact mat on the ground, where they produce blooms and pods until the September harvest time, when they are cut off just below the ground, two rows at a time, by a one-horse power machine, which works as rapidly as the horse can walk. Men follow with forks, pile the beans in small cocks, and leave them to dry about three weeks before threshing. The thresher is the same which is used for grain, with a few slight modifications to avoid the crushing of the beans. Some planters still use the more primitive methods of trampling with horses, or horses hitched to harrows or to wagons. After the threshing the beans are hauled to the nearest warehouse to await shipment.

The irrigation of this crop more than doubles the yield, or increases it from about 1,500 pounds of dried beans to the acre to 3,000 pounds. It will be noted that in the foregoing description of methods of cultivation no mention was made of the application of water, and this points to the notable thing in bean irrigation. It is, generally speaking, a misstatement to say that the beans are irrigated, for the truth of the matter is that they are not touched by water from the time of their planting until they are harvested. The irrigation is applied before the crop is planted, and as the soils of the region are exceedingly retentive of moisture, this application lasts the deep-rooted bean throughout its period of growth. A crop planted without this preliminary irrigation of the ground is only half of what it might be, unless the last rain is exceedingly heavy and finds the ground well prepared for its reception. The planters who do not



Courtesy Bureau of Soils, U. S. Dept. of Agriculture.

WINDBREAKS OF EUCALYPTUS TREES ACROSS THE DELTA PORTION OF THE VALLEY.



Courtesy Bureau of Soils, U. S. Dept. of Agriculture.

DRIFTED SAND ALONG A WINDBREAK SHOWING WASTE OF GROUND.

practice this winter irrigation before the crop is put into the ground use furrow irrigation about the first of July, when the bushes are of a fair size; but this method is expensive on account of the extra labor in furrowing and cultivation, though it is of great value in the areas of light, loose soil, which could not hold the winter application for a great length of time.

The presence of moisture in the soil is a prime factor in the marketing of the beans, as it is the practice of the buyers to send their agents through the fields to bid on the crop, the bid being determined almost entirely on the question as to whether there is enough moisture present in the soil to properly mature the crop. Part of the valley is given up to the ordinary white navy bean and the black-eyed bean, both of which mature earlier and are better able to withstand drouth.

The other principal crops of the val-

ley are the sugar beet, deciduous fruits, English walnuts, and barley. The beet is the most important next to the bean, but its introduction came within the past five years and followed the establishment of the Oxnard sugar factory, at Oxnard. The beet is irrigated in practically the same manner as the bean and produces a good crop, but has the disadvantage of impoverishing the soil when rotation is not practiced.

It must be admitted, however, that irrigation in this valley is not what it should be when the natural advantages are considered. No other county in the southern semi-arid portion of California is so well supplied with water as Ventura. The Ventura and Santa Clara Rivers, with their tributaries, drain a great area of mountainous country, and in the winter are torrents, carrying off the major part of the rainfall immediately, since the mountains are water-washed and gullied and for the most

part treeless. Enough water is retained in the mountains to furnish only a small summer supply for irrigation, and this is drawn upon only when the rainfall has been deficient, or less than 15 inches.

There is an artesian belt which supplies some water. The winter supply, however, is unlimited. Even in the years of lightest rainfall these rivers are roaring, and every little canyon, dry and parched in summer, runs bank-full after a rain. It is the general opinion of those who have farmed the lands that large crops are always possible with 15 inches of winter rain, and the annual run-off is sufficient to supply every foot of ground in the county with more than 15 inches; so all that would be necessary to produce maximum crops each year would be canals to divert the flood-water upon the valley lands. This would mean a great advancement for the ranchers of Ventura county, and would place their valley in the forefront of California's agricultural districts, with an absolute surety of salable crops at large profits in ever-ready markets. On the most conservative estimate the actual profit from each acre of land should be almost \$60 annually, and this would warrant the expenditure of even more money than is necessary for the development of an extensive system of winter irrigation. Moreover, this system could be developed here without the slightest fear from alkali, and even in those seacoast areas which contain alkali in such quantities as to be now unavailable for cultivation the drainage problem is so simple that their reclamation would be a paying enterprise.

With irrigation, too, other beneficial results would surely follow. The first of these would come from the fertility-laden flood-waters, always carrying in suspension a great amount of sediment, largely organic matter rich in plant food. Experiments show that this sediment not only supplies sufficient soil elements to offset those taken off by the plants, but that its plant food may be actually in excess of that carried off, so that the lands are made richer each year. Attention has already been called to the wind-breaks necessary to prevent the drifting of sand in the delta portion of the valley. The second great advantage of more extensive irrigation would be in connection with these. The addition of the finer silt particles would serve to bind the sands, make them more retentive of moisture, and the area of cultivated land would be so increased that the wind-breaks, with their wasted areas of 50 or 60 feet on each side, could be removed. Coupled with this, it might be feasible to clothe the sides of the mountain with trees, and thus help to prevent the rapid run-off of the winter rains; also with the introduction of the sugar beet, which takes a great deal from the soil, the use of the flood-waters, serving to offset this entirely or in a large measure, will make more remote the day when artificial fertilizers may have to be resorted to; and with flood-waters, rather than artesian, applied where the alkali problem exists, there would be an easier solution of that problem, as the flood-waters are not impregnated with harmful salts by leaching through the soil.



“ANOTHER NATIONAL BLUNDER.”

NOTE.—It is not often that we are able to give our readers something on forestry along humorous lines. Therefore we take unusual pleasure in reprinting the following communication which recently appeared in *The Rocky Mountain News*, of Denver. We reproduce it as a sample of one kind of opposition to the federal government's forest reserve policy, and as a further argument in favor of establishing more reserves.

There are many pretenders, but here we have the real champion of personal liberty. He shakes George III until one hears the ancient bones rattle. Science, scientists, and the federal government are taken by their several necks and tossed into space. The President is advised, an ex-President goaded, and the “eastern dude” is broiled and served with *sauce piquante* by this defender of the people's rights.

The “defy” is made, and it is indeed an inspiring sight, with Mattes well to the front and center, in the full glare of a self-directed lime-light, waving on high the Magna Charta, and with the spirit of '76 burning hot within his veins—that famous old brand unadulterated, and in this case reinforced by the buzz-saw. Now will the federal government tremble, and purchase peace by permitting the wild-cat sawmill free access to the remaining timber on the public domain. The way has been pointed. Here is the rally cry for freedom—and free timber.—EDITOR.

To the Editor of The Rocky Mountain News :

The timber question is as old as English history, and it is a continual struggle of human nature against the tyrannies, castes, and fads that civilization is so prone to breed. The blundering tyrannies of the English kings became so unendurable that a special amendment of the Magna Charta abolished their forest reserves and forbade their re-creation. The timber question also figured in the revolution; the lumbermen were forbidden to ship their products from one colony to another and the pine tree was the first emblem of American liberty—the Pine Tree flag. That was a very serious national blunder for Great Britain. The forest is still the home of freedom and its fruits are the perpetual nourishment of the people's rights.

We are well acquainted—eastern people are—with a class of beings, the offspring of suddenly acquired wealth, having little ability and less love for work, but a great tendency to ape aristocracy. Idle from their youth, in order to kill time they took to travel, and, unlike the tramp who wanders over his own country, they wandered abroad. The great works of civilization had little of interest for them, and their apish instincts led them to the woods. Here they found their heart's delight—great tracts of timber owned by royalty and nobility, abounding in game, and the vulgar, common people entirely excluded.

Upon their return a great cry was

raised, lamenting the gradual disappearance of our forests and game. It had little effect, for the Anglo-Saxon had come here, not to protect the wilderness against civilization, but to transform it into a garden. The common people very naturally refused to listen to their best to vacate the country and abandon their high vocation.

They wandered forth again and fell in with the Khedive in his Egyptian deserts, who, unable to distinguish between cause and effect, was planting trees to make rain. They hurried home and, enlisting science on their side, raised another wail for the preservation of the forests, and Congress heeded them to the extent of allowing them a fourth of the public domain to cultivate rain on the Great American Desert. The timber-culture act was a very harmless blunder, as harmless as it was fruitless, and when the rainmaker and the newspaper sharps showed Congress the absurdity of the law it was very sensibly repealed.

Then a new pretext was devised. Congress was induced to protect the natural forests that remained in order to preserve our rivers; the forest reserve was invented. Invented? No! The ancient English forest laws were merely transplanted to free American soil; and what a history they are making for themselves, and what trouble they stir up.

Can you stop the sun in his course?
Can you turn back the star of empire?

Can you unmake man, whose first command was to subdue the earth? Neither can you head off the western pioneer, the great American home builder, the nation builder, that exceeds any product of history. And what are you after? You want to run the common people out of the woods in order that the wild game may furnish sport for your wealthy eastern dudes—your “American aristocracy.” Pretexts without number have been invented, but not one scientific fact has been demonstrated that favors the forest-reserve idea.

The first reserve was established, and what happened? Fire followed fire. Our frontiersmen said to themselves: “Dead timber makes better cabins than green, and better firewood, too.” So they immediately set fire to the timber and laid up stores enough for a lifetime; for your unlettered backwoodsman reasons in this manner: “Dead timber don't make rain, nor does it make rivers or shelter game; consequently I will be allowed to take all I want of it.” He reasons that way, and whenever he is shut out of the timber fires follow. The more reserves we have, the more fires. Out of seventeen big timber fires in Colorado last summer the state official who fought them says twelve were in forest reserves and on the prohibited state lands. The more strictly the laws are enforced the bigger the fires. You cannot govern western pioneers by British forest laws. They have the old spirit of '76 yet, and the dumping of the cargo of tea into Boston harbor is repeated in the Rocky Mountains a dozen times a summer.

A case happened last summer that would never be published but for the writer. A poor mountaineer, not even owning his team, had two tons of hay to feed his horses in the grassless forest of a reserve while he got out dead poles for neighboring ranchmen's fences. He never imagined the reserve laws so strict as to forbid such a harmless trespass; but he was arrested, and, as he had nothing else in the world, his little haystack was confiscated. What happened? A fire that killed thousands of acres of our best timber, and still other fires that cost the government thou-

sands of dollars to extinguish. The government officials laid the blame on the sheepmen, as usual.

I prevented a worse fire about the same time. Seven hundred and fifty thousand acres of land were withdrawn from settlement in order to create another reserve. The little sawmills, including my own, were shut down, and the “timber rats”—the individual timber workers, who get out posts, poles, and firewood for themselves and the other settlers—were ordered off the ground. I knew the people, and I knew there would be war. Patrick Henrys sprang up in every direction. I had to do something, but instead of imitating George III, I went to fighting the reserve. One Irishman boldly told a man he mistook for a government official: “I can go up into the timber and burn it all down and you cannot stop me nor prove it on me.” It is a notorious fact that the authorities have never convicted a fire-bug. The people will not testify against one another in a common cause. I had to fight to save the timber while the people were slyly trying to induce me to move my mill to other settings, so that they would not injure a friend; but I devoted all my energies to moving the government, and finally appealed directly to the President. Roosevelt learned his strenuousness from our frontiersmen, and he knows their love of liberty. When he heard how the people felt about it, he immediately vetoed the reserve.

And yet these same despised and abused “timber rats” have been preserving our forests for years by extinguishing the fires started by the ignorance of camping tourists and eastern sportsmen, who have no idea of the high combustibility of green pine timber. They make the best of citizens when it comes to popular government, and the Rocky Mountains will furnish all the William Tells the nation will ever need.

But the forest reserves will have to go. The only reason they have not already gone—gone up in smoke—is that the Government is not enforcing the reserve laws. Whenever it does there is war. Nobody respects them.

While the above happenings were going on three railroads and half a dozen big sawmills were cutting 200,000,000 feet of timber in a neighboring reserve without so much as consulting the authorities about it. What government!

The sheepmen are trying a new kind of war that is likely to send the reserves up in legal smoke. They have obtained a decision from a federal judge that the reserves are unconstitutional. They are surely inconsistent with the Magna Charta of Anglo-Saxon liberty.

The reserves are fast changing from a fad to a first-class national humbug. The laws have been amended until they do not even protect the timber. As this statement may appear incredible I will quote from the Secretary of the Interior's last annual report: "While for the open public lands there is no provision of law which enables the department to sell timber, such provision is made for the forest reserves;" and a little further on he says reserve timber "is sold to anybody." The forest reserve circular of March 21, 1898, page 11, says: "In order to meet the necessities of persons, firms, companies, or corporations, whose business requires a large and continuous supply of timber, it is hereby provided that where the annual consumption exceeds 1,000,000 feet of timber, board measure, application for the succeeding year's supply may be made in time to permit the appraisal and sale of the timber desired six months in advance of its actual need." The corporations cannot get timber from the unreserved public lands at any price. Where is the protection?

From fire? No doubt the reserve officials send in good fire reports. They want to hold their positions; but the newspapers give different reports. It has been customary for the people in and near the timber to watch for smoke and extinguish the fires, but if their timber is taken away from them and they are compelled to court the officials in charge before they can get it, the latter will have a lonesome time fighting fire. Two years ago I got all the men needed to fight a big fire. They came with their own provisions and camping outfits, and never asked a cent

for their trouble. Last year a reserve supervisor could not get men to fight his fire, and the state's fire-fighter is now asking for authority to impress men into his service. Popular government is a success in the West. All other kinds are failures. A hundred cavalrymen are trying to enforce the laws in the Yellowstone Reserve, but a hundred more are asked for, and all the standing armies of Europe cannot enforce the laws in all the forest reserves. Imperialism is too unpopular.

Why do the common people object to reserves? It is a question between kinds of government—popular government and monarchical government. Under the former the people are supreme; under the latter they have no rights until they are granted them by the supreme ruler. Outside reserves, the common people legally help themselves to the timber; inside, they must first ask permission from some representative of the supreme ruler, the Honorable Secretary of the Interior. Talk about imperialism!

But should the people be allowed so much liberty? It is wise that they should be. Timber is one of the vital necessities of life—for fuel, for buildings. The East has allowed all its coal to come under private ownership, and with a country full of coal they are having a famine. Would it be wise to put all our timber in charge of one man? Even the common law protects the people's right to free timber. In Colorado last year a gardener dug a tree from one man's yard and planted it in another's as a gift. In the absence of any statute, common law was applied, and it was found that there was no theft, no trespass, and not even malicious mischief.

What then becomes of the great cry of "stealing government timber?" In a monarchy it might be stealing—in some very tyrannical monarchy—and has been punished by death, but in America it has always been our right even as we have a right to the land, to the rain that falls, and to the air we breathe. There is an old national statute making it a trespass, but other laws have been passed restoring the right to

the people while keeping it from the corporations.

"How, then, shall we protect our timber?" It does not need protecting. After building up the mightiest nation on earth, one-third of our land still grows timber; and while that may not be enough for the future, we can draw on the governor of Canada, who has discovered the largest forest of the world in his dominions, 4,000 miles long, 700 miles wide, and offers to supply us all we can use for a century if we will merely take off the tariff.

"But the sawmills are slaughtering it." The poor sawmills! They have borne more abuse than the early Christians. They only cut the big, ripe trees. It was the farmers that girdled the trees and made bonfires of them, and then pulled everything up by the roots. It was the farmers that turned the impervious subsoil on top of the spongy mold and caused the freshets and dried up the springs. Yet Cleveland devoted his first term trying to annihilate them. With more than Christian meekness they said nothing and went on sawing wood. The sawmill men appreciate their high vocation. When they stop sawing the nation will stop growing, and civilization will come to a halt and the world start back toward chaos again. They even get blamed for all the bad weather, but if the chief of our Weather Bureau knows anything about climate, timber has no appreciable effect upon it.

"But the sawmills should at least run their business more scientifically." Who is able to teach the sawmill men the science of their business? It was they who perfected the ax, the most perfect tool of man, the toolmaker of the scientists. Gladstone considered it an accomplishment to be able to chop down a tree, and so does Roosevelt. And no tool on earth requires the skill the circular saw does. It is so delicate that it feels the rotation of the earth and runs better east to west than north and south. Can our "forestry scientists" instruct them? They want them to pile and burn the brush, but any farmer knows it had better lie scattered and rot in order to enrich the soil. "But it helps the spread of fire," they

say. Not as much as bonfires; and big brush piles throw sparks farther than scattered brush does.

"But surely the government can educate them." With the editor's permission I will review:

The Woodman's Handbook, Part I. Henry Solon Graves. Bulletin 36, Bureau of Forestry, United States Department of Agriculture.

Gifford Pinchot, forester for the government, recommends it as "thoroughly valuable to the lumberman and the forester alike, a long step toward the better understanding and appreciation of each by the other." The author states that his purpose is "to give a collection of tables and rules of practical use to lumbermen." He tells how over forty different log rules for board feet are in use, "many of them admitted to be accurate and some almost absurd." These rules are "presented without discussion of their respective merits." In fact, he admits that he has "made no sufficiently extensive study to justify a positive statement that any one of the rules is best," and winds up his preface with asking where he can find some more. Then he gives forty-three log scales for board measure alone, and modestly suggests that the ignorant sawmill man experiment upon them all and find out for himself which is the best. This is "valuable" science—about as valuable as anything our forestry scientists have yet produced. If the author should ever go into the grocery business with forty-three different kinds of scales and begin experimenting on his customers he would have to be correct. If he does not really know how to make an accurate log scale I can show him in ten minutes how to do it with a compass, a yard stick, and simple addition, subtraction, multiplication, and division, and he will be able to figure a perfect scale in a few hours without any more "extensive study." The other half of the book is about as valuable, and as the author is director of a forest school, there is little doubt that it will turn out about as many sawmill men as our agricultural colleges do farmers.

Let the sawmills alone. Drop the timber question. Those two great world builders, the settler and the sawmill

man, have marched across the American continent hand in hand and built up the mightiest nation on the earth in one of the greatest wildernesses; and they have much work ahead of them. Let them alone.

What, then, shall we do with the Forestry Bureau? If these "scientists" will not keep out of mischief and let the West alone, abolish it. Look at their ignorant interference. They are telling us that the little sheep pack the ground so that the rain will not sink into our gravelly soil, while the big cows and horses do no harm. They are telling the sawmill men to cut this tree and not cut that one, while we have to make the kind of lumber the settlers need and choose the trees that will make it. We know our business. They are telling us to burn the offal, when a lighted cigar will easily start a fire in our tinder-box forests. And the Interior Department tries to compel the frequenters of the reserves to do these things or go to prison.

"Why, they are burning the brush in all the reserves." They are not. A government official comes to inspect a tie camp. A feast is prepared for him—turkey, oysters, and champagne—and on the day of his arrival my informant is ordered to take some men and pile some brush. After dinner the inspector is shown the men at work, and then he goes back and reports that the law is being complied with. What fools these mortals be!

"But there can be no harm in the Forestry Bureau investigating scientific problems connected with forestry." When they arrive at erroneous conclusions, there is always harm, to say nothing of the money wasted. Have they the ability to conduct original investigations? Here is how they investigated the effect of timber upon the snow: Money was sent to one of our college professors. He got a friend to go up into the mountains and take a half dozen kodak views of the snow, who found where it had drifted under clumps of trees, and the photos were engraved and a bulletin published, in which the professor dogmatically stated that timber is a great preserver of snow. He did not even see the snow, but upon

this report 750,000 acres of land were withdrawn from settlement in order to furnish water for a proposed government reservoir.

But the greatest objection to forest reserves is that they stop development forever. The homestead law does not apply to reserved lands, nor do the other laws enabling the people to acquire ownership of the public land. Excluding Alaska, about 526,000,000 acres are open for settlement. The reserved lands sum up 151,000,000, of which 60,000,000 acres are in forest reserves that can never be settled upon, not even inhabited or even frequented by people who respect law, for the reserve laws are made by government officials without even consulting the people affected by them. They are impossible to keep, and are not fit for savages, and the people have no redress except in defeating a President, and in the territories they have not even that. What government! The worst of tyrants are the petty tyrants, and behold we see the forestry associations assembled in convention at Colorado Springs last October calling for federal troops "to patrol the reserves."

Shall this nation go on growing, or shall we go on making forest reserves and forever stop its growth? Shall the people have their natural rights restored to them and preserved, or shall the government cater to the spirit that depopulated Europe and built up America? Shall our pioneers be our natural heroes, or the forestry faddists and "scientists," the nation's pets? Read "Forest Law," in the Encyclopedia Britannica, and compare those laws with the reserve laws shown in the Land Office circulars, and you will agree with me that forest reserves and human liberty cannot stand upon the same ground. One or the other must go down.

H. J. M. MATTES.

Fort Collins, Colo.

All this reminds us of an old Tennessee moonshiner, who, commenting on the activity of the revenue officers, said: "Since these doggone government fellers begin acomin' round, a man caint earn an honest livin' any more."

RECENT PUBLICATIONS.

Transactions of the Royal Scottish Arboricultural Society, vol. xvii, part I. Printed for the Society at Edinburgh, 1903. Pp. 168 and appendices. Illustrated

"Ye may be aye sticking in a tree; it will be growing when ye're sleeping," is the motto of this society, and the report of its transactions shows that it does not confine its operations by any means to the mere planting of trees. The papers included cover the whole range of forest activities and are of interest and value, particularly those on the Larch disease. Several papers treat of foreign forests, as in Germany and the Pyrenees, and tell of unique conditions. The entire report is of greater general interest than are most such publications.

Transactions of the English Arboricultural Society, vol. v, part II. Printed for the Society at Carlisle. Pp. 362. Illustrated. 1902-1903.

The greater part of the record is given up to the excursions of the society at its summer meeting in France. Included in this are several reports on French forest operations and a comparison of English and French methods. These and other papers, like those of the Scottish Society, have a broad general interest, which should appeal as well to the lay reader interested in the general subject of forestry as to the practical forester. In both, the prime factor for consideration is the "estate" in its relations to forestry and lumbering, which marks a contrast to the "woodlot" areas of the United States, on the one hand, and the vast regions being worked by lumber companies, on the other. There are some analogous conditions in this country, of course; yet, even leaving them out of consideration, there are still many points in the forest policy in England and Scotland which can be made a basis for profitable comparisons.

Utah Farmers' Institutes, Annual No. 6, for the year ending June 30, 1902. Published by the Agricultural College of Utah, Logan, Utah. Pp. 160. Illustrated.

Papers read at the Farmers' Institutes during the year under consideration are incorporated in this volume, as is required by a state law. They deal naturally with agricultural problems which confront the ranchers of the state, and are instructive to any one interested in irrigation and the reclamation of arid lands. A paper on the possibilities of arid farming opens a new field of discussion, and should give an impetus to agriculture in some parts of the state where it will never be possible to employ irrigation. The great depth of Utah soils makes them extremely retentive of moisture, and crops can be grown in some areas now considered arid with no further addition of moisture than that afforded by the annual precipitation. The reclamation of alkali lands being conducted in the region of the Great

Salt Lake is the subject of one paper in which the alkali problem is set forth in plain terms and the need of drainage and drainage laws urged.

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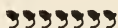
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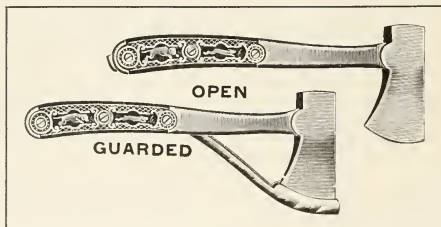
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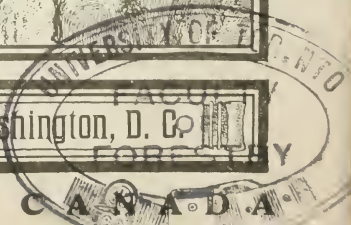
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2. The preservation and development of our national resources by the construction of storage reservoirs by the Federal Government for flood protection, and to save for use in aid of navigation and irrigation the flood waters which now run to waste and cause overflow and destruction.
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5. The adoption of a harmonious system of irrigation laws in all the arid and semi-arid states and territories under which the right to the use of water for irrigation shall vest in the user and become appurtenant to the land irrigated, and beneficial use be the basis and the measure and limit of the right.
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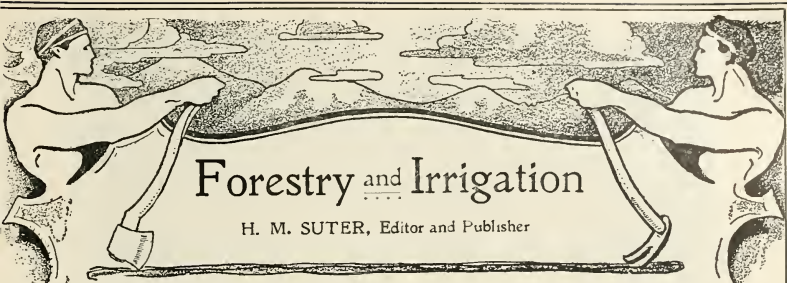
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Forestry and Irrigation.

VOL. IX.

JUNE, 1903.

No. 6.

NEWS AND NOTES.

Forest Work Outlined in Minnesota.

Mr. Gifford Pinchot, Forester of the Department of Agriculture, has just returned to Washington from a trip to northern Minnesota, where he made a tour of the Cass and Leech Lake region. In company with Commissioner Richards, of the General Land Office, he inspected the work carried on during the past summer and winter under the direction of Mr. Eugene S. Bruce, Lumberman in the Bureau of Forestry. The principal object of this work was to select, in accordance with the provisions of the Morris act, passed at the first session of the last Congress, a tract of 225,000 acres for a forest reserve, about the headwaters of the Mississippi. In addition, ten sections of land were to be chosen, to remain unlogged in the interest of the permanent beauty of the region.

On the 225,000 acres to be chosen for a forest reserve from the Chippewa Indian lands, now to be opened, the law provides that 95 per cent of the timber shall be removed under rules and regulations prescribed by the Forester, one of the objects of whose recent trip was to determine on the manner of selecting the five per cent to remain and the rules to be employed. It was found that excellent work had been done by the members of the Bureau, and that the situation, both on the ground and in the public sentiment of the state, was most favorable to the proposed reserve. Reproduction of the forest is abundant and easily secured if fires can be kept out. In fact, the fire problem is the greatest one to be faced. In order to meet it in part, the bill provides for the burning of tops and other débris of the

logging at a time when there will be no danger that the fire will spread.

At a dinner in St. Paul, arranged in honor of Mr. Pinchot by the Minnesota Club, Governor Van Sant and other prominent men in the state who are interested in forestry were present. Among the addresses was one by Mr. Fred G. Weyerhaeuser, a prominent lumberman of Minnesota, who said that the lumberman had come to see the practical importance of forestry in his operations. Brief addresses were made by Senator Clapp, Representative F. C. Stevens, Professor Tucker, and Mr. F. M. Eddy.

The list of guests at this banquet, in addition to the Governor, included State Auditor S. G. Iverson, who, by virtue of his office, is state forest commissioner; Gen. C. C. Andrews, state fire warden; Professors S. B. Green and F. D. Tucker, of the state agricultural school; Herman Chapman, superintendent of the experiment station at Grand Rapids; Mayor F. M. Kratka, of Thief River Falls; Gen. W. A. Kobbe, D. R. Noyes, who was Mr. Pinchot's host in St. Paul; Ambrose Tighe, B. F. Beardsley, Chas. Cristadoro, Webster Wheelock, R. C. Jefferson, W. B. Dean, Winthrop Noyes, and Conde Hamlin.

Spring Drouth in the East.

Many owners of truck farms and market gardens in the Middle Atlantic States have had it forcibly brought home to them during the month of May that great loss is bound to accrue to them through protracted dry weather during the most important part of the growing season. On the one hand, those with-

out irrigation plants of some sort are confronted by serious losses, particularly in the early vegetable and strawberry crops. On the other hand, farmers who have some means of applying water to their crops are doubly jubilant, because the warm sunshine, in connection with water, has made sturdy growth, and also because the general drouth conditions have made good produce scarce and high-priced. In Washington, situated in the center of an immense market gardening area, which was not visited by rain between May 4 and May 22, it is a noteworthy fact that the strawberries in market are distinctly of two classes: those grown under conditions which left everything to natural sources and those which have resulted from care and the application of needed water. The former are undersized and unattractive; the latter large and of fine color and appearance, and the difference in the price obtained for the two qualities is quite as marked as the difference in looks and flavor.

These things go to prove that irrigation for the eastern farmer is not in any sense a fad, but is well within the realm of hard, practical fact if the grower wants to make sure of good profit on intensive crops.

President Roosevelt Interested in Forestry and Irrigation.

A record of the speeches of the President on his western tour would show many apt allusions to the conservation of the woods and waters of the country through which he has passed. From the beginning of his tour he has constantly called the attention of his audiences to the need of conserving their country's resources through a wise forest policy, and the development of them by the preservation and use of water supplies. It is noteworthy that he has never lost an opportunity during this time to speak at educational institutions, and in California particularly he made a series of addresses at the collegiate institutions of the state, including Pomona College at Los Angeles, the University of the Pacific at San José, Santa Clara College

at Santa Clara, Stanford University at Palo Alto, and culminating in a commencement address at the University of California at Berkeley. In all of these he showed that he was quick to observe and appreciate the resources of California, and he urged on his hearers the necessity of working toward the fullest realization of the bounties that a generous nature had bestowed by making the most of them and their perpetuation. In all cases he showed himself thoroughly conversant with the broad aspects of both forestry and irrigation and the benefits to be derived from them.

Much of the pleasure of his trip depended on the efforts of the forest rangers, especially in his visits to the Big Tree groves and the Yosemite Valley. He was thoroughly interested in them and in their work, the address to his forest-ranger escort at Santa Barbara being a case in point. His trip through the West should bear fruit in a reawakening of the question of making the most of natural resources, not for the moment merely, but for future time.

Irrigation Surveys on Colorado River.

During the winter of 1902-1903 surveys and examinations have been made by agents of the U. S. Geological Survey along the Colorado River, in a country remote from civilization, where it was difficult to obtain necessary supplies. The surveys started in an almost unknown country, and extended from the mouth of the Colorado to cover an area nearly 400 miles long from north to south and from 1 to 10 miles in width.

The greater part of the work was done by Messrs. Rayburn and Robertson, who made the triangulation surveys. In addition to the survey work, certain areas have been mapped and contours shown at 10-foot intervals. This included all of the irrigable and bottom lands from Eldorado Canyon to Yuma, with the exception of about 40 miles between Ehrenberg and Picacho, which will be completed during the fall of 1903.

In addition to the mapping, investigations were carried on to determine the discharge of the Colorado at Bull's Head above Needles and at Yuma, with daily observations of the temperature and the variation in the amount of silt by quantity and weight; also observations as to the amount of silt carried at various depths of the river. Turbidity observations were also made, and at Yuma samples of the water were taken and forwarded for analysis to the Agricultural Experiment Station at Tucson, Ariz.

Measures of the Gila River were made, and of the amount of water in various ditches from the Colorado. Experiments were carried on as to the best handling of silt in ditches and canals and the beneficial results to be obtained from the collection of sediment on cultivated fields; also as to the velocities at which water erodes the bottoms of canals and at which it deposits silt in them; also of the proper slope of canal banks.



Lands Withdrawn for Irrigation. Pursuant to recent orders from the Secretary of the Interior, certain public lands have been with-

drawn from entry pending action on proposed irrigation projects under consideration by the national government. For the Bear Lake project, on the southeastern boundary of Idaho, near Utah, reservations have been made to include the following:

Townships 10 and 11 S., ranges 36 and 37 E., B. M.

Township 12 S., range 37 E., B. M.

Townships 12 to 16 S., inclusive, range 38 E., B. M.

Townships 6, 7, 8, 9, 14, 15, and 16 S., range 39 E., B. M.

Townships 7, 8, and 9 S., range 40 E., B. M.

To cover the Big Horn project, reservations in northern central Wyoming have been made as follows:

Township 54 N., ranges 80 and 81 W., 6th P. M.

Township 55 N., ranges 81 and 82 W., 6th P. M.

Townships 56 and 57 N., ranges 82 and 83 W., 6th P. M.

Orders withdraw the following for the Cody project in the northwestern part of Wyoming, near the Yellowstone National Park:

Township 52 N., ranges 102 and 103 W., 6th P. M.

Township 53 N., ranges 101 and 102 W., 6th P. M.

Township 54 N., range 101 W., 6th P. M.

Township 55 N., ranges 100 and 101 W., 6th P. M.

Township 56 N., ranges 97 to 100, inclusive, W., 6th P. M.

Township 57 N., ranges 97, 98, 99, W., 6th P. M.

Township 57 N., ranges 95 and 96 W., 6th P. M.

In connection with the Piney Creek project, the following areas have been restored to entry:

Township 51 N., ranges 80, 81, 83, and 84 W.

Township 52 N., ranges 80, 81 and 84 W.



Forest Rangers Greet the President.	Forest Ranger Roger S. Baldwin, of the Pine Mountain and Zaca Lake Forest Reserve in southern California, sent FOR-
--	---

ESTRY AND IRRIGATION an account of how the rangers acted as escort to President Roosevelt during his visit to Santa Barbara. This account will be of interest to the readers of the magazine, especially in connection with the short address the President made to the rangers, in which he showed his appreciation and understanding of forest work.

Twelve rangers from the Ventura County division of the reserve, under Forest Supervisor Willis M. Slosson, rode 40 miles from Nordhoff to Santa Barbara, where they were joined by twelve others from the Santa Barbara County division. The men wore blue flannel shirts with army buttons, khaki trousers and leggins, and buckskin gauntlets. Behind each saddle was strapped the khaki blouse, and in each hat was a sprig of pine. Bits, bridles, and spurs were polished, and the best horses obtainable were in evidence. When the rangers saluted the President, he immediately recognized them, say-



FOREST RANGERS FROM PINE MOUNTAIN AND ZACA LAKE FOREST RESERVE WHO ACTED AS PRESIDENT ROOSEVELT'S SPECIAL ESCORT AT SANTA BARBARA, CAL. COL. WILLIS M. SLOSSON, SUPERVISOR OF RESERVE, DISMOUNTED.

ing, "Why, these are the forest rangers. I am very glad to see you, boys." During the stay in and about Santa Barbara the rangers were given places of honor in the escort and were made useful in policing the line of march, holding up the trolley cars, turning back intruding teams, and keeping the crowds back.

At the Santa Barbara Mission, Colonel Slosson presented the President with an album of photographs of the reserve in behalf of the Ventura County rangers, all of the pictures having been taken and finished by the rangers themselves. In accepting this gift the President spoke as follows:

"Let me say a word of thanks to the members of the forest force, who acted as my escort. I wish to thank the other gentlemen also, but particularly the members of the forest force. I am, as you gentlemen probably know, exceedingly interested in the question of forest preservation. I think our people are growing more and more to understand that in reference to the forests and the wild creatures of the wilderness our aim should be not to destroy them simply for the selfish pleasure of one generation, but to keep them for our children and our children's children. I wish you, the forest rangers, and also all the others, to protect the game and wild creatures, and of course in California, where the water supply is a matter of such vital moment, the preservation of the forests for the merely utilitarian side is of the utmost consequence, and there are no members of our body politic who are doing better work than those who are engaged in the preservation of the forests, the keeping of nature as it is for the sake of its use and for the sake of its beauty."

Mr. Roosevelt also added, in an "aside" to "the boys" themselves, "and I like the way you ride."

Everywhere the rangers were treated with marked courtesy. They were practically made the guests of the Potter Hotel, and took lunch, on a special invitation from Commander Kimball, in the captain's cabin of the U. S. training ship *Alert*.

Appalachian Mountain Club's Excursion. The Appalachian Mountain Club, of Boston, Mass., has planned a number of outings this year, some of which have already been given. The principal events on the annual program include an excursion on Decoration Day, or rather, one covering five days from May 29 to June 2, a summer camp in New Hampshire, and a fall trip to the Adirondacks. Special meetings were held May 8, 9, 13, 16, 19, and 30. These included lectures, field lessons in geology, and tramping tours about Boston. The club takes an interest in forestry and related subjects, and has done a great deal to popularize nature study and appreciation in and around Boston.

Yale Forest School Notes. Henry S. Graves, director of the Yale Forest School, sailed for Rotterdam, May 5, to spend the summer abroad for the purpose of studying the forest methods in use in Europe, the results of his investigations to be used in connection with the work of the Yale School. Professor Graves will visit the most prominent forest schools and museums of Germany, Austria-Hungary, and France, and will make collections of books, instruments, specimens, and other material for use at Yale to aid the students and to illustrate his own lectures. His headquarters, while abroad, will be at the University of Munich, where he studied some years ago.

Professor Graves was at West Point for several weeks previous to his departure for Europe, directing the party of Yale Forest School seniors who have been working on the government reservation connected with the United States Military Academy.

The Yale Summer School of Forestry will be held, as usual, this year at Milford, Pa., the work being in charge of Assistant Professor J. W. Toumey, who has been advanced to a full professorship in the forest school.

Mr. Gifford Pinchot, Forester of the United States Department of Agricult-

ure, has been elected to a professorship in the Yale Forest School, and while he will continue his work and his residence in Washington, he will, by special arrangement, deliver a course of lectures at Yale during the coming collegiate year.

Professor William H. Brewer has resigned the professorship of agriculture at Yale and has been appointed professor emeritus. He has always taken a considerable and active interest in forestry, and was the author of the article on the "Relation of Forestry to the Public Health" which appeared in the January, 1903, issue of FORESTRY AND IRRIGATION.



Recent State Forest Legislation.

Since the publication in the April issue of FORESTRY AND IRRIGATION of notes on "Recent Forest Legislation" additional information has been received concerning acts which have been passed or are still under consideration by various states.

Maine.—An appropriation of \$2,500 for 1903 and a like amount for 1904 for public instruction in forestry was made under section 15 of the original forest act, and the coming fall will probably see a chair of forestry established at the University of Maine. A slight change was made in section 4 of the original act creating a Forestry Commission.

Minnesota.—Twelve amendments were made in the Minnesota forest fire warden law at the recent session of the legislature, which, it is felt, will improve the measure considerably. The legislature also enacted a law authorizing the State Forest Board to purchase land for forest purposes. The board is authorized to acquire by purchase for the state at a cost not exceeding \$2.50 per acre, and preferably at the sources of rivers, any land in the state that is adapted to forestry, but not to exceed in any one congressional township one-eighth of the area of the township, and to take such steps as are necessary to maintain forest thereon according to forestry principles. One-quarter part of the net forest revenue from such lands is to be paid to the respective towns in which

the lands are situated. No appropriation was provided to carry the law into effect. An appropriation was made, however, for the enlargement of the Itasca State Park and for the erection of a building therein, \$20,000 being set aside for the purchase of additional land and \$5,000 for the building. The park is at present under the control of the Attorney General. The legislature enacted as an amendment to a previous law a provision giving a bounty of \$2.50 per acre per year for a period of six years for each acre planted and kept in good condition with any kind of forest tree except Black Locust. This is limited to ten acres to any one person.

California.—An appropriation of \$10,000 has been made for preservation, improvement, and maintenance of the California Redwood Park, in Santa Cruz county. The money is to be used in building roads, bridges, etc., and for the employment of a warden and necessary assistants, \$5,000 to be available during this year and \$5,000 in 1904.

Pennsylvania.—Six forest laws were passed at the last session of the Pennsylvania Legislature. House bill No. 44 is as follows:

"An act conferring upon persons employed under existing laws by the Commissioner of Forestry for the protection of state forest reservations, after taking the proper oath of office, the same powers as are by law conferred upon constables and other peace officers, to arrest without first procuring a warrant, persons reasonably suspected by them of offending against the laws protecting timber lands, and also conferring upon them similar powers for the enforcement of the laws and regulations for the protection of the state forest reservations, and for the protection of the game and fish contained therein, and further conferring upon them the power to convey said offenders into the proper legal custody for punishment; this act to apply only to offenses committed upon said reservations and lands adjacent thereto." A second bill passed authorizes the Governor to appoint a Deputy Commissioner of Forestry and an additional clerk in the office of the Commissioner of Forestry.

A third bill empowers the Commissioner of Forestry and the Forest Reserve Commission to give street railway companies the privilege to construct, operate, or maintain lines on highways bordering on or within forest reservations. A fourth bill allows the State Forest Reserve Commission to expend in the purchase of lands for state forest purposes a sum not to exceed \$300,000 in any one fiscal year. Proceeds derived from the state forest lands, by the provisions of this act, are to go into a special fund which may be used for protecting and improving forest lands or for the purchase of additional land. The fifth act directs the Commissioner of Forestry to erect suitable buildings on the Mont Alto Reservation, or to purchase lands and buildings adjacent thereto, at a sum not exceeding \$6,000. These buildings are to be used as a practical school of forestry for the instruction of forest wardens for the state lands. The cost of the instruction is limited to \$10,000 for the two years ending June 1, 1905. The sixth bill provides for the erection and fitting up of a sanatorium on the Mont Alto Reservation for the benefit of poor consumptives, under the management of the Commissioner of Forestry, and \$8,000 is appropriated for the construction and maintenance for two years from June 1, 1903.

The number of these forest acts and the breadth of interest which they show point to excellent work and great interest in forestry in Pennsylvania, an example which could profitably be followed by other states.

Massachusetts.—A bill was introduced in the Massachusetts Legislature at its recent session providing for the establishment of the position of State Forester, but failed to pass, and will be introduced again next year, when it is hoped it will receive favorable action.

Meantime the Massachusetts Forestry Association has made an appeal to its members for voluntary subscriptions to a fund of \$3,000 for the purpose of employing a forester to work under the direction of the Executive Committee for the coming year. The fund is to be used to pay the salary of a forester at

\$1,200, for his traveling expenses, and for promoting practical work by the distribution of seedling trees and in other ways.

Connecticut.—A law relating to state forestry has recently passed both houses of the Connecticut legislature and is a distinct advance for the forest interests of the state. By its provisions the state forester is authorized to take such measures as he may deem expedient to obtain a profitable growth of timber on the state forest reservation, and to sell such timber when desirable, the proceeds to go toward the maintenance and improvement of the forest.

A former act is amended so that the price at which oak, pine, or chestnut lands may be bought at a sum not exceeding \$4 instead of \$2.50, as formerly; and another significant change is that which makes the reservation at Portland a state forest instead of a "park."

The sum of \$2,000 for the two fiscal years ending September 30, 1905, is appropriated for the work to be done in planting, fencing, protecting the lands from fires and trespassers, and preserving the game, fish, and timber. This is an inadequate sum, but the powers conferred on the forester show a considerable advance, as they enable him to carry out a complete system of forestry on the state forest in Portland.



Forestry in Hawaii.

The legislature of the Territory of Hawaii has passed an act providing for a Board of Commissioners of Agriculture and Forestry, in which provision is made for a forest policy for the islands. This act provides for a superintendent of the Forest Department, who will have charge of all matters relating to forestry, and will be assisted by a corps of foresters and rangers. The matters particularly specified by the act as coming under the jurisdiction of the Forest Department include the custody and regulation of all lands to be set aside under the provisions of the act, and to protect the forests for the purpose of conserving and regulating the water supply. Ways and means are to be devised for making the forests self-

supporting, and measures are to be taken for the exclusion of trespassers, stock, and fires from the public forest domain.

The Governor is authorized, by and with the consent of the Board of Commissioners of Agriculture and Forestry, to set aside lands for forest reservations and to accept the care and control of private lands for forest purposes.

The territorial senate has just passed a bill which appropriates about \$23,500 a year for two years for the Department of Forestry, and providing for the salary of a chief forester at \$3,000. He will have full and direct control of the forest work, being independent of the experiment station and answerable only to the Board of Commissioners, whose members are appointed by the Governor, by and with the advice and consent of the territorial senate.

The Bureau of Forestry at Washington is greatly interested in the work contemplated in Hawaii, and since it is the desire of those persons in the island most deeply interested in the subject, it will give help and advice in the preliminary steps. Mr. William L. Hall, Chief of the Division of Forest Extension, will start for Honolulu in August to assist in organizing the forest work.

Appropriation Vetoed. Governor Odell, of New York, on May 15, vetoed the annual state appropriation of \$10,000 for the New York State College of Forestry, of Cornell University.

His action was based upon the adverse report of the legislative committee appointed to examine the state lands in the Adirondacks. This report criticised severely the management of the college forest.

Association Matter. At a recent meeting of the Executive Committee of the Board of Directors of the American Forestry Association the matter of increasing the annual dues of the members of the Association, which was referred to it by the Board, was brought up for consideration. The Committee decided to recommend that the annual dues be increased to \$2.50 a year, and this proposition for increase

be submitted to the members of the Association at the special summer meeting to be held at Minneapolis, Minn., in August. Notice of the proposed change will be given in connection with the official announcement for the summer meeting, and if this action of the Executive Committee is approved, it will go into effect January 1, 1904.

Reclamation Service Notes. Mr. Charles D. Walcott, Director of the U. S. Geological Survey has

just returned to Washington after an extended trip in the southwest. He visited the San Carlos and Tonto Reservoir sites in Arizona, and met and discussed with the people of the Salt River Valley the main points in connection with the government's attitude in carrying out the provisions of the national irrigation act. Later Mr. Walcott visited the Grand Canyon, in connection with geological work that is being carried on in that region.

Mr. Morris Bien, of the Survey, is negotiating for the purchase of lands and water rights in connection with the Truckee project in Nevada.

Mr. F. H. Newell, Chief Engineer of the Reclamation Service, is now making an extended trip through the West in connection with the various proposed irrigation projects that are being considered under the law of June, 1902.

Forestry in Italy In a recent report Mr. Neville-Rolfe, British consul in Naples, refers

to the widespread interest now being taken in Italy in the question of reforestation. In 1877 about 4,000,000 acres were withdrawn from the operation of the old forest laws, as well as about 1,000,000 acres in Sicily and Sardinia. The consequence was a reckless destruction of forests; and now it is generally admitted that the state must step in to save those that are left and to aid in replanting. The question now being discussed is what trees are to be used for the latter purpose. The Italian oak is of little use except for railway sleepers; there is plenty of chestnut all over the country, and pine trees would

grow luxuriantly and prove most useful. The cork tree, however, appears to be the one which would prove economically the most valuable, and it has hitherto been almost wholly neglected in Italy. In 1900 the cork exported was valued at only \$180,000, and much, no doubt, was used at home. But a few years ago Spain exported wine corks to the value of over \$5,000,000.

In Italy about 197,000 acres of land are under the cork tree, chiefly in Sicily and Sardinia; in Portugal the area is 741,000 acres, in Spain 617,000, and in Algeria 694,000 acres. The Calabrian cork forests have been almost wholly destroyed, the trees having been burnt for charcoal, and even Sicily now imports corkwood in considerable quantities. Seventy years ago nearly all the cork imported into England came from Italy. But since then most of the Italian forests have been destroyed for charcoal and to produce potash, and those that remain are being devastated for the same purpose; and no one thinks of replanting the ground, which naturally gets washed away, owing to the absence of trees. Large forests containing a majority of cork trees are continually being released from the forest laws, and there is a risk that the production of cork in Italy will soon cease. Nothing can replace cork in its manifold use, and now, when vast quantities are used in making linoleum and in shipbuilding, an adequate supply of it is of great economic importance.

Connecticut Forestry Association Meets. The annual meeting of the Connecticut Forestry Association was held at Hartford, May 2. Although the meeting was not quite as well attended as that held a year ago, interest in the work of the Association was not lacking. Mrs. Jessie B. Gerard, of the Connecticut Federation of Women's Clubs, made an address on the work being done by that organization in favor of forestry, and Mr. Mulford, the state forester, who has just been elected president of the Association, told of the work being done with the \$2,000 appropriation received from the General Assembly two years ago. He

said that a portion of the appropriation has been expended to purchase, survey, and protect about 700 acres of forest land near Portland. The work at Windsor, where 60,000 trees have been planted to determine the best means for reclaiming Connecticut forest lands, is being conducted at the expense of the state experiment station. A good portion of the original appropriation is still available.

George R. Griswold, member of the Advisory Committee of the Association, and an agent of the Bureau of Forestry at Washington spoke of the assistance which the federal government offers to owners of woodlands who wish aid in forest work. The following officers of the Association were elected for the ensuing year: President, Walter Mulford, New Haven; Vice-Presidents, T. S. Gold, West Cornwall; Henry Ferguson and Willis I. Twitchell, Hartford; Secretary, Everett S. Geer, Hartford; Corresponding Secretary, Miss Mary Winslow, Weatogue; Treasurer, Alfred Spencer, Jr., Hartford; Auditor, Appleton R. Hillyer, Hartford; Advisory Committee, the officers and Dwight Loomis, P. Henry Woodward, Nathan F. Peck, John L. Dennison, Rev. John T. Huntington, Miss Antoinette Phelps, Theodore Worth, and E. V. Preston, Hartford; Mrs. Jessie B. Gerard, South Norwalk; George R. Griswold, Old Lyme, and Dr. E. H. Jenkins, New Haven.

Opening for Sawmills in Cuba.

Mr. Max J. Baehr, U. S. Consul at Cienfuegos, Cuba, in a late report writes interestingly of

the present status of the lumber trade at that port as follows:

"Many complaints have been made relative to the lack of milling facilities for dressed lumber. A lumber dealer of this city, Mr. Hunter, states that there are only two small sawmills here, neither of much utility, and they charge exorbitant prices for dressing lumber—\$9 per 1,000 feet. He has leased for four years, with the privilege of buying at the expiration of that time, the best milling site in Cienfuegos, and he offers

this site free of rent to any enterprising American who will establish a modern sawmill here. He will promise the American all of his own sawing, and no doubt he would receive the work of the many large plantations in this province and that of the new Cuban Central Railroad. Mr. Hunter says that there is a great local demand for doors, window frames, and moldings at very profitable prices, these articles being now imported from the United States under heavy rates of duty.

"The fact that an American firm has established a good sawmill in Habana and is now buying logs in this port and shipping them to the mill, paying freight rates equal to a shipment to the United States, makes it apparent that the establishment of a mill in this city under the conditions mentioned would be very profitable. My own investigations along this line substantiate Mr. Hunter's conclusions.

"In connection herewith, I would mention that the two principal export woods of Cuba—mahogany and cedar—are steadily enhancing in value, and the holders of the choicest timber lands on the north coast, as well as those holding lands adjacent to the new Central Railroad, are advancing their prices. Nevertheless, there are good mahogany lands on the south coast of Cuba that may yet be bought at a low figure."

Operations of the Bureau of Soils. Surveys will be made by the Bureau of Soils of the Department of Agriculture under Milton

Whitney during the current year to cover 27,850 square miles, distributed generally throughout the country. About 33,785 square miles have already been surveyed, and these embrace almost every phase of agricultural industry in the United States. These surveys are valuable, particularly in the West, where the soil types, with their origin and processes of formation, are described, with recommendations as to crops grown, possible yields, adaptability of certain soils to crops, soil problems, irrigation and drainage, location, origin, and composition of

alkali, and the reclamation of lands from alkali, swamps, or sand. It can be seen that these surveys cover a multitude of important details, and requests are daily pouring into the Bureau for surveys in particular localities. In addition to the regular survey work in charge of field parties, Mr. Thomas H. Meaus, head of the soils surveys of the United States, is making practical demonstrations of the reclamation of alkali lands, and is at present in the Yakima Valley, Washington, installing a system of drainage which will make available a large acreage now worthless. The Yakima Valley has but 10 inches annual rainfall, and irrigation has everything to do with its development. If the alkali problem can be solved, there will be a manifold increase in farm values there.

Irrigation in India. In view of the great irrigation works being planned by the federal government, the report of irrigation works for India recently published by the British Government is of interest. According to this report, the "productive works"—that is, those constructed out of loan funds in the expectation that they would prove directly remunerative—yielded a net revenue of about \$8,000,000, the largest on record, equivalent to a percentage of 7.36 on a total capital outlay of \$110,000,000. This percentage has only once been exceeded, viz., in 1897-'98, when it was 7.50. The most profitable results were obtained in the Punjab and Madras, where the percentages were 11.24 and 9.05, respectively. Out of 35 works classed as productive, 13 (including all the canals in Bengal, the Deccan, and Gujarat) are never expected to cover the interest on the capital outlay. The 22 actually productive works yielded 10.11 per cent. One canal, the Cauvery delta in Madras, returned 34.81 per cent. If the total surplus profits realized up to the end of 1900-1901 be added together, the open canals have produced 27½ per cent, after paying all charges for interest and working expenses.

No new productive works were opened

in 1900-1901, but about \$3,000,000 was spent on seven new works in Upper Burma, the Punjab, and Sind. With regard to works constructed out of the famine grant as "famine-protective works" not expected to be remunerative, it is noteworthy that they yielded a return of 2.35 per cent on capital. But this is largely due to the great and increasing success of the Swat River Canal, which alone yielded 10.41 per cent. Five more protective works are under construction. There is a large number of "minor works," which irrigated 2,625,456 acres in 1900-1901, and returned 7½ per cent on capital. Those in Sind proved the most lucrative, yielding 26.18 per cent. Another class of "minor works," for which no capital accounts are kept because they were mostly constructed under native rule, irrigated 2,581,829 acres. Moreover, Madras Presidency has 28,000 tanks and 6,000 irrigation channels, irrigating 3,173,250 acres. The total area irrigated by all descriptions of works in 1900-1901 was 19,646,000 acres, the largest on record. The total capital outlay on works for which capital accounts are kept has been about \$141,000,000, yielding in 1900-1901 about 6¾ per cent, after payment of interest, etc. The value of the crops raised on the irrigated area during the year was estimated at \$138,000,000, or approximately the amount of the capital outlay.

Water Power In connection with the in the Adirondacks.

gagings of streams in the State of New York by the U. S. Geological Survey, an examination of the water-power resources of the western slope of Lake Champlain has recently been made by Mr. Robert E. Horton; and two gage stations have been established on Saranac River, the largest stream flowing out of the region. This river has its headwaters in the Saranac group of lakes, in southern Franklin county. These lakes lie at an elevation of about 1,450 feet above Lake Champlain. The stream where it leaves Lower Saranac Lake has acquired, from the extensive drainage area and the great volume of

stored water of the lakes, a large, steady flow, and in falling more than 1,400 feet in its course of 25 miles to Lake Champlain at Plattsburg, it produces numerous waterfalls, which afford not only beautiful scenery but also great water-power facilities, some of which have been utilized. The largest water power on the river, however, affording the unusual fall of 245 feet to drive turbines, remains still undeveloped.

The object of the gagings is to determine the volume of the flow and its variation from day to day, so that the amount of horse-power the streams can furnish may be ascertained. One of the gaging stations is located near Plattsburg, at the mouth, and the second is near the foot of the Saranac group of lakes.

Other streams of the Champlain region—the Au Sable, Bouquet, and Chazy—have also been examined with reference to their industrial value. The streams of this locality resemble one another and are notable from the fact that their headwaters lie in the heart of the Adirondack region, the most elevated part of the state, while the sources of other outlets into Lake Champlain are only 90 feet above tide water.

Studying Forest Fire Problem.

Last year within two weeks over \$12,000,000 worth of timber and other property was destroyed by forest fires in Oregon and Washington. This enormous loss occurred upon a restricted area and represents only a very small part of the annual loss from this source. Every timbered region of the United States suffers year after year from fire. The annual loss is estimated at from \$25,000,000 to \$50,000,000. Forest fires have been regarded as almost inevitable, and few systematic attempts have been made to prevent or control them except in the states of New York, Pennsylvania, and Minnesota, which have efficient systems of fire protection.

The Bureau of Forestry has this year undertaken a thorough study of the forest-fire problem in several different regions. It has placed men in forest

districts to study fires while in the process of burning. Instead of waiting until the fires are over and relying for information on local reports, as has been done heretofore, the fires are now being observed by the Bureau's agents, and full data will be obtained as to how they were caused, how fast they burn, what conditions favor or hinder them, and just what damage they do to the soil and to tree growth. Each agent of the Bureau has been assigned to a district and is investigating all fires that occur within his territory. For example, one man studies a lumber tract, another a farming district, a third a turpentine orchard.

In connection with this detailed study, the agents will observe the methods of fire protection practiced by railroads and other owners of timber lands. The fire warden systems of the states which have forest-fire laws and the patrol system in use on the federal forest reserves will also be observed closely.

By such methods the Bureau of Forestry hopes to replace with carefully gathered facts the vague general notions that now exist about forest fires. When the problem is solved for any particular region, the Bureau will be ready to recommend methods of fire prevention and control for the private land owner, and to suggest forest-fire legislation for the various states.

The investigation is now in progress in northern Florida and southern Alabama and Georgia under the direction of Ernest A. Sterling. H. J. Tompkins, with a small corps of assistants, has begun the work in Minnesota, Wisconsin, and Michigan. Later in the season a study of forest fires will be made on the Pacific coast.



Uncompahgre Valley Water Consumers Act. At a meeting held at Olathe, Colo., May 5, several hundred farmers and business men, with delegates from all the canal companies of the Uncompahgre Valley, were empowered to incorporate to form a legal body to deal with the federal government in all matters which may arise in connection with the

Uncompahgre Valley reclamation project, one of the five great irrigation undertakings the government has now in hand. The organization was accomplished without any friction, four officers and an executive committee of seven being elected by the delegates to draw up a constitution and by-laws and to incorporate for the transaction of business.

Mr. A. L. Fellows, resident hydrographer, who has the work in charge for the government, addressed the meeting, outlining the scope of the undertaking and explaining the rights and duties of the consumers. From an engineering standpoint, he said, he believed the Uncompahgre project to be the greatest of the five irrigation undertakings now under consideration by the national government, and he estimates that 125,000 acres will be under the main canal at a cost not to exceed \$25 an acre to the consumers, the amount to be paid in ten annual installments. He suggested that some revenue might be derived from power developed at the dam, which would materially decrease the cost to the farmers. Mr. Fellows also suggested the plan of organization whereby complications could be avoided by having the government deal with the corporation in the adjusting of all claims, even to buying the ditches; if the corporation could make satisfactory terms with ditch owners, the government might advance the money. He explained that there would be several canals leading from the Gunnison tunnel, and if the Gunnison River did not furnish enough water to irrigate all of the valley at its lowest water season, storage reservoirs would be constructed.

It will be seen that the incorporation of the water consumers simplifies the matter of dealing with them, as was done in the case of the Tonto Reservoir, described in our May issue. The question of dealing with water users will probably be simplified in this manner with all of the projects, making such minor modifications of detail as may seem to be required by local conditions. A description of the Gunnison River tunnel may be found in the April issue of FORESTRY AND IRRIGATION.



HON. FRANCIS E. WARREN,

UNITED STATES SENATOR FROM WYOMING.

HON. FRANCIS E. WARREN, United States Senator from Wyoming, has been one of the most conspicuous and energetic advocates of irrigation legislation in the United States Senate. Coming from a state in which originate most of the large rivers whose waters are used in irrigation, it is fitting that he should originate many of the ideas which have been embodied in national legislation relating to irrigation.

Senator Warren was born at Hinsdale, Mass., June 20, 1844; he received an academic education, entered the 49th Massachusetts Volunteers as a private, serving from 1862 to 1865; he then engaged in farming and stock raising in Massachusetts until 1866, when he removed to western Dakota, the country afterwards being organized into the Territory of Wyoming. He engaged in the mercantile business in Cheyenne, and became interested in live stock; later he was elected governor of Wyoming Territory, and subsequently became the first governor of the new state. He has served in the United States Senate since 1890, his present term expiring in 1907.

Of large frame and equally strong mental grasp, Senator Warren is at all times a commanding figure, and in his advocacy of irrigation legislation he has attracted attention to the

necessity of action by Congress. His principal efforts were at first directed along the line of securing amendments to the River and Harbor Bill, by which reservoirs should be built by the general government as part of its system of river improvement, carried on by the corps of engineers of the United States Army. He secured the passage of the item authorizing surveys in Wyoming and Colorado, and resulting in a report on the subject, prepared by Capt. Hiram M. Chittenden.

When it became apparent that the River and Harbor Bill could not become the means of national irrigation, Senator Warren lent his aid to the passage of what is known as the reclamation law of June 17, 1902. In the administration of this law Senator Warren has taken great interest, and by his counsel and advice has sought to make the operations of the law of advantage to the country as a whole as well as to his own state.

FORESTRY AT HONGKONG.

DESCRIPTION OF A NOTEWORTHY EXPERIMENT IN TREE PLANTING THAT SHOULD BE IMITATED IN THIS COUNTRY.

BY

MARK WINCHESTER,

BUREAU OF FORESTRY.

A RETROSPECT on the work of the English foresters at Hongkong along planting lines may be of interest in this country because of the proximity of that section of Asia to the new possessions of the United States. Of course the conditions are by no means similar, because the Philippines at the present time are to a great extent heavily forested; but if the time ever comes when we are to carry on planting operations there, we may profit greatly by the mistakes and experiences of these foresters.

Hongkong was ceded to Great Britain in 1842, and the city of the same name has been built almost entirely since that time. Along the water front is a narrow strip, where are situated the wharves, principal places of business, and the Chinese quarter. From this commercial district the cliffs rise abruptly to a height of 2,000 feet, and on this steep hillside, on streets terraced one almost directly above the other, are the homes of the European residents.

When the English first came, this hillside was simply a series of barren rocks, with a few rank weeds here and there, and perhaps a little herbage and brushwood along the margins of the streams, as its only vegetable growth. Today the incline from base to summit, taken in connection with the superb ocean view, can be classed as one of the

most beautiful combinations of natural and artificial scenery in the world. The streets are well shaded, and the white walls of the houses contrast prettily with the green foliage. Everything is spotlessly clean. And it has been by the united efforts of the forester, the architect, and the engineer that this marvelous change has been wrought.

The first record of forest work on the island is in the late seventies. In 1878 five thousand cocoa palms were planted for ornamental purposes. It was evidently not the proper zone for them, because, although they flourished as far as foliage is concerned, and therefore answered the purpose for which they were put in, they did not bear any ripe fruit. The two years intervening between 1878 and 1880 were enough to demonstrate that it would be extremely difficult to get trees to grow on the side of the hill, for the plantings of 1878 and 1879 on the exposed slopes were complete failures.

Until 1881 all of the planting was done with two-year old plants reared in nurseries established near the planted territory. In the planting of 1881 a departure was made from the plan of previous years, and 60,000 of the trees resulting from this season's work came from seed planted in place. These were all Chinese White Pine (*Pinus sinensis*),



GENERAL VIEW OF THE HILLSIDE AND HARBOR AT HONG KONG.



RESULT OF PLANTING AND TRANSPLANTING ON A HILLSIDE STREET.

and in fact this species has been used predominantly in all of the operations. Planting in place is far more economical than the nursery method, because it saves the nursery expenses, the transfer of the young trees to the place of planting, and the labor of setting them out. In addition to the fact that it was the cheaper method of the two, the seeds planted in place seemed to succeed better than did the two-year old plants, for the reason that the roots of the latter were so long that when they were moved from their nursery bed sufficient soil did not adhere to give them a start in their new situation.

The cost of this planting is but one-fifth of that by the nursery plan. The losses are perhaps one-third of the whole number of seeds put in. At the end of the first year the plants reached a height of from three to six inches. The gaps left by the plants which fail to come up are filled in about two years after the other plants show themselves above the surrounding vegetation. Under the most favorable conditions, in sheltered ravines and on southern aspects, success has attended this kind of planting; the trees on the hilltops, however, as has been the case with those planted by other methods, are failures, although they will sometimes grow for a few years.

In 1883 twenty-five varieties of bamboo were tried. These were very generally successful, and several years later more were put in.

The great difficulty was to get trees to grow at the higher elevations, both because of the exposed situation and because of the scantiness of the soil. At a monastery near Hongkong, at an altitude of about eight hundred feet, were observed some fine large Sweet Gum trees (*Liquidambar formosana*.) The wood of this tree is in great demand in the manufacture of tea chests, because it has absolutely no odor. A few years later a number of trees of that species were put in and succeeded fairly well. The Japanese Pine (*Pinus thumbergii*) was also tried at the higher levels and did well, as did the Camphor tree up to five hundred feet, under good soil conditions. This latter tree grows to an

enormous height, and is exceedingly valuable for the making of clothes cabinets and chests. A large number of them were also set out along the road, where they have grown vigorously.

This road planting has been a very important feature of the Hongkong work, and it was begun in almost the first year of which any record has been kept. Bamboos, Pines, Banyans, and indigenous Oaks were the principal species used. In connection with this work of beautifying the roads, some interesting results have been obtained by transplanting. Banyan trees one hundred feet in height were lopped down to fifteen or twenty feet, bound around with straw, and transplanted to the edges of the roads with almost perfect success.

The adaptability of these trees and their persistence in the face of adverse circumstances are very striking to one walking along the hillside streets. In many cases where they are planted on the downhill side the drop is very abrupt and the soil covering correspondingly scanty. In these cases the tree, instead of giving up in despair, burrows with what roots it can, sending the others out along the top of the ground, and continues to grow and flourish as though the conditions were favorable.

In 1888 broadcast sowing was begun, both on the slopes and along the roads. A bulletin of 1901 says, after comparing results for three years, that broadcast sowing is as good as the expensive methods. The fact that the latter cost \$54 an acre and the former but \$5 makes this a rather startling statement.

Although Chinese White Pine has always been by far the most prominent species in the planting, in later years others have been increasingly used. *Cunninghamia sinensis*, *Tristania conferta*, Masson's Pine (*Pinus massoniana*), and the Gums are the best of the newer species, the two latter succeeding fairly well even at the high elevations. Japanese Cedar (*Cryptomeria japonica*), Japanese Pine, Camphor, and Eucalyptus are also good trees for this locality. The foresters here add their testimony



SECTION OF SLOPE PLANTATION, SHOWING GRADATIONS IN TREE GROWTH AS THE ALTITUDE INCREASES.



ROAD PLANTING NEAR THE SUMMIT.

to the statement, which seems to be pretty universally accepted now, that the prevention of malaria by Eucalyptus planting is a fallacy.

The success they have had with planting in this vicinity cannot be said to have been brought about entirely under the benign influences of nature, for she has interposed some rather serious obstacles. The first great difficulty was to find a good time for planting, because in the autumn, the best season for putting in the trees, the rainfall is very poor.

The typhoons which sweep over that coast of Asia did considerable damage, although many of the trees which were blown down were straightened and braced up, and after a period of nursing were restored to their former strength. Much trouble was caused at different times by birds eating the seeds of the in place and broadcast sowing.

Many of the *Tristania conferta* and Japanese Cedar fell victims to the white ant, and the Pines and Banyans suffered greatly from a caterpillar pest which appeared in 1893, 1894, and 1895. In the case of the Caterpillars (*Eutricha punctata*), however, many of the trees, even after losing their foliage, survived and regained their vigor. No way was found of getting rid of these caterpillars except the laborious method of hand-picking, which anywhere but in an exceedingly low wage country like China would be utterly impracticable. It has

been recorded as a rather peculiar fact that the times when the caterpillars were most plentiful were also the worst years of the bubonic plague.

Mahogany was tried in the plantations, and although for a time it grew well, it was later practically ruined by borers. Fire, the enemy at large of the forester, has not failed to visit the work of the Department there. On the aspects exposed to the winds and the terrific heat of the sun, everything in the dry season is in a thoroughly combustible condition, and the tree planters, in order to protect their work, have been obliged to clear several miles of fire barriers, some ten and some fifteen feet in width.

At the present time the Forest Department at Hongkong is doing but little broadcast and in place planting, because the area for this has practically been exhausted. They are, however, still doing a good deal of work along the roads and streets. From now on their principal task will be to protect and care for the plantations already under way. Experiments with new species will also be pushed vigorously.

The problems confronting these foresters have been many and vexatious. Theirs has truly been in all respects an "up-hill" work, and that they have transformed so much of that treeless slope into a veritable hanging garden is a testimonial to their energy and persistence.

NOTE.—The foregoing description calls attention to the great need of such planting in the United States. No doubt every reader of this article knows of spots practically barren of tree growth near our leading cities that might be made beautiful and healthful with even less energy and persistence than has been required in the work at Hongkong. It is an example well worthy of emulation by us.—[EDITOR.]



PRACTICAL IRRIGATION IN HUMID AREAS.

METHODS EMPLOYED AND RESULTS OBTAINED
FROM THE APPLICATION OF WATER TO CROPS
IN REGIONS OF CONSIDERABLE RAINFALL.

BY

BRISTOW ADAMS.

PART I.

LEAVING out of consideration a narrow strip of country along the Pacific Coast from the Canadian border to the northern boundary of California, where the average annual rainfall approximates 100 inches, the humid areas of the United States may be said to lie wholly east of the 100th meridian. In this region the average precipitation amounts to about 35 inches, the heaviest rainfall, 60 inches, occurring in Florida in the southeast, and gradually decreasing toward the northwest to about 15 inches in the Dakotas.

Irrigation has naturally attracted more attention in the arid states, in the region from the Cascade and Sierra Ranges on the western border of the continent eastward to the states bordering on the Mississippi River, than it has elsewhere in the country. This is so for the simple reason that that section has needed irrigation in order to properly grow and mature crops.

The humid area, conversely, has not taken such an interest in developing irrigation, depending, in the main, on natural rainfall to mature crops and provide for all needed moisture. Lately, however, and particularly through the greater interest in irrigation in the West, eastern farmers have been looking into the subject of irrigation as a means of increasing the value of the natural resources at hand. Also it has proved distinctly advantageous to make use of water artificially applied during the periods of drouth which are apt to occur in the eastern growing season. It can be said that the East is learning from the West, although the first irrigation plants in the country, leaving out of consideration those of the aboriginal

nations in the Southwest, were on the Atlantic seaboard, with Boston as claimant for honors as having had the first irrigation ditch in the country.

As noted in an article on the general practice of irrigation, published in the May number of FORESTRY AND IRRIGATION, there is hardly a state in the Union which does not make some use of irrigation, but it is a remarkable fact that the two states of the humid area having the most copious rainfall—Florida and Louisiana—have the most extensive irrigation plants. In general it may be said that the Southern States, more favorably situated than the rest of the country, are paying more attention to applying water to crops than other states in the humid regions where the need would seem to be more urgent.

Detailed descriptions of the various plants used in the Eastern States will give a general idea of how the work is being done, and of the results which follow.

Massachusetts.—Truck and fruit farms in the neighborhood of Boston have made use of irrigation for a long time, and the success achieved led many farmers to try the project. At first there was not sufficient knowledge of methods to be employed among those who recently took up irrigation. A number of gardeners near Boston use the city water supply, while others have independent sources of water and use pumps, either steam, gasoline, or wind-propelled.

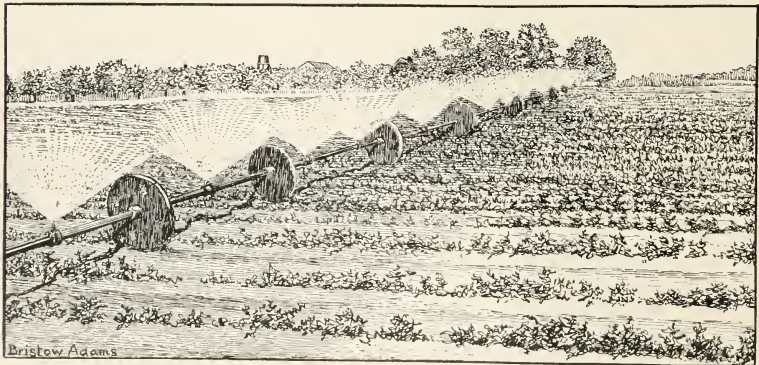
The Hittinger Fruit Company, of Belmont, Massachusetts—a suburb of Boston—is one of the best-known firms which makes use of irrigation in that neighborhood. Their business is fruit culture in connection with greenhouses

for small fruits and early vegetables. The firm admits that it made the mistake of going extensively into the field of irrigation without sufficient tests of the value, and have lately done away with a large part of the irrigation system which was first established on an elaborate scale. They say that they find that fine fruit is produced rather through frequent cultivation than the constant application of water. This admission shows that they fell into the most common and most injurious fault in the application of water, and one especially attributed to beginners, that of over-irrigation. Now, on the other hand, according to their own testimony, they have done away with irrigation, yet none of their crops is raised without the artificial application of water. This illustrates the difficulty experienced in getting statistics of irrigation in the East, where the garden hose and small ditch are not conceived to be irrigation in any sense worthy of the name.

The Hittinger Company plants its strawberries in rows on little raised hills and waters at infrequent intervals during the growing season by letting water run between the hills from open pipe or hose. Lettuce is not "irrigated" at all, yet the ground is thoroughly wet to the depth of two or three feet, first being watered with open hose and then by trenches in which the water is allowed to run for a day at a time. The lettuce is then planted, and when ready for

market is brighter, more crisp, and has been grown with less trouble from plant diseases than if it had been watered every day or two. This, allowing for the difference in the crop and the scale on which it is planted, is identical with the methods in use for the extensive culture of lima beans in California, as described in the May number of *FORESTRY AND IRRIGATION*.

The Hittinger plant makes use of a special and very simple apparatus, and one that is valuable where there are inequalities in the surface of the ground, for by its use the expense of leveling and grading can be done away with. The water supply is obtained from one of the Boston city reservoirs, and comes under a pressure of 25 pounds to the square inch. In the center of each quarter acre there is a firmly planted post, six inches square and about seven feet high. On top of this post is pivoted a 20-foot beam. A two-inch pipe runs from a main pipe to the top of the post, where, by means of an expansion joint, it divides to form two ten-foot arms, to the ends of which are coupled about twenty feet of garden hose, terminating in an ordinary nozzle. As the whole apparatus revolves, it can be seen that one man, with a force of water which will throw a stream from 30 to 40 feet, can effectually irrigate nearly half an acre, and can so regulate the supply as to suit the needs of a crop under any condition or stage of growth. Six of



MOVABLE SPRINKLERS ON FARM OF DAVID ASTLE, VINELAND, N. J.

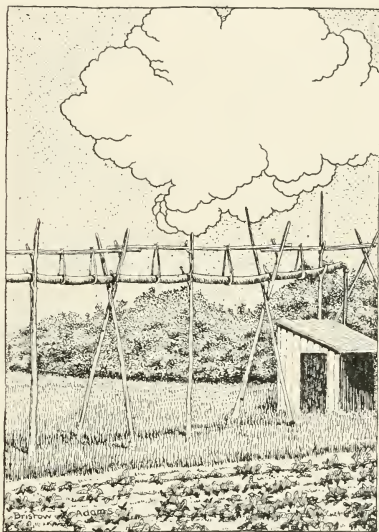
these distributing stations will suffice for $2\frac{1}{2}$ acres, and where water can be obtained under pressure the system is inexpensive. Where a natural pressure does not exist, a small force-pump used during the watering process would add but little to the cost.

New Jersey.—In this state, as well as in Massachusetts, sprinkling is used instead of the commoner application directly to the soil by furrows or flooding. In some cases a network of overhead pipes furnished with sprinklers is so arranged that by the simple turning of a valve an actual rain can be closely imitated over the area under the pipe system. William Ash and Sons, of Vineland, N. J., installed an extensive system based on this plan, but later discarded some of it because of the trouble caused by rust in the pipes. It might be possible to obviate the danger from rust, but unless that is done valves will be clogged and joints will leak. The great advantage of the overhead pipe apparatus comes from the convenience in handling and the absolute doing away with the expense of labor connected with the application of the water. Again, where shade-grown crops are to be irrigated, the overhead framework of pipes forms a support for the cloth used for shading.

Another gardener of Vineland, N. J., uses a large supply pipe along one side of the fields to be irrigated, and at intervals along its length are lateral pipes with couplings and valves, to which a section of rubber hose is attached, and this in turn is connected with a long pipe which extends across the field, supported on wooden disks or wheels at intervals of about 12 feet. Starting at one end of the tract to be irrigated, the long lateral pipe is connected with the supply pipe at the side of the field by means of the rubber hose, and as the ground is watered the pipe is pushed along on the wheels to the limit of the hose, when it is uncoupled and attached to the next lateral vent, and so on until the whole area is watered. The advantages claimed for this device are: that the water, by means of the sprinklers placed at intervals on the lateral pipes, can be regulated to the

needs of different parts of the ground and crop; that there are no permanent fixtures in the field itself to interfere with thorough cultivation or to take up any room from the crops. The rows or furrows of the field are run the same way that the large wheels progress, so that there is no crushing of the crop, the wheels being made to run in the furrows or between the rows.

Still another market gardener in the same neighborhood uses the same kind of a main pipe along the edge of the field, but at right angles to the furrows



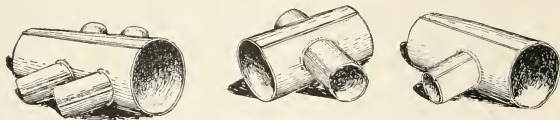
CANVAS HOSE SUPPORTED ON POLES FROM A GASOLINE-ENGINE PUMPING STATION.

instead of parallel with them. From this extend lateral outlets, with valves and couplings, but to these a hose is attached, which carries water for furrow irrigation. A modification of this form is used in almost all cases where small fruits and vegetables are grown by irrigation, though in many instances tarred cotton duck is substituted for all but the main lines of pipe. This hose was introduced by Mr. George A. Mitchell, of Vineland, though notable adaptations have been made of it.

among them a very serviceable sluice hose with open lateral ports, which may be regulated by tying with stout cord, this latter improvement being the device of Mr. George H. Patch, of Wisconsin.

This hose is easily made, the canvas being torn into strips approximately

the boiled oil alone is used. Such hose will not stand great pressures, but for many purposes will be found inexpensive, conveniently handled, and adapted to a variety of uses. It can be run along the ground or supported on poles in the air. Couplings can be made with galvanized iron pipe inserted and tied



FORMS OF GALVANIZED IRON LATERALS FOR USE WITH OILED DUCK HOSE.

three times the diameter of the pipe desired, with an allowance for width of seam, which is sewed on a heavy sewing machine. The hose is then saturated inside and out in boiling coal-tar and linseed oil, four parts to one. It can then be wrung through a clothes-wringer and left ten days to dry. In some cases

with stout cord, and lateral branches may be made with T joints of any light pipe which will fit the hose. A majority of the truck gardeners of New Jersey use gasoline engines, as being cheaper, easier to operate than steam, and also because a licensed engineer is not required by law to operate them.

(Continued in July number.)

THE FORESTS OF CANADA.

BY

HENRY S. CULVER,

U. S. CONSUL, LONDON, ONTARIO.

THE composition and present condition of the timber areas of Canada are not generally understood by the people of the United States. They are too much inclined to look upon them as one unbroken forest rather than as separate and distinct areas, and they erroneously associate with these different areas the best timbers known to have their habitat in this northern country.

A general idea of the composition of the Dominion forests may be formed by ignoring the minor belts of timber and the isolated forest reserves and dividing the main forest lands into three great belts or divisions.

This, of course, necessitates leaving

out of the report the forests of the maritime provinces, which are extensive and valuable, covering about one-tenth of the area of those of Ontario and Quebec; but the forests of New Brunswick and Nova Scotia may be compared in a general way to those of Maine. By the division suggested, we have three great timber belts in the Dominion: the northern or spruce belt, the southern or commercial belt—both east of the Rocky Mountains—and the British Columbia belt, west of the Rocky Mountains. In point of value, for general purposes the western or British Columbia belt is far superior to either of the eastern areas mentioned, for the reason that the climate, tempered as it is by the warm

waters of the Pacific Ocean, promotes a more perfect growth and development of the different species. Here is found not only the valuable Red Fir, or Oregon Pine, generally distributed throughout the entire province along the coast and on the mountains, but also the Red Cedar, the Western Spruce, the Yellow Cedar, the Hemlock, the Balsam Fir, the Western White Pine, the Western Yellow Pine, the Maple, and the Western Oak in such quantities as to make this, perhaps, the most valuable timber belt on the North American continent. This belt extends from the forty-ninth parallel north to the sixtieth parallel, a distance of some 770 miles, and is from 200 to 300 miles wide. The best timber does not extend to the extreme north. That portion is covered with Black and White Spruce, and constitutes a very extensive pulp-wood range.

Dr. Dawson, in describing the Red Fir, or Oregon Pine, says :

The best grown specimens are found near the coast, in proximity to the waters of the many bays and inlets which indent it. Here the tree frequently surpasses 8 feet in diameter at a considerable height above the ground, and reaches a height of from 200 to 300 feet, forming prodigious and dark forests. The timber is used for house-building, shipbuilding, wharves, piles, masts, furniture, fencing, etc.

Next in importance to the Oregon Pine is the Red Cedar. Mr. J. R. Anderson, deputy minister of agriculture for the province, says :

"The tree is very generally distributed in Vancouver Island and on the coast of the mainland to the westward of the Coast range. Scarce in the dry central plateau, it again occurs in considerable quantities in the Selkirk and Gold ranges of the mountains.

"As in the case of the Douglas, or Red Fir, the finest specimens are to be obtained in proximity to the seacoast. Here the tree attains an immense size, an idea of which may be formed from the fact that some of the native canoes, which are all hewn out of the trunks, are 6 feet and more from the level of the gunwale to the bottom.

"Although second in importance as

regards its economic value, it is a more valuable wood than the Oregon Pine, being used principally for interior finishing, cabinet-making, doors, shingles, and posts."

But this region, by reason of its great distance from the markets of the East and the lack of cheap transportation, will remain comparatively in its primeval state until the eastern forests, which are more accessible, are nearly exhausted or until better transportation facilities are afforded.

The northern belt is perhaps greater in extent than all the other timber belts and reserves of Canada combined. According to the best authority, it extends from the eastern coast of Labrador north of the fiftieth parallel in a northwesterly direction to Alaska, a distance of some 3,000 miles, with an average width of perhaps 500 miles. This vast strip of timber land, if placed upon the territory of the United States, would extend from Maine to California, and from the southern shore of Lake Erie to the northern boundary line of Georgia. It is known as the spruce forest of the Dominion, the great bulk of the timber being of that species—black and white—the other important trees being Larch and Poplar.

Although this region has been but partially explored, it is claimed that many of the trees in the southern portion are of a lumber-producing size, but the greater portion is fit only for pulp.

When it is considered that spruce is distributed in vast quantities through all the forests of Canada, and that an almost incalculable amount will be produced in this great northern belt, it is hardly exaggeration to say that the Dominion possesses an inexhaustible supply of pulp wood.

Dr. Bell, of the Geological Survey of Canada, says of the forest :

"In our northern or spruce forests, a bird's-eye view of the country would show a patchy appearance, due to the fact that these different areas have been burnt over at different times.

"The White Spruce attains its full growth in about one hundred and fifty years, and there are second-growth patches of this tree of all sizes and all ages, up to one hundred years or more,

together with some of the old forest. Spruce trees grow much more rapidly up to about thirty years than they do afterwards. The addition made between thirty and one hundred years is much slower."

In describing its area, he says:

"The area of our northern forests may be reckoned as forty-four times as great as that of England. Any one of these forty-four parts will produce wood enough to supply the ordinary demands of the present population of Canada—that is, 5,000,000 people could get what is required for mining, fuel, etc., by taking the timber from a space the size of England—and would be able to allow the other forty-three equal parts to be in reserve or used for export."

This great region, which has remained so long unexplored, is about to be brought within the reach of civilization through the railway being built from Sault Ste. Marie to Hudson Bay. This will make available at least the timber growing around the bay and along the line of the road, and may possibly provide a more accessible field of pulp wood than can be obtained in any other way for the rapidly growing industries of the "Soo."

The southern or commercial timber belt spreads over a very wide territory. It comprises that portion of Ontario and Quebec lying between the forty-fifth and fiftieth parallels of latitude and bounded on the east by the St. Lawrence River and on the west by the Great Lakes and Manitoba. Great interest centers in this great timber region by reason of its proximity to the manufacturing centers of the United States and because it contains the most valuable timber for lumber east of the Rocky Mountains.

It is not, however, a compact and unbroken belt of first-class timber. Climatic conditions seriously interfere with the development and growth of some of the best species of timber that inhabit this region, for none of the best ones extend farther north than the watershed between Hudson Bay and the Great Lakes, approximately the fiftieth parallel of latitude, and many of them find their northern limit far south of this parallel. Besides, all timber deteriorates

in value and becomes less in volume as it approaches the limit of climatic growth. The composition and extent of this timber belt can be better understood by taking a map of the Dominion and tracing its boundaries and noting the northern limit of the most valuable species. The forty-fifth parallel, which is approximately the southern limit of this region, cuts out entirely one very valuable species—the Black Walnut—whose northern limit of growth is the latitude of the city of Toronto, while a few miles north of this parallel is the northern limit of Red Cedar and White Oak. A line drawn from the city of Quebec to Sault Ste. Marie will designate the northern limit of Beech, while a line drawn from the northern part of New Brunswick to the north shore of Lake Superior will mark the northern boundary of Sugar Hard Maple. Two other valuable species which have their northern limit within this belt are Elm and Birch.

The king of the northern forests is White Pine, which has its northern limit, as have also White Cedar and Red Pine, at this fiftieth parallel of latitude. This region is now virtually its only home in the Dominion of Canada. It was at one time supposed that it had a very extensive northern range, but Dr. Bell states that its distribution is comparatively southern, very little, if any, being found north of the fiftieth parallel, which marks the watershed between Hudson Bay and the Great Lakes. This belt would furnish an enormous supply of excellent timber but for the destruction wrought by forest fires. Dr. Bell calculates that about one-third of this territory may be considered as under second growth up to about 10 years of age, one-third as intermediate, and one-third including trees of 100 years or more, and this applies doubtless to all the forest areas of Canada; but as to this particular belt, which lies at the very doors of the great manufacturing establishments of the United States, and is the one foreign timber region upon which we rely, one must admit that the available supply of first quality timber is alarmingly limited.

The Canadian forests have never been called upon to pay the enormous tribute to multiplying industries that our forests have; but they have been decimated by the speculative lumberman and the improvident settler, and ravaged by fire until those which are most accessible bear little resemblance to their primeval state.

But it is not too late for the Canadian people to preserve what is left of their great timber reserves, and by a vigorous and judicious system of reforestation they may be able to meet every demand for their best timber for a long time to come. They are awake to the responsibility and are taking measures to preserve what is left and to reforest the waste places. In this connection I quote from an interesting memorandum addressed to the commissioner of crown lands by Thomas Southworth, clerk of forestry for Ontario. He says:

"I have devoted a great deal of time and study to the question of the feasibility of restoring and preserving the growth of White Pine upon lands not adapted for settlement which have been wholly or partially cleared either by lumbering operations or by fire. Until lately such a measure has not been considered possible except at an outlay which, under existing circumstances, would preclude its adoption. Recent investigations, however, have thrown new light on the matter by dispelling the erroneous views formerly current, and still held by some, as to the natural process of forest reproduction. It was popularly believed that when the original pine forest was destroyed and the soil remained uncultivated the succeeding crop of spontaneous vegetation consisted in all cases of trees of a less valuable character, such as Poplar, Birch, Bird Cherry, and Jack Pine, and that some natural law precluded a second growth of White Pine. The circumstance which gave color and plausibility to the theory was that in the majority of cases lumbered-over lands were subjected to the ravages of fire, frequently more than once, which swept away not merely the undergrowth, but the seeds deposited in the forest soil, so that when after the lapse of years vegetation again

appeared the lighter seeds, carried long distances by the wind, were the first to occupy the soil.

"Careful examination of many cut-over tracts and information derived from various sources afford abundant evidence that while the result of repeated fires may be to utterly destroy the White Pine so as to prevent its spontaneous reproduction, the first crop will naturally, and as a rule, be succeeded by a speedy growth of its own kind, and that, where protection from fire is afforded, these seedlings supply the vacancy left by the removal of the original forest and furnish a merchantable crop within a reasonable time. Already, there are large areas of cut and burned over land on which young White Pines are found intermixed with less valuable trees, which only require to be guarded against forest fires to yield a profitable crop long before the present virgin timber resources of Ontario are exhausted. Even after a district has been burned over, White Pine or Spruce will spring up where the seeds latent in the soil have not been burned, or where enough of the original trees remain to furnish seed. Near the village of Plevna, in the county of Addington, a tract of land of considerable extent has been withdrawn from settlement on account of the valuable crop of young pine timber which has grown up during the past twelve or fourteen years' immunity from fires. There are many such tracts scattered throughout the province, unsuited for general agriculture, which will in due course contribute to the timber supply.

"The problem of reforestation is greatly simplified when it is understood that all that is really required to be done in most cases to secure a certain, if somewhat tardy, restoration of the original forest growth is to allow the reproductive energy of nature to have full play, with immunity from fire. So long as it was supposed that when the first pine crop was removed the second growth was invariably of an inferior and comparatively valueless character, and that nothing short of artificial planting at enormous cost would restore the pine growth, it is not surprising that a

policy of mere exploitation was pursued, by which it was sought to harvest the original crop of virgin timber as fast as the demands of the market warranted, and in a manner that would provide the greatest revenue to the province.

"Since it has been established that it is possible to profitably grow successive crops of our most valuable trees on our non-cultivable lands, the question of the cheapest and most expeditious plan to pursue in this regard becomes very important. The greatest factor

is, of course, the prevention or lessening of forest fires, and in the effort to do this many things must be considered. The withdrawal of certain lands from settlement, the degree of restriction found necessary upon the liberty now enjoyed by hunters, tourists, prospectors, trappers, and others in the crown domain, the means of checking fires once started, and many other things must be carefully considered in enacting legislation with this aim in view."

IRRIGATION OF SUMATRA TOBACCO.

DESCRIPTION OF AN INTERESTING INDUSTRY NOW FLOURISHING IN FLORIDA.

BY

CLARENCE J. BLANCHARD.

FLORIDA, in the minds of Northerners, has been associated so long with fruits and flowers that it comes rather in the nature of a surprise to find agriculture developed there on a scale commensurate with many sections of the North. Northern brains, money, and push are responsible in some degree for the revival, but Floridians are awakening rapidly to a better appreciation of the latent possibilities of their state, and while welcoming their brothers from the North are themselves adopting the latest ideas of farming with success. Scientific methods, improved machinery, and diversified crops are gradually replacing the old customs, the antiquated machinery, and the one-crop system. The results are already reflected in better homes and a more industrious and cheerful people.

The city of Quincy, county seat of Gadsden county, is in northwestern Florida, in that narrow strip of land lying just south of Georgia. It is in the heart of the famous Sumatra tobacco district, the product of whose plantations scored 20 points higher at Paris than the leaf from the island of Sumatra. Recently I spent a day driving over the

plantations of the Owl Commercial Company and Schroeder & Arquimbau, two of the largest planters in the state.

The Sumatra plant requires special soil, cultivation, and irrigation to bring it to perfection, and the success of the planters in Gadsden county has not been achieved without the most careful study of the plant's needs, and long and patient experimenting with soils and fertilizers. The plant also requires protection from the direct rays of the sun; hence these large plantations are covered with framework over which are stretched millions of yards of cheese cloth, or over which miles of narrow slats have been placed. The soil is prepared with utmost care. Twenty-six wagon-loads of stable manure and one and one-half tons of cotton-seed meal per acre are thoroughly mixed with the soil. The plants are grown from the seed, which is usually planted in a small clearing in a swamp, and under cheese cloth. As soon as they have reached the size of young cabbage plants they are transplanted.

The young plants are carried in baskets by women or children, who follow the men down the rows. With a sharp-



Courtesy Bureau of Soils
PLANTS GROWN UNDER SHADE APPROACHING MATURITY.



Courtesy Bureau of Soils
SHADE GROWN TOBACCO AFTER SEVERAL PRUNINGS.

poined stick the planter makes a hole about 4 inches deep, into which he places the plant, packing the earth about it with a few deft touches. The plants are set about 14 inches apart, the rows being about two feet apart. When the field is equipped with an overhead pipe line with sprays every 33 feet, the plants are irrigated in the evening; otherwise the watering is done with a dipper in the morning. From ten to fourteen thousand plants are set to the acre. As soon as the plants are firmly set a "scooter" is run between the rows, throwing up a flat-bottomed furrow in which the water is run from wooden troughs which divide the field at regular intervals. These troughs are supplied from the reservoirs above the field, or from pipes directly connected with pumping plants on the streams. In the overhead system, now recognized as the most perfect and satisfactory method of artificial watering, two-inch pipes run over the frames in parallel lines about 40 feet apart, extending all over the fields. At intervals of 40 feet a small iron pipe extends upward about 4 feet above the shades, the upper end being closed with a spraying attachment. When the water is turned on in the pipes it comes out of the sprayer in a fine mist and falls like a gentle rain upon the plants. Sumatra tobacco is cultivated constantly, no weeds or grass being permitted to grow in the field. A constant watch is kept to prevent injury from the pests to which the plant is subject. The first of these and probably the worst is the black cut-worm, which working under ground cuts the young plant down near the roots. Should the plant survive this enemy, the planter keeps a lookout for the bud-worm fly, an insect that lays its eggs in the center of the bud and bites a hole in the new leaf not larger than a pin point, but which will be as large as a silver dollar when the plant is full grown. Paris green and corn meal prove effective against this pest, and are applied like common insect powder. When the plant has grown to some height the green horned worm, with insatiable appetite, makes his appearance. He eats a leaf 12 by 24 inches in a single night and still is

not satisfied. The grasshoppers, too, cause much annoyance, and the planters fight them in various ways. When they are very numerous they are rounded up by a large force of laborers and driven out of openings in the sides of the fields. When not too numerous, Guinea fowls are introduced into the fields, and they soon complete the destruction of the hoppers. A Guinea hen in full action after a grasshopper is a sight not soon forgotten, and the insect has but a small show for his life. Boys and girls with wooden flappers go over the fields at regular intervals and aid in the destruction of the hoppers.

Tobacco grows amazingly fast, in some instances attaining 9 feet in 37 days, and the plants must be frequently supported by strings attached to the frames. When the tobacco is gathered it is taken to drying-houses, which are immense barn-like structures with large openings to permit the free passage of the air. When thoroughly dried it comes to the warehouse for sorting into its proper grade. There are 9 grades—light, medium, and dark, with spotted and plain of each of the above. Other grades are called seconds, strippers, fillers, and trash, the latter being the waste after sorting. All the work of sorting and grading is performed by colored women. Children are employed in stripping. For a period of not less than nine months the tobacco goes through a sweating process. Then it is weighed and bulked down. Later the bulks are changed, the center of the package being placed on the outside. Then it is brought to the casing room and moistened. After this it comes to a sorting room, where it is graded by colors. Next it is sent to the tyer's table, where it is tied up after the leaves have been sorted and sized. The packages then go back to the bulk-room, where it goes through a process of drying out. It is then brought back to be sized to the inch, and is put into bales, which are again stored for two weeks or more. The bales are then burlapped, marked according to grade, and shipped.

A fair yield of Sumatra tobacco in Gadsden county is a thousand pounds

to the acre, although it frequently runs as high as fourteen or fifteen hundred. The finest leaf brings as high as \$6 a pound, although the average is probably not more than \$3.50. This

industry requires the investment of large capital, gives employment to a small army of colored people, and has become a strong factor in the material development of Gadsden county.

THE RANGE HOG AS A FOREST PROBLEM

BY

CHARLES H. SHINN,

HEAD RANGER, SIERRA FOREST RESERVE.

IN the lower portions of the California Sierras the officers engaged in caring for and protecting the forest reserves find that droves of half-wild hogs have often been permitted to run at large, more particularly in districts where many oak trees grow. These hogs generally belong to poor settlers who live within the reserves, or who have their homes just outside a reserve, in some small village, either on deeded land or as holders of tracts to which they have not yet perfected titles. Even the richest settler is not apt to own more than a hundred "porkers," and usually the droves consist of from twenty to fifty.

The true "range hog" is remarkably well adapted to his environment. He is a long, lean, tough, strong, fierce, and rough-coated animal, a lineal descendant of the half-wild "razor-back" of western and southwestern literature; but in coming up from the swamps and prairies to the highlands of the Sierras he has acquired even greater size and fighting ability. The solitary old "tuskers" become very savage and picturesque creatures, fit prey for the long boar-spear of any huntsman, and capable of fighting off or destroying almost any number of dogs.

Although the regulations bar hogs from these reserves, the swiftness and cunning of the animals is so great, and they are all so much at home in the woods, that it is a difficult matter to follow them up or to keep them out. They will dodge into the thick, thorny shrubs where neither man nor horse can follow

and where dogs dare not attack them, or they will back up between rocks and into gullies, show fight, and charge their pursuers. A mother with her five or six spotted pigs will usually attack anything in sight; and she has need to be fierce, as the forest shelters many coyotes and mountain lions and an occasional lynx.

None of the Sierra forests contains a pure stand of oak, but large areas of it on the western slopes in the reserves below 5,000 feet elevation contain many species of oak, both evergreen and deciduous. The principal species are the Highland Live Oak (*Quercus wislizeni*) and the California White Oak (*Quercus lobata*). These oaks are mixed with pines; first the Gray Pine (*Pinus sabiniana*), the nearly worthless "Digger Pine" of the foothills; then higher up the Bull Pine (*Pinus ponderosa*). Still further up the Digger Pine disappears and the superb Sugar Pine (*Pinus lambertiana*) comes in. But the hog problem is almost altogether one of the thousand feet between the 2,500 and the 3,500 foot levels along the western townships of the California reserves, where the forest consists of oaks, Digger Pine, and Bull Pine.

The injury done by the range hogs in this belt of country is partly to seedling trees and partly to the pasturage. When I came to this (the Sierra Reserve) last November, I observed large areas of soft, rich soil so deeply uprooted that it looked as if it had been freshly spaded. This had been done by bands of range hogs in search of roots



RANGE HOGS IN MIXED FOREST OF OAK AND PINE, SIERRA FOREST RESERVE, CALIFORNIA.

of perennial grasses and of some of our small but nutritious native bulbs, such as the *Brodias* and the *Calochorti*. The rooting was also deep under many oaks and pines, but at this season, just after the early rains, it was most noticeable in the rich open "flats" and hollows within the reserve. I examined carefully one tract of eighty acres and the following comparative areas were found:

	Acres
Area in fairly good young forest.....	36
Area in poor and fire-injured forest.....	18
Area in heavy growth of shrubs.....	20
Area in scant pasturage and rocky ridges..	30
Area in good pasturage and rich hollows..	9

A drove of not more than thirty hogs had deeply broken the sod on nearly all of the open spaces, and especially over the nine acres of richer soil, so that a fair estimate of their work would be forty-five acres of this one tract examined. By January most of this ground had been rooted over again. In February the drove was taken away, but now, in April, the uprooted places are not grass-grown, but weedy, and the pasturage is undoubtedly much injured.

The pioneers claim that young pine

groves frequently spring up where range hogs have been allowed to work at will, as they root up the close mat of pine needles and give the seed a chance to start. But wherever, in November, December, and January the fresh rooting of these animals had taken place under the pine trees on the eighty acres before alluded to, I found that the seedlings had been entirely destroyed. It seems evident that the burning of the pine needles with the first rains will furnish a better chance for reproduction than any hap-hazard dependence upon range hogs.

Many cattle owners recognize the injury done to perennial grasses by bands of hogs. These grasses were once very abundant, and formed a close mat over large areas; but overstocking has in many places made their growth very "bunchy," under which circumstances the injury done by the hogs is especially manifest. The annual grasses are eaten off, but seldom uprooted.

As far as the settlers themselves are concerned, the habit of turning out their hogs has been in most cases unprofitable and even burdensome. The hogs are

often lost, stolen, or destroyed by wild animals. In any event, they fare badly, suffer greatly in winter, make poor food, and bring but low prices when sold.

When kept in fields, fed and cared for, and especially when "bred up" into better stock, they are one of the best money-makers of the mountain ranch.

Forest officers can justly press this point home to the land owners in and near the reserves, and can refer them to the many and excellent publications upon the care of the hog that have been issued by the U. S. Department of Agri-

culture and by the various experiment stations throughout the country.

As a closing illustration, Mr. Muhley, a settler in this region, tells me that two years ago he bought forty hogs and turned them "out on the range" (in the reserve). When he tried to "round them up" at intervals during the last winter, in order to obey the regulations of the reserve, he was able to find only ten, with no small pigs, and he is now carrying a rifle in order to shoot the two or three hogs that have "run wild" and still stay in the heavy chaparral.

OKLAHOMA IRRIGATION

DESCRIPTION OF METHODS THAT HAVE BROUGHT
SUBSTANTIAL SUCCESS AFTER EARLY FAILURES.—
A PRACTICAL WAY TO FIGHT DROUTH.

BY

A. S. PERRY,

IN THE WESTERN FRUIT GROWER.

IRRIGATION! What is it? You may say it is applying water by artificial means to procure the growth of vegetation during drouth or where the water supply is inadequate. This is partly right, but does not cover the matter by any means. We will not try to describe it in full, but will enlarge on the former definition somewhat. It is the means by which a poor man with only a small outlay can go onto lands that are deemed unfit for tillage, and with only five or ten acres produce profitable employment for a large family, make a pleasant home, and save more money than the average man in an agricultural country will from 160 acres of the best and most valuable lands. It is the only thing that will bring about the beautiful homes that in the future will be seen all over the lands that are now called the arid and semi-arid lands of America. The time will come, and we hope is not far off, when this will be resorted to and 50,000,000 of people will find profitable employment tilling lands that today are supposed to be worthless. Most

likely our government will have to solve the problem and set the stone to rolling.

We will now come down to some of our own experience. First, the writer spent the earlier part of life trying to grow fruit in a semi-arid region without irrigation. This proved unprofitable, as there were as many failures as there were crops. Next, the same work was resumed in another region, which proved no better than the first, so far as rain was concerned. After three years of total failure with small fruits we found ourselves with an empty pocket-book and a debt of \$950 hanging on our word and honor to pay, with nothing more to secure it than 160 acres of land that belonged to Uncle Sam, on which we had placed a filing for homestead entry. This was poor upland and very sandy. Under these circumstances, the conclusion was arrived at that one of three things had to be done: We must irrigate, emigrate, or quit the business of growing nursery stock and small fruit for market.

We decided to irrigate. An old wind-

mill was bought on our promise to pay \$12.50 within three months. Testing showed that sheet water existed at a depth of 14 to 20 feet in the coarse sand. A well was dug and a large amount of water procured; a pump that should have thrown 7,000 gallons per hour would not keep the water off the diggers while finishing the well and walling the same. Success was crowning our efforts. Next a reservoir was built, 100 feet in diameter, the walls being a complete circle and 4 feet high. This was soon filled from the work of the never-tiring windmill. The pond was too small, but work could not be resumed until we had rain, as we needed every drop of the water. As soon as rain relieved us we turned the water out of the reservoir and dug it from the inside until we had the banks 7 feet high. This again proved too small, and another

reservoir was attached to it on the rear from the well, with walls 7 feet high and 300 feet long, making another pond 100 feet square, the first pond forming one side.

The following winter the third pond was dug, still to the rear of the second and of the same size. The need of so many ponds was to preserve all the water that could be pumped during the winter or when the rain relieved the irrigating. The mill can thus be kept running all the time, whether wet or dry weather. By having so much water stored we are able to handle 40 acres of nursery stock and keep it growing during the severest drouth. These ponds were made to hold like jugs (except from evaporation) by puddling one hour per day for two weeks. This was done by using a drag to stir the mud. Stirring the water keeps it muddy, and the



TYPICAL WINDMILL AND RESERVOIR FOR IRRIGATION.

mud settling stops the pores of the soil, which will soon become impervious to water and seepage will stop. This will work on any clay soil.

Our next experiment was on another part of the field where no clay subsoil existed. Eighteen inches of sandy soil covered a bed of almost pure sand, which extended fifteen feet. Here a reservoir was built 200 feet long and 100 feet wide. The same method of puddling was resorted to, but not enough water could be held in the pond to make it a success; besides, the bottom was so soft that a horse would mire in it like quicksand. A fence was put around the pond inside of the banks and twenty-one head of hogs procured and placed in the pen. No shade was provided for them, but the mill was steadily pouring a stream of cold water in the pond, so it was "root hog or die" with the heat. The hogs rooted and the water raised, and in a short time we were using water from this pond for our plants, the result being that the bottom was as solid as either of the ponds on clay.

The results of three years of inexperienced work with the water had given us means to build the ponds mentioned and to procure windmills and pumps adapted to the work and save some money to enlarge our business with. Now we felt that we had a "down-hill pull" and commenced enlarging our nursery planting and small fruit blocks. Two acres of strawberries were set, and the first crop gave us the neat sum of \$315 per acre above paying for picking, crating, and express charges. We also planted raspberries and blackberries; the former proved unsuccessful on account of soil being too light, but fine tip plants were secured and have since proved a source of good revenue, as other nurserymen cannot raise them in this part of the country without water. The blackberries pay \$200 to \$225 per acre above picking and crating. The cost of cultivating and irrigating being about \$30 per acre, leaves a good margin on the right side for the grower. Strawberries cost a little more, about \$50 per acre per annum. You may say, "Doesn't that vary with the amount of rain?"

It does. The less rain we have, the less the cost, for if there is not much rain the weeds do not get the start of you, for you irrigate, and before the weeds have time to germinate, the plow has dislocated and destroyed them, while with the rain the whole field is on you at once, and thus gets the start and costs more to clean it up than the cost of irrigation.

Another successful year has passed and we have paid the debt of \$950, with 12 per cent interest. After closing out our salable plants, we are pleased to find that we still have money to further enlarge our planting of berries and nursery stock. The following year we grow stock under contract for nurserymen that want to be sure of getting fine stock. This we can assure them, for they will not suffer from drouth. The fall of 1900 arrives and we are loaded with a fine supply of extra fine stock for the planter, as well as having turned about \$2,000 worth of fruit into cash. A fair price prevailed on the nursery stock, and after selling it out, which was an easy matter, as all our customers by this time had learned that our stock is exceptionally fine on account of having water for it, the profits of a year's work were at once put into a farm lying on the bank of the North Canadian River. About forty acres of this is in ideal shape for irrigation without much grading. A twelve-horse power gasoline engine and centrifugal pump, which is giving us 1,000 gallons per minute, was installed, and the land planted in berries and potatoes. Potatoes are yielding 250 to 300 bushels per acre, and at this time are bringing \$1.25 per bushel. The price for the entire crop will average about 80 cents per bushel. The berries now are in fine condition and will be in shape for a large crop next spring, whereas, without irrigation, there would be nothing alive at this time, after the prolonged drouth we have suffered, and which is not yet broken.

The cost of running our engine is within a few cents of \$2 per ten hours run, and enough water will be thrown to cover ten acres 1½ inches deep after allowing the usual one-third for loss in ditches.

THE REDWOOD,

CALIFORNIA'S MOST VALUABLE TIMBER
TREE, WHOSE MANY UNIQUE QUALITIES
GIVE IT A WIDE RANGE OF USEFULNESS.

ARDENT believers in the excellence of Redwood lumber have ascribed to it so many worthy properties that many persons, and especially easterners, accept many statements concerning it with a grain of salt. Perhaps this may account for the comparative infrequency of its use except in the neighborhood of its growth, though it is more likely that high freight rates have a great deal to do with its lack of use in the eastern United States. It has been stated that the wood makes excellent fuel, and that it is fireproof; that it is the lightest wood that can safely be used in building, and that it is so heavy that it will sink in water; that it can be cut and worked easier than White Pine, and that it is so hard it will turn the edge of a steel tool.

These very apparent inconsistencies may be reconciled in some degree by a slight modification of the statements. Clear Redwood is at once light, easy to work, soft, and straight-grained. Redwood burls, or knotty excrescences put forth by the tree to heal a hurt, are heavy enough to sink in water, and hard and tough enough to daunt an edged tool. They are, when properly worked, very beautiful, being susceptible of a high polish, which, with their rich red color, makes them like mahogany in finish and curly maple in texture. As for being fireproof, it can be said that the absence of resinous gums makes the wood fairly fire resistant, and that cases have been known in San Francisco, which is built mainly of Redwood, where a party wall of that material has offered an efficient check to the spread of a conflagration. Moreover, the fire record of San Francisco, essentially a wooden city, whose hills and high winds make many difficulties for the local fire department, show that there has been an immunity from serious fires not enjoyed by any other city in which the

use of wood for building purposes has been so general.

Redwood is unique, not only in its lumber qualities, but in its manner of growth, distribution, and other silvicultural characteristics, all of which have been brought out in a bulletin recently published by the Bureau of Forestry. This publication makes a careful study of the tree, its methods of reproduction, and goes into the question of applying the principles of forestry to lumbering operations in the California Redwood groves. Also it treats of the fungus growths which attack the tree, and the insect enemies, finding in both these latter cases that the Redwood is singularly immune from depredations which work havoc among many other woods.

The Bureau of Forestry sought to find out whether there would be profit in holding cut-over lands for future crops, and going to the expense of protecting the young growth in lumbering operations and from fires. It has been stated, and believed even by those who live among these trees, that the Redwood represents what an Irishman might call "an extinct living species," and that efforts toward its reproduction would be futile, as conditions under which the trees started, one thousand or more years ago, no longer exist. To most any observing person it is apparent that this idea is an absurdity. The old giants among the Redwoods are bound to be cut, except in a few places where they may be preserved in parks, for the simple reason that it is profitable to lumber them, and future generations of these trees will never attain the size of the patriarchs of the virgin forest because the sawmill man cannot afford to wait that long; but it has been demonstrated by Mr. R. T. Fisher, of the Bureau of Forestry, that Redwood reproduces itself abundantly

by sprouts and occasionally by seed, and that in thirty years under fair conditions it should yield 2,000 feet B. M. to the acre.

It is inevitable that the old forests will be lumbered, but that need not mean total destruction, which is apt to follow the wasteful methods now in use. The Mendocino Lumber Company, operating in Mendocino county, California, has done a great deal toward the adoption of a rational Redwood forest management, and has secured excellent growths on its cut-over lands, which, had they been lumbered in the usual careless manner, would have been worthless at this time.

The ordinary Redwood (*Sequoia sempervirens*) and the Big Tree (*Sequoia washingtoniana*) are distinct species, though their lumber is called by the same name. Comparatively little lumber comes from the latter, as it occurs only in scattering bodies and not accessible to markets. Moreover, most of the Big Trees are preserved and their destruction is now hedged about with much sentiment.

The commercial Redwood grows to a greater height than any other American tree, though it is exceeded in girth and age by the Big Tree. The best specimens are 350 feet high and 20 feet in diameter. Most of those being cut at present are upwards of 500 years old, the oldest being about 1,375 years. When normal the tree has a straight, slightly

tapered bole, clear for 100 feet or more, with a crown of comparatively short horizontal branches, which occupy from one-half to one-third of the total length. It has no taproot, but the other roots strike downward at a sharp angle, forming a compact woody mass, well adapted to securing water. The bark forms a remarkable resistant to fire and



VIRGIN REDWOOD, SOUTH FORK OF EEL RIVER, CALIFORNIA. THE TREE AT ITS BEST.

thoroughly protects the older trees from any flames which may go through the forest. The normal is not the common form, as the tree assumes a variety of shapes, depending on local conditions, and in some cases the crown is a few flat limbs near the top on one side, or perhaps a thick mass of little bushy branches extending from the ground to

the top of the tree. Many trees have burls on the trunk 10 feet long, and some carry curious protuberances, called "hanging necks." These deformities are caused, in most cases, by the efforts of the tree to heal its hurts.

The tree requires apparently only that the soil be moist, and the best specimens are found where a canyon or arroyo assures considerable seepage or where creek bottoms afford an abundant supply of water. The moisture of the soil affects the development of the Redwood, but the moisture of the air affects its range and regulates its distribution, for

comes from trees which have grown in the bottoms or "flats" under favorable conditions. "Flinty" timber is more apt to be found on the slopes, and the tree's vitality is so great and it endures so many vicissitudes, all of which leave their record, that the grain of the wood bears a direct relation to the eventfulness of its life. These differing conditions of the lumber give rise to such varying statements as are quoted in the first part of this article.

The Redwood forest itself is of the selection type, and contains trees of a wide range of age in a single mixture,



REDWOOD SPROUTS 6 TO 8 YEARS OLD, CRESCENT CITY.

but, contrary to the usual selection for est, the large, mature trees outnumber the small ones. Sucker and seedling share in the reproduction, but unequally, in a ratio of about 100 to 1. The germination quality of the seed is poor; so also are the opportunities for germinating, as the seed requires considerable light, and the suckers crowd the seedlings out, even when germination takes place. In some places of the forest a ray of sunlight never penetrates. The crown of the Redwood is, nevertheless,

almost as thin and open as that of the Larch, and in a mixed stand the Redwood's branches die off more rapidly than those of its companions, and the crown bends eagerly to those places where the light enters the forest canopy; yet the young trees, suckers from mature roots, grow under shade that would kill seedlings and survive year after year until they get more light, perhaps from the felling of the parent tree, when they shoot up with vigor. In some places the new growth grows in clumps as white as potato sprouts in a dark cellar. Under any conditions the shoots of one season's

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growth are as soft and juicy as young asparagus.

The enemies of the Redwood are few, and the tree suffers little from them. Wind seldom damages it. Even fire, the greatest enemy of all, though it has for centuries run through these forests, has had comparatively small effect. Underbrush and young trees are killed, but the thick bark protects the old trees. In cut-over lands, however, the damage from this source is great. Dr. Hermann von Schrenk has found that fungus attacks it but seldom, and then does but little injury.

A brown rot does some damage at the base of trees, but does not affect them for any great length, and the tree's remarkable immunity from forms of decay has enabled it to reach such a great age. Dr. A. D. Hopkins finds that the insect enemies are few in number and insignificant in their damage, being held in check by parasites in great measure, and for the most part preferring other trees in the same neighborhood to the Redwood.

It remains, then, to be said that man is the greatest enemy these forests have.

Even now, with the growing demand for the tree and the awakening appreciation of its uses, lumbering operations are carried on with a small margin of profit, as the methods have to be on a gigantic scale, from the size of the tree and the trouble in getting the lumber to market. Steam is used throughout the process of lumbering, and the fall of a tree not only destroys everything within its path of 250 feet, but in most cases splinters the tree itself, so that all of the crown and a large portion of the bole is a shattered and tangled wreck. At least a quarter of the stand is a total loss, and is, moreover, a source of con-

siderable trouble and expense. Logs are peeled and the bark and branches set on fire. Then the yarding crew, with donkey-engine and tackle, gets the log under way for the mill, and as it goes plunging and plowing along hardly a tree in its vicinity is left uninjured.

If reasonable care were exercised there would be a much better chance for good stands of second growth Redwood, which is valuable timber at 45 years old, and while the virgin stands are yielding from 20,000 to 150,000



SECOND GROWTH REDWOOD AT MENDOCINO, 40 TO 45 YEARS. THE YOUNGER GROWTH FORMS A RING AROUND THE PARENT TREE.

board feet per acre, the cut-over lands in the number of years specified should yield at least 3,000. And with the future which Redwood assuredly has, this would be a profitable holding. In Sonoma county trees are now cut to a diameter of 10 inches at a profit, and they grow to this size in from 20 to 25 years.

The uses for Redwood are growing. Its resistance to fire has been noted, and, as stated, insects seldom injure it. In sea water and in moist places generally it resists decay, but the marine teredo destroys Redwood piling as readily as any other. At present the market is



REDWOOD FLAT, CRESCENT CITY. CHARACTERISTIC GROWTH ON LEVEL GROUND.



BROWN ROT OF REDWOOD. POCKETS OF DISEASED WOOD ON LOG PARTLY SUBMERGED IN A STREAM.

limited, for all practical purposes, to California, although occasional cargoes go to the Orient, where it should become popular, since exhaustive tests prove it immune to attacks of the destructive white ant or termite. At home it is useful for all kinds of finishing and construction lumber. Many of the finest houses throughout California are built of Redwood and shingled with it. In addition, all of the interior work, including solid panels for wainscoted walls and ceilings, is made of the wood, which takes either a high polish or a more popular soft, oiled finish. For shingles, railroad ties, electric-light poles, paving blocks, tanks, and pipe-staves it is an excellent wood. Contact with the ground and with moisture affect it but little, and miles of banded pipes of Redwood staves are used in irrigation works on the Pacific coast.

In conclusion it may be said that there are good chances for forest management among the Redwoods, but that the narrow profits of the lumbering make the simplest and most inexpensive methods the best. The Mendocino

Lumber Company has operated with an eye to the future, and as they have cut no trees under 20 inches and spared the young trees in their operations as far as possible, the hills where they operate are well wooded, with a thick enough stand to insure clear trunks and a consequent lessening of the danger from fire, in contrast to the usual system of laying bare the land. The result of this case has been in every way worth the trouble and the land is becoming more and more valuable instead of being a rain-washed and fire-devastated waste. The example set by this company is very much to the point, its methods being cheap and practical. Other companies may find more care necessary to keep fires out of the young growth if they start forest methods now, and everything will have to be done with a sharp eye to the cost. But under the average prevailing conditions the whole Redwood country from Oregon to Monterey Bay can be made to perpetuate itself in timber and regain much of its original value.

PRACTICAL HELPS FOR IRRIGATORS.

CONSTRUCTING A RESERVOIR—SUCCESSFUL PUMPING PLANT—AMOUNT OF WATER REQUIRED FOR IRRIGATION.

Directions for Building an Earthen Reservoir.

A COMPETENT irrigation engineer has furnished the following directions for constructing a reservoir of substantial size by building a bank of earth across a natural ravine to receive and impound waters.

Such a bank should be founded upon solid homogeneous earth, containing at least a considerable percentage of clay, so as to be practically impervious to water under considerable pressure. The site of the foundation should be cleared of all vegetable matter, and should be left rough by plowing several furrows across the ravine lengthwise of the proposed bank, so that a good bond can be made between the foundation and the embankment. The bank should be of

earth, free from roots or other vegetable matter, and preferably a mixture of clay, sand, and gravel. Not more than two-thirds of its bulk should be of any one of these materials. It may be put in place by means of scrapers, and should be kept damp, so that it will pack well. This can be done by means of a hose or sprinkling cart.

In the course of construction the bank should be thoroughly compacted by teams or rolling. The men and teams handling the scrapers are valuable for this purpose, but should be supplemented by something else. A herd of cattle or sheep might be driven back and forth or herded on the embankment, or rollers may be used; but these should be

corrugated, so as not to leave a smooth surface. The slope of the embankment should be about 3 to 1 on the water side and 2 to 1 on the lower side, and the top width should be not less than 5 to 10 feet.

An ample spillway should be provided in some location where the waste waters may be discharged without injury to the dam, and should be of such a capacity as to discharge the highest flood to which the drainage basin is subject, without danger of overflowing the dam.

Provision for drawing off the water may consist of a cast-iron pipe in the bottom of the ravine under the dam, with the earth carefully puddled and packed around it on all sides to prevent percolation along the pipe. It would be still better to lay the pipe wholly or partly in a bed of concrete, as this can be tightly bonded with the earth. The pipe, of course, would be provided with suitable valves for opening or closing the outlet.

In regard to the flow which the

ditches should have, this depends upon many factors. The most important of these factors is the quantity of water which it is intended to carry. The following is a table which may be of use. The slope, as stated, is the least allowable for each case, and a somewhat greater slope would be better, but it should not be very much greater.

Discharge.	Depth.	Bed-width.	Slope.
<i>Sec. ft.</i>	<i>Feet.</i>	<i>Feet.</i>	<i>Feet per mile.</i>
3	1	1	10
5	1	2	8
5	1	3	5
15	2	2	4
20	2	3	5

The column marked "bed-width" means the bottom of the ditch. It is assumed that the side slopes will be 1½ horizontal to 1 vertical; the discharge is given in cubic feet per second, and one cubic foot per second is equal to 450 gallons per minute.

Pumping Water for Irrigation.

Mr. A. B. Fowler, of Guernsey, Wyoming, writes that he has a pumping plant belonging to Mr. E. F. Hurdle and himself, consisting of a second-hand 70-horse power boiler and 50-horse power engine, costing \$1,500 in place. The running expenses amount to \$5 per day for labor and fuel. By means of it 7 cubic feet of water per second are raised to a height of 20 feet. This amount of water irrigates one acre per hour of crops planted in rows, and one-half an acre per hour when used in flooding. The pump is estimated to furnish sufficient water for 500 acres in diversified

crops, but up to the present the engine has not been operated for more than one-third of the time in any season, as yet only about 200 acres of land being under cultivation.

This device has been an unqualified success, and would be in any other similar locality where an abundance of water can be had. For such a plant to be profitable it is necessary to have a good market for the crops raised, or plenty of live stock to feed. It is probable, however, that water is obtained in this way as cheaply as can be had through ditches.

Amount of Water Required to Irrigate an Acre.

A cubic foot per second flowing through an irrigation season of one hundred days will deliver about 200 acre-feet, or will cover 100 acres 2 feet in depth. In most localities this is sufficient water for the production of an average crop. In California, where water is scarce, less is used, and for

orchards twice as large an area can be irrigated.

When irrigation is first practiced more water is needed to thoroughly wet the subsoil, but after a few years a less quantity is required, and in some localities, as at Fresno, California, no water is applied on the surface, the seepage

from the canals keeping the fields sufficiently moist.

Two acre-feet for an acre is an average allowance for the arid region as a whole.

Five acres per miner's inch, or 250 acres per second-foot, may be taken as the most economical use, say at River-

side and Redlands; where ditches are lined, water is carefully measured, and citrus fruits are irrigated. This must be furnished about two hundred days on an average. It is equivalent to 138 acre-feet of water per acre irrigated. This duty can be improved by the use of pipes.

THE LOCUST.

DESCRIPTION OF THE RANGE, HABITS, AND METHODS FOR PLANTING ONE OF AMERICA'S MOST VALUABLE TIMBER TREES.

BY

WILLIAM L. HALL,

CHIEF OF DIVISION OF FOREST EXTENSION, BUREAU OF FORESTRY.

THE Locust (locally known as Yellow or Black) (*Robinia pseudacacia*), originally indigenous to the mountainous region from Pennsylvania to Georgia, and possibly as far west as Arkansas and eastern Indian Territory, is now widely naturalized, through cultivation and other agencies, throughout the United States east of the Rocky Mountains. Of recent years it is appearing in great abundance on abandoned hillside farms of Pennsylvania, Ohio, and Kentucky, and is also increasing in the southern portion of the plains region west of the Mississippi. It rarely forms extensive pure growths except in southern Pennsylvania, Ohio, and eastern Kentucky, where it is most abundant. Even in these localities it is usually associated with other deciduous trees, occurring in small scattered groves.

It has been more or less employed as an ornamental tree and considerably planted in the Middle West for economic purposes. Its tendency to sprout from the root and its frequent failure through the attack of borers have brought it into disrepute in many sections. However, these drawbacks are not general and where present can, to some extent, be obviated by proper methods of management.

The range for planting the Locust is extensive, covering the region between

the Appalachian Mountains and the Mississippi River, and extending west of the Mississippi south of the 38th standard parallel as far as the Rocky Mountains. It is also well adapted to the valleys of Utah, Idaho, and eastern Oregon and Washington if planted on irrigated land. The planted groves to be seen near Salt Lake City, Utah, and Walla Walla, Wash., are among the best in the United States.

The growth of the Locust is very rapid, especially in rich soil, where during its early growth it makes an average annual increase of 2 to 4 feet in height and $\frac{1}{4}$ to $\frac{1}{2}$ inch in diameter. After the first 25 or 30 years the average accretion, both in height and diameter, lessens, and by the fiftieth year usually almost ceases. When the tree is once established, it sprouts vigorously from the root, so that coppice growth is easily maintained. The trees usually attain a height of 40 to 80 feet, with a diameter of 2 to 3 feet.

The largest and best Locust trees are generally found in well-drained, deep clayey, lowland soil, but it grows successfully on sandy and gravelly soils, and is said to produce more durable timber there than in better situations. On wet soils it is of slow growth and short-lived. Its roots are shallow, and where the soil is poor reach out to great distances to obtain nutriment. The

habit of shallow rooting is in part accountable for its sprouting tendency as well as for its rapidity of growth and its adaptability to soils underlaid by tenacious subsoil. With favorable soil conditions, Locust trees grow almost as well on slopes and hillsides as on level land.

The timber of the Locust has found extensive use as fence posts, ribs of vessels, tree-nails, telegraphic insulator

and pruned while young it will produce straight poles 18 to 20 feet long.

It is most commonly used for fence posts, for which purpose it is extensively grown. The ease with which it is handled, its rapid growth while young, and its ability to endure extremes of heat and drouth add to its usefulness for this purpose. A post of 4 to 5 inches in diameter can be produced on good soil in 7 or 8 years, and when used



BLACK LOCUST FOREST PLANTATION, 12 YEARS OLD, IN MEADE COUNTY, KANSAS.
TREES 6 TO 8 INCHES IN DIAMETER AND 30 FEET HIGH.

shanks, and in the manufacture of vehicles. It also has been used somewhat for railroad ties and telegraph poles. Its great durability in contact with the soil makes it very valuable for use in the ground, and its toughness and elasticity adapt it to use where great strength is required. On account of its tendency to produce a short trunk and numerous branches, it is not well suited for use as telegraph poles and seldom produces one of good length, but if planted thickly

in the ground will last from 8 to 15 years. Unlike many timbers, the young wood is almost as durable in the soil as the old, on account of the large proportion of heartwood.

The Locust is one of the most valuable trees that can be used for planting in Oklahoma and the Indian Territory, where it is seldom attacked by borers, and where it can be grown for fence posts with a profit often exceeding that to be obtained from agricultural crops.

Many farmers and ranchmen have established plantations to supply the posts and poles required in keeping up fences and sheds, in this way saving themselves a very substantial amount annually.

The Locust is propagated easily from root cuttings and from seed. The latter is the most common method. The seed retains its vitality for a number of years if kept in the pods or buried deep in the ground, in the latter case having been known to grow after seven years; but seed out of the pods will not germinate well after two years. The pods ripen about July or August and the seed can be sown immediately, when it will generally come up and make a considerable start the same season: if kept for spring planting it is advisable to keep the seed in moist sand in a cool place during the winter. Old seed and that kept dry over winter is best handled by soaking in warm water for a day or two immediately before planting. The seed when once soaked should not be allowed to dry out, but should be planted immediately while in a moist condition.

The seed should be sown in well-pulverized, rich loam soil in early spring. If hand cultivation is to be given, the seed may be sown in drills 12 to 15 inches apart in a bed, but if horse cultivation is to be practiced, it should be sown in rows 3 $\frac{1}{2}$ feet apart. The seed should not be covered more than $\frac{1}{2}$ to $\frac{3}{4}$ of an inch deep. A pound contains about 28,000 seed and is sufficient for a row 900 feet long. The seedlings will be large enough to set out in their permanent sites the following spring or fall.

The method of management adopted

in a plantation of Locust largely determines its usefulness and value. Thick planting should be the rule in order to force the tree into straight, tall growth. In most cases 4 by 4 or 3 by 6 feet are suitable distances.

If the trees are planted in a solid block and surrounded by a few closely planted rows of other trees, there will be no difficulty from sprouting. Sprouts do not grow where the ground is shaded.

Every effort should be used to keep the trees in thrifty growth for the first 12 or 15 years. Borers seldom injure the trees that are growing rapidly, but confine their attacks to those of less vigor. If damage from borers is apprehended, the trees should be cut for use before they cease rapid growth. Sprouts from the stumps will at once renew the growth. By this method of cutting, a crop of posts can be produced every 10 or 12 years.

The best success usually results when the Locust is grown mixed with some other heavy-foliaged tree, as its own shade is not dense enough to keep out grass and weeds. As accompanying or nurse trees, the Osage Orange, Russian Mulberry, Hardy Catalpa, and White Elm do well, as they cast heavy shade and do not grow rapidly enough to overtop the Locust. The associate tree need not occupy more than one-third of the spaces in the mixture. The Locust is a good tree to plant with the Black Walnut, where the latter is desired as the permanent stand. The two may be planted alternately in the rows. Within 15 years the Locust may be cut for use as fence posts, leaving the Black Walnut for the final stand.

RECENT FOREST FIRES.

THE CONTINUANCE OF SPRING FIRES CAUSES IMMENSE DAMAGE IN A NUMBER OF STATES.

THE most severe forest fires of May have extended from Maine and Canada on the northeast, along the region bordering on the St. Lawrence and the Great Lakes, to the forests of Min-

nesota west of Lake Superior. According to press reports received by FORESTRY AND IRRIGATION, not one of the New England States was exempt from fires during the past month, and at the

time of going to press the most serious fires in New York and Pennsylvania were still burning.

Maine.—May 5 a forest fire endangered the town of Kennebunk, but was fought off successfully by a force of railroad men and citizens. It burned over an area of 1,000 acres and destroyed property valued at \$13,000. The flames started from sparks from a locomotive on the Boston and Maine Railroad. On the same date large tracts in the neighborhood of Bemis and Houghton were burned over and the Brimstone camps of the Berlin Lumber Company were destroyed. The mill of the International Lumber Company at Bemis was threatened, but a large force of men, gathered from nearby camps, got the fire under control. The loss here was mainly in the standing timber, and was started from brush fires. A fire at the same time in the neighborhood of Ellsworth and Lamoine threatened the latter town, which was saved only by hard work after several houses and barns on the outskirts had been consumed. Lumber camps were destroyed. This fire again broke out with increased vigor a week later, after it had been supposedly checked. On May 12 severe fires were raging in Washington, Hancock, and Penobscot counties, burning over vast areas and threatening the mills of the Great Northern Paper Company at Milinocket. The fire was successfully fought at this point by a force of 300 men. Greenville, just south of Moosehead Lake, was threatened by a fire started from burning brush. These Maine fires were in no sense different parts of the same burned area, but were distributed through four widely separated parts of the state.

New Hampshire.—A fire which might have had some relation to that which threatened Bemis, Me., near the Rangeley Lakes, was reported as burning in New Hampshire on May 2, denuding the mountains and sweeping thousands of acres near the northern border of the state. May 15 rain checked forest fires along the Connecticut River between Stratford and Lancaster. The northern parts of Vermont and New Hampshire have not been so thoroughly fire-swept

in years, the loss aggregating at least \$700,000.

Massachusetts.—Hundreds of acres in Worcester county were swept by forest fires about May 1. The owners of woodlots have been the principal sufferers, and the fires are supposed to have originated in the careless burning of brush. On May 14 serious fires were reported from the western portion of the Cape Cod peninsula in the neighborhood of Sandwich, and threatening that village. A strong southerly wind carried the flames from a portion of the woods which were burned over a few years ago to the more thickly grown tracts, and spread so rapidly that the fire wardens were unable to cope with it. A magnificent summer home on the shore of Spectacle Lake was burned, and deer, fleeing before the flames, sought refuge in the lake.

Rhode Island.—Heavy losses have been reported from this state and from Connecticut, the light rainfall during April making the ground and underbrush very dry. No details are obtainable, but the principal losers are owners of woodlands.

New York.—The most destructive fire which has visited the Adirondack region in years burned from April 30 to the middle of May, and did great damage to standing timber and to buildings. Driven by a high wind, the forests were devastated in the neighborhood of Lake Placid and Loon Lake, and for more than 100 miles along the lines of the Delaware and Hudson and New York Central railways. The woods were dry as tinder, and it is supposed that the flames started from the sparks from a locomotive. Thousands of cords of pulp wood and hundreds of cords of charcoal were destroyed when the fire first started. Dwellings were burned at Plumadore, a summer cottage was destroyed at Lake Placid, and the big hotels there seriously threatened. On May 5, after a slight check, there was a fresh outbreak on the northern slopes of the Adirondacks, and near Everton a boy was burned to death. The paper-making village of Newton Falls was saved by fierce, persistent fighting, in which the fire companies of nearby villages lent

their aid. So great was the danger that all of the women and children were taken away by train. Many families in this region were rendered homeless, and some escaped only when driven into the Oswegatchie River. Rain and heavy snow checked the fire in the neighborhood of Cranberry Lake.

On May 11 these fires, which were believed to have been effectually extinguished, broke out again with increased fury, and, driven by high winds, threatened Benson Mines, which had suffered some loss in the previous fires. The damage from this series of fires cannot be estimated, and details of the destruction were meager in all cases, as the telegraph and telephone lines were destroyed. Thousands of acres are known to have been burned over, and in many places the country is cleared of all vegetation. May 2 a fire broke out in the mountains around the military reservation at West Point, and the Yale forest students who are working on the government tracts tried to check it. The entire battalion of cadets was called out to fight the fire and succeeded in stopping the advance of the flames toward the Military Academy's buildings. Considerable damage was done to timber on government property.

Forest fires on two sides of Port Jervis, Orange county, May 2 threatened the town with destruction, especially as the men were all away. The women of the town organized a bucket brigade and saved the village property adjacent to the fire. Several thousand acres on the estate of George Chapin, near Lebanon Lake, Sullivan county, were burned over at the same time, deer, antelope, and other game being destroyed. This fire is said to have been of incendiary origin, and Mr. Chapin offered a reward of \$2,000 for the apprehension of the person who started it. It is known also that the extensive Adirondack fires were in some instances deliberately and maliciously started, and that as soon as one was extinguished another was kindled. In one instance a twelve-year-old boy set fire to the woods in several places, even after he had been apprehended starting one fire which almost resulted

in loss of life. May 20 the Adirondack fires were gaining headway so rapidly that it was predicted nothing short of a deluge of rain could prevent the absolute laying waste to three counties, with unprecedented losses. May 25 the fires were said to be under control.

Pennsylvania.—From May 10 to 14 fires burned over wide areas in Pennsylvania, devastating the country around Altoona, between that city and Johnstown, and west of the latter place in the Laurel and Chestnut ridges. For sixty hours lumbermen and mountaineers fought the flames without a rest and managed to save the villages of Dunlo, Vintondale, and Twin Rocks, which were in imminent danger. Houses were destroyed in Westmoreland county, and timbered tracts in Cambria and Somerset counties were burned over, involving the destruction of much standing and sawed timber. Near Bradford, on the northern boundary of the state, fires again broke out on May 13, after \$1,000,000 worth of property had been destroyed by fires on April 30. Here the greatest trouble was to divert the flames from oil wells. Near Ormsby fifty oil rigs were burned and a family is missing. It is feared that the members perished.

Maryland.—Fires around Cumberland, May 2, destroyed several square miles of standing timber, the loss from this source alone in one small area amounting to \$20,000. Many small buildings, much fencing, lumber, ties, and cordwood were also destroyed.

Virginia.—A mountain forest fire in the southwestern part of Frederick county, near Winchester, burned May 1 and 2, destroying 4,000 acres of valuable timber and 20,000 panels of fence. Two large residences with their barns and outbuildings were burned, and the losses from these amounted to many thousands of dollars.

Michigan.—Fires were raging all through the northern part of the Michigan peninsula from April 27 to May 1. These were reported in the last issue of FORESTRY AND IRRIGATION, though the extent of the loss was not then known. Since those reports additional details have shown that many buildings

were destroyed, and that the fires were general through a wider region than at first supposed, as there is hardly a town of that part of the state which did not report serious destruction in its immediate vicinity.

Wisconsin.—The fires in the neighborhood of Ashland, which started April 27, were reported in our last issue. The little town of Kimball was destroyed, with considerable lumber, some of it on cars. Fires of some magnitude spread through the woods along Lake Superior between the Michigan and Minnesota boundaries, but were fortunately arrested by a heavy downpour of rain. From Appleton, under date of May 6, there have been reports of earlier and more serious spring fires than usual, most of them being confined to hardwoods; pulp and pine wood suffered but little. In a large part of the territory where the fires burned, the snow was still on the ground, and this fact aided in quelling the flames more rapidly than is generally the case.

Minnesota.—Fire ran through about 9,000,000 feet of down timber on the

Cass Lake Indian Reservation on May 1. This timber was blown down last fall, and it was recommended at that time that the pine be cut and the money go into the Chippewa Indian fund; but the work was not done last fall, though it was stated that it was to have been started within a week of the date when the fire started. Besides lying in the snow, the lumber suffered greatly from this fire, and thousands of dollars have been lost to the Indians.

Canada.—Fires on both sides of the St. Lawrence River, in Quebec and Ontario provinces, were reported as burning from April 30 to May 7, destroying many thousands of cords of pulpwood, much standing timber, and a few small settlements. The Laurentian region, north of Montreal, suffered severely, people abandoning farms and animals in their efforts to escape. The little village of Morrison was wiped out and a Canadian Pacific train only got through by going at full speed, and even then the cars were scorched. Part of the country north of Lake Superior was also in flames at that time.

RECENT PUBLICATIONS.

Any of these books will be sent by the publishers of "Forestry and Irrigation," postpaid, to any address on receipt of the published price, with postage added when the price is marked "net."

Grundriss der Wildbachverbauung. Volume II. By FERDINAND WANG. Published by S. Hirzel, Leipzig. Price, 16 marks.

The wars and other political disturbances of the 17th and 18th centuries wrought great havoc in the forests in the mountains of southern Europe. The population became very impoverished and a wholesale destruction of the forests went on from year to year until great regions in the Pyrenees, the French, Austrian, and German Alps, and the mountains of Italy and of Bohemia became the scenes of annual floods and terrible erosions, landslides, and avalanches. Early in the 19th century the situation became so serious that the prevention of such disasters became a national policy. Millions were spent in the correction of streams and reforestation. In many places the work was almost in vain, but on the whole patient steady labor was, at a great price, rewarded with success. At present the systems applied have become scientific enough to allow of incorporation into a general text-book.

The work of Ferdinand Wang in two volumes is such a hand-book, and is a com-

pilation of all the experience gained by engineers and foresters in Europe during the last century. The first volume deals with the theoretical part of the discussion, the effect of forests in the regulation of drainage and the consequent results of deforestation in mountainous districts. Unfortunately this volume is not available at present. The second volume is entirely technical and deals with the methods of correcting wild torrents in the mountains, of preventing avalanches and rolling stones by protection forests, and of erosions by correcting the water flow and reforestation. These subjects are treated in detail, and the text is elucidated by a great number of plates and figures. The section on protection forests and on erosions is particularly interesting. Many instructive pictures show the various stages of the process of founding protection forests and preventing serious erosions. The work seems to have been done with great speed, and, as the pictures show, with complete success.

A very large section of the book is given up to a detailed description of tree planting on high mountains and eroded areas. A great

number of diagrams are used and the various methods given at considerable length. The book closes with a historical sketch of the work in each European country, and in Japan, thus finishing an exhaustive treatise on all the phases of European water regulation and reforestation in mountainous territory.

Although it suggests far too elaborate methods for our conditions, the two volumes should be of great value in the solving of similar problems in America. This particularly applies to the management of protection forests and the correction of erosion. Some of the pictures in these subjects show exactly the same conditions as those in America, and adaptations of the preventive measures there suggested would undoubtedly be of practical use.

W. F. HUBBARD.

Handbook of Climatology. By Dr. JULIUS HANN, Professor of Cosmical Physics in the University of Vienna and editor *Meteorologische Zeitschrift*. Translated, with the author's permission, from the second revised and enlarged German edition, with additional references and notes by R. De C. Ward, Assistant Professor of Climatology, Harvard University. The Macmillan Company, New York. 1903. Pp. 437. Price, \$3.00 net.

Professor Ward gives us not merely a translation of this admirable work, but a volume that contains many additions and improvements, with a view of adapting it to American needs.

The work is especially rich in references. Nearly every page contains a number of footnotes suggesting where the student may go for further information. Chapter XI is devoted to the "Influence of Forests on Climate." While the author does not treat the subject exhaustively, he presents an excellent summary of the present state of knowledge on the subject.

The book is timely and well in advance of present text-books on climatology.

Wood: A Manual of the Natural History and Industrial Applications of the Timbers of Commerce. By G. S. BOULGER, F. L. S., F. G. S., F. R. H. S., A. S. I., Professor of Botany and Lecturer on Forestry in the City of London College, and formerly in the Royal Agricultural College. Pp. 359. Illustrated. London: Edward Arnold. New York: Longmans, Green & Co., 1902. Price, \$2.60.

The author does not claim perfect accuracy or completeness for this work; it is rather a compilation of the most important facts relating to the subject and a collection of statistics gathered from various parts of the world. Originality is neither expected nor desirable.

In part I the origin, structure, development, classification, defects, durability, and uses of wood are discussed. The classification is merely a general one, and is based both on general appearance and microscopic structure, and the chapter on defects is an exceedingly

brief one, of no great practical value to American students. The uses of wood are described in twenty pages. In the chapter on supplies of wood the forest area of all the principal countries of the world is given, with brief mention of the principal timber trees. References to North America are based principally on the reports of Dr. B. E. Fernow (1886) and Prof. Charles S. Sargent (1882). The author draws the conclusions that in spite of substitutes the use of wood increases with advancing population and civilization; that there is still in many lands much waste and but little thought for the future, and that although a dearth of timber may be far distant a considerable enhancement in the price of the commoner kinds may be expected.

Part II, "Woods of Commerce, Their Sources, Characters, and Uses," is by far the most valuable part of the book. The description of each species is necessarily very brief and incomplete, but nevertheless a collection of such data for the whole world has considerable value and is of practical use for handy reference.

Home Floriculture. By EBEN E. REXFORD. Pp. 300. Fully illustrated by drawings and Photographs. Published by the Orange Judd Company, New York and Chicago. Price \$1.00.

This book is a familiar guide to the treatment of ornamental and flowering plants for the house and garden. Mr. Rexford has long been an authority on floriculture for the amateur, using that word in its true original sense, one who does a thing for the love of it. He frankly says that one who does not love flowers and who does not have a certain "knack" with them cannot succeed. But for one who will give care and thought to the window garden or an outdoor one, this book will prove helpful and instructive. There are special chapters on various phases of home floriculture, and full descriptions of the most valuable plants, with attention to their needs, treatment, and the vanquishing of their enemies.

Coupled with the painstaking details of the text, so that no one need go wrong if directions are heeded, there is also a charming literary style, often wanting in works of this nature, and an enthusiasm for the subject, which puts the reader in full sympathy with the author and strikes a bond of friendship at once. While it is so written that it may be read through with pleasure at one time, its value increases from its qualities as a ready reference on any question of home gardening which may arise, a carefully prepared and exhaustive index adding much to its worth. It is the best contribution which has been made to the literature for the amateur florist for many years.

Our Northern Shrubs. By HARRIET L. KEELER. Pp. 521. Illustrated by 205 full-page halftones from photos and 35 pen-and-ink drawings. Chas. Scribner's Sons, New York. Price, \$2 net (postage, 16 cents).

"Our Northern Shrubs" is planned upon the same lines as the author's deservedly pop-

ular volume, "Our Native Trees." It describes the shrubs which are native to the region extending from the Atlantic Ocean to the Mississippi River and from Canada to the northern boundaries of our Southern States. In addition, many foreign shrubs that have been grown here for years are noted.

The arrangement of shrubs is by families, each member being given both a popular and a scientific description. Amateur botanists and nature-lovers will find it a handy guide for the identification of our many shrubs, and through it will be able to learn accurately their habits and characteristics.

The arrangement of the text in this volume is exceptionally good. There is at the beginning a division by genera and species of all the shrubs described. Following is a detailed description of each species, in most cases accompanied by an appropriate illustration. At the end of the volume a glossary of botanical terms and an index of Latin names add much to its value.

In "Our Northern Shrubs" Miss Keeler has written a book that will likely do much to popularize the study of shrubs, just as in her earlier volume, "Our Native Trees," she aroused increased interest in the trees of the United States.

Recent issues of the general magazines contain articles of interest on forestry and kindred subjects. The charm of out-of-doors is more and more finding a place in the civilization of the present day, and the current literature gives abundant expression of that charm. *Scribner's* for June has an entertaining article, illustrated by wonderful photographs, entitled "A New Playground in the New World." This describes the beauties of the Selkirks or Canadian Rockies, in the region around Banff and Mt. Stephen. Another keenly appreciative article in the same magazine is "The Lover of Trees in Italy." *The World's Work's* June issue is, paradoxically, devoted to "the world at play," and practically the entire table of contents is given up to vacations, fishing, camping, hunting, boating, mountaineering, etc. *Outing* takes one out of doors, and *Country Life*, in its June issue, by means of almost perfect illustrations, gives enchanting pictures of rural life.

PUBLISHER'S NOTES.

The advertisement of Camp Algonquin, a summer camp for boys, will be found on another page of FORESTRY AND IRRIGATION. This camp is under the able direction of Mr. Edwin De Merritte, who has made a special study of the needs of boys during a summer outing, and whose experience dates back to 1886, with the founding of the present camp on Asquam Lake, Holderness, N. H. Here there is opportunity for all sorts of sports under careful supervision, and every provision is made for hearty fun and recreation. Although the wild surroundings of the camp have been in no way sacrificed, the buildings are commodious and comfortable, so that

"roughing" has all of its charms and none of its inconveniences. Mr. De Merritte, as principal of the De Merritte School of Boston, has had much success in the training of boys, and if it is desirable, arrangements can be made for tuition during the summer, although it is understood that the object of the camp is

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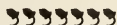
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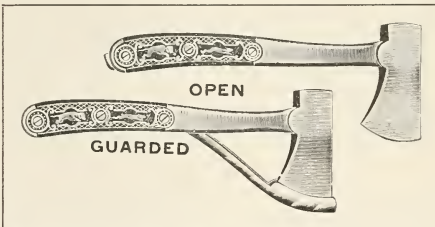
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X—No. 7

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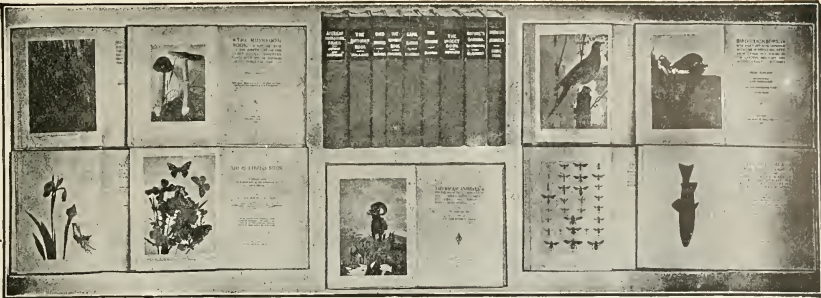
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2. The preservation and development of our national resources by the construction of storage reservoirs by the Federal Government for flood protection, and to save for use in aid of navigation and irrigation the flood waters which now run to waste and cause overflow and destruction.
3. The construction by the Federal Government of storage reservoirs and irrigation works wherever necessary to furnish water for the reclamation and settlement of the arid public lands.
4. The preservation of the forests and reforestation of denuded forest areas as sources of water supply, the conservation of existing supplies by approved methods of irrigation and distribution, and the increase of the water resources of the arid region by the investigation and development of underground supplies.
5. The adoption of a harmonious system of irrigation laws in all the arid and semi-arid states and territories under which the right to the use of water for irrigation shall vest in the user and become appurtenant to the land irrigated, and beneficial use be the basis and the measure and limit of the right.
6. The holding of an annual Irrigation Congress, and the dissemination by public meetings and through the press of information regarding irrigation, and the reclamation and settlement of the arid public domain, and the possibilities of better agriculture through irrigation and intensive farming, and the need for agricultural education and training, and the creation of rural homes as national safeguards, and the encouragement of rural settlement as a remedy for the social and political evils threatened by the congestion of population in large cities.

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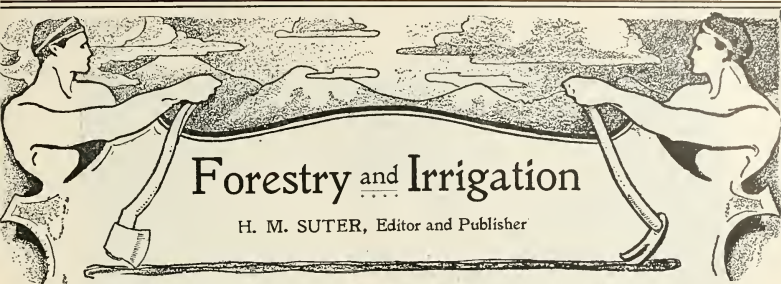
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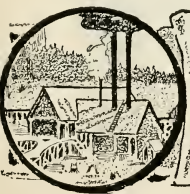
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Courtesy Geological Survey

FALLS ON UPPER CATAWBA RIVER IN GREAT SMOKY MOUNTAINS, NORTH CAROLINA.
(SEE PAGE 332.)

Forestry and Irrigation.

VOL. IX.

JULY, 1903.

No. 7.

NEWS AND NOTES.

Summer Meeting of American Forestry Association.

Upon the invitation of the governor of the State of Minnesota and the city of Minneapolis, the American Forestry Association will hold its summer meeting at Minneapolis on Tuesday and Wednesday, August 25 and 26. The place of meeting will be the Commercial Club of that city. The morning session on Tuesday will be devoted to business. Tuesday afternoon and Wednesday morning and afternoon will be given up to the program of the meeting. On Tuesday evening the Commercial Club will entertain the visitors. On Wednesday evening a mass meeting will be held and short addresses delivered by a number of men prominent in the forest movement.

This promises to be one of the most successful meetings ever held by the association. The recent creation of the Minnesota Forest Reserve and the active work to be carried out on it under the direction of the Bureau of Forestry commands not only local but national attention. The Minnesota Reserve is a day's ride from Minneapolis, and will well repay a visit, though there will be no official excursion by the association. On this reserve exists the largest solid body of White and Norway Pine east of the Rockies, and it is easily accessible by rail and boat. The program of the meeting will consider the work already undertaken by the Bureau of Forestry on the Minnesota Reserve and the future policy under the bureau. The effect of the reserve upon the state and locality will be discussed in its relation to the lumber industry, to agriculture, and to public health and recreation. Other questions of national im-

portance, such as the general future of the forest reserves, taxes in their relation to private forestry, state forestry movements, and forest fires *versus* reproduction will also be discussed. These and other questions of importance should assure much interest and a good attendance.



College of Forestry to be Discontinued.

On June 17, at its annual spring meeting, the Board of Trustees of Cornell University decided to suspend instruction in the New York State College of Forestry. This action was brought about by Governor Odell's veto of the annual state appropriation of \$10,000 for the maintenance of the College of Forestry, as noted in the June number of FORESTRY AND IRRIGATION. This suspension, the trustees add, will hold until the state sees fit to provide means for again taking up the work. Meanwhile all appointments to the instruction force, including that of the director, are vacated.

The act of the governor in vetoing the appropriation came as a direct result of the report of the legislative committee appointed to investigate forest conditions in the Adirondacks, and while some of the points of criticism of operations on the college tract embodied in that report were well taken, it is regrettable that their consideration should have had the drastic effect of closing the forest school, which was annually preparing a number of trained foresters at a time when the need for them is daily growing more apparent. It is also to be regretted that the trustees could not see their way to continue the

work of the school on their own responsibility until they could put it on such a basis as would again commend it to the state authorities and to again receive state aid.

**Western
Irrigation
Interests
the East.**

The National Irrigation Association has begun a campaign, already proving successful, of interesting business men of eastern trade centers, and particularly of New York, in the reclamation work that has done so much for the advancement of the West. This association, through its southern California branch, has opened an office in New York city, with Mr. C. B. Boothe, of Los Angeles, an ardent worker in the interests of irrigation, in charge. Mr. Boothe is already in close touch with the Merchants' Association, one of the most important business men's organizations of the metropolis, and the members have appointed a special committee on irrigation to look into the matter and report at the first fall meeting. Mr. Boothe is at present in Los Angeles, where he has just gone to spend some time in further enlarging the scope and membership of the Southern California Section of the National Irrigation Association. This section has long had a large and influential membership among the solid business men of the southern part of the state, all of whom are deeply interested in the advantages to accrue from an increase in the possibilities of irrigation.

**Irrigation
Works to be
Built.**

Attention is called to the proposals being asked for by the Interior Department for the construction of irrigation canals, ditches, and reservoirs, and the opportunity they afford to engineers and contractors. Thus in an indirect way industry is being stimulated by the government works under construction, and money will be taken into the country to be benefited by the works. An advertisement of proposals for irrigation works appears among the pages devoted to such matter in this magazine.

The particular irrigation system contemplated in this case will involve the construction of a dam in the Truckee River, Nevada, to store water for diverting the water through 15 miles of canals into the Carson Basin. It is proposed to take 1,400 cubic feet of water per second from the river and irrigate with it 200,000 acres of land. Each settler will probably be permitted to take up 80 acres, to be paid for in an amount equal to the cost of the works pro rata, not to exceed \$15 per acre for land and water, and it is expected that payments of \$1 per acre per year will be permitted. This is one of the five great projects undertaken by the provisions of the national irrigation act.

**Forestry at
Harvard.**

Harvard University, through the Lawrence Scientific School, has established a course in forestry, instruction to begin next fall under the direction of Mr. R. T. Fisher, who is now in the employ of the Bureau of Forestry. Mr. Fisher has had considerable experience in the forest problems of this country, being the author or collaborator on several bulletins published by the bureau. He is particularly fitted for a New England school, having given much attention to woodlots and forest conditions in that section of the country. The requirements for admission to the course are the same as those for any other program in the Lawrence Scientific School, and catalogues and circulars giving detailed and definite information may be obtained from the secretary, J. L. Love, 16 University Hall, Cambridge, Massachusetts.

**To Irrigate
Ancient
Babylon and
Chaldea.**

Sir William Willcocks, late Director General of Reservoirs, Egypt, and the designer of the great Assuân dam, has turned his attention to the project of reclaiming the wonderfully fertile valleys of the Tigris and Euphrates rivers, and proposes to make use of the canals and reservoirs which remain from an ancient civilization. This region was once

known as the richest in the world, and its cities, Nineveh and Babylon, were the centers of a magnificent civilization, built upon the great agricultural resources of the valleys in which they were situated. It is pointed out that although desolation now reigns over a large part of the area under consideration, yet the land has steadily been gaining in fertility from the annual overflows of the rivers and from the fact that no extensive agricultural operations have taken anything from the soil. With the Bagdad Railway completed to form a method of transportation, and a rebuilding of old irrigation works, the country could again take its place at the head of the agricultural regions of the world, for no other place is more favored for the production of cereal crops. Cane, cotton, and tobacco will grow in tropic abundance, and it is confidently expected that capital can be interested from the financial centers of Europe. Labor can be had in abundance and at a low wage from India.

In this connection it may be noted that the Carnegie Institute has taken steps looking toward an investigation of the causes of present aridity in that part of Syria which was the biblical Palestine, and was at one time marvelously fertile. Various reasons have been assigned for its present barren conditions, among them being the increase of alkali and the injurious effects which have followed complete deforestation.

For an Appalachian Forest Reserve. We present in this issue an address by the Hon. James Wilson, Secretary of Agriculture, on the advantages to accrue from the establishment of a national forest reserve in the southern Appalachians. The discussion of this subject brings up no new matter, as FORESTRY AND IRRIGATION has remarked upon it frequently in the past, and will continue to do so until the reserve stands as an assured fact. A bill to establish it has been twice before Congress and has been favored by two Presidents—McKinley and Roosevelt. The latter especially has been strongly

in favor of it, and sent a special message concerning it to Congress at the last session. In June, 1902, a bill providing for the purchase of lands for the proposed reserve was passed by the United States Senate, but not in time to be considered by the House before adjournment. At the next session the bill was not allowed to come to a vote in the House, which was highly regrettable, since the Senate had passed it almost unanimously, and it was known that a majority of the Representatives were in favor of it.

The reasons for such a reserve are ably set forth in the address printed elsewhere in the Magazine, but it is worth while to call renewed attention to the value of preserving the forested areas of the mountains to prevent the rapid run-off of the spring rains and the annual floods, which destroy so much property along the Atlantic Coast rivers from Virginia southward. It is an assured fact that the bill will again come up in Congress, and the necessity of action is urged on every community to instruct its Congressional delegation to work for an Appalachian reserve; and it is particularly incumbent upon the people of the Southern Atlantic States to see that their Representatives and Senators present a solid front in this matter.

Water Users to Buy Plant. The Bear Valley Water Company, which supplies water to orange orchardists in the neighborhood of Redlands, California, is considering a proposition by which the users of the water may buy out the company, which at present is formed of men who have little direct interest in the irrigation except the collection of water rents of the orchardists. The Bear Valley Company, by the terms of an agreement now pending, will sell its reservoir in Bear Valley and its dam site in the "narrow" of the Santa Ana Canyon, together with its entire system of distribution, for \$625,000. The water users who form the contemplated new company will issue bonds to the amount of \$900,000, to mature in 50 years and bearing in-

terest at 5 per cent. Sufficient capital has already been interested to insure subscription for all of the stock. After paying the old company for its plant, this will leave enough for the construction of a dam at "the narrows" with a storage capacity sufficient to furnish 600 inches during the irrigating season. In addition to this, a new 90-foot dam can be built in Bear Valley, increasing the storage capacity there fourfold. Stock in the new company will be issued to all users who have acquired rights, and in proportion to the amount of water used. They will pay a fixed charge per inch, sufficient to pay interest on the bonds, maintenance of plant, and other expenses, estimated at 20 cents per inch. If this is carried through, the Bear Valley irrigation system, the largest in California, will be removed from the interests of capitalists and placed in the hands of those to whom the water is a direct rather than an indirect benefit. The analogy between this plan and that adopted by the National Government in its irrigation projects is apparent.

The Passing of the Three Sisters.

The accompanying photographs show various stages in the lumbering of three Redwood trees reputed to be the biggest lumbered in California at one time. They grew close together on less than one-half an acre of ground, and prior to their felling were known as the "Three Sisters." Although much of the lumber is lost in the crashing fall of such monster trees, the three made more than 350,000 feet of good lumber, the largest making 150,000 feet. In the accompanying photographs, number 1 shows three men standing in the undercut of one of the trees, which was 19 feet 4 inches in diameter. Number 2 shows a smaller tree in the act of falling. Some idea of its size may be gained from a comparison with the size of the house near its base. Number 3 is the butt of a tree 19 feet 4 inches in diameter, the ladder and men on it giving an impression of its size. The stump shown in number 4 is that of the largest of the Sisters, and measured 24 feet 6 inches across.

The falling tree shown in the second photograph is not one of the Three Sisters, but is interpolated in this series as showing graphically the operation of felling the Redwoods, from the undercut to the bare stump. While it is to be regretted, from some points of view, that the Redwoods are being cut so rapidly, it has been demonstrated that with care to prevent the destruction of young growth and a sufficient protection from fire, the forests will renew themselves through sprouts, and cut-over lands can be profitably lumbered in 45 years. Mr. E. S. Mainwaring, Forest Ranger in the Sierra Forest Reserve, to whom we are indebted for the accompanying pictures, suggests the gathering of Redwood seeds for distribution over the United States, as there are few sections with plenty of moisture and good soil where the Redwood will not grow. It has been tried in a number of localities and with some success as an ornamental or shade tree, and its growth is rapid.

Irrigation Wells in Australia.

Australia, with an area nearly equal to that of the United States proper, has a large arid interior. In fact, Andrew Carnegie, in a recent speech, referred to this great island as a mere shell of civilization around an empty interior. Nevertheless, much is being done toward the reclamation of parts of this arid area, and some irrigation is being done with deep artesian wells. One of these extends to a depth of 5,040 feet. The largest flow obtained was 6,000,000 gallons daily. The artesian area is said to be estimated at 264,600 square miles, or approximately one-tenth of the total area of the island.

White Pine in New England.

In most of the New England States there are large areas of waste land coming up in White Pine, which, if protected and encouraged, will soon become valuable timber. A study of these areas in southeast Maine, southern New Hampshire, parts of Vermont, the north tier of counties in Massachusetts and part of Plymouth county, and



STEPS IN THE FELLING OF A CALIFORNIA REDWOOD: 1. THE UNDERCUT. 2. IN THE ACT OF FALLING. 3. BUTT OF LOG, PEELED OF ITS BARK. 4. THE STUMP.

some areas in Rhode Island and Connecticut will be made this summer by the Bureau of Forestry. The work will begin near Mt. Monadnock. This will be a continuation of the work begun last year.

Personnel Changes in Bureau of Forestry.

Dr. John Gifford, formerly assistant professor in the New York State College of Forestry at Cornell University, will shortly leave this country in

order to investigate the new Luquillo Forest Reserve in the eastern part of the Island of Porto Rico. This reserve was established only last January, and Dr. Gifford's investigation will have an important bearing on its management.

Dr. Hermann von Schrenk has been appointed chief of the Division of Forest Products, the appointment to take effect July 1. In his new position he will have charge of the work in dendro-chemistry, timber tests, and wood preservation, which includes the experiments in railroad work for the preservation of

ties, tests of bridge timbers, and other wood material. He was formerly with the Bureau of Plant Industry of the Department of Agriculture.

Public Funds for Irrigation. Commissioner Richards, of the General Land Office, has prepared a statement giving the exact amount of the fund set apart for the reclamation of arid lands under the irrigation act of June 17, 1902.

It shows a total of \$7,530,338 for the years 1901 and 1902, distributed among the states and territories as follows:

Arizona, \$81,773; California, \$503,270; Colorado, \$628,995; Idaho, \$507,448; Kansas, \$49,135; Montana, \$772,377; Nebraska, \$235,194; Nevada, \$23,414; New Mexico, \$147,237; North Dakota, \$1,227,496; Oklahoma, \$1,008,795; Oregon, \$910,961; South Dakota, \$307,362; Utah, \$146,824; Washington, \$794,088; Wyoming, \$385,762. The total for 1901 was \$3,144,861, and for 1902 \$4,565,516.

The returns on the sale of public lands for the first three quarters of the present fiscal year indicate that the receipts will be about equal to the two preceding years, so that by the first of July the irrigation fund in the treasury will be about \$15,000,000.

New Forest Reserves. Several new forest reserves have recently been created by Presidential proclamation. Two of these new reserves, the Logan and Manti, are located in Utah. The Logan Forest Reserve is situated near the northern boundary of the state, within Cache and Rich counties, and is 182,080 acres in extent. The Manti Reserve, covering an area of 584,640 acres, is in Sanpete, Sevier, Emery, and Carbon counties, in central Utah.

The Lewis and Clarke Forest Reserve and the Flathead Reserve in Montana, along with new additions to both, have been combined and will hereafter be known by the name of the former. The Lewis and Clarke Forest Reserve is now the second largest in the United States, containing an area of 4,670,720 acres,

and is located in the northwestern part of Montana, in Flathead, Teton, Lewis and Clarke, and Missoula counties.

Steps Taken to Secure Reservoir. A mass meeting was held in the city hall plaza of Phoenix, Ariz., June 7, at which it was

announced that 10,000 acres had been subscribed to the Salt River Valley Water User's Association, the central organization with which the federal government will deal in building a storage reservoir on the Tonto site, as told in the May number of FORESTRY AND IRRIGATION. This amount will secure the construction of the reservoir, and other acreages are being signed as fast as clerks can make out the papers. It is said that many old farmers with an inborn fear of the word "corporation" who have hitherto withheld their signatures are signing as quickly as possible. Mr. George H. Maxwell delivered a strong address in favor of the national irrigation movement.

To Conserve the Water Supply. The Pike's Peak Forest Reserve of Colorado will receive this summer the special attention of the

Bureau of Forestry. A party of seven men will make a study of that part of the reserve lying south of the cogwheel railroad up Pike's Peak, in order to determine whether the great damage done the land by fire may be overcome, and what may be done to improve the drainage conditions. This part of the reserve is of the greatest importance to Colorado Springs and Pueblo, which derive their water supply from lakes and streams within it. All of the water for Pueblo comes from the Seven Lakes region. Nearly the whole tract has been burned over, and the destruction of timbers has resulted in a very great reduction in the water supply. The purpose of the Bureau in making this study is chiefly to determine what may be done to improve the drainage conditions of the reserve. Colorado Springs and Pueblo are growing rapidly and require every year a larger amount of water. The supply, scanty enough now,

is likely soon to prove inadequate unless the forests, which conserve the water, are restored and protected. A study will be made of the burned areas in order to learn what trees are coming up on them and how such reproduction may be hastened. It may be necessary to plant trees on much of the land; if so, tree nurseries will have to be established and planting plans made. But the principal part of the work will be a scheme of fire protection. It is absolutely necessary, if anything is to be done for the reserve, that fires should be kept out, and only recently have conditions become so favorable that fire protection is practicable. It will be useless to plant, useless to improve the natural reproduction, unless the provisions for keeping the fires under control are made effective. There is promise of success in this task. The importance of the water supply to the adjacent cities guarantees public interest in the protection and improvement of the reserve, the country is accessible, mines are numerous, and timber from the reserve is easily marketed.

Studies of Commercial Trees.

A study of the Balsam will be carried on this summer in the Adirondacks and in Maine.

Some work has already been done in the Adirondacks, and the object of the coming season's work will be to conclude the study, the results of which will probably be published early next spring. The main purposes of the investigation of Balsam are to determine its suitability for use as paper pulp, the quantity which is now standing, and the results that can be expected in the production of a second crop under conservative methods of lumbering. A study of the Poplar in Maine has come about through the increased use of that wood as paper pulp material. Its general scope is similar to that of the Balsam investigation. The work on southern hardwoods is to continue the study which has already been carried on for two field seasons. Its purpose is to determine the stand, the uses and possible uses, and the best methods of management for the

following important commercial hardwoods of the south: Tulip tree, White Oak, Post Oak, Chestnut Oak, Basswood, Chestnut, the Hickories, and White Ash.

Tree Planting. A number of states are planting trees on waste lands and forming forest reserves. In some cases the work is one of reforestation, and in others it is proposed to make trees grow in regions like the sand hills of Nebraska, which are unfit for agriculture and may be made useful as forested areas.

Indiana.—The State has purchased 2,000 acres of land in Clark county for a forest reserve. Of this tract 1,500 acres are covered with young second-growth timber of varying quality, and 500 acres are tillable. The State Forest Board will attempt to prove the profit in growing native hardwoods, and will plant Oak, Walnut, Ash, Hickory, and other suitable species and give them careful cultivation. The entire tract will be placed in timber.

Kansas.—Secretary Hitchcock, of the Interior Department, has ordered the withdrawal of 94,732 acres of land lying just south of the Arkansas River, in Kearney, Finney, Grant, and Haskell counties, for a large experiment in forest planting similar to that made on the Nebraska forest reserves. The land will be set aside as a regular forest reserve in the usual manner, or President Roosevelt will be asked to set it aside for the direct purpose of experimental tree planting. The conditions are similar to those in Nebraska, the region being made up of wind-formed sand hills, now covered with bunch grass. There is no surface drainage and no possibility of cultivation, since the sand begins to drift as soon as it is tilled. Planting will be begun within the next year.

California.—The Bureau of Forestry has planted many acres of burned-over lands in the San Gabriel and San Bernardino Mountains in southern California during the past winter. Heavy rains helped the planters, and the seeds of the November sowing have already

germinated. This work has had the interest and coöperation of the country which it affects. The Los Angeles County Water and Forest Association contributed \$266, and the board of trade of Pasadena \$600, toward the expense of planting. The country is alarmed at a decreasing water supply, and the conserving influence of trees on the burned slopes is a vital matter. A squad of 10 to 15 men under Mr. T. P. Lukens, of Pasadena, has been planting seeds for three months. Knobcone Pine has been planted in the dry, burned spots; Incense Cedar and Sugar Pine in the moister, cooler places, and Western Yellow Pine in all situations. The work gives promise of good results.

Nebraska.—One hundred acres of land in the sand hills of the Dismal River Forest Reserve, Nebraska, were planted this spring by the Bureau of Forestry—eighty acres in pine seedlings, 100,000 being set out; the other twenty acres were planted with seed. The work will be continued this summer, and the nursery will be enlarged so as to cover two acres. The Bureau intends to increase the size of the nursery gradually, so as to make it grow enough seedling trees every year to furnish sufficient stock for the planting. It is intended to plant the whole of the Niobrara and Dismal River reserves, which are now barren sand hills, to forest. The Dismal River Reserve includes 86,000 acres; the Niobrara Reserve, 126,000. A survey of the boundaries of the Niobrara Reserve will be made this summer.

To Map Alaskan Forests.

The federal government has undertaken the mapping of the forest areas of southern Alaska, and for that purpose has sent Mr. W. A. Langille, a timber cruiser in the employ of the Bureau of Forestry, to make a general reconnaissance to ascertain the quantity, quality, varieties, and location of timber along the Pacific coast from a point near the southern boundary and working north. He will probably get as far as Skagway this year. Other cruisers will follow him, as the territory to be covered is vast. The results of

these surveys will be embodied in maps, which will be of great value to lumbermen and to others interested in the resources of the region. A number of sawmills are already in operation in this region. The rainfall throughout this part of the country is great, and the sea fogs carry much moisture. As a consequence the forest growth is rank, there are quantities of down timber, and the wooded slopes are covered with dense undergrowths and damp moss. Fire can make but little headway, and each year sees an enormous waste from older trees which die and fall. The principal trees are Hemlock, Spruce, Yellow and Red Cedar. With good methods of transportation, lumbering operations should vie with fisheries as one of the great industries of the territory.

Addition to Pennsylvania Forest Reserves.

A deed has been recorded in the register's office at Lewistown, Pa., conveying 4,613 acres of forest land to the state.

This is all mountain land, situated in Armagh township, Mifflin county, and will be added to the forest reserves. At present the timber on it is young, the mature trees having been cut off for mine props by the William Whitmer & Sons Co., which turned the land over to the state for a consideration of \$13,838, or just \$3 an acre.

Forestry and Irrigation in the Year Book.

The current issue of the "Year Book of the Department of Agriculture" contains much that is of interest on

forestry and irrigation. William L. Hall, Chief of the Division of Forest Extension, of the Bureau of Forestry, who has charge of all the tree-planting experiments carried on by the government, discusses the possibilities of his work and makes the significant statement that the best value from such work comes from such areas as have been practically deforested, or in places where it is desirable to start forest growth. "Forest planting," he says, "is not practicable in those regions which are as yet well timbered and in

which the reproductive power is sufficient to renew the stand as the trees now standing are cut away. Broadly speaking, this includes in the South the hardwood region of the Southern Appalachians and the pine belt from Virginia to Texas. In the northeast it includes the spruce forests in New York, Vermont, New Hampshire, and Maine. It includes sections elsewhere, as in the Alleghany Mountains. In the West it includes the heavily timbered portions of California, Oregon, and Washington, and smaller sections elsewhere. In other parts of the United States than those mentioned above, there are sections in which the supply of timber is wanting or is becoming insufficient to meet the demand and in which the natural production is not sufficient to insure a second crop."

In an article on irrigation it is stated that there are more than 7,000,000 acres of irrigated land in the United States, and the total cost of irrigating plants is \$64,289,601. The value of irrigated crops for the single year of 1899 was \$84,433,438, or 30 per cent greater than the total coast of the plants. The number of irrigators in that year was 102,819, and the average size of irrigated farms was 71 acres.

Maine Forest Fire Law Defective.

A law passed by the legislature of Maine during the past winter authorizes the forest commissioner to police the timber lands in unorganized townships, in order to protect them from fire. Under the provisions of that law wardens will be engaged at \$2 per day for such time as they may be actually employed in fighting fire, and assistants may be summoned at any time, who shall be paid 15 cents an hour for services rendered. Even where the selections of wardens are made by actual visits to the townships, and the characters of the individuals are looked into as carefully as may be, it is still manifestly impossible to be assured that a warden employed in this way will not have his cupidity aroused over the possibility of a sure daily wage; and even if a man would not actually set fire to

a certain area for the sake of the emolument from fighting the flames, he will be apt to allow the fire to burn more than it otherwise might if his amount of pay did not depend on the length of time he was needed. The consideration of this contingency does not arise from mere surmise, but from actual observations at the time of the recent forest fires in the Adirondacks, where the setting of fires by fighters hired under this time system was a matter of common comment.

Forest Building at St. Louis.

Contracts have been let for the construction of the Forest, Fish, and Game building for the Louisiana Purchase Exposition, to be held at St. Louis next year. An elaborate system of tanks and ponds, with appropriate spaces for the exhibition of fish and game and all that pertains thereto, will occupy the eastern half of the interior. The entire western half will be given up to the forest display contemplated by the United States government, and this will be supplemented by exhibits demonstrating the forest policies and operations of foreign governments. The exterior of the building will be severely simple, with no towering features. Its general proportions will be pleasing and much color will be employed in its decoration.

Louisiana Forestry at St. Louis.

The Southern Cypress Company has agreed to furnish a full cypress exhibit for Louisiana at the world's fair, and will present the principal features of the cypress industry from the tree to the various finished products. This will also be done in the case of pines and hardwoods by other companies, each trying to eclipse the other in the perfection and interest of its exhibit. The Louisiana Spanish moss will be shown as it grows and as it finally appears in horse collars, mattresses, saddlery work, and upholstery; in another space will be given an exposition of the turpentine industry, and in another the making of paper from straw, rice, wood pulp, and cane.

Dams Give Way. Recently two big dams went out under the stress of heavy floods, resulting in considerable property loss, but fortunately in no loss of life. At Hatch, Utah, on the Panguitch branch of the Sevier River, an irrigation reservoir under construction broke its dam and destroyed considerable property, as well as ruining the prospects for the extensive irrigation works contemplated for this summer. Hatch is in the extreme southern part of the state and 50 miles from a railroad. The other dam which was washed out was on the Coweeman River, which empties into the Cowlitz a short distance above Kalama, Wash. This dam was situated in a narrow canyon, and when it gave way under the pressure of water from melting snow a large shingle and saw-mill and several bridges were carried away in the torrent. The dam was the property of the Coweeman Rafting and Driving Company, on whom the principal loss will fall. They will rebuild as soon as possible.

To Solve Water Problems. The Division of Irrigation Investigations of the Department of Agriculture, through the experiment station connected with the University of California, at Berkeley, will commence a series of experiments which will have an important bearing on water problems, and particularly in California. Some of these will touch on a determination of the evaporation of water from soil and plant surfaces, and from cultivated and non-cultivated soil surfaces, and will be under the direction of Professor Fortier, of Montana, and A. P. Stover, lecturer on irrigation at the university. An exhaustive study of pumping water for irrigation will be made by Professor J. N. Le Conte and A. J. Turner, both of the College of Mechanical Engineering, who will work in connection with the irrigation investigations. Another phase will be the investigation of pumping water as it affects the level of ground water. In addition to these, the questions of seepage losses will be taken up,

the duty of water, the value of winter irrigation, and the location of wastes in irrigating. The series of investigations will cover a period of two years and will be very exhaustive.

Remove Dead Wood. *The Journal of the Royal Horticultural Society of England*, in commenting on the statement that there are more insect and fungoid pests which attack trees in that country than there were a few years ago, calls attention to the prevalent carelessness in not removing dead trees and branches from otherwise well-managed estates. In some cases the owner insists on retaining dead growths because they are "picturesque." Dead trees should be removed and limbs cut in all practicable cases, and in pruning away the branches they should be cut flush with the good growth and the wound coated with tar or other substance which will protect the cut from the entrance of fungi or insects. When this is done the tree covers the wound with new bark and no opening is left for the penetration of decay into the trunk itself.

Harvested His Own Planting. It has been urged many persons to plant trees as a heritage for those who come after them, and the reiteration of this statement leads people to believe that there is no profit from tree planting to be enjoyed by the planter himself. To offset this idea, there is the case of a Kansas farmer who in 1877 planted trees on a homestead claim, which trees have since yielded him timbers for three large barns, and have supplied lumber and fuel in abundance. Mr. S. Bethers, of Rice county, Kansas, began his tree planting experiments in 1877, using Osage Orange to produce fencing, and Cottonwood, Walnut, and a little Soft Maple to supply lumber. These trees have not only supplied his timber needs, but there is now standing a fine grove, which adds materially to the comfort of his family and his stock, and gives protection against storms. His experience has been that all trees do best on

bottom lands, and that Osage Orange, Russian Mulberry, and Box Elder are best for higher locations. Native varieties, he says, give more satisfactory results than others.

Government Investigations. The Geological Survey will make during the present year a series of investigations of artesian and other underground waters in the eastern United States, and these will embrace areas in all of the New England States. New York will have two problems investigated—the waters of Long Island, and this, in connection with the complete soil survey of that area by the Bureau of Soils of the Department of Agriculture, will give much useful information to farmers and others; the second relates to the occurrence, composition, and economic value of the spring waters of the whole state. New Jersey will also have a complete survey for underground waters, and in the South, Georgia, Alabama, Mississippi, Kentucky, and Tennessee will have their water resources of this nature examined. Arkansas, Missouri, Iowa, Minnesota, Wisconsin, Illinois, and Michigan will also have certain areas investigated.

Racing for Redwoods. The *San Francisco Chronicle* is authority for the statement that the Pacific Coast railroads, including the Santa Fé line and the Southern Pacific, are contemplating extensive operations for entering the north coast counties of California, which have heretofore been without railway connection with the rest of the state. It is supposed that the bone of contention is found in the Redwood forests, and that it will not be long before these great tracts will be lumbered if railroad facilities are provided for getting the product to lucrative markets. This supposition is borne out by the fact that the Santa Fé line has recently acquired control of large areas of Redwood forests. The transcontinental roads realize that they have in these vast timbered areas a ready stock of profitable freight available from the date of the opening of any track pene-

trating them, and that the business cannot be exhausted for many years. Even with complete deforestation, it is probable that the country will still be valuable as an agricultural locality on account of its abundance of moisture.

Largest Dam in the World. British engineers in India propose to dam the Tungrahbadra River, which flows through the Madras Province, for the purpose of irrigation, to offset dry-season conditions. The dam is to be built at Hospet, which is near the center of the southern portion of the Indian peninsula, and will be nearly a mile long and 150 feet high. This will form a lake 40 miles long, with an area of 150 square miles, and impound 200,000,000,000 cubic feet of water. As compared to the great dam at Assuân, Egypt, it can be seen that the Tungrahbadra dam will be a quarter of a mile shorter, but about twice as high, and will impound six times the amount of water. However, if the Nile dam should be raised to the height originally planned, and for which the foundations were built, this disparity would not be so great.

Uses for Wood Waste. On account of decreasing supplies it is becoming more and more important that many mills manufacturing lumber products should find ways to utilize waste wherever possible. Sawdust, for example, can be easily converted into wood meal, and one or two mills for the process cost little and take up but a small amount of room. This meal can be used in a variety of ways, and in Germany, where a greater use of waste products is made, there is considerable industry in the manufacture of pressed tiles, for use in the arts, and particularly in compositions for insulation in electrical work. Coarser waste can be made into wood wool with the proper machinery, which can be placed in any odd corner, requires but little power or attention, and gives good profits. Wood wool is useful for packing material, and, being elastic and clean, is much used for bedding in hos-

pitals or barracks. The finest kinds of the wool are also used for antiseptic bandaging. Almost any waste can be converted into oxalic or acetic acid, and by distillation wood alcohol and other products may be obtained. At present the United States does not make as much use of waste as it should in any of its industries, but finds it a matter of expense instead of income. The lesson learned in the cotton industry, whereby the vexatious problem of disposing of the seeds was solved by making them an extremely valuable part of the crop, can be profitably pondered by many of the lumber-manufacturing interests.

Artesian Basins in Idaho and Oregon.

The United States Geological Survey has published a preliminary report of the survey made by Israel C. Russell of the artesian basins in southwestern Idaho and southeastern Oregon. This report bears directly on the question of irrigation in those states, and the results shown are more favorable for artesian wells than had at first been anticipated. It was discovered that the geological conditions in the Snake River Canyon from the vicinity of Glenn's Ferry westward to the boundary between Elmore and Ada counties and in the Bruneau and Little Valleys are such that a surface flow may be expected. This was named the Lewis artesian basin. In southeastern Oregon the reconnaissance in Oregon showed that a surface flow may be expected in at least three valleys in addition to that of the Snake River. These are the broad valley in which Malheur and Harney Lakes lie, Otis Valley, and the valleys of the north and middle forks of the Malheur River.

Other Woods Wanted.

It is becoming more and more necessary that a substitute shall be found for Spruce in the paper-making industry, and it is probable that experiments will show many trees which can be profitably utilized, and thus serve the double purpose of keeping the industry alive and saving the Spruce from total

destruction. The possibilities of straw, corn stalks, and waste from sugar cane, have not yet been exhausted, and the prevention of waste has never had sufficient attention. Spruce has so far established itself as the pulp material *par excellence*, that most manufacturers will hear of no other. Nevertheless Poplar, Cottonwood, Hemlock, and even "Old-field" Pine are being used, and for the best paper a blend of other woods is used in connection with Spruce. In spite of the present prejudice in favor of Spruce pulp, there are signs which point toward the use of other pulps with no admixture of Spruce at all.

New Wells for Irrigation.

Near Exeter, Tulare county, California, wells are being driven and pumps installed for a system of orchard irrigation. The lifts are high ones, and the pumps are run by electric power. Almost all the land is side-hill property, and the amount of water required is not large. The same contractor has set up fourteen plants in the neighborhood since last summer, and four more are contemplated.

To Prolong Life of Wood.

News of what is announced as an important and valuable discovery comes from Liverpool, England, where Mr. R. A. Powell is said to have perfected a process which vulcanizes, preserves, and seasons wood, and makes it extremely hard without brittleness or a tendency to split or crack. It is also claimed that the wood treated is impervious to water, and that the treatment is equally efficacious for all kinds of wood. The process may be applied to either hard or soft woods, and in the case of the latter it renders them tough and hard. It includes a boiling in saccharine substance until the pores are filled with solid matter, after which the moisture is evaporated at a high temperature. The treatment takes but little time, and considerable material may be completed and ready for use daily. It is believed that the experiment will help solve the question of the preservation of railway ties.



CAPTAIN GEORGE P. AHERN,

DIRECTOR OF THE PHILIPPINE FORESTRY BUREAU.

CAPTAIN AHERN was born December 29, 1859, and received his appointment to the United States Military Academy at West Point from New York in July, 1878. Graduating four years later, he was assigned to duty with the infantry arm of the service, and served at Forts Snelling, Minn., and Shaw and Missoula, Montana. He was appointed professor of military science at the Montana College of Agriculture in 1891, and held that position until 1898, with the exception of some details to recruiting duty in the East. He served in Cuba in 1898, and since that time served at various official duties in New York and Washington, until ordered to Manila, where he arrived early in 1899. While in the Philippines he was entrusted with important administrative details, and was on duty with the Court of Claims until April 14, 1900, when he was transferred to the Forestry Bureau. He returned to the United States for a short time in 1901 to study forest methods and to secure trained foresters for the Philippines service.

Captain Ahern's first active interest in forest work was at the Montana College of Agriculture at Bozeman, where, in addition to his duties as instructor in military tactics, he was professor of forestry. He interested himself particularly in an exhibition of the commercial and other timbers of Montana for the World's Columbian Exposition at Chicago in 1893. After his work with the Court of Claims in Manila, and his organization of the United States

patent service in the islands, he was detailed to take charge of forest work, and later organized and was placed in charge of the Forest Bureau at Manila. He has taken a great interest in the promotion of biological study of the flora and fauna of the islands, and has gathered about him a number of young scientists who are doing good work in developing the ultimate object he is seeking—the fullest possible knowledge of the natural economic resources of the Philippines. He is constantly on the alert to enlarge his working force and to bring out of the chaotic general impression that the islands are very rich some particular facts which will show wherein the true values may be found. The Philippine forests are rich in material, and Captain Ahern's task is to gather information and to institute methods which will make the material available in the best way.

THE PROPOSED SOUTHERN APPALACHIAN FOREST RESERVE.*

BY

HON. JAMES WILSON,

SECRETARY OF AGRICULTURE.

IT occurred to Congress to instruct me to study the Southern Appalachian forest range so as to give them some information with regard to conditions there, what effect the destruction of the forests down there might have upon that locality and, incidentally, upon all the people of the United States. Instructing me to do anything of that kind means that I am to find a scientist to do it. The department of Agriculture has something like one-half, or a little more, of the scientists under pay and direction of the United States Government. They study what pertains to production from the soil all along the line. We are all fellows with those who work in the fields with their coats off, those who are wrestling with nature and her products. And so it was my privilege to send down some of our foresters, who were accompanied by geologists—famous men from the city—and they made a careful study of that great backbone of the eastern United States.

There we find the highest peaks, the highest mountains east of the Mississippi, the oldest formations, the locality that has watched over, if I may use the expression, the formation of the eastern half of the United States. And when the geologist communes with those mountains he learns much of their history in what he has seen, of another age

before the lower lands around them emerged from beneath the waters. The purpose is to save the mountain tops and the forests extending along that range from its northern to its southern extremity for a reserve or pleasure ground for the people of the United States. What Congress is proposing to do now should have been done half a century ago, and if the reserve had been made there then and the northern people had met the southern people and had communed in that pure atmosphere up there, some things that have unhappily occurred might not have occurred within the last half a century. But now materialistic questions present themselves with regard to these great mountains. It is very interesting to study them in all their relations. No matter to what lines of science a man may devote his time he will be interested in studying the great Southern Appalachian range. It has so much of interest all along the line.

The most interesting feature of any country is its people. In that region you find people whose forefathers were there probably two centuries ago, and if the impression ever reaches you, as it has found its way into some of our minds, that they are a lower order of humanity, banish that thought at once. There are as fine people, pure people,

* Lecture delivered before National Geographic Society.

in those great mountain ranges and gorges as you will find anywhere in the world. I did not notice that the ladies wore dresses from Paris, nor that the gentlemen wore diamonds in their shirt fronts, but I did see the image of God in the faces of those grand mountaineers, and the women—the mothers, the daughters, the wives—strewn with fresh flowers the narrow way of life. You find no other strain in those mountains.

After spending half a day to get to the top, you will have left the most magnificent samples of hardwoods in the valley—Black Walnut and Cherry and other valuable kinds. As you go up the mountain, Nature changes her plantings. You come to the Chestnut Oak, you find the Chestnut itself, and you get past them and come to the very tip top of the range, where you find the Balsam Fir struggling with nature for a living; but you find more than that. The most beautiful flowers I have ever seen in my life—flowers that are seen nowhere except on those mountain tops—are found up there, as if nature were making amends for the hardships presented. Rhododendrons are found up there, and they are surpassingly beautiful both in flower and foliage.

Those rocks, the geologist who accompanied our party informed me, are of the very oldest. They seem to have a working plan, a relationship between them and the woods whose roots encircle them and cover them from observation, and I suppose no plants on the face of the earth have to be so industrious and work so hard as the roots of those trees have to do to find a sustenance from those rocks. As is well known, they do and they must, and, where nature is left entirely alone and not interfered with, that relation continues beautifully and goes on from year to year and from century to century, and that grand aggregation of the finest hardwoods we have in the United States continues, and little sediment finds its way to the valleys, although the heaviest rainfalls on the continent are there, with the exception of a little section in the northwestern part of the United States. Still, that rain permeates gradually through the leaves

and the roots and into the rocks, and finds its way out farther down in springs that are the headwaters of the great rivers of the Gulf States. There is much interest attaching to those rivers and to those mountains that are the guardian angels of the infancy of those magnificent streams. Those streams are hard working. There are over 6,000,000 spindles now in the Southern States—those Gulf States and those Southern Atlantic States—being turned a considerable part of the time by the waters that come down from those mountains. There seems to be a well-understood plan between the manufacturer and nature in that regard. The mountain holds the moisture until it is needed in the summer time, and then lets it out gradually.

Up to the present time something like one-fifth of all the cotton grown in the Southern States has been manufactured mostly in this region, and without doubt the time will come when all the raw material of that kind will be manufactured there. People from the East are going there and taking capital and skill. People from the North are going there and taking capital and skill and enterprise, and seem to feel very much at home among the Southern people.

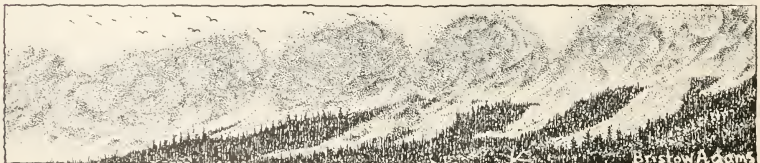
But mischief is being done now. The bark mill, the saw-mill, the fire, and the farmer are at work denuding those magnificent hills, and if the process goes on it will only be a question of time when the rivers will have no nursing angels in those mountains, when the great rainfall on those mountains will find its way down into the valleys, carrying everything movable with it and going as a torrent on its way, wreaking destruction as it goes, until it reaches its level in the Atlantic Ocean. You would blame the farmer? He has to struggle at best to make a living in those mountains. He clears the hill of wood so as to grow a little corn or rye. He clears it higher and higher up until he reaches the very top. In a few years the soil he finds there, that gives him a light crop to begin with, is all gone. Where the woods are left entirely alone you find no wash; but where they have been stripped off immediately destruction be-

gins, and the debris is washed down from the hills until the primitive rock is reached again. All the disintegration that has been going on there for centuries back is washed away when the roots are destroyed, and no new disintegration taking place, the wash from those hills goes on down, covering the little farms and the valleys and wreaking destruction until it reaches its level in the Atlantic Ocean. The fires do a very great deal of mischief in that mountain range. The bark mills furnish a market for the bark of the magnificent Chestnut Oak, the great tree furnishing a ton of bark when cut down for the purpose of getting that bark, and let lie until the next fire comes so that it may be destroyed.

The proposition now, with regard to remedying the evils that are going on and multiplying, is that the United States Government should own those mountain tops—not necessarily to disturb the homes of any of the people there. There will be work enough for all the people who now live in those mountains in the care of the forest reserve. The United States Government now possesses 70,000,000 of acres of forest reserves in the Western States, and is planning new reserves. The President of the United States has power to create a forest reserve whenever he thinks it wise, and our late Presidents have thought it wise, and new reserves are being planned continually. The South has no forest reserve. It should have. There should be a reserve reaching as far as the rivers require protection in their infancy. Every river from the Mississippi northward to the Potomac finds its rise in that range of mountains. The rivers on the northwest of the mountains, like the Tennessee and the Ohio, are also fed, so that the people

living on the Tennessee and the Ohio are just as much interested as the people living in all those Gulf States and those Southern Atlantic States. The taking care of the agricultural interests of the Southern people is imperative upon the nation. The United States will suffer whenever any one feature will suffer. The progress and prosperity of our common country will be retarded whenever the interest of any one section is retarded. The destruction going on in the Appalachian range at the present time is detrimental to the progress and prosperity of all the United States. It will not cost a great deal of money for the United States to buy those lands and hold them as a forest reserve, and put roads through them, and beautify them, and sell the crop of wood that may be harvested every year, which will furnish more than is now produced, conserve the best interests of the forest, and provide a delightful summering place for all the people of the valleys between that range of mountains and the Gulf States on the one side and the Atlantic coast on the other. The man from the North will go down there in summer. The man from the South will come up there in summer. The expense of caring for the reserve will be abundantly found in the annual crop of woods that may be sold.

These are the plain statements with regard to the proposed Appalachian Forest Reserve. I regard it as my duty, and the duty of the scientists associated with me, to consider the interests of every human being under the American flag who produces anything out of the soil. It is our duty to give the country the facts, to inform Congress along those lines, so that they may do their duty, not only to those of us who live now, but to future generations.



CULTIVATION OF RICE IN THE UNITED STATES.

A CROP WHICH MUST DEPEND ON IRRIGATION
THOUGH GROWN IN HUMID AREAS. METHODS
USED IN THE PRINCIPAL RICE-GROWING DISTRICTS.

BY

LESLIE HARRISON.

IT can be stated that rice cannot be grown without irrigation, and for all practical purposes that statement will hold true; for while it is true that "Providence" rice has been grown in the past, and is grown yet, it is also true that rice grown without the artificial application of water has comparatively small commercial value in the rice industry of the Southern States.

The methods of cultivation and irrigation are widely different in the two great rice districts of the country; for excepting the fact that the resultant crop is the same, and that both are grown by means of irrigation, there are few points of likeness. For example, Carolina rice-growing is historically the oldest in the country, and its present methods show almost the same primitive conditions which have characterized rice cultivation from its first Asiatic beginnings. Louisiana and Texas, on the other hand, whose industry has more than taken the place that was once occupied by South Carolina and Georgia, make use of the most improved methods, with expensive modern machinery for harvesting and threshing, and are now engaged in irrigation works of great magnitude.

Rice growing is not by any means a new venture in this country. In 1694 a storm-tossed Spanish vessel put into Charleston harbor, where it lay for some time to undergo necessary repairs. During this stay the captain of the vessel gave to one of the citizens of the town a handful of rough rice. From this one handful, through careful seeding and cultivation, developed the notable Carolina rice, now world-famous. For a long

time Georgia and the Carolinas furnished the principal part of the rice crop of the country, and for a number of years preceding the civil war these states produced 105,000,000 pounds of cleaned rice annually. At the present time the annual yield is about 50,000,000 pounds.

Louisiana now produces more than half of the rice raised in this country, the annual output amounting to some 200,000,000 pounds. The history of her rice industry dates back to the exiled Acadians—French settlers from Nova Scotia—who in the last half of the eighteenth century began the raising of "Providence" rice; but providential rain was not to be depended on, and fat years were invariably followed by lean ones, so that irrigation came to be more and more desirable, until now the systems of Louisiana are among the most elaborate and valuable in the country.

IRRIGATION OF RICE IN THE CAROLINAS AND GEORGIA.

The rice industry of the Atlantic coast is confined to tidewater areas from Cape Fear to the Florida boundary of Georgia. In this area there are about 80,000 acres on which rice might be grown, but, as a matter of fact, only about half of this is cultivated. The water supply is entirely from coastal rivers, and the plantations must lie far enough above salt water to avoid its bad effects on the fields. This limits the cultivation to a strip lying not more than 30 miles from the coast, and seldom less than 15. In a few cases where the river water is brackish at certain seasons, storage reservoirs are provided to offset these conditions; and where the water is always

too salt or the lands are above tidewater, the planter must depend on water taken from inland streams, lakes, or reservoirs.

Almost all the irrigation in the Carolinas and Georgia is of a simple nature. When reservoirs are required a small stream is dammed, so that the water backs up to form a reservoir, while the land below is irrigated by direct flow from the dam through suitable ditches or canals.

In the case of irrigation from tide water, banks or levees are thrown up, and these are pierced by "trunks," or long boxes made of heavy timber and closed by a sort of gate at each end. These trunks are placed at an approxi-

to drain the field, the inner gate is held permanently open, while the outer one closes when the tide is up, thus preventing any inflow.

Drainage forms an essential part of rice culture, being absolutely necessary at the time of harvesting. Undertiling is of advantage in the Atlantic coastal fields only when the water is supplied from reservoirs or lakes. The rivers carry too much sediment during the freshet season to make a system of under-drainage successful, as the tiles would soon become clogged; yet the slopes are for the most part fit for good drainage with but little grading. A system of low dikes and small ditches



Courtesy Department of Agriculture.

COMBAHEE RIVER, SOUTH CAROLINA, A TIDAL STREAM ON WHICH THE MOST EXTENSIVE CAROLINA RICE PLANTATIONS OCCUR.

mately mean distance between the limits of high and low tides, so that the water of high tide will flow through them onto the fields to be flooded, or so that the flood water may be turned off at the time of low tide. The gate at either end of the trunk is so arranged as to act as a valve, the pressure of the water against it serving to keep it shut unless it is held open by a lever provided for that purpose and worked from the top of the retaining bank or levee. Water flowing in at a time of high tide can be retained on the field for as long a time as is desirable, for when the tide drops, the water inside of the levee is held by the automatic closing of the inner gate. In the same manner, when it is desired

through the field accomplishes the desired results of equable application and depth of water, with rapid run-off when a draining of the field is desired.

Rice is a shallow feeder. Its mass of roots spreads out just below the surface, and none of them strike down to any great depth. On this account all plowing is shallow, generally not more than 3 or 4 inches deep, though a greater depth might be advantageous as giving more plant food. In some places the ground is so stiff that it is flooded before plowing. Afterwards it is put in condition by disc harrow and roller.

On lands flooded by rivers which carry rich sediment fertility is easily assured, but in many instances, and particularly

in the growing of upland rice, fertilizer is needed, and this should be of a high grade to give best results, as cheap fertilizer is a false economy. Naturally the fertilizer varies in different localities; but cotton-seed meal, blood and bone, and other well-known mixtures are used, most of them containing a good percentage of potash.

In planting great care must be exercised in the selection of the seed rice, in order that it may be free from the volunteer "red" rice and from weed seeds. Uniform kernels are also desirable, as a uniform crop will permit of a higher polish than kernels that vary. The seed is sown in March and April, and early sowing has many advantages, though some crops are put in as late as June, with varieties which mature quickly. The time of sowing also differs in different sections, and is affected by the weather and to some degree by the migrations of birds, which work havoc on the crop, either when planted or in the fall when the grain is in the "milk" stage. The grain is planted either by drills or in hoed trenches and dropped by hand. The drilled method insures an even stand, which is a matter of some importance. It may be even planted broadcast and harrowed in or it may be planted in hills. Some planters recommend the latter method, as it insures easy cultivation and a more effective campaign against weeds.

After planting, the next important step is flooding, and this is done soon after the seed is sown, sometimes on the same day. Seed that is not to be covered is clayed before planting by stirring it in clayed water, so that the flooding will not float it. Flooding serves several purposes. It protects the grain from the birds and causes quick germination. This water is left on the field several days, or until the seed is well sprouted. It is then drained off and no more water is applied until the plants are well up and the fields show considerable green. Then a "stretch" flow is turned on for a few more days, until the plants are about six inches high, affording nourishment to the rice and impeding or destroying weed growths. When the plants have at-

tained a sufficient growth under the stretch flow the water is gradually lowered to an average depth of a few inches, and remains on the field for a period of from two weeks to a month, the duration depending on local soil conditions. Then the dry growth follows for about a month and a half, and during this time the crop is cultivated with horse or hand hoes; weeds and volunteer rice are removed, and in some cases an intermediate flooding is made to protect the plants from grubs. When the plant begins to joint the harvest flow is turned on and this is kept almost touching the rice heads until their bending tells that the grain is ripe. The field is then drained for harvest.

The quantity of water required for irrigation is not looked into, but it is probable that here, as in many other places, the fault of over-irrigation is a common one. The supply from tidal streams is almost unlimited, and the whole question of water rights is never brought up, as there are none.

Harvesting machinery is not used, the grain being cut with hand hook or sickle. The beds in the field are narrow and usually small, to permit of complete drainage, and this would entail much breaking down of the grain and subsequent waste if a harvester were used. The grain is cut before it is dead ripe, or while the lower eighth of the head is still "in the milk," for if cutting is delayed until the head is quite ripe, there is much loss from the shelling out in handling. A high stubble is left, on which the grain cures for a day or two, when it is placed in shocks after being put up in straw-bound sheaves. As soon as possible, in order to avoid loss from storms, the grain is taken to the threshing-houses. These are permanent structures, one on each plantation, built on the bank of a stream or tidal canal, where tugs and lighters can get the rice to take it to market. The milling is a complicated process, for, after threshing, the rice or "paddy" still has two coverings—a coarse outer husk and a thin close skin. These are taken off by special processes, and the different products—bran, flour, grain, and chaff—separated. In addition to this,



Courtesy Department of Agriculture.

PLOWING RICE FIELDS WITH OXEN, BAYOU PLAQUEMINE, LOUISIANA.



Courtesy Department of Agriculture.

BINDERS AT WORK IN THE RICE FIELDS, RAYWOOD, TEXAS.

the commercial article is always polished to give the grain the smooth, pearly appearance, which artificially enhances its market value, but detracts from the real food value.

IRRIGATION OF RICE IN LOUISIANA AND TEXAS.

The rice of the Gulf States is now grown mainly on the uplands, and does not depend on tidal irrigation. With the use of modern methods and ma-

civil war, but until they do so they can not easily compete with improved machinery at home or cheap labor abroad. The production could and should be doubled, as we now produce less than half of the rice consumed in this country, and the use of rice as a staple article of food is constantly increasing.

Acadian success with Providence rice, intermittent as crops were, showed that, with proper methods of cultivation and irrigation, Louisiana was particularly



Courtesy Geological Survey.

BREAKING SOD WITH GANG PLOWS AND TRACTION ENGINES FOR RICE PLANTING, BAY CITY, MATAGORDA COUNTY, TEXAS.

chinery, the industry has developed into a leading one in these two states, while it has declined in the Carolinas and Georgia.

During the last fifty years, however, rice production in the United States has grown but little, and only the present time sees any great advance in production over the crop of 1850, for the decline in the Atlantic States has offset the advance in the Gulf States. It is possible that the former may adopt some of the methods in use in the latter, and thus regain the prestige held before the

fitted for this crop. At first, the only attempt at irrigation was the raising of levees above the rice fields to reserve some of the heavy rainfall, instead of allowing it to waste into the bayous. When water was needed to flood the fields, the levees were cut and the water allowed to flow on the plants; but in dry seasons this method of irrigation was worthless, and something more dependable had to be devised. Later it was discovered that upland soil was especially suited to the growing of rice, good crops being obtained in wet seasons, and it became

only a matter of getting water to them when large areas could be cultivated and the industry could furnish a profitable commercial venture, worthy of the enlistment of capital.

The introduction of the steam-pump furnished the impetus which was needed. After some failures with pumps of wrong type or limited capacity, large centrifugal pumps were introduced to raise the water from bayous to canals. From these canals the water was pumped directly on the fields, and the problem was practically solved.

Yet there were a number of local conditions which made irrigation very different from what it was elsewhere. For example, it might be said that the only point of similarity between the Louisiana rice canal and the irrigation canal of the Western States is that both are filled with water for the purpose of irrigation. Beyond that the comparisons are contrasts, to use a Hibernianism. For instance, water flows in the western ditch and stands at a level in the rice canal; the source of supply in the West is above the field to be irrigated, and below it in Louisiana; the canal of the West is dug below the surface of the land through which it passes, while the rice canal is built up on the surface of the ground, and on the highest ground to be had; the western canal holds water poorly, losing much through seepage through the soil, and the levees of the rice canal are impervious.

The proper construction of these levees, however, is of prime importance. The surface of the ground upon which the levees are to rest must be absolutely clear of all vegetation, and must then be plowed and pulverized, so that the earth embankment placed above will make a good "joint." To aid in this, deep furrows are plowed in the foundation earth, and the levee banks are built up firmly and of good material. This has to be done to prevent devastating breaks, as some of the canals are so large that they appear to be rivers of no inconsiderable size. Indeed, it is proposed to navigate some of them with lighters and barges for the transportation of "paddy" from the threshers to the mills which turn out the finished

product. For examples of the great size of these canals, we have the Eagle Lake Rice Irrigation canal, 17 miles long and 200 feet wide; the Trespalacios canal, $4\frac{1}{2}$ miles long and 200 feet wide, and the Treadway canal, 25 miles long and 220 feet wide. Another canal, now under construction, will be 56 miles long and 175 feet wide.

Owing to the fact that these canals are practically on a level and have no current in many cases, they are subject to obstruction through the growth of water weeds, and these constitute a serious menace to the usefulness of the smaller ditches, unless the growths are removed.

The water in these canals all has to be pumped, and in most cases from bayous which are below the sea-level, onto lands which lie as high as 70 feet above. For such a raise it is necessary in most places to have several lifts, the first one being from the bayou or stream, and the others at intermediate points along the canal. The pumps are of two types only, both suction pumps, however—the centrifugal and rotary. The former is the more popular, as it does not need direct connection with the propelling machinery, being run by belt or rope transmission. The rotary pumps, when properly established, should be more efficient than the centrifugal, and as they are run much more slowly, there is less wear and tear; but the increased cost of installation, owing to the necessity for permanent and strong foundations, limits their use. Boilers and engines are of varied patterns, but any that are good will serve the purpose.

Fuel is of three kinds—coal, wood, and oil. Of these, coal is the most expensive and oil the cheapest and most convenient to handle. Wood can be had near at hand, as most of the bayous are in heavily wooded districts; but the cost of labor brings the price above that of fuel oil, which is delivered from the nearby Texas oil fields at a low rate. In Texas particularly, where much of the irrigation is from artesian wells, crude oil is the most important factor in the fuel and power question.

From the canals the water is distributed over the fields through measuring



Courtesy Department of Agriculture.

MAIN PUMPS, RAYWOOD CANAL COMPANY, LOOKING ACROSS TRINITY RIVER, TEXAS.



Courtesy Department of Agriculture.

DISCHARGE OF MAIN PUMPS, RAYWOOD CANAL COMPANY.



Courtesy Department of Agriculture.

UNLOADING FUEL WOOD, ABBOTT-DUSON PLANT, BAYOU DES CANNES, LOUISIANA. THIS PICTURE SHOWS A BATTERY OF PUMPS ON TYPICAL BAYOU BANKS.

flumes, and is held at different levels in the sloping field by means of low levees, over which the water may flow until all the levels are flooded. Planters are now making these levees in the fields very flat and with gradual slopes, so that they interfere but little with the cultivable surface of the ground and allow the passage of the reaper and binder for harvesting. Since the water rises to the tops of these field levees, almost an average crop of rice is raised on them, and the fact that they can be cultivated and harvested makes it possible to keep out the weeds and red rice.

The application of water to the crop differs in some particulars from irrigation on the Atlantic coast. In the first place, the Louisiana farmers depend on early rains to start the crop, and need no flooding to protect the grain from birds, since the reed-bird or bob-o-link

is not the pest in Louisiana and Texas that it is in the Carolinas and Georgia. The first growth of the crop, or until the plants are from six to ten inches high, is made without artificial application of water, but after that the fields are kept flooded until within ten days of harvest time, when the levees are cut, and the water drains off rapidly by means of ditches provided for that purpose, leaving the ground dry enough to permit the use of the reaper and binder. As the harvesting machinery is similar to that used elsewhere for wheat, so also is the threshing outfit. Mills are large and form an industry by themselves, not being in any way connected with the separate plantations, as is the case in the Carolinas.

Several things will have to be done before the rice industry of Louisiana and Texas will be placed on as good a

basis as that of the Atlantic seaboard in the matter of water supply. At present magnificent operations are going on, and great ventures are being pushed forward under state and national sanction. At present in many localities the bayou supplies are being overdrawn, so that many acres have had to be abandoned on account of lack of water, and in some instances brackish water has backed up from the sea because the bayou supplies have been so depleted. There seems to be no recognition of water rights on some of these supply streams and bayous, and as a conse-

quence there are too many pumping plants on some, all of them being poorly supplied in dry seasons. In Texas, where artesian irrigation is used to a greater extent, the flow can be readily measured, the duty of water calculated, and only enough ground planted to be sufficiently irrigated; but development for the present threatens to be too rapid for present institutions to keep pace with it, and some radical departures will have to be made to secure all water needed and to protect users in their rights to that water.

THE EVOLUTION OF THE AXE.

BY

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FEW of us realize the important part the axe has played in the development of civilization. Of all tools, it is the one of greatest usefulness and the one which we could afford the least to spare. In early times, when machines and tools were more precious, it was of greater importance, but even today the pioneer uses it in preference to other tools. With it he fells the forest and builds his home.

Few of us realize also the many changes in the axe from the rough stone hatchet of the savage to the perfected steel implement of today. No wonder the aborigines were unable to combat the forest, and no wonder civilization gained its greatest progress in the grain-yielding plains.

The savage in the forest of the tropics without this implement is barely able to hold his own, and is little more than the hundreds of other animals and plants with which he struggles for a livelihood.

The axe had its beginning in a pounding implement of rough stone. It gradually developed into a tool with an edge for hacking and pole for pounding. Its efficiency was finally increased by

the addition of a handle. It has remained a combined pounding and cutting implement up to the time of the manufacture of the double-bitted steel axe. A chopper goes into the woods to cut, and the larger the cutting edge at his disposal the better; but as a tool for general utility the double-bitted is inferior to the common single-bitted axe with curved hickory handle.

A good axe should be solid steel. It is said that hand-made axes tempered by the heat of natural gas are the best. It should have a curved blade with bulging faces; such an axe throws out the chips and does not stick. These carefully proportioned curves give to the American axe its great efficiency. A professor of art in Germany once said that a thing with artistic lines is usually the thing of greatest utility, and he gave as an illustration the American axe.

Illustrations I and II are from the collection in the Smithsonian Institution. Illustration I shows the evolution of the axe of the Old World.

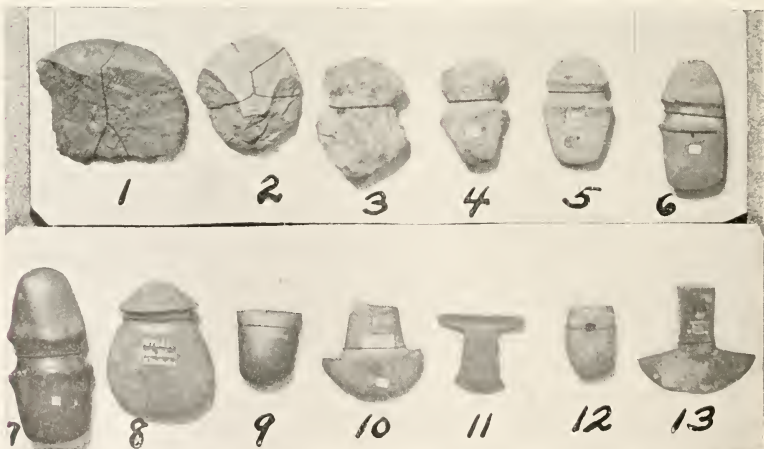
Axe No. 1 is the earliest and simplest form of cutting implement known to have been made by man. It was roughly flaked from a nodule of flint;



I. SHOWING EVOLUTION OF THE AXE OF THE OLD WORLD; FROM PHOTO OF COLLECTION AT THE SMITHSONIAN INSTITUTION, WASHINGTON.

France. No. 2 is a cutting implement of flint shaped by chipping in Sweden. No. 3, of flint, shaped by chipping and finished by grinding in Sweden. No. 4 was made of non-chipable material, pecked into form and then ground. No. 5, made of non-chipable material, pecked into form, ground, and then polished; the pole was roughened for insertion in a wooden handle; Switzerland. No. 6

is ground serpentine, fitted in staghorn socket for insertion in wooden handle. No. 7 is cast bronze, with blade and provision for insertion of wooden handle. No. 8, cast bronze, blade flat, with raised edges for insertion in wooden handle. No. 9, cast bronze, with wings and stop to aid in fixing handle. No. 10, cast bronze, with wide wings at sides and hook at upper end to aid in



II. EVOLUTION OF THE AXE OF THE AMERICAN INDIAN; FROM PHOTO OF COLLECTION AT SMITHSONIAN INSTITUTION, WASHINGTON.

fixing handle. No. 11, cast bronze, socketed for insertion of handle; ring at side to aid in fixing handle. No. 12, stone, pecked into shape, ground, and drilled for insertion of handle; Sweden. No. 13, stone, pecked into shape, ground, and drilled for insertion of handle. No. 14, iron axe, with curved pole, used for cutting timber in Fusan, Korea. No. 15, modern Americanized European chopping axe of iron and steel in use throughout the world.

Illustration II shows the evolution of the axe of the American Indian.

No. 1 is simply a broken stone, used for hacking and pounding. No. 2, stone, made from oval water-worn boulder, chipped from one side to a rude edge, possibly hafted; Virginia. No. 3, notched stone axe, fragment of rock chipped slightly on margins and notched for attachment of handle; Virginia. No. 4, ground stone, water-worn pebble of trap rock, pecked or battered into shape and then ground to an edge; pole used as a hammer; Rhode Island. No. 5, stone axe, grooved, of porphyry, pecked into shape, then ground; encircling groove with bordering ridges for attachment of handle; Massachusetts. No. 6, grooved stone axe; fine-grained stone ground all over; flat back, groove with bordering ridges for attachment of handle; Ohio. No. 7, grooved stone axe; two-edged, groove in middle, with bordering ridges, surface ground and part polished; Pennsylvania. No. 8, grooved stone axe, blade nearly round, ground all over, groove near pointed pole for attachment of handle; Costa Rica. No. 9, stone axe, squarish outline, polished all over, with notches in edges for attachment of handle, pole hollowed to fit handle above. No. 10, stone axe, semi-lunar blade, with tenon or stem for insertion of handle; Brazil.

No. 11, copper axe, with winged pole for attachment by cords to handle; Cuzco, Peru. No. 12, stone axe, water-worn pebble, pecked and ground to edge, hole drilled through center flatwise, pole squared and ground lengthwise for attachment of handle by cords; Bolivia. No. 13, copper axe, chopping-knife form, stem or pole perforated for attachment of handle; Peru.



III. SHOWING THREE GERMAN AND TWO AMERICAN AXES.

Illustration III shows three typical modern German axes. These implements differ radically from the common American axe, but are not so clumsy and inefficient as they appear at first sight. For the purpose of comparison one single-bitted and a double-bitted American axe are included in the picture.

PRACTICAL IRRIGATION IN HUMID AREAS

METHODS EMPLOYED AND RESULTS OBTAINED
FROM THE APPLICATION OF WATER TO CROPS
IN REGIONS OF CONSIDERABLE RAINFALL.

BY

BRISTOW ADAMS.

PART II.

THE first part, published in the June number of *FORESTRY AND IRRIGATION*, described irrigation for truck gardens in the New England and Middle Atlantic States. This, the concluding part, takes up the question of irrigation in the southern and western parts of the humid area of the United States, and gives the general conclusions arrived at from the examples presented in both papers.

Florida.—It must not be supposed that the Atlantic seaboard states between Maine and the Florida peninsula, outside of the two previously enumerated, do not make use of irrigation, but in general it may be stated that these three, of the extreme Eastern States, have put in the most expensive plants, and ones involving greater outlays of time and ingenuity, as well as money. Maine, Connecticut, and Rhode Island, of the New England group, have small areas in irrigated crops, the water in the first-named state being pumped from wells, while in the latter states the water is diverted from streams along bottom lands at no other cost than the ditching. New York and Pennsylvania of the Middle Atlantic States, and the two Carolinas, Georgia, and Alabama to the south, make use of irrigation in some degree, but as in the case of Connecticut, only where every convenience is afforded for direct application of water from wells or streams without expensive plants. In most cases the increased value of the crop for one year will more than pay the entire cost of installation of irrigation service.

When we come to Florida, however, the irrigation question becomes broader, more complicated, and more important

in the state's agricultural development. Conditions of soil and water supply make possible in some localities a system of sub-irrigation, easily installed, extremely effective, and simply operated. While Florida has an abundance of rainfall, it is subject to severe drouths, especially during the growing period, from February to June, when produce for northern markets should make its best growth. Underlying the whole state is a high-water table, from which an unlimited supply of water can be drawn at all times. In many localities the soil is sandy to the depth of about 4 feet, under which sand there is an impervious bed of clay or hard-pan. Beneath this hard-pan, at varying distances of from 10 to 60 feet, abundant water can be had with a strong surface flow. This is piped from the well to the upper side of the tract to be irrigated, where it is conducted into a long pipe, having at intervals downward extending valved pipes which discharge into terra-cotta pipes, each having an elbow turned toward the piece of ground to be irrigated. From these elbows, which are just above the hard-pan, there extend into the field, in the direction of the dip or inclination of the ground, lines of unglazed tile, with a cross-section of the shape of a horseshoe, open-side down toward the hard-pan. When water is needed the valves or cocks at the upper end of the field are opened and the ends of the tile drains at the lower end of the field, where they discharge into a drain or open ditch, are closed. The water from the loose joints and open bottoms of the tiles is taken up through the soil. When the ground is sufficiently wet the water is turned off at the supply pipe, the ends

of the drains are opened to carry off the excess water, and the operation has been completed with but little expenditure of time and labor. It can be readily understood, however, that this system is available for use only where the conditions described exist. Where the hard-pan comes within 3 or 4 feet of the surface, this is a complete and satisfactory system, rendering its user absolutely independent of rainfall; but soil conditions have to be thoroughly understood before such a system is installed; otherwise every bit of work and expense might be wasted.

Another Florida system, where crops are tilled by hand, is based on the use of overhead iron pipes with sprinklers. A pump connected with a well forced the water through a main pipe—run straight across the center of the field—and from this main pipe laterals are run out at right angles to each side, clear across the field in the other direction. At intervals along these laterals are stand-pipes about 4 feet high, and on top of these are rotary sprinklers. The lateral pipes are only about a foot above the ground and are supported on solid board partitions, thus dividing the field into compartments, each of these being tilled separately. The most unique thing about this scheme is the protection it affords against frost. When there is any danger from freezing, wooden bows are put across these beds or compartments, and sheets of cotton cloth are stretched over these; then the main supply pipe is connected with the steam-boiler and steam forced through all the pipes, raising the temperature beneath the sheets, and over the whole field, many degrees above the frost mark. This insures the grower against the two causes which operate toward a loss of crops in Florida—drouth in spring and early summer and freezing in winter. Thus equipped, the gardener is independent of the vagaries of nature as known in Florida, and has reduced the question of production to a certainty.

The foregoing systems are examples of what has been done by wide-awake irrigators in Florida in adapting special means to special needs. The method employed on the leading farms, after the

water supply has been secured from well, stream, or lake, is to run continuous underground cement pipes to hydrants, plugs, or standpipes, from which the water is distributed in furrows. The pipes are made and laid at the same time by a machine working in a trench previously prepared, and extend without break to any part of the field. The pipe is composed of two parts sand and one of cement, with a usual inside dimension of 3 inches and an outside one of 6 inches. Sand is obtainable everywhere in the state, and the cost of such pipe is about 10 cents a foot.

Texas—Passing by the extensive rice irrigation works of Louisiana and Texas and other Southern States, as enterprises requiring great areas and large capital, although there are many small tracts which grow rice profitably, we come to the general question of the value of irrigation in these states as an offset for drouth conditions. A glance at the figures for the four principal crops of Texas—cotton, corn, wheat, and oats—shows their total annual valuation to be about \$200,000,000. A dry year cuts these values in half, which represents an actual loss to the state of \$100,000,000. It is not to be expected that irrigation will save this amount in a season of drouth, but it should do much to obviate a large part of the loss.

The coastal plains and the artesian belt in the neighborhood of San Antonio could make greater use of irrigation than at present. Mr. F. F. Collins of San Antonio, irrigates from an artesian well, making his crops sure, and explaining that therein lies the big profits in farming. He purchased 148 acres of mesquite prairie, having sufficient slope to allow water to reach all parts of it by gravity. His well flowed 1,000 gallons per minute, enough water to irrigate 400 acres. A second well was put down, but the combined flow was no greater than that from the single one, showing that the first one had just about gauged the capacity of the water vein.

The farm was divided into 12½-acre plots, each with a small, comfortable house and good barn. Water pipes were conducted from a 4,000,000-gallon reservoir, into which the well discharged



Courtesy U. S. Geological Survey.

JUMBO HOME-MADE WINDMILL, TYPICAL OF THE KANSAS-NEBRASKA PLAINS, WHERE PREVAILING WINDS ARE FROM ONE DIRECTION. VIEW NEAR LINCOLN, NEBRASKA, SHOWING PART OF RESERVOIR IN FOREGROUND.

without pumping, the head of water being 20 feet above the surface. The land was cleared of its mesquite timber in 1900, and was ready for crops in the early spring of 1901. Garden truck was grown, and the return on the investment was 14 per cent for the first year. The rent charged was \$22.75 per acre, which, after deducting \$2.75 land tax, made a net return of \$20. One tenant sold his crop of Irish potatoes at the rate of \$250 per acre, and in the fall planted the same ground with sweet potatoes, which netted \$275, making an annual income of \$525 per acre for the area in potatoes. A German tenant, from the proceeds of one year's work, paid all expenses of a family of five, including stock feed for the entire year, and at the end of the time had \$3,600 in bank.

Mr. Collins has purchased an adjoining tract, where he will put the same methods in operation, and has built another reservoir, with a capacity of 12,000,000 gallons. Both of these have been stocked with black bass, showing

another use to which they may be put. The example will be followed by other land-owners in the neighborhood of San Antonio, but the wonder is that more people do not take up the matter. Here conditions were simplified to the fullest degree. Water was good and abundant, and could be directed to land of marvelous fertility without any expense for pumping plant.

Kansas.—In northwestern Kansas and southern Nebraska the windmill plays a more important part in regard to the water supply than in other parts of the country. Here most of the water obtainable is found in underground channels, and the supply seems practically limitless. Windmills of every pattern are in use—from the clumsy home-made affair to the best of the steel type which has been perfected to a high degree of efficiency. Also the Kansas wind, as is well known, sweeps over the prairies with a steady and unremitting force, affording the cheapest of power. With the use of reservoirs much of this windmill-raised water is

available for irrigation, and the gentle slopes of the undulating prairies make the application an easy matter. On account of the steadiness of the wind there is much more to be said in favor of the windmill for the plains of the middle West than for the states east of the Mississippi; for it must be borne in mind that the windmill is very apt to stand idle during the period it is most needed

in the East, for the drouth times are also times of least wind, when no breezes stir and the land seems to bake in its own shimmering heat.

Wisconsin.—Mr. George H. Patch, of Stevens Point, Wis., has made some valuable contributions toward the general practice of irrigation in humid regions. His method of applying water is of the simplest. He uses a large



Courtesy U. S. Geological Survey.

WINDMILL AND WATER ELEVATOR ON BLUE RIVER, NEAR MILFORD, NEBRASKA.

sluice hose of oiled duck with lateral ports in it, each extending over a short apron to avoid deep washing at the points where the water is applied. These ports open directly into the furrows to be irrigated, a few being opened at a time, then closed, and a few more opened further along until the entire field has been watered at one end. The sluice hose may then be moved out to the limit reached by the water of the first operation, the same program is repeated, and the whole piece of ground is watered according to its needs. He states, as a result of experiments, that well water is apt to be richer with nitrates (plant foods) than water taken from streams, but found that by stirring up the mud and muck of decayed vegetation in the stream from which some of the water was pumped, much of this silt could be deposited on the ground, improving its quality, its fertility, and making the water spread better and go farther in the furrows.

Mr. Patch's experiments brought out many practical points of this nature, and though they were undertaken with this end in view rather than with the idea of trying to prove the value of irrigation, which he was already sure of, they bore out his belief by giving a 75 per cent increase in yield of strawberries, and would have given a much greater percentage if strawberries rather than knowledge based on experience had been what he most desired.

The descriptions of actual working plants given above show that the idea for irrigation in the humid regions is far beyond the stage of the mere propaganda and well into the realm of real practice; yet it must be admitted that the practice is spreading slower than it should when its manifold benefits are considered. There is little real value in urging the merits of irrigation, for its merits should be well known.

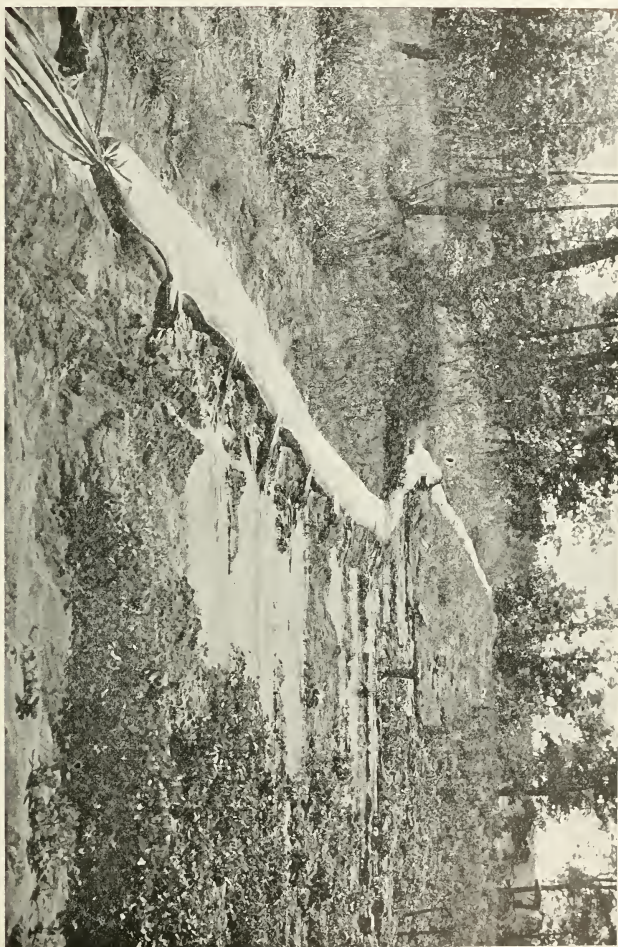
In the humid states the question of the water supply need give but little trouble. There are many farmers who have running streams in every field, but who do not apply the water to the ground, and the great trouble is that they do not know the best methods.

Perhaps the easiest way is to pump the water from running streams to an elevation from which it could reach all parts of the farm, and the amount of water carried by a stream at any given point can be easily determined. On many farms the water can be distributed by gravity over the best bottom areas from a dam.

Where pumps are used, the kind of pump will depend largely on the water supply. The centrifugal pump is perhaps best for an open well or for pumping from a stream or reservoir, but must never be given a suction lift of more than 20 feet; but the water from such a pump can be forced an additional 20 feet in elevation. If the water is to be lifted more than 20 feet, or sprinkled on the land under pressure instead of being flowed on, a direct-acting suction pump must be used. Force pumps may be used where large quantities of water are needed, but for usual purposes simple pumping machinery is best, and the general cost for the average types is less than \$100.

For the power to run the pump local conditions must be consulted. On the whole, gasoline is one of the most satisfactory powers, and serviceable engines can be installed for about \$100 or more, depending on the horse-power required. The objection to the use of windmills has been stated above, and for extensive work they are out of the question unless they pump into a reservoir from which the water can be distributed direct by gravity. Steam boilers and engines are less advantageous than gasoline because they require more care and constant attention. In some cases the water itself may be made to furnish the power for raising it, but this is so much a matter of local conditions that it is not worth while to make general statements. A water-wheel may be used, or, where it is desired to store water from a stream, a hydraulic ram is the best apparatus.

When we come to the question of transportation of water, the field widens, so that a description would degenerate into a mere catalogue. Pipe lines of iron, vitrified sewer pipe, and of wood are in common use. The oiled canvas



DISTRIBUTING WATER FROM A 12 INCH CANVAS HOSE, STEVENS POINT, WIS.

Courtesy U. S. Geological Survey.



Courtesy U. S. Geological Survey.
CONSTRUCTING AN EARTHEN RESERVOIR EMBANKMENT, COLUMBIA, MO.

hose, previously described, is more and more coming into use and has many advantages. Wooden troughs, elevated or on the ground, are used by many truck gardeners, but here again local conditions and materials will determine what is best in individual cases.

For water storage a reservoir on the highest part of the farm will be found valuable in many instances, though with a powerful pump and a good water supply it can be done away with. Tanks may be said to be valueless, as small ones are not worth much and large ones have to be constructed at prohibitive cost. Where it is not possible to have cement or masonry lined reservoirs, a

simple and practical way is to dig out the reservoir and puddle the sides and bottom to make it water-tight. Even in sandy districts this can be done by hauling clay into the reservoir and then puddling by driving cattle over it while a small amount of water is put in with it.

In the application of water it must be borne in mind that for furrow irrigation there must be a slope of at least one foot in one hundred. For level ground the sprinkling method is best. Where there are very steep slopes, terrace irrigation will be found advisable, with ditches running parallel with the contour lines instead of at right angles, as is the case with gentle slopes.

ECONOMIC VALUE OF FORESTS.

AMERICAN AND ENGLISH ECONOMISTS HAVE PAID LITTLE ATTENTION TO THIS SUBJECT IN THEIR WRITINGS — AN INVITING FIELD OF STUDY.

BY

PROFESSOR ERNEST BRUNCKEN,

BILTMORE FOREST SCHOOL.

IN the writings of English and American political economists hardly more than casual mention can be found of the economic function of forests and forest products, notwithstanding the fact that forests and the industries depending upon their products are second in economic importance to agriculture alone. The German and French economists have not so utterly neglected this branch of their science. Yet even they do not treat it with the same thoroughness which they accord to such branches of production as farming and mining. If one wishes to inform himself thoroughly on matters of this kind he must go to the writings of foresters, especially German foresters.

The reasons for this strange default of economists may be found in the peculiarity of forest wealth production, which sets it apart from every other kind of economic production. One must have considerable knowledge of

technical forestry in order to understand these peculiarities fully, with the economic consequences flowing from them, and some such technical knowledge is needed even to appreciate the existence of such peculiarities. Yet even the most elementary acquaintance with forestry is often lacking in the mental equipment of economists.

The peculiarities of the forest as a branch of economic production are briefly these: Every other form of producing wealth from the land yields a harvest once a year, or at most there is a short period of preparation, as in orchard culture, after which there is an annual harvest. In the case of the forest from 20 to 150 years must elapse before a harvest is possible. Although there is an annual increase in value, that increase cannot be withdrawn. It must of necessity be reinvested in the same business, as it were. Nor is the value of the final crop merely the sum

of the annual increments. It is rather the result of many and complex biological and economic forces, to analyze which all the skill of the technical forester is required.

A second peculiarity of the forest is that there is no definite time when the crop is mature, as there is in every form of agriculture. To say at what particular time a forest should be cut and replaced by a young crop, in order to get the highest possible value, very elaborate analyses are needed, taking into consideration physical, biological, and economic factors. This cannot be done by the economist who is not also a forester, and consequently the field is not attractive to him.

An additional reason, perhaps, why American and English economists have so conspicuously neglected the economic relations of the forest is the circumstance that in neither of these countries has there hitherto been much productive forestry. England has depended for its lumber supply upon importation, and in the United States we have merely harvested the supply unaided Nature provided. We have practiced what might be called *extractive* instead of

productive forestry. As a consequence the commercial side of the lumber trade has seemed more important than the productive, and our economists may have taken the statistics of this trade for all there was of the economic relations of forests.

It must be obvious to the economist, forester, and statesman that the adoption of a proper forest policy by this country must be even worse than the hit or miss affair it will be under the best circumstances unless this economic factor is fairly well studied. Nor will it be sufficient for our purpose if we simply acquaint ourselves with the results of the German forest economists' work, for they have naturally concerned themselves almost exclusively with conditions where forest wealth is the product of cultivated woodlands, while in this country we are at best in the transition stage of what I have called *extractive* forestry, and the economic consequences must of necessity differ accordingly.

There is here an inviting and almost virgin field for the labors of a few well-trained and intelligent American economists or foresters.

FLOODS AND IRRIGATION.

A SUGGESTION AS TO HOW DESTRUCTIVE
FLOODS IN CERTAIN REGIONS MAY BE CON-
TROLLED AND TURNED TO VALUABLE USE.

BY

GUY ELLIOTT MITCHELL,

EDITOR THE NATIONAL HOMEMAKER.

EVERY manufacturer in the United States has had a twofold economic interest in the great floods which have been sweeping down the Missouri and the Mississippi. The most generally recognized interest lies in the fact that much property has been destroyed, many farms devastated, and the purchasing capacity of a large number of producers crippled, handicapped, and in many cases obliterated. Another

feature of the flood problem which is not so often thought of is the question of the solution of this national problem through the construction of government storage reservoirs. It has been demonstrated beyond question that a comprehensive system of reservoirs to store and regulate flood waters which can be depended upon every spring, at the heads of the Missouri, the Arkansas, the Platte, and their tributaries,

would so reduce the flow of the Missouri River before it reaches St Louis as to keep not only it, but the Mississippi, within safe bounds.

Of course, the flood sufferer who sees a great yellow surge going by St Louis six or seven feet higher than the danger line may well express some skepticism as to the possibility of the government or any other agency constructing reservoirs sufficiently gigantic to impound all this excess of water.

But the reservoirs themselves would be only a part of the storage system. Of course the construction of such reservoirs would mean that the waters safe in them would be used for irrigation, and the official surveys indicate that something over 30,000,000 acres is the amount of land which can be irrigated from the water supply running eastward from the Rocky Mountains. Had such a system been in operation the June floods would have been diverted, first, into the great storage reservoirs necessary to irrigate this land; second, into the hundreds, if not thousands, of miles of canals, ditches, and laterals necessary for its irrigation; and, third, under the land itself. The stored water would not be used until the dry months of July and August, when the Missouri and its tributaries are but shallow, meandering streams; but during May and June the watering of this great area of

land—soaking it to the depth of a couple of feet—would be done directly from the streams themselves, or rather from the great canal system which would be necessary to carry the water inland from the rivers. This immense body of cultivated land would therefore act as a sort of sponge, and the effect would be to reduce the flow of the Missouri as though a vast obstruction had been thrown across its bed and its water flooded over all this land.

The Mississippi is able to take care of its own floods or of the floods of any one of its tributaries, but when all the rivers which flow into it go on the rampage, death and destruction must be the outcome. The equalization of the flow of the Missouri River would in a great measure mean the control of the Mississippi and a greatly decreased annual expenditure for flood protection under the River and Harbor Bill.

The carrying out of such a government policy would not only palliate the floods, but furnish homes for hundreds of thousands of prosperous farmers and result in vast good to the entire nation. We would have a dense farming population, occupying small individual areas of land and contributing to the prosperity and growth of hundreds of towns and cities, where now the country is in many places only very sparsely settled.

PROBLEMS OF THE YAZOO DELTA.

FORESTRY, IRRIGATION, AND DRAINAGE ARE ALL NEEDED FOR THE HIGHEST DEVELOPMENT OF THIS REMARKABLY FERTILE REGION.

THE Yazoo Delta lies in the northwestern part of Mississippi and, broadly speaking, embraces a stretch of country along the Mississippi River from Memphis, Tenn., to Vicksburg, Miss. Its eastern boundary is formed by the Tallahatchie and Yazoo Rivers, or, more properly, by a range of bluffs which extend in an arc away from the Mississippi, touching that stream at the two cities mentioned. Strictly speaking, the delta lies at the lower end of

the Yazoo River, and is formed by the lands enclosed between that stream and the greater one which gives the state its name. This is a region of winding bayous and slow-moving streams, which interlace and intersect, forming a network of waterways and making islands of almost all tracts of country in the region. In fact, the whole delta area is an island, because bayous at the northern end connect with the Tallahatchie, drawing their waters from the

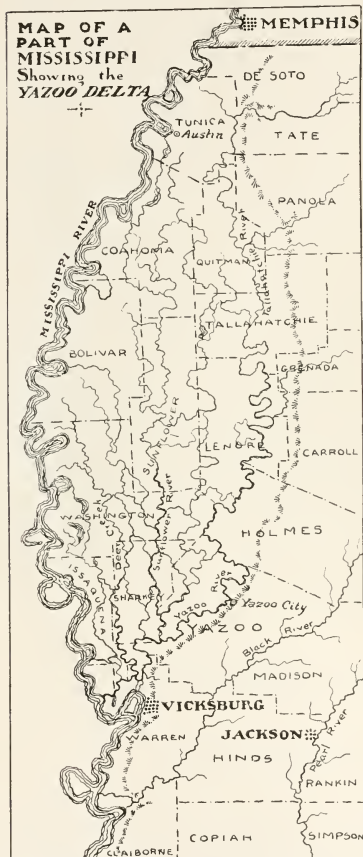
Mississippi River itself. The Tallahatchie flows into the Yazoo, which in turn flows into the Mississippi at the southern end of the delta. This region, much of whose lands are perennially

wide and contains about 6,200 square miles, contains 20 per cent of the improved lands in Mississippi, which yield 30 per cent of the total crop value of the state. It is pointed out by the Bureau of Soils, U. S. Department of Agriculture, that agricultural conditions of the region can be very much improved, so that it will far surpass present conditions.

As early as 1718 the French recognized the agricultural value of the Yazoo country, settlements being made at that time. Again, under the sovereignty of England, in 1763, there was a new influx of colonists, and during the Revolution the settlements afforded a safe harbor for refugees from both parties to the conflict. During the earliest colonial days agriculture was subordinated to the fur trade, but it was not long before many crops were raised, tobacco and indigo being the staples. With the English occupancy the cultivation of cotton was adopted, and from that time to this it has been the staple article and has been grown to the exclusion of almost every other crop.

Even now, with a soil and climate adapted to a most extensive range of products, and with every assurance that stock raising, truck farming for the early northern markets, or the cultivation of rice would produce a greater revenue and in other ways be distinctly advantageous, it remains a fact that many important articles of home consumption are brought into the country, including foodstuffs inferior to those which might be raised at home. Even the corn to feed the necessary farm animals is not produced in sufficient quantities to supply the local demand. In addition to this, much of the cotton land is deteriorating in value from too long a consecutive period in one crop.

Conditions in the Yazoo Delta are those which pertain to almost all regions where there is an annual overflow from a river bearing large quantities of silt. The banks of the streams from continual deposits are higher than the interior country, forming natural dikes on which the cultivated areas are found. The back country, which is perennially inundated by the water which backs up from the



THE DELTA AND VALLEY OF THE YAZOO RIVER.

inundated, is naturally of a remarkable fertility, and the Yazoo Delta has become famous for its cotton crops.

The census of 1900 showed that the Yazoo Valley, which in its larger dimensions is 200 miles long by 65 miles



WINTER SCENE IN YAZOO DELTA, MISSISSIPPI, SHOWING SUBMERGED FORESTS. A CONDITION OFTEN MET IN WINTER AND SPRING.

Mississippi and gets in through breaks in these uplands, is exceedingly fertile, and in a great measure is covered with hardwood forest, in which, in some places, extensive lumbering operations are being carried on. Through these back country stretches there are innumerable bayous, sometimes forming lakes of considerable size, and in others long stream-like threads of water-courses. In the late summer and early fall these are at their minimum depth, but in the period from January to June, and more particularly in March, they are apt to be obliterated, except as they are indicated by clear spaces in the

forest, in the general inundation which covers the ground to an average depth of about three feet.

The Yazoo and Sunflower Rivers and Deer Creek are the principal water-courses in the Delta country. Directly east of the Yazoo River, which forms the eastern boundary of the Delta country, there is a higher section of ground, which rises abruptly from the bank of the river to a height of from 500 to 700 feet above the flood plain. The soil over this hill country is a silt loam, fertile and highly productive, but of such a peculiar consistency as to be remarkably subject to damaging ero-

sion, melting away like sugar into the streams and gullies, even where the surface is comparatively level.

In fact, the soil conditions are quite as peculiar and interesting as the topographic. The soil of most of the area, that which is technically known to the Bureau of Soils of the Agricultural Department as Sharkey clay, covers two-thirds of the delta, and this is the portion annually overflowed. Each flooding leaves sediments of the richest character. Unfortunately these floods do not subside until it is too late for cotton planting. Mr. Whitney, chief of the Bureau of Soils, says that much of this land will produce two bales of cotton per acre, a phenomenal yield, and with cotton at ten cents a pound, a project to reclaim these lands by drainage is naturally agitated. A sandy loam along the streams is now used for cotton, but has been worked out by too long crop-

ping in that staple, and its favorable location near navigable streams makes it fit for the production of early crops for market. It has admirable drainage, and early Irish potatoes should give a profit of \$200 an acre. A loam contiguous to this is particularly well suited to cotton, as a good stand can be had nearly every year. The Yazoo clay, which, next to the Sharkey clay and the upland silt loam, is the most common soil, needs under-drainage to make it of the best use, as it is hard to cultivate unless conditions are just right. For example, if it is plowed at the right time, it can be made loose and friable during the cultivating season. If it is plowed when wet, it sinks back into a solid mass, whose surface, on drying, becomes solid and compact. If it is too dry when plowed, the result is seen in long rows of brick-like clods, which are as intractable as boulders.



Courtesy Bureau of Soils.

EXCESSIVE EROSION ON NEARLY LEVEL LAND, YAZOO UPLANDS. GULLIES WITH VERTICAL WALLS EAT INTO CULTIVATED LAND WITH REMARKABLE RAPIDITY, AND THIS MAY BE PREVENTED ONLY BY REFORESTATION.



BEECH GROWTH ON UPLANDS NEAR THE YAZOO DELTA. AN INSTANCE OF EROSION OVERCOME BY FOREST. THE SURFACE, ONCE BADLY GULLED, IS NOW HELD INTACT.

Courtesy Bureau of Soils.

To cope with these various soils and conditions various means are suggested. For the smaller areas improved methods of cultivation and a wider range of crops are needed, and these will come in time. The principal problems and the largest ones lie with the upland silt loam, to the east of the delta, and with the Sharkey clay in the back country. Here the kindred aids of forestry, drainage, and irrigation must be invoked. For the present, forestry will be valuable to check the erosion of the small streams, which flow directly into the delta drainage system. These cut back rapidly into the upland soils, and what was once a level elevated plain is gullied and exceedingly rough. At first it will be necessary to bind this as far as possible with Bermuda grass or Lespedeza, and in some places alfalfa would be a successful crop and would insure a considerable return in stock raising. In the localities locally known as Cane Hills, where the erosion has been most marked, nothing short of permanent reforestation will get the best returns. Open forestation would interfere but little with the value of this extensive area for cattle grazing, and Lespedeza, which flourishes in the shade, would afford good forage.

The most important gains could be attained with a system of drainage to supplement the natural levees along the streams. In many places these streams twist and turn and their banks enclose a large area of the rich bottom land subject to annual overflow. In some cases an artificial levee half a mile in length would complete a large circuit of dikes, enclosing from inundation an area of fertile soil of considerable extent. This planted in cotton would yield in the first year enough to pay the cost of the work and would be perennially productive. It could also be arranged to flood it at any time, to augment its fertility, with the silt-laden waters of the rivers at flood periods.

Also this water could be controlled for irrigation, and with perfect soil con-

ditions much of the delta land could be profitably grown to rice. This crop would have advantages known to no other locality. In the first place, it would have the inexhaustible water supply of the Atlantic Coast States and would have the same advantage of a direct application from the streams to the lower lands without any expense for pumping. In common with the Gulf States it would have a firm soil on which heavy harvesting machinery could run, thus combining the great advantages of the two most important rice-growing areas.

The national government does not at present contemplate engaging in reclamation ventures in this region. The Bureau of Soils in pointing out the measures which should be adopted for proper utilization of the resources recognizes that some of the projects are too large in scope to be attempted without state or national aid, or at least without the investment of great capital. But some of the reclamation can be done by private individuals and to good advantage. It suggests that proper methods of forestation in the upland region would make a valuable timber reserve for the future needs of the state, and state aid might properly be enlisted in such forestation. These forests would supply the demand when the timbered areas of the lowlands are all cut over, and the place they once occupied given over to cultivated crops, which, under the drainage and irrigation systems suggested, would yield much more valuable returns.

For immediate benefits less dependence must be placed on a single crop—cotton; the feed for stock, supplies for laborers, etc., could and should be produced at home. The older plantations should more generally understand the use of fertilizers for the cotton lands with depleted soil resources. Truck farming on the Yazoo sandy loam and the planting of binding grasses and forests with stock raising in the Cane Hills would also be particularly beneficial.



JUNE FOREST FIRES.

DAMAGES WROUGHT BY THE FLAMES WHICH WERE MAINLY CONTINUATIONS OF THE DESTRUCTION WROUGHT IN THE PRECEDING MONTHS.

AN account of forest fires is necessarily an iteration and reiteration of old and well-known causes and effects. Year after year the annually recurring dry seasons bring their records of destruction in the fires which devastate the woods of North America, and in most cases the damage is the result of a moment's carelessness or neglect. It is quite discouraging to note the long time required to bring the general public to a proper realization of the fact, to quote Gifford Pinchot, Forester of the United States Department of Agriculture, that "of all foes which attack the woodlands of North America no other is so terrible as fire." A contemplation of the great fires of the past is an object lesson for the present, yet every decade is marked by a forest fire disaster entailing incalculable loss to this country.

The Miramichi fire of 1825 destroyed in nine hours a belt of forest 80 miles long and 25 miles wide along the Miramichi River, in New Brunswick, killing every living thing in its path, including fish, which were found dead in heaps on the river banks. Several towns were destroyed and at least 160 persons perished. Even more terrible than this was the Peshtigo fire of 1871, which covered over 2,000 square miles in Wisconsin and killed 1,500 persons. At the same time a fire in Michigan burned a strip 180 miles long and 40 miles wide, clear across the state, and brought death to several hundred people. In 1881 Michigan was again visited by a severe fire, covering nearly 2,000 square miles and killing nearly 500 persons. The fire near Hinckley, Minnesota, in 1894, destroyed \$25,000,000 worth of property; 2,000 persons were left destitute, and 500 lives were lost. Had it not been for the heroic conduct of locomotive engineers and other railroad men the loss of life would have been trebled. In the case of the Hinckley fire, a little forethought would have obviated the dis-

aster, as the fire was smoldering for days near the town and could have been easily put out before the high winds came and drove the flames with uncontrollable fury. Last year great fires in Oregon and Washington involved losses amounting to almost \$13,000,000, and thousands of forest animals were destroyed. In this case the loss of life was not so great as in the eastern fires, owing to the fact that the areas were not thickly settled, but at least 20 persons met death. In all these cases the fires were in September or October, the worst months, the fall in general being the time of greatest danger. In the case of a dry spring, such as has prevailed in many parts of the country this year, the losses in the spring months and early summer are apt to be severe.

It can be stated, however, that many of the states are becoming alive to the danger from forest fires, and some have careful laws drawn to prevent this danger. Minnesota, for example, has a good system of fire patrols and wardens, and the laws for the prevention and control of forest fires have been carefully framed and have proved efficacious in practice. The Forest Commissioner of Maine has just sent notices all over his state calling the attention of the public to the grave danger from fires in the woods, and giving precautions, penalties, and warnings to all who set fires in timbered areas. The state foresters of Washington are now preparing themselves to forestall during the coming dry season any repetition of last year's catastrophes, and the state commissioner of public lands is appointing many men whose business takes them into the timbered country as fire wardens and patrolmen, and under the forest laws of the state all state land cruisers are *ex officio* fire wardens. The National Bureau of Forestry has undertaken during the present year an exhaustive study of the fire problem, and the operations

of the field parties now looking into the matter will be shown invaluable suggestions when the collected material is made available.

As in May, so in June, the fires did most damage in the New England States and in New York and Pennsylvania. In fact, the most serious of the fires of the past month were but continuations of the month before, and exceeding them in extent and damage done, until they were providentially quenched by rains just after the first week of June had passed. So pronounced did these fires become that they cast a veil of smoke along the northern Atlantic seaboard, and the cities of Boston, New York, Philadelphia, Baltimore, and Washington were shrouded in partial darkness for several days. This effect was most noticeable in the vicinity of New York city, and the smoke haze was partly responsible for the running aground of the trans-Atlantic liner *Deutschland* in New York harbor.

Maine.—A writer in the *American Lumberman* places the Maine forest fire losses in the past two months as high as \$10,000,000, and other estimates range from that figure down to \$2,000,000. It is probable that an average between these two sums will more nearly approximate total of losses, though it is hard to make close calculations at this time. It is certain, however, that the devastation has been widespread and in many localities complete. These fires were at their height about June 6, and were at that time general over a large portion of the state. The 35 fires reported by Forest Commissioner Ring on May 20 had increased to at least 100, most of them in the northern and eastern sections. They were general along the New Brunswick border from Eagle Lakes south to Schoodic Lake, destroying several settlements and many lumber camps. Moosehead Lake has been practically surrounded by flames, and the country between Machias and Bangor, especially in the neighborhood of Cherryfield, has suffered severely. Fourteen miles of the Bangor and Aroostook Railway have been destroyed, and at least 30 sets of farm

buildings. In fact, it is hard to name a single river valley in the whole state which has not been fire-swept in a greater or less degree. Two lives are known to have been lost, one at Napleton and one at Haynesville. On June 8 heavy rains effectually quenched most of the New England fires, including those of Maine, especially near the coast. This rain was practically the first to break a fifty days' drouth, which had reduced the country to a state of tinder.

New Hampshire.—The White Mountain region in the neighborhood of Berlin and Berlins Falls was swept by forest fires on June 4, and the two places were practically surrounded by the flames. Groveton, to the north, was also threatened, and at one time all the inhabitants had prepared to leave. From Milan, near the Maine border, southwest to Littleton and Bethlehem, near the Vermont state line, the fires were general. In addition, there were fires in the neighborhood of Ashland, near Lake Winnepesaukee. Ashes from these fires in the northern part of the state fell in the streets of Nashua, in the extreme southern part. New fires were reported from the southern part on June 6, and the state's losses were at that time estimated at \$3,000,000. One-third of this figure is probably nearer correct. Some of the New Hampshire fires, as well as those in Maine, are known to have been started from sparks from locomotives.

Vermont.—Fires were general through Vermont in the early part of June, ranging from Island Pond, on the north, as far south as Wallingford, below Rutland. Two tracts of 2,000 acres of fine timber were completely devastated, one at Wallingford and one at Danby. Reservoirs of city water supplies were nearly empty, until the rains of June 8 partly refilled them and quenched the fires.

Massachusetts.—Eastern and central Massachusetts were visited by fires in the early part of June. The loss in the Connecticut Valley is said to amount to \$200,000. Fires have been reported as extending from Granville, Mass., and Coleridge, Conn., as well as from Conway, Goshen, and West Hampton, Mass. In the southeastern part of the state 250

acres were burned over about 8 miles north of Bedford.

New Jersey.—Large tracts of land in the vicinity of Lakewood and Lakehurst were burned over June 4. Special trains were sent with crews to fight the fires, which at first were uncontrollable. The burned tracts were along the line of the Ridgeway branch of the Central Railroad of New Jersey, and the flames were presumably started by sparks from locomotives.

New York.—The June fires in the Adirondacks were but continuations of those which started in April, though the scene of the heaviest fires shifted from the Lake Placid region, the storm center of the principal earlier conflagrations, to the Catlin Lake and Cold River country. On June 6 Governor Odell authorized the state comptroller to furnish Colonel Fox, forest commissioner, with funds to more effectually fight the flames. Opinions had been expressed that Colonel Fox had been hampered in the good work he was doing with his army of fire-fighters by a lack of funds. On June 8 the drought which had prevailed for nine weeks was broken by heavy rains. Although more than an inch fell the fires were not entirely quenched, as they were burning deep in the forest floor, and only days of downpour can effectually extinguish them. With the force of men in the field to fight the remaining fires, it is felt that all danger is practically over. On June 10 Samuel Pasco, indicted for the offense of starting fires which wiped out villages and swept away millions of dollars' worth of property, was arrested near Glens Falls. He did not attempt to explain his motive in setting the fires. Estimates of the damage done in New York are scarcely trustworthy as yet, but conservative computations, based on the calculations of persons who

ought to know, place the loss at not less than \$5,000,000, and it is possible that a full investigation will show more.

Michigan.—Forest fires raged for three days following June 13 near Eckerman and other points in the northern Michigan peninsula, much standing timber as well as logs, cordwood, and tanbark being burned.

Washington.—Reports from Seattle, dated June 11, state that fires threaten serious destruction near the town of Enumclaw, which narrowly escaped destruction in the fires of last fall. The woods are ablaze all around Granite Falls, and Ellsworth Camp, on Nasel River, was destroyed, with a loss of about \$10,000. The fire burned through about three sections of timber owned by the Weyerhaeuser syndicate.

California.—A newspaper report from Chinese Camp states that lightning ignited dry grass and caused a fire which spread over 30,000 acres on Hughes Brothers' grazing range on Marsh's Flat. This range runs into the mountains, and as there were 3,000 head of horses and cattle on it, it is thought that many of them undoubtedly perished. This fire started June 8. On June 18 more than 2,000 acres of grazing land were burned over near Bealsville, on the summit of Bear Mountain, in Kern county.

Canada.—The villages of Hopewell Cape and Musquash, in New Brunswick, have been reported destroyed as a result of forest fires which surrounded them for days before the fire-fighters were driven back. Two steamers were destroyed, several bridges, many residences and manufacturing plants, as well as the court-house of Albert county, in which Hopewell was situated. About 800 people were left destitute. Fire in the Laurentian region near Montreal was still burning fiercely on June 5.



RECENT PUBLICATIONS.

Any of these books will be sent by the publishers of "Forestry and Irrigation," postpaid, to any address on receipt of the published price, with postage added when the price is marked "net."

Silviculture. By ALBERT FRON, Agricultural Engineer and Assistant Inspector of Streams and Forests. With an introduction by Dr. P. Regnard, Director of the National Agricultural Institute. Illustrated by 55 half-tone engravings and text figures. 16mo. Pp. 563. Price, paper, 5 francs (\$1.00); bound, 6 francs (\$1.20).

This volume is the latest of a series of manuals published by J. B. Ballière & Fils, Paris, under the general title of *Encyclopédie Agricole*.

As the preface states, it is intended to be a popular exposition of the principles of silviculture, or forestry, as we too often say in this country, and at the same time to be a practical guide to woodland owners, large and small.

The book follows the usual line of European works of the kind, and goes even farther than most of them in considering general principles briefly and practical methods in detail. This is perhaps no fault in a work distinctly intended for French farmers, yet one cannot help regretting that such books are not broader in their scope. If a Canadian or an Algerian, for instance, wanted to learn something of silviculture, this would avail him little. This point of view, however, has not yet found many supporters in Europe, and the book before us is not to be condemned on that account. Within the lines that the author has laid down he has done well.

For American foresters the only especial value that the book has is a good *French* forestry bibliography, a list of French forestry associations and journals, and a chapter upon forest fire insurance. From the last it appears that while the French companies do not seek such business, it is possible to insure forests in almost any part of France against loss by fire. The indifference of the insurance companies seems to be due largely to the lack of knowledge upon which to base equitable rates, but when it is stated that the maximum premium is 10 per cent on young pine forests and less than 1 per cent on mature deciduous forests, the difference between the security in that country and in this is emphatic.

ALFRED GASKILL.

Handbook of Birds of the Western United States.

By FLORENCE MERRIAM BAILEY. Pp. 512. Illustrated. Houghton, Mifflin & Co., Boston. Price, \$3.50 net.

This book describes the birds of the United States found west of the 100th meridian, each species being designated by plumage, distribution, nest, and food. Some idea of the great number of birds in the western United States may be gained from the fact that though the descriptions are brief, the volume contains

over 512 pages. The introduction contains much valuable information, condensed to a point to be of use to the amateur ornithologist, and to students of the subject generally. The volume is abundantly illustrated with over 600 text drawings and 33 full-page plates by Louis Agassiz Fuertes, recognized as the best bird artist since Audubon. Valuable bibliographies are given, with bird lists, and many useful hints on the study of ornithology from the viewpoint of the general naturalist, collector, oölogist, or economic ornithologist.

Analytic Keys to the Genera and Species of North American Mosses. By CHARLES REID BARNES, Professor of Botany, University of Wisconsin. Revised and extended by Fred De Forest Heald, Fellow in Botany, with the cooperation of the author. Published by the University, Madison, Wisconsin. Pp. 368. Price, \$1.00.

This work, with its careful details, has a value to bryologists and amateurs which cannot easily be calculated. To persons making a life study of mosses it presents some new ideas in the presentation of genera and species, and in a sensible method of nomenclature. Through amateurs, who by its help may be able to better gather the facts of distribution, variation, and relationships, the use to the bryologist will be apparent. An earnest student, equipped with microscope and this manual, ought to be able to identify any mosses which he may collect in this country, and it is with the idea of encouraging a study of the mosses that the keys are published. More than 100 pages of the publication are given up to an appendix giving descriptions of species and varieties.

Public Roads in New Jersey. Ninth Annual Report of the Commissioner of Public Roads. By HENRY I. BUDD. Pp. 243. Illustrated. Public Printer, Trenton, New Jersey.

The question of building good public roads in the United States is one that is receiving an increasing amount of attention. The movement for better highways is becoming one of the most important before our people, and New Jersey is well in the lead of the action along this line. For several years past a large amount of work has been done, and each report of the road commissioner shows a gratifying increase in the mileage of good roads constructed. In addition to containing a detailed statement of all the road work done during the past year, which will be of great interest to citizens of the state, this report could be used to advantage as a text-book on the subject of good roads, as it contains descriptions

of the methods pursued in New Jersey and elsewhere in road building and the materials used. There is also a text of the road laws, and methods of assessing taxes for road-building funds.

Handbook on Linear Perspective, Shadows, and Reflections. By ORTO FUCHS, Director of Maryland Institute Schools of Art and Design, Baltimore, Md., and formerly Professor of Drawing at the United States Naval Academy. Published by Ginn & Co., Boston. Pp. 44, plates 13. Price, \$1.25.

This is a comprehensive and concise treatise on perspective drawing and should prove valuable to both teacher and student, and to artists generally. The explanations are simple yet clear, and the plates and problems follow logically the consecutive steps through which the book develops the subject. A particular advantage is the arrangement of the plates, which are double-page size and are placed loose in a small portfolio in the back, so that they may be used side by side with the explanatory text. A study of this work should fix in one's mind the principles on which the whole theory of perspective is based.

Forty-fifth Annual Report of the State Horticultural Society of Missouri. Published by the State Printer, Jefferson City, Mo. Pp. 416. Illustrated from photographs.

This report contains the usual list of officers of the society and the accounts of the meetings held during 1902, one in June at Eldon, and one in December at Springfield. At these meetings valuable papers were read on ornamental and fruit trees, flowers, and vegetables. There is some attention paid to forestry and irrigation, and in addition to the work done in the state there are incorporated with the report a number of extracts from authoritative sources. An interesting report on the growing of strawberries under irrigation tells of a six and eight fold increase in yield, with better quality of berries, though they ripen a few days later. To the practical horticulturist of Missouri the book should have considerable value.

Annual Report of the State Geologist of New Jersey for the year 1902. Accompanied by three forest bulletins. Pp. 150. Two diagrams. Published by the State Printer.

Problems of wood and water come in for a large share of the State Geologist's report. Forestry occupies a considerable space with accounts of work, of practical aid to landowners in handling forest lands, of forest fires with methods for their checking and control. In the report and the accompanying bulletins there are also articles on "Forest Fires in New Jersey During 1902," "Notes on Basket Willow Culture," "Does Forestry in New Jersey Pay," which is answered in the affirmative, and "Forest Reservations in the Pines Belt of New Jersey." The relation of the forests to the watersheds of the state are pointed out, especially in relation to the floods which visited the Passaic

region during the spring of last year, and in relation to the artesian water supply, which is an important item in New Jersey.

Twenty-third Annual Report of the New Jersey State Agricultural Experiment Station, and the Fifteenth Annual Report of the New Jersey Agricultural College Experiment Station, for the year ending October 31, 1902. Published by the State Printer, Trenton. Pp. 594. Illustrated by drawings and photographs.

Several reports are included in this book, making it comprehensive in the extreme, and it contains expert testimony from state chemists, biologists, botanists, entomologists, etc., whose thorough experiments during the past year have been of a most practical nature. Some space is devoted, naturally, to the famed Jersey mosquito, and the methods used for the checking of the pest, and the work being done along this line, if carried on systematically, should rid the state of most of the obnoxious insects.

American Park and Outdoor Art Association. Sixth Annual Meeting, Boston, 1902. In three parts. Part I, Proceedings; part II, Addresses; part III, School Garden Papers. Pp. 86, 46, and 44. Published by the Secretary at Rochester, N. Y.

The second part of the report is naturally of a more general scope and contains addresses by John De Witt Warner, J. Horace MacFarland, and Myra L. Dock, member of the Pennsylvania State Forestry Commission. Though the association concerns itself mainly with aesthetic considerations, as its name signifies, they do not lose sight of practical values, and aim, especially in connection with the conservation of the forests, to wed the interests of use and beauty.

Report of the Michigan Forestry Commission for 1902. Pp. 107. Illustrated by 38 plates from photographs. Published by the state printer, Lansing, Mich., 1903.

This excellent report, prepared by the commission of a state which is more and more becoming alive to the needs of careful forest management to husband its resources, holds lessons for every state. A number of men in the state are aware of the deterioration which will take place in farm and other values if the forests are not properly conserved, and they are carrying on a vigorous campaign of education and example in the face of some criticism and a lack of sufficient funds to bring forth the best fruits of their beliefs.

Every one of the many reports in this volume are of interest, and all of them taken together form an exposition of the needs and resources of the Michigan forests. There are more than twenty carefully prepared papers, and it would be unwise to single any one out for particular comment, as each presents the particular point of view of some authority or industry. Michigan's wealth bears a close relation to her forests, not only through such

manufacturing establishments as those which have made Grand Rapids noted as a furniture center, but through the connection between her forests and water supply, farms and orchards, and her mines and railroads. The report brings these points out clearly, and should do much toward educating the mass of the people into a cordial support of the work to which the members of the commission are pledged.

The Principal Species of Wood: Their Characteristic Properties. By CHARLES HENRY SNOW. John Wiley & Sons, N. Y. Pp. 203. Illustrated with 39 half-tone plates and a large number of helpful text figures. Price, \$3.50.

The author of this work has produced a book of a distinctly new type, designed particularly for the instruction of woodworkers and other users of such material, on the distinguishing characteristics of the principal American and a number of foreign woods. An admirable feature of the book is the presentation of technical information in a popular style, and we believe the author has succeeded in making his subjects clear to the layman. No attempt is made to give exhaustive descriptions of species. The author has aimed rather to acquaint the reader with the wood and botanical characteristics of all of the important genera of trees, such as the Oaks, Ashes, Maples, Pines, Spruces, Firs, etc., met with in commerce. Brief attention is also given to the great classes to which arborescent plants belong—Exogens and Endogens. A full enumeration of all the important timber species is given and a host of useful information is brought together in concise form under each, including particular mention of the uses, qualities, mechanical and distinguishing features of the wood. Some 125 or more species of native and exotic trees are thus treated. The excellent half-tone composite plates illustrate the characteristic habit (crown and trunk) of the tree in nature, a representative species in each genus being chosen; the characteristics of the bark and of the wood are also clearly shown in connection. The reader cannot fail to receive much assistance from this book in becoming acquainted with our common and useful timber trees. The author wisely admits the possibility of errors in getting together so much technical information, but we note only two slips of importance, which should be corrected in a future edition. Plate 17 looks suspiciously like *Salix babylonica*, while "Plate 18 (Catalpa)" is mainly *Paulownia imperialis*, only the figure at the lower left-hand corner illustrating Catalpa.

Journal of the Columbus Horticultural Society, 1902. Pp. 154. Illustrated by half-tones. Published by the Society at Columbus, Ohio.

Four numbers of the quarterly journal of the Horticultural Society make up the volume and the report for the year. They comprise the proceedings of the society, reports and papers read, etc. They show a successful year for the

society and for horticultural work in the state, with considerable attention paid to questions of forestry.

The Mountains of California. By JOHN MUIR. Pp. 381. Illustrated by 54 engravings and maps. Published by the Century Co., New York. Price, \$1.50.

No other person is so well fitted to write of the mountains of California as John Muir, whose life among them has given his character the rugged yet beautiful characteristics of the Sierras. The Century Company has issued a new edition of this great work, which tells not only of the mountains themselves, but of the trees that clothe them and the wild life which they harbor. Next to a visit to the Golden State, where one is never out of sight of mountains, this book will give the best appreciation of the beauties of the Coast Range, the high Sierras, and the ranges of the southern part of the state. As a "nature book," this work ranks higher than most of those which have been written in the more recent renaissance of this sort of literature.

Trees, Shrubs, and Vines of the Northeastern United States. By H. E. PARKHURST. Pp. 451. With over 100 illustrations. New net. (Postage, 12 cents.)

In this book the author describes the trees, shrubs, and vines of the northeastern United States in a popular way, the book being designed especially for persons who have never studied botany. To these it will appeal as a valuable guide to a familiarity with the salient characteristics of trees, shrubs, and vines.

Mr. Parkhurst has taken as a background for his description of the subject matter the collection of trees, shrubs, and vines in Central Park, New York, and it is interesting to note that this is the first time that a complete description of those contained in the park has been published. He considers the collection to be the most representative one to be found in this country.

The volume contains accounts of a series of botanical excursions in Central Park, with descriptions of the various growths seen and examined. These chapters are among the best popular nature studies we have yet seen.

The Story of the Trapper. By A. C. LAUT. Pp. 284. Illustrated. Published by D. Appleton & Company, New York. Price, \$1 25. (Postage, 12c.)

This book, by the author of "Heralds of Empire" and "Lords of the North," forms a part of Appleton's Story of the West Series. In it Miss Laut has told in a vivid narrative the story of the trapper, whose work as a forerunner of civilization is here given full and deserved credit. The accounts are thrilling and all ring true, as written by one who knows the conditions and has no need to go for interest past the simplest facts. In addition to the histories of the trading companies, the book gives a prose epic of the trapper's life.

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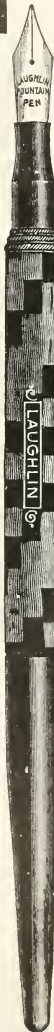
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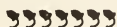
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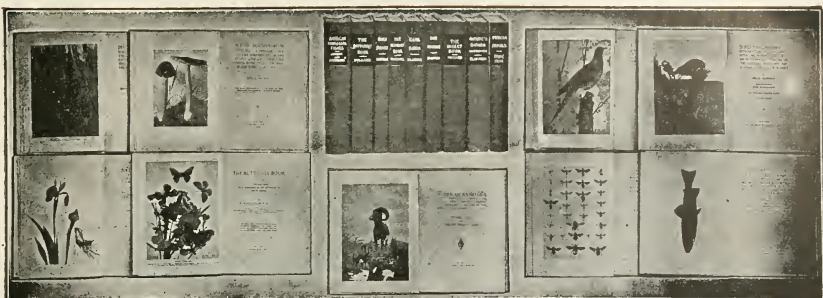
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2. The preservation and development of our national resources by the construction of storage reservoirs by the Federal Government for flood protection, and to save for use in aid of navigation and irrigation the flood waters which now run to waste and cause overflow and destruction.
3. The construction by the Federal Government of storage reservoirs and irrigation works wherever necessary to furnish water for the reclamation and settlement of the arid public lands.
4. The preservation of the forests and reforestation of denuded forest areas as sources of water supply, the conservation of existing supplies by approved methods of irrigation and distribution, and the increase of the water resources of the arid region by the investigation and development of underground supplies.
5. The adoption of a harmonious system of irrigation laws in all the arid and semi-arid states and territories under which the right to the use of water for irrigation shall vest in the user and become appurtenant to the land irrigated, and beneficial use be the basis and the measure and limit of the right.
6. The holding of an annual Irrigation Congress, and the dissemination by public meetings and through the press of information regarding irrigation, and the reclamation and settlement of the arid public domain, and the possibilities of better agriculture through irrigation and intensive farming, and the need for agricultural education and training, and the creation of rural homes as national safeguards, and the encouragement of rural settlement as a remedy for the social and political evils threatened by the congestion of population in large cities.

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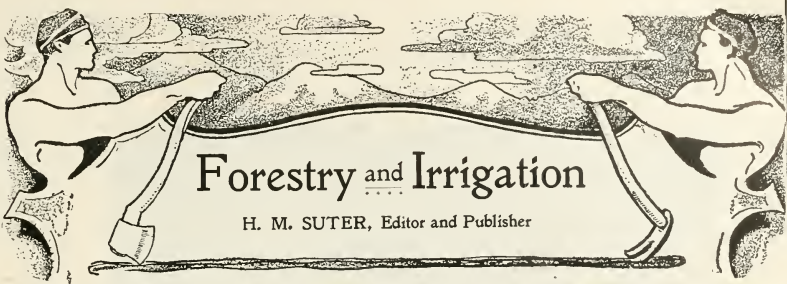
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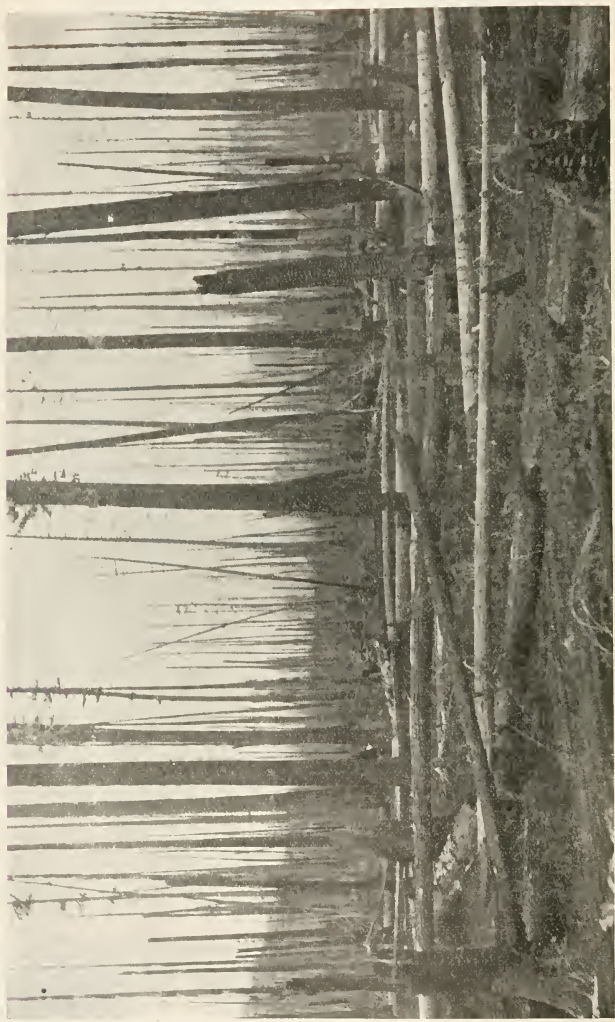
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VIEW SHOWING ABSOLUTE DESTRUCTION OF A FOREST BY FIRE.

Forestry and Irrigation.

VOL. IX.

SEPTEMBER, 1903.

No. 9.

NEWS AND NOTES.

A Pointer for the Irrigation Congress.

The Eleventh National Irrigation Congress will meet at Ogden, Utah, September 15-18, fuller announcement of which is given on page 452 of this issue. The questions to come before this congress are matters of vital concern to the entire nation. There will be reports from experts in the lines of irrigation and forestry, discussions of legal complications arising in the field of irrigation, the application of the provisions of the National Irrigation Act, and the important question of colonization. The open discussion of these topics will undoubtedly be of great value. But an omission, an unintentional one we trust, is that no direct reference has been made in the preliminary program to the question of the repeal of the existing land laws. If the National Irrigation Act is to bring that measure of value in the development of the arid regions that its framers intended, if the development of the West is to proceed steadily and along safe lines, the Desert Land Law, the Timber and Stone Act, and the commutation clause of the Homestead Act must be repealed. At present much of the land that can be made valuable through the carrying out of the provisions of the National Irrigation Act is being gobbled up by speculators, in many cases fraudulently. If this is allowed to continue, the very purpose of the National Irrigation Act, the providing of homes for the small settler on the public domain, will be defeated. The Eleventh National Irrigation Congress owes the movement for the repeal of the land laws a hearty indorsement. If only this is done by the congress, it will be a decided success. To fail to do it is

an acknowledgment by the delegates to the congress of their ignorance of the real needs of the West, or acquiescence in the stealing of the public lands that is going on at an alarming rate under the present laws.



Eastern Interest in Repeal of Land Laws.

While on the subject of the repeal of the existing land laws it might be well to remind readers of FORESTRY AND IRRIGATION that this is by no means a question for western people only. The disposal of the remaining public domain is a problem of grave importance to every section of the country, and every patriotic citizen owes it as his duty as such to take an active interest in its solution. The public lands, the only outlet for our rapidly increasing population, are being gobbled up by speculators. The result will be that soon the only valuable lands for settlement will be in the hands of speculators, who will hold them at such high prices as to discourage small settlers, or they will go to make huge ranches and landed estates, thus preventing full settlement and development of the West. This acquiring of lands is being done in a manner so glaringly fraudulent as to make the rottenness of some of our municipal governments seem mild in comparison. The land laws have been so perverted from the original intent of their framers that they have become a positive menace to the country. The article elsewhere in this issue by William E. Smythe on "The Home-maker or the Speculator" points out very forcibly the dangerous position the nation is drifting into on the public-land question.

The land-grabbers are very wide awake, while the general public is not, and the danger is that it may not be until too late. The remedy rests with Congress, and Congress will not act until public opinion insists upon its acting. The efforts thus far made in Congress looking to a cure for this evil have been thwarted by the friends of the speculators in Congress, who are at all times very active. The land laws should be repealed along the lines laid down by President Roosevelt in his message to the last session of the 57th Congress. The time to act is now.



Kicking About Forest Reserves. In Wyoming certain residents are howling loudly against the extension of the boundaries of the Yellowstone Forest Reserve. They protest that the extension of the reserve interferes with the pasturing of their sheep and cattle, and that the live-stock industry in this section is thus greatly retarded. Their protests smack a good deal of the ignorance of the real object of setting aside forest reserves that has been heard in other sections of the West. The reserves are made to furnish timber and to conserve water. It is not meant that the public domain shall be given over to large cattle and sheep ranchers to the exclusion of the balance of the people. And this is exactly where the protest originates. Long and unrestricted use of the public lands for private interests has bred a class who have no respect for the law, and who oppose the government in every step it makes in trying to administer the remaining public resources for the benefit of all the people. A favorite trick of this class to cover their designs is to shriek out against the supposed injustice that forest reserves do to the small settler. This is highly ridiculous, for were the small settler where the average large rancher wished him, he would need the sympathy and help of all of us.

That the forest reserves are of great value in preserving the water and timber resources of the West is indisputable. Considering the great area they cover

and the number of people they affect, the amount of inconvenience they cause is unusually small. The rules governing the reserves are liberal. They allow settlers a reasonable amount of free timber; mineral claims may be developed, and the owners of agricultural lands within the borders of reserves are protected. Grazing also is permitted under proper restrictions in nearly all the reserves. But the government is breaking up the stealing of timber as a business and the fencing of public grazing lands by ranchers. This brings the bulk of the opposition to forest reserves.

President Roosevelt, in increasing the reserves, is merely carrying out the policy of every Executive since the inauguration of the forest reserve policy under President Harrison. He has a more intimate knowledge of the conditions and needs of the West than any previous Executive, and for this very good reason his work along this line will be of greater value.

Take away the howl of the "grafters" and the opposition to forest reserves will crumble. A perusal of the Forest Reserve Manual issued by the Department of the Interior by any fair-minded person will convince them of the fairness of the government's side of the matter.



Want Forest Reserves. In striking contrast to the foregoing claims that forest reserves are ruining their country is a petition recently received by the Department of the Interior. This petition, signed by 95 per cent of the male residents of the Teton Basin, lying in Fremont and Bingham counties, Idaho, and just outside the boundaries of the much criticised Yellowstone Forest Reserve, asks that this region be set aside as a forest reserve.

The petitioners give as reasons for their request that reckless lumbering is ruining both old and young timber, overgrazing is having a decidedly bad effect on water supply, and that herders have been responsible for forest fires that have done great damage to the

timber and water resources of the region.

A second petition, signed by practically all the settlers of the region, calls for the establishment of a forest reserve in certain mountain lands known as the Shoshone Range in Cassia county, south central Idaho. Here, too, the timber resources have been recklessly treated and are rapidly nearing an end, while at the same time the water supply of the region is seriously threatened. The petition is accompanied by a plot of the lands which are asked to be reserved; they include about 185,000 acres.

Sound Advice. The following sensible advice to its readers is given by the Saratoga (Wyo.) *Sun*, one of the most ably edited newspapers in the state:

"Gentlemen, when you get done howling over the forest reserve question, suppose you take up something else just for a change. The forest reserves will, no doubt, be modified and made to comply as nearly as may be with the timbered area, for really the government is not interested with anything else. When that is done, and done properly, rest assured that the forest reserve is there to stay. And you can rest assured of another thing—that the government is not going to allow the reserves to be turned into pasture lands for the benefit of stockmen. The government is setting aside these reserves for the purpose of preserving the timber on them, in order to hold the snow to make water for irrigation purposes, to carry out the great plan inaugurated when the irrigation bill was passed. The government (and every sane person) recognizes the fact that it is the man who builds ditches and plants alfalfa, grain, and vegetables that is the bone and sinew of the country, and it is for the home-maker that all of this forest reserve and irrigation work is being done, and not for the man who travels in a sheep wagon here and there over the country or roams the land with a round-up wagon and a band of cowboys. Howl as much as you have a mind to, but you will find in the end

that the President knows exactly what he is doing and why he is doing it."

A New Use for Forest Reserves.

A new use for forest reserves has been discovered in Wyoming by way of New York. In

the August number of the *North American Review* there is an article on "Aggressive Forest Reservation," by James P. Kimball. The author of this article has large ranching interests in the region of the Yellowstone Forest Reserve in Wyoming, and he resents very bitterly the extension of the boundaries of this reserve, even though the government is reserving its own land. Not so long ago the Department of the Interior refused to eliminate a large tract of land from the Cascade Forest Reserve in Oregon which would have benefited a certain mining company in which Mr. Kimball was deeply interested. So much for Mr. Kimball and his reasons for writing an article objecting to the forest-reserve policy of the government.

The *North American Review* is devoted to the discussion of the world's great questions, if we are to believe some of its advertisements of itself. But as deeply as FORESTRY AND IRRIGATION is interested in forest reserves and all matters relating to our forests, we cannot see that the ground covered by this article is so important as to give it a place among the contributions of "the earth's intellectual leaders." Further, it is not the editor's keen interest in forest matters that decided him in selecting this article for publication. As Mr. Kipling says, "that is another story."

The editor of the *North American Review* is at the head of a well-known publishing house, and he directs several other publications, notably *Harper's Weekly*. He is backed by, and owes allegiance to, large moneyed interests that are hostile to President Roosevelt. Under pretended friendly guise his publications have been carrying on a very contemptible campaign, trying to arouse feeling against the President. Any person who knows the situation and has read *Harper's Weekly* the past few months understands this fully.

And here is the kernel of the little story: Mr. Kimball collided with the government while it was making forest reserves—once, twice. He was provoked and immediately set down his opinions in an article under the title mentioned. We are ready to say that it is a well-written article, though disagreeing decidedly with the contents of it. The writer knew of the attitude of Colonel Harvey's publications and picked them out as the most likely place to get a hearing.

Colonel Harvey, reading this article, found that it talked much of the "cult" of forest preservation, whatever that may mean. It charged the government with setting up a large game preserve in Wyoming and in harassing the people in the name of the "cult." And all this was aided and abetted by the President. Colonel Harvey knew nothing of the sheep raising and mining business that had prompted the supposedly righteous wail from the Wyoming man. But here seemed a chance to hurt the President with his western friends, and the article was used.

FORESTRY AND IRRIGATION is not a political journal; moreover, it does not agree with all of President Roosevelt's policies, but we cannot refrain from exposing such cheap trickery as the above, especially when it comes within the field of forestry. It is hardly what one would expect from the editor of "A Journal of Civilization."

Forestry School at the University of Michigan.

Filibert Roth, B. S., professor of forestry, and Charles A. Davis, A. M., instructor in forestry. The university is to be congratulated on two important things in the establishment of such a course. The first is in the selection of Professor Roth as the head of the new school, and the second and even more important is the initial establishment of all work on the basis of graduate study. Such a step in the beginning assures real value for the work done by the

school, will give a better training, and will secure students of broader general education and of more mature minds than if the course were made simply a term of lectures in an undergraduate year. The two years' graduate study leads to the master's degree in forestry. The university is particularly well situated for forest work, and short trips either by steam or trolley cars will take the student to places where all conditions of forest, showing the results of good and bad management, can be met with. The university itself has a forest reserve of over 8,000 acres, and much of the field-work will be carried on in this tract. Requirements for admission and a synopsis of the courses to be pursued, together with other information, may be had by applying to the University of Michigan, Ann Arbor, Mich.

First Report of Reclamation Service.

The First Annual Report of the Reclamation Service, by Mr. F. H. Newell, chief engineer, which will be published as a Congressional document, is about to be issued by the United States Geological Survey.

In his letter of transmittal the Director of the Survey notes that the reclamation law of June 17, 1902, which is quoted in full, is so general in its terms that its success or failure may be said to rest almost wholly upon its administration, innumerable details not being touched upon in the law.

The work of examination and survey is described by states. In most instances the field-work is still in progress, and in nearly every locality there are alternative methods of reaching the desired end, the relative merits of which cannot be determined until careful estimates have been made. In brief, it may be stated that work has been carried on in the following localities in the various states and territories: On Salt and Gila rivers in Arizona, on Colorado River in California, on North Platte, Gunnison, and Grand rivers in Colorado; on Snake River in Idaho, on the deep-well problems of western Kansas, on Milk River in Montana, on the artesian-well probabilities of western Nebraska,

on Carson and Truckee rivers in Nevada, on the artesian probabilities of central Oregon, on Bear River in Utah, on Yakima River in Washington, around Lake De Smet, and also on Sweetwater River in Wyoming.

At each of the places where systematic work has been carried on, preliminary temporary withdrawals of public lands have been made, but the areas which may be reclaimed are indicated only in a general way by these temporary segregations. The final determination of the reclaimable area rests upon a summation of all the facts of feasibility and cost, so that it can be stated only as the last of a series of estimates.

The impossibility of stating in advance what lands will ultimately be recommended for reclamation will result in great disappointment to many persons. The fact that lands have been tempo-

rarily set aside is, in the eyes of many, an indication that these lands will be reclaimed; and although every attempt has been made to warn individuals of the futility of filing upon these lands under the homestead law, they persist in taking up the land on the bare possibility that the surveys and examinations will ultimately show it to be reclaimable. It is an unfortunate condition, which apparently cannot be corrected at present.

**Forestry
at the
University
of Maine.**

The University of Maine, at Orono, offers during the spring term of the second year courses in practical farm forestry, including the production of wood crops on the farm, the utilization of waste places, the management of the woodlot,



Courtesy U. S. Department of Agriculture

IRRIGATION COMMUNITY IN VALLEY OF VIRGIN RIVER, UTAH, SHOWING TOWN OF
ROCKVILLE AND FARMING LANDS.

the effect of grazing, and the control of fires. The terrible losses suffered by Maine this spring from forest fires point to the fact that the state needs a vigorous forest policy to protect her greatest source of wealth.



The Truckee Valley Irrigation Project.

Although there has been no necessity for as many preliminary steps, and, from this cause, less general comment on the Truckee River project to be undertaken under the provisions of the national irrigation act, still that project is in many ways farther advanced than any of the others. It has been more fortunate than the other four proposed national irrigation ventures from the fact that there was less deeded land lying under its proposed canals, thus making it far easier to adjust land matters. It is predicted that this reclamation scheme will more than double the population of Nevada, and bring a class of home-builders who will do much for the welfare of the state, instead of merely extracting the mineral wealth and having their homes and general interests elsewhere. The contract for canal construction was awarded to Charles A. Warren & Co., of San Francisco, and the E. B. and A. L. Stone Company, of Oakland, Cal., the lowest bidders. It is proposed to take 1,400 cubic feet of water a second from the Truckee River about 30 miles east of Reno, Nevada, and divert it by means of a canal 32 miles long, with laterals extending over some 300,000 acres of land. This will accommodate from 30,000 to 50,000 settlers, and under the administration proposed by the United States each one will be assured of water and at a rate not to exceed \$2 per acre a year.

This is the first definite action taken by the Interior Department looking to actual construction under the reclamation act.



California Summer School of Forestry. The lectures on forestry held at Idyllwild, San Jacinto Mountains, Riverside county, California, during the past month were well attended, and accomplished

much in the way of properly defining the difference between arboriculture and silviculture, or between æsthetic and economic growing of trees. The forest lesson of most importance to the state of California, and particularly to the southern part of that State, is concerned directly with the water supply for irrigation, and on that account there is great interest in the work of forest preservation and reforestation now being carried on by the Bureau of Forestry.

The regular lectures were under the auspices of the University of California, and were given by Dr. Willis L. Jepson, of the department of botany, and Professor Arnold V. Steubenrauch, of the department of agriculture. The former discussed the life histories of several trees and of those peculiar to California, and the latter took up questions of forestry. In addition to the regular courses, there were several lectures by Ralph S. Hosmer, of the Bureau of Forestry, who is investigating the forest resources of southern California. T. P. Lukens, of Pasadena, an agent of the Bureau, who is greatly interested in reforesting the mountains near the southern California orange groves, spoke of the work he has done toward reforestation and the measures which should be generally recommended.

In this connection it is interesting to note that five members of the Bureau of Forestry are investigating conditions on Mt. Lowe and the surrounding mountains to find out the best trees for reforesting the bare slopes which have been swept by fire. They will probably establish a forest tree seed nursery near Pasadena, in order to set out seedling trees, which they have found to be better than "in place" planting of seed. Much attention is also being directed to the matter of prevention of forest fires.



California Irrigation Plans. The past few months have been notable for an increased activity in irrigation projects for California, and a number of new ventures have been started, while old companies have been rejuvenated and have entered the field again, better prepared for service than

before. The old Central Canal, the largest venture now on foot in California, has been the scene of a large part of this irrigation renaissance, after the part of the work which had been completed had been lying idle for nine years, owing to litigation. A company has recently been incorporated to carry the work to completion, and the canal when finished will irrigate some 400,000 acres, lying not alone in Glenn and Colusa counties, but also, under plans which have just been formulated, in Yolo and Solano counties. Under this canal is the great Glenn ranch of 40,000 acres, most of which is now being subdivided and sold in lots of from 40 to 160 acres.

The Modesto Canal, in the San Joaquin Valley, is now practically completed, and will make diversified farming possible in a region where great wheat farms depended on natural precipitation. Now the large tracts will become small holdings, and the way will be opened for a larger agricultural population in the great central valley of the state. This canal, with the Woodbridge and Stanislaus canals, will do a great deal toward the development of the interior of California.

Articles of incorporation have been filed at Chico, California, for the Butte County Canal Company, which will irrigate about 20,000 acres of land in Butte and Sutter counties with water taken from the Feather River, near Oroville. The incorporators are J. P. Clark, of Fresno; A. K. Whitton, of San José; D. C. McCallum, of Oroville, and Willard Sheldon, E. A. Bridgeford, C. M. Wooster, and M. S. Sheldon, of San Francisco. Application has already been made and contracts signed for the first water rights under the canal.

Among other irrigation matters of importance to the state at the present time are the changes indicated in the following: The bonded indebtedness of the city of Tulare and about 35,000 acres adjacent to it on account of irrigation water will be settled by a compromise on payment of \$270,000 by September 1. As most of this money has already been secured and deposited for the purpose, the liquidation is assured, and there are already signs of

a reawakening in the district. The Spreckels Company contemplates the installation of a pumping plant and canal system in the Salinas Valley sugar beet district, which will bring under irrigation 5,613 acres of the most fertile land in the valley. This venture is to extend the area in sugar beets, and will depend on the wishes of the land-owners as to whether it will be carried out or not. But as it will provide for a sure crop and for a certain home market for the same, there is no doubt but what it will be put in operation. The water in the Hemet Lake reservoir, which comes from perennial streams in the San Jacinto Mountains, is higher than ever before, and during July was 105 feet deep before serious drains were made on it for irrigation. It is supposed that there will be a large reserve supply left after the irrigation season is over, so that even with an unusually dry year following this, the lands under its canals will not suffer. Heretofore the Hemet Water Company has not had a particularly profitable existence, and it is stated that its receipts were, last year, \$8,000 less than the cost of maintenance. That it is beginning to prove profitable is shown by the fact that the tax assessment on the property has been materially increased.

Lakeview, a Riverside county colony, has developed a fine supply of water from wells which will supply all the needs of the area under the colony's tract, 8,600 acres of which are irrigable. In drilling one of the wells here a cottonwood log was struck at a depth of 144 feet, and shortly before this a number of pine cones were brought to the surface. The rehabilitation of the Bear Valley scheme has already been noted, and the work of organizing the water users' association, which will bring this venture to a successful issue after many years of failure, is progressing smoothly and rapidly. The San José Water Company will construct a big reservoir near Wrights, in the Santa Cruz Mountains, to supply water for domestic and irrigation uses. A large tract of land at Rio Vista, near Suisun, has been bonded by a syndicate which announces its intention of spending \$1,000,000, if neces-

sary, in reclamation, most of it to be in the way of drainage. The soil is marvelously rich, like that on Bouldin Island, which has made the asparagus industry of that place famous.



**Impressions
of Philippine
Forestry.**

William A. Dempsey, writing to the *Oregon Timberman* from Manila on lumbering in the Philippines, makes the following comment on the work of the forestry bureau:

"While in Manila I called upon Capt. George P. Ahern, chief of the forestry bureau, and was much pleased to learn of the work being done under his direction. From him I learned that the insular government, through his department, would grant concessions to cut timber upon payment of royalty, the official in charge selecting such trees as they would allow the logger to cut.

"Captain Ahern is very enthusiastic in his work, and I am sure he would place the records of his department at the disposal of any lumberman desiring information regarding the Philippine forests.

"As it is their intention to perpetuate their forests by supervising the cutting, to that end they will require a corps of trained men who have made forestry a study. At present they feel the need of experts, but this demand will soon be supplied from the American colleges, several of which are training students for this special work.

"Under this system loggers and millmen cannot acquire title to land, and they are prohibited from denuding it of timber. In short, they cannot cut any trees except those bearing the official mark. They might install their logging plants, make roads and landings, and then learn that the amount they could get from a given area would not be sufficient to justify them in operating. I believe, however, that this element of

uncertainty will be removed when they have at their disposal enough men and money to enable the bureau to make an accurate survey of the timber lands and to estimate the amount of timber thereon.

"While these restrictions are sure to keep American capital from seeking timber investments in the islands, at least for a time, I am persuaded that they are wise and have for their purpose the conservation of the forest area of the country. This is a matter of great importance, for every agricultural product of the country requires moisture or shade, and the indiscriminate cutting of timber would in time seriously affect the production of hemp, tobacco, copra, and sugar, all of which require a regular supply of rain, and the hemp must have shade as well.

"On the whole, I am convinced of the good work being done by the forestry bureau, and I am informed that its system is so perfected and extensive that they can furnish statistics of the amount of timber cut, and as the timber is classified in groups, they can segregate the total into the quantities of the several varieties, and can readily determine the amount of each variety of wood cut in a province or district. All this information will be of inestimable value to the future lumberman of the islands.

"In connection with the bureau they have a laboratory where tests of Philippine woods are made, and although unable to witness the tests, I was surprised to see the many fine qualities of the wood when brought out by native workmen under the direction of American superintendents. Here were samples of nearly all of the merchantable woods of the archipelago, and the finish given them by Americans showed plainly the possibilities of the woods when they finally reach the markets for which they are adapted."





HON. EDWARD A. BOWERS,

SECRETARY OF THE AMERICAN FORESTRY ASSOCIATION.

HON. EDWARD A. BOWERS, Secretary of the American Forestry Association, who is in charge of the active campaign now being carried on by the organization to extend its membership and influence, is unusually well qualified for this position, both by inclination and experience. He is a native of Connecticut, and received his education at Yale University, graduating from the academic department in 1879 and from the law school in 1881.

Mr. Bowers, in addition to winning marked success as a lawyer, has had an enviable record in the public service. In 1886 he was appointed by the Secretary of the Interior a special inspector in the public land service, in which work he was engaged until 1889, when he resigned. On March 31, 1893, he was appointed Assistant Commissioner of the General Land Office, a position he filled until June 12, 1895, when he resigned, later being appointed Assistant Comptroller of the Treasury.

Mr. Bowers has long been deeply interested in the forest problems of the United States. His connection with the public land service afforded him unusual opportunities for studying the forest questions of the public domain. He has traveled in and studied the forest systems of Europe, and has thus acquired an intimate knowledge of the main features of the subject.

Mr. Bowers has been actively identified with the American Forestry Association since 1889. He was Corresponding Secretary in 1890-'91, and has been a member of the Executive Committee and Board of Directors since 1893. In March of this year Mr. Bowers was elected Secretary of the Association, and is devoting much time and energy in furthering its aims. He is a pleasing and convincing speaker, and with his deep knowledge of and interest in forestry is rendering the Association valuable service. Mr. Bowers' home is in New Haven, Conn., where, in addition to his law work, he is a lecturer in forest administration and law at the Yale Forest School.

THE AMERICAN FORESTRY ASSOCIATION MEETING.

THE SUMMER SESSION AT MINNEAPOLIS WAS ONE OF THE BEST ATTENDED AND MOST INTERESTING HELD BY THE ASSOCIATION.

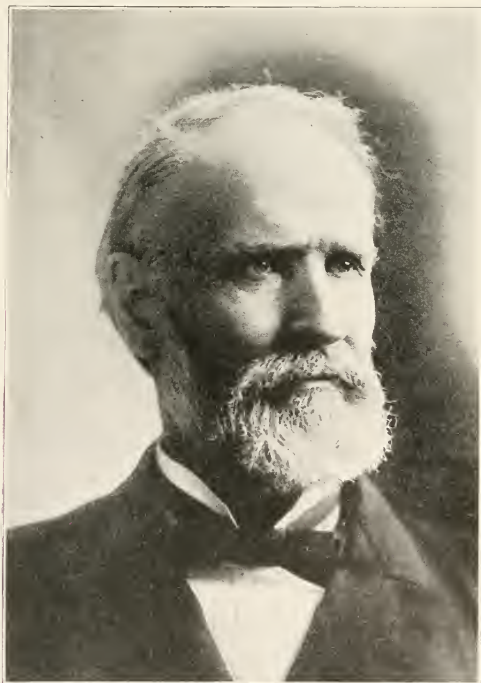
THE American Forestry Association met at Minneapolis August 25-26, and devoted a large part of its sessions to the consideration of forest problems which directly affected the State of Minnesota. Many of the papers provoked warm discussion, and altogether much of value was elicited from the points of view of the various interests represented. The attendance at

the several sessions was large and thoroughly representative. A number of the leading lumbermen of the State were present and took part in the discussions. There was a noticeably large attendance of ladies, many of them members of the Federation of Women's Clubs, who took such an active part in the agitation for a national forest reserve in Minnesota.

Gen. C. C. Andrews, State Fire

Warden, made the address of welcome. Immediately following that came a spirited discussion over the points brought out by a paper on "The Effect of the Chippewa Forest Reserve on the Locality," by Herman H. Chapman, superintendent of the University of Minnesota Experiment Farm at Grand Rapids, in which he stated that lands which grew Jack Pine and Norway Pine were generally unfit for agriculture, being too sandy and requiring too much artificial fertilizing to make them paying farm properties. This discussion was participated in by A. G. Bernard, of Cass Lake; Prof. Filibert Roth, head of the school of forestry of the University of Michigan, and by R. L. McCormick, president of the Mississippi Valley Lumbermen's Association, which organization met in Minneapolis at the time of the American Forestry Association's convention.

W. B. Douglas, Attorney General of Minne-



HON. JAMES WILSON, SECRETARY OF AGRICULTURE AND PRESIDENT OF THE AMERICAN FORESTRY ASSOCIATION. HIS ADDRESS WAS A NOTABLE FEATURE OF THE MINNEAPOLIS MEETING.

sota, presented a paper on "State Parks and Their Relation to Forestry," with special reference to the work which had been done toward reforesting the Itasca State Park, of which he is the custodian. Dr. C. A. Schenck, forester for the Vanderbilt estate at Biltmore, N. C., and director of the Biltmore Forest School, presented a paper on "Financial Results at Biltmore," interesting in its setting forth of the possibilities of private forestry.

The afternoon session of Tuesday, the 25th, began with an address on the "Progress of Forestry in Michigan," by Edwin A. Wildey, member of the Michigan Forestry Commission; this was followed by a paper on "Forestry Courses in Agricultural Colleges," by Prof. S. B. Green, head of the department of horticulture and forestry at the University of Minnesota. Prof. Ernest L. Bruncken, in charge of courses on Forest Law and Forest Economics at the Biltmore Forest School, and formerly a member of the Wisconsin Forestry Commission, read a paper on "Taxation; Its Effect on Private Forestry," in which he advocated some needed reforms.

On Tuesday evening, August 25, the delegates were given a reception at the Commercial Club, among those present being Governor Van Sant and President Northrop, of the University of Minnesota.

The Wednesday morning session was more largely attended than the others on account of the interest which attached to the paper by Eugene S. Bruce, lumberman of the Bureau of Forestry, on the "Work and Policy of the Bureau of Forestry on the Minnesota National Forest Reserve." In this address he told of the difficulties the government had encountered in making the forest



THE BACKWARD BOY: I'VE NEVER HAD MUCH USE FOR SCHOOLMARM'S BEFORE, BUT PERHAPS I SHALL LEARN SOMETHING FROM YOU.—ST. PAUL "PIONEER PRESS."

reservation authorized under the Morris act, and gave a detailed history and description of the reserve. He said that the 5 per cent of merchantable timber to be left on the land was too low a limit, and that 25 per cent would give better results. The paper had a great deal of interest and value, especially to those who were directly interested in lumbering the tract under government contracts. Secretary Wilson attended the session, but declined to preside on the plea that he had come to learn, rather than to direct things. Several miscellaneous matters came up at this time, including an invitation from Chattanooga to hold the next meeting there in order to stimulate the movement for a national Southern Appalachian forest reserve. B. A. Fowler, of Phoenix, Ariz., was appointed a delegate to the National Irrigation Congress to be held at Ogden, Utah, in September. Following this there was a general discussion on the points brought out by Professor Bruncken's paper of the day before, and

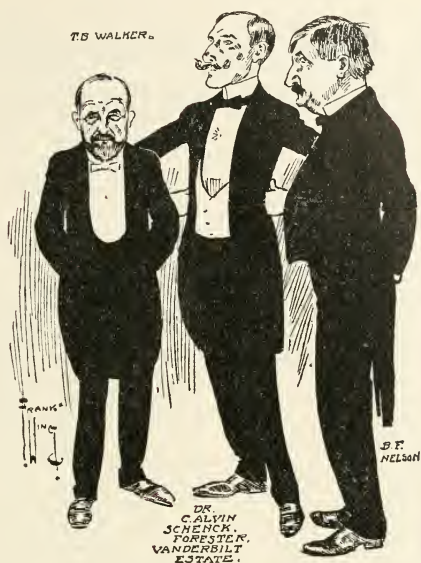
all who spoke, including Dr. Schenck; Dr. Folwell, of the University of Minnesota; George K. Smith, of St. Louis, Secretary of the Southern Lumber Manufacturers' Association, and R. L. McCormick, opposed the whole idea of timber taxation as at present administered. Then followed the paper of B. F. Nelson on "A Lumberman's Idea of Reforestation," and after that T. B. Walker, of Minneapolis, addressed the meeting on "Our Past and Future Forest Policy." As both of these latter addresses were by practical lumbermen, the Wednesday morning session was notable as being given up entirely to the lumber interests in their relation to the forest movement.

The Wednesday afternoon session was marked by several important papers, starting with one by Prof. Filibert Roth, director of the School of Forestry of the University of Michigan, on the "Possibilities of Reforestation in the White Pine Belt." This was followed by an address on "The Future of Our

National Forest Reserves," by Hon. Edward A. Bowers, Secretary of the association. He spoke of the better understanding among the people generally as to the purpose of the forest reserves, particularly in the West, where their situation at the headwaters of important streams gave them value on account of the needs of irrigation. Prof. C. W. Hall, of the University of Minnesota, spoke on the "Geographical Features of Water Control in the Upper Mississippi Valley." Prof. L. H. Pammel, of the department of botany of the Iowa State Agricultural and Mechanical College, discussed "Some Forest Conditions in Western Wisconsin," and he was followed by Dr. B. E. Fernow, whose address on "Needs of the Hour" closed the sessions. He said that the principal needs were the realization by legislatures and officials of the immediate seriousness of the forest situation, the establishment of well organized forestry bureaus in all States, and, above all, an efficient fire police.



SKETCHES MADE AT AMERICAN FORESTRY ASSOCIATION MEETING.—FROM MINNEAPOLIS "JOURNAL."



AT THE RECEPTION BY THE COMMERCIAL CLUB; SEVERAL PROMINENT DELEGATES AS THEY APPEARED TO ARTIST FRANK WING OF THE MINNEAPOLIS "JOURNAL."

On the evening of Wednesday, August 26, Secretary Wilson addressed a mass meeting at the Plymouth Church. This address was on the general subject of "Forestry," and designed to give his listeners a correct notion of the work being done by the Bureau of Forestry and by all who are interested in forest extension and preservation.

A gratifying feature of this meeting was the attitude of the press of the "Twin Cities" especially, and of even more remote places. Excellent and

accurate accounts were given by the St. Paul *Pioneer Press*, the Minneapolis *Journal*, *The Times*, the St. Paul *Globe*, *The Dispatch*, and others. Many gave important editorial comment, marked not only by a genuine interest in the subjects presented at the meetings, but also by an evident knowledge and conviction on the several points under discussion.

Future issues of FORESTRY AND IRRIGATION will contain addresses delivered at this session.



FORESTRY ON THE FARM.*

THE VALUE OF THE FARM WOODLOT AND
SUGGESTIONS FOR ITS MANAGEMENT.

BY

GIFFORD PINCHOT,

FORESTER, U. S. DEPARTMENT OF AGRICULTURE.

BEFORE our ancestors came to this country forestry had already taken an important place in Europe. It was based there entirely on the exclusion of the farmer from all rights in the forest. Forest protection arose purely from game protection, and the farmer was carefully kept out of the forest. He got in that way an extreme respect for the forest and for forest protection; and when the early Pilgrims came over to America they brought with them the tradition of centuries of respect for the forest.

The consequence was that when this handful of people landed on the shore of a continent which they did not know stretched westward for about 3,000 miles, nearly half of which was covered with forest, one of the first things they did was to provide for the protection of trees, for protection to the forest, which in actual fact was one of the severest obstacles with which they had to contend. They began passing laws in Massachusetts, New York, and New Jersey to prevent the cutting of timber which might be used for masts. It was simply a survival of what had come over with them from the other side. Then, as there came a better understanding of their situation, driven into their minds by their contention with the forest for the bare necessities of life, the conception of forestry which until recently held sway practically throughout the United States came gradually into being. The forest was recognized as the enemy of the farmer, and his whole effort for many years was to get rid of enough of it to give him a place to raise his crops.

With that conception of their relation to the forest, the pioneers pressed westward, and they carried with them the American axe, which, so far as I know, is the most effective tool that man has yet devised; and the American axeman-farmer began getting rid of the forest as rapidly as possible. Then came slowly the reaction, the beginning of which we are feeling now, the reaction in favor of forest protection, and the destruction of the forest began to be limited and controlled, partly by the agitation of the forest question, but chiefly by the economic condition of the nation. This question, like many others, has its solution in the economic situation. The situation in early days was that there was more timber in the country than people at the time had any reason to believe they should need. Timber was cheap, and much of it had to be got out of the way to make room for the farm. For that very reason, until just now, it was not worth anybody's while to look to forest protection. The economic situation was not ready for the agitation which was being made in favor of it, and consequently forest preservation interested very few people and had no hold whatever on the great body of the nation. Now we are getting to the place where it is worth men's while to consider whether forest protection is not to the advantage of their pockets.

The essence of forest policy, as we understand it now, the basic principle of it in this or any other country, is the putting of every part of the land to its best use. That conception controls the whole forest policy of the national government. It controls, likewise, the forest

* From an address delivered before the New York Farmers' Club.

policy of a good many of the large landholders who are taking up this question, and in some respects most important of all, it should control the policy of the practical farmer on the ground. As a producer, the farmer is vitally interested, necessarily, in this point of view; as consumer, his conception of the matter is a totally different one.

First, then, a word as to the relation of the farmer to the forest as a producer. If it be the policy of the farmer to put every bit of his land to the best use, it must be his policy to make his bit of woodland as productive to him as possible, and usually in one of two ways—either by giving him his material for fence posts, building materials, and cordwood, or by yielding its money equivalent. The farmer, as a rule, is not interested in his woodlot as capital; he does not care especially what the interest on his capital thus invested amounts to (that is for the lumber company); the farmer thinks that his woodlot must either give him as much usable material as possible or the largest return in dollars and cents. He takes up the question usually from the point of view of immediate profit, and he begins to cut his woodlot in order to get from it what he most immediately needs, and usually that is his cordwood, his fence posts, and timber for his house or his barn. He goes at it generally in the wrong way, because the material he needs is usually the best material on the ground. The farmer wants straight timber, his wife wants clean split stuff for the stove, and he himself wants rails that will split easily. So he takes the best there is. The result is shown over thousands of square miles in woodlots producing a very small fraction of what they might easily yield.

It is one of the most difficult things to give more than general directions for handling woodlots unless you go on the ground and see what they need. The forester who attempts to give advice as to handling any tract that has been cut over in this way has a piece of work on hand very much like that of a doctor, and he is constantly obliged to compromise with the things he would like to do, because of mistakes already made.

There are, however, certain general directions which may be very briefly touched upon.

The first is, in cutting out your woodlot, take the bad trees and the trees of the kinds that you do not want reproduced. The composition of any piece of forest is necessarily determined by the seed trees which produce the trees from which it grew. It is perfectly obvious that if you want White Oaks in your woodlot, you must leave the White Oaks and cut out the other trees. The selection of the best and most useful species by the farmer has led to very serious deterioration in the character of the woodlots over the eastern parts of the United States. As I came across by rail from San Francisco a little while ago, I was immensely struck by the wretched condition of the woodlots along the line of the railroad. Everywhere the best timber had been cut. The wood had been taken out almost entirely without regard to the future crop, and, as the leaves were off, I could see the extremely poor and unproductive condition of a great majority of the woodlots along the road. This matter is of enormous importance, because between *one-third and one-half of the forests of the United States is in the hands of farmers*, and depends for its preservation and right treatment on the point of view that the practical farmer takes of the handling of his woodlot.

Having stated these obvious things about selection of species, the next thing is the choice of the individual trees. Pay no attention whatever to the distribution of the trunks on the ground. It makes no difference that the intervals between the trunks of the trees are unequal. A tree's health is almost entirely determined by the crown, and that is the place to look in deciding what trees to take and what to leave, remembering always that the more valuable kinds of trees are to be left for seed and the unsound trees taken out everywhere. The place to look is at the crown. Select your trees so that what remain will be so spaced that each one will have the best possible amount of growing space.

In a growing forest it is not less un-

fortunate for the trees to stand too far apart than too close together. What is wanted is a healthy stand of the most valuable kind of timber, and for that we must have tall, straight trees, with trunk clear of branches far above the ground. They must have room enough, but not too much room. I make this point strongly, because I find in dealing with men on the ground that their first idea, as a rule, is to thin out, and generally to thin out far too strongly. In that way danger lies. Give your trees sufficient growing space, but be careful not to give them too much. If you admit too much light to the ground, so that it dries out and the grass starts, it becomes difficult for the young seedlings to gain a footing. You must keep the soil moist and loose and in condition for a good seed bed, and to that end keep the forest dense.

There are two kinds of cutting which the farmer is called upon to do. The first, of which I have already spoken, is thinning in order to give the trees which form the future crop the best chance for satisfactory growth. In my experience, it has been a most useful rule, as it is a very safe one, to ask yourself this question: What are the trees that are to form the future crop in this forest? In very many cases you will find yourself led in this way to take out old trees of large size which otherwise would seem naturally indicated to remain, because after considering you find that the majority of the crop is composed of younger trees. If the old trees were permitted to stand, they would inevitably shade out the younger ones beneath them, and you would have a lot of slim poles growing up between old useless trees with spreading crowns. The Germans call these overbearing trees "wolves" in their forest terminology, because they bear down and destroy the little ones. They shut out from the light the young trees which would otherwise come out and in due time make valuable timber. This, to my mind, is a point of very great importance.

When you come to the second kind of cutting, which is the final cutting, when you take out the old trees under which

there is young growth, or where you expect young growth will shortly be, you will find many different methods open to your choice. The one essential thing to remember is that your object in taking out the old trees must be not only to harvest them, but to get a young crop. Just as soon as that conception is born among the farmers and lumbermen of this country, the forests will be safe, but until that time there can be no assurance of safety. That is the kernel of the whole business: you must provide for a second crop.

You will have noticed, in talking with farmers on the ground and with the managers of your own farms, that young trees less than 10 or 12 feet in height apparently do not exist for them. I have had lumbermen tell me over and over again that certain trees, as, for example, Yellow Poplar, never reproduce themselves. I have taken the men who made these statements into the forest, and have shown them quantities of young growth of the trees which they say never reproduce themselves. The lack is not of young trees, but of the habit of taking them into account. A young tree of three or four years' growth may be as important for the future of the forest as one 20 feet high. Therefore, in cutting out the old trees, save every little seedling that you possibly can, and throw the old timber in such a way as to break down as little as possible of the young growth. Every sound tree can be thrown at least three ways, and the chopper soon gets into the habit of taking damage to young growth into account when he gets ready to fell the tree. It is astonishing how difficult it is to get men to take slight precautions at the beginning, and yet how easily they fall into the practice of them after a little.

I am reminded in that connection of the experience of the Bureau of Forestry with an important timber tract in the Adirondacks belonging to a member of this club. After careful study on the ground, the Bureau laid down certain rules for the cutting of Spruce. These rules were discussed and revised with the owner and the lumberman, and with the jobbers who were to do the work. Be-

cause the matter was in the hands of a practical lumberman, the rules were applied by the jobbers without any increase whatever in price, which means that the cost of the logging to the owner over ordinary methods was nothing at all. Forest destruction in logging is often a matter of habit of mind. As soon as the logger falls into the way of saving young growth, he does it as a natural consequence of his work, without thought and practically without greater cost of time or effort than his work demanded before.

One of the most effective methods of forest reproduction for the use of the farmer is technically called the Group System. Like the rest of forestry, it is simply an application of the methods which we learn from Nature herself. You have all seen over and over again where a single tree or half a dozen trees together have fallen in the forest from wind or some other cause, and have left an opening which has come to be filled with young growth. The tallest and most vigorous trees will be in the middle of the opening and the smaller ones under the denser shade of the sides. All that is necessary to extend the reproduction in such a case is to cut away the old trees at the sides of the hole. If you need timber faster than

a single opening will produce it, make others. Then, as the young growth spreads, these holes will spread, and gradually you will find the whole surface of the ground has been occupied by young growth, which, spreading like a series of spots of oil on the surface of the water, gradually meet. Then your reproduction is complete, and the forest cover has never been seriously broken. This is perhaps the simplest of what we call the silvicultural systems, and the one decidedly the best adapted for the woodlot of the farmer. Nothing more need be said of it except to make the openings comparatively small, not more than twice the height of the trees, to work up the trunk and the top immediately after they are down, and to let the young growth spread gradually year after year until the openings run together. Young trees that have been crushed from the fall of an older tree, if released at once, spring up and make good timber, but they may be permanently ruined if they are pressed down for three or four days.

Such work as this is simply and easily carried out, and with these simple precautions leads, wherever the reproduction is good, and that is nearly everywhere throughout the humid regions of the United States, safely and inevitably to the preservation of the forest.

PRACTICAL IRRIGATION A SUCCESS IN FLORIDA.

FACTS AND STATISTICS CONCERNING THE RECENT DEVELOPMENT OF A MOST IMPORTANT PART OF THE STATE'S NATURAL WEALTH.

THE adoption of extensive irrigation enterprises in Florida came as a natural result from several fundamental causes, chief among which is the fact that in Florida irrigation can be applied to a relatively larger area than in any other state in the Union. Practically the entire surface of the state is level, nowhere reaching an altitude of 500 feet, and, in addition to this, the water supply is readily available and inexhaustible. The state's total area is

58,680 square miles, of which 4,440 square miles, or 8 per cent, is water, making the state first in the extent of its water surface. Aside from the surface waters of lakes and streams, there appears to be a great artesian basin near the coast line extending entirely around the state and to areas adjacent to tidal rivers and large lakes. On the ridges or higher lands in the central part the wells do not have a surface flow, but afford an abundant supply of

water when pumped. Although the state has a heavy mean annual rainfall, it is subject to severe drouths during the growing period between February and June. The soil is naturally non-retentive of moisture, and owing to the great heat, evaporation is excessive. During the dry seasons the need of irrigation is imperative, especially as the products of the truck farms and groves are of great commercial value, rendering even a partial loss of crops very costly.

In general, the lands of Florida may be classified as hammock, high pine, flat wood, and swamp. The hammock land is covered with Live Oak, Hickory, Cedar, Palm, and Magnolia. When cleared it is the most fertile, and is usually planted in truck. High pine land is favorable for horticulture, but as the soil is thin, heavy fertilization is required. The flat woods are largely given to grazing, although in some sections they have been found well suited to the growing of potatoes. The swamps when drained are peculiarly adapted to the cultivation of rice and sugar.

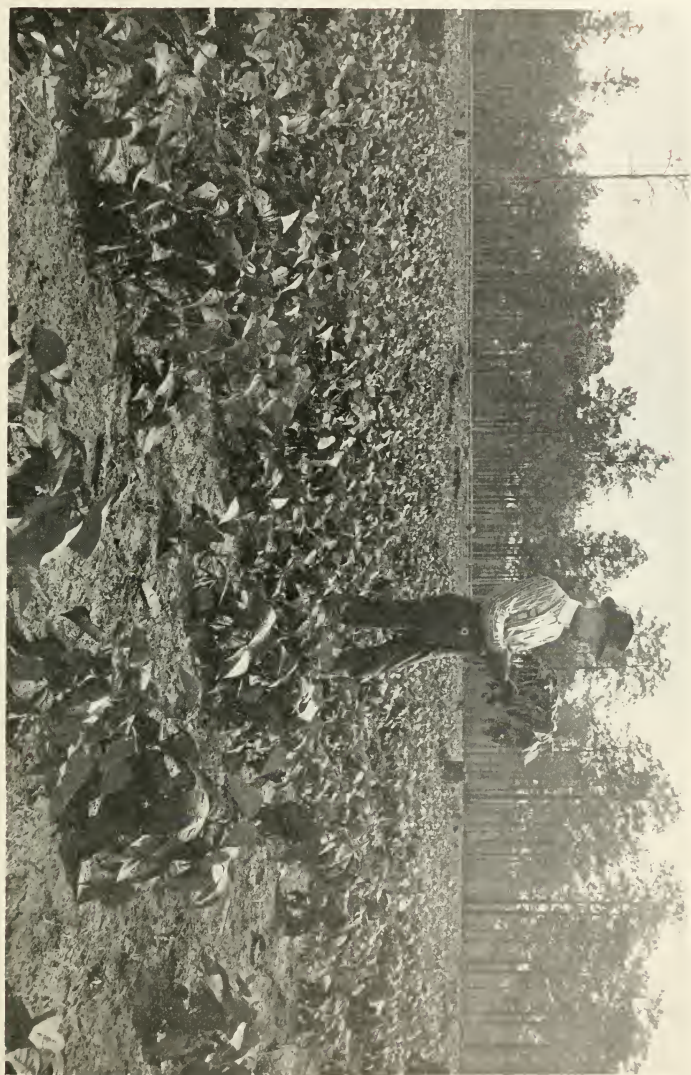
The history of irrigation and intensive farming in Florida dates from the two severe successive frosts of the winter 1894-'95, which destroyed nearly all of the large orange groves of the state. Previous to that time irrigation was confined to an occasional watering of orange groves during the periods of spring drouth. Many of these irrigation systems were large and expensive, consisting of engines, pumps, reservoirs, and iron pipes. After the frost they were abandoned, and for several years were left to rust and decay.

About this time truck farming began to assume considerable proportions, and a number of orchardists turned their attention to this industry. In the first experiments with irrigation in the growing of early vegetables the old engines and pumps were utilized, many of them by the orchardists themselves, who were forced by circumstances to engage in the industry. A majority of these old plants, however, were secured for little or nothing by small farmers and transferred by them to other parts of the state. The first trial of irrigation gave a hint of the possibilities of intensive

agriculture, and created an active demand for the old machinery in all parts of the state. With a better knowledge of the soil, fertilizer, and water requirements of certain vegetables came improved yields and greater profits, and irrigation and truck farming began to extend all over the state. The results have been so generally satisfactory that much interest and enthusiasm on the subject have been aroused among the progressive farmers and among those interested in farm investments in the state.

In comparison with the soil of western states, that of Florida is very poor. Successful farming requires large quantities of fertilizer and frequent and careful cultivation. It is therefore somewhat remarkable to find a state which has been thought to require the importation of a soil before it could produce a crop holding such a prominent place in the truck-producing region. While Florida contains extensive phosphate beds, very little, if any, of this valuable fertilizer is used within her borders nearly all that is mined being shipped outside of the state. The principal commercial fertilizer used comes from the large packing-houses and from manufacturers of fertilizer in other states.

The Florida truck farmer enjoys a distinct advantage in being able to plant in September and to place the products of his fields on the northern markets when there is no competition and when prices are highest. He harvests in January, February, March, and April, and is practically through with his crops before the truck from other states is ready for shipment. Intensive cultivation of small areas therefore brings greater profits than are derived from large tracts devoted to the same crops in other states, and instances are common where with careful irrigation 5 or 10 acres yield a comfortable living with but a few months' work. Intensive agriculture when combined with irrigation tends to promote the growth of small, compact communities, affording the farmers a greater degree of social enjoyment, better schools, and numerous other advantages which are unusual in ordinary farming communities.



FIELD OF IRRIGATED STRING BEANS, SANFORD, FLORIDA.

The districts in which irrigation is practiced are widely scattered. Commencing in the extreme northwestern portion, they extend through the central part, with numerous areas on the east and Gulf coasts. In northwest Florida irrigation is applied in the growing of Sumatra tobacco, while in other sections it is utilized in the cultivation of truck and small fruit farms, orange groves, pineries, and nurseries. The water for irrigation is obtained from streams, lakes, and non-flowing wells, by various pumping devices, or from artesian wells having a strong surface flow.

IRRIGATION SYSTEMS.

Pumping Plants.—Florida's streams, while large and of great volume, have little fall, and irrigation by gravity ditches is not practicable. Hence the water from the streams and lakes is pumped into reservoirs on the higher lands and thence diverted to the fields. The expense of installing and operating a plant is the only limitation upon the growth of irrigation, but the initial outlay is so great as to prohibit its application to any except special crops which yield the largest returns.

The pumping plants are reported chiefly from the vicinity of Quincy, in Gadsden county, where Sumatra wrapper tobacco is grown, and from Gainesville, in Alachua county; but others are scattered throughout the state. The systems in Gadsden county are the largest and most expensive in the state. The water for these plantations is pumped from creeks and rivers to reservoirs, sometimes 120 feet above and nearly a mile distant from the streams. These reservoirs are cement lined and hold from 500,000 to 2,000,000 gallons. The capacities of the pumps range from forty to sixty thousand gallons per hour. In some cases the water is pumped directly into troughs and led upon the fields, while in others the elevation of the fields necessitates two lifts and two reservoirs. On one of the plantations two turbine wheels are used, one of 45-horse power coupled direct to two triplex pumps. One pump delivers water 1,500 feet west of the river to fields 40 feet higher. The other delivers

water 4,200 feet to a reservoir 50 feet above the stream.

At Gainesville the pumping plants are used in the irrigation of truck, principally lettuce and cucumbers. The water is pumped direct to the fields in iron pipes and applied by means of hydrants and hose connecting with the main supply pipe, or by overhead sprays arranged on stand-pipes in various parts of the fields.

Many of these pumping plants are in operation in other parts of the state, but are used mostly in the orange groves. Irrigation is keeping pace with the rapid increase in the areas devoted to this fruit, as it has been found of great value in promoting the growth and health of the trees during the dry season.

Artesian Wells.—The artesian basin of Florida, which is now being developed by wells, is already a very important factor in intensive agriculture. The great extent of the basin and the accessibility of its waters presage a much greater utilization of this method of irrigation in the future.

The water horizons vary somewhat, but are nowhere at great depth, flowing wells being obtained by borings from 20 to 500 feet. Many of the deeper wells reported are on the Island of Terra Ceia on the Gulf coast, and in Brevard county on the east coast. The greatest variations in the horizons are noted in the Gulf coast area. Nearly 100 wells are reported from Hillsboro county, most of them in or near Tampa. These wells are from 25 to 120 feet deep and have a comparatively strong flow. In Manatee county, and particularly on the Island of Terra Ceia, 60 miles south of Tampa, the wells have depths of from 240 to 500 feet.

A large number of wells are reported from Orange county with depths varying from 80 to 200 feet. In this county, a considerable area near Sanford, on the St. Johns River, has been developed by these wells. This district affords one of the best concrete illustrations of the results of irrigation in connection with the cultivation of garden crops, which in the neighborhood of this place has become the principal industry of the people.

The greatest utilization of artesian water within a given area is on the Island of Terra Ceia, where the individual areas under cultivation are small, ranging from 5 to 30 acres. The wells on the island have a strong surface flow, and show no diminution in volume after several years' continuous use. A 3-inch artesian well, costing about \$350, frequently will irrigate 10 acres. At Sanford the capacity of the average artesian well is 5 acres, and the cost varies from \$60 to \$125 for 3 and 4 inch wells. At Hastings, St. Johns county, a 4-inch

artesian waters of the state contain sulphur in considerable quantities, the cause of failure may lie elsewhere. Experienced irrigators ascribe the lack of success in east Florida to excessive flooding and failure to cultivate the land immediately after irrigating and not to injurious mineral ingredients in the water. It seems probable, therefore, that, with further study and experiment with reference to crops, soil, and the quantity of water required, irrigation may prove as successful in the east coast region as elsewhere.



FIELD OF IRRIGATED LETTUCE, SANFORD, FLORIDA.

flowing well affords sufficient water for the irrigation of 10 acres or more. One well is reported to have irrigated 45 acres.

Considering that successful irrigation requires skill and experience, the failures reported in Florida are very few. The greatest number of unsuccessful attempts to irrigate from artesian wells are reported from the east coast region, where irrigation has not made the same progress as in other sections of the state. The reason commonly ascribed by irrigators for these failures is that the artesian waters are strongly impregnated with sulphur and have proven injurious to plant growth. Inasmuch as all the

METHODS OF IRRIGATION.

Irrigation by Pumps.—The most elaborate irrigation systems in the state are employed in the vicinity of Quincy, Gadsden county, in the growing of Sumatra tobacco. The Sumatra plant requires special soil, cultivation, and irrigation to bring it to perfection, and the present success of the planters has been attained only after the most careful study of the plant's needs, and long and frequent experimenting with soil, fertilizers, and irrigation.

The best grade of Sumatra requires protection from the direct rays of the sun; hence these large plantations are

covered with framework, over which millions of yards of cheese cloth are stretched or miles of narrow slats are laid. The soil must be prepared with the utmost care, and 26 wagon loads of stable manure and $1\frac{1}{2}$ tons of cottonseed meal per acre are thoroughly mixed with it. The plants are grown from the seed, which is usually planted in small clearings in a swamp and under cheese cloth. As soon as they reach the size of young cabbage plants they are transplanted, and are set about 14 inches apart in rows 2 feet apart. From 10 to 14 thousand plants are set to the acre. Many of the fields are equipped with overhead pipe lines, with sprays every 33 feet, the water being applied in the evening.

Where overhead irrigation is not practiced, the fields are divided at regular intervals by wide wooden troughs. These troughs are supplied from reservoirs above the field, or from pipes directly connected with pumping plants on the streams. As soon as the plants are firmly set a "scooter" is run between the rows, throwing up a flat-bottom furrow, through which the water is directed from the troughs.

In the overhead system, now recognized as the most perfect and satisfactory method of artificial watering, 2-inch pipes are run over the frames in parallel lines about 40 feet apart and extending all over the fields. At intervals of 40 feet a small iron pipe, the upper end of which is closed with a spraying attachment, extends upward about 4 feet above the shades. When the water is turned on it comes out of the sprayer in a fine mist and falls like a gentle rain upon the plants. Tobacco grows extremely fast, in some instances attaining 9 feet in 37 days, necessitating support for the plants. A fair yield of Sumatra tobacco in Gadsden county is 1,000 pounds to the acre, although it frequently runs as high as 1,500 pounds.

The industry requires the investment of large capital, gives employment to a small army of colored laborers, and has become a strong factor in the material development of Gadsden county. At present all the irrigated plantations are controlled by people from the North.

In the vicinity of Gainesville, where lettuce and cucumbers are the leading products of the truck farms, scientific methods are employed to bring the crop to early maturity. The lettuce is planted in thoroughly moistened seed beds, protected by canvas stretched over frames, and the irrigation in nearly all cases is by means of sprays from overhead standpipes. In some cases the sprays are affixed to the ends of movable pipes, which are turned first to one side and then the other, one spray covering 20 feet each way. Along the north and west sides of the beds large steam pipes are laid as a protection against cold nights and to force the growth of the plants. As soon as the lettuce has a good start it is heavily irrigated every day. As the lettuce is marketed, cucumber plants are set between the rows, so that when one crop is over another is well along.

Orange groves are irrigated in various ways. One irrigator in Brevard county uses a No. 6 hydraulic ram in a small stream on his place. The stream has a fall of 6 feet, and the ram lifts the water through a 2-inch pipe to a reservoir 37 feet above and 400 feet from the stream. From the reservoir the water is carried in iron pipes by gravity to a 6-acre orange grove, a small pinery, and garden. Irrigation is by hose attached to hydrant connection on main pipes. The expense of operation amounts to very little, and the plant has been a success for several years. Some of the largest groves are piped throughout with cement pipes connected with 2-inch hydrants, to which the hose is attached. In others the water is carried to the trees by means of furrows. Trees which are irrigated are said to better hold the fruit, which does not split when the rains set in.

Irrigation from Artesian Wells.—The largest areas in truck irrigated by artesian wells are in the hammock lands, the soil of which is black, light, and largely composed of vegetable mold, though seldom very deep. Irrigation has been successful in several sections of pine lands, though these are not, as a rule, as rich as the hard-wood hammocks. The initial outlay for irrigation by wells is large, as the land must be cleared, leveled, and ditched before it

is ready for putting in the tiling and iron pipes. Several systems are employed in irrigating the fields. One in common use is as follows: Continuous underground cement pipes are laid from the wells to hydrants, plugs, or stand-pipes, from which the water is distributed in small furrows between the rows. These pipes are made and laid by the same machine, in trenches previously prepared, and extend without a break to any desired part of the field. The pipe itself is composed of two parts sand and one part cement, with the usual

it is possible to irrigate one acre and leave all the surrounding acres dry. Drainage is managed in the same way and through the same pipes, by cutting off the flow of the wells and removing the plugs or cut-offs.

Irrigation in the vicinity of Tampa is largely by underground drains of wood, the water being run from the wells through pipes into ditches which are connected with V-shaped drains running at right angles. By closing or opening these drains at the lower end the land is irrigated or drained at will.



IRRIGATED CELERY FARM OF A. ROBBINS, SANFORD, FLORIDA.

inside measurement of 3 inches and an outside measurement of 6 inches, and costs about 8 cents per linear foot.

In one of the systems of sub-irrigation the water is carried through pipes 14 inches below the surface, broken every 10 inches and laid in beds of charcoal. The lines of pipe are laid every 20 feet. These pipes run east and west and are crossed every 280 feet by 4-inch water-tight supply pipes. At the junction of these pipes is a brick and cement box or pocket, into which all pipes empty. The bottom of this box is 21 inches below the surface, and the flow of the water is regulated by a system of plugs or cut-offs. Under this system

One irrigator near Oviedo reports the use of artesian water primarily for the purpose of warming a covered nursery. He has hydrants 4 feet apart each way and irrigates with sprays. During the coldest night of 1902, when the thermometer registered 18° F. for several hours, the temperature in this shed did not go below 48° or 50° at any time. The hydrants are used also to irrigate the ground, both methods of irrigation being found necessary there, owing to the remarkable porosity of the soil. It is said that a stream of water might play all day on one square yard without adding perceptibly to the moisture of any of the rest of the ground.

The temperature of the artesian water is about 72° F., and advantage is taken of this by numerous irrigators on Terra Ceia island. The artesian flow is turned on the north side of the cucumber fields, and has been found to protect them from frost for some distance.

GENERAL STATISTICS.

Among the humid states where irrigation is practiced for general crops, Florida continues to hold first place in the number of irrigators, amount invested in irrigation systems, acreage irrigated, and total value and average value per acre of irrigated crops.

In 1902 irrigation was reported from 405 farms, the irrigated area being 3,772 acres and the irrigation systems representing a constructive outlay of \$512,859. The total artificially watered area producing crops was 3,313 acres and the value of the crops grown thereon was \$1,432,530, an average of \$432 per acre. The irrigation systems cost \$446,569, an average of \$135 per acre. There were 56 farms, having an irrigated area of 459 acres, which did not produce crops in 1902, the land being in young orange trees. The cost of constructing irrigation systems supplying these farms was \$66,290. There were also reported 25 irrigation plants, costing \$26,658, that were not operated in 1902.

The highest average value per acre of irrigated products is reported from Manatee county, the irrigation being by windmill, steam pump, and hydraulic ram. One of these systems is employed in the irrigation to two acres of pot

plants and nursery stock, which are sold mainly to owners of conservatories in the North. The value of the products in 1902 is reported as \$30,000, or \$15,000 per acre.

The lowest average first cost of irrigation per acre is reported from Saint John county. This is partly due to the large volume of the wells and to the simple methods employed in applying the water to potatoes, the principal crop irrigated. The comparatively high average first cost of irrigation in Orange county is due to the expensive system of tiling employed in applying the water and draining the land. In Manatee county, where the system of tiling for irrigation and drainage is also very complete, the wells have a stronger flow and greater pressure, and supply larger areas, thus reducing the initial outlay per acre for irrigation.

In view of the very large increase in the use of irrigation in the cultivation of general crops and the success which seems to have uniformly followed its application, a very much greater development in the trucking industry is to be expected.

In nearly every section of the state possessing favorable transportation facilities, the first experiments with irrigated truck have resulted in a steady increase in the acreage thus cultivated.

The information contained in the foregoing article is contained in a report prepared by Clarence J. Blanchard for the Census Bureau, and is based upon information obtained by correspondence and work in the field.

THE HOMEMAKER OR THE SPECULATOR?

A STRONG NOTE OF WARNING ON THE DISPOSAL OF THE REMAINING PUBLIC LANDS.

BY

WILLIAM E. SMYTHE.

SHALL the nation's great domain of western arid lands and the nation's money be used to enrich a comparatively few greedy individuals, or shall they be

used to furnish security and happiness for millions of men, women, and children?

Uncle Sam is still rich enough to give

us all a farm, and an irrigated farm at that. It is not a dream, but a fact, that the present population of the United States can be duplicated on the arid public domain in the West.

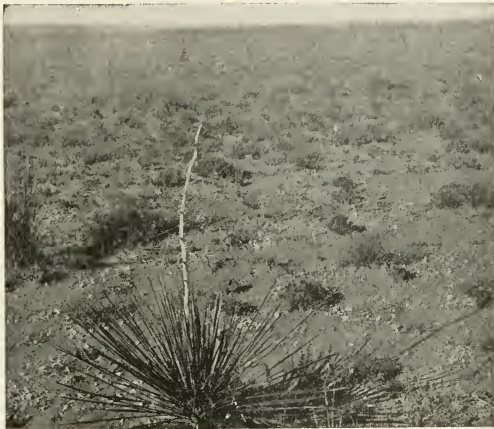
This can be done without making new competitors for those already engaged in agricultural pursuits in the east and in the south. On the other hand, this wonderful act of planting a new nation in what is now all but an unbroken wilderness will confer enormous benefits on those sections which are already covered with farms, factories, and towns.

The subjugation and settlement of the great empire of public lands means that every factory wheel in the United States must whirl faster, that every banking house must handle more money, and that every railroad must transport more passengers and freight. This, in turn, means a larger and busier population in every eastern and southern town, and that, of course, will quicken and enlarge the demand for all the products of the soil in the older sections of the country.

In the meantime, that which is grown from the soil to be conquered by irrigation in the West will go almost exclusively to the feeding of new home markets to be created within the arid region itself and to the satisfaction of unlimited demands in the Orient and in the frozen north.

Congress has decreed that the great policy of national irrigation shall be entered upon without delay. Already the engineers and surveyors are doing their work, and five great projects have been reported favorably to the Interior Department. Only about \$7,000,000 are required to carry all five to completion, and the money is in the Treasury awaiting the call. But upon the threshold of the greatest constructive policy to which this nation ever set its hand a new and appalling obstacle is encountered.

Almost every acre of these lands which the nation is about to prepare for the swarming of a home-building population may, under existing laws, be stolen and used as the basis of a profitable speculation. And those who desire to secure these lands for speculative purposes are strong enough to tie the hands of Congress until the deed shall have been done. This, too, in spite of the fact that the President of the United States has urged the repeal of these iniquitous land laws as something which is vital to the success of the national irrigation policy.



A BIT OF DESERT LAND BEFORE THE APPLICATION OF WATER.

Shall the nation's land, then, and the nation's money be used to enrich a comparatively few greedy individuals, or shall they be used to furnish security and happiness for millions of men, women, and children?

This is the question which must be answered when Congress meets again. The answer depends absolutely upon the will of the people as it shall be made known to their representatives at Washington. No power on earth except the power of an aroused and indignant public opinion can save the arid region from falling prey to the speculators who are alive to their opportunity while the people are asleep.

In his last message the President recommended the repeal of the desert-land law, of the commutation clause of the homestead law, and of the timber and stone act. These are the provisions of existing statutes under which absolutely the most valuable property now owned by the American people is being systematically absorbed into private ownership by those who cannot use it, but who propose to sell it at enormous profit to real home-seekers when the nation shall have multiplied its value an hundred fold by means of irrigation.

The nation has land for every man who will make his home upon it in good faith—who will break the sod, plant crops, build a house, and settle down to support his family from the soil; but the nation has no land—at least it ought to have none—for the man who merely seeks to forestall the actual settler and sell out to him at a profit or become a landlord collecting income from his tenants.

Under the present land laws millions of acres are being taken by those who have no thought of breaking the soil, planting crops, or building homes. They are mere adventurers and speculators.

The desert-land law gives them a chance to obtain for a song, without residence and without cultivation, 320 acres of the richest soil on earth—enough for sixteen families. The commutation clause of the homestead law gives them a chance to take up 160 acres with but the barest pretense of residence, and that for only fourteen months. The timber and stone act enables them to acquire forests and quarries for a bagatelle, and to hold them for speculative advances.

Frank Stockton left the hero of his famous tale hesitating before two doors. If he opened one it meant life and happiness, if the other death; and the question was never answered—"The Lady or the Tiger?"

Uncle Sam stands at the door of the arid region. His foot is on the threshold, his hand is on the latch.

Shall it be the home-maker or the speculator? Shall it be life and happiness for millions or a riot and a carnival

of speculation at the expense of the people. There is but one way to answer the question in the interest of the nation's welfare—that is to repeal the existing land laws in accordance with the President's recommendation.

IRELAND'S GREAT LESSON FOR AMERICA.

Two very big things have already happened in the brief history of the twentieth century. Each of these things makes for the greater economic freedom of the race; each represents a lofty conception of statesmanship. Both were undertaken by English-speaking peoples—the one by Great Britain, the other by the United States; the one the presentation to the English Parliament of the Wyndham bill for the restoration of the land to millions of people in Ireland, the other the passage, a year ago, of the National Irrigation Act, which aims to make homes for millions of people in the arid region of the West.

Between these two great measures there is a singular analogy. Both of them deal with the foundation principles of civilization. They aim to give man a secure foothold on the soil; they aim to put him in possession of the primal means of existence; they recognize his right to participate in the ownership of natural wealth.

The event in Ireland marks the last gasp of dying feudalism. The event in America marks the entrance upon a new and momentous stage of that policy of material conquest over new areas which is the real secret of prosperity and greatness of the Republic. Both events do infinite credit to the governments which brought them about, and both are hopeful signs of the tendency of the times.

But those who are familiar with what is going on in the west, strange as it may seem, look with a certain envy on Ireland. She is dealing with a problem almost identical with our own. The only difference is the difference between rebuilding an old house and building a new one; but she has learned a lesson which we must learn in order to realize the full benefit of the policy on which we have entered. This lesson is that

there is no peril to the peace of a country like the peril of land monopoly.

Land monopoly robs men of a large portion of the products of their labor. It nullifies the spirit of constitutional guarantees which seek to give assurance of political freedom. No man is free in the true sense of the term who is beholden to another for the means of his existence, and land monopoly makes rebels instead of patriots. In the case of Ireland it drove more than half the population away from the native soil. It filled their hearts with bitterness, and even sent some of her children into the ranks of England's enemies in the hour when her life was at stake.

On the other hand, it is a well recognized truth that no nation can have a better bulwark than millions of men who own their own homes. It has been well said that "no man ever went to war in defense of his boarding-house."

All these things are familiar enough to thoughtful people. Why say them again? For this reason: the crushing burden which Ireland is now preparing to slip from her shoulders the American people are proceeding, by means of a subtle and silent process, to take upon their own. There is danger, very grave danger, that one of the most beneficent acts of national legislation ever framed and passed may miscarry; that instead of making homes for millions of small proprietors, we shall make vast stock ranches and lordly private estates for a comparatively few great proprietors.

AN ENTRANCING VISION.

The scheme for the reclamation of the arid public domain undoubtedly delights the imagination of the American peo-

ple—the making of something out of nothing, the creation of a multitude of homes where the desert now exists. Gratifying evidence of the fact is found on every hand; but there is another side to the matter. How many people know anything about the details of the undertaking? How many actually appreciate the value of the imperial domain of the west which is still the property of the United States? Probably not more than one in ten thousand. And of those who do, a considerable proportion belong to the class of speculators and adventurers



SCENE SHOWING THE RESULT OF IRRIGATION.

who know too well how to acquire valuable parts of this property for themselves and who are proceeding to do so with startling rapidity in all sections of the West.

Some day the full story of the looting of the people's heritage will be told. When it is, the average American citizen will open his eyes with amazement; and he will pass from amazement to indignation. The question is, Will he do so in time to avail anything, or will he only lock the door after the horse is stolen?

A DANGEROUS COMBINATION.

The present system of disposing of the public lands is the product of two kinds of statesmen—those who knew too much and those who knew too little. Selfish enlightenment and unselfish ignorance make a dangerous team; and this is the team which has been whirling the American people to the edge of the precipice of land monopoly.

There are strong influences in the West which want laws that make it easy for the land to be stolen. Stealing is a hard word. Let us call it kleptomania. Then there are strong influences in the East which have been so busy pattering over tariff and currency problems as to leave no time to become acquainted with far greater issues which actively involve the economic liberties of the people.

IRELAND'S WOES A WARNING.

There stands Ireland, emerging after

centuries of bitter and heart-breaking strife from the toils of land monopoly; and there stands the great West, marching steadily into the same hateful toils. It is costing the English Government over half a billion dollars to get out of the predicament which the American people are now getting into at an appalling rate. Over 2,000,000 acres of land are going to the speculators every month, or over 24,000,000 acres every year.

What will it cost us to stop the crime before it is too late? The price of this deliverance is an irresistible public demand for the repeal of the existing land laws. When this has rolled in upon Congress from all parts of the country, Congress will act in response to the recommendations of the President's message. Until then there is no hope that it will act. The American people should remember Ireland's experience.

THE PINE LANDS OF THE SOUTH.

POSSIBILITIES OF FOREST GROWTH IN THE SOUTHERN ATLANTIC COAST STATES AND THE NECESSITY FOR ADEQUATE PROTECTION TO MAKE PROFITABLE LUMBERING.

BY

H. C. PUTNAM.

AFTER a thorough investigation of the forests of North and South Carolina and Florida, and particularly in those localities where pine woods have grown up on plantations which were once cultivated, I have been most forcibly convinced of the possibilities to follow forestation in many localities. I am firm in the conviction that state or national influences should be exerted in the formation of one or more forest reserves in this region, if only for the purpose of forming an object-lesson to the people of the southeastern states. In this paper I got all my information at first hand and spent three months during the past winter in the states mentioned, most of the time in the pine forest or in

the cypress swamps. I visited all of the lumber camps that I could, and spent sufficient time at each to get the details of the business.

Having been for the past 45 years in touch with forest and lumbering operations in Wisconsin, and entirely familiar with the details of measuring and estimating standing timber, I feel fairly well qualified to speak on what I saw of the conditions during these three months in the Carolinas and Florida. Moreover, I have been familiar with the timber interests of the South for the past 10 years. A half century ago, in 1854-'5, I was a civil engineer and was much in its forests and saw many of them in their virgin state, as but little had been cut at that time. Ten years ago I again



SCENE IN A TYPICAL LONGLEAF PINE FOREST.

visited most of the sawmills in the states named, so I feel competent to judge of present and past conditions.

In all this time I have noted many changes in conditions. Only a few of the sawmills in the South were making money in the manufacture of lumber ten years ago. At that time, the Northwest—Michigan, Wisconsin, and Minnesota—was cutting eight to ten billion feet of lumber a year; Maine and New Hampshire produced 500,000,000, and a small amount of lumber from the small sawmills of the South was sold in the North at little or no profit. At the present time the product of the Northwest has been cut down about three-fourths; what is left in Maine and New Hampshire is largely reserved for the pulp mills, and the South is the base of supplies for pine, and nearly 10,000,000,000 is being cut annually in the regions of Long and Shortleaf Pine; and this lumber is bringing good prices. All of this pine is of good quality, but in many places is but thinly scattered over the land; a fair estimate per acre, averaging all stands together, would be 5,000 feet, board measure, or a little less. This is on a basis of an average of three logs—standard 16-foot size—to a tree, ten to twenty logs per 1,000 feet. These are liberal estimates for timber in the states from North Carolina around the coast to Georgia, and I presume I may include Alabama. There is more timber in Louisiana and eastern Texas, but it will not be there long, as they are cutting it off faster than in any other of the Southern States. I fully believe that after ten years of such removal of the timber as is now being done, there will not be enough left in the states along their lines to supply the three great railroads—the Atlantic Coast Line, Seaboard Air Line, and Southern—now running from Virginia to Texas.

Yet all conditions are favorable for reforestation, and new growths can be depended upon if they have "half a chance." The climatic conditions are unusually favorable, and growth is rapid. I saw 12,000 feet per acre cut from a large tract, and besides seeing it cut, sawed, run through the dry kiln and planing mill, and put on the cars for

the north, I took the trouble to verify the figures. I measured the stumps and tops for myself, and found that the 12,000 feet had been honestly cut from the land. Some stumps had a diameter of 30 inches. A count of the annual rings on many showed that the growth during the first twelve years was marvelous, some of them having grown 8 to 10 inches in diameter.

This was on an old plantation on which I had been as a surveyor in 1854, and the land was then cultivated and planted in cotton. In 1855 the field, having been cropped in cotton or corn for more than 20 years, was "turned out" to grow up to timber, according to the general practice before the inauguration of the present system of fertilizing with phosphates. Where this timber stood at the beginning of the present year I had seen the hills of cotton in 1854; and in February, 1903, the old cotton rows or hills were still to be traced. By getting the cost of all on board the cars and the actual figures of the price paid for the lumber, I found there was a profit of nearly \$100 an acre. On that amount the interest, taxes, and other expenses during the time the trees were growing would be less than \$15 per acre. This stand was on average sandy land in Berkeley county, S. C., west of the Santee River, and about 45 miles north of Charleston.

Another farm that was under cultivation in 1855 was "turned out" to recuperate and grew up to Shortleaf Pine, which was cut off in less than 20 years, and the land again put under cultivation. Again it was left idle and has become one of the handsomest Longleaf Pine forests I have ever seen. The stand is very thick—at least 150 trees to the acre—and they average 50 feet in height and 8 inches in diameter. They stood so even and trim that I was reminded of the planted forests I have seen in Germany between Berlin and Dresden. One reason for the excellence of this stand was because it was near the owner's home and had been protected from depredations, including the most disastrous one of fire. This was in the same county, on the old "King's" road, and the land is a part of the

"Shingler" plantation, on which the Shingler family have lived for more than 100 years. On the estate of "Mexico," owned by Myzeek Porcher in 1854, there is now a magnificent forest. In that year I saw 10,000 of his 15,000 acres in cotton and corn, and the 400 slaves of Porcher gathering the crop. Now these 10,000 acres are well timbered and owned by the Atlantic Coast Lumber Co. of Georgetown, N. C. When I drove through the woods 10 years ago there was then a good stand of saw timber, and last winter when I visited the place again I found the timber large enough to well repay lumbering operations. This place is also in Berkeley county.

I have given these special examples in order that any one who cares to may verify a fact that is true of all the southern Atlantic states. And this fact is, that if there is any protection whatever the lands there will make the finest kind of pine forest growth, because of the excellent conditions and the persistence of the young pines in springing up. The pine belt of these and the Gulf states was almost a "forest

primeval" when I visited the region 50 years ago, with just clearings enough for the cultivated lands of the plantations. These lands, when cropped successively for about 20 years, were turned over to forest growth again, all the better, as far as forest was concerned, for the cultivation which they had undergone. They were seeded from the old trees, and the young trees are not hindered by the scrub growths which in the northwestern states of Michigan, Wisconsin, and Minnesota, immediately spring up after the old forests are removed, and so retard the reforesting of northern pine lands. This difference I have also personally proved, for I have experimented with 10 acres in the Wisconsin woods, taking a sandy loam very similar to the North and South Carolina soil. It was reseeded from an adjacent grove of 50 old White Pines, and fenced to protect it from grazing and all live things. Fires were kept out, and at the end of 25 years of care and trouble I have succeeded in getting a fair stand of young White Pine, none of which is more than 10 feet high.

Had I taken at the same time 1,000



A SOUTHERN PINE FOREST, SHOWING PATH OF A DESTRUCTIVE FIRE AFTER LUMBERING.



WASTEFUL LUMBERING METHODS IN A LONGLEAF PINE FOREST.

acres in South Carolina, at the price then offered me of 50 cents an acre, I would now have a forest worth a great deal of money. This I could have been assured of if I had at that time put on one corner of the tract one of the old slave families, with a cabin and \$200 worth of stock and farm implements, and allowed my caretaker any amount of ground for cultivation up to 100 acres. I would have ordered him to keep out fires, and even if most of the merchantable timber had been culled before I bought I would now have at least 900 acres of good forest, worth many times the original investment and all subsequent costs. In the meantime the old fellow and his dozen "head," as he calls his children, would have made a good living, and my tract would have been an object-lesson for the people of the county. The opportunities are not gone yet, and in some places it is now more than ever true that many such tracts can be found, where the best thing that could be done would be to put some reliable negro and his family on part of the land, his only rental being a patrol of the rest. The

cost would be slight, and with a cabin for one's own use it would pay to go there each year to stay a few days in the pine woods to see the forest growing. The writer has several such tracts and will soon have more. The negroes are actually living there, working the open lands and caring for the forest, and taxes and all other expenses are very light. I can see in this a step toward the solution of some of the "Southern problems" the North talks about, and have come to the conclusion that the negro and the forests in the Carolinas are all right if left alone to work—and grow.

I have spoken of the precautions that are necessary to keep out that gravest of dangers, the forest fire, and I am perfectly satisfied that with this danger eliminated reforestation is assured with no other effort. There are fire laws in nearly all of the Southern States, with adequate penalties, but they, as in other sections of the country, are not properly enforced. Men owning stock, and perhaps 40 or 50 acres of land, will deliberately set fires which burn over many

thousands of acres, "so the grass will start up a little sooner for the stock."

For the first two years the young pine is more intent on pushing its root down into the soil to moisture rather than on reaching upward for light, and the growth is tender, making it an easy prey to fire. On the other hand, the southern pine does not seem to be as seriously affected by grazing as the northern White Pine; yet those persons who should be interested in keeping the fires out give but little heed to the matter and often fail to see that fires alone are the great agents of destruction. Yet those states are worth more today, acre for acre, for the forests they can grow with the cheapest kind of care than for the corn and cotton which they produce; and I feel that I am stating only the truth of the matter when I say that with fire protection such as the State of Minnesota now has, these states will be rich in their woodlands, for only one-fourth of their total area is under cultivation or ever will be. They could then raise

even more cotton and corn than they do now. Personally I would rather own the "old fields" of the South, with their forest possibilities, if the flames are kept out, than the bonds of any railroad in the United States from the standpoints of safety of the investment and eventual sure returns. Moisture, climate, and soil are all there, but, with the forest floor annually burned over, growth is retarded, if not effectually checked. Moisture for the forest and other uses is not retained in the soil, roots are exposed, and there is loss where there should and could be gain. If each state spent \$5,000 annually in preventing fires, for patrols, for the enforcement of the fire laws, and for the promotion of interest and knowledge among the people, who hardly realize the great loss suffered by the community in a forest fire, they would accomplish more real good than they could with the expenditure of \$500,000 in any other way.

This is not the sentimental "forestry" of "Woodman, spare that tree." It is



PINE TREES 16 INCHES IN DIAMETER, THE RESULT OF NATURAL REPRODUCTION IN AN OLD FIELD WHICH WAS CULTIVATED AS LATE AS 1877.

a matter of dollars and cents, and if I had a million dollars to invest I would sooner put it in southern pine lands, where there was some timber and the chance for more to grow, with a fire law enforced, than in any other form of investment that I can think of. It is fortunate that men who know the value of this timber are beginning to buy it up, and to improve forest conditions through knowledge and management. Yet when the legislatures of the various states meet next fall, the subject of practical forestry should receive the attention it deserves, for there is no part of the country where it is so natural for the forests to grow, nor where they are so easily maintained, as in the south Atlantic states.

And this brings us naturally to the question of state or national aid in the work of caring for the forest interests of the great pine belt of the South. It extends from Virginia through North and South Carolina and Georgia, and follows the Gulf states to and into Texas. It is about 2,000 miles long and approximates 200 miles in width, or, in other words, it contains more than 250,000,000 acres. When I first went through this country very little of it was cut, but at the present time much is being destroyed either through carelessness or wantonness. It certainly seems desirable that the national government, which has created many reserves in the West, should turn its attention to the needs of this region—which has not a single reserve—where cheap lands, con-

ditions of soil and climate, and accessibility make it seem particularly desirable. There would be no expense other than the setting aside of the land and the patrolling of it to keep out fire, as the pine would take care of itself and be an object-lesson to all the surrounding country. In fact, the Department of Agriculture has already spent several hundreds of thousands of dollars in an effort to make tea grow in the Carolinas, while very little has been spent in tree saving. And, so far as direct returns bear on the subject, it would seem that the trees were worth much more than the tea, and the relative expense should have been in an inverse proportion. The western and the Appalachian forest reserves are known to be worthy projects by all who have given the matter any consideration, and I would add my plea for a "Southern Pine Forest Reserve," where the Longleaf, Loblolly, Slash or Rosemary, and the Shortleaf Pines will grow. This reserve should be about 50 miles from the coast, and might include any desired amount of land. If Congress should pass an act enabling the United States to acquire a suitable area, perhaps 100,000 acres, each state in which the lands might lie could set aside the state lands suitable for the purpose and let the general government have full control over them, as in the case of the western reserves. It would be the best possible use that could be made of much of the land and an invaluable lesson to the citizens of the entire South.

THE ELEVENTH NATIONAL IRRIGATION CONGRESS.

THE ANNUAL SESSION WILL BE HELD AT OGDEN, UTAH, SEPTEMBER 15-18, 1903—SOME OF THE SPECIAL FEATURES WHICH WILL MAKE IT ATTRACTIVE AND VALUABLE TO THE PEOPLE OF THE WHOLE UNITED STATES.

GREATER effort than ever before has been put forth to make the coming session of the National Irrigation Congress a notable one. Various causes have tended to produce this re-

sult. In the first place, the State of Utah, which is to be congratulated on the fact, has made an appropriation of \$6,000 to make the congress a success, and is the first state which has taken

such a step. Its citizens have duplicated the sum by private subscription. Government scientists will be in attendance and a number of high officials, including the Secretary of Agriculture, will deliver addresses. President Roosevelt has endorsed the Ogden Congress very warmly. But more than all, there has been a more marked enthusiasm and *esprit de corps* among the promoters of the meeting than has been heretofore displayed, and the zeal with which preparations are being made and the care for every detail is full warrant for an excellent session.

This convention touches on matters of vital concern to the American nation, for no question of national growth is of more importance than this one of internal expansion, the annexation of arid America. Delegates will be present from all states and territories and the governors of several will also be in attendance. The facts adduced from such a meeting will have an important bearing on the expenditure of the \$10,000,000 which has been appropriated or set aside under the provisions of the national irrigation act for the reclamation of the sixteen states and territories specified in that act. It is particularly appropriate that this great bound in the irrigation spirit should find its expression in Utah, the pioneer state in irrigation science.

First of all, the congress will be practical. It will draw its influences from irrigation experts, practical farmers, fruit growers, representatives from state and national agricultural institutions, engineers, foresters, press representatives, business men, manufacturers, officials, and law-makers. The program will include practical lessons in irrigation and forestry, reports of experts, application of provisions of the reclamation act, state progress under the national act, views on the settlement of legal complications, and the pertinent and important theme of colonization. Already the presence of the following has been assured: Hon. James Wilson, Secretary of Agriculture; Senator W. A. Clark, President of the Congress; Gifford Pinchot, Forester, U. S. Department of Agriculture; F. H. Newell,

Chief Engineer, U. S. Reclamation Service; Charles D. Walcott, Director, U. S. Geological Survey; George H. Maxwell, Executive Chairman of The National Irrigation Association, and a number of others whose interest in forest and irrigation matters is well known. Newspaper correspondents representing the important papers of the country have been provided for in a special excursion from Washington, and their accounts of the meeting and of the irrigated country, through which a carefully arranged itinerary will take them, will be of great benefit in spreading the tenets of the irrigation faith throughout the country.

To sum up, it may be said that the wish expressed by President Roosevelt in his address endorsing the Congress, which was delivered in Ogden during his recent western tour, will be more than realized. He said:

"I am delighted that the National Irrigation Congress is to be held here next fall, and I congratulate the State of Utah upon the fact that its legislature was the first ever to pass an appropriation for such a congress. There can be nothing of greater importance to the welfare and growth of this country during the half century that is opening than this question of irrigation. . . . I most earnestly hope that you and all the other states in interest will push and will in every way endeavor to make the meeting of the Irrigation Congress here in Ogden a thorough success; and I say that not merely in the interest of the states which are to be benefited by irrigation, but in the interests of the Union, I want to see that Congress a success; I want to see the work of irrigation made the greatest possible success."

In addition to the Irrigation Congress there will be held at the same time, in Ogden, an Arid States' Fruit Exhibit with the general features of a fair, at which the usual attractions will be present. This exhibit will have an added interest from the number and value of the prizes offered, among which will be loving-cups, gold and silver medals, and cash prizes. Senator W. A. Clark, of Montana, has offered a \$500 loving-cup for the finest exhibit of fresh fruits grown under irri-

gation; the Pabst Brewing Company, of Milwaukee, offers a beautifully designed silver loving-cup, representing "Ceres," for the best exhibit of barley grown in the arid states and territories,

and H. C. Havemeyer, of New York, in behalf of the American Sugar Refining Company, offers a cup valued at \$500 for the best exhibit of sugar beets grown in the arid or semi-arid regions.

FORESTING THE NEBRASKA SAND-HILLS.

NOTES ON THE PROGRESS OF THE GOVERNMENT WORK IN THE TREELESS WEST.

BY

C. A. SCOTT,

BUREAU OF FORESTRY.

THE Nebraska forest reserves are sand-hill reserves; they were set aside by presidential proclamation on April 16, 1902, for the purpose of determining whether or not trees can be grown successfully in the sand-hills. We believe this to be possible and entirely practicable, and it is our purpose to improve the general conditions of the country by establishing forests on these reserves. The presence of trees on the hills that are now as bleak as anything that can well be imagined will beautify the country and in time supply the local demands for forest products.

It is hoped that the results of this work will be of great value to the people of the entire state. If we find by experiment that certain trees are well adapted to our conditions, and that they grow and flourish in the sandy soil, we can then recommend such trees for general planting.

The Dismal River Forest Reserve, because of its nearness to the railroad and base of supplies, was selected for the seat of our work. This reserve contains 86,000 acres and lies between the Dismal and Middle Loup River, in Thomas county. During the summer of 1902 this reserve was surveyed and a nursery site chosen. The most suitable location for a forest nursery was found along the Middle Loup River, 2 miles west of Halsey, where we established our headquarters and began permanent improvements.

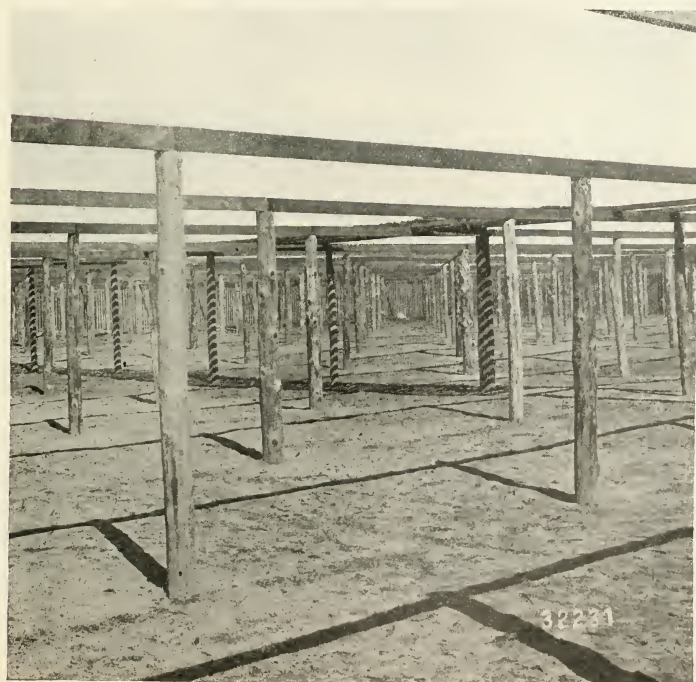
The Bureau of Forestry had decided to grow from seed the trees that are to be used in planting this reserve. The very first work begun was the preparation of a one-half acre seed-bed. The site chosen for the nursery grounds is bottom land lying close to the river and about 8 feet above the level of the water. The ground, before being cleared, was grown up to a thicket of plum and choke-cherry brush. Strange as it may seem, the very first tools we made use of in preparing for the coming forest was a mattock, one of the worst enemies a tree has.

The ground was grubbed, plowed, harrowed, and raked, the latter operation being repeated until the soil was free of roots and in proper condition to receive the seed. The seed-bed block was then set with 8-foot posts, placed 8 by 8 feet each way. These support a roof of woven picket fencing, which affords the little seedlings partial shade and shelter from the wind and hail. The entire enclosure when completed resembled a huge chicken coop. The separate seed-beds within the enclosure are 7 feet wide by 136 feet long. Each bed has a capacity of 20,000 seedlings, and there are 21 such beds in the half-acre block.

After the preparation of the seed-beds came the collecting of pine seed. A party of four men were sent into Pine Ridge and the Black Hills to collect seed of the Bull Pine (*Pinus ponderosa*), and



INTERIOR OF SEED BED DURING THE WINTER, 15 INCHES OF SNOW ON LEVEL.



VIEW OF SEED BED BEFORE THE SLAT ROOFING WAS PUT ON.



RESERVE BUILDING, DISMAL RIVER FOREST RESERVE, NEBRASKA.

two men were sent into the forests of Michigan and Minnesota to collect Jack Pine (*Pinus divaricata*) seed. A large quantity of Red Cedar seed was gathered along the Platte River, in western Nebraska. It was late in the season before the seed was received at the reserve headquarters, and we succeeded in planting only five of the seed-beds before winter set in.

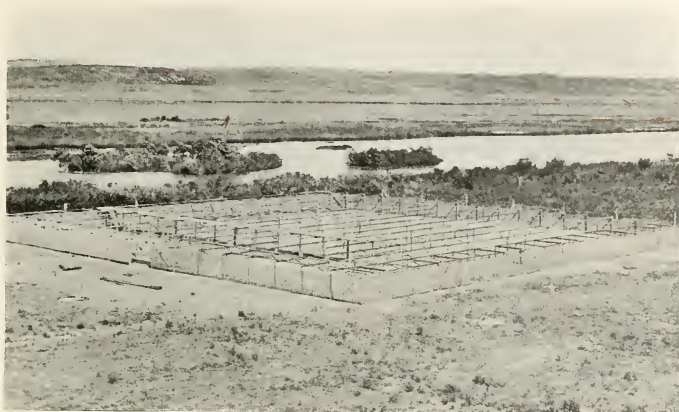
With the opening of spring seed planting was resumed, the remainder of the original half-acre block was planted, and another half acre was prepared in a similar manner to the first, and this was also planted in pine seed.

As to the kind of seed that is doing the best with us, I believe that I can safely say that the seedlings from the fall-planted Bull Pine seed are much ahead of any of the others. The trees

are larger and have withstood the attacks of fungus diseases more successfully than any of the spring planting. Some of the seed that we planted failed to germinate; other species germinated only a small per cent and came up so slowly that they were quite provoking. The Jack Pine seed, which is very small, germinated readily, but because of the extreme tenderness of the little trees this species suffered a heavy loss by damping off. However, there are yet enough surviving plants to make a fair stand. It is altogether probable that fall-planted Jack Pine seed will produce seedlings that will withstand damping off fully as well as the Bull Pine have done. Damping off is a fungus disease which is common during warm, moist

weather, and it attacks the trees during the very early stages of their growth.

This season marks the beginning of the work on the Niobrara Reserve, which contains 126,000 acres, lying between the Niobrara and Snake rivers, in Cherry county. We have at present a party of six men surveying the boundaries and making a thorough study of the woody species found growing there and of the conditions under which they are growing. In my trip across the reserve last week with Professor Emerson and Mr. Mast we were highly pleased to find the conditions there so favorable to our work. The reproduction of the Red Cedar and the Pine along the rivers, creeks, and canyons is splendid, and we found some comparatively young trees growing out in the hills. The rank growth of grass now covering the



VIEW OF NURSERY BED ON DISMAL RIVER FOREST RESERVE, NEBRASKA. LOUP RIVER AND SAND-HILLS IN THE BACKGROUND.

hills will prevent further natural reproduction. There still remains a few scattering trees of the forest of the hills; these are veterans of many years and the stumps of their comrades which long since fell before the axe are still evidence of the mighty trees that once

studded the hills. Some of these stumps were found by measurement to be as much as 28 and 32 inches in diameter—wonderful trees for sand-hills. We believe that where forests once grew, forests can certainly be made to grow again.



EXTERIOR VIEW OF SEED BED; OPEN SPACE IN CENTER USED FOR AN ENTRANCE.

THE PRACTICE OF IRRIGATION IN WASHINGTON.

IRRIGATED AREA HAS BEEN GREATLY INCREASED DURING THE LAST THREE YEARS—EXAMINATION OF WATER RESOURCES BEING MADE BY NATIONAL GOVERNMENT.

THAT the people of Washington are turning more and more to irrigation as a means of developing the state's resources is shown by recent Census Office reports. The statistics covering the past three years, the period since the census year 1899, shows a very substantial increase in the area under irrigation and the number of irrigators.

Especial interest is now being shown in the development of eastern Washington, owing to the fact that the United States Reclamation Service is making a preliminary examination of the water resources of the region with a view of determining the advisability of constructing national irrigation works. About 2,600,000 acres of public land have been withdrawn from entry pending the result of this examination. In view of this the following account of irrigation development in Washington up to the present time will be of value:

Irrigation in Washington is confined practically to the territory east of the Cascade Mountains, which, ranging north and south, divide the state into two parts dissimilar in topography, soil, and climate. The Columbia River drains all of the eastern territory.

There has been considerable increase since 1899 in the irrigated area of the state and in the number of irrigated farms. Beside the ditches actually operated in 1902, there are a number of ditches, some of them covering an extensive area, which did not carry water until 1903.

In 1899 the number of irrigators in Washington was 3,513, and the number of acres irrigated 135,470. The figures for 1902 are, respectively, 4,585 and 154,962. The cost of irrigation systems in operation was, in 1899, \$1,679,319, and in 1902 \$2,330,758. The total length of main ditches in 1902 was 1,095 miles.

IRRIGATION FROM THE COLUMBIA RIVER AND ITS TRIBUTARIES.

The Columbia River, including Clarks Fork, heads in the Rocky Mountains west of Helena, Montana. It crosses the northern part of Idaho and flows northwestward across the northeastern corner of Washington until it reaches the international boundary; there it makes an abrupt bend and flows in a general southerly direction until it turns west a few miles below the mouth of Snake River and forms the boundary between the states of Oregon and Washington.

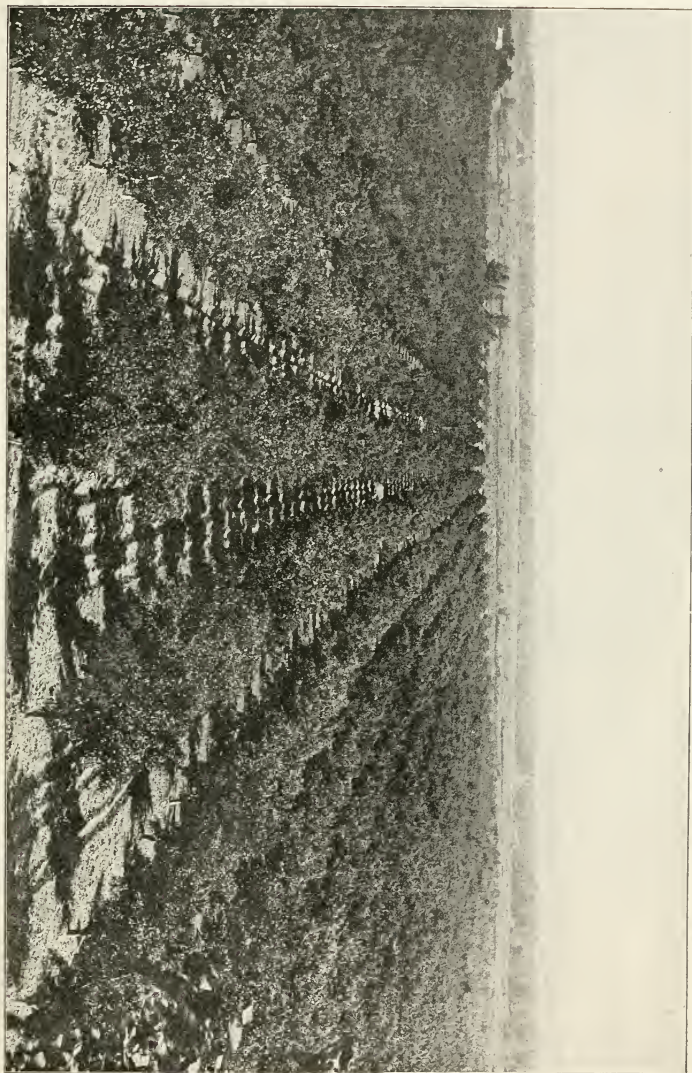
Next to the Colorado, the Columbia is the largest river in the arid region of the United States, its drainage basin including parts of Oregon, Washington, Idaho, Montana, and a large area in Canada. The entire drainage area of the Columbia River is 216,537 square miles, about one-half of which belongs to the Columbia River proper and one-half to its main branch, Snake River.

The portion of Washington drained by the Columbia River is arid and semi-arid, and, except in a few localities, irrigation is necessary for continuous successful farming. The valleys comprise some of the most productive farming lands in the United States, having a deep soil of apparently alluvial deposits mixed with volcanic ash with an underlying bed of clay. The soil of the uplands is less fertile, but produces with sufficient moisture heavy wheat crops.

BELOW SNAKE RIVER.

Most of the territory in Washington drained by the Columbia River and its tributaries below the mouth of Snake River produces crops without irrigation, but for some crops, and especially for hay and fruit, many find the artificial application of water desirable.

In 1902 the number of irrigators was



AN IRRIGATED ORCHARD IN THE YAKIMA VALLEY, WASHINGTON.

387; the number of acres irrigated, 8,252; the number of irrigation systems in operation, 135; the cost of construction of the operated systems, \$45,998, or an average cost of \$5.57 per acre irrigated, and the total length of main ditches, 99 miles. Irrigation was chiefly from the Walla Walla River and its tributaries.

IRRIGATION FROM SNAKE RIVER.

Snake River enters Washington near Lewiston, Idaho, and joins the Columbia near Pasco. In 1902, 911 farms of Washington, with an irrigated area of 4,968 acres, were watered from this river, its tributaries, and the springs and wells in the drainage basin. There were operated 77 irrigation systems, representing an initial expenditure of \$109,853, or an average first cost of \$22.11 per acre. There were 68 miles of main ditch. Most of the irrigated land lies in Asotin county. From Asotin Creek and its tributaries 810 farmers irrigated 3,225 acres from 6 irrigation systems, costing \$94,100. The total length of main ditches was 26 miles.

IRRIGATION FROM THE YAKIMA RIVER.

Nearly four-fifths of the irrigated acreage of Washington and nearly half of the irrigated farms are found in the Yakima Valley. The Yakima River has its source in Keechelus Lake, on the eastern slope of the Cascade Mountains, in Kittitas county, Washington, and flows through Kittitas and Yakima counties, joining the Columbia River near Kiona.

There has been since 1899 important development of irrigation systems in the Yakima Valley. Two large canals have been constructed, and the older systems have been extended. Some of these systems had difficulty in securing water in 1902, and unless storage reservoirs are constructed in the mountains, it is not probable that there will be any further important development of irrigation from this river. The total number of farms irrigated in 1902 from the Yakima River and its tributaries and from springs and wells in the Yakima Valley was 2,505, and the area irrigated 121,705 acres. There were operated 255

irrigation systems, which cost \$1,968,555, or an average cost of \$16.17 per acre irrigated. The total length of main ditches was 618 miles. More than half of the irrigated area in the valley is watered from the Yakima River direct. The principal tributary of the Yakima River is the Natches River, which in 1902 supplied water to 575 farms, having an irrigated area of 20,232 acres.

Irrigation from the Columbia River between the mouth of the Okanogan River and the mouth of the Yakima River is practiced chiefly for fruit growing. In 1902 there were 500 irrigated farms, having an irrigated area of 14,378 acres. The irrigation systems, 189 in number, cost \$168,364, or an average initial cost of construction of \$11.71 per acre irrigated. There were 209 miles of main ditches. About half the irrigated farms in this division are watered from the Wenatchee River and its tributaries. In 1902 there were 253 farms, having an irrigated area of 3,285 acres, watered from this stream. There were in operation 34 irrigation systems, which cost \$95,755.

While the percentage of increase of irrigation from the Okanogan River and its tributaries since 1899 has been large, the irrigated area is small. There were, in 1902, 62 irrigated farms and a watered area of 2,257 acres. The 45 irrigation systems in operation cost \$12,374, or an average first cost of \$5.48 per acre irrigated. The total length of main ditches was 34 miles. Most of the irrigated land is watered from the Similkameen River and Conconully Creek and their tributaries.

There is very little irrigation in Washington from the Columbia River and its tributaries above the mouth of the Okanogan River. In 1902 there were 126 irrigated farms, with an average irrigated area of 18.9 acres, and 78 irrigation systems representing a construction cost of \$14,369, or an average cost of \$6.05 per acre.

IRRIGATION IN WESTERN WASHINGTON.

The western or coast portion of the state is humid, and irrigation is not generally practiced, but, owing to the

slight rainfall in the summer months, there is a growing disposition to apply water artificially to the land during the periods of drouth. More than one-half of the irrigated acreage in western Washington is reported for the valley of the Dungeness River, a region of rich and deep soil producing remarkable

yields. In 1902 there were reported for western Washington 94 irrigated farms, having an irrigated area of 1,025 acres. Sixteen irrigation systems were in operation. These represented a construction cost of \$11,245, or an average of \$10.97 per acre irrigated. There were 17 miles of main ditches.

FOREIGN TRADE IN FOREST PRODUCTS.

IMPORTS EXCEED THE EXPORTS, THOUGH RECENT STATISTICS INDICATE THAT THIS CONDITION SOON MAY BE REVERSED.

THE United States is so generally considered a producer of forest products that it will possibly surprise many persons to know that during the calendar year just past the imports of forest products exceeded the exports by more than \$10,000,000. The total value of importations amounted in 1902 to about \$60,000,000, or 6.6 per cent of the total, while the exports were valued at about \$50,000,000, or 3.6 per cent of all goods sent out. While the exports are now exceeded by the imports, it seems to be indicated by the trend of trade in the past few years that this condition will be reversed, though there can be no diminution in our imports, for they are composed for the greater part of products which cannot be found in the United States. For example, the principal item among the imports comes from the various gums from which rubber is made, and last year they were imported to the value of \$25,000,000, or nearly one-half of the total. Ordinary lumber, to the value of nearly \$20,000,000, came next in importance, and of this the common sawed lumber, most of which came from Canada, was worth \$12,000,000. Round timber was also received from Canada, and various cabinet woods, such as mahogany, most of which came from Mexico, Nicaragua, and Cuba, were worth more than \$3,000,000. Then there were dye-woods, chief among which was logwood, and various gums used in the arts and industries, including camphor, shellac, and \$1,000,000 worth of chicle, which

forms the basis for the chewing gum annually used by the American girl. Wood pulp, most of which came from Canada, was worth \$2,000,000, and cork from Portugal and Spain amounted to almost that much. The rest of the imports included cinchona bark, from which quinine is made, and various other products used in medicines, as well as some vegetable ivory, natural palm leaves, charcoal, hemlock bark, naval stores, such as tar, pitch, and turpentine, and other miscellaneous things in quantities too small to be specially classified.

Of exports from this country, the principal item comes from ordinary boards, deals, and planks, of which nearly 1,000,000,000 feet were shipped, the value being \$17,000,000. Joists, scantling, staves, headings, shooks, shingles, and other lumber exported were worth about \$10,000,000, and round, hewed, and sawed timber exported was worth about the same. Naval stores, such as turpentine, rosin, tar, and pitch, most of which went to the United Kingdom, were valued at \$12,000,000. Wood pulp exports amounted to \$740,000 worth, and were marketed almost entirely in two countries—the United Kingdom and Belgium. Most of the tan bark sent abroad during the year went to Japan.

Two countries—Brazil and Canada—stand out conspicuously among those which furnish forest products to the United States. Generally Brazil is in the lead in value of imports, but last

year the values from that country were slightly below the annual average, while those from Canada were above, and for the first time in many years outvalued those of Brazil, and led those of all other countries. Brazil's lead comes from the great quantities of rubber she sends to the United States, while Canada's importations are chiefly lumber. The two together furnish imports to the value of \$33,000,000, or considerably more than half of the entire volume from foreign countries. After these countries come the United Kingdom, British East Indies, Belgium, Portugal, Germany, British Oceania, and Mexico, in order, and all of these import forest products to the value of \$1,000,000 or over.

Of our exports, the United Kingdom, in lumber as in most other things, took

the greater amounts, the forest products shipped to that destination having an aggregate value, in 1902, of \$16,231,000. No other country took nearly so much, and the next in order was Germany, with \$4,233,000 worth. Then followed the Netherlands, Canada, Mexico, Belgium, France, British Australasia, Argentina, and Italy, in order, all of these taking products valued in excess of \$1,000,000.

These statistics, which were prepared by the Division of Foreign Markets of the Department of Agriculture, naturally include only what might be termed the raw forest products, and the vast amount of manufactured articles which use wood in their construction, such as furniture, farm machinery, carriages, and other finished products, are not counted in such a tabulation.

FOREST FIRE RECORD.

IN ACCORDANCE WITH ESTABLISHED RULE, THE SCENE OF GREAT FOREST FIRES DURING AUGUST HAS SHIFTED FROM THE EAST TO THE WEST.

IN the fall of the year the scene of forest fires, like the "course of empire, westward takes its way." With the exception of a single fire in the New England States, there has been none of any great magnitude east of the Mississippi River since our July record, and only one east of the Rockies. Colorado and Utah were both visited by forest fires, but with the exception of these the greater part of the destruction has been confined to the three states on the Pacific Coast—Washington, Oregon, and California.

New Hampshire.—A fire two miles north of North Danville started July 27. Besides doing considerable damage to standing timber, destroyed 25 cords of wood and 200,000 feet of sawed lumber, most of which was insured. The fire started from a lighted match carelessly thrown on the ground by some wood-choppers.

Minnesota.—Mayor Stein, of Cass Lake, Minnesota, who, under the laws of Minnesota is a deputy fire warden

by virtue of his office, sent a telegram to General C. C. Andrews, Chief Fire Warden of the state, saying that forest fires were burning on Star Island, which is government land, reserved by the Morris bill. This was on July 28. General Andrews replied, "Take 30 to 60 men and quell fire." This was done, and the action was in marked contrast to the quibbling between government and state rangers as to who should put out a California fire which was in disputed territory. While their petty fight as to jurisdiction was going on, the fire was burning and gaining headway.

Colorado.—What was at first reported as a serious forest fire on Cameron's Cone, near Colorado Springs, turned out to be a brush fire which did little damage, and was extinguished by railroad section men within three hours after it started, on August 5. The promptness of their work averted what might have been a damaging fire, as there is much inflammable timber in the neighborhood.

Utah.—Brush fires, started by camp-

ers, threatened to destroy Binghamton, a mining town 25 miles south of Salt Lake City, on August 3. It was feared that the town would be destroyed, but a force of 300 miners succeeded in turning the flames away from the town, and later extinguished the blaze before it did much damage.

Oregon.—On August 15 the Associated Press reported a forest fire which had destroyed millions of feet of timber, and was threatening saw-mills and ranches in the mountains near Sparta, not far from Baker City. The fire had been burning for a week when first reported, and reached serious proportions on the 15th. At that time it was still spreading its area, and unless checked threatened the timber on the whole Cornucopia Range.

Washington.—The first forest fires of the season reported in Snohomish county occurred July 24, and at that time had crossed the boundary line from Kings county and were traveling north through heavily timbered country. Instructions were sent to deputy game wardens by the county commissioners to secure as many men as possible and check the flames. This was done, and the damage reported at that time was slight. Later fire destroyed the Wheeler-Osgood Company's plant at Everett, causing a loss of about \$30,000, of which \$15,000 was insured. This was the second time that fire swept through the plant in the past few months. The company will probably not rebuild at Everett, but will consolidate its interests at Tacoma, where it is already established. On August 18 a forest fire burned near Elk, 25 miles north of Spokane, covering nearly 1,000 acres in a tract of burned-over pine and cedar. For four days more than 100 men fought the fire, but could not control it, and the latest reports were that 12,000,000 feet of timber had been destroyed.

California.—The first serious fire of the summer in the San Gabriel Reserve occurred on the Prairie Fork of the San Gabriel River, north of Baldy and 3 miles from the Big Horn mine, on July 30. Thirty rangers were immediately concentrated at the spot and, aided by 20 men from the mines, fought the

flames, which were under control in two days. For the next two months, or until the heavy winter rains set in, the San Gabriel and San Bernardino Forest Reserves, on whose safety the permanency of the water supply of southern California depends, will be in constant danger from fire. A continuation of the differences of last year between the state and government rangers, according to newspaper reports, disgracefully marked the progress of the fires which burned in and near the Yosemite National Park. For several weeks prior to August 4 fires had been burning near that gateway to the park guarded by El Capitan and Cathedral rocks. Both state and government forces claimed that a fire near Glacier Point was in the other's jurisdiction, with the result that the flames progressed unchecked for some time. Then when state and government lands were both damaged, the fire fighters—the park guardian with his troops and the state fire wardens—got to work, only after considerable damage had been done which might have been averted in the first place if the fires had been fought in the interests of all, regardless of where they were. Both sides seem to have been at fault, for both withheld aid while the fire was burning. Considerable damage was done to the pine and oak groves which cover the mountains.

On August 4 Alden L. Youngman, of Glen Ellen, brought suit against the Southern Pacific Company for \$2,700 damages sustained by a fire which devastated his property a year ago. It is alleged that the fire was started by a locomotive of the defendant corporation. The outcome of this suit will have a bearing on the attitude of railways toward fires started by their engines or employes, and will be important from the fact that at least one-half of the forest fires now occurring in the country are directly due to railroads. Several hundred men battled with a fire in the neighborhood of Relief Hill, near Nevada City, for four days, and then did not have it under control. By July 9 it had burned over 5 square miles of timber land, and was still burning. Much cut lumber was also destroyed by

this fire, and flumes were saved only by arduous fighting. A fire in the mountains near Caliente, 30 miles south of Bakersfield, destroyed grass on ranges, grain fields, and forest. It burned many thousands of acres, and was fought by train crews of the Southern Pacific and Santa Fé companies, as well as by paid fighters hurried to the scene by the Kern County Land Company, whose holdings were endangered. On

August 9 it had burned three days, and was not then under control.

Canada.—A message from White Horse to Vancouver, dated August 1, said that a destructive brush fire in that neighborhood had assumed serious proportions along the line of the White Pass and Yukon Railway. Every available man fought the fire until quelled, though not until much damage had been done.

RECENT PUBLICATIONS.

Any of these books will be sent by the publishers of "Forestry and Irrigation," postpaid, to any address on receipt of the published price, with postage added when the price is marked "net."

The Water Fowl Family. By LEONARD C. SANFORD, I. B. BISHOP, and T. S. VAN DYKE. 20 full-page illustrations. Pp. 598. The Macmillan Co., New York.

This volume is the latest issued as a part of the American Sportman's Library under the general editorial supervision of Caspar Whitney. It contains fourteen chapters on the shooting of ducks, geese, swans, and shore-birds, by L. C. Sanford. T. C. Van Dyke is the author of the portion devoted to the water fowl of the Pacific coast, while L. D. Bishop supplies a detailed description of each bird as it is brought into prominence in the text.

The entire volume is written in an entertaining style, the three authors collaborating being among the best of our sporting writers. The subjects have been treated throughout in a popular way, rendering the book not only valuable as a sort of encyclopedia of the water fowl family, but enjoyable reading for the average sportsman.

A valuable feature of the book is the large number of excellent full-page drawings by Louis Agassiz Fuertes, Charles Livingstone Bull, and Martin Justice. Large clear type, good paper, and attractive binding combine to make it an excellent piece of book-making.

The Improvement of Rivers. A Treatise on the Methods Employed for Improving Streams, for Open Navigation, and for Navigation by Means of Locks and Dams. By B. F. THOMAS and D. A. WATT. Pp. 356, quarto size. Illustrated with 92 full-page and folding plates. Price, \$6.00 net; postage, 47 cents. John Wiley & Sons, New York.

At this time of rapidly growing interest in the use of our rivers for navigation, irrigation, and the related problem of controlling flood waters, this book is most timely. It is claimed to be the first work of its kind printed in the English language.

The object of the book is to provide in concise form a description of the various systems

employed for bettering the conditions of navigable streams, together with the methods usually adopted for their design and execution. This branch of engineering is practically untaught in the engineering schools of the United States, but the authors hope that the publication of this volume may have some effect in calling attention to this defect, and perhaps result in widening the scope of some of the usual engineering courses, and thus prepare students for the engineering service of the government.

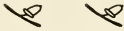
The volume is divided into three parts: Part I is devoted to general improvements of rivers; Part II, improvement of open rivers, and Part III treats of the improvement of rivers by canalization. Dikes, levees, storage reservoirs, locks, canals, and the various kinds of dams are all described at length. The many excellent illustrations and the fact that the book is written in plain language, free from many of the usual technical engineering terms, renders it of value to the general reader as well as the technically trained man.

The Woodlot. By HENRY SOLON GRAVES, Director of the Yale Forest School, and R. T. FISHER, Bureau of Forestry. Pp. 90. Illustrated by photographs and diagrams. Bulletin 42 of the Bureau of Forestry, U. S. Department of Agriculture. Washington: Government Printing Office, 1903.

This bulletin is intended to be of value to owners of woodlots, particularly in New England, where the material for its preparation was gathered. Its most interesting and unique feature lies in the series of diagrams, where, by outlines of trees and explanatory text, improvement and reproduction cuttings are graphically explained. With the aid of these, any one who gives the bulletin a careful reading should be able to make the most of the possibilities of any given woodlot area.

The first part of the bulletin explains fully the meaning of improvement and reproduction

cuttings, tells when, how, and why they should be made, and sets forth the benefits to follow. There are also suggestions for pruning, the protection of forests against fire, grazing, insect enemies, and storms, and a general discussion of New England woodlands and the practicability of forestry. It can be said that from this latter viewpoint—that of practicability—this is one of the most important bulletins recently issued by the government.

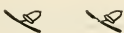


PUBLISHERS' NOTES.

The success of FORESTRY AND IRRIGATION'S Real Estate Department has been so marked that its management has felt justified in greatly increasing the space devoted to it. Some idea of its scope may be obtained by glancing at the advertisement of its properties among the back pages of this issue. The ready reception which such a department has met is due, we feel, to the fact that the magazine itself guarantees honest treatment, and requires no money unless sales are actually made. Moreover, all properties listed will bear out everything claimed for them, and in most cases will prove much more attractive than the brief advertising announcement proclaims them. Any one interested in buying or selling real estate, no matter where situated, will do well to correspond with the manager of the Real Estate Department, Lee M. Lipscomb, FORESTRY AND IRRIGATION, Atlantic Building, Washington, D. C.

The Hardy Catalpa has been proved by long experiment to be an excellent tree for timber purposes, and this, with its remarkably rapid growth, makes it valuable for plantations, either as a source of domestic supply or for an investment. George W. Tinscher, at Wilsey, Kansas, has had considerable experience in growing this species, and reports remarkable success. He can supply seedling trees in large numbers for plantation purposes, or he will take contracts for setting out plantations of 60 acres or more. Those who wish to grow the Catalpa can correspond to advantage with Geo. W. Tinscher, Wilsey, Kansas, whose advertisement appears in this magazine.

The general increase in interest in the problems of reforestation has an expression in an advertisement in the present issue of FORESTRY AND IRRIGATION. We refer to the announcement of the Scandinavian Tree Seed Establishment, conducted by Johannes Rafn, Copenhagen-F, Denmark, which appears among the advertising pages and requests correspondence with first-hand collectors of tree seeds, of both conifers and hardwoods. There has been a lately growing demand for American tree seeds in Europe, both for ornamental and forest purposes.



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IRRIGATION IN THE NORTHWEST

has become an important matter to the farmer, and its influence on this region, in every way, can hardly be estimated as yet.

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"Wonderland 1903" has a chapter on this subject which may interest you. The book is published by the Northern Pacific Railway Company and if you send six cents in stamps to **CHAS. S. FEE, General Passenger Agent, St. Paul, Minn.**, he will send you a copy.

There are also other chapters of interest—amongst them one on Yellowstone Park, another on Puget Sound, and yet another on the Columbia River.

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REAL ESTATE

FORESTRY AND IRRIGATION conducts a real estate department, the services of which are offered to all readers of this magazine. It will endeavor, through judicious advertising and correspondence, to buy and sell property of every kind. In other words, this department will act as an agent in any transactions our readers may have involving real estate. For this service there will be no charge unless a sale is concluded, when the usual commission will be expected.

To all interested we would say that it costs no more than the postage from your end to make known your wants—either to acquire or dispose of property.

We desire to impress our patrons with the fact that this magazine guarantees honest treatment. The Real Estate department is managed by competent and experienced men who will devote their best efforts toward building up a national business and a national reputation for fair dealing. We call particular attention to the fact that no property will be listed on our books that will not bear out under the closest investigation everything that is claimed in its behalf. While we wish to handle small properties and will give them careful attention, we propose to make a speciality of large properties and enterprises, as we have exceptional opportunities for reaching capital seeking paying investments, especially in the West and South. The character of investments which seem to be most in demand are manufacturing sites, farming, grazing, and timber lands. We also have inquiries relative to orange groves both in Florida and California.

PROPERTIES FOR SALE

DISTRICT OF COLUMBIA

We make a speciality of Washington City real estate and investments, and are prepared to furnish any information desired to those looking to an investment, or toward a temporary or permanent residence.

12 PER CENT INVESTMENT.—Large apartment house in the most central and fashionable part of Washington's residence section. Every apartment taken. Only \$40,000.

Also handsome white stone front dwelling of 12 rooms; lot 20 x 75 feet, in the most exclusive section of Washington's aristocratic quarter. Only \$13,000.

ALABAMA

TIMBER—TUPELO GUM, OAK, ASH, AND POPLAR.—7,000 acres, heavily timbered, on lakes and river front; 65 miles to Mobile by river. \$5 50 per acre for timber; 10 years to remove. Will cut 5,000 feet of gum per acre, and 3,000 feet of oak, guaranteed to bring \$25 per 1,000, firsts and seconds; common \$17, and culls \$12 per 1,000, on local market. Conveniently situated for direct shipment to European market.

KAOLIN LAND.—"Solid bed of Kaolin," vein 14 feet thick, apparently inexhaustible; only partially mined to determine quality and quantity. On timber tract of 160 acres, near Heflin; 9 miles from railroad, 1½ miles from Tallapoosa River. Entire property, \$10,000.

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ORANGE RANCH IN FULL BEARING.—46 acres farm, with citrus and deciduous fruits, in the best fruit belt of California. Home and outbuildings, with abundant water for irrigation and domestic use. Ready market for all crops. Will pay more than 15 per cent. on purchase price, which is only \$3,000.

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The following tracts of Longleaf Pine and Cypress lands—on or near the west coast of Florida:

(1) 64,000 acres; average cut, 2,000 feet of pine to the acre. These lands lie in the noted lemon, orange, and vegetable belt of the state, and have transportation facilities by both rail and water.

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FLORIDA—Continued

(2) 110,000 acres; this land will cut on an average of from 1,500 to 2,000 feet per acre of pine, and is also located in the best citrus fruit belt of the state.

(3) 247,000 acres; virgin forest, cutting on the average of 5,000 feet per acre, based on a very conservative estimate. About one-fifth cypress and four-fifths pine. Maximum cut of pine 18,000 feet, and of cypress 50,000 feet per acre. Transportation facilities good.

(4) 390,000 acres, located on a navigable river, with transportation to the Gulf of Mexico. This tract contains a large area of valuable cypress. The cut will average from 2,000 to 3,000 feet per acre of cypress and pine. This land, aside from the value of its timber, is also one of the finest cattle ranges in the state.

(5) 230,000 acres; this tract has about the same characteristics as tract (4).

(6) 110,000 acres; estimated cut of timber is 1,500 feet per acre. This tract is within the citrus fruit belt of the state and will be valuable for either colonization or cattle-raising after the timber is cut. A new railroad is being built through this tract.

(7) 90,000 acres; this tract contains 70,000 acres of Longleaf Pine and 20,000 acres of Cypress. The timber is estimated to cut from 2,000 to 3,000 feet per acre. A large sawmill costing \$40,000 is located on this land and is included in the sale of the land and timber. This mill is located on a river to which a great deal of this tract is contiguous.

(8) 130,000 acres. This tract adjoins tract 8 and will cut not less than 3,000 feet of Longleaf Pine to the acre.

(9) 12,000 acres of fine grazing land.

(10) 30,000 acres of fine grazing land, being one of the best cattle ranches in the state.

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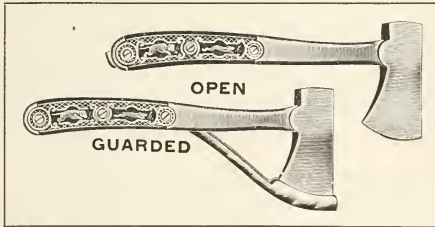
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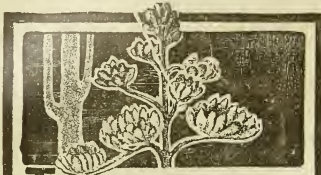
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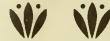
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