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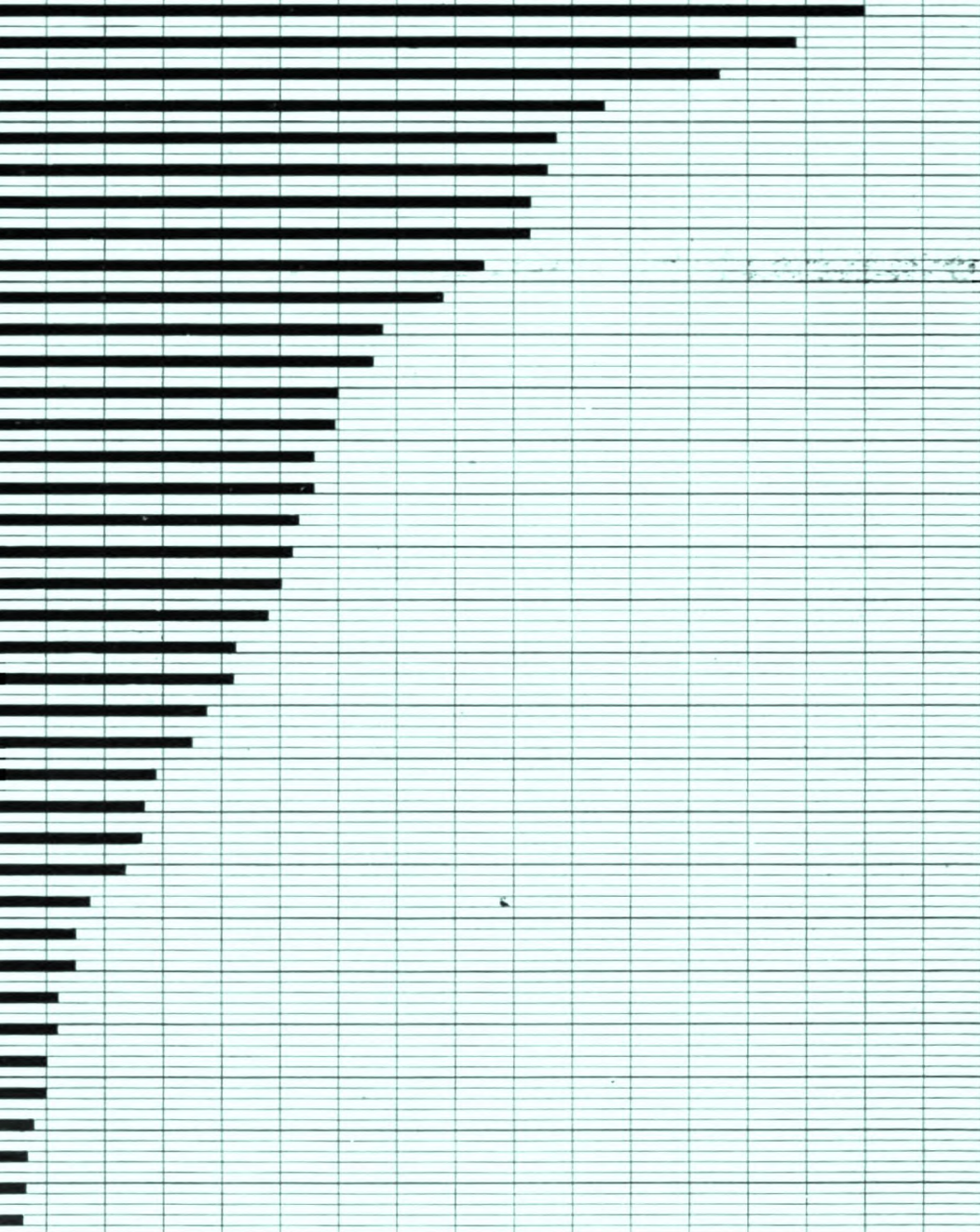
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Report of the National Conservation Commission, ...

National Conservation Commission, Henry Gannett, United States. President (1901-1909 : Roosevelt)

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113

United States
REPORT OF THE NATIONAL
CONSERVATION COMMISSION

FEBRUARY
1909

SPECIAL MESSAGE FROM THE
PRESIDENT OF THE UNITED STATES
TRANSMITTING A REPORT OF THE
NATIONAL CONSERVATION COMMISSION,
WITH ACCOMPANYING PAPERS

IN THREE VOLUMES
VOLUME I

EDITED UNDER THE DIRECTION OF THE EXECUTIVE
COMMITTEE BY HENRY GANNETT

NEW YORK
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WASHINGTON
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1909

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SENATE OF THE UNITED STATES,
February 18, 1909.

Resolved, That the special message from the President of the United States, transmitting a report of the National Conservation Commission, with accompanying papers and illustrations, be printed in full as a document, taking number 676 of the present Congress, the number of the document containing the special message of the President transmitting this report.

ii

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TABLE OF CONTENTS.

	Page.
Special message of the President-----	1
Letter of transmittal of the report to the President-----	11
Report of the National Conservation Commission-----	13
Minerals-----	15
Lands-----	17
Forests-----	19
Waters-----	21
National efficiency-----	25
Joint conservation conference-----	27
Personnel of the conference-----	28
Statements by the Secretaries-----	37
Water resources—	
What we have-----	39
What we use and waste-----	40
Where we stand-----	43
What we need to do-----	45
Forests—	
What forests do-----	51
What we have-----	52
What is produced-----	54
What is used-----	55
What is wasted-----	57
Where we stand-----	58
What should be done-----	60
Duty of the private owner-----	61
Economy in the mill-----	66
Task of the States-----	68
The nation's task-----	69
Where we might stand-----	72
Sources of material-----	73
Lands—	
The national estate-----	75
Use and abuse of lands—	
Agricultural industries-----	75
Productivity of the soil-----	76
Abandoned farms-----	78
Necessity for increasing crops-----	79
Decline in exports of foodstuffs-----	80
Wastes due to noxious insects and mammals-----	81
Losses of live stock by disease-----	81
Wild game and fur-bearing animals-----	82
Fish-----	82
The open range-----	82
Swamp and overflow lands-----	83
Increase in private holdings-----	84
The public lands—	
Data and policy-----	85
Land disposal-----	86
Land classification-----	86
Timber and stone act-----	87
Commutation clause of homestead act-----	87
Dry-farming lands-----	88

	Page.
Statements by the Secretaries—Continued.	
Lands—Continued.	
The public lands—Continued.	
Desert-land law	88
Grazing land	89
Rights analogous to scrip	90
Separation of rights	90
Mineral lands	91
Coal lands	91
Oil, gas, and other nonmetallic mineral lands	92
Rights of way	92
Timber under control of United States	92
Conclusions	93
Mineral resources—	
Summary	95
Basis of estimates	96
Fuel resources	97
Coal	97
Peat	99
Petroleum	100
Natural gas	101
Iron ores	102
Gold, silver, copper, lead, and zinc	104
Phosphate rock	105
Miscellaneous	106
Structural materials	107
Fire losses	108
Consumption and waste	108
Loss of life in mining industries	109
A rational basis for conservation of mineral resources	109
How the duration of supply may be extended	110
Organization and proceedings of the commission	115
Personnel of the commission	116
Proceedings of the Joint Conservation Conference	123
Address of—	
President Roosevelt	124
Governor Chamberlain, of Oregon	128
Mr. Taft	136
Senator Flint, of California	142
Mr. John Hays Hammond	145
Prof. Marston Taylor Bogert	145
Mr. A. W. Damon	150
Mr. Thomas F. Walsh	153
Governor Johnson, of Minnesota	157
Governor Smith, of Georgia	161
Senator Nelson, of Minnesota	163
Governor Noel, of Mississippi	169
Governor Ansel, of South Carolina	171
Governor Broward, of Florida	173
Senator Newlands, of Nevada	173
Mr. W. P. Lay	175
Dr. Charles R. Van Hise	178
Mr. J. H. Richards	180
Ex-Governor Blanchard, of Louisiana	182
Mr. Joseph N. Teal	185
Prof. G. E. Condra	186
Dr. J. T. Rothrock	188
Senator Smoot, of Utah	191
Mr. Roswell Page	195
Mr. William E. Mullen	196
Senator Edwards, of Canada	199
Mr. Frank H. Lathrop	201
Mr. Andrew Carnegie	202
Ex-Governor Pardee, of California	204
Mr. Powell Evans	205
Mr. James S. Whipple	206
Governor Johnson, of Minnesota	211

Proceedings of the Joint Conservation Congress—Continued.	Page.
Address of—	
Ex-Governor Blanchard, of Louisiana.....	214
Prof. Frank W. Rane.....	216
Dr. W J McGee.....	217
Governor Hoggatt, of Alaska.....	219
Mr. Walter R. Stubbs.....	220
Governor Deneen, of Illinois.....	223
Governor Broward, of Florida.....	230
Governor Woodruff, of Connecticut.....	236
Ex-Governor Van Sant, of Minnesota.....	238
Governor Ansel, of South Carolina.....	240
Report of Committee on Resolutions.....	241
Address of—	
Mr. Edward G. Acheson.....	249
Mr. E. W. Wickey.....	252
Mr. Bernard N. Baker.....	253
Mr. Henry A. Barker.....	255
Dr. Cyril C. Hopkins.....	255
Mr. Edward R. Taylor.....	258
Mr. John B. Atkinson.....	260
Dr. George F. Kunz.....	262
Mr. George W. Koerner.....	264

LIST OF ILLUSTRATIONS.

	Opposite page.
Forest regions of the United States.....	53
Public forest lands.....	54
Forest products in 1907.....	55
Lumber cut, by species, in 1907.....	55
Lumber cut, by States, in 1907.....	56
Relative lumber production in ten States in 1880 and 1907.....	56
Acreage of improved land.....	79
Percentage of improved land.....	79

SPECIAL MESSAGE OF THE PRESIDENT

TRANSMITTING THE

REPORT OF THE NATIONAL CONSERVATION COMMISSION

To the Senate and House of Representatives:

I transmit herewith a report of the National Conservation Commission, together with the accompanying papers. This report, which is the outgrowth of the conference of governors last May, was unanimously approved by the recent joint conference held in this city between the National Conservation Commission and governors of States, state conservation commissions, and conservation committees of great organizations of citizens. It is therefore in a peculiar sense representative of the whole nation and all its parts.

(With the statements and conclusions of this report I heartily concur) and I commend it to the thoughtful consideration both of the Congress and of our people generally. It is one of the most fundamentally important documents ever laid before the American people. It contains the first inventory of its natural resources ever made by any nation. In condensed form it presents a statement of our available capital in material resources, which are the means of progress, and calls attention to the essential conditions upon which the perpetuity, safety, and welfare of this nation now rest and must always continue to rest. It deserves, and should have, the widest possible distribution among the people.

The facts set forth in this report constitute an imperative call to action. The situation they disclose demands that we, neglecting for a time, if need be, smaller and less vital questions, shall concentrate an effective part of our attention upon the great material foundations of national existence, progress, and prosperity.

This first inventory of natural resources prepared by the National Conservation Commission is undoubtedly but the beginning of a series which will be indispensable for dealing intelligently with what we have. It supplies as close an approximation to the actual facts as it was possible to prepare with the knowledge and time available. The progress of our knowledge of this country will continually lead to more accurate information and better use of the sources of national strength. But we can not defer action until complete accuracy in the estimates can be reached, because before that time many of our resources will be practically gone. It is not necessary that this inventory should be exact in every minute detail. It is

essential that it should correctly describe the general situation; and that the present inventory does. As it stands it is an irrefutable proof that the conservation of our resources is the fundamental question before this nation, and that our first and greatest task is to set our house in order and begin to live within our means.

The first of all considerations is the permanent welfare of our people; and true moral welfare, the highest form of welfare, can not permanently exist save on a firm and lasting foundation of material well-being. In this respect our situation is far from satisfactory. After every possible allowance has been made, and when every hopeful indication has been given its full weight, the facts still give reason for grave concern. It would be unworthy of our history and our intelligence, and disastrous to our future, to shut our eyes to these facts or attempt to laugh them out of court. The people should and will rightly demand that the great fundamental questions shall be given attention by their representatives. I do not advise hasty or ill-considered action on disputed points, but I do urge, where the facts are known, where the public interest is clear, that neither indifference and inertia, nor adverse private interests, shall be allowed to stand in the way of the public good.

The great basic facts are already well known. We know that our population is now adding about one-fifth to its numbers in ten years, and that by the middle of the present century perhaps one hundred and fifty million Americans, and by its end very many millions more, must be fed and clothed from the products of our soil. With the steady growth in population and the still more rapid increase in consumption, our people will hereafter make greater and not less demands per capita upon all the natural resources for their livelihood, comfort, and convenience. It is high time to realize that our responsibility to the coming millions is like that of parents to their children, and that in wasting our resources we are wronging our descendants.

We know now that our rivers can and should be made to serve our people effectively in transportation, but that the vast expenditures for our waterways have not resulted in maintaining, much less in promoting, inland navigation. Therefore, let us take immediate steps to ascertain the reasons and to prepare and adopt a comprehensive plan for inland-waterway navigation that will result in giving the people the benefits for which they have paid but which they have not yet received. We know now that our forests are fast disappearing, that less than one-fifth of them are being conserved, and that no good purpose can be met by failing to provide the relatively small sums needed for the protection, use, and improvement of all forests still owned by the Government, and to enact laws to check the wasteful destruction of the forests in private hands. There are differences of opinion as to many public questions; but the American people stand nearly as a unit for waterway development and for forest protection.

We know now that our mineral resources once exhausted are gone forever, and that the needless waste of them costs us hundreds of human lives and nearly \$300,000,000 a year. Therefore, let us undertake without delay the investigations necessary before our people will be in position, through state action or otherwise, to put an end

to this huge loss and waste, and conserve both our mineral resources and the lives of the men who take them from the earth.

I desire to make grateful acknowledgment to the men, both in and out of the government service, who have prepared the first inventory of our natural resources. They have made it possible for this nation to take a great step forward. Their work is helping us to see that the greatest questions before us are not partisan questions, but questions upon which men of all parties and all shades of opinion may be united for the common good. Among such questions, on the material side, the conservation of natural resources stands first. It is the bottom round of the ladder on our upward progress toward a condition in which the nation as a whole, and its citizens as individuals, will set national efficiency and the public welfare before personal profit.

The policy of conservation is perhaps the most typical example of the general policies which this Government has made peculiarly its own during the opening years of the present century. The function of our Government is to insure to all its citizens, now and hereafter, their rights to life, liberty, and the pursuit of happiness. If we of this generation destroy the resources from which our children would otherwise derive their livelihood, we reduce the capacity of our land to support a population, and so either degrade the standard of living or deprive the coming generations of their right to life on this continent. If we allow great industrial organizations to exercise unregulated control of the means of production and the necessaries of life, we deprive the Americans of to-day and of the future of industrial liberty, a right no less precious and vital than political freedom. Industrial liberty was a fruit of political liberty, and in turn has become one of its chief supports, and exactly as we stand for political democracy so we must stand for industrial democracy.

The rights to life and liberty are fundamental, and like other fundamental necessities, when once acquired, they are little dwelt upon. The right to the pursuit of happiness is the right whose presence or absence is most likely to be felt in daily life. In whatever it has accomplished, or failed to accomplish, the administration which is just drawing to a close has at least seen clearly the fundamental need of freedom of opportunity for every citizen. We have realized that the right of every man to live his own life, provide for his family, and endeavor, according to his abilities, to secure for himself and for them a fair share of the good things of existence, should be subject to one limitation and to no other. The freedom of the individual should be limited only by the present and future rights, interests, and needs of the other individuals who make up the community. We should do all in our power to develop and protect individual liberty, individual initiative, but subject always to the need of preserving and promoting the general good. When necessary, the private right must yield, under due process of law and with proper compensation, to the welfare of the commonwealth. The man who serves the community greatly should be greatly rewarded by the community; as there is great inequality of service, so there must be great inequality of reward; but no man and no set of men should be allowed to play the game of competition with loaded dice.

All this is simply good common sense. The underlying principle of conservation has been described as the application of common sense to common problems for the common good. If the description

is correct, then conservation is the great fundamental basis for national efficiency. In this stage of the world's history, to be fearless, to be just, and to be efficient are the three great requirements of national life. National efficiency is the result of natural resources well handled, of freedom of opportunity for every man, and of the inherent capacity, trained ability, knowledge, and will, collectively and individually, to use that opportunity.

This administration has achieved some things; it has sought, but has not been able, to achieve others; it has doubtless made mistakes; but all it has done or attempted has been in the single, consistent effort to secure and enlarge the rights and opportunities of the men and women of the United States. We are trying to conserve what is good in our social system, and we are striving toward this end when we endeavor to do away with what is bad. Success may be made too hard for some if it is made too easy for others. The rewards of common industry and thrift may be too small if the rewards for other, and on the whole less valuable, qualities, are made too large, and especially if the rewards for qualities which are really, from the public standpoint, undesirable are permitted to become too large. Our aim is so far as possible to provide such conditions that there shall be equality of opportunity where there is equality of energy, fidelity, and intelligence; when there is a reasonable equality of opportunity the distribution of rewards will take care of itself.

The unchecked existence of monopoly is incompatible with equality of opportunity. The reason for the exercise of government control over great monopolies is to equalize opportunity. (We are fighting against privilege.) It was made unlawful for corporations to contribute money for election expenses in order to abridge the power of special privilege at the polls. Railroad-rate control is an attempt to secure an equality of opportunity for all men affected by rail transportation; and that means all of us. The great anthracite coal strike was settled, and the pressing danger of a coal famine averted, because we recognized that the control of a public necessity involves a duty to the people, and that public intervention in the affairs of a public-service corporation is neither to be resented as usurpation nor permitted as a privilege by the corporations, but on the contrary to be accepted as a duty and exercised as a right by the Government in the interest of all the people. The efficiency of the army and the navy has been increased so that our people may follow in peace the great work of making this country a better place for Americans to live in, and our navy was sent round the world for the same ultimate purpose. All the acts taken by the Government during the last seven years, and all the policies now being pursued by the Government, fit in as parts of a consistent whole.

Our public-land policy has for its aim the use of the public land so that it will promote local development by the settlement of home makers; the policy we champion is to serve all the people legitimately and openly, instead of permitting the lands to be converted illegitimately and under cover, to the private benefit of a few. Our forest policy was established so that we might use the public forests for the permanent public good, instead of merely for temporary private gain. The reclamation act, under which the desert parts of the public domain are converted to higher uses for the general

benefit, was passed so that more Americans might have homes on the land.

These policies were enacted into law and have justified their enactment. Others have failed, so far, to reach the point of action. Among such is the attempt to secure public control of the open range, and thus to convert its benefits to the use of the small man, who is the home maker, instead of allowing it to be controlled by a few great cattle and sheep owners.

The enactment of a pure-food law was a recognition of the fact that the public welfare outweighs the right to private gain, and that no man may poison the people for his private profit. The employers' liability bill recognized the controlling fact that while the employer usually has at stake no more than his profit, the stake of the employee is a living for himself and his family.

We are building the Panama Canal; and this means that we are engaged in the giant engineering feat of all time. We are striving to add in all ways to the habitability and beauty of our country. We are striving to hold in the public hands the remaining supply of unappropriated coal, for the protection and benefit of all the people. We have taken the first steps toward the conservation of our natural resources, and the betterment of country life, and the improvement of our waterways. We stand for the right of every child to a childhood free from grinding toil, and to an education; for the civic responsibility and decency of every citizen; for prudent foresight in public matters, and for fair play in every relation of our national and economic life. In international matters we apply a system of diplomacy which puts the obligations of international morality on a level with those that govern the actions of an honest gentleman in dealing with his fellow-men. Within our own border we stand for truth and honesty in public and in private life, and war sternly against wrongdoers of every grade. All these efforts are integral parts of the same attempt, the attempt to enthrone justice and righteousness, to secure freedom of opportunity to all of our citizens, now and hereafter, and to set the ultimate interest of all of us above the temporary interest of any individual, class, or group.

The nation, its government, and its resources exist, first of all, for the American citizen, whatever his creed, race, or birthplace, whether he be rich or poor, educated or ignorant, provided only that he is a good citizen, recognizing his obligations to the nation for the rights and opportunities which he owes to the nation.

The obligations, and not the rights, of citizenship increase in proportion to the increase of a man's wealth or power. The time is coming when a man will be judged, not by what he has succeeded in getting for himself from the common store, but by how well he has done his duty as a citizen, and by what the ordinary citizen has gained in freedom of opportunity because of his service for the common good. The highest value we know is that of the individual citizen, and the highest justice is to give him fair play in the effort to realize the best there is in him.

The tasks this nation has to do are great tasks. They can only be done at all by our citizens acting together, and they can be done best of all by the direct and simple application of homely common sense.

The application of common sense to common problems for the common good, under the guidance of the principles upon which this republic was based, and by virtue of which it exists, spells perpetuity for the nation, civil and industrial liberty for its citizens, and freedom of opportunity in the pursuit of happiness for the plain American, for whom this nation was founded, by whom it was preserved, and through whom alone it can be perpetuated. Upon this platform—larger than party differences, higher than class prejudice, broader than any question of profit and loss—there is room for every American who realizes that the common good stands first.

The National Conservation Commission wisely confined its report to the statement of facts and principles, leaving the Executive to recommend the specific steps to which these facts and principles inevitably lead. Accordingly, I call your attention to some of the larger features of the situation disclosed by the report, and to the action thereby clearly demanded for the general good.

WATERS.

The report says:

Within recent months it has been recognized and demanded by the people, through many thousand delegates from all States assembled in convention in different sections of the country, that the waterways should and must be improved promptly and effectively as a means of maintaining national prosperity.

The first requisite for waterway improvement is the control of the waters in such manner as to reduce floods and regulate the regimen of the navigable rivers. The second requisite is development of terminals and connections in such manner as to regulate commerce.

Accordingly, I urge that the broad plan for the development of our waterways recommended by the Inland Waterways Commission be put in effect without delay. It provides for a comprehensive system of waterway improvement extending to all the uses of the waters and benefits to be derived from their control, including navigation, the development of power, the extension of irrigation, the drainage of swamp and overflow lands, the prevention of soil wash, and the purification of streams for water supply. It proposes to carry out the work by coordinating agencies in the federal departments through the medium of an administrative commission or board, acting in cooperation with the States and other organizations and individual citizens.

The work of waterway development should be undertaken without delay. Meritorious projects in known conformity with the general outlines of any comprehensive plan should proceed at once. The cost of the whole work should be met by direct appropriation if possible, but if necessary by the issue of bonds in small denominations.

It is especially important that the development of water power should be guarded with the utmost care both by the National Government and by the States in order to protect the people against the upgrowth of monopoly and to insure to them a fair share in the benefits which will follow the development of this great asset which belongs to the people and should be controlled by them.

FORESTS.

I urge that provision be made for both protection and more rapid development of the national forests. Otherwise, either the increasing use of these forests by the people must be checked or their protection against fire must be dangerously weakened. If we compare the actual fire damage on similar areas on private and national forest lands during the past year, the government fire patrol saved commercial timber worth as much as the total cost of caring for all national forests at the present rate for about ten years.

I especially commend to the Congress the facts presented by the commission as to the relation between forests and stream flow in its bearing upon the importance of the forest lands in national ownership. Without an understanding of this intimate relation the conservation of both these natural resources must largely fail.

The time has fully arrived for recognizing in the law the responsibility to the community, the State, and the nation which rests upon the private owners of private lands. The ownership of forest land is a public trust. The man who would so handle his forest as to cause erosion and to injure stream flow must be not only educated, but he must be controlled.

The report of the National Conservation Commission says:

Forests in private ownership can not be conserved unless they are protected from fire. We need good fire laws, well enforced. Fire control is impossible without an adequate force of men whose sole duty is fire patrol during the dangerous season.

I hold as first among the tasks before the States and the nation in their respective shares in forest conservation the organization of efficient fire patrols and the enactment of good fire laws on the part of the States.

The report says further:

Present tax laws prevent reforestation of cut-over land and the perpetuation of existing forests by use. An annual tax upon the land itself, exclusive of the timber, and a tax upon the timber when cut is well adapted to actual conditions of forest investment and is practicable and certain. It is far better that forest land should pay a moderate tax permanently than that it should pay an excessive revenue temporarily and then cease to yield at all.

Second only in importance to good fire laws well enforced is the enactment of tax laws which will permit the perpetuation of existing forests by use.

LANDS.

With our increasing population the time is not far distant when the problem of supplying our people with food will become pressing. The possible additions to our arable area are not great, and it will become necessary to obtain much larger crops from the land, as is now done in more densely settled countries. To do this, we need better farm practice and better strains of wheat, corn, and other crop plants, with a reduction in losses from soil erosion and from insects, animals, and other enemies of agriculture. The United States Department of Agriculture is doing excellent work in these directions, and it should be liberally supported.

The remaining public lands should be classified and the arable lands disposed of to home makers. In their interest the timber and

stone act and the commutation clause of the homestead act should be repealed, and the desert-land law should be modified in accordance with the recommendations of the Public Lands Commission.

The use of the public grazing lands should be regulated in such ways as to improve and conserve their value.

Rights to the surface of the public land should be separated from rights to forests upon it and to minerals beneath it, and these should be subject to separate disposal.

The coal, oil, gas, and phosphate rights still remaining with the Government should be withdrawn from entry and leased under conditions favorable for economic development.

MINERALS.

The accompanying reports show that the consumption of nearly all of our mineral products is increasing more rapidly than our population. (Our mineral waste is about one-sixth of our product, or nearly \$1,000,000 for each working day in the year. The loss of structural materials through fire is about another million a day. The loss of life in the mines is appalling.) The larger part of these losses of life and property can be avoided.)

Our mineral resources are limited in quantity and can not be increased or reproduced. With the rapidly increasing rate of consumption the supply will be exhausted while yet the nation is in its infancy unless better methods are devised or substitutes are found. Further investigation is urgently needed in order to improve methods and to develop and apply substitutes.

It is of the utmost importance that a bureau of mines be established in accordance with the pending bill to reduce the loss of life in mines and the waste of mineral resources and to investigate the methods and substitutes for prolonging the duration of our mineral supplies. Both the need and the public demand for such a bureau are rapidly becoming more urgent. It should cooperate with the States in supplying data to serve as a basis for state mine regulations. The establishment of this bureau will mean merely the transfer from other bureaus of work which it is agreed should be transferred and slightly enlarged and reorganized for these purposes.

CONCLUSIONS.

The joint conference already mentioned adopted two resolutions to which I call your special attention. The first was intended to promote cooperation between the States and the nation upon all of the great questions here discussed. It is as follows:

Resolved, That a joint committee be appointed by the chairman, to consist of six members of state conservation commissions and three members of the National Conservation Commission, whose duty it shall be to prepare and present to the state and national commissions, and through them to the governors and the President, a plan for united action by all organizations concerned with the conservation of natural resources.

(On motion of Governor Noel, of Mississippi, the chairman and secretary of the conference were added to and constituted a part of this committee.)

The second resolution of the joint conference to which I refer calls upon the Congress to provide the means for such cooperation. The principle of the community of interest among all our people in

the great natural resources runs through the report of the National Conservation Commission and the proceedings of the joint conference. These resources, which form the common basis of our welfare, can be wisely developed, rightly used, and prudently conserved only by the common action of all the people, acting through their representatives in State and nation. Hence the fundamental necessity for cooperation. Without it we shall accomplish but little, and that little badly. The resolution follows:

We also especially urge on the Congress of the United States the high desirability of maintaining a national commission on the conservation of the resources of the country, empowered to cooperate with state commissions to the end that every sovereign commonwealth and every section of the country may attain the high degree of prosperity and the sureness of perpetuity naturally arising in the abundant resources and the vigor, intelligence, and patriotism of our people.

In this recommendation I most heartily concur, and I urge that an appropriation of at least \$50,000 be made to cover the expenses of the National Conservation Commission for necessary rent, assistance, and traveling expenses. This is a very small sum. I know of no other way in which the appropriation of so small a sum would result in so large a benefit to the whole nation.

THEODORE ROOSEVELT.

(THE WHITE HOUSE, *January 22, 1909.*)

LETTER OF THE CHAIRMAN OF THE NATIONAL
CONSERVATION COMMISSION
TRANSMITTING THE
REPORT TO THE PRESIDENT

NATIONAL CONSERVATION COMMISSION,
Washington, January 11, 1909.

SIR: Herewith I have the honor to place in your hands the report of the National Conservation Commission, created by you June 8, 1908, to inquire into and advise you as to the condition of our natural resources, and to cooperate with other bodies created for similar purposes by the States.

The executive committee designated in your letter creating the commission organized on June 19 and outlined a plan for making an inventory of the natural resources of the United States. On July 1 work was undertaken, accordingly, with the cooperation of the bureaus of the federal departments, authorities of the different States, and representative bodies of the national industries. The results of this cooperative work are herewith submitted as appendixes of the commission's report.

The mass of material which constitutes the inventory has been summarized under the direction of the secretaries of the respective sections of the commission so as to assemble the most salient points of the inventory. At the first general meeting of the commission, on December 1, 1908, the summaries of the four sections of the commission were presented and were supplemented by personal statements of the experts in the several bureaus in the executive departments who had immediate charge of the inventory along their special lines of work. After the discussion of the summaries and statements the commission united in the report which is herewith submitted.

In view of the peculiarly valuable contributions and services rendered by the experts of the several departments, the commission at its closing session unanimously adopted the following resolutions:

Whereas the commission, in the discharge of the duties committed to it, has been greatly aided by the patient labors and the ability and zeal of its secretary and the secretary of each of its four sections, and of the experts in the government service who lent their assistance in the collection of statistical and other data necessary to the elucidation and proper understanding of the subjects dealt with, and to the preparation of its report: Therefore

Resolved, That the commission hereby makes cordial acknowledgment of its obligation to the gentlemen referred to and tenders them its thanks.

Resolved further, That the secretary of the commission be directed to transmit to each of those who prepared papers and who appeared before the commission a copy of these resolutions.

In addition, I desire to call your special attention to the spirit and devotion of the gentlemen without whose services the making of the national inventory would have been impossible. Through their great interest in the task intrusted by you to the commission and to them, a great part of their work in connection with the inventory was performed outside the official hours. Furthermore, the material which they have prepared presents valuable information in connection with the work of the several executive departments which otherwise would not have been collected at this time. The assembling of this vast amount of material is largely due to Mr. Henry Gannett, whom you designated for this work, and to whose expert knowledge and power of generalization the commission owes more than it can repay.

In its cooperation "with other bodies created for similar purposes by the States," the National Conservation Commission has had most valuable assistance. Within the first month after the creation of the commission, the governors of 5 States had appointed conservation commissions, and an equal number of organizations of national scope had named conservation committees. At the time of the recent joint conservation conference 33 States and Territories had formed conservation commissions. The number has now increased to 36, with indications that nearly all of the remaining States will soon take similar action. The number of national organizations which have appointed conservation committees is 41.

The report herewith submitted was unanimously approved by the joint conservation conference. Further action was taken by the conference in authorizing a joint committee on cooperation, to be composed of six members of state conservation commissions and three members of the National Conservation Commission with its chairman and secretary. This committee is to devise ways and means for effective cooperation between all forces working for the conservation of natural resources. By this action the conservation movement enters the field of definite constructive work, for which its labors in ascertaining the country's present status and future outlook were simply preparatory.

Very respectfully,

GIFFORD PINCHOT,
Chairman.

The PRESIDENT,
The White House.

REPORT OF THE (NATIONAL CONSERVATION COMMISSION)

The duty of man to man, on which the integrity of nations must rest, is no higher than the duty of each generation to the next; and the obligation of the nation to each actual citizen is no more sacred than the obligation to the citizen to be, who, in turn, must bear the nation's duties and responsibilities.

In this country, blessed with natural resources in unsurpassed profusion, the sense of responsibility to the future has been slow to awaken. Beginning without appreciation of the measure or the value of natural resources other than land with water for commercial uses, our forefathers pushed into the wilderness and, through a spirit of enterprise which is the glory of the nation, developed other great resources. Forests were cleared away as obstacles to the use of the land; iron and coal were discovered and developed, though for years their presence added nothing to the price of the land; and through the use of native woods and metals and fuels, manufacturing grew beyond all precedent, and the country became a power among the nations of the world.

Gradually the timber growing on the ground and the iron and coal within the ground came to have a market value and were bought and sold as sources of wealth. Meanwhile, vast holdings of these resources were acquired by those of greater foresight than their neighbors before it was generally realized that they possessed value in themselves; and in this way large interests, assuming monopolistic proportions, grew up, with greater enrichment to their holders than the world had seen before, and with the motive of immediate profit, with no concern for the future or thought of the permanent benefit of country and people, a wasteful and profligate use of the resources began and has continued.

The waters, at first recognized only as aids to commerce in supplying transportation routes, were largely neglected. In time this neglect began to be noticed, and along with it the destruction and approaching exhaustion of the forests. This, in turn, directed attention to the rapid depletion of the coal and iron deposits and the misuse of the land.

The public conscience became awakened. Seeing the increased value and noting the destructive consumption and waste of the natural resources, men began to realize that the permanent welfare of the country as well as the prosperity of their offspring were at stake.

The newly awakened sense of duty found expression in a call by the President upon the governors of the States to meet him in conference, and in the declaration of this conference at its sessions in

the White House in May, 1908. The action of the conference led to the appointment of the National Conservation Commission, with authority to collect information and cooperate with similar commissions appointed by the States in the great work of conserving the natural resources of the country.

In the growth of the country and gradual development of the natural resources there have been three noteworthy stages. The first stage was that of individual enterprise for personal and family benefit. It led to the conquest of the wilderness.

The next stage was that of collective enterprise, either for the benefit of communities or for the profit of individuals forming the communities. It led to the development of cities and States, and too often to the growth of great monopolies.

The third stage is the one we are now entering. Within it the enterprise is collective and largely cooperative, and should be directed toward the larger benefit of communities, States, and the people generally.

In the first stage the resources received little thought. In the second they were wastefully used. In the stage which we are entering wise and beneficial uses are essential, and the checking of waste is absolutely demanded.

Although the natural resources are interrelated they are unlike, and each class requires distinct treatment. The land is a fixed quantity which can not be materially increased, though its productivity and availability for the uses of man may be greatly augmented; the forests are variable in quantity and may be destroyed by fire, waste, and improvident use, or protected and improved in such way as to meet human necessities. Together the lands and the forests are improvable resources.

The minerals are limited in quantity and can not be increased or improved by anything which man may do. They are expendable resources.

The fresh waters are limited in quantity, though the supply is permanent. They form a naturally renewable resource which man may do nothing to increase, but may do much in the way of conservation and better utilization.

The treatment applied to each class should be adapted to its own fullest development and best utilization and to those of the other classes of resources.

The wastes which most urgently require checking vary widely in character and amount. The most reprehensible waste is that of destruction, as in forest fires, uncontrolled flow of gas and oil, soil wash, and abandonment of coal in the mines. This is attributable, for the most part, to ignorance, indifference, or false notions of economy, to rectify which is the business of the people collectively.

Nearly as reprehensible is the waste arising from misuse, as in the consumption of fuel in furnaces and engines of low efficiency, the loss of water in floods, the employment of ill-adapted structural materials, the growing of ill-chosen crops, and the perpetuation of inferior stocks of plants and animals, all of which may be remedied.

Reprehensible in less degree is the waste arising from nonuse. Since the utilization of any one resource is necessarily progressive and dependent on social and industrial conditions and the concurrent development of other resources, nonuse is sometimes unavoidable.

It becomes reprehensible when it affects the common welfare and entails future injury. Then, it should be rectified in the general interest.

For the prevention of waste the most effective means will be found in the increase and diffusion of knowledge, from which is sure to result an aroused public sentiment demanding prevention. The people have the matter in their own hands. They may prevent or limit the destruction of resources and restrain misuse through the enactment and enforcement of appropriate state and federal laws.

At every stage in the growth of our country, strong men grew stronger through the exercise of nation building, and their intelligence and patriotism grew with their strength. The spirit and vigor of our people are the chief glory of the republic. Yet even as we have neglected our natural resources, so have we been thoughtless of life and health. Too long have we overlooked that grandest of our resources, human life. Natural resources are of no avail without men and women to develop them, and only a strong and sound citizenship can make a nation permanently great. We can not too soon enter on the duty of conserving our chief source of strength by the prevention of disease and the prolongation of life.

Wastes reduced and resources saved are the first but not the last object of conservation. The material resources have an additional value when their preservation adds to the beauty and habitability of the land. Ours is a pleasant land in which to dwell. To increase its beauty and augment its fitness can not but multiply our pleasure in it and strengthen the bonds of our attachment.

In the conservation of all the resources of the country the interest of the present and all future generations is concerned, and in this great work—involving the welfare of the citizen, the family, the community, the state, and the nation—our dual system of government, state and federal, should be brought into harmonious cooperation and collaboration.

MINERALS.

The mineral production of the United States for 1907 exceeded \$2,000,000,000, and contributed 65 per cent of the total freight traffic of the country. The waste in the extraction and treatment of mineral products during the same year was equivalent to more than \$300,000,000.

The production for 1907 included 395,000,000 tons of bituminous and 85,000,000 tons of anthracite coal, 166,000,000 barrels of petroleum, 52,000,000 tons of iron ore, 2,500,000 tons of phosphate rock, and 869,000,000 pounds of copper. The values of other mineral products during the same year included clay products, \$162,000,000; stone, \$71,000,000; cement, \$56,000,000; natural gas, \$53,000,000; gold, \$90,000,000; silver, \$37,000,000; lead, \$39,000,000, and zinc, \$26,000,000.

(The available and easily accessible supplies of coal in the United States aggregate approximately 1,400,000,000 tons.) At the present increasing rate of production this supply will be so depleted as to approach exhaustion before the middle of the next century.

(The known supply of high-grade iron ores in the United States approximates 4,788,150,000 tons, which at the present increasing

rate of consumption can not be expected to last beyond the middle of the present century. In addition to this, there are assumed to be 75,116,070,000 tons of lower grade iron ores which are not available for use under existing conditions.

The supply of stone, clay, cement, lime, sand, and salt is ample, while the stock of the precious metals and of copper, lead, zinc, sulphur, asphalt, graphite, quicksilver, mica, and the rare metals can not well be estimated, but is clearly exhaustible within one to three centuries unless unexpected deposits be found.

(The known supply of petroleum is estimated at 15,000,000,000 to 20,000,000,000 barrels, distributed through six separate fields having an aggregate area of 8,900 square miles. The production is rapidly increasing, while the wastes and the loss through misuse are enormous. The supply can not be expected to last beyond the middle of the present century.

The known natural-gas fields aggregate an area of 9,000 square miles, distributed through 22 States. Of the total yield from these fields during 1907, 400,000,000,000 cubic feet, valued at \$62,000,000, were utilized, while an equal quantity was allowed to escape into the air. The daily waste of natural gas—the most perfect known fuel—is over 1,000,000,000 cubic feet, or enough to supply every city in the United States of over 100,000 population.

Phosphate rock, used for fertilizer, represents the slow accumulation of organic matter during past ages. In most countries it is scrupulously preserved; in this country it is extensively exported, and largely for this reason its production is increasing rapidly. The original supply can not long withstand the increasing demand.

The consumption of nearly all our mineral products is increasing far more rapidly than our population. In many cases the waste is increasing more rapidly than the number of our people. In 1776 but a few dozen pounds of iron were in use by the average family; now our annual consumption of high-grade ore is over 1,200 pounds per capita. In 1812 no coal was used; now the consumption is over 5 tons and the waste nearly 3 tons per capita.

While the production of coal is increasing enormously, the waste and loss in mining are diminishing. At the beginning of our mineral development the coal abandoned in the mine was two or three times the amount taken out and used. Now the mine waste averages little more than half the amount saved. The chief waste is in imperfect combustion in furnaces and fire boxes. Steam engines utilize on the average about 8 per cent of the thermal energy of the coal. Internal-combustion engines utilize less than 20 per cent, and in electric lighting far less than 1 per cent of the thermal energy is rendered available.

With increasing industries new mineral resources become available from time to time. Some lignites and other low-grade coals are readily gasified and, through the development of internal-combustion engines may be made to check the consumption of high-grade coals.

Peat is becoming important; it is estimated that 14,000,000,000 tons are available in the United States. Its value is enhanced because of distribution through States generally remote from the fields of coal, oil, and natural gas.

The uses of all our mineral resources are interdependent. This is especially true of coal and iron, of which neither can be produced or

used without aid from the other, and in the production or reduction of all other minerals both coal and iron are employed. The same standard minerals are necessary to the development of power, of which the use is increasing more rapidly than that of any other commodity.

The building operations of the country now aggregate about \$1,000,000,000 per year. The direct and indirect losses from fire in the United States during 1907 approximated \$450,000,000, or one-half the cost of construction. Of this loss four-fifths, or an average of \$1,000,000 per day, could be prevented, as shown by comparison with the standards of construction and fire losses in the larger European countries.

So far as the ores are taken from the mines and reduced to metals, these resources are capitalized; but after thus being changed to a more valuable form they should be so used as to reduce to a minimum the loss by rust, electrolytic action, and other wastes.

There is urgent need for greater safety to the miner. The loss of life through mine accidents is appalling, and preventive measures can not be taken too soon.

The National Government should exercise such control of the mineral fuels and phosphate rocks now in its possession as to check waste and prolong our supply.

While the distribution and quantity of most of our important mineral substances are known in a general way, there is imperative need for further surveys and investigations and for researches concerning the less-known minerals.

LANDS.

(The total land area of continental United States is 1,920,000,000 acres. Of this but little more than two-fifths is in farms, and less than one-half of the farm area is improved and made a source of crop production. We have nearly 6,000,000 farms; they average 146 acres each. The value of the farms is nearly one-fourth the wealth of the United States.) There are more than 300,000,000 acres of public grazing land. (The number of persons engaged in agricultural pursuits is more than 10,000,000.)

(We grow one-fifth of the world's wheat crop, three-fifths of its cotton crop, and four-fifths of its corn crop.) We plant nearly 50,000,000 acres of wheat annually, with an average yield of about 14 bushels per acre; 100,000,000 acres of corn, yielding an average of 25 bushels per acre; and 30,000,000 acres of cotton, yielding about 12,000,000 bales.

We had on January 1, 1908, 71,000,000 cattle, worth \$1,250,000,000; 54,000,000 sheep, worth \$211,000,000; and 56,000,000 swine, worth \$339,000,000. The census of 1900 showed \$137,000,000 worth of poultry in this country, which produced in 1899, 293,000,000 dozen eggs.

There has been a slight increase in the average yield of our great staple farm products, but neither the increase in acreage nor the yield per acre has kept pace with our increase in population. Within a century we shall probably have to feed three times as many people as now; and the main bulk of our food supply must be grown on our own soil.

The area of cultivated land may possibly be doubled. In addition to the land awaiting the plow, 75,000,000 acres of swamp land can be reclaimed, 40,000,000 acres of desert land irrigated, and millions of acres of brush and wooded land cleared. Our population will increase continuously, but there is a definite limit to the increase of our cultivated acreage. Hence we must greatly increase the yield per acre. The average yield of wheat in the United States is less than 14 bushels per acre, in Germany 28 bushels, and in England 32 bushels. We get 30 bushels of oats per acre, England nearly 45, and Germany more than 47. Our soils are fertile, but our mode of farming neither conserves the soil nor secures full crop returns. Soil fertility need not be diminished, but may be increased. The large yields now obtained from farms in Europe which have been cultivated for a thousand years prove this conclusively. Proper management will double our average yield per acre. The United States can grow the farm products needed by a population more than three times as great as our country now contains.

The greatest unnecessary loss of our soil is preventable erosion. Second only to this is the waste, nonuse, and misuse of fertilizer derived from animals and men.

The losses to farm products due to injurious mammals is estimated at \$130,000,000 annually; the loss through plant diseases reaches several hundred million dollars; and the loss through insects is reckoned at \$659,000,000. The damage by birds is balanced by their beneficent work in destroying noxious insects. Losses due to the elements are large, but no estimate has been made of them. Losses to live stock from these causes are diminishing because of protection and feeding during winter. The annual losses from disease among domestic animals are: Horses, 1.8 per cent; cattle, 2 per cent; sheep, 2.2 per cent, and swine, 5.1 per cent. Most of these farm losses are preventable.

There is a tendency toward consolidation of farm lands. The estimated area of abandoned farms is 16,000 square miles, or about 3 per cent of the improved land. The causes of abandonment differ in different parts of the country. Where most prevalent, it is caused principally by erosion and exhaustion of the soil.

The product of the fisheries of the United States has an annual value of \$57,000,000. Fish culture is carried on by the nation and the States on an enormous scale. Most of the more important food species are propagated, and several species are maintained in that way. Fish from forest waters furnish \$21,000,000 worth of food yearly, a supply dependent on the preservation of the forests.

Our wild game and fur-bearing animals have been largely exterminated. To prevent their complete extinction the States and the United States have taken in hand their protection, and their numbers are now increasing. Forest game yields over \$10,000,000 worth of food each year.

With game birds the story is much the same—wanton destruction until the number has been greatly reduced, followed in recent years by wise protection, which in some cases allows the remnant to survive and even to increase.

Each citizen of the United States owns an equal undivided interest in about 387,000,000 acres of public lands, exclusive of Alaska and the insular possessions. Besides this there are about 235,000,000

acres of national forests, national parks, and other lands devoted to public use.

Good business sense demands that a definite land policy be formulated. The National Conservation Commission believes that the following will serve as a basis therefor:

1. Every part of the public lands should be devoted to the use which will best subserve the interests of the whole people.

2. The classification of all public lands is necessary for their administration in the interests of the people.

3. The timber, the minerals, and the surface of the public lands should be disposed of separately.

4. Public lands more valuable for conserving water supply, timber, and natural beauties or wonders than for agriculture should be held for the use of the people from all except mineral entry.

5. Title to the surface of the remaining nonmineral public lands should be granted only to actual home makers.

6. Pending the transfer of title to the remaining public lands they should be administered by the Government and their use should be allowed in a way to prevent or control waste and monopoly.

The present public-land laws as a whole do not subserve the best interests of the nation. They should be modified so far as may be required to bring them into conformity with the foregoing outline of policy.

FORESTS.

Next to our need of food and water comes our need of timber.

Our industries which subsist wholly or mainly upon wood pay the wages of more than 1,500,000 men and women.

Forests not only grow timber, but they hold the soil and they conserve the streams. They abate the wind and give protection from excessive heat and cold. Woodlands make for the fiber, health, and happiness of the citizen and the nation.

Our forests now cover 550,000,000 acres, or about one-fourth of the United States. The original forests covered not less than 850,000,000 acres.

Forests publicly owned contain one-fifth of all our standing timber. Forests privately owned contain four-fifths of the standing timber. The timber privately owned is not only four times that publicly owned, but is generally more valuable.

Forestry is now practiced on 70 per cent of the forests publicly owned and on less than 1 per cent of the forests privately owned, or on only 18 per cent of the total area of forests.

The yearly growth of wood in our forests does not average more than 12 cubic feet per acre. This gives a total yearly growth of less than 7,000,000,000 cubic feet.

We have 200,000,000 acres of mature forests, in which yearly growth is balanced by decay; 250,000,000 acres partly cut over or burned over, but restocking naturally with enough young growth to produce a merchantable crop, and 100,000,000 acres cut over and burned over, upon which young growth is lacking or too scanty to make merchantable timber.

We take from our forests yearly, including waste in logging and in manufacture, 23,000,000,000 cubic feet of wood. We use each year 100,000,000 cords of firewood; 40,000,000,000 feet of lumber; more

than 1,000,000,000 posts, poles, and fence rails; 118,000,000 hewn ties; 1,500,000,000 staves; over 133,000,000 sets of heading; nearly 500,000,000 barrel hoops; 3,000,000 cords of native pulp wood; 165,000,000 cubic feet of round mine timbers, and 1,250,000 cords of wood for distillation.

(Since 1870 forest fires have destroyed a yearly average of 50 lives and \$50,000,000 worth of timber. Not less than 50,000,000 acres of forest is burned over yearly.) The young growth destroyed by fire is worth far more than the merchantable timber burned.

One-fourth of the standing timber is lost in logging. The boxing of long-leaf pine for turpentine has destroyed one-fifth of the forests worked. The loss in the mill is from one-third to two-thirds of the timber sawed. The loss of mill product in seasoning and fitting for use is from one-seventh to one-fourth.

Of each 1,000 feet which stood in the forest, an average of only 320 feet of lumber is used.

We take from our forests each year, not counting the loss by fire, three and a half times their yearly growth. We take 40 cubic feet per acre for each 12 cubic feet grown; we take 260 cubic feet per capita, while Germany uses 37 and France 25 cubic feet.

We tax our forests under the general property tax, a method abandoned long ago by every other great nation. Present tax laws prevent reforestation of cut-over land and the perpetuation of existing forests by use.

Great damage is done to standing timber by injurious forest insects. Much of this damage can be prevented at small expense.

To protect our farms from wind and to reforest land best suited for forest growth will require tree planting on an area larger than Pennsylvania, Ohio, and West Virginia combined. Lands so far successfully planted make a total area smaller than Rhode Island; and year by year, through careless cutting and fires, we lower the capacity of existing forests to produce their like again, or else totally destroy them.

In spite of substitutes we shall always need much wood. So far our use of it has steadily increased. The condition of the world's supply of timber makes us already dependent upon what we produce. We send out of our country one and a half times as much timber as we bring in. Except for finishing woods, relatively small in amount, we must grow our own supply or go without. Until we pay for our lumber what it costs to grow it, as well as what it costs to log and saw, the price will continue to rise.

The preservation by use, under the methods of practical forestry, of all public forest lands, either in state or federal ownership, is essential to the permanent public welfare. In many forest States the acquirement of additional forest lands as state forests is necessary to the best interests of the States themselves.

The conservation of our mountain forests, as in the Appalachian system, is a national necessity. These forests are required to aid in the regulation of streams used for navigation and other purposes. The conservation of these forests is impracticable through private enterprise alone, by any State alone, or by the Federal Government alone. Effective and immediate cooperation between these three agencies is essential. Federal ownership of limited protective areas

upon important watersheds, effective state fire patrol, and the co-operation of private forest owners are all required.

The true remedy for unwise tax laws lies not in laxity in their application nor in special exemptions, but in a change in the method of taxation. An annual tax upon the land itself, exclusive of the value of the timber, and a tax upon the timber when cut, is well adapted to actual conditions of forest investment, and is practicable and certain. It is far better that forest land should pay a moderate tax permanently than that it should pay an excessive revenue temporarily and then cease to pay at all.

Forests in private ownership can not be conserved unless they are protected from fire. We need good fire laws, well enforced. Fire control is impossible without an adequate force of men whose sole duty is fire patrol during the dangerous season.

The conservative use of the forest and of timber by American citizens will not be general until they learn how to practice forestry. Through a vigorous national campaign in education, forestry has taken root in the great body of American citizenship. The basis already exists upon which to build a structure of forest conservation which will endure. This needs the definite commitment of state governments and the Federal Government to their inherent duty of teaching the people how to care for their forests. The final responsibility, both for investigative work in forestry and for making its results known, rests upon the States and upon the nation.

By reasonable thrift, we can produce a constant timber supply beyond our present need, and with it conserve the usefulness of our streams for irrigation, water supply, navigation, and power.

Under right management our forests will yield over four times as much as now. We can reduce waste in the woods and in the mill at least one-third, with present as well as future profit. We can perpetuate the naval-stores industry. Preservative treatment will reduce by one-fifth the quantity of timber used in the water or in the ground. We can practically stop forest fires at a cost yearly of one-fifth the value of the merchantable timber burned.

We shall suffer for timber to meet our needs until our forests have had time to grow again. But if we act vigorously and at once we shall escape permanent timber scarcity.

WATERS.

The sole source of our fresh water is rainfall, including snow. From this source all running, standing, and ground waters are derived. The habitability of the country depends on these waters. Our mean annual rainfall is about 30 inches; the quantity about 215,000,000,000 cubic feet per year, equivalent to ten Mississippi rivers.

Of the total rainfall, over half is evaporated; about a third flows into the sea; the remaining sixth is either consumed or absorbed. These portions are sometimes called, respectively, the fly-off, the run-off, and the cut-off. They are partly interchangeable. About a third of the run-off, or a tenth of the entire rainfall, passes through the Mississippi. The run-off is increasing with deforestation and cultivation.

Of the 70,000,000,000 cubic feet annually flowing into the sea, less than 1 per cent is retained and utilized for municipal and com-

munity supply; less than 2 per cent (or some 10 per cent of that in the arid and semiarid regions) is used for irrigation; perhaps 5 per cent is used for navigation, and less than 5 per cent for power.

For municipal and community water supply there are protected catchment areas aggregating over 1,000,000 acres, and over \$250,000,000 are invested in waterworks, with nearly as much more in the appurtenant catchment areas and other lands. The population so supplied approaches 10,000,000, and the annual consumption is about 37,500,000,000 cubic feet. The better managed systems protect the catchment areas by forests and grass; the water is controlled and the storm product used, but there is large waste after the water enters the mains.

For irrigation it is estimated that there are \$200,000,000 invested in dams, ditches, reservoirs, and other works for the partial control of the waters, and that 1,500,000,000,000 cubic feet are annually diverted to irrigable lands, aggregating some 20,000 square miles. Except in some cases through forestry, few catchment areas are controlled, and few reservoirs are large enough to hold the storm waters. The waste in the public and private projects exceeds 60 per cent, while no more than 25 per cent of the water actually available for irrigation of the arid lands is restrained and diverted.

There are in continental United States 287 streams navigated for an aggregate of 26,226 miles, and as much more navigable if improved. There are also 45 canals, aggregating 2,189 miles, besides numerous abandoned canals. Except through forestry in recent years, together with a few reservoirs and canal locks and movable dams, there has been little effort to control headwaters or catchment areas in the interests of navigation, and none of our rivers are navigated to more than a small fraction even of their effective low-water capacity.

The water power now in use is 5,250,000 horsepower; the amount running over government dams and not used is about 1,400,000 horsepower; the amount reasonably available equals or exceeds the entire mechanical power now in use, or enough to operate every mill, drive every spindle, propel every train and boat, and light every city, town and village in the country. While the utilization of water power ranks among our most recent and most rapid industrial developments little effort has been made to control catchment areas or storm water in any large way for power, though most plants effect local control through reservoirs and other works. Nearly all the freshet and flood water runs to waste, and the low waters which limit the efficiency of power plants are increasing in frequency and duration with the increasing flood run-off.

The practical utility of streams for both navigation and power is measured by the effective low-water stage. The volume carried when the streams rise above this stage is largely wasted and often does serious damage. The direct yearly damage by floods since 1900 has increased steadily from \$45,000,000 to over \$238,000,000. The indirect loss through depreciation of property is great, while a large loss arises in impeded traffic through navigation and terminal transfers.

The freshets are attended by destructive soil erosion. The sediment annually carried into lower rivers and harbors or into the sea is computed at 783,000,000 tons. Soil wash reduces by 10 or 20 per cent the productivity of upland farms and increases channel cutting.

and bar building in the rivers. The annual loss to the farms alone is fully \$500,000,000, and large losses follow the fouling of the waters and the diminished navigability of the streams.

Through imperfect control of the running waters lowlands are temporarily or permanently flooded. It is estimated that there are in mainland United States about 75,000,000 acres of overflow and swamp lands requiring drainage; that by systematic operation these can be drained at moderate expense, and that they would then be worth two or three times the present value and cost of drainage, and would furnish homes for 10,000,000 people.

It is estimated that the quantity of fresh water stored in lakes and ponds (including the American portion of the Great Lakes) is about 600,000,000,000,000 cubic feet, equivalent to three years' rainfall or eight years' run-off. Some 6,000,000 of our people draw their water supply from lakes.

A large part of that half of the annual rainfall not evaporated lodges temporarily in the soil and earth. It is estimated that the ground water to the depth of 100 feet averages $16\frac{2}{3}$ per cent of the earth volume, or over 1,400,000,000,000,000 cubic feet, equivalent to seven years' rainfall or twenty years' run-off. This subsurface reservoir is the essential basis of agriculture and other industries and is the chief natural resource of the country. It sustains forests and all other crops and supplies the perennial springs and streams and wells used by four-fifths of our population and nearly all our domestic animals. Its quantity is diminished by the increased run-off due to deforestation and injudicious farming. Although the volume of the available ground water is subject to control by suitable treatment of the surface, little effort has been made to retain or increase it, and it is probable that fully 10 per cent of this rich resource has been wasted since settlement began. The water of the strata below 100 feet supplies artesian and deep wells, large springs, and thermal and mineral waters. It can be controlled only through the subsurface reservoir.

Of the 35,000,000,000,000 cubic feet of cut-off, the chief share is utilized by natural processes or by agriculture and related industries. On an average the plant tissue of annual growths is three-fourths and of perennial growths three-eighths water; of human and stock food over 80 per cent is water, and in animal tissue the ratio is about the same; and since water is the medium for organic circulation, the plants and animals of the country yearly require an amount many times exceeding their aggregate volume. Even in the more humid sections of the country the productivity of the soil and the possible human population would be materially increased by a greater rainfall, leaving a larger margin for organic and other chemical uses. Except through agriculture and forestry little general effort is made to control the annual cut-off, although some farmers in arid regions claim to double or triple the crop from given soil by supplying water just when needed and withholding it when not required.

Water is like other resources in that its quantity is limited. It differs from such mineral resources as coal and iron, which once used are gone forever, in that the supply is perpetual; and it differs from such resources as soils and forests, which are capable of renewal or improvement, in that it can not be augmented in quantity, though like all other resources it can be better utilized.

It is now recognized by statesmen and experts that navigation is interdependent with other uses of the streams; that each stream is essentially a unit from its source to the sea; and that the benefits of a comprehensive system of waterway improvement will extend to all the people in the several sections and States of the country.

It is also recognized, through the unanimous declaration of the governors of the States and Territories adopted in conference with the leading jurists and statesmen and experts of the country, that in the use of the natural resources the independent States are interdependent, and bound together by ties of mutual benefits, responsibilities, and duties.

It has recently been declared by a majority of our leading statesmen that it is an imperative duty to enter upon a systematic improvement, on a large and comprehensive plan, just to all portions of the country, of the waterways and harbors and Great Lakes, whose natural adaptability to the increasing traffic of the land is one of the greatest gifts of a benign Providence; while the minority indorsed the movement for control of the waterways still more specifically and in equally emphatic terms.

Within recent months it has been recognized and demanded by the people, through many thousand delegates from all States assembled in convention in different sections of the country, that the waterways should and must be improved promptly and effectively as a means of maintaining national prosperity.

The first requisite for waterway improvement is the control of the waters in such manner as to reduce floods and regulate the regimen of the navigable rivers. The second requisite is development of terminals and connections in such manner as to regulate commerce.

In considering the uses and benefits to be derived from the waters, the paramount use should be water supply; next should follow navigation in humid regions and irrigation in arid regions. The development of power on the navigable and source streams should be coordinated with the primary and secondary uses of the waters. Other things equal, the development of power should be encouraged, not only to reduce the drain on other resources, but because properly designed reservoirs and power plants retard the run-off and so aid in the control of the streams for navigation and other uses.

Broad plans should be adopted providing for a system of waterway improvement extending to all uses of the waters and benefits to be derived from their control, including the clarification of the water and abatement of floods for the benefit of navigation; the extension of irrigation; the development and application of power; the prevention of soil wash; the purification of streams for water supply; and the drainage and utilization of the waters of swamp and overflow lands.

To promote and perfect these plans scientific investigations, surveys, and measurements should be continued and extended, especially the more accurate determination of rainfall and evaporation, the investigation and measurement of ground water, the gauging of streams and determination of sediment, and topographic surveys of catchment areas and sites available for control of the waters for navigation and related purposes.

NATIONAL EFFICIENCY.

Since the greatest of our national assets is the health and vigor of the American people, our efficiency must depend on national vitality even more than on the resources of the minerals, lands, forests, and waters.

(The average length of human life in different countries varies from less than twenty-five to more than fifty years.) This span of life is increasing wherever sanitary science and preventive medicine are applied. It may be greatly extended.

Our annual mortality from tuberculosis is about 150,000. Stopping three-fourths of the loss of life from this cause, and from typhoid and other prevalent and preventable diseases, would increase our average length of life over fifteen years.

(There are constantly about 3,000,000 persons seriously ill in the United States, of whom 500,000 are consumptives. More than half this illness is preventable.)

(If we count the value of each life lost at only \$1,700 and reckon the average earning lost by illness as \$700 per year for grown men, we find that the economic gain from mitigation of preventable disease in the United States would exceed \$1,500,000,000 a year.) In addition, we would decrease suffering and increase happiness and contentment among the people. This gain, or the lengthening and strengthening of life which it measures, can be secured through medical investigation and practice, school and factory hygiene, restriction of labor by women and children, the education of the people in both public and private hygiene, and through improving the efficiency of our health service—municipal, state, and national. The National Government has now several agencies exercising health functions which only need to be concentrated to become coordinated parts of a greater health service worthy of the nation.

The inventory of our natural resources made by your commission with the vigorous aid of all federal agencies concerned, of many States, and of a great number of associated and individual co-operators, furnishes a safe basis for general conclusions as to what we have, what we use and waste, and what may be the possible saving. But for none of the great resources of the farm, the mine, the forest, and the stream do we yet possess knowledge definite or wide enough to insure methods of use which will best conserve them.

In order to conserve a natural resource, we must know what that resource is by taking stock. We greatly need a more complete inventory of our natural resources; and this can not be made except through the active cooperation of the States with the nation.

The permanent welfare of the nation demands that its natural resources be conserved by proper use. To this end the States and the nation can do much by legislation and example. By far the greater part of these resources is in private hands. Private ownership of natural resources is a public trust; they should be administered in the interests of the people as a whole. The States and nation should lead rather than follow in the conservative and efficient use of property under their immediate control. But their first duty is to gather and distribute a knowledge of our natural resources and of the means necessary to insure their use and conservation, to impress the body of

the people with the great importance of the duty, and to promote the cooperation of all. No agency, state, federal, corporate, or private, can do the work alone.

(Finally, the conservation of our resources is an immediate and vital concern.) Our welfare depends on conservation. The pressing need is for a general plan under which citizens, States, and nation may unite in an effort to achieve this great end. The lack of cooperation between the States themselves, between the States and the nation, and between the agencies of the National Government, is a potent cause of the neglect of conservation among the people. An organization through which all agencies—state, national, municipal, associate, and individual—may unite in a common effort to conserve the foundations of our prosperity is indispensable to the welfare and progress of the nation. To that end the immediate creation of a national agency is essential. Many States and associations of citizens have taken action by the appointment of permanent conservation commissions. It remains for the nation to do likewise, in order that the States and the nation, associations and individuals, may join in the accomplishment of this great purpose.

Accompanying this report, and transmitted as a part thereof, are detailed statements by the secretaries of the several sections, and many papers and illustrations prepared by experts at the request of your commission.

GIFFORD PINCHOT, *Chairman.*

W J MCGEE,

Secretary, Section of Waters.

OVERTON W. PRICE,

Secretary, Section of Forests.

GEORGE W. WOODRUFF,

Secretary, Section of Lands.

J. A. HOLMES,

Secretary, Section of Minerals.

Attest:

THOMAS R. SHIPP,

Secretary to the Commission.

DECEMBER 7, 1908.

JOINT CONSERVATION CONFERENCE

SUPPLEMENTARY REPORT

This joint conservation conference, in session assembled in the city of Washington on this 10th day of December, in the year 1908, representing the several States and Territories of the United States through governors of States, state conservation commissions, delegates, and representatives of state and national organizations dealing with natural resources, does hereby resolve and declare:

Having heard the report of the National Conservation Commission read, and having fully deliberated thereon, we hereby indorse the said report as a wise, just, and patriotic statement of the resources of the nation, of the thoughtless and profligate manner in which some of these resources have been and are being wasted, and of the urgent need for their conservation in the interests of this and future generations, to the end that the prosperity and perpetuity of the nation may be assured.

We especially approve of the principle of cooperation among the States and between these and the Federal Government laid down in that report and in the earlier report of the Inland Waterways Commission, and urge both state and federal legislatures to enact such laws as may be necessary to extend and apply such cooperation in all matters pertaining to the use and conservation of our resources.

We especially commend and urge the adoption of the policy of separate disposal of the surface rights, timber rights, and mineral rights on the remaining public lands of the United States; and we approve the disposal of mineral rights by lease only, and the disposal of timber rights only under conditions insuring proper cutting and logging with a view to the protection of growing timber and the watersheds and headwaters of streams used for navigation and other interstate purposes.

We also especially approve and indorse the proposition that all uses of the waters and all portions of each waterway should be treated as interrelated; and we emphatically urge prompt and effective legislation providing for the immediate and proper development of the waterways of the country for navigation, water supply, and other interstate uses, preferably by direct federal appropriations; otherwise by the issue of bonds.

Fully approving the policy of improving the waterways of the country for navigation and other interstate uses of the waters, we urge the prompt adoption of the broad plan recommended by the Inland Waterways Commission for waterway development under an executive board or commission appointed by and acting under the direction of the President of the United States.

Approving those portions of the report pointing out the need for continued investigation and more extended scientific research, we also

urge that this policy of gaining more definite and specific knowledge relating to our resources be adopted by the several States no less than by the Federal Government.

Especially commending the portions of the report dealing with diminished national efficiency due to disease and premature death among our citizens, we urge the adoption of the policy of protecting life and health by States, municipalities, and communities, no less than by the Federal Government; and we urge further investigation of all other means whereby the efficiency of individual citizens, and hence of the State and nation may be increased.

We favor the maintenance of conservation commissions in every State, to the end that each Commonwealth may be aided and guided in making the best use of those abundant resources with which it has been blessed.

We also especially urge on the Congress of the United States the high desirability of maintaining a national commission on the conservation of the resources of the country, empowered to cooperate with state commissions, to the end that every sovereign Commonwealth and every section of the country may attain the high degree of prosperity and the sureness of perpetuity naturally arising in the abundant resources and the vigor, intelligence, and patriotism of our people.

PERSONNEL OF THE CONFERENCE

The Joint Conservation Conference was composed of the following:

Hon. Wilford B. Hoggatt, governor of Alaska.
 Hon. Joseph H. Kibbey, governor of Arizona.
 Hon. X. O. Pindall, acting governor of Arkansas.
 Hon. Rollin S. Woodruff, governor of Connecticut.
 Hon. H. B. F. Macfarland, chairman Board of Commissioners, District of Columbia.
 Hon. Preston Lea, governor of Delaware.
 Hon. Napoleon B. Broward, governor of Florida.
 Hon. Hoke Smith, governor of Georgia.
 Hon. W. F. Frear, governor of Hawaii.
 Hon. Charles S. Deneen, governor of Illinois.
 Hon. Walter R. Stubbs, governor-elect of Kansas.
 Hon. Jared T. Sanders, governor of Louisiana.
 Hon. Austin L. Crothers, governor of Maryland.
 Hon. Curtis Guild, jr., governor of Massachusetts.
 Hon. Fred M. Warner, governor of Michigan.
 Hon. John A. Johnson, governor of Minnesota.
 Hon. E. F. Noel, governor of Mississippi.
 Hon. George Curry, governor of New Mexico.
 Hon. John Burke, governor of North Dakota.
 Hon. George E. Chamberlain, governor of Oregon.
 Hon. Régis H. Post, governor of Porto Rico.
 Hon. Martin F. Ansel, governor of South Carolina.
 Senator William C. Edwards, representative of Canada.
 Hon. R. H. Campbell, representative of Canada.
 Mr. Andrew Carnegie.
 Mr. John Mitchell.
 Dr. Albert Shaw, editor Review of Reviews.

Personal representatives of governors:

Mr. J. C. Needham, California.
 Mr. William G. Evans, Colorado.
 Hon. Eugene Hale, Maine.
 Col. John A. Ockerson, Missouri.
 Hon. Francis G. Newlands, Nevada.

Personal representatives of governors—Continued.

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 Hon. James S. Whipple, New York.
 Hon. Rosewell Page, Virginia.
 Hon. William Irvine, Wisconsin.
 Hon. Charles R. Van Hise, Wisconsin.
 Hon. William E. Mullen, Wyoming.

Representatives of the States:**Alabama—**

Hon. W. P. Lay, chairman conservation commission.
 Hon. Frank H. Lathrop, member conservation commission.
 Mr. J. B. Powell, member conservation commission.

California—

Mr. Francis Cuttle, member conservation commission.
 Mr. Frank H. Short, member conservation commission.
 Mrs. Lovell White, member conservation commission.
 Mr. Grant Conard.

Colorado—

Hon. Simon Guggenheim, U. S. Senator from Colorado.
 Mr. I. N. Stevens, member conservation commission.
 Mr. Clarence P. Dodge, member conservation commission.
 Mr. Ellsworth Bethel, member conservation commission.
 Mr. Brooks Irlone.

Connecticut—

Mr. Albert N. Abbee.
 Mr. R. T. Crane.

Delaware—

Hon. Benjamin Nields, member conservation commission.

Florida—

Hon. William H. Milton, U. S. Senator from Florida, and chairman conservation commission.
 Hon. Duncan U. Fletcher, member conservation commission.

Georgia—

Mr. John A. Betjiman, member conservation commission.

Illinois—

Hon. Isham Randolph, chairman conservation commission.
 Dr. H. Foster Bain, member conservation commission.
 Dr. Cyril C. Hopkins, member conservation commission.
 Mr. Glenn W. Traer, member conservation commission.

Indiana—

Hon. Henry Riesenber, chairman conservation commission.
 Hon. Chas. S. Bash, member conservation commission.
 Mr. Joseph D. Oliver, member conservation commission.
 Mr. E. W. Wickey, member conservation commission.

Kentucky—

Mr. John B. Atkinson, member proposed conservation commission.
 Mr. Wm. R. Belknap, member proposed conservation commission.
 Hon. D. C. Edwards, member proposed conservation commission.
 Mr. Fred W. Keisker, member proposed conservation commission.
 Mr. F. C. Nunemacher, member proposed conservation commission.
 Mr. J. C. Tomlin, member proposed conservation commission.
 Mr. J. B. Bennett.
 Gen. John B. Castleman.
 Mr. A. D. James.
 Mr. John W. Langley.
 Col. A. T. McDonald.
 Mr. Clifton J. Waddill.

Louisiana—

Hon. Henry E. Hardtner, chairman conservation commission.
 Hon. Harry P. Gamble, secretary conservation commission.
 Maj. F. M. Kerr, member conservation commission.

Maryland—

Mr. Bernard N. Baker, chairman conservation commission.
 Prof. William Bullock Clark, member conservation commission.
 Mr. Edward Hirsch, member conservation commission.

Massachusetts—

Prof. Frank W. Raue, chairman conservation commission.

Representatives of the States—Continued.**Michigan—**

Hon. Wm. H. Rose, chairman forestry commission.
 Hon. W. B. Mershon, member forestry commission.
 Hon. Wm. F. Knox.
 Hon. Huntley Russell, commissioner of the state land office.

Minnesota—

Hon. F. B. Lynch.
 Mr. P. H. Nelson.
 Mr. S. D. Works.

Mississippi—

Prof. H. L. Whitfield.

Missouri—

Mr. W. K. Kavanaugh, chairman commission on waterways.
 Dr. Herman Von Schrenk, chairman commission on forestry.
 Dr. William H. Black, member commission on waterways.
 Mr. T. H. Herring, member commission on waterways.
 Mr. W. K. James, member commission on waterways.
 Mr. S. Waters Fox.

Nebraska—

Prof. G. E. Condra, chairman conservation commission.
 Mr. P. H. Marlay, member conservation commission.
 Mr. F. D. Wead, member conservation commission.

New Jersey—

Mr. E. B. Voorhees, chairman conservation commission.
 Mr. Alfred Gaskill, state forester and member conservation commission.
 Dr. Henry B. Kümmel, member conservation commission.
 Mr. Henry J. Sherman, member conservation commission.
 Mr. Morris R. Sherrerd, member conservation commission.

New Mexico—

Hon. Solomon Luna, chairman conservation commission.
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New York—

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 Hon. Henry H. Persons, member conservation commission.
 Hon. Frederick Skene, member conservation commission.
 Hon. Frederick C. Stevens, member conservation commission.

Ohio—

Mr. Jacob A. Beldler, chairman forestry bureau.

Oregon—

Hon. Joseph N. Teal, chairman conservation commission.

Pennsylvania—

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 Mr. Powell Evans, member conservation commission.
 Mr. A. B. Farquhar, member conservation commission.
 Col. Wm. S. Harvey, member conservation commission.
 Hon. W. R. Smith, Member of Congress.

Rhode Island—

Mr. Henry A. Barker, chairman conservation commission.
 Mr. J. Herbert Shedd, member conservation commission.
 Mr. Jesse B. Mowry.

South Carolina—

Mr. E. J. Watson, chairman conservation committee.
 Prof. Earle Sloan, member conservation committee.

South Dakota—

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Tennessee—

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Utah—

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Virginia—

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Representatives of the States—Continued.**West Virginia—**

- Mr. Hu Maxwell, chairman conservation commission.
- Mr. Nell Robinson, member conservation commission.
- Mr. James H. Stewart, member conservation commission.
- Mr. G. W. Atkinson.

Representatives of national organizations:**American Academy of Political and Social Science—**

- Prof. Emory R. Johnson, chairman conservation committee.
- Dr. S. M. Lindsay, member conservation committee.

American Association for the Advancement of Science—

- Prof. Wm. F. M. Goss, personal representative of the president.

American Association of Agricultural Colleges and Experiment Stations—

- Mr. J. L. Snyder, president.

American Automobile Association—

- Mr. Powell Evans, personal representative.
- Mr. C. Gordon Neff, member conservation committee.

American Bar Association—

- Mr. John Hinckley, secretary.

American Chemical Society—

- Prof. Marston T. Bogert, president.
- Dr. F. W. Clarke, chief chemist U. S. Geological Survey, and member conservation committee.
- Mr. R. B. Dole, member conservation committee.

American Civic Association—

- Mr. J. Horace McFarland, president.
- Mr. Clinton Rogers Woodruff, secretary.
- Mr. A. B. Farquhar, member conservation committee.

American Electrochemical Society—

- Mr. Edward G. Acheson, president.
- Mr. Edward R. Taylor, chairman conservation committee.

American Federation of Labor—

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American Institute of Electrical Engineers—

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American Institute of Mining Engineers—

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- Mr. E. R. Buckley, first vice-president.
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American Railway Association—

- Mr. Arthur Hale, personal representative.

American Railway Engineering and Maintenance of Way Association—

- Mr. Wm. McNab, president.

American Scenic and Historic Preservation Society—

- Mr. Hiram J. Messenger.

American Society of Civil Engineers—

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Representatives of national organizations—Continued.**American Society of Mechanical Engineers—**

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Appalachian National Forest Association—

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Business Men's League of America—

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Mr. Geo. W. Simmons, member conservation committee.

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Mr. Lauriston Ward.

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Mr. A. C. Fuller, member executive committee.

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General Federation of Women's Clubs—

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Mrs. John D. Wilkinson, chairman committee on waterways.

Miss Laura D. Gill.

International Tax Association—

Mr. Lawson Purdy, vice-president.

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Interstate Inland Waterway—

Mr. C. S. E. Holland, president.

Interstate Mississippi River Improvement Association—

Mr. Charles Scott, president.

Lakes-to-the-Gulf-Deep Waterway Association—

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Dr. Ira Remsen, president.

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National Association of Agricultural Implements and Vehicle Manufacturers—

Mr. Newell Sanders, chairman conservation committee.

National Association of Audubon Societies—

Mr. T. Gilbert Pearson, member conservation committee.

National Association of Cotton Manufacturers—

Mr. C. J. Woodbury, secretary.

National Association of Manufacturers—

Mr. James W. Van Cleave, president.

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- National Business League of America—
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- National Forest Conservation League—
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- National Hay Association—
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- National Hickory Association—
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Mr. I. T. Pryor.
- Upper Mississippi River Improvement Association—
Mr. Thomas Wilkinson, president.
- Woman's National Rivers and Harbors Congress—
Mrs. Frances Shuttleworth, corresponding secretary.

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Mr. Henry Gannett, geographer national conservation commission.
Mr. Robert Follansbee.
Mr. R. B. Dole.
Dr. D. T. Day.
Mr. M. R. Campbell.
Dr. C. W. Hayes.
Mr. M. O. Leighton.

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 Mr. Wm. L. Hall.
 Mr. R. S. Kellogg.
 Mr. A. C. Shaw.
 Mr. Philip P. Wells.
 Mr. E. A. Ziegler.

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Hon. Fred Dennett, Commissioner.
 Mr. Francis W. Clements, first assistant attorney.
 Mr. E. C. Finney.

Bureau of Statistics, Department of Commerce and Labor—

Dr. O. P. Austin, Chief.

Bureau of Entomology—

Dr. L. O. Howard, Chief.
 Mr. C. L. Marlatt.
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Weather Bureau—

Prof. Willis L. Moore, Chief.
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Reclamation Service—

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Indian Office—

Mr R. G. Valentine.

Bureau of Plant Industry—

Dr. B. T. Galloway, Chief.

Bureau of Corporations—

Mr. W. B. Hunter.

Biological Survey—

Dr. C. Hart Merriam, Chief.

Bureau of Statistics, Department of Agriculture—

Hon. Victor H. Olmsted, Chief Statistician.

Bureau of Fisheries—

Mr. Hugh M. Smith.

Office of Experiment Stations—

Dr. A. C. True, Director.

Bureau of Chemistry—

Dr. H. W. Wiley, Chief.

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Dr. Milton Whitney, Chief.

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 Mr. Geo. N. Babb, New York.
 Mr. R. Dan Benson, Pennsylvania.
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 Mr. Nathan D. Bill, Massachusetts.
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 Mr. W. P. Brown, Washington.
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 Mrs. Lina Simpson Poffenboyer, West Virginia.
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 Mr. J. T. Pryor, Texas.
 Mr. C. E. Rafferty, Washington, D. C.
 Hon. F. A. Richards, Massachusetts.
 Mr. Franklin C. Robinson, Maine.
 Mr. G. A. Rogers, Kansas.
 Mr. W. B. Royster, Tennessee.
 Mr. F. D. Ryan, Washington.
 Mr. C. G. Smith, New York.
 Mr. H. C. Smith, Louisiana.
 Mr. Edwin A. Start, Massachusetts.
 Mr. Charles J. Swift, Georgia.
 Mr. E. C. Taleny, Mississippi.
 Mr. S. Tallaferrio, Texas.
 Mr. M. B. Trezevant, Louisiana.
 Mr. Louis Ed. Vanoff, Louisiana.
 Mr. J. S. Warren, Tennessee.
 Mr. J. H. Woods, Massachusetts.
 and

The National Conservation Commission.

GIFFORD PINCHOT,
Chairman of the Joint Conference.

THOMAS R. SHIPP,
Secretary of the Joint Conference.

STATEMENTS BY THE SECRETARIES.

SECTION OF WATERS (Inland Waterways Commission).

SECTION OF FORESTS.

SECTION OF LANDS.

SECTION OF MINERALS.

WATER RESOURCES.

WHAT WE HAVE.

The sole source of our fresh water is rainfall (including snow). From this source our running, standing, and ground waters are derived. The habitability of the country depends on these waters.

Through the observations and measurements of the Weather Bureau at some 4,000 stations our rainfall is known more accurately than that of any other equal area on the globe. The records furnished by Chief Willis L. Moore, interpreted and reduced by Henry Gannett, show a yearly mean of approximately 30 inches. The quantity falling on the land averages about 200,000,000,000 cubic feet per year; including the rainfall on water areas, it is 215,000,000,000,000 cubic feet.* The volume is ten Mississippi rivers.

The yearly rainfall on the more humid two-fifths of the country east of the ninety-fifth meridian (or what may be called the State Divide forming the eastern boundary of the Median States—North Dakota, South Dakota, Nebraska, Kansas, Oklahoma, and Texas) is

* The quantitative view of water, except in smaller measures, is so new to thought that familiar units are lacking. Municipal water supply is generally expressed in gallons, irrigation water in acre-feet, stream flow in second-feet (or more accurately seconds-feet), and water for certain uses in the variable and indefinite miner's inch. There is urgent need of a unit applicable to the quantities commonly used for water supply, irrigation, and various other purposes. Moderate familiarity with the metric system would render convenient as such a unit the stere (equivalent to the kiloliter or cubic meter, the virtual basis of the metric system for capacity or tridimensional measure), which roughly approximates—like the liter the quart—the cubic yard in quantity and the ton in weight of water, while the kilostere approximates 1,000 tons and an acre-foot. The kilostere is especially convenient in discussing the water supply of the United States in that it permits expression of the leading values in round numbers not too large for ready comprehension—the mean rainfall totaling 6,000,000,000 kilosteres, and its main derivative fractions being expressible in sixths of this total. A kilostere of water is equivalent to a cube of 32.8 feet.

A few of the equivalents involved in the use of the stere for the measurement of water (reckoned at maximum density) follow:

- 1 liter=1.057 quarts; 0.264 gallon; 61.023 cubic inches; 2.205 pounds.
- 1 kiloliter=1,000 liters; 1 stere; 1 cubic meter; 264.17 gallons; 35.314 cubic feet; 2,204.62 pounds.
- 1 kilostere=1,000 kiloliters; 264,180 gallons; 35,314.45 cubic feet; 0.8107 acre-foot; 1,102.31 tons.
- 1 gallon=3.785 liters; 231 cubic inches; 0.1336 cubic foot; 8.34 pounds.
- 1 cubic foot=28.317 liters; 7.48 gallons; 62.43 pounds.
- 1 cubic mile=147,197,952,000 cubic feet; 4,168.208 kilosteres; 3,397,200 acre-feet; 4,594,784,072 tons.
- 1 ton=2,000 pounds; 32.04 cubic feet; 907.19 liters; 239.65 gallons.
- 1 pound=27.68 cubic inches; 0.4536 liter; 0.12 gallon.
- 215,000,000,000,000 cubic feet=6,088,236,690 kilosteres; 4,935,720,845 acre-feet; 1,460.6 cubic miles.
- 215,000,000,000,000 cubic feet±6,000,000,000 kilosteres; 5,000,000,000 acre-feet; 1,500 cubic miles.

nearly 48 inches; the quantity about 140,000,000,000 cubic feet. On the semiarid fifth of our area in these Median States (or between the ninety-fifth and one hundred and third meridians) the rainfall averages 30 inches and aggregates over 40,000,000,000 cubic feet. The rainfall on the western two-fifths of the country, including our arid lands, averages about 12 inches, or some 35,000,000,000 cubic feet.

Of the total rainfall, over half is evaporated; about a third flows into the sea; the remaining sixth is either consumed or absorbed. These portions, which may be called, respectively, the fly-off, the run-off, and the cut-off, are partly interchangeable. About a third of the run-off, or a tenth of the entire rainfall, passes through the Mississippi. The run-off is increasing with cultivation and deforestation.

The 110,000,000,000 cubic feet of fly-off influences climate, and thus affects agriculture and other industries. Except in moderate degree through management of the land surface, it is beyond artificial control.

The 70,000,000,000 cubic feet of run-off is available for water supply, irrigation, navigation, and power. It is controlled in small part, and may be wholly controlled by proper means.

The remainder of the rainfall (or cut-off) is either consumed in plant growth and other chemical combinations, or else permeates the deeper strata and passes subterraneously into the sea. It is partly controlled, chiefly through farming and forestry; and the control may be much increased.

WHAT WE USE AND WASTE.

Of the 110,000,000,000 cubic feet of water annually evaporated, a reasonable use is made through the settlement and general industrial development of the country. It is adapted to largely increased population and industries.

Of the 70,000,000,000 cubic feet annually flowing into the sea, little more than 100,000,000 cubic feet, or one-seventh of 1 per cent, is taken from rivers and lakes and protected catchment areas for municipal and community supply and related purposes; less than 2 per cent (or some 10 per cent of that in the arid and semiarid regions) is used for irrigation; perhaps 5 per cent may be reckoned as in small use for navigation; and less than 5 per cent is utilized for power. It is estimated that 85 per cent to 95 per cent of the volume is wasted in freshets or destructive floods.

It is reckoned by Chief Leighton of the hydrographic branch of the Geological Survey that for municipal and community water supply there are protected catchment areas aggregating over 1,000,000 acres, and that fully \$250,000,000 are invested in waterworks with nearly as much more in the appurtenant catchment areas and other lands. The population so supplied approaches 10,000,000; the annual consumption is about 37,500,000,000 cubic feet, or one-twentieth of 1 per cent of our run-off. The better managed systems protect the catchment areas by forests or grass; the water is completely controlled, the storm product is stored, and there is little waste save through overlavish use after the impounded flow enters the mains.

For irrigation it is estimated by Director Newell of the Reclamation Service that there are \$200,000,000 invested in dams, ditches,

reservoirs, and other works for the partial control of the waters (in addition to the value of the land, which is virtually fixed by the availability of the water); and that 1,500,000,000 cubic feet, i. e., three-quarters of 1 per cent of our total rainfall, or 2 per cent of that on the western two-fifths of our area, are annually diverted to irrigable lands aggregating some 13,000,000 acres. Except in some cases through forestry, there is little effort to control the catchment areas, and few reservoirs are large enough to hold the storm waters; so that the waste in public and private projects exceeds 60 per cent, while less than 25 per cent of the water actually available for irrigation of the arid lands is restrained and diverted.

There are in mainland United States 287 streams navigated for an aggregate of 26,226 miles,^a and about an equal additional mileage might be made navigable by waterway improvements. There are also 45 canals with a mileage of 2,189, besides numerous abandoned canals.^b On lake and sound routes there is large traffic, but the navigation of rivers and canals is too small for definite record. Several hundred million dollars have been expended on special projects, yet, "in spite of large appropriations for their improvement, our rivers are less serviceable for interstate commerce to-day than they were half a century ago."^c The cost of water carriage averaging about one-fourth that of rail carriage, and our railway freightage during 1906 reaching 217,000,000,000 ton-miles at an average rate of 0.77 cent, the shipping of one-fifth of our freight by water would have saved over \$250,000,000 to our producers and consumers. Except through forestry in recent years, together with a few reservoirs and canal locks and movable dams, there has been little effort to control headwaters or catchment areas in the interests of navigation; and none of our rivers are navigated to more than a small fraction even of their effective low-water capacity.

The theoretical power of the streams is reckoned by Leighton at 230,000,000 horsepower. The amount now in use is computed by the Census Office at 5,350,000 horsepower, and the amount running over government dams and not used is estimated by the Chief of Engineers at about 1,400,000 horsepower. The amount now available at a cost comparable with that of steam installation is estimated by the hydrographic branch of the Geological Survey at 37,000,000 horsepower, and the amount prospectively available at 75,000,000 to 150,000,000 horsepower. The 37,000,000 horsepower to-day available exceeds our entire mechanical power now in use, and would operate every mill, drive every spindle, propel every train and boat, and light every city, town, and village in the country. The nominal value is \$20 per horsepower year; the price ranges up to \$100 or \$150. While the utilization of water power ranks among our most recent and most rapid industrial developments, little effort has been made to control catchment areas or storm waters in any large way for power development, though most plants effect local control through reservoirs and structures. Nearly all of the freshet and flood water runs to waste, and the low waters which limit the

^a Preliminary Report of the Inland Waterways Commission, 1908: Herbert Knox Smith on "Navigable Streams of the United States," p. 35.

^b Ibid.: Herbert Knox Smith on "Canals in the United States," p. 192.

^c Ibid.: "Message of the President," p. vi.

efficiency of power plants are increasing in frequency and duration with the increasing flood run-off.

The practical utility of streams for both navigation and power is measured by the effective low-water stage; the volume carried when the streams rise above this stage (75 to 90 per cent of the run-off) is not only wasted but does serious damage. The direct yearly damage by floods since 1900, as computed by Leighton, has increased steadily from \$45,000,000 to more than \$238,000,000; the indirect loss through depreciation of property is probably greater; while the largest loss is that arising in impeded traffic through navigation and terminal transfers.

The freshets are attended by destructive soil erosion. The soil matter annually carried into lower rivers and harbors or into the sea has recently been reckoned by Dole and Stabler at 783,000,000 tons. Its removal seriously reduces the productivity of upland farms, and increases channel cutting and bar building in the rivers. It is estimated that soil erosion reduces farm production 10 to 20 per cent; that the annual loss to the farms alone is \$500,000,000; and that large losses follow the fouling of the waters and the diminished navigability of the streams.

Through imperfect control of the running waters, lowlands are temporarily or permanently flooded. It is estimated that there are in mainland United States 75,000,000 to 80,000,000 acres of overflow and swamp lands requiring drainage; that by systematic operations these might be drained and the water made available at moderate expense, and that they would then be worth two or three times the present value and cost of drainage, and would furnish homes for 10,000,000 inhabitants.

A part of the run-off lodges temporarily in lakes and ponds. It is estimated that the quantity of fresh water so stored (including the American portion of the Great Lakes) is about 600,000,000,000,000 cubic feet, equivalent to three years' rainfall or nine years' run-off. Over the water surface evaporation is rapid, and the influence of the lakes on climate is correspondingly large; and the natural reservoirs yield a water supply ordinarily requiring no control of catchment area. Some 6,000,000 of our people draw their water supply from lakes. All the larger and deeper lakes are navigated; they serve the chief part of our inland commerce by water.

A large part of that half of the annual rainfall not evaporated lodges temporarily in the soil and earth as ground water. According to texture, fire-dry rocks contain 1 to 3 per cent, air-dry rocks 5 to 25 per cent, and saturated rocks and earths 10 to 40 per cent of water, while the optimum moisture for plant growth in top soil ranges from 4 to 20 per cent; and it is estimated that the ground water to the depth of 100 feet (in which it is available for hand pumps and capillarity and deep-rooted trees) averages 5 per cent over 1,000,000 square miles, 20 per cent over another third of the country, and 25 per cent over the remaining third, a mean of 16½ per cent. This ground water forms a subsurface reservoir of over 1,400,000,000,000,000 cubic feet, equivalent to seven years' rainfall or twenty years' run-off. It is the essential basis of agriculture and most other industries, and the chief natural resource of the country; it sustains forests and all other crops, and supplies the perennial streams and springs and wells used by four-fifths of our

population and nearly all our domestic animals. Its quantity is diminished by the increased run-off due to deforestation and injudicious farming. Throughout the upland portions of eastern United States the average water table has been lowered 10 to 40 feet, so that fully three-fourths of the springs and shallower wells have failed and many brooks have run dry, while the risk of crop loss by drought has proportionately increased. Although the available ground water is subject to control by such treatment of soil and plant growth as to prevent freshets, little effort has been made to retain it or increase its volume, and it is probable that fully 10 per cent of this rich resource has been allowed to drain away since settlement began. The water of the deeper rocks (below 100 feet) supplies artesian and other deep wells, thermal and mineral waters, and large springs. It can be controlled in part, chiefly through the subsurface reservoir, and the supply may be much better utilized.

Of the 35,000,000,000,000 cubic feet of cut-off, the chief share is utilized in natural processes or by agriculture and related industries. On an average, plant tissue in annual growths is three-fourths and in perennial growths three-eighths water; of human and stock food over 80 per cent is water, and in animal tissue the ratio is about the same; and water is the chief vehicle for the transmission of enteric and many other diseases. Since water is the medium for organic circulation, the plants and animals of the country yearly require an amount many times exceeding their aggregate volume. The average man of 150 pounds ingests over a ton (32 cubic feet, or 13 times his volume) of water each year, and an average bushel of corn requires over 700 cubic feet, or 22 tons, of water in the making, of which the larger part is evaporated and added to the fly-off. Even in the more humid sections of the country the productivity of the soil and the possible human population would be much larger if the rainfall were greater, leaving a wider margin for organic and other chemical uses. Except through agriculture and forestry, little general effort is made to control the annual cut-off, although some farmers in arid regions claim to double or triple the crop from given soil by supplying water just when needed and withholding it when not required.

WHERE WE STAND.

Our stock of water is like other resources in that its quantity is limited. It differs from such mineral resources as coal and iron, which once used, are gone forever, in that the supply is perpetual; and it differs from such resources as soils and forests, which are capable of renewal or increase (provided the supply of water suffices), in that its quantity can not be augmented. It differs also in that its relative quantity is too small to permit full development of other resources and of the population and industries depending on them. Like all other resources, it may be better utilized. It must be better utilized in order to derive full benefit from lands and forests and mines.

Although our rainfall of 215,000,000,000,000 cubic feet is 2,500,000 cubic feet per capita for a population of 86,000,000 (or 250,000 cubic feet, allowing for the 90 per cent waste), our growth in population and industries is seriously retarded by dearth and misuse of water. Fully a third of our territory (1,000,000 square miles, the

area of Great Britain, Germany, France, Spain, Portugal, Italy, Austria, and Denmark combined) remains practically unoccupied and nearly unproductive by reason of aridity; while the public lands sufficiently humid for agricultural settlement are taken, the cost of transportation is limiting production, and our citizens are emigrating in thousands to other countries. With half our land area and the same water, our capacity for population and industries would be great as now; with twice our water equably distributed over our present land, our capacity would be more than doubled.

Hitherto water has seldom been regarded as a resource to be exploited and conserved; it has been viewed vaguely as a prime necessity, yet merely as a natural incident or providential blessing. In its assumed plenitude the idea of quantity has seldom arisen, though the waste is least in those arid regions in which customs are better adjusted to the values and interrelations of water. Under the English common law, prevailing in eastern United States, the water is held appurtenant to the land; under the Code Napoleon, prevailing in Louisiana, it virtually appertains to the community; under the Spanish-Roman law, prevailing in western United States, water is subject to prior appropriation and beneficial use, and hence appertains primarily to the individual or family, while the land is essentially appurtenant to the water traversing it.

Not being deemed a resource when our fundamental law was framed, the waters were in no wise granted by the people, except as employed in commerce under federal authority; and since their value has arisen through the natural growth and orderly development of our population and industries, they seem in equity to belong to the people collectively. When required by municipalities or communities, water is restrained and used as a matter of course, and the cost of the appurtenant land and works for its control is ordinarily borne by taxation offset by water rates, i. e., the water is appropriated and exploited, and then conveyed or sold as a commodity in the interests of the population supplied; and in all cases the investment (generally at first thought burdensome) proves either highly remunerative or inconsiderable in proportion to the benefits. When streams are controlled by individuals for power under federal grants, the power becomes a taxable commodity used, rented, or sold, certain rights being retained by the Federal Government in the interest of the people; and power developed by the nation in works connected with commerce is used, rented, or sold. Some States recognize a residuary right of the people in the natural waters, or in the headwaters of streams used for water supply or navigation, and this recognition seems to be extending over the country; but the usage of the different sections is not uniform, the exercise of the right of the people generally varying with the aridity of the land or the density of the population.

Since most navigable streams bound or traverse different Commonwealths, while the waters forming them are unstable and essentially interstate, the States generally have refrained from waterway improvement, save through a few canals and drainage projects; and since the headwaters on which the navigability depends are commonly intrastate, the Federal Government has refrained from assuming more than a partial and ineffective control of the navigable waters. Thus a half-hearted and irresponsible or repressive policy has grown up; navigation has been neglected and allowed to decline; both con-

trol of the running waters and recognition of their value have been delayed, and private monopoly has been permitted to invade to their detriment the source waters on which the rivers depend.

Some of our navigable and other waters are international, and questions of both civil jurisdiction and control or use of the flow have been or are being composed by treaty or convention sanctioned by laws of the nations in interest. In the Great Lakes and Columbia regions each second-foot of flow corresponds to about a square mile of land surface drained—i. e., an outtake of 10,000 second-feet involves relations equivalent to titular questions affecting 10,000 square miles of territory; and in the Rio Grande and Rio Colorado regions each second-foot of flow is equivalent to 20 or 25 square miles of territory.

It is now recognized by leading statesmen and experts that navigation is interdependent with other uses of the streams;^a that each stream is essentially a unit from its source to the sea;^b that the power of the Federal Government to improve navigable streams extends above the limit of navigability;^c and that the benefits of a comprehensive system of waterway improvement will extend to all the people in the several sections and States of the country.^d

It is also recognized, through the unanimous declaration of the governors of the States and Territories adopted in conference with the leading jurists, statesmen, and experts of the country, that in the use of the natural resources the independent States are interdependent, and bound together by ties of mutual benefits, responsibilities, and duties.^e

It has recently been declared by a majority of our leading statesmen that it is an imperative duty to enter upon a systematic improvement, on a large and comprehensive plan, just to all portions of the country, of the waterways and harbors and Great Lakes whose natural adaptability to the increasing traffic of the land is one of the greatest gifts of a benign Providence; while a strong minority of the nation's statesmen indorsed the movement for control of the waterways more specifically and in equally emphatic terms.

Within recent months it has been recognized and demanded by a majority of the people, through many thousand delegates from all of the States assembled in conventions in different sections of the country, that the waterways should and must be improved promptly and effectively as a means of maintaining national prosperity, the cost to be borne either by federal appropriations or by the issue of bonds.

WHAT WE NEED TO DO

The first requisite for waterway improvement is control of the waters in such manner as to reduce floods and regulate the regimen

^a Preliminary Report of the Inland Waterways Commission, 1908: "Findings," p. 22.

^b *Ibid.*: "Message of the President," p. 4.

^c *United States v. Rio Grande Irrigation Company* (174 U. S., p. 690 et seq.; also report of the Committee on the Judiciary on "Power of the Federal Government to acquire lands for national forest purposes" (60th Cong., 1st sess., H. R. Rep. 1514), p. 20.

^d Preliminary report of the Inland Waterways Commission, 1908: "Findings," p. 24.

^e Proceedings of the Conference of Governors, 1908, p. 193.

of the navigable rivers; the second is development of terminals and connections in such manner as to regulate commerce.

Most of the headwaters, especially in mountainous regions, may be so controlled by forestation as to diminish floods and ameliorate low waters, and at the same time clarify streams required for water supply and augment the subsurface reservoir of ground water. The effect of forest cover, with the attendant mulch, is to diffuse the rainfall and convert it into ground water, thereby reducing the surface run-off and holding the water back for use in plant growth or in seepage run-off through clear springs and brooks serving to maintain the rivers during dry periods, while the evaporation from the plants serves to increase the rainfall. Under proper management these benefits may be made self-sustaining through increased production.

Most lowland headwaters are on agricultural land, and are subject to control by judicious farming. Since no upland farm receives sufficient rainfall for the highest productivity, every acre should be made to utilize all the water reaching it. This may be effected by deep plowing and proper selection of crops on level land, by contour cultivation and terracing on rolling land, by dust-mulching on arid land, and by other devices of scientific farming. Thereby storm freshets may be cut off, the reservoir of ground water augmented, the springs and wells maintained, and the streams clarified and kept up during dry periods. The devices should be made not only self-supporting, but a source of increased production and profit.

About commercial centers and in populous districts, the paramount use of water is for domestic and manufacturing purposes; and the requisite supply should continue to be appropriated with the appurtenant lands and controlled under consistent State laws and federal regulations in the direct interest of the people. The catchment areas should be protected by proper covers of forest, grass, or other crops yielding reasonable returns, in such manner as to prevent both floods and soil wash with consequent pollution of the reservoirs and menace to life. When supplies are taken from lakes or the ground-water reservoir, both the maintenance of the public health and other uses of the waters (including navigation) should be duly weighed under the principle of the greatest good to the greatest number for the longest time. Wise administration demands that the water-supply projects be made so nearly as possible self-supporting through collateral benefits in order that potable water, as a prime necessary of life, may be placed within reach of all.

Refuse from household, farm, factory, mine, and city should be prevented from polluting streams, or extending needlessly into the ground water or contaminating the air. In rural households and communities refuse should be so treated as to yield high-grade fertilizer; urban sewage should be converted and utilized as a source of municipal revenue; and mine refuse should be treated as a by-product.

In arid and semiarid lands irrigation is (next to water supply) paramount, and all the water should be made available for the population dependent on each catchment basin. To this end the headwaters should be so controlled as to regulate the flow, the reservoirs should be large enough to store the surplus and prevent waste, and navigation should be limited to reservoirs and canals. Each irrigation project should be self-supporting; and any surplus or return

water should remain in the natural channels available for other uses pending complete consumption in irrigation.

The navigable streams, partly controlled through their headwaters, should be further regulated by lock dams, movable dams, reservoirs, and other engineering devices found expedient in particular cases. They should be administered under federal regulations in the interest of the people, either independently or in cooperation with States, municipalities, communities, corporations, or individuals, as may be found expedient in particular cases. The projects should comprise such terminals and sites and such regulation thereof as may be essential to commerce. Drainage projects should be adapted, so far as practicable, to aiding in the control of the waters for navigation and related purposes.

When necessary, provision should be made for levees, jetties, hurdles, wing dams, revetment, matting, dredging, and other means of temporary and supplementary control of the waters and channels; and both the works and their sites should be acquired and protected under federal or State authority.

When consistent with other uses of the waters, fish should be propagated and protected in streams and lakes, and necessary fishways should be provided in connection with dams and other works; and State and federal laws relating to fish and fisheries in inland and coast waters should be unified.

In the design and construction of works connected with water supply, irrigation, navigation, or the control of water for other purposes, consideration should be given to the power developed thereby and to the equity of the people in this value of the waters; and all benefits derived from power in connection with works installed at the public cost should be applied to the public welfare through protection against loss or diminution of the cost of additional works, or in other proper ways.

In considering the benefits to be derived from the 215,000,000,000,000 cubic feet of water annually received, the paramount use should be that of water supply; next should follow navigation in humid regions and irrigation in arid regions. The utilization of power from the navigable and source streams should be kept subordinate to the primary and secondary uses of the waters, though, other things equal, power development should be encouraged, not only to reduce the drain on other resources, but because properly designed reservoirs and power plants retard the run-off and so aid in the control of the streams for navigation and other uses.

The broad plan already framed by statesmen and experts and approved by the Executive should be put in effect. It provides for a system of waterway improvement extending to all of the uses of the waters and benefits to be derived from their control, including the clarification of the water and the abatement of floods for the benefit of navigation, the extension of irrigation, the development and application of power, the prevention of soil wash, the purification of streams for water supply, and the drainage and utilization of the waters from swamp and overflow lands; and that the work shall be carried on by existing agencies in the federal departments under an administrative commission or board to be appointed by the Presi-

dent, acting in cooperation with States, municipalities, communities, corporations, and individuals.^a

The improvements should conform to the plan already outlined.^b In the Atlantic-interior system there should be a deep waterway from Gulf of Mexico to the Great Lakes and a deep and continuous Atlantic inner passage from New England to Florida, the present plan for improving the Ohio should be carried out promptly and should be perfected by any forestation and reservoirs required to control the headwaters, the upper Mississippi and the Missouri should be improved and canalized, the lower Mississippi should be connected with the Rio Grande and with the waters of Florida by inner passages, the navigable rivers flowing into Gulf of Mexico and Atlantic Ocean should be improved, and all appropriate links in the system should be adapted to vessels of standard depth and should be connected with one another and with the Great Lakes by canals of standard dimensions. In the Columbia-Puget system the rivers should be improved and requisite connecting canals should be constructed; and in the California system Sacramento, San Joaquin, and Feather rivers should be so improved as to open the country to interstate and foreign commerce.

To promote and perfect the plan, scientific investigations, surveys, and measurements should be continued and extended, especially the more accurate determination of rainfall and evaporation, the investigation and measurement of ground water, the gauging of streams and determination of sediment, and topographic surveys of catchment areas and sites available for control of the waters for navigation and related purposes.

It has been roughly estimated that the inland waterways of the country could be improved in ten years at a cost of \$50,000,000 annually in such manner as to promote interstate commerce and at the same time greatly reduce the waste and extend the use of the waters. If done at the cost of the people, the burden would be 62½ cents per capita per year, or \$6.25 in all, for a population of 80,000,000. This burden should be assumed without delay either by appropriations or by the issue of bonds in small denominations bearing low interest, adapted to distributing both the burden and benefits among the people.

It is roughly estimated that the direct benefits would comprise an annual saving in transportation of \$250,000,000; an annual saving in flood damage of \$150,000,000; an average annual saving in forest fires of at least \$25,000,000; an annual benefit through cheapened power of fully \$75,000,000; and an annual saving in soil erosion (or corresponding benefit through increased farm production) of \$500,000,000—a total of \$1,000,000,000, or \$12.50 per capita annually, i. e., twenty times the cost. In addition, large benefits would result from extended irrigation, from the drainage and settlement of swamp and overflow lands, and from purified and cheapened water supply with consequent diminution of disease and saving of human life.

Various indirect benefits would arise through the interrelations among the natural resources. For example, the development of water traffic in lieu of rail carriage would reduce the constantly

^a Preliminary Report of the Inland Waterways Commission, 1908: "Recommendations," pp. 25-27.

^b *Ibid.*: "Inquiries in Progress," p. 29.

increasing consumption of ties and mine timbers, now a heavy drain on our forests; it would reduce the consumption of iron, since water vehicles require but a quarter to a third of the metal required by rail vehicles of like capacity; and it would correspondingly reduce the consumption of coal for both propulsion and smelting. At the same time the reduced use of ties and mine timbers would save the forests and so aid in protecting the headwaters on which the navigable streams depend for both supply and regimen.

With a view to promoting interstate commerce, the Federal Government has aided railways by subsidies and grants to the extent of many hundred million dollars, thereby contributing materially to the 228,000 miles of railways and collateral property aggregating about one-seventh of our national wealth and earning nearly \$2,500,000,000 annually; yet although our railway freightage runs only about three-quarters of a cent per ton-mile (or half that of Europe), our distances are so great that many commodities can not be moved with profit to and from our ports, and our export of foodstuffs have declined to the disturbance of our foreign commerce. Our farm and forest products exceed \$8,000,000,000, our mineral products are \$2,000,000,000, and our products of manufacture are fully \$15,000,000,000 annually, or a gross nominal output (with considerable duplication) of \$25,000,000,000. Of this aggregate, much is not moved by rail, and much more is moved short distances only; yet we paid for railway freightage alone in 1906 no less than \$1,659,925,643. Reckoning the total cost of domestic traffic by rail and water and wagon, together with freightage on imports, it is probable that an average American family pays for transportation of food and clothing nearly or quite one-third of their actual cost, i. e., our consumers pay too much and our producers get too little for the necessaries of life. This condition would be relieved, while the railway business would be promoted rather than injured, by the development of water transportation on an adequate scale. The promotion of interstate commerce by railway aid was wise and beneficent in its time; but it is now time to supplement this agency of commerce by others better adapted to our multiplied population and enormously increased production.

It is estimated that the income derived from power developed by works for the improvement of navigation, if utilized at current market rates in cooperation with States and citizens, would alone compensate the entire cost of maintenance and continued development after the initial expenditure of \$500,000,000 as a working capital. In any event the first cost should be deemed an investment in the interest of the people, certain to yield large returns in public welfare and national growth.

Whether or not the initial investment be so made as to yield pecuniary returns, the just and reasonable demand of a majority of the people for the improvement of their waterways should be met, and that the more promptly by reason of seventy years of repression.

W J MCGEE,
Secretary, Section of Waters.

FORESTS.

WHAT FORESTS DO.

Our industries which subsist wholly or mainly upon wood pay the wages of more than 1,500,000 men and women.

Forests not only grow timber, but they hold the soil and they conserve the streams. They abate the wind and give protection from excessive heat or cold. Woodlands make for the fiber, health, and happiness of each citizen and of the nation.

The fish which live in forest waters furnish each year \$21,000,000 worth of food, and not less than half as much is furnished by the game which could not exist without the forest.

The industries which use wood wholly or mainly in manufacture represent an investment of over \$2,250,000,000 and yield each year a product worth nearly \$3,000,000,000.

Forests conserve streams by regulating their flow. Our knowledge of the effect of forests upon the quantity of water carried by streams is not yet complete. Our knowledge of the effect of forests upon the regularity of stream flow has an adequate basis of observation and record.

We do not possess complete scientific proof that forests increase rain, but known laws governing rainfall and the known physical effects of forests lead straight to that conclusion. A part of the falling rain or snow is checked by the tree tops and returned to the air by evaporation. But this evaporation is wholly or nearly compensated for by the smaller evaporation from the soil under forest cover than from the soil in the open. The forest soil gives up water to the air more slowly than either brush land, meadow land, or cultivated fields.

Both observation and record show fully that forests powerfully affect the manner in which water reaches streams and passes down them. The forest floor is a blanket, and like a blanket it will hold more water than will the harder and relatively less porous soil of the open. A saturated forest soil will hold more than half its dry weight in water, or over 6 inches of water for every foot of soil. This, as well as the breaking up of forest soil by the roots of trees and undergrowth, makes it more effective than any other cover for the intake of water into that vast underground reservoir from which all streams and springs are fed.

When the forest is cleared from a mountain watershed the blanket formed by the decaying leaves, branches, and fallen trees is burned up, dried by the sun, or carried off by wind and water. This is inevitably followed by increase in the frequency and duration of

floods. This fact is known to every man who has had an opportunity to observe it. To those who have not had this opportunity the story is told by actual record of stream flow upon the following rivers for a period during which the mountain forests on their watersheds were rapidly denuded. These are such as the Ohio, Monongahela, Allegheny, Cumberland, Alabama, Savannah, Wateree, Congaree, and Muskingum.

That surface conditions affect stream flow is shown by the record of streams whose naturally treeless watersheds by cultivation have been made more retentive of water. The principal watershed of the Red River lies in the prairie country of western Texas and Oklahoma. With slightly decreased rainfall this stream shows during the last sixteen years a marked decrease in the frequency and duration of floods and of low water. During this period much of its watershed has been cultivated, groves have been planted, and fires checked, resulting in a larger capacity for the absorption and storage of water.

That forests hold soil and that hillsides denuded of forest do not hold their soil is to be seen in any mountain region in the United States. One small stream has been found by actual measurement to deposit silt in one year equal to $1\frac{1}{2}$ tons per acre of its watershed. For the whole United States the loss of soil each year is from one to two thousand million tons. At the lowest estimate the total quantity of silt carried by our streams would cover 1 foot deep a surface of more than 900 square miles. The larger part of it is deposited in the lower courses of our streams and in our harbors, a menace to navigation and to present developed water powers, and a handicap to their development.

The National Forests in the Rocky Mountain and Pacific coast States afford summer ranges to over 12 per cent of the cattle and 21 per cent of the sheep in the States in which they lie. If this live stock were not fed in the forests during the summer months it would be without natural forage during the winter. For the East, the number of forest-fed live stock can not be given. But notably in the southern pine belt and in the southern mountains, live-stock owners, especially small holders, turn out their sheep, cattle, and hogs in the forests for the larger part of each year.

That the existence of nearly all kinds of wild game depends directly upon the conservation of the forest is well known. The deer killed in six States alone in the northeast represents each year a food value of over \$1,000,000. The raw furs exported yearly from the United States are worth \$7,000,000 to \$8,000,000, and raw furs worth in the aggregate still more are kept for manufacture here. Most of these furs are taken from forest animals. Relatively few kinds of fresh-water fish, and mainly those of inferior food value, will endure in streams fed from denuded watersheds.

WHAT WE HAVE.

Our forests now cover 550,000,000 acres, or about one-fourth of the United States. The original forests covered not less than 850,000,000 acres.

(Forests publicly owned contain one-fifth of all timber standing. Forests privately owned contain at least four-fifths of the standing tim-

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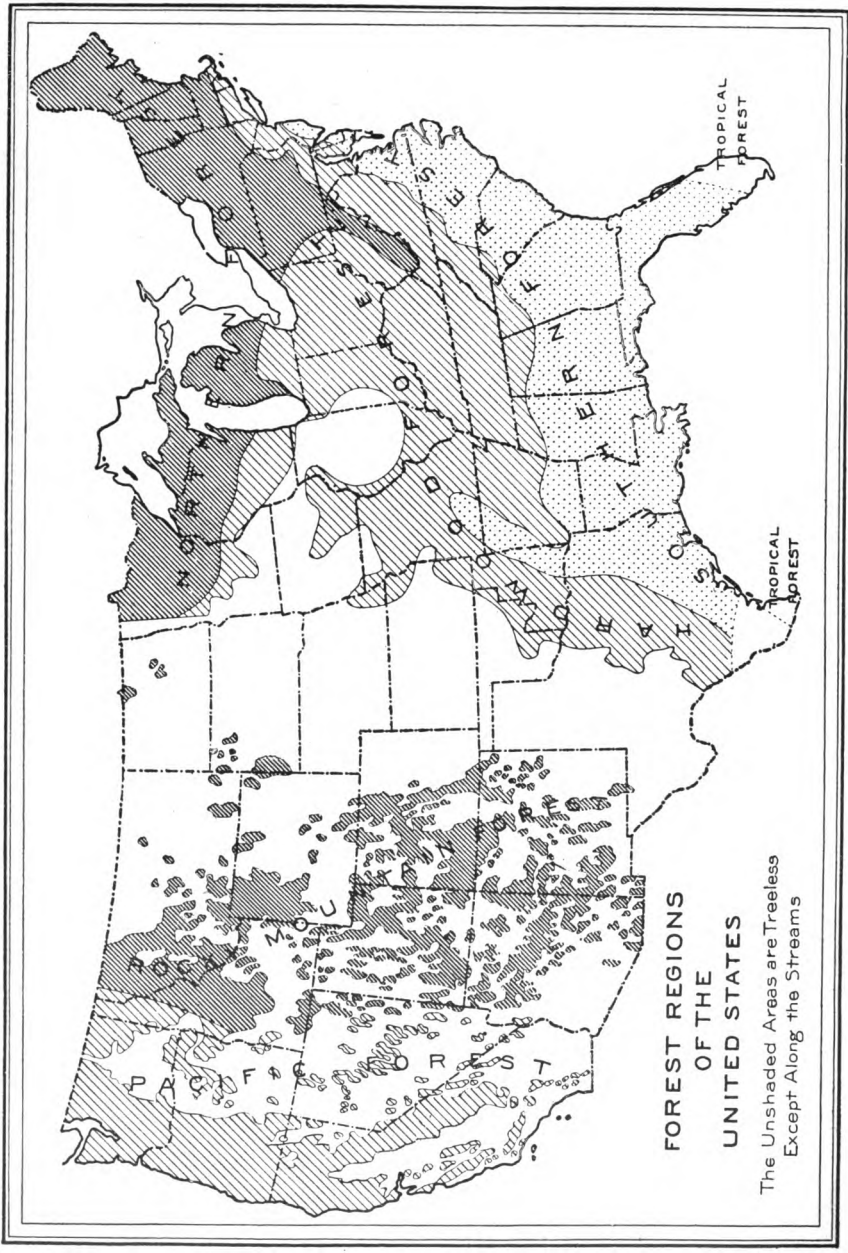


FIG 1.

ber. The timber privately owned is not only four times that publicly owned, but it is generally more valuable.)

Forestry is now practiced on 70 per cent of the forests publicly owned and on less than 1 per cent of the forests privately owned, or on only 18 per cent of the total area of forests.

The original forests of the United States contained timber in quantity and variety far beyond that upon any other area of similar size in the world. They covered 850,000,000 acres, with a stand of not less than 5,200,000,000 board feet of merchantable timber, according to present standards of use. There were five great forest regions—the northern, the southern, the central, the Rocky Mountain, and the Pacific. (See fig. 1.)

The northern forest was the home of the white pine. With it grew red pine, spruce, hemlock, cedar, balsam fir, and several hardwoods. Before clearing and logging began, the northern forest probably covered 150,000,000 acres, and contained not less than 1,000,000,000 board feet. In the southern forest the yellow pines were the most common trees, with hard woods on the better soils and cypress in the swamps. The southern forest probably covered 220,000,000 acres and contained at least 1,000,000,000 board feet. The central forest was nearly all hardwoods, among which the more important were oak, yellow poplar, elm, hickory, chestnut, red gum, ash, and walnut. Its area was about 280,000,000 acres and its stand 1,400,000,000 board feet. The Rocky Mountain forest was coniferous and grew mainly upon the mountains. Western yellow pine was the most common tree, with lodgepole pine, larch, spruce, western red cedar, western white pine, and Douglas and other firs abounding locally. The Rocky Mountain forest covered about 110,000,000 acres with a stand of 400,000,000 board feet. The Pacific forest was nearly all evergreen, chiefly Douglas fir, western yellow pine, redwood, western red cedar, sugar pine, and several other firs, cedars, and spruces. Its trees were the largest and its stands the heaviest recorded by history or by geology. The Pacific forest probably contained 90,000,000 acres, with a stand of 1,400,000,000 feet.

As well as these great forest regions, the United States probably contained 100,000,000 acres, chiefly in the West, of scrubby forests and brush land, of great value in conserving stream flow and for fuel, posts, and other small material.

Our present forests, except upon the Pacific coast and in the Rocky Mountains, are mere remnants of those which once covered 45 per cent of the country. Clearing for agriculture, logging, and fire have reduced this to 29 per cent, or 550,000,000 acres, with a probable stand of 2,500,000,000 board feet. The northern forest now contains 90,000,000 acres, or 60 per cent of its former area; the southern forest 150,000,000 acres, or 68 per cent; the central forest 130,000,000 acres, or 46 per cent; the Rocky Mountain forest 100,000,000 acres, or 91 per cent; and the Pacific forest 80,000,000 acres, or 89 per cent of its original acreage.

Fire, careless cutting, and excessive grazing have greatly injured the composition and quality of existing forests. No native tree has yet become entirely extinct, but the commercial supply of every kind, except those of the Pacific forest, is seriously reduced. The following estimates of the quantity of timber publicly and privately owned have been compiled by the National Conservation Commission.

Forests publicly owned are nearly all in the West. (See fig. 2.) They consist of National Forests, national parks, Indian reservations, military reservations, the forests of the unreserved public domain, and state forests. They contain over 100,000,000 acres of merchantable timber, with a stand of 484,200,000,000 board feet, distributed as follows:

<i>Public forest lands.</i>		Total stand.
In national forests.....	board feet.....	390, 000, 000, 000
In national parks.....	do.....	11, 000, 000, 000
In unreserved public domain.....	do.....	14, 000, 000, 000
In Indian reservations.....	do.....	34, 000, 000, 000
In military reservations.....	do.....	200, 000, 000
In state forests.....	do.....	35, 000, 000, 000
Total.....		484, 200, 000, 000

Forestry is practiced on 70 per cent of these public forests.

Forests privately owned fall into two classes—farmers' woodlots and larger private holdings. Woodlots contain 300,000,000,000 board feet of saw timber and 1,500,000,000 cords of wood. They cover 200,000,000 acres, 95 per cent of which is in the region east of the plains, where woodlots form about one-half the forest. Woodlots consist in the main of scattered patches of original forest, from which the best timber has been cut. They are made to yield little saw timber, but furnish the chief supply of fuel, posts, and rails, and of wood for other domestic and some local uses. Particularly in the East woodlots furnish a considerable number of hewn ties. Through their location among farm lands and their small individual area, woodlots suffer less damage from fire than do large timber tracts. But they are seldom conserved by the regulation of either cutting or grazing.

Corporate holdings with the larger individual holdings contain about 1,700,000,000,000 feet of timber. This is, on the average, the most valuable timber in the United States. Forestry is practiced on much less than 1 per cent of the timber tracts privately owned.

WHAT IS PRODUCED.

The yearly growth of wood in our forests does not average more than 12 cubic feet per acre. This gives a total yearly growth of less than 7,000,000,000 cubic feet.

Nearly all our native commercial trees grow much faster than those of Europe. We already grow post timber in twenty to thirty years, mine timber in twenty-five to thirty-five years, tie timber in thirty-five to forty years, and saw timber in thirty to seventy-five years.

We have 200,000,000 acres of mature forests, in which yearly growth is balanced by decay; 250,000,000 acres partly cut over or burned over, but restocking naturally with enough young growth to produce a merchantable crop; and 100,000,000 acres cut over and burned over, upon which young growth is either wholly lacking or too scanty to make merchantable timber.

That our forests grow very slowly, although the individual trees of many kinds grow fast, is our fault. In Europe, forests composed of trees growing much slower than most of ours produce over four times as much because the forests are cared for.

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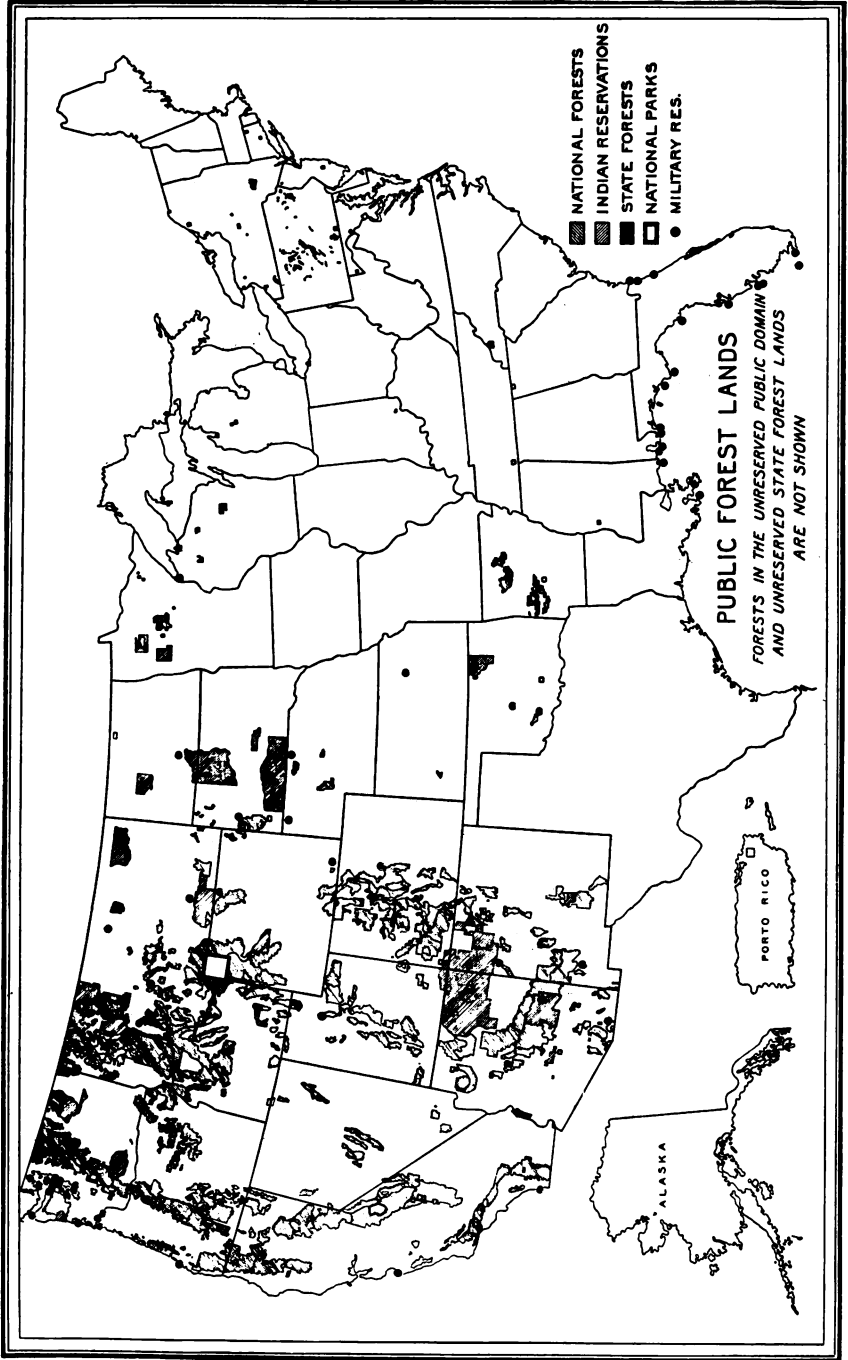


FIG. 2.

FOREST PRODUCTS IN 1907.

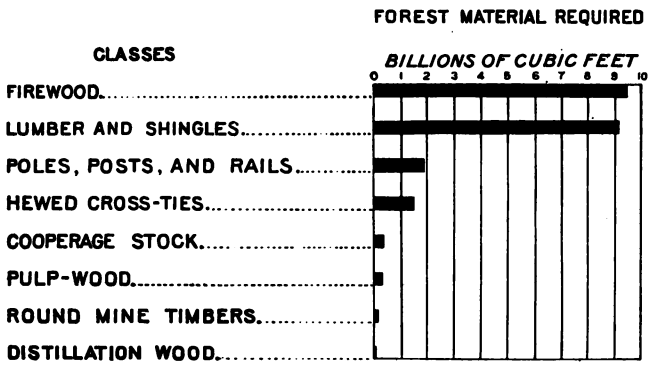


FIG. 3.

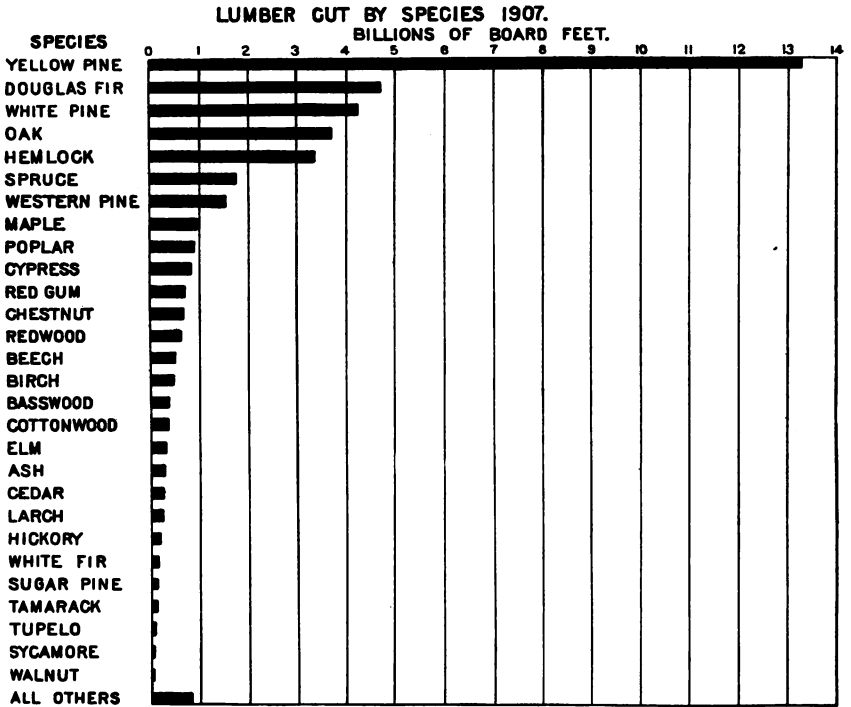


FIG. 4.

We have twenty important kinds of trees which produce in one hundred years or less, timber fit for the saw. In favorable localities, cottonwood, red gum, white ash, and loblolly pine in the South, and redwood, Douglas and other firs, Sitka spruce, and western yellow pine on the Pacific coast, will grow saw timber in thirty to seventy-five years.

Under present conditions, chestnut, cypress, redwood, yellow poplar, red and black oak, loblolly, jack, red and white pine, and western yellow pine will grow post timber, four to eight inches in diameter, in fifteen to thirty years. We are already getting mine props in twenty-five to thirty-five years from red or black oak and loblolly pine, from white oak in forty-five years, from red pine in forty years, from lodgepole pine in sixty years, from western yellow pine and Douglas fir in the Rocky Mountains in fifty years and on the Pacific coast in thirty-five years.

The time now needed to grow a tie in our forests runs from thirty-five years for red gum to one hundred and fifty years for white cedar and tamarack in the northern swamps. Douglas fir and western yellow pine on the Pacific coast, and chestnut, red oak, and loblolly pine are, on the average, making tie timber in forty to forty-five years, cypress in sixty-five years, longleaf pine in seventy-five years, white oak in eighty years, lodgepole pine in the Rockies, and beech, in 100 years, and western hemlock in one hundred and thirty years.

These figures are taken from measurements of trees grown in forests not conservatively managed. In the same forests, conservative management would, as the result of greater density, less unsoundness, and the growing of desirable kinds, not only yield several times as much timber in the same period, but would increase the growth of individual trees.

The 200,000,000 acres of mature forest in the United States is mainly in the northern Rockies and on the Pacific coast, the very regions in which the immature forests grow most rapidly. The 250,000,000 acres partly cut or burned over but restocking naturally with young growth are mostly in the southern mountains and in the southern pine belt. The 100,000,000 acres cut over and burned over, upon which young growth is wholly lacking or too scanty to make merchantable timber, are chiefly in the Lake States and in the southern pine belt.

WHAT IS USED.

We take from our forests yearly, including waste in logging and in manufacture, 23,000,000,000 cubic feet of wood.

We use each year 100,000,000 cords of firewood, 40,000,000,000 board feet of lumber, more than 1,000,000,000 posts, poles, and fence rails, 118,000,000 hewn ties, 1,500,000,000 staves, over 133,000,000 sets of heading, nearly 500,000,000 barrel hoops, 3,000,000 cords of native pulp wood, 165,000,000 cubic feet of round mine timbers, and 1,250,000 cords of wood for distillation.

The volume of wood needed in 1907 to produce each of these great products is shown graphically in figure 3. The kind and quality of timber used for these products vary enormously. The great bulk of firewood comes from farmers' woodlots or from forests already

logged. Some of it is made from wood unfit for any other use. But a large part is taken from immature trees, especially hardwoods of kinds valuable for lumber.

Lumber and shingles are usually made from large timber of high quality. Lumber is being made in commercial quantities from thirty kinds of trees. The amount cut from each of them is shown in figure 4. Softwoods furnish 77 per cent of our total yearly lumber supply, and hardwoods 23 per cent.

The southern pines furnish over 30 per cent of our lumber; Douglas fir about 12 per cent; white pine, 10 per cent; oak, 9 per cent; and hemlock over 8 per cent.

The lumber cut in 1907, by States, is shown in figure 5. Washington was first, with 9.4 per cent; Louisiana second, with 7.4 per cent; Texas came next, with 5.5 per cent; and Mississippi, Wisconsin, and Arkansas followed closely, with about 5 per cent each.

The center of lumber supply in the United States shifts constantly, as one region is cut over and another is attacked. The relative production of ten States in 1880 and 1907 is shown in figure 6.

In 1880 these ten States produced 53.8 per cent of the total cut of 18,125,432,000 board feet, and in 1907 they produced 52.4 per cent of the total cut of 40,256,154,000 board feet. The changes in the output by States are striking. Michigan supplied 23 per cent of the total lumber output in 1880 and 4.5 per cent in 1907. Washington yielded less than 1 per cent in 1880 and over 9 per cent in 1907.

Over three-fifths of our shingles are made from western red cedar, chiefly in Washington, and the remainder mainly from eastern white cedar, cypress, and redwood. Telephone, telegraph, and electric light and traction companies use each year between three and four million poles in various lengths above 20 feet. Three-fifths of these are white cedar, cut chiefly in the Lake States, and over one-fourth is chestnut. Much cedar and chestnut, as well as many woods common to other regions are used for smaller-sized poles and for posts and fence rails. The oaks, chiefly white oak, furnish over 45 per cent of the hewn railroad ties. The cutting of young oak for ties, next to the cutting of oak logs for lumber, is the most serious drain upon our oak forests. Other kinds much used for ties are the southern and western pines, cedar, chestnut, cypress, and hemlock. Many woods are used for slack cooperage stock, of which the chief are red gum, pine, elm, beech, and maple. A large part of the tight cooperage stock is high-grade white oak, which results in another heavy drain upon the oak forests.

Our paper and pulp mills use over 3,000,000 cords of native wood each year and import more than 900,000 cords from Canada. Nearly three-fifths of the native pulp wood is spruce, cut mostly in the North-eastern States, and one-fifth is hemlock, which comes chiefly from Pennsylvania and Wisconsin.

The cutting of mine timbers takes each year great quantities of immature timber from forests in the mining regions, the kinds used varying with the locality.

Nearly all wood used for distillation is beech, birch, and maple. In relatively few cases this wood is saved from the waste in logging.

LUMBER CUT BY STATES 1907.

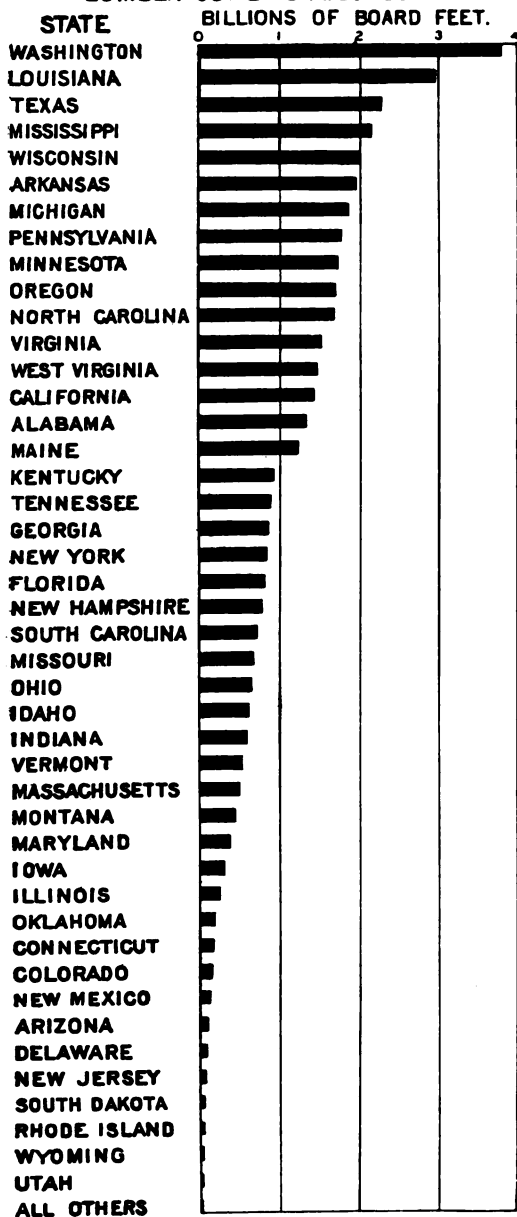


FIG. 5.

RELATIVE LUMBER PRODUCTION IN TEN STATES IN 1880 AND 1907

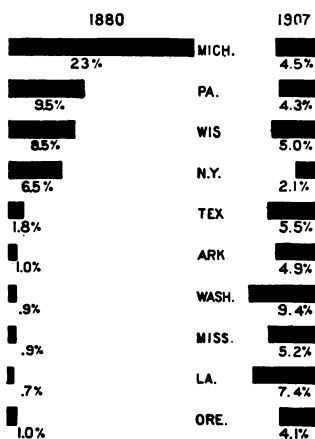


FIG. 6.

WHAT IS WASTED.

Since 1870 forest fires have each year destroyed an average of fifty lives and \$50,000,000 worth of timber. Not less than 50,000,000 acres of forest are burned over yearly. The young growth destroyed by fire is worth far more than the merchantable timber burned.

One-fourth of the standing timber is left or otherwise lost in logging. The boxing of longleaf pine for turpentine has destroyed one-fifth of the forests worked. The loss in the mill is from one-third to two-thirds of the timber sawed. The loss in the mill product through seasoning and fitting for use is from one-seventh to one-fourth. Great damage is done by insects to forests and forest products. An average of only 320 feet of lumber is used for each 1,000 feet which stood in the forest.

Prodigious waste has accompanied our use of the forest. The chief causes are fire, wasteful methods of logging and turpentineing, waste in the mill, and waste in the use of wood.

Forest fires have destroyed many billion feet of commercial timber. They have driven the forest from vast areas, upon which the actual planting of trees will be needed before the forest will return to them. They have destroyed or injured young growth whose value is much more than that of the timber burned. They have changed greatly for the worse the quality and composition of existing forests. To them is due, far more than to the wasteful logging which they have usually followed, the decline in the utility of our streams for all useful purposes; and, through erosion, forest fires are working destructive change in the configuration of the land itself.

The average waste in the woods is 1,000 board feet to every 4,000 board feet logged. This is due to a variety of causes, many of which could be wholly removed with both present and permanent profit, and all of which could be greatly reduced with the same result. Chief among them are plans for logging poorly made or poorly carried out; the leaving of merchantable timber in the woods either actually cut or in dead trees, trees partly unsound, or trees of the less valuable kinds; the waste of timber in high stumps and long tops, and in the failure to cut logs to such lengths that the tree is most profitably used; breakage in felling, loss in lodged trees, and in driving; and the use of good timber for temporary construction in logging, for which inferior timber would serve equally well. But still more serious than all these forms of waste combined, in its effect upon the future timber supply, is the well-nigh universal damage in logging, for the most part wholly unnecessary, to the young growth.

The experience of half a century has clearly shown in Virginia, the Carolinas, and Georgia that turpentineing under present methods renders a permanent naval-stores industry in the South utterly impossible. These methods usually render the forest unproductive in four or five years. They have so greatly reduced the longleaf-pine forests available for turpentineing that in some localities trees 4 or 5 inches in diameter are now being boxed. This generally means an exceedingly low return in turpentine and the death in a year or two of trees, which would otherwise have grown to make lumber.

In the mill logs lose from 30 to in some cases as much as 70 per cent of the volume of timber they contain. Two-thirds of this, under present conditions, is an unavoidable waste. One-third can practically and profitably be avoided. In the manufacture of lumber,

which forms over nine-tenths of the total mill product, the merchantable output is about two-thirds the contents of the log, not including the bark. For the entire lumber cut of the United States under present practice the saw kerf forms on the average 13 per cent of the total volume of the log, edgings and trimmings 9 per cent, and slabs 9 per cent. Cutting to standard lengths and widths, carelessness in manufacture, and accidents cause a loss of 5 per cent.

The waste in seasoning, in the factory, and in the use of the final product is far more difficult to estimate closely. In the building trades the waste in seasoning from staining, warping, and checking, and the loss in fitting material to final forms are not less than 15 per cent. The waste in cutting stock to required sizes and in eliminating defects is 20 per cent in box factories and 25 per cent in furniture factories.

In the aggregate great damage is done each year to standing and cut timber by injurious forest insects. Much of this damage can be prevented at small expense. The application, practically without cost, of simple preventive measures against injurious forest insects and insects which attack forest products would greatly reduce the unnecessary losses which they occasion. The protection of the forest from insect depredations, both by preventive measures such as conservative logging and by remedial measures when necessary, is no less a part of practical forestry than is the protection of the forest from fire. The damage to timber standing and cut by insect attack is not so generally apparent nor so generally understood as the damage to the forest by fire. But the injury done is both great and constant. Unless forest owners take vigorous steps against it wherever it threatens still larger losses will inevitably ensue.

Great causes of waste, vast in their effect upon our forests, are the general failure to realize that the cost of growing timber as well as logging and manufacture must be reckoned in its value; and tax laws which force men to realize immediately on their holdings and so lead to unprofitable and wasteful logging, and which compel the abandonment of cut-over lands for taxes.

WHERE WE STAND.

We take from our forests each year, not counting the loss by fire, three and one-half times their yearly growth. We take 40 cubic feet per acre for each 12 cubic feet grown; we take 260 cubic feet per capita, while Germany uses 37 cubic feet and France 25 cubic feet.

We invite by overtaxation the misuse of our forests. We should plant, to protect farms from wind and to make stripped or treeless lands productive, an area larger than that of Pennsylvania, Ohio, and West Virginia combined. But so far, lands successfully planted to trees make a total area smaller than Rhode Island. And year by year, through careless cutting and fires, we lower the capacity of existing forests to produce their like again, or totally destroy them.

The condition of the world supply of timber makes up already dependent upon what we produce. We send out of our country one and one-half times as much timber as we bring in. Except for finishing woods, relatively insignificant in quantity, we must grow our own supply or go without.

By wasteful logging, fire, and general failure to provide for a second crop we have made our forests less productive than any others of similar area in the world, in spite of the remarkably quick growth of most of our timber trees. We have taken our dividends out of our forest capital until we have greatly reduced the capital itself. Our use of wood per capita is larger than that of any other nation. Canada, which has 60 acres of forest per capita to our 6, uses less than 200 cubic feet per capita; Germany uses 37 feet, France 25 feet, and Great Britain 14 feet. We use 260 cubic feet.

We have 65,000,000 acres of cut-over and burned-over forest land, upon which actual planting will be necessary to produce a merchantable crop of timber. Of the 9,500,000 acres of forest cut over each year, 1,000,000 acres is cleared for farms; 5,750,000 acres is restocking naturally with enough young growth to produce a merchantable crop; and 2,750,000 acres go to increase our national task in forest planting. But the entire area already planted successfully in our whole history is less than one-fifth of that upon which we destroy the forest every year.

White pine is so nearly used up that the lumber sawed from it in the Lake States has fallen off 70 per cent since 1890, and since 1900 over 45 per cent in the whole country. We make 16 per cent less oak lumber and 22 per cent less yellow poplar lumber than we did seven years ago. Douglas fir and yellow pine, now our chief source of supply, are going far quicker than they grow, and the yellow pine is going very rapidly. Yellow pine lumber costs 65 per cent more at mill than it did in 1900; Douglas fir costs 63 per cent more; white pine 53 per cent more; oak 54 per cent, yellow poplar 78 per cent, and hemlock 55 per cent more.

We tax our forests under the general property tax, a method of taxation abandoned long ago by every other great nation. In some regions of great importance for timber supply, and in individual cases in all regions, the taxation of forest lands has been excessive and has led to waste by forcing the destructive logging of mature forests, as well as through the abandonment of cut-over lands for taxes. That this has not been even more general is due to under-assessment, to lax administration of the law, but to no virtue in the law itself. Already taxes upon forest lands are being increased by the strict enforcement of the tax laws. Even where this has not yet been done, the fear that it will be done is a bar to the practice of forestry.

The protection of all public forests from fire is not yet achieved, and an average of 1 acre in every 10 of forest privately owned is burned over yearly. Many of these fires destroy little or no old growth, but wherever fire runs in our forests it either reduces or destroys their capacity to produce again.

We send wood out of the country, and we bring it in. But for each billion feet brought in we send out 1,500,000,000 feet, and the total difference goes to increase by nearly 1 per cent the yearly drain upon our forests. No other country is or will be in a position to meet our needs. Europe imports more wood than she exports. Africa imports structural timber, and can export only expensive hardwoods. The same is true of India, the chief forest country of Asia. China imports wood, and will require any surplus furnished by Siberia and Manchuria. Japan should finally supply her own needs. The Philip-

pinus now import much timber, but should eventually grow it, with some surplus for export to China. The total stand of merchantable timber in the Philippines is about equal to the lumber cut in the United States for two years. Alaska has probably as much as the Philippines. Hawaii can export only hardwoods in small quantities. Mexico and Central and South America import structural timber and export mahogany and cedar. South America has great forests which when utilized and cared for should supply the home market. We get about 900,000,000 feet of lumber and 900,000 cords of pulp wood from Canada each year, or 2 per cent of the lumber and 23 per cent of the pulp wood which we use. Canada has more spruce pulp wood than we have, but her standing saw timber is only about one-third of ours. Canada will eventually require all the lumber which her forests can grow.

Whether we take care of our forests, or whether we do not, we can expect (save for a trifling quantity of finishing woods) to use what timber they grow, and no more.

The records prove that, other factors remaining constant, industrial progress is accompanied by increased consumption of wood. This fact is so universally manifest that it can not be thought an accident. It may be regarded as a law of industrial life.

It might be supposed that the substitution of other materials for wood which takes place with industrial progress would decrease the per capita need of wood, but such is not the fact. Substitutions may diminish consumption for specific purposes, but this is more than made up for by the development of needs for wood along new lines or of greater needs along old lines. Only rising prices can serve to lessen the consumption of wood by an advancing nation, and after wasteful use has been cut off, any further reduction means an economic disadvantage. It means harder conditions of life, a handicap on industry.

In the United States our use of wood is lavish. By better methods in the woods, at the mill, and in ways of use we can make what we have go further than we are now making it go, without industrial hardship. On the other hand, our legitimate need will certainly not decline but advance as we go on to greater industrial strength. We can without hardship reduce our per capita consumption through economies; but after we have reached a reasonable basis we must expect to see our needs advancing again. We are like a growing family which is extravagantly living beyond its income, but which is sure to need, when it has cut off extravagant use, an advancing income through future years.

WHAT SHOULD BE DONE.

We should stop forest fires. By careful logging we should both reduce waste and leave cut-over lands productive. We should make the timber logged go further by preservative treatment and by avoiding needless loss in the woods, the mill, the factory, and in use. We should plant up those lands now treeless which will be most useful under forest. We should so adjust taxation that cut-over lands can be held for a second crop. We should recognize that it costs to grow timber as well as to log and saw it.

We should continue and perfect, by State and nation, the preservation by use of forests already publicly owned; and we should extend it to other mountain forests more valuable for the permanent benefit of the many than for the temporary profit of a few.

For each million acres of forest in public ownership over 4,000,000 are privately owned. The conservation of public forests is the smaller task before the nation and the States. The larger task is to induce private forest owners, which means 3,000,000 men, to take care of what they have, and to teach wood users, which means every one, how not to waste.

If these things are done, they will conserve our streams as well as our forests. If they are not done, the usefulness of our streams will decrease no less than the usefulness of our forests.

THE DUTY OF THE PRIVATE OWNER.

Four-fifths of our standing timber is in private hands. The conservation of our forests and of the timber used depends mainly upon individual forest owners and users. If American citizens will protect their forests from fire, will provide by conservative logging for a good second crop, and will take every reasonable precaution against the waste of timber in the woods, in the mill, in the factory, and in use, their forests will eventually supply more than their need, continuously. If these things, each one of which will pay now and in the future as well, are not done, this nation will ultimately be dependent upon public forests. These, if cut absolutely clean, would furnish only enough lumber to meet our national need for ten years. At the end of that time they would be exhausted. If we are to be saved from great suffering for lack of timber, the forests of private owners must supply the timber.

STOPPING FOREST FIRES.

Forest fires are preventable at a cost slight in itself and insignificant compared with the value of the timber they destroy. Experience on the National Forests has shown that the way to keep down fires is to employ men to watch for them during the fire season. An expenditure of a few hundred dollars in employing men to patrol during the dangerous part of the year is vastly more effective than the expenditure of many times this sum in the attempt, often futile, to put out fires already under headway.

The cost per acre of protecting the forest from fire varies directly with the density of settlement, with local sentiment, with the character of the country and of the forest, with the means of transportation and communication, and with the length of the fire season.

Studies made by the Department of Agriculture and the experience of private owners who are protecting their forests from fire show that the forests of the southern mountains and of the southern pine belt can be effectively patrolled for 2 cents per acre per year. The northern forests can be patrolled thoroughly for not more than 4 cents per acre, and the Rocky Mountains and Pacific coast forests for 1½ cents per acre. These estimates mean, if their owners would cooperate effectively, that all forests in private hands in the United States can be protected from fire for less than \$10,000,000 a year—about the cost of one *Dreadnought*. It also means that at an ex-

penditure of \$10,000,000 a year, a yearly loss in merchantable timber of about \$50,000,000 would be prevented. This does not count the saving in young growth.

The best methods of fire protection for private owners vary greatly with the conditions which fix its cost. But for all regions the following principles are sound on tracts of some size:

1. Employ an adequate force whose first duty is to patrol against fires. Give them all the tools they need, and mount them if they can so work more effectively. In the South and in the Rocky Mountains a mounted patrol is best. In many parts of the northern and Pacific forests, men can do their best work on foot.
2. Increase the efficiency of the fire-fighting force and reduce its size by building trails for patrol. Telephone lines can be built cheaply and if properly distributed throughout the forest, and combined with a good trail system, will increase several times the area which can be effectually patrolled by one man.
3. Build up a local sentiment against fires by making the damage they do plain to all.
4. Cooperate in fire patrol with other forest owners, Above all cooperate with those who own tracts contiguous to your own. This will render your patrol and theirs not only cheaper but vastly more effective.

FOREST PLANTING.

Forest planting means the protection of denuded watersheds from erosion, and the protection of farm homes and crops from wind and cold. In many localities, it means the production of timber near by instead of bringing it from a distance at much greater cost.

The United States contains 65,000,000 acres of stripped land, suitable only for the growing of trees, which will not bear a productive forest again except through the actual planting of trees, or sowing of tree seeds. The West contains 16,000,000 acres of naturally treeless land which should be planted to trees in the interest of agriculture in the prairie region and on irrigated lands elsewhere. Thus far, we have planted in all less than 1,000,000 acres, of which probably less than one-half is successful, because we have planted, for the most part, without adequate knowledge of where, what, and how to plant.

As regards the need for tree planting, the United States naturally falls into three regions—the Eastern, the Central, and the Western.

The Eastern region lies east of the prairie States. In it the planting of trees for the production of timber is of much more importance than for protection to stream flow or to crops. It contains lands of the following classes, which can be planted with profit to their owners:

Cut-over lands not good to farm, upon which, usually as a result of repeated fires after logging, natural reproduction is not taking place. Lands suitable only for forest, but which have been cleared, farmed unsuccessfully, and then abandoned. Woodlots in which planting is necessary to supplement natural reproduction or to take its place.

Cut-over and burned-over lands in need of planting aggregate 3,500,000 acres, and occur mainly in the Adirondack region and in the northern portion of the lake States; abandoned farm lands occur mainly in New England and in the southern mountains; unproductive woodlots are characteristic chiefly of the region west of the Appalachians and east of the prairies.

The Southern States contain about 12,000,000 acres upon which natural reproduction is insufficient or lacking, but upon which adequate fire protection will in the main restore good forest conditions. In the eastern region about 92,000 acres have been planted, of which 5,000 acres are state forest lands.

The Central region comprises the prairie country, which includes Illinois, Iowa, North Dakota, South Dakota, Nebraska, and Kansas, the prairie district of Minnesota, and those parts of Oklahoma and Texas which lie west of the hardwood belt. It contains about 14,000,000 acres, which should be planted to trees for the protection of crops from wind, to reduce evaporation, and to grow timber for farm and other local uses. Planting already covers 831,000 acres in this region, and wherever rightly done yields remarkably high profit.

The Western region includes the Rocky Mountain and Pacific coast States. In it the planting problem is mainly Federal. Not less than 5,000,000 acres or about 3 per cent of the area of the National Forests must be planted to protect watersheds, and to increase the production of timber. Southern California alone contains probably not less than 1,000,000 acres outside National Forests which are now unproductive and could be made productive under trees. Planting is necessary upon nearly 3,000,000 acres to protect crops on irrigated lands in the western region. Private owners have planted only 37,000 acres of such lands thus far. On national forests experimental planting and sowing has been done upon 1,762 acres. This has been carefully planned and carried out, and already furnishes the knowledge required for successful planting on a large scale, as soon as the necessary funds are available.

To sum up, our task in forest planting is vast. Thus far in actual acreage successfully planted our accomplishment is wholly inadequate. The area of naturally treeless lands already planted is utterly insignificant in comparison with their total extent. Upon denuded forest lands we have planted only 1 acre to each 10,000 we have to plant.

RECOGNIZING THE VALUE OF TIMBER.

We have manufactured more lumber and other forest products than we require. That is, we have established a consumption per capita, based not merely on actual need, but on a lavishness, a disregard for possible substitutes, and a scale of waste in the use of wood, equaled in no other country. Supply has been regulated to a demand swollen not so much by industrial development, great as it has been, as by a product unduly cheap, because the items of logging and manufacture were considered the main costs of producing it. The cost of growing the trees has always been left out.

That there is, in the economic sense, overproduction of lumber is wholly true, because we manufacture more lumber than our forests can yield permanently. No economic reason fully explains the difference between the price of lumber grown in the United States and of lumber grown in Europe. Difference in the density of population explains it only in part. But neither that nor the relation of supply to demand is the chief cause. It lies in our failure to realize that if we are to grow timber continuously to meet our needs its value must be reckoned by the cost of growing it as well as by

the cost of logging and manufacture. Stumpage prices in the United States average less than one-fifth of the price of lumber at the mill. The value of anything which is needed is at least what it will cost to grow it again.

We pay generally less for lumber than it is worth, with a slight present gain to ourselves individually, and by so doing we discourage the right use of the forest and greatly increase the cost of lumber to ourselves later on, and to those who come after us. We must recognize the actual value of timber now, or pay an excessive price for it in the future, and we have carried destruction so far that we shall probably have to do both.

CONSERVATIVE TURPENTINING.

An important source of waste is boxing small trees, which yield little turpentine and soon die. If left standing, these small trees would make lumber and pay well. Another source of waste is boxing larger trees so deeply that they die in a few years or are blown down, while in the meantime the deep wound made in boxing invites fire. The cup and gutter method of turpentineing, introduced by the Federal Government, yields 30 per cent more turpentine and better turpentine, does not invite windfall, and lessens injury from fire. Under this system, combined with other economies still more recently devised, a forest can probably be worked for fifteen to twenty years, and made to yield much more turpentine, with small injury to the merchantable timber.

If improved methods of turpentineing are given general use in long-leaf pine forests and in the working of other southern and western pines, they will mean both a permanent naval-stores industry, a higher profit to turpentiners, and an important gain in the continuous timber yield of our forests.

CONSERVATIVE LOGGING.

Through careless and destructive logging on private forest lands, an average of 25 per cent of the merchantable timber is left standing, or otherwise wasted in the woods. On National Forests, from which has been sold yearly for the last three years an average of about 250,000,000 board feet of timber, the total waste in logging is about 10 per cent. This timber was sold at prices no lower than those paid for timber of the same kind and quality on private forest lands. It was logged and manufactured by the lumbermen who bought it, and sold by them in the open market, in competition with lumber cut from private forest lands under wasteful methods. Last year the Federal Government was asked by lumbermen to sell at good prices, from National Forests, ten times as much timber as it sold. That it did not make more timber sales was partly because the force on National Forests was not large enough to handle them. But if lumbermen can with profit buy timber at what it is worth from the forest lands of the people, and log it conservatively, they can do at least as well with their own.

Part of the waste in logging is unavoidable under present conditions. The following discussion deals specifically with those items of waste which it is practicable to avoid now, often with higher im-

mediate profit to the owner of the land from which the timber is cut, and always with higher permanent profit from the land itself after it is cut over the first time.

Care for young growth.—The loss to the value of the forest, through injury to young growth in logging, is larger than the waste of merchantable timber. A small part of this damage is unavoidable. Nearly all of it is avoidable without materially increasing the cost of logging. It costs no more money to fell a tree uphill than to damage young growth by felling it downhill. It does not cost much to release young trees bent over by the tops of felled trees. More logging roads, skidding paths, and snake trails than are really needed kill much young growth, and they do not make for cheap logging. Rolling logs down hill is seldom necessary, and it often breaks down young trees which are worth more than the log is worth, to the lumberman who means to hold his cut-over land, or to the men to whom he sells it. Young trees are worth at least as much as it costs to replace them, or about \$10 an acre; and \$10 an acre spent in forest planting will seldom give us as good a forest as nature will grow for us, if we will take care of the young growth.

Leaving seed trees.—How many and what seed trees to leave, and where, depends on the cost of logging, on the character of the forest, and on the power of its most valuable trees to reproduce themselves. There are no general rules which apply to all forests. It is seldom necessary to leave prime timber as trees for seed. Unsound trees which will probably live long enough to seed up the area, scrubby trees already bearing seed, but unfit for lumber, and thrifty trees too small to be logged with the highest profit now, generally serve the purpose well.

The lumberman who claims that it does not pay to leave seed trees to shed seed, or to take care of young trees, because we may not live to harvest them, forgets these things: that second growth grows much faster than first growth; and that cut-over lands suitable only for forest purposes, which bear young growth, already have a good market value, while cut-over lands bearing neither timber nor young growth have little or no value.

Saving immature trees.—Poor grades of lumber come chiefly from small trees. As the tree gets larger the proportion of choice grades increases. A good many lumbermen are now cutting small trees at a profit, which figured against what they would make from the same trees in ten or twenty years means not profit, but loss. Some lumbermen are cutting small trees at a direct loss. There is no more fruitful investigation for any lumberman than to figure from the cut of his own mill the volume and grades of lumber sawed from trees of different sizes.

The full use of standing timber.—The failure to cut fire-killed or otherwise damaged timber, to log inferior kinds along with the most valuable kinds, and the leaving of isolated patches which are hard to reach means an average loss to the owner of 1,000,000 to every 10,000,000 feet logged and often much more. It also means much greater danger from fire and insects, and a second growth poor in kind and quality.

Clean work in the woods.—Waste in the woods comes in part from leaving trees, which, though partly unsound or otherwise defective,

are still merchantable. It comes in part from high stumps, from trees broken in falling and from lodged trees, from leaving timber in the tops and from failure to cut logs into lengths so as to provide for the fullest possible use of each tree. It comes in part from leaving in the woods, skid poles, ties, camp logs, and other timber used in temporary construction, instead of saving it for pulp, for lumber, or for use again. Especially after deep snow, scattered logs are often left lying in the woods, or even piled on the rollways. In the construction of logging roads and temporary buildings much waste occurs in the unnecessary use of timber of valuable kinds.

There are very few lumbermen in the United States who are not guilty of this waste in one or more forms. The remedy requires no detailed plan. It calls for thorough supervision, for the habit of thrift on the part of the operator, and the enforcement of thrift among his men. A logger who wastes timber in the woods for his employer should be sent out from them just as quickly as a wasteful edgerman or grader is sent out of the mill.

Economy in transportation.—In railroad logging unnecessary loss occurs in the failure to pick up logs fallen from cars or scattered by wrecks.

An average of probably 5 per cent of the timber put into streams for driving is lost. On long drives and rough streams a small part of this damage is unavoidable. But it can probably be reduced on the average by more than half by peeling and drying out logs of kinds which do not float well, by stream improvements, and by reasonable care on the drive itself.

ECONOMY IN THE MILL.

An average of more than one-third of the wood in the log is wasted in the mill. It is practicable, under present conditions, to reduce this nearly one-half. This means the use of thinner saws, of more bandsaws and resaws, and the disuse of gang saws. It means better machinery, more careful manufacture, and the sawing in round edge, or "waney" form of lumber which is worked over again before being finally used. It means the change of grading rules and market usage to admit random widths, odd lengths, and shorter and narrower pieces, and to allow defects which do not seriously reduce the value of the product for the use to which it is to be put. And it means fuller utilization of short boards, slabs, and waste.

MANUFACTURE OF BY-PRODUCTS.

Even when forest products are manufactured and used economically, great opportunity remains for the conversion of wood not utilized in logging or in the mill into useful by-products by chemical and other means. As timber becomes more valuable, we approach more nearly that complete utilization in which every part of the felled trees will be used.

If all the wood wasted in the manufacture of yellow-pine lumber in 1907 had been steam distilled for the production of wood turpentine, it would have yielded more than the total production of gum turpentine in that year. If all the wood wasted in the manufacture of lumber from spruce, hemlock, poplar, and cottonwood in 1907

had been used for paper making, it would have furnished all the paper made from wood in that year. If all the wood which went to waste in the manufacture of chestnut lumber in 1907 had been used to make tanning extract, we would have produced twice as much as was produced from the chestnut cord wood used for this purpose. The waste in the manufacture of beech, birch, and maple lumber in 1907 was nearly equal to the quantity of these woods cut for distillation. The waste in the manufacture of oak lumber was twice the quantity of all hardwoods used for distillation. These are some of the great examples of the failure to use wood fully.

PRESERVATIVE TREATMENT OF TIMBER.

Of all the wood in every form now in use in the United States, decay, fire, insects, and salt water borers destroy not less than the equivalent of 8,000,000,000 board feet each year. Of these, decay is far the most destructive. It is also the easiest to retard. The preservative treatment of timber will lengthen by ten to twenty years the life of woods now commonly used for posts, poles, ties, mine timbers, bridge timbers, and for much other construction work. It will also make profitable the use of many woods which, untreated, decay so quickly that they have little or no value. If preservative treatment makes the life of timber in use twice or three times that of untreated timber, only one-half or one-third as much timber is consumed by that use. Nor does this take into account that large saving in the labor of replacing decayed timber, which in the maintenance of railroad tracks, using untreated ties, is about one-third the cost of the new ties used each year, to keep the track in condition.

In 1907, 1,250,000,000 board feet of timber were treated, which was not more than one-quarter the quantity which could have been treated with profit to its users. There are about 700,000,000 ties in railroad tracks in the United States. They represent, untreated, an average cost per tie of about 12 cents a year. If all were treated the increase in their length of service would mean a saving of $2 \frac{3}{10}$ cents per tie per year, or a total annual saving of about \$16,000,000. More than \$2,000,000 could be saved each year by treating all the poles, and nearly \$2,000,000 if all the piling were treated. The saving in timber used in the mines would be about \$12,000,000. If lumber so exposed in use that treatment is profitable were treated, the saving would not be less than \$15,000,000. This means a total practicable saving of over \$47,000,000 a year. It means also that the increased life given these timbers would make an annual saving in wood equivalent to 4,000,000,000 board feet, or 10 per cent of the yearly lumber cut.

Two preservatives are widely used in the United States. These are creosote and zinc chlorid. The chief advantage of creosote is that once injected into wood it prevents decay permanently. Its chief disadvantages are its cost and scarcity. Zinc chlorid is cheaper and an excellent antiseptic. But it will leach out if the treated wood is exposed to moisture.

A farmer can treat a fence post with creosote for about 10 cents and make it last twenty years. Apparatus costing from \$50 to \$75 will treat from 50 to 100 posts a day, depending upon the kind of timber. The butt of a 30-foot telephone pole can be treated for from 75 cents to \$1. The plant will cost from a few hundred to several thousand

dollars, depending upon its capacity. Piling properly treated with creosote is not attacked by salt-water borers. Mine timber can be treated with zinc chlorid for from \$4 to \$5 per thousand board feet. Ties can be thoroughly treated with zinc chlorid for 10 to 12 cents and creosoted for 20 to 30 cents.

USE OF SUBSTITUTES.

Seasoning and factory wastes can be reduced somewhat by improved methods of drying and manufacturing. But a larger part of the necessary saving in the use of timber must come through the substitution of other materials. Stone, brick, steel, and concrete are now less expensive building materials than wood, when depreciation and fire risks are taken into account. Steel is rapidly supplanting lumber in car construction, and concrete, steel, and masonry are taking its place in bridges. Savings possible in building and railway construction alone, if carried to the limit, would diminish by at least one-third the present consumption of lumber. In the furniture industry it is estimated that approximately 50 per cent of the beds now manufactured are made of metal. The use of pressed steel for desks, file cases, and other office furniture is becoming more and more common. To a small extent, as yet, steel is replacing wood for wagon axles, rims, hubs, and spokes, and in the form of thin plates is being used for paneling in wagon bodies.

TASK OF THE STATES.

The States in their relation to the forest face these specific duties: To adjust taxes on forest lands, so that they can be held profitably for forest purposes; to pass good laws for safeguarding forest property from fire, and enforce them; to conserve state forests and extend them to cover other forest lands needed for the permanent benefit of the whole State; and to cooperate with the Federal Government in teaching the people how to take care of their forests.

THROUGH BETTER TAX LAWS.

From now on the relation of taxation to the permanent usefulness of the forest will be vital. Present tax laws prevent reforestation on cut-over land and the perpetuation of existing forests by use. Laxity in their application and special exemptions supply no remedy.

Taxation of forest lands should be based either on the yield when cut or on the earning power of the forest. The former would mean a tax on the land alone, plus a tax on the timber when harvested; the latter would mean an annual tax on the capital value of the forest calculated upon the net returns expected from it. The tax on the timber when cut and an annual tax upon the land itself, exclusive of the timber, has practical advantages. It does not involve forecast of the rate of interest, of the risk of loss by fire, or of timber values, nor does it require exact statistics of the growth of timber.

A tax on the timber when cut and an annual tax upon the land itself, exclusive of the timber, is well adapted to the actual conditions of forest investment, and is practicable and certain. It would insure a permanent revenue from the forest in the aggregate far greater

than is now collected, and yet be less burdensome upon the State and upon the owner. It is better from every side that forest land should yield a moderate tax permanently than that it should yield an excessive revenue temporarily, and then cease to yield at all.

THROUGH BETTER FIRE LAWS.

Forest fire laws are ineffective partly because they are wrongly framed, but mainly because they are not enforced. The purpose of forest fire laws is to prevent fires. That principle should obtain in enforcing as well as in drafting them. A fire law inflicting reasonable penalties which is enforced, is much more effective than a fire law inflicting excessive penalties which is loosely applied or waived.

Each State within whose boundaries forest fires are working grave injury, and that means every forest State, must face the fact squarely that to keep down fires needs not merely a law upon the statute books, but an effective force of men actually on the ground to patrol against fire. The man who puts out the most fires is the man who is looking for them, not the man who goes to a fire after it is under way. The system of voluntary fire wardens is good as far as it goes; but to make it really effective it must be combined with a force of trained men, whose first duty is fire patrol and who are sufficiently paid for their work.

STATE FORESTS.

In most States the area of forest land which will best serve the people of the State under state ownership and administration is much larger than the area now in state forests. In the extension of state forests, and in the better management of all state forest lands, the States face an immediate individual problem. Especially in the Lake States, vast areas of denuded lands, abandoned after logging destructive beyond all parallel, must be planted to trees long before they will even pay taxes.

EDUCATION.

The duty of teaching forest owners and users everywhere, how to conserve their forests, rests both with the Federal Government and with the States. The active cooperation of each State is essential. Many States present forest problems peculiar to themselves, which it is incumbent mainly upon each of them to solve. This can not be done without money, nor without trained men under a state forest organization.

THE NATION'S TASK.

The Federal Government, in its relation to the forest, faces two great tasks. The smaller is the conservation by use of forests which are already the property of the nation, or which it may acquire. The larger, in cooperation with the States, is to lead private owners to conserve by use four-fifths of the forests of the United States, which means to make forestry a household word and bring about universal household knowledge of its purpose, methods, and results. Forestry, through its relation to waterways and the wide shipment of its products, has special interstate relations.

ON PUBLIC FOREST LANDS.

In National Forests.—The forest lands which belong to the whole nation are in the National Forests, the Indian and military reservations, the national parks, and the unreserved public domain.

The National Forests conserve most of the water and one-third the timber of the West. This national heritage, whose resources so far as they can be measured in money are worth nearly two billions of dollars, is being rightly administered for the permanent use of the whole people.

At an average cost for protection of less than one-fifth of a cent per acre, the damage by fire on National Forests for the last three years has been, per million acres, about 3 per cent of that on private forest lands. In the same period the use of the National Forests by the people has more than doubled. In 1908 so great were the demands of the people's business that an average of only one-fifth of the time of the forest rangers could be given to fire patrol. This was the equivalent of all the time of one man for the patrol of 580,000 acres, an area half the size of the State of Delaware.

The quantity of mature timber taken from the National Forests each year could be increased several times with safety to the forest and with benefit to the people. But if the forest logged is to yield a good second crop, 20 to 30 cents must be spent for every thousand board feet harvested, in marking the trees to be cut, in supervising the logging, and in burning, as a safeguard against fire, the brush left upon the ground. If funds are provided to meet the growth of National Forest business, the safety of the forests will not be endangered nor will their increase year by year in national usefulness be checked. If these funds are withheld, either the National Forests must be inadequately protected or inadequately used. The least important of the great functions of the National Forests is to furnish revenues. It would be bad business management no less than short-sighted public policy to let any part of the property of the people lack the funds for operating expenses needed to make it yield its full return. But the use of the National Forests by the people, great as it is already, has only begun. It will increase as fast as adequate means are provided.

In national parks and Indian and military reservations.—National parks, Indian reservations, and military reservations contain a total of 13,000,000 acres of forest land, and more than 45,000,000,000 board feet of timber. Their location with reference to the National Forests makes cooperation in handling them an obvious and essential step.

The cooperation of the Department of Agriculture with the Department of the Interior in the handling of forest lands in Indian reservations is good in plan and purpose, and effective so far as funds are available; but for lack of money the larger area of forest lands in Indian reservations is neither being protected from fire nor conservatively used.

The forest lands in national parks and military reservations, as well as in Indian reservations, subject to the specific purposes for which they are held, should be administered under the policy and methods which obtain on National Forests, and adequate funds should be provided for the work.

It is no less the duty of the nation to take good care of all its forests than it is the duty of the private owner to conserve his forest holdings.

On forest lands of the unreserved public domain.—The timber and stone act has been in force thirty years. It has brought about for \$30,000,000 the sale of timber worth at a very conservative estimate over \$300,000,000. The number of entries is 88,000, and they cover a total of nearly 12,000,000 acres. The Federal Government, as the steward of the people, is losing yearly about \$25,000,000 of the actual value of timber still being disposed of under this act, as well as the title to 1,500,000 acres of land which should be kept permanently as the property of the nation. The timber and stone act should be repealed, not only because of these facts, but also because it does not serve any useful public purpose. With its repeal there is urgent need for the sale of mature timber at its actual value and under proper restrictions, from unreserved public lands, both for the use of settlers and to supply the general need.

By consolidation of holdings.—Several western railroads own, as land grants, the odd-numbered sections in many National Forests. Legislation is urgently needed to permit the Federal Government to acquire these sections and other interior private holdings by exchanging for them timber inside the Forests or land of equal value outside, so far as practicable in compact bodies. Until such exchanges are made the protection and use of National Forests cut up by land grants or other large private holdings will continue to be expensive and difficult.

In the Appalachian forests.—Studies made at the direction of the congress show that the purchase for conservation by use of mountain forests in the southern Appalachians and in the White Mountains is an immediate national duty. Every acre in these proposed National Forests is on the watershed of navigable streams, most of which carry interstate commerce. These watersheds are already partly denuded and the process is going steadily and rapidly forward. The millions spent by the Government in dredging silt from the streams which flow from these mountain forests is insignificant in comparison with what must be spent unless the cause is dealt with, as well as the effect. Observation and record both show that the frequency and duration of floods in many of these streams is increasing. The flood damage in one year was more than it would have cost the Federal Government to buy in that year these eastern mountain forests, whose conservation is essential to the material welfare of the people of the East. The purchase by the Federal Government of all the mountain forest lands in the southern Appalachians and in the White Mountains is neither necessary nor advisable. The purchase of not more than 10 per cent of their total area upon the watersheds of important streams and the cooperation of the Federal Government in the conservation of adjacent forest lands owned by the State or privately would get adequate results.

Delay has entailed enormous preventable damage to forests and farms in the Appalachian and White Mountain regions, to their developed water powers, and to their vast water powers not yet developed. If delay continues, the damage will be irreparable.

COOPERATION WITH STATES.

The Federal Government has made forest studies in cooperation with ten States. These studies have aided in sound forest legislation, in a better handling of state forest lands, and in a better understanding by the people of the State of the need for forest conservation. This fruitful cooperation, in which the Federal Government bears, and rightly bears, one-half the cost, should be available to all other States. The money spent upon it is not merely an admirable national investment, but it maintains the principle of active cooperation between State and nation, vital to the right working out of our national forest problem.

EDUCATION.

The right use by American citizens of the forest and of timber will not be general until they learn how to practice forestry. For ten years the Department of Agriculture, by spreading broadcast the facts gained in its forest studies and by actual cooperation with the individual in the handling of his timber tract, his woodlot, his forest plantation, and his timber-treating plant, has carried forward a national campaign in education. One great result is the awakening of the American people to their national and individual need for forest conservation. The other is the conservative management of private forest lands of small area relatively, but of great value as object lessons.

Forestry has been given root and being in the great body of American citizenship. No country takes poorer care of its private forests than ours, and no nation has a more wholesome and enthusiastic public sentiment for the right use of the forest than our own. The basis already exists upon which to build a structure of forest conservation which will endure. But for this is needed the definite commitment of the Federal Government to its inherent duty of teaching the people how to care for their forests. Neither private enterprise unaided nor state enterprise unaided will achieve this result soon enough.

So far as practicable and within reasonable limits the forest studies made by the Department of Agriculture should be paid for by the industries and individuals whom they directly benefit. But the final responsibility for investigative work in forestry, which otherwise could not be done effectively or done soon, rests upon the Federal Government.

WHERE WE MIGHT STAND.

By reasonable thrift we can produce a constant timber supply beyond our present need, and with it conserve the usefulness of our streams for irrigation, water supply, navigation, and power.

Under right management our forests will yield over four times as much as now. We can reduce waste in the woods and in the mill at least one-third, with present as well as future profit. We can perpetuate the naval-stores industry. Preservative treatment will reduce by one-fifth the quantity of timber used in the water or in the ground. We can practically stop forest fires at a total yearly cost of one-fifth the value of the standing timber burned each year.

We shall suffer for timber to meet our needs until our forests have had time to grow again. But if we act vigorously and at once we shall escape permanent timber scarcity.

We take out of our forests each year three and a half times as much wood as they grow, partly because we waste more wood than any other nation. The saving of wood practicable in logging, in the mill, and in use has already been pointed out, but we fail to produce each year much more than the wood we need because we misuse the forest.

Against an average yearly growth of 12 cubic feet per acre in the United States, the forests in Germany, all of which are rightly handled, yield each year 48 cubic feet per acre, and their most common trees do not grow naturally as fast as ours. It is certain that the average annual yield of forests in this country can be made, through protection from fire and through conservative logging, much larger than that of forests in Germany.

Every owner of forest lands can stop fires and log conservatively, with immediate profit, as well as with permanent profit.

Most other countries have already learned that the forests which are not conserved will be used up, and they are taking care of what they have. We are among the last to learn it. We can profit by that knowledge if we will. But if we will it means action united, vigorous and prompt, State and nation.

SOURCES OF MATERIAL.

The estimates which this summary contains are based on all information about our forests possessed by the Federal Government and upon vigorous work for about six months in the special field of inquiry before the section of forests of the National Conservation Commission. One feature of the latter has been the sending out of more than 100,000 requests for information to forest owners and forest users throughout the United States.

The inventory made by the section of forests, simply because its scope has been wider than that of any other inventory of our forests, has shown still more clearly the urgent need for exact knowledge of just where we stand. We must have as a working basis a careful census of the kind, quality, and quantity of standing timber in the United States, of the condition of our forests, and of the wood we use for all important purposes. The nation can no more invite the best use of a national resource unless it knows essentially what that resource is than can the individual direct his own business successfully without taking careful stock of what he has.

The compilation of the data upon which this summary is based would have been impossible had it not been for the vigorous cooperation of state and federal agencies concerned, as well as of organizations representing national industries dependent wholly or mainly upon the forest. Had it not been for the cooperation of the Bureau of the Census, the voluminous and detailed computation necessary to the statement of the final results could not have been made in time; had it not been for the cooperation of the Bureau of Corporations we should not possess a trustworthy estimate of the aggregate amount of standing timber in the United States; and to the United States Geological Survey and to Mr. Bailey Willis, geologist and engineer, is due

the scientific and comprehensive statement of fact as to the relation of the forests to the stream. These and many other agencies, federal, state, and private, have provided the material upon which this summary is based.

Both in the preparation of this summary and throughout the work preliminary to it I have been associated with Mr. R. S. Kellogg and Mr. W. T. Cox, of the Forest Service, who were designated for this task by the Forester. Their individual share in several important phases of the work greatly exceeds my own.

Through the compilation of material relating to forests and forestry, the following members of the Forest Service have aided greatly in the work: Messrs. W. Bradfield, H. S. Bristol, E. E. Carter, E. H. Clapp, T. C. Cleveland, jr., M. Cline, C. S. Chapman, S. T. Dana, E. H. Frothingham, W. B. Greeley, W. L. Hall, L. F. Hawley, G. M. Homans, C. Leavitt, L. Margolin, A. B. Patterson, A. S. Peck, J. G. Peters, A. C. Ringland, H. S. Sackett, W. F. Sherfesees, H. A. Smith, G. B. Sudworth, H. F. Weiss, P. P. Wells, E. A. Zeigler, and R. Zon.

Valuable assistance in the compilation of data has also been rendered by Prof. Henry S. Graves, director of the Yale Forest School, and a member of the National Conservation Commission; by Prof. Filibert Roth, in charge of instruction in forestry at the University of Michigan, and by Prof. F. R. Fairchild, assistant professor of economics in Yale University. Through general supervision of the methods for securing statistical data relating to forests and of the form of its final presentation, as well as in the aid throughout the work of his wide knowledge and experience, Mr. Henry Gannett has helped greatly to make the compilation what it is.

OVERTON W. PRICE,
Secretary, Section of Forests.

LANDS.

THE NATIONAL ESTATE.

(The land area of the United States, excluding Alaska and the insular possessions, is about 3,000,000 square miles, or 1,920,000,000 acres. Of this area over half is arable, and a little less than half is occupied as farm land. About one-fourth is forest and one-eighth sparse wood land and cut-over land.) Two-fifths is arid or semiarid, generally requiring irrigation; one twenty-fifth is swamp and overflow land requiring drainage. Most of the dry, wet, and sparsely wooded lands, with part of the forest area, is adapted to grazing.

(About two-thirds of the land has passed into private holdings. Of the original 1,920,000,000 acres there remained July 1, 1908, 387,000,000 acres open to entry; nearly all of this is arid or otherwise unsuitable for settlement by families. There are also about 235,000,000 acres in national forests, national parks, and other lands reserved for public use.

USE AND ABUSE OF LANDS.

AGRICULTURAL INDUSTRIES.

In 1900 the farm lands comprised 838,591,774 acres; there were 5,737,372 farms, averaging 146.2 acres each. Of the farm lands, 414,419,487 acres, or 50 per cent of the farm area and 21.6 per cent of the total land area of the country, were improved. The value of the farms was \$20,439,901,164, or 23 per cent of the wealth of the country. Of this value, 81.3 per cent was in lands and buildings, 15 per cent in live stock, and 3.7 per cent in implements and machinery.

The value of farm products in 1900 was \$4,717,069,973, or \$822 per farm, yielding a gross return of 23 per cent on the capital. Since 1900 agricultural production and investment have increased greatly, though exact figures are lacking.

In 1900, 10,381,765 persons, or 35.7 per cent of the wage-earners of the country, were engaged in agriculture. The proportion of the population so occupied is decreasing; in 1880 it was 48.3 per cent. The use of farm machinery is increasing rapidly.

We grow four-fifths of the corn crop, three-fifths of the cotton-crop, and one-fifth of the wheat crop of the world. We plant about 100,000,000 acres of corn, yielding an average of 25 bushels per acre; nearly 50,000,000 acres of wheat, averaging about 14 bushels; and 30,000,000 acres of cotton, yielding about 12,000,000 bales.

We had on January 1, 1908, 71,000,000 cattle, worth about \$1,250,000,000; 56,000,000 swine, worth \$339,000,000; and 54,000,000 sheep, worth \$211,000,000. In 1900 we had \$137,000,000 worth of poultry, which in 1889 produced 293,000,000 dozen eggs.

PRODUCTIVITY OF THE SOIL.

Over one-third of our wage-earners are engaged in agriculture, and all our people depend for their chief food supply on the productivity of the soil. The productivity is conveniently measured by crop yield.

Our crop yield per acre, according to the last three censuses, has been as follows:

Yield per acre.

	1899.	1889.	1879.
Barley..... bushels..	26.8	24.3	22.0
Corn..... do....	28.1	29.4	28.1
Oats..... do....	21.9	28.6	25.3
Rye..... do....	12.4	13.1	10.8
Wheat..... do....	12.5	13.9	13.0
Rice..... pounds..	807.0	797.0	632.0
Hay..... tons..	1.4	1.3	1.1
Potatoes..... bushels..	93.0	83.6	96.7

The yield estimated by the Bureau of Statistics of the Department of Agriculture for forty years, grouped by averaging ten-year periods (in order to eliminate the effect of exceptional years), is as follows:

Yield per acre.

	1867-1876.	1877-1886.	1887-1896.	1897-1906.
Corn..... bushels..	26.2	21.1	24.0	25.4
Wheat..... do....	12.0	12.5	12.7	18.8
Oats..... do....	27.5	27.8	25.5	30.1
Barley..... do....	22.8	22.4	22.7	25.5
Rye..... do....	13.6	13.0	12.9	15.7
Buckwheat..... do....	17.6	14.5	15.3	18.1
Hay..... tons..	1.22	1.24	1.20	1.43
Potatoes..... bushels..	90.0	82.0	75.0	86.0
Cotton..... pounds..	181.0	170.0	172.0	191.0

Of these figures, those taken from the census are the more accurate, those taken from the Bureau of Statistics the more fairly representative of trend. They show that on the whole our crop yields are not decreasing; especially during the last ten years they have increased.

Grouped by States, the figures (appended among the accompanying papers) show for the older States an increase in yield throughout the forty years; and for the States in an early stage of settlement at the beginning of the record they show the influence of relatively large yields from virgin soil, followed first by a reduction and later by an increase of yield with improvement in agricultural methods.

The foregoing figures were supplemented by information obtained directly from every county in the United States. A schedule of inquiries was sent to a large number of farmers asking them whether in their judgment the fertility of the soil in their neighborhood was maintained, and, if so, whether by means of fertilizers or crop rota-

tion, or both. The answers, to the number of about 30,000, are in accord with the foregoing figures. In the northeastern States little land is impoverished; in most counties none was reported. In the southeastern States the impoverishment is greater, though, except in West Virginia and Georgia, the proportion is not large. In the southern central States, excepting Alabama, Kentucky, and Tennessee, the proportion of impoverishment is large; while in the northern central States, excepting North Dakota, Nebraska, and Kansas, the proportion is small. In the western portion of the country there is a wide range, five States reporting no reduction in productivity, two reporting a small proportion, and four a considerable proportion. The total area of the counties comprising impoverished land is 307,730 square miles, or 10.3 per cent of the land area of the United States.

Local diminution in productivity is traceable to different causes:

1. The chief cause is erosion, including both leaching and washing of the soil. The annual loss due to this cause has been estimated at 7 to 10 per cent on upland farms, or some \$500,000,000 yearly for the country. It can be largely or wholly prevented by proper cultivation and selection of crops.

2. A potent cause is continuous cropping, coupled with injudicious seeding. It can be counteracted by rotation of crops, selection of seed, and use of fertilizer.

3. A frequent cause of diminished yield is ravage of growing or ripening crops by insects, or sometimes by mammals. It can be remedied by the application of modern scientific methods.

That diminution in productivity is unnecessary is shown clearly by comparing our crop yields with those of long-settled and densely populated countries, in which the farming is more careful. The following figures show that our yields of oats, barley, and rye are much below, and our yield of wheat below half, those of Germany and the United Kingdom:

Average yield per acre, 1897-1906.

Country.	Wheat.	Oats.	Barley.	Rye.
United States.....	13.8	30.1	25.5	15.7
Germany.....	28.0	47.4	33.5	24.2
Austria.....	17.8	27.2	22.9	17.6
Hungary.....	17.6	30.4	22.7	17.3
France.....	19.8	27.3	22.4	16.7
United Kingdom.....	32.2	44.6	34.3	26.2

Both the American and European figures showing crop yield are in accord with fundamental principles. It is the natural law of soil to increase in fertility when properly treated. In a state of nature plants spread over rocky or earthy surfaces and combine with the action of the elements in disintegrating the material; the humus and other acids of plant growth and decay decompose the inorganic substances and dissolve the earth salts, rendering them available for plant food, and unless the slopes are excessive the material is in time reduced to a rich soil supporting an abundant flora. When such a soil is brought under cultivation it may by suitable treatment, including selection and rotation of crops, cultivation, drainage or irrigation, and other means, be made to continue increasing in richness

and productivity; and in most cases the increase may be aided by judicious mulching and fertilizing.

The value of commercial fertilizer used in the United States is increasing; in 1880 it was \$0.10, in 1890, \$0.11, and in 1900, \$0.13, per improved acre.

In conformity with these figures and principles, the largest yields of cereal crops are in the northeastern States, where intensive cultivation has been made necessary by dense population and consequent scarcity of land, and in the arid regions, where careful selection and cultivation have been induced by scarcity of water.

The figures for our crop yield since 1868 show a notable increase during some ten years past which can hardly be ascribed to the growth of intensive culture alone. It seems fair to credit this increase chiefly to the general improvement in farming due to the acquisition and diffusion of definite information by the Department of Agriculture, in conjunction with the experiment stations, state agricultural departments, agricultural colleges, and other scientific agencies. In connection with improved knowledge, the introduction of seeds and plants adapted to special conditions of soil and climate and the eradication of insect enemies have been important factors in maintaining and increasing production.

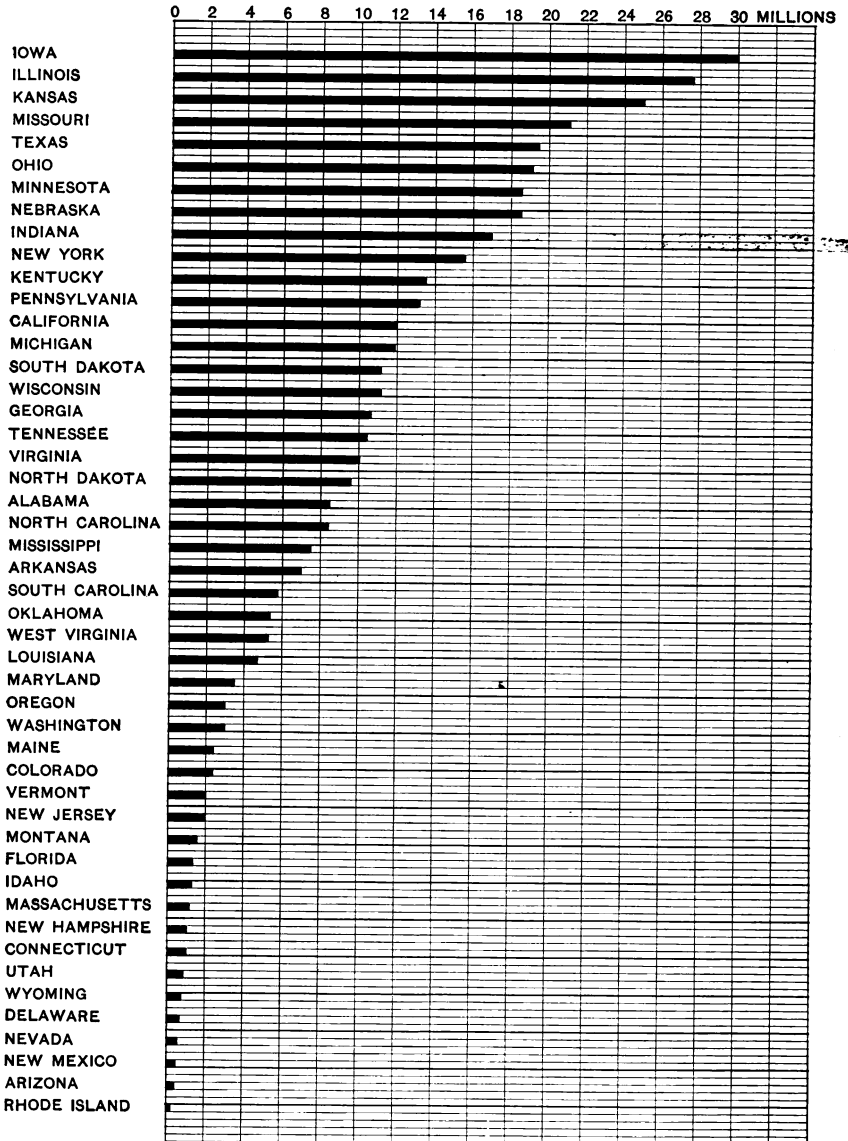
ABANDONED FARMS.

The schedule of inquiries addressed to the farmers in all the counties of the United States included questions as to the extent of abandoned farms. The 30,000 replies tabulated show that 16,597 square miles of farm land, or 0.6 per cent of the total area of the country, have been abandoned, and that 6,076 square miles, or 0.2 per cent of our territory, were, after abandonment, devastated by soil erosion.

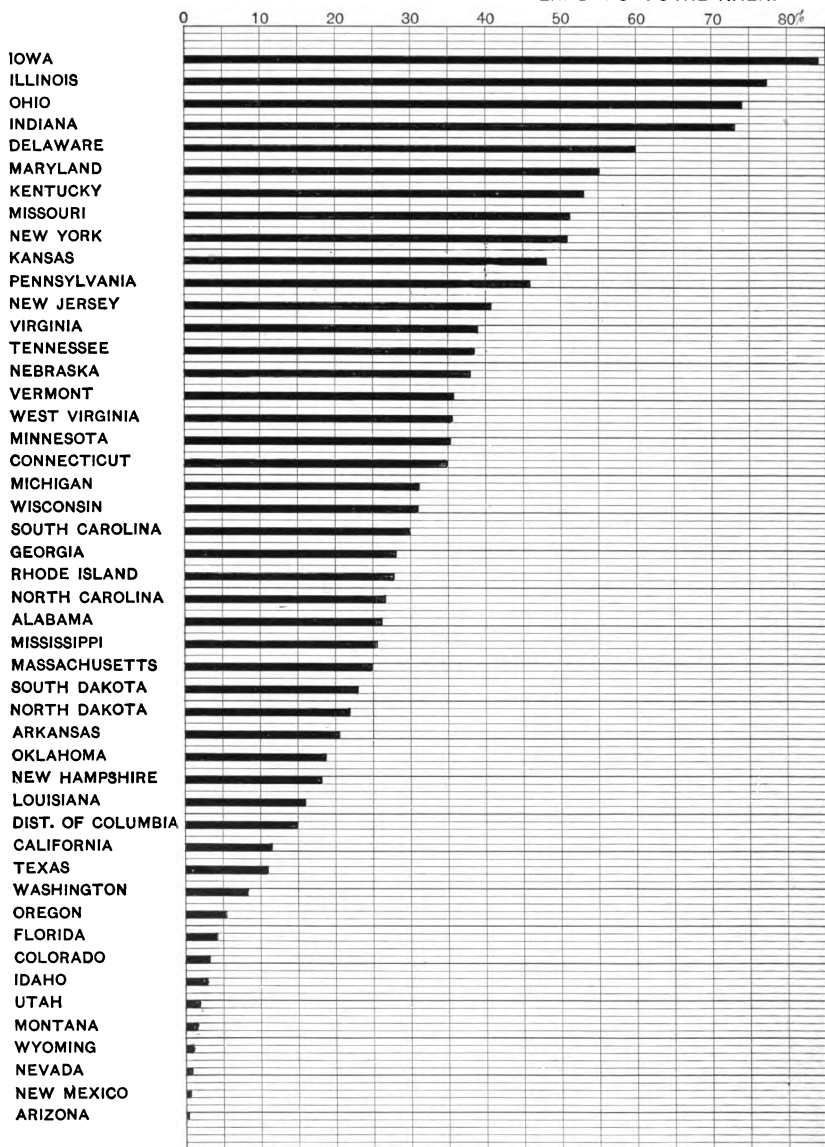
Half of the abandoned lands are in southeastern United States. A few years ago abandoned farms were common in New England; of late they are largely reoccupied and rendered productive mainly by Italian or French-Canadian farmers.

Neither the abandonment of farms nor the local impoverishment of fields can justly be ascribed to deterioration of the soil; like our low crop yields, they are due to general industrial and economic conditions, which are not only susceptible of control, but are steadily changing with increasing density of population. In most rural districts, land is cheap and abundant, and labor costly; and the chief efforts of farmers are directed toward getting the largest returns per unit of labor rather than per unit of land. Especially in newly settled areas, farming is hasty and careless; the same crops are grown year after year until they run out; no attention is given to soil wash or to the maintenance of friability by drainage or otherwise, and little to the selection of seed; while fertilizing and mulching are neglected. In its legitimate use, the soil is abused to the limit. The condition is due partly to ignorance and cupidity, though chiefly to inadequate transportation facilities. With increasing population, markets are brought nearer to the farms, and traffic is facilitated; then, as in some of the northeastern and southern States, intensive or at least careful cultivation is adopted, and generally within a few seasons the productivity is raised even above that of the virgin soil.

ACREAGE OF IMPROVED LAND IN 1900.



PERCENTAGE OF IMPROVED LAND TO TOTAL AREA.



In districts liable to extensive soil erosion, the abandonment of fields is disastrous; in some cases the old-field erosion not only removes the soil proper, but carries away the subsoil and even the surficial deposits, exposing bare rocks or intractable formations over which soils naturally redevelop with extreme slowness, and can not be extended artificially except at large cost. The fact that over 6,076 square miles, or 3,888,640 acres, of our abandoned fields have been destroyed in this way is appalling. Not only would the area form nearly 100,000 farms capable of sustaining a population exceeding that of any one of our 12 least populous States, but each gully starts others in such manner as continually to extend the devastation. The evil should be remedied without delay. Communities and States should be awakened to the sacrifice of public interest through old-field erosion. First in connection with abandoned fields, and progressively in cultivated fields, soil wash should be considered a public nuisance, and the holder of the land on which it is permitted to occur should be held liable for resulting damages to neighboring lands and streams.

NECESSITY FOR INCREASING CROPS.

The population of the United States in 1900 was 76,303,387; probably it will double by the middle and triple before the end of the present century. In view of this growth, the question of food supply assumes the highest importance. How shall the greatly augmented demand for foodstuffs be met? Can sufficient food be obtained from our own soil or will it become necessary to import, and, if we import, how shall we find the means?

Hitherto we have not only supplied ourselves with foodstuffs, but have had a small (and decreasing) surplus for export. They were in the last census year produced from 647,666 square miles of farm land, or 21.6 per cent of the total land area of the country. To supply the needs of our prospective population at the end of the present century by merely increasing the area of farm land would require that nearly two-thirds of our entire area be under cultivation—or far more than our aggregate arable lands, since arid districts, rugged country, and mountainous areas too elevated to produce crops form half the area of the United States. Even during recent decades the increase in cultivated land has not kept pace with that of population. Between 1890 and 1900 the population increased at the rate of 20.7 per cent, while the area of improved land increased only 15.9 per cent; and, as cultivation crowds on cultivability, the difference must widen.

Aside from the importation of foodstuffs, but one feasible way of meeting our growing demand appears—i. e., to increase our crop yields. That this is not only feasible but entirely practicable is shown by the larger yields of long-settled countries, by the reclamation of abandoned farms with increasing local population, by the general increase in our crop yield during the last decade, and by the natural tendency of soils to increase in fertility when properly treated.

There is some diversity of opinion among experts as to the trend of our crop yield and as to the reasons for increase or decrease. Early in 1908 there was a decided opinion (expressed at the governors' conference and elsewhere) that our yield began to decline soon after the

breaking up of the virgin soil and has continued to decline throughout the country, but the exhaustive figures brought together, largely by Victor H. Olmsted, Chief of the Bureau of Statistics, Department of Agriculture, and appended among the accompanying papers, render it fairly clear that the minimum is already past and that the normal increase in productivity has begun. Thus far the increase is slight and does not at all keep pace with the growth in population. The conditions affecting productivity are discussed by Professor Whitney, Chief of the Bureau of Soils; Doctor Galloway, Chief of the Bureau of Plant Industry, and other specialists in accompanying papers.

DECLINE IN EXPORTS OF FOODSTUFFS.

During the last ten years our exports of foodstuffs have diminished relatively as compared with the preceding decade, suggesting that we are consuming more and more of our product. This may represent a temporary oscillation, like several in the past; it may be due in part to inadequate transportation facilities, such as prevented the satisfactory movement of the harvests of 1906; but it probably marks the beginning of the end of our exportation of foodstuffs.

The proportion of our wheat crop exported yearly as wheat and flour since 1871 has ranged about from 8 to over 41 per cent; the fluctuations being traceable to variations in size of crop coupled with the increasing home demand. The home consumption per capita since 1871 has ranged from 3.44 to 7.07 bushels, averaging about 5 bushels, with a tendency to increase. The percentages of exports to total crops, averaged by groups of years, have been: 1871-1877, 23.3 per cent; 1879-1887, 31.17 per cent; 1888-1897, 30.45 per cent; and 1898-1907, 27.18 per cent. From the first to the second of these groups there was a decided increase in the proportion of exports; the period was one of rapid extension of settlement in wheat-growing districts. In the second and third groups the proportion was practically the same, though the extension of settlement continued. The fourth group shows a decline, and the last four years a great decline, not only in the proportion but in the absolute volume of exports.

Exports of other cereals are too small and too irregular in amount for useful discussion.

The amount of meat produced annually is not recorded, but the number and value of live stock are estimated annually by the Department of Agriculture, while the live stock and meat exports are recorded. When the values of such exports are compared with those of live stock, the figures show a marked decline in foreign shipments during the last decade. The figures are in accord with those for wheat and flour.

Both classes of exports seem to show that the country is past the period of maximum proportional exportation of foodstuffs, and that hereafter the proportion will continue to decrease as the demands of our industrial population gain on our agricultural production. This conclusion is fortified by the values of our exports of all crude foodstuffs and food animals, which has fallen from \$305,000,000 in 1898 (the largest in our history) to \$167,000,000 in 1907, with an average of \$151,000,000 for the six years 1902-1907, inclusive.

The record of exports is consistent with the fact that in no case is the production of our food crops increasing so rapidly as our population. In the decade between 1890 and 1900 the increase of population was 20.7 per cent; the increase in production was 19 per cent for corn, 15 per cent for wheat, and 7 per cent for oats, potatoes making no appreciable gain. The increase in live stock is more marked, though it averages less than the gain in population; during the same decade cattle increased 23 per cent and sheep 24 per cent, while swine increased only 5 per cent.

WASTES DUE TO NOXIOUS INSECTS AND MAMMALS.

Aside from careless or ignorant farming and such hostile climatic conditions as storms and droughts, the most serious enemies to crops are noxious insects and mammals.

The chief insect enemies of the grains are the corn-root worm, the bollworm, the chinch bug, the Hessian fly, plant lice, grasshoppers, cutworms, and army worms. The worst enemy of cotton is the boll weevil. Fruits are injured chiefly by the codling moth and the San Jose scale. The Bureau of Entomology estimates that the annual damage by noxious insects to growing crops, fruit trees, and grain in storage is no less than \$659,000,000. This total includes the cost of preventive measures which greatly reduce the aggregate loss.

The average yearly loss to animal products from flies, ticks, and other insects is estimated at \$267,000,000. This does not include the enormous loss of human life and the cost of disease due to house flies, mosquitoes, fleas, and other germ-carrying insects—a loss much greater than that suffered by the live stock and their products.

The Biological Survey estimates that the damage to live stock and crops by wolves, rats, mice, and other mammals averages over \$100,000,000 yearly. This figure also includes the cost of preventive measures; without them the losses would be much greater. Birds generally are beneficial as destroyers of noxious insects and mammals.

While the figures are staggering in the aggregate, they represent careful and frequently repeated estimates by conservative specialists, and in each case they are in accord with the common observation of intelligent farmers and other citizens. They must be regarded as trustworthy and as representing an enormous preventable waste.

LOSSES OF LIVE STOCK BY DISEASE.

The appended statement by the Bureau of Statistics of the Department of Agriculture shows that the average loss by disease during the past five years was: Among horses, 1.8 per cent; among cattle, 2 per cent; among sheep, 2.2 per cent, and among swine, 5.1 per cent. The aggregate annual loss averaged \$93,000,000.

The most prevalent disease among cattle and swine is tuberculosis; it is estimated that at least 1 per cent of beef cattle, 10 per cent of dairy kine, and 2 per cent of swine are affected. Sheep and cattle suffer seriously from scabies, while hog cholera is prevalent among swine. Texas fever among cattle (transmitted by a tick) is a destructive disease, causing a direct annual loss estimated at \$40,000,000. All these diseases are remediable, and some or all may be eradicable,

The total annual losses to the agriculture of the country, including live stock, animal products, and grain in storage, from insects, mammals, and disease is estimated at \$1,142,000,000, or one-sixth of the total production.

WILD GAME AND FUR-BEARING ANIMALS.

Our wild game and fur-bearing animals have been largely exterminated. One of the most painful chapters in the period of our wanton waste is the destruction of wild game. Everyone knows the story of the passing of the buffalo and of the fur seal; not so well known is the recent history of the moose, caribou, deer, elk, antelope, mountain sheep, and mountain goat. A generation ago most of these abounded on the western plains and mountains; now they are rarely seen. Fortunately, before their complete extermination, most of the States and the United States began their protection, and under wise laws, generally well enforced, many of the game animals are now increasing.

With protection the game animals, like many fish and game birds, are becoming a source of large benefit to the country, as is well shown in the appended statement by Dr. C. Hart Merriam, Chief of the Biological Survey.

With game birds the story is much the same—wanton destruction until the number was greatly reduced, followed in recent years by wise protection, allowing the remnant to survive and even to increase.

Our game animals and birds supply food, skins, furs, and feathers to the annual value of several million dollars, and the amount is increasing.

FISH.

Our fish supply is now largely dependent on artificial propagation. The annual value of the fisheries of the United States is \$57,000,000; the products form an important element of our food supply. Salmon, trout, shad, lobsters, and other important varieties are maintained almost exclusively by propagation and restocking.

The production and propagation of fish and the restocking of streams and lakes are seriously retarded by conflicting laws or absence of laws in the different States; in some cases, as in Columbia River, the diversity of state laws is seriously inimical to the maintenance of the fisheries. It is of the utmost importance that the States should cooperate among each other and with the Federal Government for the protection and development of the fish and fisheries of interstate streams and lakes.

THE OPEN RANGE.

The area of open range on the Great Plains, in the Rocky Mountains and in the Great Basin exceeds 300,000,000 acres. The climate ranges from temperate to hot and from semiarid to desert. The pasturage was originally variable in quality, though generally sparse. The greater part was excessively overstocked soon after settlement began, and in some districts the pasturage was virtually destroyed. On the whole the range is in bad condition and of greatly reduced value; the portions occupied by sheep are especially poor, owing to overstocking and trampling.

It is clear that the public range is greatly deteriorated and that the deterioration is still in progress. It is equally clear that it might be restored by proper regulation of grazing, coupled in some cases with complete protection for terms of years, perhaps with some reseeded. The requisite control can be exercised only by the owner of the range, the Federal Government. Experts are of opinion that in most cases restoration can best be accomplished by leasing to stock owners for considerable periods, and allowing them to fence their holdings; for under such a system the stockmen would be interested in maintaining and improving the pasturage, while the governmental cooperation would afford protection from lawless invasion by competitors. The same system would alleviate the shocking cruelty of the range, under which stock have been starved and frozen and slaughtered by thousands through the shortsight and cupidity of stockmen having no interest in range or State beyond that of skinning it to the utmost for immediate profit.

SWAMP AND OVERFLOW LANDS.

The area of swamp and overflow lands is estimated at 75,000,000 or 80,000,000 acres, or about 4 per cent of our territory. The swamp-land area is capable of fairly exact delimitation and has been generally mapped, while the land subject to overflow can not be sharply defined, and the statements of area are merely approximate.

The swamp-land act of 1850 granted to the States then in existence all the lands within their limits classed by the surveyors of the General Land Office as swamp. Under this act 65,582,503 acres have been patented to the States; while 1,307,700 acres, nearly all in Minnesota, remain in public possession.

Of the swamp lands patented to the States, 60,142,003 acres have been conveyed to individuals or companies, leaving in possession of the States 5,440,500 acres.

In the States not affected by the swamp-land act the greater part of the wet lands have apparently passed into private ownership, except in those admitted since 1850, to which it has been judicially decided that the act does not apply and in which the swamps are inconsiderable, the United States still retains the greater share.

The cost of reclaiming swamp and overflow lands varies widely. Generally it is estimated that the value of the reclaimed lands is double or triple the original value plus the cost of reclamation. Practically all the wet lands of the country can be reclaimed at profit, and it is estimated that they would form homes for a population of 10,000,000. The chief obstacle is lack of coordination; generally the work can not be done by settlers or pioneer families, or even by communities, since reclamation projects are necessarily extensive and costly, and in many cases cross state boundaries. The plan of the Inland Waterways Commission contemplates reclamation of swamps and requisite protection of overflow lands as a part of a general system of improvement designed for the control and utilization of the waters. The plan is feasible, and when carried out will doubtless benefit the country greatly through increasing the capacity for population and production and converting the present wastes into sources of wealth.

The reclamation of swamp and overflow lands is in progress in several sections, usually under state appropriations, sometimes by

county authorities or drainage districts. Details appear in appended papers prepared in the Geological Survey and in the Office of Experiment Stations.

A large incidental benefit arising from the drainage of swamp and overflow lands is the reduction of malarial and other disorders and the increase in viability and efficiency of our population. This aspect of the reclamation is discussed by Prof. Irving Fisher in the appended paper on "Conservation of life and health."

INCREASE IN PRIVATE HOLDINGS.

About five-sixths of the land area of the United States has passed into private holdings. In the early history of the country there were extensive land grants, most of which were gradually subdivided with settlement.

The land laws of the United States were framed with a view to the settlement of the country and the making of homes, and during the greater part of our history this policy was pursued by both nation and settlers. During recent decades, especially since forests, minerals, waters, and in some cases pasturage, came to be recognized as valuable in themselves apart from the land surface, individuals and corporations have frequently taken advantage of opportunities to acquire large holdings of land in order to gain control of the associated resources, and in many instances energetic farmers and other owners have acquired large tracts of land for agricultural purposes. The question of land holding is fundamental to the policy and practice of our Government, and it would seem of the greatest importance to ascertain whether the current tendency is toward large holdings with consequent landlordism, or toward smaller subdivisions and freehold homesteads. Naturally the tendency can be ascertained only through the facts of private ownership in the several sections of the country.

With a view to gaining the best information available, a schedule of inquiries was sent out in large numbers to selected farmers residing in every county of the United States; and, while the inquiries were designed to elicit information on other subjects, several were directed to the question of increase or decrease in area of holdings. When the 30,000 useful replies, averaging about 10 from each county, were classified by counties, it was found to be the opinion of the correspondents that in 48 per cent of our area the size of farm holdings is increasing, and that in the remaining 52 per cent the size is either decreasing or there is no appreciable change.

The States in which the majority of the farm holdings were reported as increasing are mainly those west of the Mississippi, with a few farther eastward. Thus it appears that the tendency toward increase is greatest in newly settled regions, and that in the long-settled sections the average holdings either remain unchanged or tend to decrease.

In the holdings of mineral lands there is a marked tendency toward increase in area. This is decided in the case of iron lands, and is of course connected with the greater economy of large operations in mining, transporting, smelting, and manufacturing. In oil lands the tendency toward consolidation is apparently slight; in coal lands

and those containing other minerals the tendency toward increase is intermediate.

In timber lands the tendency toward consolidation is strong, and has gone far toward placing control of such lands in a few hands. It appears that the monopolization is partly in the interests of economy in logging, milling, and manufacturing, but chiefly speculative.

On the whole there is a distinct tendency toward increase in size of holdings, chiefly in nonagricultural lands, but it is not so decided as to indicate that the homestead policy is unsatisfactory to the American people or out of accord with public welfare.

THE PUBLIC LANDS.

DATA AND POLICY.

The inquiry concerning the public lands involved a continuation of the work of the Public Lands Commission appointed by the President October 22, 1903. The information compiled by that commission has been utilized with such amplification or modification as seems justified by the added experience of three years, and the further knowledge obtained by the government bureaus directly in touch with public-land questions, viz., the General Land Office, the Geological Survey, the Reclamation Service, the Forest Service, and the Indian Office.

So far as the lands owned by the United States are concerned, the effort has been to determine the true relation of the public-land laws, as they are and as they should be, to the fundamental conditions affecting the permanent efficiency of the people. The former is mainly founded on the following premises:

1. The nation should hold in its possession and maintain in efficient condition those areas which are less valuable for agricultural use or home making than for conserving unique natural beauty and wonders, the water supply, and the timber.

2. The resources still belonging directly to the nation which must necessarily be diminished and finally destroyed by use, should be exploited and used in a way to return the greatest benefit in the long run to the greatest number, the essential caution being to prevent waste, and, without prohibiting or hindering economical development, to prevent such monopoly as might artificially increase the cost of the resources to the people beyond what would bring to the exploiter a full reasonable profit and no more.

3. When the land itself, independent of the minerals under its surface, is more valuable for agricultural use than for permanent dedication to the public use, it should be conveyed in such areas as will furnish a reasonable living to an average family to those who will actually make homes on it, and to no others.

4. Pending the disposal of any public land by reservation for public use, or by appropriation under the public-land laws, it should be protected from deterioration and so administered as to serve the best interests of all the people.

These conditions can not be met certainly without a classification of the public lands.

LAND DISPOSAL.

On July 1, 1908, there were about 755,000,000 acres of public lands neither appropriated nor reserved, including approximately 368,000,000 acres in Alaska and 387,000,000 acres in mainland United States. Between June 30, 1904, and June 30, 1908, the unappropriated and unreserved area of mainland United States was reduced from 473,836,402 acres to 386,873,787 acres.

The problem of dealing with the remaining public land is the more difficult and important because the choice lands for farming are gone. There is great pressure for disposing of the remaining public land in larger homesteads on the plea that, since it is of less efficiency, a family will need more to make a reasonably comfortable living. Yet, although the highest number of final homestead entries—37,568, covering 5,241,120.76 acres—was made in 1901, the entries for the year ending June 30, 1908, were 29,636, covering 4,242,710.59 acres, which number was exceeded only in the years 1901 and 1902. The people themselves, therefore, are showing concretely that the inducement to enter public land need not now be increased, since the desire to secure a homestead of 160 acres is still strong enough to increase rather than diminish the number of entries.

In other respects the public-land laws, as they exist to-day, do not, either in their substance or in the limited opportunities for strictly administering them, furnish the necessary protection to the people's interest in the public lands. Changes are necessary, not only because the present laws are not suited to existing conditions, but also partly because these laws, as originally drawn, contemplated conditions and needs which have been greatly modified by unforeseen political, social, and economic conditions, and by decisions of the Land Department and of the courts which were not foreseen by the lawmakers. This will be noted in connection with each law considered. The conditions are described in an appended paper by Mr. H. H. Schwartz, chief of special agents, General Land Office.

LAND CLASSIFICATION.

Because of the diversified condition of the public lands there is need to know, for reasonably small areas, whether the surface is chiefly valuable for agricultural purposes, for timber, or for grazing purposes. As to what is beneath the surface, we need to know whether the land is mineral or nonmineral. The mineral lands must be subdivided into various classes, according to the kind of mineral. With reference to the surface, the main classification must be into timber, grazing, and agricultural land. Having once admitted that the surface of all lands should, except in so far as it is actually needed for exploiting the minerals beneath it, be acquired by those who will best use it for the public welfare in lumbering, grazing, or agriculture, and that the minerals themselves should be exploited in reasonably large but limited areas by those who have the knowledge, skill, and capital, it follows irresistibly that no scheme of public-land laws can be thoroughly effective for the purposes for which they are enacted, unless they provide for or allow an authoritative classification of the lands. The power to classify should, as a matter of course, carry with it the power to reclassify when changing conditions

or newly discovered evidence show that the lands involved should be differently classified.

The cost of classification will necessarily be considerable, but it will be possible, by prompt and skillful classification, to save the Government amounts many times greater than the cost, without requiring more than reasonable prices for any lands and none for those disposed of for home making. Scientific classification would ultimately fix with certainty, according to the productive value of the surface, a reasonable home-making area for each class of agricultural land, and thus solve that problem without mistake or friction.

A discussion of the question of classification by Hon. Fred Dennett, Commissioner of the General Land Office, is appended.

TIMBER AND STONE ACT.

The timber and stone act of June 3, 1878, was passed in order to give the home maker a timber lot to be used in conjunction with his homestead. This is evidenced by the debates in Congress at the time of the passage of the act; also by the provision that the applicant to purchase must declare "that he does not apply to purchase the same on speculation, but in good faith to appropriate it to his own exclusive use and benefit." As the timber of the country was cut off and destroyed by reckless lumbering and forest fires, the value of timber land increased with great rapidity. The farsighted lumber operators foresaw that the value of the fine timber would increase for some time in geometrical progression. They therefore followed a natural business instinct, and began to take advantage of the timber and stone act to acquire the best forests in the West. They employed cruisers, who went over and determined the value of the various legal subdivisions containing heavy stands of timber. They allowed the public to know that they would purchase certain timber land from any who might enter it under the timber and stone act. In some instances they imported shiploads and carloads of their employees and other persons, furnishing them with the necessary funds to buy. These persons entered valuable contiguous quarter sections, and transferred them wholesale to their principals. A specific instance is that in Modoc County, Cal., where more than 85 per cent of about 25,000 acres of timber land entered in one calendar year was transferred before May 1, as was shown by a search in the recorder's office of the county. Over 14,000 acres of this went to one man, and the bulk of the rest to three others.

It is clear that the timber and stone act does not fulfill the purpose for which it was passed, and that it should be repealed.

COMMUTATION CLAUSE OF THE HOMESTEAD ACT.

The Commission on the Public Lands, in its report and appendix of February 13, 1905, shows with great clearness that the commutation provisions of the homestead act open the door to immense possibilities for fraud. The illegal acquisition at \$1.25 per acre of land worth ten or even a hundred times that sum easily follows the opportunity. Quarter sections covered with heavy timber are often worth from \$10,000 to \$20,000 or more; and it is well worth a man's time and expense to build a small shack and actually live on such land for

fourteen months in order to acquire it. To do certain small acts of improvement during this time is a matter of small moment to the mala fide settler. The net gain, if the entryman sells the land for anywhere near its value at the end of the time, is often at the rate of several thousand dollars per year. Even so, there is strong reason to believe that most of those who acquire lands fraudulently under the commutation clause do not profit to any great extent, but are paid only a small wage for giving their time and homestead right to others who wish to acquire the valuable land in defiance of law.

The commutation provisions of the homestead act should be absolutely repealed, and anybody wishing to obtain land from the United States, free of cost, should show the bona fides of his intent to make it his home by living there the full five years required by the homestead act.

An alternative recommendation would be that after three years bona fide and continuous residence at home on the land, an entryman may commute it if his improvements and cultivation are so ample that they show beyond a doubt that he is taking the land for farming and not for other purposes.

It is recommended strongly that no commutation should be allowed for land covered with valuable timber unless sufficient clearing and successful cultivation have been made to remove any doubt as to the intent of the entryman; also that grazing only should not be allowed as sufficient cultivation of land to warrant commutation.

The grounds for these recommendations are set forth by Mr. Schwartz, chief of special agents, General Land Office, in an appended paper.

DRY-FARMING LANDS.

The principle that land capable of agriculture should be given to the home maker only in such areas as will by farming maintain an average family in reasonable comfort is commended. In certain localities dry farming would be successful on land which does not contain water for drinking and other domestic use. In these cases the home can not be maintained on the land itself, and it would seem wise to allow it to be established at some place near enough to serve as the base of operations for improving and actually cultivating the land entered; but successful production of crops and a continuous home in the neighborhood should be required.

DESERT-LAND LAW.

The Public Lands Commission, in its reports of 1904 and 1905, showed that the practical working of the desert-land law is lamentable. The small force of special agents and inspectors at the command of the Land Department and the heavy burden of routine work devolving upon them in the way of hearings has made it impossible thus far to investigate by government agents whether the reclamation work and improvements claimed have actually been made. The fact that the land can be obtained in larger quantities than under any other agricultural law offers an inducement to fraud, and there are usually others interested, by reason of being like circumstanced, who are available for manufacturing proof on the record when the facts upon the ground are absurdly deficient.

The desert-land law might possibly be repealed in toto without harm to the best interests of the people in its public-land property. Such a repeal would not make it impossible for a man to get possession of land desert in character by living on and reclaiming it under the homestead law, but there are those who claim that the requirement of residence is incompatible with the desert character of the land, and that a home can not be established or maintained until after the land is reclaimed. In deference to the view that such land would remain unreclaimed if it were not for a law similar to the desert-land act, it is recommended (1) that entry be limited to 160 acres; (2) that residence to the exclusion of a home elsewhere must be established by the entryman within three years after the original entry; (3) that the entryman must prove that he has actually resided upon the land for two full years immediately preceding the date of final proof; (4) that final proof must be made not less than four nor more than seven years after the original entry; (5) that final proof must show that at least one-fourth of the land has been successfully cultivated to crops by irrigation for two successive seasons; (6) that no commutation be allowed; and (7) that there shall be no charge to entrymen except the fees required in homestead cases.

The object of these modifications is to accomplish the purpose of the present desert-land act, namely, an actual reclamation of land, and at the same time maintain the best features of the homestead law. The matter is discussed in an appended paper by Mr. W. B. Pugh, of the General Land Office.

GRAZING LAND.

There are more than 300,000,000 acres of public land, of which the surface can not at present be successfully farmed. This is an area more than ten times as large as Ohio. Nearly all this land can be used for grazing. Under existing law any person can at any time take any number of any kind of live stock upon any part of this public range. To obstruct or try to prevent him is a criminal offense. Under these circumstances nobody has either the power or inclination to prevent overgrazing. The result is that the range is overstocked, and the forage is rapidly deteriorating both in quantity and quality. As the grazing grows poorer, there is no tendency to diminish the overstocking. Each stockman wants his neighbor to do that. Meantime changed conditions of transportation and market make the raising of sheep more profitable than cattle growing, with the result that sheepmen have for years been crowding on the already overstocked range, and their sheep have hastened the destruction of the forage plants. Contentious strife, destruction of property, breach of the law, and even murder, have followed.

It is recommended that the surface of the remaining public domain be dedicated by law to grazing purposes with reasonable regulation, (1) to insure that the land may be entered at all times under the homestead laws for the bona fide purpose of home making, (2) to protect the rights of those who already have stock on the public domain, (3) to allow fencing for individual or community use, (4) to impose such conditions in the permits as shall prevent overstocking

and gradually bring the range back to its full forage capacity, and (5) to make sure that the distribution and use of grazing rights shall be equitable and shall carry with it the indispensable element of business certainty concerning duration and conditions of the permit.

Discussion of the grazing lands appears in appended papers by Mr. A. F. Potter, of the Forest Service, and by Mr. A. D. Melvin, of the Bureau of Animal Industry.

RIGHTS ANALOGOUS TO SCRIP.

There are various "location, selection, and scrip" rights outstanding against the public domain. These are rarely used for the making of homes. Some of them have been in existence over half a century, and are yet unused. They originally were supposed to have a value of only \$1.25 per acre, but the growth of the country and changed conditions make them worth now from \$10 to \$20 per acre. These rights are a source of never-ending difficulty and embarrassment in the administration of the public land. It is strongly recommended that Congress pass a law for their retirement which will fix a reasonable limit of time in which they may be located, or selections made as the case may be, after which the rights shall be redeemable in cash. An appended paper by Mr. S. W. Williams, of the General Land Office, gives details.

SEPARATION OF RIGHTS.

In 1906 the Interior Department discovered that vast areas of coal lands were being taken up with or without knowledge of their coal character under the various nonmineral laws. President Roosevelt, to prevent this improper and wasteful disposal of coal, withdrew over 68,000,000 acres, all or part of which in each township involved were known by the Geological Survey to contain coal. It is not lawful to take coal land under the homestead law. Therefore, as the law stands to-day, more than 50,000,000 acres, much of the surface of which is valuable for farm homes, is withheld from the homesteader, and unless the law is changed that fundamental principle of national efficiency, which demands that the agricultural lands be placed free of charge in the hands of agricultural home makers, can not be applied to this land, because the surface must eventually, by purchase of coal and surface together, under the coal-land laws, fall into the hands not of homesteaders, but of miners. On the other hand, President Roosevelt was so convinced that the agricultural land laws should not be used for the purpose of acquiring coal lands that he has, by withdrawal and classification, dedicated the above-mentioned vast area of coal entry, but, to protect the homesteader, has urged Congress to amend the public-land law so that a homesteader can get freely what he ought to have and the miner get only full opportunity to mine his coal without holding farming land away from agricultural home makers, either at prohibitive prices or as the foundation for tenant farming. The accompanying paper by Hon. Fred Dennett, Commissioner of the General Land Office, discusses the matter fully.

MINERAL LANDS.

There is no way to use both the surface and the resources beneath it to their best advantage in the long run for the largest number except by disposing of them separately. Our present knowledge of the needs of the country does not warrant recommendation that the precious metals be disposed of otherwise than by sale, either with or without the surface; but the following recommendations seem fully justified:

(1) That the area of lands containing precious metals entered by any one person or association should be definitely limited, and that entries made on reserved lands should give title to only so much of the surface as may be found reasonably necessary for exploitation of the minerals. This is in line with the fundamental principles of preventing monopoly and devoting the surface of the land to its highest use. The limit should not be so low, however, that it will interfere with the economical exploitation of the resources as viewed from the business standpoint.

(2) That all locations must be filed at the local land offices within six months of their initiation. This is absolutely demanded by the need for the Land Department to know when a claim is initiated against the public land.

(3) That a location be considered abandoned unless followed by final proof and cash entry within a reasonable limit of time. The reason for this is that right to mineral land should go only to bona fide miners, not to speculators, and that a locator should make good his claim or get out of the way reasonably soon.

The reasons for these recommendations are stated in an appended paper by Mr. E. C. Finney, of the General Land Office.

COAL LANDS.

With regard to coal lands, it is clear that the coal still owned by the people, when classified by the Geological Survey, should be disposed of under leases only. The present coal-land law makes it impossible for any one association of persons to obtain legally more than 320 acres. This is not sufficient for the conduct of an economical mining business. The area which may be leased should be increased materially. It is recommended briefly as follows: (1) That in this and in all changes of the law valid existing rights should be protected; (2) that, except for rights already initiated, no patents or final certificates issue for any public lands, except with a specific reservation of the coal; (3) that the patents also reserve specifically a reasonable provision that the miner may, with compensation to the surface owner, acquire such part of the surface as may be needed in producing the coal; (4) that provision be made for reasonable damages if mining operations injure any property of the owner of the surface; (5) that the Secretary of the Interior shall lease the public coal lands under such regulations as he may deem wise for the protection of the public interest, in such reasonably limited areas, with such charges, and for such reasonable periods as may be fixed and made certain in each lease; and (6) that, at the discretion of the Government, the lease may be renewed or the lessee compensated for

his improvements after termination of the lease period by a method fixed in each lease.

Details appear in appended papers by Mr. T. J. Butler, of the General Land Office.

OIL, GAS, AND OTHER NONMETALLIC MINERAL LANDS.

Oil, gas, and other nonmetallic mineral lands can at this time be acquired under the placer mining law, which means that any person can get possession of as much land containing such minerals as he can discover and locate, even though it were millions of acres, and that he need not buy from the Government unless and until he desires. When this is compared with the restriction of coal land to 320 acres, the ill logic of both laws is evident. It is recommended that these minerals should be disposed of under practically the same conditions as recommended above for coal.

RIGHTS OF WAY.

No public-land laws fall so far short of being right and equitable as those which provide for rights of way. In many instances the most important of these laws fail to give that certainty to the grantees or permittees which is absolutely necessary for business security. In other instances they give rights so far-reaching that the equity of the people in the subject of the permits is forever lost. In other cases the exact nature of the grant is subject for grave dispute between permittees and the Government. The laws should be indubitably certain and just both to the people and to the permittees. It is recommended that all the right-of-way laws be codified and made just, reasonable, and certain. They should give to the permittee security against revocation, except for nonuse or misuse, and a sufficient period of enjoyment. The people, on the other hand, should have, among other reservations to reasonably safeguard their welfare, the certainty that at some reasonable time in the future the subject-matter of the permit will return to their control to be disposed of according to the demands of the public welfare at that time. The right-of-way laws should also provide a definite procedure for the revocation of any right of way because of willful and continued nonuse or misuse of the privilege.

TIMBER UNDER THE CONTROL OF THE UNITED STATES.

Outside of the meager quantities of poor timber remaining upon the unappropriated public domain, the timber still belonging to the United States is 70 per cent in the national forests and 30 per cent in national parks and Indian reservations. Most of the timber in the parks and Indian reservations is not only valuable to the people as a possible future timber supply, but is also of the highest importance, like that upon the national forests, to conserve the run-off of water. Government reserved timber land also conserves natural scenic beauties and wonders, furnishes a health and pleasure resort of value to the people, and stands as a last refuge for the preservation of certain wild animals, birds, and fish, which would otherwise be exterminated. It is recommended that the administration of all the timber lands of

the United States be delegated to that governmental agency most fitted to care for it. At the present time the timber of national parks and Indian reservations is suffering badly from lack of broad and scientific management.

CONCLUSIONS CONCERNING THE PUBLIC LANDS.

1. The remaining public lands should be properly classified.
2. Modifications of the public-land laws should protect carefully all rights initiated prior to such changes.
3. The public-land laws should provide for every contingency which might arise in connection with the conservation and administration of the land and other resources belonging to the United States, and should intrust each class of stewardship to that governmental agency best fitted to handle it efficiently.
4. The surface chiefly valuable for agriculture, independent of the disposal of the resources beneath the surface, should be given only to actual homemakers in areas reasonably capable of supporting a family.
5. The surface more valuable for conserving water run-off, unusual natural scenic beauties or wonders, and timber, than for homemaking, should be held by the Government, independent of the disposal of the resources beneath the surface, for the use of all the people, and maintained effectively in a condition to insure its highest efficiency for all time; but such exploitation should not be allowed to impair in any way national parks or national monuments.
6. The right to exploit the mineral resources belonging to the nation and to use a sufficient part of the surface therefor, should be granted to those who actually intend to exploit them, in such limited areas, for such periods, and under such conditions as will, for each class of mineral, bring about seasonable and economical exploitation, but prevent such monopoly as might injure the interests of the people.
7. Rights of way should be allowed for definite and limited periods only, varying for each class of right of way, with reasonable conditions to protect the public interest in the subject-matter and use of the permit and with such certainty to the permittees against revocation during the permit period, for any cause except nonuse or misuse.
8. Pending the disposal of any public land by reservation for public use or by appropriation under the public-land laws, it should be protected by the Government from deterioration and administered so as to serve the best interests of all the people.

So much of the foregoing statement as pertains to the "use and abuse" of our lands was prepared chiefly by Mr. Henry Gannett, of the United States Geological Survey, geographer of the National Conservation Commission.

GEORGE W. WOODRUFF,
Secretary Section of Lands.

MINERAL RESOURCES.

SUMMARY.

The annual products of the mines of the United States now exceed \$2,000,000,000 in value. They contribute 65 per cent of the freight traffic of the country. The industry employs over a million men at the mines, and twice that number in handling, transporting, and manufacturing the products.

The waste or losses in the mining, preparation, and use of the mineral products is estimated to exceed \$1,500,000 per day.

The available and accessible commercial coal in the United States aggregates approximately 1,400,000,000 tons. At the present increasing rate of production this will be depleted and will approach exhaustion before the middle of the next century; and the additional 1,600,000,000 tons of inferior coal and lignite not now available economically will approach exhaustion before the end of the next century.

The known supplies of high-grade iron ores in the United States approximate 4,788,150,000 tons, which at the present increasing rate of consumption can not be expected to last beyond the middle of the present century. These are also estimated to be 75,116,070,000 tons of low-grade iron ores which may hereafter be available.

The known supplies of petroleum, natural gas, and high-grade phosphate rock can not be expected to supply the nation's needs through the present century.

The losses from fire in the United States during 1907 were approximately \$450,000,000, of which some \$400,000,000 was preventable waste.

During 1907 we produced 480,000,000 tons of coal, and the annual production has increased at the average rate of more than 7 per cent. We also produced 52,000,000 tons of iron ore, and the production since 1880 has increased at the average rate of 110 per cent during each of the three decades. In 1907 we produced nearly 870,000,000 pounds of copper; more than 17,000,000 pounds of aluminum; 365,000 tons of lead; 223,000 tons of zinc; 166,000,000 barrels of petroleum; 52,000,000 barrels of cement; 30,000,000 barrels of salt; more than 2,265,000 tons of phosphate rock; and we also extracted clay products to the value of \$159,000,000; natural gas, \$53,000,000; stone, \$71,000,000; gold, \$90,400,000; and silver, \$37,000,000.

The total value of our metallic products during 1907 was \$900,000,000; of mineral fuels, \$788,000,000; and of nonmetallic mineral products, other than fuels, more than \$378,000,000.

During 1907 our production was 40 per cent of the world's production of coal; 45 per cent of the world's production of iron ore;

22 per cent of its gold; 30 per cent of its silver; 33 per cent of its lead; 27.5 per cent of its zinc; 54.6 per cent of its copper; 52 per cent of its phosphate rock; and 63 per cent of its petroleum.

During the year we imported mineral products to the value of \$255,000,000 and exported mineral products to the value of \$340,000,000.

BASIS OF ESTIMATES.

Our mineral wealth deserves special consideration and treatment, for the reason that it can not be increased or reproduced. The water for power and other purposes comes and goes continuously up to its limit; the grain crop of one year is succeeded by that of another; within a century one forest may replace another; by still slower process and at great cost the soils which are now being eroded may be replaced from the subsoil or the decay of rocks below; but the deposits of coal which have accumulated during the geologic ages of the past were finished long before man came into existence, and there is but the one supply. As this coal is used it is completely destroyed. No new supply will come when the one now existing is exhausted. The destruction of the metals is slow, but the ore supplies are far more limited than the coal. Of these also there is but one supply; and the metals themselves are slowly but certainly wasted by wear and by various destructive agencies.

The need for an inventory of the mineral resources of the nation grows out of the fact that the production and consumption of these resources are increasing at a rapid rate, and that the mineral supplies for future use are limited.

We should therefore know the quantity of each of these resources available for future use; the increasing rate at which they are being produced or consumed; and the probabilities as to the continuance of this increasing rate. From such data we may form at least an approximate estimate as to the duration of the supplies; and through adequate investigations we may determine the possibilities of increasing the duration of these supplies by developing more efficient methods of production and use.

The incompleteness of the available data renders the making of an inventory of mineral wealth more difficult than that of forests and water resources, and illustrates the need of further investigation. However, the coal fields have been mapped with such accuracy that future discoveries of coal outside of the limits indicated for existing fields are not likely to exceed 1 per cent of the total known supply; and future investigations are likely to diminish rather than increase the estimates of the quantity available within these limits.

Our knowledge of the quantity and distribution of other minerals is less definite, but enough is known to prove that the deposits are limited in extent, and that at the present increasing rates of consumption the supplies of many important minerals will be largely depleted or exhausted before the nation has added another century to its history.

The data for this inventory have been prepared by experts of the United States Geological Survey from records of their investigations and other sources. In the papers by these experts accompanying the commission's report the data are given in detail.

It is not claimed for the statements presented in this inventory of the mineral wealth of the country that the data in all cases are of quantitative exactness or that all the data are of the same degree of accuracy in detail; but all available data have been considered, and only such as are deemed reliable have been used.

Even should future development prove that these estimates are 10 or 20 per cent in error, the need for a wise conservation of resources would stand out none the less prominently and positively. Thus the data for the estimates of coal have been published and distributed among geologists and mining engineers for six months, and the only changes suggested have indicated that the estimates are too high, and that the figures for the duration of the supplies should be reduced rather than increased.

FUEL RESOURCES.

Of all our minerals, the fuels which supply heat, light, and power for domestic and industrial purposes are the most fundamentally essential to the nation. The use of fuels involves their immediate and complete destruction; and increase in the use of other materials also increases the consumption of fuels for both metallurgical and manufacturing purposes, for as the nation has now passed its early development stage, manufacturing, with consequent use of fuels, will increase much more rapidly than will population. A more thorough inventory of the fuels (coal, oil, gas, and peat) is therefore of prime importance.

COAL AND ITS DISTRIBUTION.

The following estimates concerning the original supply, production, and ultimate exhaustion of coal in the United States were prepared by Messrs. M. R. Campbell and E. W. Parker, of the United States Geological Survey, and are based largely on their own investigations, supplemented by data obtained from state geological surveys and private mining companies.

The areas occupied by the anthracite, bituminous, and lignite coal fields aggregate 496,776 square miles, or about 17 per cent of the total area of the country. It is estimated that these coal fields contain a total of 3,000,000,000,000 tons of coal, of which about one-third is regarded as accessible only with difficulty, and not available for mining at the present time. Of the total amount, 1,400,000,000,000 tons of high-grade coal are considered both easily accessible and available for mining under existing conditions.

The geographic distribution of the total coal supply, including that easily accessible and available and 500,000,000,000 tons not now available, is as follows: East of Mississippi River, 800,000,000,000 tons, distributed over an area of 138,022 square miles; west of the Mississippi and east of the hundredth meridian, 160,000,000,000 tons, distributed over an area of 63,044 square miles; in the Rocky Mountain region, including the Great Plains area of Wyoming and the two Dakotas, 930,000,000,000 tons (largely lignites), distributed over an area of 124,700 square miles; and in the Pacific coast States, 10,000,000,000 tons, distributed over an area of 1,830 square miles.

The easily accessible and available anthracite and bituminous coals occupy a total area of 250,531 square miles, and aggregate about 1,160,000,000,000 tons; the lignites, occurring mainly in the Dakotas, Montana, Utah, Colorado, New Mexico, Texas, Louisiana, Mississippi, and Alabama, occupy a total area of 148,609 square miles, and aggregate 385,000,000,000 tons; and the accessible subbituminous coals, ranging in quality between the bituminous and lignite, occupy an area of 97,636 square miles in Montana, Wyoming, and the Rocky Mountain region, and aggregate 355,000,000,000 tons.

The several varieties of bituminous and subbituminous coals and lignites differ to a considerable extent in their composition and heating value, but after giving due consideration both to the quantity and quality of the different coals, it is calculated that the geographical center of coal distribution in the United States is at a point in southeastern Nebraska.

PRODUCTION AND DURATION OF SUPPLY.

From the beginning of coal mining in this country (1814) to the close of 1907 there were mined nearly 7,000,000,000 (6,865,000,000) tons. Adding to this the one-half additional, representing the waste in mining, gives a total of more than 10,000,000,000 tons taken from supplies originally available.

The rate of production has increased rapidly. The average increase from 1846 to the close of 1907 was 7.36 per cent per annum, practically doubling the production every ten years. There has, however, been a decreasing rate of increase in production when considered on a basis of twenty-year averages, and Mr. Henry Gannett, of the United States Geological Survey, on this basis estimates the easily accessible and available coal supplies, aggregating 1,400,000,000,000 tons, would be exhausted by about the year 2027, and that the entire coal supply would be exhausted about the year 2050.

As a practical matter it should be understood that coal production will not increase to a certain point and then cease, but that long before the time of exhaustion of supply has been approached there will come a gradual decline in annual production of coal owing to its increasing scarcity and cost. Already the price of anthracite and some other coals is advancing because of exhaustion of thicker beds and increased cost of working.

The adoption of more efficient methods in connection with the mining and utilization of coal, and the increasing use of water power and other substitutes for fuel in power development will diminish the present increasing rate of consumption, and thereby extend the life of our coal supplies beyond the dates mentioned. On the other hand, it is to be expected that manufacturing will continue to grow more rapidly than population, and this will increase the rate of coal consumption for power purposes even more rapidly than for heating.

The factors in the above estimates are sufficiently reliable to make it clear that without a serious lessening of the present rate of coal consumption, either through more efficient use of this fuel or through the extensive development of substitutes for it, long before the middle of the next century is reached the nation's supplies of available coal will be so largely depleted as to bring serious hardship and a curtailment of industry.

In the earlier days of anthracite coal mining, and in fact until within the last ten years, 40 per cent of the contents of the coal fields was considered a maximum recovery, but conditions have so improved, both in the adoption of better mining methods and in the utilization of what were formerly considered waste sizes, that 60 per cent may now be considered a fair estimate of the coal recovered for commercial use.

It is probable that up to the present time the total loss in the mining and use of bituminous coal has been over 50 per cent of the production. During the last few years, however, the percentage of loss in mining the higher grades of bituminous coal has been largely reduced. This 50 per cent waste includes the coal left in the mine workings for the support of the roof, the coal of lower grades left as unprofitable at current prices, that which is unworkable because of such structural difficulties as faults or dikes and pinchings, and also that rendered unworkable by breaking up due to prior removal of the underlying beds.

The estimated loss in the transportation of anthracite coal is about 2 per cent, and that for bituminous coal is doubtless much larger. On the basis of the 1907 production, this means an annual loss from this source alone of 1,700,000 tons of anthracite coal.

No accurate estimate can be made as to the total unnecessary losses in connection with the use of coal for different purposes, but lines of urgently needed investigation are indicated by the facts that the vast majority of the power plants of the country convert less than 10 per cent of the heat units in the coal into actual work, and that lighting plants convert less than 1 per cent of the heat value of the coal into electric light. The large amounts of gases from blast furnaces are being used to a small but increasing extent in the development of gas-engine power. In the coking industry gases and other by-products to the value of \$55,000,000 went to waste in 1907.

EXTENDING THE DURATION OF THE SUPPLY.

The first step in extending our fuel supply should be to lessen the waste in mining, handling, and transportation of coal. There are equally great possible savings in the use of coal, not only in preventing waste now recognized as such, but also in discovering means of avoiding the losses involved in the transformation of heat into mechanical energy, and this into electric energy and light.

Water power will doubtless prove a valuable substitute for coal in the development of power and light in many parts of the country, and the use of the heat of the sun and of alcohol and other organic fuels as substitutes for coal is worthy of serious consideration and investigation.

PEAT.

In European countries where fuel is expensive 10,000,000 tons of peat are used annually for fuel purposes. A preliminary and incomplete examination of the peat beds of the country has developed the fact that they extend over an area of more than 11,000 square miles, the larger part of which is distributed through the New England States, New York, Minnesota, Wisconsin, New Jersey, Virginia, the

449382

Carolinas, and Florida—States which contain little or no coal. Extensive deposits are also found in a few coal-producing States—Iowa, Illinois, Indiana, Ohio, North Dakota, and South Dakota.

This area indicates a possible production of 13,000,000,000 tons of air-dried peat fuel. At \$3 per ton in the air-dried form (which would be a reasonable price for fuel in the States having but little coal) this peat would have a fuel value of \$39,000,000,000. If all of it were used in by-product gas producers, 640,000,000 tons of ammonium sulphate could be manufactured as a by-product, and at current prices this would have an aggregate value of more than \$36,000,000,000.

Recent investigations have shown that much American peat, when dried, will be admirably adapted for use as a source of producer gas for charcoal, for certain grades of coke, for the production of various by-products, for illuminating gas, as a filler for fertilizers, in the manufacture of paper, and for packing material.

PETROLEUM.

The proved oil territory in the United States has fairly exact limitations, but the available information concerning the lateral exhaustion of the pools in this territory and the possible discovery of additional pools is too incomplete to permit of its use as a basis of prediction. Special investigations into the supplies and production of petroleum have been conducted by Dr. David T. Day, of the United States Geological Survey, and these investigations, together with the facts given in the volumes on Mineral Resources of the United States and in the reports of the several state geological surveys, have yielded fairly accurate information concerning the known oil supplies of the country.

The six known petroleum fields aggregate 8,450 square miles, distributed as follows: The Appalachian field, in the States of New York, Pennsylvania, Ohio, West Virginia, Kentucky, and Tennessee; the Lima-Indiana field, in Ohio and Indiana; the Illinois field, in eastern Illinois; the Mid-Continent field, in Kansas and Oklahoma; the Gulf field, in Texas and Louisiana; and the California field. Of these the Illinois, Gulf, and California fields lead in production. The development of these fields has shifted the center of petroleum production rapidly westward to Oklahoma. The yield of oil is from 1,000 to 10,000 barrels per acre, and the total available supply in these fields is estimated at 10,000,000,000 to 24,000,000,000 barrels; perhaps 15,000,000,000 barrels may be taken as a fair average estimate of the available supply. There is, of course, the possibility and even the probability of the discovery of other oil fields as explorations are extended, but these figures must be considered as representing our actual knowledge of the oil resources of the United States.

In 1907 the petroleum production amounted to 166,000,000 barrels. The total amount produced during the last half century is more than 1,800,000,000 barrels. A careful study of the increase in rate of production and consumption during that time indicates that if this increase continues the supply of petroleum will be exhausted before the middle of the present century. However, the present production of petroleum is greater than the legitimate needs of the industry, and should be curtailed. The rapid decline in production of the fields in New York, Pennsylvania, West Virginia, Ohio, Indiana, and Kansas

indicates that within a few years the petroleum supply must come in still larger proportion from the more western fields.

One of the essential uses of petroleum is for lubricating purposes. At present fully half a pint of lubricating oil is used for every ton of coal converted into power, and in many branches of industry the proportion of petroleum used is more than twice that amount. Another important use is lighting, and this use also is practically essential, as a greater waste of coal or other fuel is involved in all other forms of lighting.

Such waste as characterizes the natural-gas and coal industries has been remarkably absent in the handling of petroleum in this country. The chief waste which needs mention here is its extensive misuse for purposes that could be easily met through the use of other materials.

During last year 35,000,000 barrels of crude petroleum were burned as fuel in locomotives and steamships and for general power development.

The large exportation of petroleum (30,000,000 barrels in 1907) is still more inimical to the future welfare of the industry. Decidedly beneficial results in extending the life of the supply would come through discontinuance of exportation and decrease of use for fuel.

NATURAL GAS.

Recent investigations of natural gas by the United States Geological Survey, through Dr. David T. Day, show that the known productive territory covers an aggregate area of 10,000 square miles, distributed through 22 States—Alabama, California, Colorado, Illinois, Indiana, Kansas, Kentucky, Louisiana, Michigan, Missouri, Montana, New York, Ohio, Oklahoma, Oregon, Pennsylvania, South Dakota, Texas, Utah, Washington, West Virginia, and Wyoming. Some of the gas fields were at one time abandoned as exhausted, but have subsequently been successfully operated for a time, although under greatly reduced pressures. The life of all the older gas fields, for example, those in portions of Pennsylvania, West Virginia, Ohio, and Indiana, is being exhausted by pumping, and the quantities of gas thus obtained have been unexpectedly large.

Records of the quantity of natural gas have been kept for the last two years only; the value of the annual output is known for the last twenty years or more. The production in 1907 was more than 404,000,000 cubic feet, with a value of more than \$52,800,000. The total value recorded by the United States Geological Survey for the twenty years from 1888 to 1907 was \$493,649,273.

It is impossible to estimate with even approximate accuracy the total quantity of gas still available for future use in the United States. However, in view of the fact that the known productive areas are limited and the quantity of gas produced in a number of the older fields is diminishing, it is safe to predict that within twenty-five years the known fields will be exhausted.

The waste of natural gas has been one of the chief sins in several States. Drillers for oil have incidentally tapped underground stores of natural gas, and have allowed it to escape until the oil could be produced. Dr. I. C. White, state geologist of West Virginia, estimates that the waste in this manner is now equivalent to a billion cubic feet per day, and has continued for a number of years. In the

Caddo field of Louisiana the daily loss of gas at the present time is estimated as 70,000,000 cubic feet, enough to light ten cities of the size of Washington, and equivalent to a waste of 10,000 barrels of petroleum per day.

This waste indicates most clearly the need of State laws to prohibit the squandering of our natural resources. Such laws applying to natural gas have already been enacted in Indiana, Pennsylvania, and Ohio, and have given gratifying results; and the country will be greatly benefited when other States follow this good example.

The prompt development of new fields of industrial enterprise to utilize the gas or pipe it to existing centers of industry, and penalizing drillers who permit the gas to waste in the air, are urgently required for the conservation of this peculiarly valuable resource.

IRON ORES.

DATA AND CLASSIFICATION.

The iron ores of the United States have been classified by Dr. C. W. Hayes, chief geologist of the United States Geological Survey, with the collaboration of other geologists and mining engineers, on the bases of chemical composition, geologic relations, and geographic distribution. All these classifications have a direct bearing on the commercial value and utilization of the ores. The value of the estimates of tonnage varies widely with different kinds of deposits; about one-eighth of the deposits may be calculated within 10 per cent, nearly three-fourths within 15 to 20 per cent, and the remainder much less closely.

In estimating the tonnage, the ores are divided into (a) those available under present conditions and (b) those not now available, but which will be used eventually, the division resting on present and prospective costs of delivery to the furnace and of reducing the ore. Among the most important factors of cost are accessibility to transportation, concentration of the deposits permitting large-scale operations, depth below the surface, and composition of the ore, including both the iron content and the character of the impurities. All limy ores carrying over 20 per cent of iron and all siliceous ores carrying over 35 per cent are considered eventually workable, also all material carrying over 4 per cent of wash ore, and all such ores known to occur in the United States are included in the estimates.

The following ore deposits are sufficiently known to indicate the basis and quality of tonnage estimates: (1) Lake Superior ores; (2) Adirondack ores; (3) Clinton ores; (4) Appalachian metamorphic ores; (5) Appalachian brown ores; (6) Appalachian carbonate ores; (7) west Tennessee brown ores; (8) eastern Texas brown ores; (9) Ozark ores; (10) Rocky Mountain metamorphic ores; (11) igneous contact ores.

ESTIMATED SUPPLIES.

The estimates of ore supplies are summarized by districts on purely commercial considerations.

The ores now considered available are estimated to amount to 4,784,930,000 tons, distributed as follows: In the Northeastern States, 298,000,000; in the Southeastern States, 535,220,000; in the Lake

Superior district, 3,510,000,000; in the Mississippi Valley, 315,000,000; in the Rocky Mountain region, 57,760,000; and on the Pacific slope, 68,950,000 tons.

Of low-grade ores not available under existing economic conditions, but which the country may be forced to use in the future, there are estimated to be 74,881,070,000 tons, distributed as follows: In the Northeastern States, 1,095,000,000; in the Southeastern States, 1,041,500,000; in the Lake Superior district, 72,030,000,000; in the Mississippi Valley, 570,000,000; in the Rocky Mountain region, 120,665,000; and on the Pacific slope, 23,905,000 tons.

ORES AVAILABLE FROM OTHER COUNTRIES.

In addition to the ores tabulated, certain foreign deposits which are dependent on the United States market must be taken into account. The most important of these are in Canada and Cuba. Although the amount of iron in these deposits can not be stated with any definiteness, the subjoined table affords some idea of their magnitude. Probably about 5 per cent of the Canadian and from 25 to 40 per cent of the Cuban ores may be available under existing conditions.

Estimated foreign ores tributary to the United States.

	Tons.
Canada and Newfoundland.....	73, 000, 000
Cuba.....	1, 505, 000, 000
Total.....	1, 578, 000, 000

During the four years 1904 to 1907, inclusive, iron ores were imported into the United States from Cuba, Spain, French Africa, Greece, Newfoundland, Labrador, the United Kingdom, Germany, Holland, Canada, Belgium, France, Norway, British India, and to a less extent from several other countries. The value of the importations steadily increased from \$1,101,384 in 1904 to \$2,062,161 in 1905, \$2,967,434 in 1906, and \$3,937,483 in 1907. The tonnage increased from something like 500,000 to about 1,375,000.

PRODUCTION AND DURATION OF SUPPLIES.

Our production of iron ores by decades and the percentage of increase since 1870 (the production of 1908 and 1909 being estimated) were as follows:

Decade.	Production.	Percent- age of increase.	Decade.	Production.	Percent- age of increase.
1870-1879	49, 022, 990	1890-1899.....	183, 667, 896	80. 10
1880-1889	101, 969, 116	108. 00	1900-1909.....	445, 373, 480	142. 40

The rates of increase are not such as to permit the construction of a curve by which the future production can be predicted. If the average increase of 110 per cent should continue, it would require the production during the next three decades of over 6,000,000,000 (6,329,000,000) tons. The supply of ore now available in the United

States is estimated at 4,784,930,000 tons. It is evident, therefore, that before 1940 either (1) the production will have reached a maximum and begun to decline, or (2) large use must be made of low-grade ores not now classed as available—else the importation of foreign ores must be greatly increased. It should be remembered that in the future use of low-grade ores the conditions will be rendered still further unfavorable through the necessary use of low-grade coals. In view of the many unknown features entering into the problem, the tendency and importance of which are not determinable, any more specific prediction as to the date of the ultimate exhaustion of the iron-ore supplies would be unwarranted.

WASTE AND EXTENSION OF ORE SUPPLIES.

Waste in the handling of iron ores in the Lake Superior district is being reduced to a small amount. The mining companies are displaying a commendable spirit not only in preventing waste of the high-grade ores, but in storing for future use the low-grade ores which it may be necessary to bring to the surface in mining operations, although not suitable for use under existing economic conditions. In other districts, especially those containing the Clinton ores, a considerable quantity of good material is at present left in the mines for the support of the roof. The waste in manufacturing is also guarded against with considerable care.

The principal factors in extending the duration of the supplies of high-grade ore will come through the utilization of the low-grade ore and through the lessening of the demand for iron and steel by developing substitutes for those materials in construction and other work.

GOLD, SILVER, COPPER, LEAD, AND ZINC.

Data concerning the ore supplies of these major metals have been prepared by Mr. Waldemar Lindgren, of the United States Geological Survey, whose report, largely based on the investigations of the Survey geologists, is appended.

THE ORE SUPPLIES.

The data are entirely inadequate for estimating the existing supplies of these metals, for the reason that they, or the ores from which they are produced, as a rule occupy comparatively small spaces, irregular and uncertain in occurrence, which can not be mapped and described with accuracy in advance of mining operations.

The areas in which these metals are known to occur, or where they may be reasonably expected to be found, are widely separated, and comprise in the aggregate less than one-third of the total area of the United States; and from this third may be excluded large areas in which the discovery of deposits is extremely unlikely.

The more important known available gold supplies are in Alaska, California, Colorado, and Nevada, all the other States contributing about one-fifth of the present total annual output. Silver is known to be mainly in Colorado, Montana, Utah, Nevada, and Idaho; lead in Missouri, Idaho, Utah, and Colorado; zinc in Missouri, New Jersey, Colorado, Wisconsin, and Kansas; and copper in Arizona, Montana, Michigan, Utah, Nevada, California, and Tennessee.

As compared to the certain future needs of the nation, the proved supplies of these metals are not great, but the discovery of large additional workable deposits is probable as the prospecting of the country is extended. Large deposits of low-grade ores are known to exist, which, although not now available for treatment, will become available as prices advance or as new processes permit handling and treatment at less cost.

PRODUCTION AND DURATION OF SUPPLIES.

A gold production of \$60,000,000 was recorded in 1852 and 1854. From that time it decreased gradually to \$30,000,000 in 1883, then rose to \$33,000,000 in 1892. Since that time the increase has been rapid, and record figures of over \$94,000,000 were reached in 1906. In 1907 the production fell to \$90,400,000.

Important production of silver began about 1860 and rapidly increased, amounting to 63,500,000 ounces in 1892. Since then the output has remained practically constant, averaging about 55,000,000 ounces yearly.

Copper production has grown at a very rapid and almost constant rate, reaching its maximum in 1906, when the output was almost 918,000,000 pounds. In 1907 it declined to very nearly 869,000,000 pounds.

From 1885 to 1895 the lead production grew at a moderate rate from 129,000 to 170,000 tons. Since 1895 the increase has been much more rapid, and in 1907 the production was 365,166 tons.

Zinc production, which was of little importance in 1880, began to increase decidedly in 1896. In that year the spelter output was 81,000 tons, and in 1907 it increased to 223,745 tons. Including that manufactured into paint, the total production in 1907 was 280,676 tons.

As to the duration of the supplies, data are not available for specific estimates. With a continuation of the present increasing rate of production, the known ores workable under present conditions will be exhausted before the middle of the present century; yet no such prediction can be made without qualification. Full knowledge of our metal resources can be gained only by exploration, and exploration does not materially anticipate unusual demand. Ten years ago a review of our metal supplies would have revealed a greater shortage than now exists, and it is quite possible that in the case of some metals our visible stock may be greater some ten years hence than at present.

Improvements in processes are steadily reducing the cost of reduction, and this will bring many ore bodies of lower grades now considered unprofitable into the list of available supplies.

PHOSPHATE ROCK.

Mr. F. B. Van Horn, of the United States Geological Survey, has brought together all available information concerning the supplies of phosphate rock in the United States. These are distributed along the western coast of Florida, along the coast of South Carolina, in central Tennessee, and in an area recently discovered in southeastern Idaho, northwestern Wyoming, and northeastern Utah. The data are not sufficiently complete to make a trustworthy estimate of the total existing supply.

The best estimate of high-grade phosphate rock that can be made at the present time is as follows:

	Tons.
South Carolina	3, 000, 000
Florida	15, 000, 000
Tennessee	103, 500, 000
Western States (Idaho, Wyoming, and Utah)	100, 000, 000
Total	221, 500, 000

In addition there are large supplies of low-grade phosphate rock, carrying from 25 to 50 per cent of calcium phosphate, for which there is now no demand, but which may find a market after the high-grade rock, containing from 60 to 80 per cent of calcium phosphate, has been consumed. Doubtless the advance in price which will precede exhaustion will hasten the development of methods rendering the use of the low-grade rock possible. No quantitative estimate of low-grade phosphate rock can be made at present.

During 1907 the production of phosphate rock was 2,265,343 tons. The total amount mined from the beginning, in 1867, to the end of 1907 was about 29,200,000 tons. The rate of increase in production in the last twenty years has averaged 117 per cent for each decade. Should this rate of increase continue the available supply of high-grade rock will be exhausted in twenty-five years.

Increase in population and the development of intensive farming will eventually extend the demand for phosphates and other fertilizing materials already existing in the Southern States. A partial contribution toward meeting this future demand will come from a more complete and efficient use on the farm of animal excrement, including that which may be procured from sewage and other sources; but to meet any large demand for phosphate materials, recourse must be had to the mineral supplies.

It is probable that additional deposits of high-grade phosphate rock may be discovered, and the duration of the known phosphate product may be extended by more efficient methods of mining and treatment. In the phosphate industry the plan now in practice to some extent in iron mining, of laying aside for the future all material too low in grade for economical use at present, should be adopted.

Another means of extending the supply lies in discontinuing exports of this material. During 1907 the United States exported 1,018,212 tons of high-grade rock, or about 45 per cent of the entire output. The total amount of high-grade material exported during the last nine years was 7,504,519 tons.

MISCELLANEOUS MINERAL RESOURCES.

Many branches of our mineral industry are based on additional mineral substances, which occur in greater or less abundance. Of these the supplies of abrasive materials, as quartz, feldspar, garnet, grindstone, infusorial earth, millstone, oilstone, and such other minerals as mineral waters, mineral paints, low-grade graphite, talc, gypsum, and salt, appear to be sufficient to meet the needs of the nation's future as well as the present demands.

The supplies of sulphur, asphalt, magnesite, borax, asbestos, and fibrous talc, like those of coal and iron ores, are clearly soon exhaustible, though if wisely used they may be reasonably expected to

extend beyond the limits of the present century. Our supplies of manganese ores, bauxite, quicksilver, antimony, high-grade graphite, corundum, and mica, like those of petroleum, natural gas, copper, gold, silver, lead, zinc, and phosphate rock, will be largely depleted or exhausted well within the present century unless known deposits are largely augmented by new discoveries. To this list may be added certain minerals of which only small quantities have yet been found in this country, such as nickel, cobalt, chromium, tin, platinum, antimony, bismuth, cadmium, tungsten, uranium, vanadium, molybdenum, and tantalum.

STRUCTURAL MATERIALS.

Data concerning the supplies and uses of structural materials and their waste through fire losses have been collected and prepared for the commission by Mr. H. M. Wilson, of the United States Geological Survey.

SUPPLIES AND USE.

The supplies of many of the materials used in building and engineering construction, such as stone, sand, gravel, clays, cement, lime, and salts, are practically inexhaustible, and for that reason need not be extensively discussed.

The use of these materials has been restricted heretofore by the wide difference in price between forest products and mineral products; but owing to improved methods the cost of the latter has been diminished, while that of wood products has advanced. Within the last decade the value of cement manufactures increased from \$9,900,000 to \$55,900,000, or nearly sixfold; and the value of clay products from \$74,500,000 to \$159,000,000, or more than double. In the same period the value of building stone increased from \$28,600,000 to \$71,100,000, or nearly threefold. A still larger relative increase in the use of these more durable building materials may be looked for, since the Government is determining the strength, durability, and fire-resistant properties of these materials, and is disseminating information as to the comparative cheapness of the more permanent work.

Through lack of exact knowledge as to the strength of these materials, present systems of building construction are expensive. Engineers and architects adopt working stresses for concrete and for metal construction ranging from one-fourth to as high as one-eighth the supposed working strength of the material, and this means that from three to six times the necessary amount of material is used.

WASTE OF MATERIAL.

The waste of minerals used in building and engineering construction comprises (1) that due to improper and wasteful methods of mining and preparing for market; (2) that due to the use of excessive quantities of material because of ignorance concerning strength and durability; and (3) that due to destruction by fire.

In addition to the waste of raw mineral products due to improper methods of mining and shipping, there is a large waste of material

due to careless and inefficient methods of manufacture. Not until better knowledge is gained as to the appropriate structural material for each particular use—steel, iron, cement, or clay products—will it be possible to materially lessen this waste.

FIRE LOSSES.

The greatest source of waste of structural materials and of money values is fire. It is one which, from the example set in European countries, can be most rapidly reduced by the substitution of fire-resisting materials for the inflammable construction now prevalent.

The cost to the country of fire, including only property destroyed, was \$217,500,000 in 1907. The cost of preventive measures, maintenance of fire departments, protective agencies, and additional cost of water supplies raised the total to over \$450,000,000.

A notable fact in the analysis of fire losses is that 27 per cent were due to exposure—that is, the fire extending beyond the building in which it originated. The extension of fires results from the use of inflammable material in construction. It is even more notable that only \$68,000,000 of the loss was on brick, concrete, stone, and other slow-burning construction, while over double that amount, or about \$148,000,000, was on frame buildings. In the last thirty-three years the total fire waste amounted in value of property destroyed to over \$4,500,000,000.

It is a reasonable estimate that one-fifth of the city water supply and distribution charges, three-fourths of the fire department charges, and over four-fifths of the fire losses, or a total of nearly \$400,000,000 per year, may be considered a preventable tax on the nation.

CONSUMPTION AND WASTE.

The recent rapid increase in the production and consumption of mineral materials forms one of the important and striking general facts brought out in the work of the commission, and this fact is of vital importance in any consideration of the duration of these resources.

This consumption of mineral products has increased more rapidly than population. Thus, in 1880 we used 1.5 tons of coal per capita; in 1890, 2.5 tons; in 1900, 3.5 tons; and in 1907, 5.6 tons. Of pig iron we used in 1880, 200 pounds per capita; in 1890, 320 pounds; in 1900, 391 pounds; and in 1907, 686 pounds. Of copper we used in 1890, 3 pounds per capita; in 1900, 4.6 pounds; and in 1907, 6.4 pounds. Of cement we used in 1890, 70 pounds per capita; in 1900, 92 pounds; and in 1907, 228 pounds.

The striking features in the economic history of the nation during the past century were the development of agricultural and mining industries and the beginning of manufacturing and transportation. The striking feature in the economic development of the nation during the present century will be the rapid extension of manufacturing and transportation industries. This will both require and explain the continuance of a rapid increase in the rate of mineral production and consumption. Nothing can check this development save the premature depletion of the resources which are essential to its progress. The prevention of such depletion is worthy of the best effort of the nation itself.

While the data are not available for an accurate quantitative estimate of the losses connected with the mining, treatment, and use of our mineral resources, the facts in hand indicate that they exceed one-fourth of the total value of our present mineral production, or \$500,000,000 yearly.

LOSS OF LIFE IN MINING INDUSTRIES.

Even more serious than the question of waste of materials is the excessive loss of life in our mining and metallurgical operations. During the past year in our coal mines nearly 3,000 men were killed and more than 7,000 were injured. During the past ten years nearly 20,000 men have been killed and probably 50,000 injured.

The number killed and injured in connection with metal mining and quarrying and in the metallurgical industries during the past year is not known, but the number will doubtless add materially to the sad record in the coal mines. The seriousness of this record is increased by the fact that the number of killed and injured for each thousand men employed in the coal mines was greater in 1900 than in 1895, greater in 1905 than in 1900, and greater in 1907 than during any earlier year of our history. This is the natural outcome of the deepening of mines and the employment of an increased percentage of untrained foreigners, rendered necessary in our mining operations by existing economic conditions. It is to be hoped that the record of 1907 represents the end of the increasing progression of killed and injured, and that henceforth loss of life will steadily and rapidly diminish through the cooperation of miners, operators, state and federal governments, and the general public.

A RATIONAL BASIS FOR THE CONSERVATION OF MINERAL RESOURCES.

In considering the conservation of resources it should be held in mind that:

(1) The present generation has the power and the right to use efficiently so much of these resources as it needs.

(2) The nation's needs will not be curtailed; these needs will increase with the extent and diversity of its industries, and more rapidly than its population.

(3) The men of this generation will not mine, extract, or use these resources in such manner as to entail continuous financial loss to themselves in order that something be left for the future. There will be no mineral industry without profits.

One of the essential steps is to adopt fundamental principles which give conservation as applied to mineral resources a rational basis. Some of the more important of these principles are as follows:

(1) The resources which have required ages for their accumulation, to the intrinsic value or quantity of which human agency has not contributed, which when once exhausted are not reproduced, and for which there are no known substitutes, must serve as a basis for the future no less than for the present welfare of the nation. In the highest sense, therefore, they should be regarded as property held in trust for the use of the race rather than for a single generation, and for the use of the nation rather than for the benefit of the few individuals who may hold them by right of discovery or by purchase.

(2) Measured in terms of the needs of a great and rapidly growing country, the mineral resources are limited in quantity.

(3) Measured in terms of the life of the nation, at the present increasing rate of consumption and waste we will, while the country is yet in its infancy, exhaust the resources necessary as the essential basis for the welfare of all succeeding generations. To shirk this responsibility on the claim that succeeding generations will probably discover other now unknown resources for their use is unjust and irrational.

(4) The right of the present generation to use efficiently of these resources what it actually needs carries with it a sacred obligation not to waste this precious heritage.

(5) The right to profit in the mining and utilization of our mineral resources does not carry with it the right to destroy the birth-right of generations yet unborn, in order that we of to-day may obtain more easily and more cheaply the products we need for present use.

(6) It is therefore reasonable to expect that the users of mineral products will pay for them such higher prices as will make profitable their mining and preparation without serious waste.

(7) It is also reasonable to expect that the resulting increase in the first cost of the crude material will insure their more efficient use, and that this in turn will both help to keep down the ultimate cost of finished products and to conserve the resources.

(8) The very abundance and cheapness of our resources have developed an American habit of waste which is the greatest menace to our future welfare. This waste of the past and present entails on us a still greater obligation to strive for the highest possible efficiency in the future mining and use of these resources.

HOW THE DURATION OF THE SUPPLY MAY BE EXTENDED.

The extension of the supply of our more important mineral resources is absolutely essential to the future welfare of the nation. How to accomplish this is a problem demanding the consideration of the best science and statesmanship the country affords.

First of all is the prevention of unnecessary waste; and for this the individual and the State and Federal governments must cooperate.

All unscientific or inefficient use of resources is waste; and the most important element in conservation is the fact that the necessary waste of to-day may, through inquiry or research or through economic conditions, become the avoidable waste of to-morrow.

The waste of these essential resources being a matter of serious national concern, it is a proper function of the Federal Government to conduct such investigations as may be necessary to determine the nature and extent of the losses of life and resources and to indicate how they may be prevented.

The Federal Government has inaugurated and has well under way investigations into the nature and causes of coal-mine explosions, with a view to their prevention; into the character and value of our coals, and into the nature and extent of the waste in coal mining; concerning the fundamental problems of combustion, with a view to preventing waste in the use of fuels; and into the nature and extent

of materials of construction, with a view to their more efficient use by the Government and the people, and to the prevention of disastrous fires. To these might be added similar investigations looking to the prevention of waste in the mining, treatment, and use of other mineral substances.

Such investigations being of service to all the people and to all the States, and being national in their purpose, may be conducted more efficiently by the General Government, as duplication in labor and cost are avoided where it would exist if the work were undertaken by the States or by individuals.

The cooperation of the States in this movement is essential as covering investigations of local problems and the enforcement of such legislation as might prove necessary in securing the fullest cooperation of the individual, who is naturally apt to consider first of all the question of immediate financial return on his investments. But the cooperation of the individual in the movement for the conservation of resources is needed, and may be counted on to the fullest extent that economic conditions will permit.

The duration of our mineral resources may be still further extended through investigations looking toward the substitution of common mineral substances for those which more rapidly approach exhaustion because of their rarity or greater importance, as, for example, the substitution of concrete for structural steel; of low-grade coals or lignite for those of higher grade; and of water power for steam.

Furthermore, in the case of certain supplies which are now being largely exported, or in the use of which waste is excessive, the duration may be extended for domestic use through such ownership or control as will prevent both sending out of the country and unnecessary waste.

Again, the prevention of waste, and hence the extension of the life of supplies, may be secured through such increase in the price of materials as will render practicable their more complete extraction and efficient use.

The miners and operators in our coal mines are both anxious to inaugurate reforms looking to greater safety and efficiency in mine operation, but the price of coal in the United States is too low to render possible many of the reforms which in other countries are successfully based on a price at the mine twice that in this country. It is believed, however, that when this situation is fully understood the American people will be ready and willing to pay whatever increase in the cost of fuel may be found necessary in order to guarantee the safety of the miner and to prevent the waste of resources, the preservation of which is no less essential to the nation's future than to its present welfare. The American consumer can regain the additional cost of the coal by handling and using it with correspondingly greater care and efficiency.

J. A. HOLMES,
Secretary, Section of Minerals.

ORGANIZATION AND PROCEEDINGS OF THE
NATIONAL CONSERVATION COMMISSION.

72539—S. Doc. 676, 60-2—8

113

ORGANIZATION AND PROCEEDINGS OF THE NATIONAL CONSERVATION COMMISSION.

On June 8, 1908, the National Conservation Commission was created by the President. The President's letter to those designated to serve on the commission is as follows:

THE WHITE HOUSE,
Washington, June 8, 1908.

The recent conference of governors in the White House confirmed and strengthened in the minds of our people the conviction that our natural resources are being consumed, wasted, and destroyed at a rate which threatens them with exhaustion. It was demonstrated that the inevitable result of our present course toward these resources, if we should persist in following it, would ultimately be the impoverishment of our people. The governors present adopted unanimously a declaration reciting the necessity for a more careful conservation of the foundations of our national prosperity, and recommending a more effective cooperation to this end among the States and between the States and the nation. A copy of this declaration is inclosed.

One of the most useful among the many useful recommendations in the admirable declaration of the governors relates to the creation of state commissions on the conservation of resources, to cooperate with a federal commission. This action of the governors can not be disregarded. It is obviously the duty of the Federal Government to accept this invitation to cooperate with the States in order to conserve the natural resources of our whole country. It is no less clearly the duty of the President to lay before the Federal Congress information as to the state of the Union in relation to the natural resources, and to recommend to their consideration such measures as he shall judge necessary and expedient. In order to make such recommendations the President must procure the necessary information. Accordingly, I have decided to appoint a commission to inquire into and advise me as to the condition of our natural resources, and to cooperate with other bodies created for a similar purpose by the States.

The Inland Waterways Commission, appointed March 14, 1907, which suggested the conference of governors, was asked to consider the other natural resources related to our inland waterways, and it has done so. But the two subjects together have grown too large to be dealt with by the original body. The creation of a commission on the conservation of natural resources will thus promote the special work for which the Inland Waterways Commission was created, and for which it has just been continued and enlarged, by enabling it to concentrate on its principal task.

The Commission on the Conservation of Natural Resources will be organized in four sections to consider the four great classes of water resources, forest resources, resources of the land, and mineral resources. I am asking the members of the Inland Waterways Commission to form the section of waters of the National Conservation Commission. In view of the lateness of the season and the difficulty of assembling the members of the sections at this time, a chairman and a secretary for each section have been designated, and the chairmen and secretaries of the sections will act as the executive committee with a chairman who will also be chairman of the entire commission. I earnestly hope that you will consent to act as a member of the commission.

One of the principal objects of the federal Commission on the Conservation of Natural Resources will be to cooperate with corresponding commissions or other agencies appointed on behalf of the States, and it is hoped that the

governors and their appointees will join with the federal commission in working out and developing a plan whereby the needs of the nation as a whole and of each State and Territory may be equitably met.

The work of the commission should be conditioned upon keeping ever in mind the great fact that the life of the nation depends absolutely on the material resources which have already made the nation great. Our object is to conserve the foundations of our prosperity. We intend to use these resources; but to so use them as to conserve them. No effort should be made to limit the wise and proper development and application of these resources; every effort should be made to prevent destruction, to reduce waste, and to distribute the enjoyment of our natural wealth in such a way as to promote the greatest good of the greatest number for the longest time.

The commission must keep in mind the further fact that all the natural resources are so related that their use may be, and should be, coordinated. Thus the development of water transportation, which requires less iron and less coal than rail transportation, will reduce the draft on mineral resources; the judicious development of forests will not only supply fuel and structural material but increase the navigability of streams, and so promote water transportation; and the control of streams will reduce soil erosion and permit American farms to increase in fertility and productiveness, and so continue to feed the country and maintain a healthy and beneficial foreign commerce.

The proper coordination of the use of our resources is a prime requisite for continued national prosperity.

The recent conference of the governors, of the men who are the direct sponsors for the well-being of the States, was notable in many respects; in none more than in this, that the dignity, the autonomy, and yet the interdependence and mutual dependence of the several States were all emphasized and brought into clear relief, as rarely before in our history. There is no break between the interests of state and national; these interests are essentially one. Hearty cooperation between the state and the national agencies is essential to the permanent welfare of the people. You, on behalf of the Federal Government, will do your part to bring about this cooperation.

In order to make available to the National Conservation Commission all the information and assistance which it may desire from the federal departments, I shall issue an executive order directing them to give such help as the commission may need.

The next session of Congress will end on March 4, 1909. Accordingly, I should be glad to have at least a preliminary report from the commission not later than January 1 of next year.

Sincerely, yours,

THEODORE ROOSEVELT.

Personnel of the National Conservation Commission.

WATERS.

Theodore E. Burton, Ohio, chairman.
 Francis G. Newlands, Nevada.
 Jonathan P. Dolliver, Iowa.
 William Warner, Missouri.
 John H. Bankhead, Alabama.
 W J McGee, Bureau of Soils, secretary.
 F. H. Newell, Reclamation Service.
 Gifford Pinchot, Forest Service.
 Herbert Knox Smith, Bureau of Corporations.
 Joseph E. Ransdell, Louisiana.
 G. F. Swain, Massachusetts Institute of Technology.
 W. L. Marshall, Brigadier General, U. S. Army, Chief of Engineers.

FORESTS.

Reed Smoot, Utah, chairman.
 Albert J. Beveridge, Indiana.
 Charles F. Scott, Kansas.
 Champ Clark, Missouri.
 J. B. White, Missouri.
 Henry S. Graves, Yale Forest School.

Wm. Irvine, Wisconsin.
 Newton C. Blanchard, Louisiana.
 Charles L. Pack, New Jersey.
 Irving Fisher, Connecticut.
 Gustav H. Schwab, New York.
 Overton W. Price, Forest Service, secretary.

LANDS.

Knute Nelson, Minnesota, chairman.
 Francis E. Warren, Wyoming.
 Swagar Sherley, Kentucky.
 Herbert Parsons, New York.
 N. D. Broward, Florida.
 James J. Hill, Minnesota.
 Geo. C. Pardee, California.
 Charles Macdonald, New York.
 Murdo Mackenzie, Colorado.
 T. C. Chamberlin, University of Chicago.
 Frank C. Goudy, Colorado.
 Geo. W. Woodruff, Interior Department, secretary.

MINERALS.

John Dalzell, Pennsylvania, chairman.
 Joseph M. Dixon, Montana.
 Frank P. Flint, California.
 Lee S. Overman, North Carolina.
 Philo Hall, South Dakota.
 James L. Slayden, Texas.
 Andrew Carnegie, New York.
 Charles R. Van Hise, Wisconsin.
 John Mitchell, Illinois.
 John Hayes Hammond, Massachusetts.
 I. C. White, West Virginia.
 J. A. Holmes, Geological Survey, secretary.

EXECUTIVE COMMITTEE.

Gifford Pinchot, chairman.
 Theodore E. Burton.
 Reed Smoot.
 Knute Nelson.
 John Dalzell.
 W J McGee.
 Overton W. Price.
 G. W. Woodruff.
 Joseph A. Holmes.

Secretary of the Commission, Thomas R. Shipp (elected by the executive committee).

At the time the National Conservation Commission was created, the Inland Waterways Commission, appointed on March 14, 1907, was reappointed. Three members were added and the commission was made the section of waters of the National Conservation Commission. The President's letter reappointing the Inland Waterways Commission is as follows:

THE WHITE HOUSE,
 Washington, June 5, 1908.

The Inland Waterways Commission was appointed on March 14, 1907. It was appointed to meet the strongly expressed and reasonable demands of the people. Commercial organizations throughout the Mississippi Valley and elsewhere demanded then and still demand such improvement of waterways and development of navigation as will prevent traffic congestion and develop com-

merce. It is an unpleasant fact that, although the Federal Government has in the last half century spent more than a third of a billion dollars in waterway improvement, and although the demand for transportation has steadily increased, navigation on our rivers has not only not increased, but has actually greatly diminished. The method hitherto pursued has been thoroughly ineffective; money has been spent freely for improving navigation, but river navigation at least has not been improved, and there is a just and reasonable demand on the part of the people for the improvement of navigation in our rivers in some way which will yield practical results. It was for such reasons as these that the commission of which you are chairman was requested to consider and recommend a general plan of waterway improvement giving reasonable promise of effectiveness.

The preliminary report of the Inland Waterways Commission was excellent in every way. It outlines a general plan of waterway improvement which when adopted will give assurance that the improvements will yield practical results in the way of increased navigation and water transportation. In every essential feature the plan recommended by the commission is new. In the principle of coordinating all uses of the waters and treating each waterway system as a unit; in the principle of correlating water traffic with rail and other land traffic; in the principle of expert initiation of projects in accordance with commercial foresight and the needs of a growing country; and in the principle of cooperation between the States and the Federal Government in the administration and use of waterways, etc., the general plan proposed by the commission is new and at the same time sane and simple. The plan deserves unqualified support. I regret that it has not yet been adopted by Congress, but I am confident that ultimately it will be adopted.

Pending further opportunity for action by Congress the work of the commission should be continued, with the view of still further perfecting the general plan by additional investigations and by ascertaining definitely and specifically why the methods hitherto pursued have failed. To this end I ask that the present members of the Waterways Commission continue their most commendable public service. I am asking three others to join them, namely: Senator William B. Allison, of Iowa; Hon. Joseph E. Ransdell, of Louisiana, a member of the Rivers and Harbors Committee of the House of Representatives and president of the National Rivers and Harbors Congress; and Prof. George F. Swain, of the Massachusetts Institute of Technology, a recognized authority on water power. When a Chief of Engineers is appointed to succeed General Alexander Mackenzie, retired, I shall also designate him a member, in lieu of General Mackenzie, whose retirement relieves him of further duty on the commission. The commission will thus be increased from 9 members to 12.

In order to facilitate the work of the commission I shall shortly issue an executive order along the lines suggested by your findings and recommendations, directing the executive departments to give the commission access to their records and all necessary and practicable assistance in securing information for submission to the President and to Congress.

An indirect but useful result of the work of the commission was the recent conference of governors on the conservation of our natural resources, held in the White House May 13-15. I take great pleasure in repeating my public expression of indebtedness and my congratulations to the commission for their signal public service in connection with this great conference; it was an event which is likely to exert a profound and lasting influence on the development and history of our country.

Copies of this letter are being sent to each of the twelve members of the Inland Waterways Commission.

Sincerely, yours,

THEODORE ROOSEVELT.

The executive committee of the National Conservation Commission, which was also designated by the President, met in Chicago on June 19, 1908, and elected Thomas R. Shipp secretary of the commission.

The committee authorized the chairman and secretary of the commission to correspond with governors and other state officials and with national organizations concerned with natural resources. It agreed to write the governors, or representatives to be appointed by them, to participate in a meeting with the National Conservation

Commission on December 8, 1908. The date for the first general meeting of the commission was fixed for December 1, 1908. It was agreed that the executive committee should issue bulletins of progress from time to time, announcing places and dates of meetings and conveying other information of service to the commission. It was decided that in the collection of information the chairman and secretary of each section should act in behalf of the section and that the data collected should be coordinated by the chairman of the commission. By general agreement, the chairman was instructed to invite all necessary expert assistance in the preparation of special statements and reports.

The compilation of data planned by the executive committee was authorized by the following executive order of the President:

EXECUTIVE ORDER.

A national conservation commission to consider and advise the President upon the condition and needs of the natural resources of the country has been appointed by the President. The heads of the executive departments, bureaus, and other government establishments are hereby instructed to secure, compile, and furnish to the said commission all such information and data relevant to its work as the commission may from time to time request, and as may be respectively within the lawful powers of such departments, bureaus, and government establishments to secure, compile, or furnish, and not inconsistent with express provisions of law.

THEODORE ROOSEVELT.

THE WHITE HOUSE, June 8, 1908.
(No. 809.)

Under authority of this executive order, the conservation commission undertook the making of an inventory of the natural resources of the United States, in cooperation with the executive departments of the Government, state officers, and with national organizations. General supervision of the compilation of material was placed in the hands of Mr. Henry Gannett, whom the President assigned to assist the commission in its work.

The work of the commission was greatly aided by the rapid appointment of state conservation commissions, which now number thirty-five.

In addition to the cooperation of state and federal agencies, the national organizations rendered valuable assistance. These organizations named conservation committees to act in cooperation with the national commission, which now reach a total of forty-one.

The first meeting of the National Conservation Commission was held in the Library of Congress, Washington, beginning December 1 and ending December 7.

Its sessions were devoted to the discussion of the inventory of natural resources, presented by the chairman and secretaries of sections, and to the preparation of the report of the National Conservation Commission to the President, which was unanimously adopted.

The report of the commission was presented to the joint conservation conference, which met in Washington December 8-10, at which, conferring with the National Conservation Commission, were 20 governors of States and Territories, personal representatives of 11 governors and governors-elect, members of 26 state conservation commissions, and presidents and representatives of 60 national organizations.

Supplementing the report, the summaries of the four sections of the commission were presented and thoroughly discussed by the governors and the conferees, after which the committee on resolutions, consisting of the governors, ex-governors, and governors-elect who were present, united in resolutions, which were unanimously adopted and which are submitted with the report of the commission. The verbatim proceedings of the joint conservation conference are also submitted with this report.

THOMAS R. SHIPP,
Secretary to the Commission.

PROCEEDINGS OF THE
JOINT CONSERVATION CONFERENCE.

out the plan as it ought to be carried out. I quite agree that there will be many instances in which it will be impossible even for a Democrat converted to federalism to give us federal jurisdiction within the States, and therefore that it is necessary to have cooperation on the part of the States. But nothing could have made that more possible than to summon the chief executives of the States into such a novel conference as that which met last May and which is met again this month—not, my dear friends, that it was intended to set a fire under Congress, but only that the information should be widespread and come down to the people, not only through federal tributaries, but also through the chief executives of the States.

I had some notes that I was going to read, but the truth is they contained so many expert statements that I am afraid you might suspect their authorship, and so if you will excuse me from going into a civil-service examination on the subject of waterways and water and where it conceals itself and how it ought to be treated, I shall content myself only with the statement of my deep sympathy with this movement and with my purpose, should the electors of the various States hit upon a suitable candidate, to do everything I can to carry on the work so admirably begun and so wonderfully shown forth by President Roosevelt.

I can not take my seat either without speaking in as strong terms as possible of the value of Governor Chamberlain's paper, in discussing the really difficult constitutional questions that are presented and the liberal and judicial and nontraditional spirit in which he has treated them.

One more subject and I am done. I concur in full in what the President has said in respect to the necessity of carrying out projects completed in their plan and which will fit into the general plan, and also in what he has said about the issuing of bonds. While it is true, as he said so forcibly, that the man who does not remember his children is worse than an infidel, it is also true that where a system can be devised by which the children shall meet and pay their portion, there is no reason why these little fellows who are growing up should not have a burden provided for them that will keep them under proper self-restraint. Now, I have no compunctions on the subject of issuing bonds, if the debt which is to be contracted ought to be met by bonds. I think we can sometimes overdo the business of what ought to be distributed expenses out of current income. There might be a reason for taking off taxation and reducing the income and meeting the expenditure by bonds for what are proper permanent expenses; and sometimes it takes as much courage and involves as much real public interest to issue bonds for a purpose for which bonds ought to be used as it does to pay as we go. In other words, it is a mere question of economic policy, and the mere fear of a criticism that an administration has issued bonds ought not to prevent us from doing justice to ourselves and to posterity.

Ladies and gentlemen, if the real power behind the throne consents, I declare this meeting adjourned.

(Thereupon, at 5.15 o'clock p. m., the meeting adjourned until Wednesday morning at 10 o'clock.)

CONFERENCE SESSIONS.**WEDNESDAY MORNING, DECEMBER 9.**

The Joint Conservation Conference was called to order at 10 o'clock a. m. in the Red Room of the New Willard Hotel by Chairman Gifford Pinchot.

The **CHAIRMAN**. Gentlemen, in calling together the first joint conference for the consideration of the conservation of the natural resources of this country, I have no statement to make further than to say it seems best for the National Conservation Commission to place before you at once, so that you may at the beginning be aware of its contents, the report which it has drafted for submission to the President. This report, since it goes to the President, is necessarily a confidential communication, and therefore no copies have been printed for circulation. It will be read to the conference, without objection, as the first order of business to-day. Governor Blanchard, of Louisiana, will read the report, but Doctor Van Hise has asked me to recognize him for a preliminary statement before Governor Blanchard begins the report.

DOCTOR VAN HISE. It seems to me the commission should have some information as to the manner in which this report has been prepared.

Last spring the executive committee held a session in Chicago at which various lines of investigation were discussed and laid out to be pursued during the summer. Advantage was taken of the fact that the President had directed the various scientific bureaus of Washington to cooperate with the commission and to furnish all necessary information. As a result of that direction on the part of the President, the commission called upon the various bureaus in Washington to make investigations of the various resources of the country, especially with reference to their amount, with reference to the rate of exploitation, the increase of exploitation, and to give estimates as to the probable time they would last, provided the future tendencies continued at the past rate.

Therefore, when the commission gathered together last week we had before us a series of papers, prepared mainly by the experts of the bureaus at Washington, but some of them also prepared in cooperation with the state organizations and with the various national associations.

During four days those data were presented to the commission. They constituted the base of the pyramid of which the report of the commission is the apex. In those reports are found the facts upon which the commission's findings are based. Without that base, it might be thought that the commission's report was not justified, but in this matter we ask suspension of judgment in case of doubt until you may see the data and the facts which these experts have presented to us as substantiating the conclusions which the commission has reached. It would not have been possible to have accomplished so much as has been done had it not been for the services of these experts, and indeed these papers, when published, will be the most important part of the report of the commission. They of course can not be read this morning—they will constitute a book when published—and yet they will furnish the basis on which States and citizens may act.

Now a report drawn up through one week of work, based upon such data as have been furnished the commission, will be necessarily imperfect, imperfect by omission as well as otherwise, but so far as it goes the commission think it is sound and they present it as a first approximation to an adequate statement of this subject, in the hope that it may advance this movement for conservation.

REPORT OF THE NATIONAL CONSERVATION COMMISSION.

The CHAIRMAN. Gentlemen, it gives me great pleasure to now introduce Governor Blanchard, of Louisiana, who will read the report to which Doctor Van Hise has just referred.

Governor BLANCHARD. Mr. Chairman and gentlemen, the report which I am about to read has been explained to you by Doctor Van Hise, and is a compilation of a vast amount of material in the way of inventory taking of the natural resources of our country which has been going on since the President appointed the National Conservation Commission in June of the present year. This report is the result of the indefatigable labors of the Conservation Commission and of the special commission appointed by it for the purpose of preparing the report itself.

[The report in full as read will be found on page 13.]

The CHAIRMAN. Gentlemen, the suggestion of the commission to this joint conference for the consideration of this material is that the specific subjects—minerals, lands, forests, and waters—should be presented to the joint conference either by the chairman of the section or some member of the section chosen by him. In the belief that that plan would meet with your approval, and acting on behalf of the commission, I have invited Senator Flint to present to you more in detail the subject of minerals. After his presentation, if that be the pleasure of the meeting, the matter will be open for general discussion, with the single qualification, if I may be allowed to make it on behalf of the conference, that the governors be given the right of way. After the governors have spoken, the discussion will be entirely open.

Senator NEWLANDS. Mr. Chairman, before this subject is entered upon I would like to make a suggestion regarding the question of inland waterways. In conversation with Senator Frye, who is chairman of the Committee on Commerce in the Senate, the committee which has jurisdiction over harbors and rivers, I inquired whether a hearing before that committee could be secured during this week, and he replied that he would be glad to meet the pleasure of the conference either upon Thursday or Friday of this week. I present the matter now, in order that this conference may take the proposition under consideration and come to some determination regarding it.

In this connection it may be well to state that the Inland Waterways Commission, which was appointed by the President over a year ago, or pretty nearly two years ago, is now a section of the National Conservation Commission, the chairman of that section being the Hon. Theodore E. Burton, chairman of the Rivers and Harbors Committee of the House. That commission, which is purely a commission appointed by the President without statutory sanction, simply in aid

of his power to make recommendations to Congress regarding legislation, entered upon an inquiry and examination and visited the different sections of the country and inspected the main rivers of the country and made a general inquiry of the subject. Prior to their report I introduced in the Senate of the United States, in a tentative way, a bill based upon discussion already had in the commission, simply with a view of testing the sentiment of the country. Later on the report of the commission was made and was sent by the President to Congress.

This bill was referred to the Secretary of War for his opinion and to the Inland Waterways Commission for its opinion. The Secretary of War approved the main features of the bill, but made some suggestions which were intended to bring it more clearly within the constitutional sphere of national action. The Inland Waterways Commission also approved the main features of the bill. That bill was considered by a subcommittee of the Committee on Commerce in the Senate and was reported favorably to the full committee with certain amendments. The bill, I will state briefly, covered, first, a waterway fund of \$50,000,000. Its second provision gave the President of the United States the power to cause investigations and surveys to be made, and, in aid of that power, to appoint a commission to be known as the "Inland Waterways Commission," which was to bring into coordination all the scientific surveys of the Government relating to water, including the various bureaus of reclamation, the Geological Survey, and other surveys. It then provided for the coordination of the national surveys and their collaboration in this work. It also provided for cooperation of the States and municipalities, and it provided that whenever the fund was diminished by expenditures to \$25,000,000 a bond issue should be made to make up the deficiency, bringing the fund back to its original amount of \$50,000,000. It also gave this commission, whenever a project was deemed feasible, the power to enter upon the work without further action of Congress.

This bill was amended in certain material particulars by the subcommittee. I will not take your time now by stating what these amendments were.

The bill was then considered in full committee, but as there was considerable difference of opinion it seemed clear that the bill could not be presented to the Senate in time for consideration at the last session. At the suggestion of the President I introduced a shorter bill providing simply for the creation of a commission without defining its powers beyond giving it the power of investigation and a small appropriation. That bill was favorably reported to the Senate by the Committee on Commerce, but unfortunately there was not time for its consideration in the closing days of Congress.

Now, I would suggest that public opinion, of course, operates powerfully upon Congress regarding these matters. These great bodies throughout the country make public opinion. Congress always follows public opinion when it is clearly ascertained upon any subject, and it seems to me it would be well, while this great and influential body of men is here, that its leading men should appear before the Committee on Commerce in the Senate and give their views and the views of this body and the views of the various sections of the country regarding this important question and the importance of providing a sufficient fund and the importance of providing for immediate commencement and consecutive prosecution of this great work.

I would suggest that perhaps Friday morning would be the more convenient time, as this conference is to be in session Wednesday and Thursday, and that a committee be appointed by the conference for the purpose of presenting this matter before the Committee on Commerce in the Senate upon Friday, at 10.30 o'clock.

The CHAIRMAN. Gentlemen, you have heard Senator Newlands's motion—I take it to be a motion?

Senator NEWLANDS. I will make that motion; yes, sir.

The CHAIRMAN. How many members do you think should be appointed on that committee?

Senator NEWLANDS. Have you any suggestion to make, Mr. Pinchot?

The CHAIRMAN. The only suggestion I have to make is that if the Senate committee is willing, it might receive all those members of the conference who may be willing to attend on Friday morning, and that you, yourself, arrange for the presentation of the subject.

Governor BLANCHARD. If the chairman please, what is everybody's business is nobody's business. If you say any members of this conference who desire to go may go, nobody will feel specially an obligation upon himself to go. I think that the Senator from Nevada is correct in saying that there should be a committee appointed and that it be made the specific duty of that committee to attend that hearing and present these matters.

Senator NEWLANDS. I would move, then, that the conference, or as many as possibly can do so, attend the session of the Committee on Commerce at 10.30 o'clock Friday morning, and that a committee of such number as the chair deems advisable be appointed by him with a view to presenting this matter to the Committee on Commerce.

Mr. LAY. I would suggest to the chair that that motion be amended: That there be appointed on this committee a member from each State.

Senator NEWLANDS. I will accept that with this proviso: That the chairman have the power to add such others to that committee as he deems advisable.

Senator SMOOT. Mr. Chairman, it seems to me if we want to get the information before the committee of the Senate, the best way is for the chair to appoint say three men for the purpose of presenting the matter to that committee. That is what should be done. We want the information to be presented, but if one from every State here is appointed, with no one designated to present the matter, we are going absolutely unprepared. The Senate committee can not waste time. If you appoint three men for the presentation of the matter and let every representative attend who desires, you will have some result, but if it is not arranged in that way I do not believe you will accomplish anything.

Senator NEWLANDS. I accept that suggestion—that the committee shall be appointed by the chair, consisting of at least one representative from each State, and that the chair select from this committee three men who shall have charge of the duty of presenting the subject to the Committee on Commerce.

Senator SMOOT. I second the motion as amended.

(The motion was unanimously carried.)

The CHAIRMAN. The committee will be appointed at the earliest possible moment.

Without objection, I will now call upon Senator Flint to present the matter of minerals. I take pleasure now in introducing Senator Flint.

SENATOR FRANK P. FLINT, OF THE SECTION OF MINERALS, NATIONAL CONSERVATION COMMISSION.

Senator FLINT. Mr. Chairman and members, I find myself in the awkward position of not being informed that I was to present this subject until a very late hour last night, when there was a meeting of this section of the commission. I have attended the various meetings and listened to the various papers that have been prepared, and can only in a general way present the matter to you here to-day.

The report read by Governor Blanchard shows clearly what has been accomplished, not only by this section of the commission, but the entire commission, and as my time is very limited and I am able to remain here but ten minutes more, I will just call to your attention in a general way the points brought out at this hearing.

The first thing I have to suggest is this: That an inventory has been compiled of the mineral resources of the country, which is admitted to be not what we would like in the way of a definite statement of just what we have. What has impressed us more than anything else in connection with this inventory is the lack of knowledge that we have on this subject, the importance that this commission should be continued, and that we should have a thorough inventory of the mineral resources of the country.

The very fact that we are not able to present to you a definite statement of our mineral resources seems to me a complete answer to those who say that this commission should no longer exist.

Some of the startling facts brought out in this report as to the waste of gas, where the statement is made in the report of this commission that the gas is now escaping from wells, both oil and gas wells, that could be saved, is sufficient to light all the cities of the United States with inhabitants of over 100,000, are worthy of our very serious consideration. It seems hardly possible that this great waste is going on, and yet this is the report of this commission, which has been giving careful study to this subject.

In the matter of coal, the report has been made that our coal will last until the middle of the next century. The report also contains the statement of the enormous waste that is now going on with reference to coal. The waste in all minerals produced in the United States to-day, it is estimated, amounts to \$1,000,000 a day. Of all the mineral produced in the United States, one-sixth is wasted. That is the estimate of this commission. Not only has there been a great waste in the minerals produced, but a great loss of life. Not only has the loss of life been great, but it has been far greater than in other countries in the same line of work, and the trouble seems to me to be a lack of harmony between the National Government and the States in the matter of regulations for the protection of life and the waste of property. There has been considerable talk about a twilight zone, which was mentioned yesterday by President-elect Taft, which seems to me all-important in the question of the minerals that we are producing in this country and also in the matter of the loss of life in these various mining enterprises.

Yesterday Mr. Mitchell, a member of the commission, stated, as he has stated a number of times in the public press, that in his opinion the people of this nation, and especially the laboring people, would gladly favor an advance in the price of coal, so that the waste would not go on as it has in the past, and so that all those human lives would

not be lost in the mining of coal, and I think that is one of the things with reference to which this conference here assembled should take radical steps, in the way of resolutions, to see if we can not bring about such a condition that the lives, which are more important than the waste of property, shall be protected by legislation, both State and national.

Another matter which this report calls to your attention is the matter of title to mineral lands, the recommendations by the mining section and the land section being that there should be a threefold title, one where the timber would be cut off under certain arrangements with the Government; second, that the surface should be farmed; and, third, that the minerals should be taken out under regulations.

Now, the condition of affairs in the country, so far as the mining laws are concerned, is as follows:

We have three different schemes for obtaining title to mineral property, viz, the coal-land laws, the lode-claim laws, and the placer-mining laws. Under the placer-mining laws we know the great frauds committed in taking up timber lands in the West, but at the same time it is difficult to frame a law that will permit placer mining and at the same time not permit the placer miner to own the surface of the ground. In other words, in placer mining as it is in the West it is necessary to take the surface or we can not have a placer mine. It seems to me there are mining claims, such as oil claims, where they might have the surface of the ground retained and then passed to the settler for farming purposes and the right given to take the oil out at the same time. Our mining laws should be changed so as to permit the various kinds of minerals to be taken out where necessary, and at the same time have the conservation of the ground that it may be used for farming.

The matter of taking out oil is another matter to which our attention has been called. Oil has been taken from the ground in various parts of this country where a mining location was made and a line of oil wells was placed along the end of the claim and then wells pumped in that way, taking the oil out of the adjoining claim. That made necessary the proposition that the man on the adjoining claim should also put down his wells. The result of this was an overproduction of oil in that place, and the oil actually lost by being pumped into large tanks, not made of iron but simply dug in the ground; and in many instances it was allowed to go to waste.

In connection with oil, another recommendation of the commission is that the oil be put to a higher use than for fuel; that coal should be used for this purpose, and our belief is that the use of oil as a fuel in our engines is a waste of the material; that if it be necessary for the future of our supply of oil, it should be conserved and put to a higher use than we are now making of it.

The coal supply is estimated to last for another century; the iron supply until the middle of the present century. With iron the statement can be made that the estimate is based only upon the class of ore they are now mining. The lower grades of ore will probably be mined in the future, and the time for the exhaustion of our mineral resources is not as near as we would be led to believe by the mere statement that iron will be exhausted in a short period. It is simply a question of the class of iron we are now mining, and not a question of the lower grades that remain yet to be mined.

Another matter called to your attention by the report of this commission is phosphate rock. There will be several talks upon this subject, and this is one of great importance to this country for the reason that this is where the mining industry comes close to the farmer. Here we find different figures presented to this commission, showing that the phosphate rock will be exhausted, as to the known supply, in about twenty-five years, and that of this phosphate rock about 40 per cent is now being exported; and the result will be that in a very short time we will find ourselves in this country in a position where we will not have phosphate to use for the fertilization of our farms; and for that reason there should be resolutions adopted, in my opinion, by this commission and the governors here assembled, looking forward to regulation of the exporting of phosphate rock. That can be done by a conservation of the mines now owned by the Government of the United States containing this rock. This subject will be treated by a number of papers, I believe, and is one of great importance.

In the matter of the question of the loss of life, Mr. John Hays Hammond, whose advice and counsel this commission has been very fortunate in having, will speak. He has talked with Mr. Mitchell, and by reason of his experience he will be able to present that subject to you in detail.

The great trouble in dealing with this mineral section is that we have to cover this entire country. Here in the East we have simply a limitation of mining to coal. Then we come to the Middle West, where they have coal and oil, and then to the extreme West, where they have minerals of all kinds. It is hard for the people in the eastern part of the United States to realize the great difference that exists in the kind of mining that goes on in the West and in the Rocky Mountains as compared with that in the coal mines in the eastern part of the country, and no one in this country is better able to present that matter from all standpoints than Mr. Hammond, who has had more experience, not only in every part of this country, but throughout the world, than anyone I know of. I will ask him to speak during the morning on the subject of labor and the differences in conditions in mining operations in this country and in other countries, as well as comparing the operations in the eastern part of our own country with those in the western part of this country.

Mr. CUTTLE, of California. Mr. Chairman, in order that this conference may have a proper record of its proceedings, I move that a committee be appointed by the chair, to be denominated a committee on resolutions, to whom shall be referred all resolutions offered before this conference, such resolutions to be referred to such committee without debate.

(Motion duly seconded, put, and carried.)

The CHAIRMAN. I will announce the committee on resolutions at the afternoon session.

Is there any discussion on this subject by any governor present? The programme, which has been tentatively established—for, of course, that means this conference will modify it in any way it sees fit—provided for one-half day for the consideration of each of the subjects, and minerals is the subject for the opening session. Is there any discussion from any of the governors with reference to the subject of minerals?

A DELEGATE. We discuss minerals and we discuss the forests and we discuss waters, but now as to the means of getting this before the people—the propaganda and the manner of educating the people. How is that to be done?

The CHAIRMAN. The principal means is that the report of the Conservation Commission and of the June conference shall be disseminated through the Government.

Dr. WILLIAM H. BLACK, of Missouri. May I inquire with reference to that point? Our commission in Missouri would like to have this information at a very early date.

The CHAIRMAN. That touches a point which the commission has felt keenly. The necessity for dissemination of this information at the very earliest possible moment is a serious one for our consideration. You gentlemen will understand, in the first place, this report must go to the President. It would not be proper to make it public until it goes to him and he sees fit to make it public. In other words, whatever is addressed to the President must be made public by the President, and while we have a very strong hope that the President will act in making it public immediately upon its receipt, that matter must be left to him. Any separate action which might be taken by this conference in the way of passage of resolutions which were not included in the formal report could be made public at once.

Unless there is immediate discussion the chair would suggest Mr. Hammond be called upon. I take pleasure in presenting to you Mr. John Hays Hammond.

MR. JOHN HAYS HAMMOND.

Mr. HAMMOND. Mr. Chairman, I hasten to relieve the apprehension of the audience, who are led by my friend Senator Flint to expect that it is my purpose to deal, as he has intimated, exhaustively with the subject of mining accidents. As a matter of fact, I have no available statistics to present upon this sudden invitation. Besides this, there is so much else of importance for discussion at this short session that I trust you will be satisfied with the general statement that I believe a very great necessity exists for improvements in the system of mining, with the view of minimizing the loss of life.

PROF. MARSTON TAYLOR BOGERT, PRESIDENT AMERICAN CHEMICAL SOCIETY.

It will be strange indeed if the science which deals with the ultimate constituents of our material universe, their combinations and transformations, could not offer any assistance in the solution of the problem as to how our natural resources may be conserved. It is chemistry that has determined the composition of those materials which make up the earth upon which we live, the atmosphere which surrounds it, and the heavenly bodies beyond. Chemistry studies the properties of the elements and their various compounds, and upon these fundamental data our industries rest.

The transformation of the raw material into the finished product consists either in changing its external form, as in wood and metal working, weaving, and the like, or there is involved a chemical

change, as in metallurgy, fermentation industries, the manufacture of glass, soap, cement, chemicals, etc. Practically all of our manufacturing processes are therefore primarily either mechanical or chemical. In the production of a metal from its ores, or of indigo from coal tar, it is chemistry that points the way; and the more complex the problem the greater the dependence upon this science. In devising new processes and in the discovery of new and useful products, chemistry is again the pathfinder. The community is apt to overlook the extent and diversity of the services rendered by the chemist because of the quiet and unobtrusive way in which the work is carried out, and yet the statement in the report of the Twelfth Census of the United States is quite correct when it says that—

Probably no science has done so much as chemistry in revealing the hidden possibilities of the wastes and by-products in manufactures. This science has been the most fruitful agent in the conversion of the refuse of manufacturing operations into products of industrial value. Chemistry is the intelligence departments of industry.

The measure of a country's appreciation of the value of chemistry in its material development, and the extent to which it utilizes this science in its industries, generally measure quite accurately the industrial progress and prosperity of that country. In no other country in the world has the value of chemistry to industry been so thoroughly understood and appreciated as in Germany. And in no other country of similar size and natural endowment have such remarkable advances in industrial development been recorded; and this, too, with steadily increasing economy in the utilization of the natural resources.

That our own Government realizes the importance of chemistry seems evident from the fact that six of our nine federal departments already maintain chemical laboratories, where they handle not only their own chemical work but also that of the Departments of State, Justice, and Post-Office, which as yet have no chemical laboratories.

Coming then to our mineral resources, in the first place, let it be kept clearly in mind that metallurgy is a branch of applied chemistry, as it is founded upon chemistry and engineering. In general it may be said that the seriousness of our mineral problem lies in the fact that these are resources that can not be renewed. It may be urged that as matter is indestructible, metals once won from their ores should not waste but accumulate. And this no doubt is partly true. It is not so with our fuels, however, for when our carbon is once burned to carbonic acid it is no longer available as fuel, until by the slow processes of vegetable life some of it is fixed in plants and gradually reduced through peat to coal again. Six times as much of our carbon is now locked up in mineral carbonates unavailable for fuel as we have in the form of coal.

The life of our mineral resources may be prolonged by the discovery of new supplies or satisfactory substitutes, by avoiding waste in mining and extracting ores, and the discovery of methods which will render low-grade or other ores available by a more complete utilization of the latent possibilities of the ore, including the recovery of all by-products, and by preventing loss of life and property from fires and explosions.

The chemist is helping in many of these lines. It is to him that we must usually turn for the production of satisfactory substitutes, for devising new processes, and for the utilization of by-products and

wastes. It was the pioneer investigations of Bunsen and De Faur which pointed the way for the use of furnace gases in preheating and in other directions, such, for example, as the recent commercial manufacture of formic and oxalic acids from the carbon monoxide present in generator gas. In smelting operations the chemist must analyze the raw materials—ore, coke, limestone, etc., the intermediate products—pig iron, if steel is to be made, and the final products, including the furnace gases and slag. Without the explosives of the chemist, modern mining, as well as most great engineering works, would be impossible. After the precious metals have been extracted it is powder which stands guard over them as it does over all the accumulated wealth and property of this and other nations. On the other hand, a chemist, Sir Humphrey Davy, by his invention of the safety lamp, has done more than anyone else to protect the miners from explosions. It is worth noting that the authorities did not appeal to a chemist until all suggested engineering methods had proven powerless to avert the terrible "firing" of the mines. The new sodium dioxide compound, "oxone," may prove of value in mine accidents, for it absorbs carbonic acid with liberation of oxygen. The oxygen upon which rescuers now depend is also the result of the skill of the chemist.

At one time the waste in the oil business was enormous, as only the kerosene was saved. Now, with the exception of occasional fires and the relatively small amount sprayed into the air with escaping natural gas, and those regions where the oil is wasted by seepage from earth pits, there is very much less lost, for chemistry has not only shown how a greater yield of kerosene may be obtained, but also how all the by-products, gas, gasoline, naphtha, lubricating oils, paraffin, vaseline, coke, and so on, may be saved with considerable financial profit. Certain of these distillates are used for the production of high candlepower illumination, as in the Pintsch and Blau gas processes. Rapid development in the use of gasoline engines has developed an enormous demand for this petroleum fraction. The most promising substitutes for gasoline appear to be alcohol and the benzole from by-product coke ovens. The former of these, although giving much higher efficiency as a fuel, is still too expensive to compete with gasoline except in special cases. The latter, as our number of by-product coke ovens increases, is likely to play a more prominent part in this field.

In 1907 over 40,000,000 tons of coke, valued at nearly \$112,000,000, were produced from about 62,000,000 tons of coal. Only 5,500,000 tons of this, or less than 14 per cent, was obtained in by-product ovens. About 54,500,000 tons of coal were coked in beehive ovens. This involved a waste of 148,000,000,000 cubic feet of gas, worth \$22,000,000; 450,000 tons of ammonium sulphate, worth a similar amount, and nearly 400,000,000 gallons of tar, worth \$9,000,000. The gases evolved in coke ovens have high calorific power. Dantin estimates that in modern ovens only 65 per cent of this is necessary to effect the carbonization. The remaining 35 per cent amounts to about 3,700 cubic feet of gas, equivalent to 420,000 calories, per ton of coke produced. As a gas engine of 1,000 kilowatt power absorbs about 3,600 calories per kilowatt, the power wasted in beehive coking amounts to over 4,000,000,000 kilowatts, or about 3,000,000,000 horsepower. We are therefore wasting enough power to establish a great

manufacturing center, enough ammonium sulphate to fertilize thousands of acres, enough creosote to preserve our timber, and enough pitch and tar to roof our houses and briquette our slag and waste coal. Lignites have been found to give not only an excellent yield of gas, but also tar, oils, paraffin, and other valuable by-products. It has recently been claimed that 1 ton of dried peat can be made to yield 162 liters of pure alcohol and about 66 pounds of pure ammonium sulphate.

In 1907, 4,000,000 tons of coal were consumed in the production of 34,000,000,000 cubic feet of coal gas for heating and illumination, worth \$36,000,000, in addition to over 100,000,000,000 cubic feet of water and oil gas, worth \$90,000,000, or \$126,000,000 worth all told.

The value of coal to the consumer depends upon its heating power, the percentage of water it contains, the amount and character of its ash and of the clinker formed, and how extensively it corrodes the grate bars. For an authoritative answer to these and similar questions, the chemist must be consulted.

The composition of furnace and flue gases has been determined by chemical analysis in smelting and other industries, and by the utilization of these gases for preheating and for the generation of power, the amount of coal consumed has been reduced, and in addition valuable by-product recovered. In gas illumination the invention of the Welsbach mantle has greatly increased the amount of light obtainable from a given weight of coal, and has correspondingly reduced the drain upon our coal resources. The conversion of carbon into acetylene through calcium carbide should also be mentioned.

As iron, according to Clarke, composes $4\frac{1}{2}$ per cent of our lithosphere, the chances of our discovering other important deposits of iron ore seem far better than in the case of other metals or of coal. The development of iron alloys is a most promising field and among these we may find satisfactory substitutes for other metals now more seriously threatened with exhaustion. The production of ferro-silicon may render available certain siliceous ores hitherto regarded as unworkable.

The chief use of iron is in the construction of railroads and of buildings. In building operations concrete is helping, not only as a substitute for iron and steel, but also as a protective covering for metallic pillars, girders, and the like. The iron and steel industry rests mainly upon chemistry and is under chemical control at every point. The production of steel by the Bessemer process depends upon the combustion of the carbon and silicon of the pig iron, the heat of combustion serving to maintain the mass molten. By the utilization of what was formerly the waste heat of blast furnaces to raise steam for the blowing engines and to preheat the blast, the amount of coal necessary to produce 1 ton of pig iron is only one-quarter what it was.

The slags are now largely used for the production of cement and concrete, as fireproof packing for steam pipes, and so forth, as ballast for railroad tracks or macadamizing highways, and for building purposes, as slag brick, slag blocks, etc., while those rich in phosphorus, as from the Thomas-Gilchrist process, are extensively employed in fertilizers. In the words of James Douglas, "When all the volatile products of the blast furnace are deprived of their heat-giving property and their chemical constituents, and with the slags, as well as

the metal, have returned their heat to man instead of to the atmosphere, and the slag itself has been turned into cement or some other useful article, it will be a question as to whether the pig iron is the principal object of manufacture or one of the by-products."

The safety and comfort of travel on our railroads depends in large measure upon the skill of the chemist in testing the character of the materials employed in their construction and operation. It may be only a delay from a hot box, due perhaps to a poor quality of lubricant, or it may be a disaster from the failure of a signal or headlight at a critical moment, or a breaking of an axle or locomotive part, because of steel brittle from impurities.

Chemistry has played a prominent part in copper metallurgy. The matte is now bessemerized and 70 per cent of our total product is refined electrolytically. The avoidable waste in mining copper, zinc, lead, silver, and many other metals is estimated as at least 30 per cent. But the values now locked up in the Arizona slags, the Comstock slimes, and the Anaconda tailings will sooner or later be recovered by chemistry.

Chemistry has finally pointed the way by which aluminum may be obtained cheaply and in large amount from its ores. Last year our consumption of aluminum was 8,500 tons, worth \$5,000,000, the world's production for 1907 being estimated at 20,000 tons. The commercial utilization of aluminum and its alloys is writing a new chapter in our mineral industry. To appreciate what this development in aluminum means it should be recalled that the total supply of it is nearly twice as great as of iron and about eight hundred times that of copper. Aluminum is already replacing copper for certain electrical purposes. A large part of the power now generated at Niagara Falls is distributed through aluminum alloy cables. It is also used for automobile castings, for air-ship construction, and for utensils of various kinds. The use of finely divided aluminum in Goldschmidt's "thermit" process of welding and casting is an important application of one of the chemical properties of aluminum.

A good example of the economy often accomplished by chemical investigation and discovery is furnished in the case of ultramarine. Many years ago, when this was made by powdering the mineral lapis lazuli, it sold for more than its weight in gold. Now that the chemist has discovered how to make the same material from such cheap substances as kaolin, sodium sulphate and carbonate, charcoal, sulphur and rosin, the price is only a few cents per pound.

In the field of the precious metals chemistry has contributed, among other things, the cyanide and chlorination processes, through which formerly rejected low-grade ores and residues have been compelled to give up their gold. The gold production of the world between 1851 and 1907 was three times that produced between 1493 and 1850. The value of our specie, upon which every commercial transaction rests, is determined by the chemists, while the green ink used in printing our bank notes, and to which they owe the name of "greenbacks," was invented by a former president of the American Chemical Society, Dr. T. Sterry Hunt. The chemist lets nothing escape unsearched. The sweepings from mints and from the shops of workers in precious metals, as well as the water in which the workmen wash their hands, are all made to relinquish the gold or silver they contain. Even waste photographic solutions must disgorge

their silver before they are released. The invention of electroplating led to the use of plated articles instead of solid ware, and thus reduced somewhat the drain upon certain of our mineral resources. The supply of platinum has been for years so limited that the price has ranged high. Chemistry has now put on the market vessels of transparent and opaque quartz, which seem likely to replace platinum for some chemical purposes.

Many other instances might be cited where chemistry has made important contributions to the economic utilization of our mineral resources, such as the carbonyl processes of Mond, for example. But there is still much to be done in improving the present wasteful methods of smelting certain of our ores, and we may look for great advances in this direction through the rapidly developing and most promising field of electro-metallurgy.

Of the various factors upon which the success of this conservation movement depends, none, in my estimation, is more important than that of awakening the producer and manufacturer to a proper realization of the value of science to our industries.

MR. A. W. DAMON, VICE-PRESIDENT OF THE NATIONAL BOARD OF FIRE UNDERWRITERS.

Mr. Chairman and fellow-conferees, it was with unusual gratification that the officers and executive committee of the National Board of Fire Underwriters, in session on the 3d instant, received through your chairman the invitation to take part in this conference. The chairman's intimation that the appointment of a committee representing the National Board of Fire Underwriters would be acceptable was at once acted upon, and the undersigned were named as such committee. We desire to express our appreciation of the honor of a representation here, and to assure you of our interest in the great work you have undertaken and in which the organization we represent will be glad to cooperate to such an extent as may properly be within its province.

In considering the waste of the national resources we can not fail to have in mind, as underwriters, the vast destruction of values by fire year by year in the United States. Your commission has admirably divided itself into sections to take cognizance of the entire subject in a fourfold view, "waters," "forests," "lands," and "minerals," indicating the intention of broad and thorough treatment. We could have desired that the diagnosis should have proceeded a step further and added "fire" as a fifth division, and we trust that what follows will make clear the desirability of some specific treatment of this branch of the subject.

The annual fire waste in the United States for the last four years was \$1,257,716,955, or an average annual loss of over \$251,000,000. This is a daily average loss of \$689,160. It is true this period includes the San Francisco and Baltimore fires. Extending the period to ten years, the loss was \$2,029,734,345, giving an average annual loss of \$202,793,434, or an average daily loss of over half a million dollars (\$556,091). This waste is an absolute loss of the wealth of the country. The property value destroyed by fire is gone beyond recovery. Insurance only shifts the distribution of the loss. An irrecoverable loss it still remains.

If this enormous waste and drain were unavoidable, this committee would have no mission nor function here; but much the larger portion of this loss of property is preventable. The irrefutable evidence of this is the extraordinary difference in the fire waste of European countries and the United States.

From reports of United States consuls it has been shown by our committee on statistics that the loss in six European countries for a period of five years was 33 cents per capita. The loss in the United States for the five years ending with 1907 was \$3.02 per capita, nearly ten times as much.

The result in 30 foreign cities gave a per capita loss of 61 cents, as against \$3.10 in the five years' average of 252 cities in the United States.

Taking the number of fires to each 1,000 population in the same cities, our committee on statistics found it to be 4.05 in the American cities, as against 0.86 for those of Europe, showing also that, in point of frequency, fires here are far in excess of those abroad.

It is to be borne in mind that the direct fire loss is not the only waste of resources—owing to the greater frequency of fires in the United States and their greater destructiveness, more expensive fire-extinguishing facilities and apparatus must be maintained here.

We may add that it has been stated that as many as 7,000 lives have been lost by fires in the United States in a single year.

The excessive difference between the fire waste of European countries and that of the United States is caused principally by—

First. The difference in the point of view and the responsibility of the inhabitants of Europe and those of the United States.

Second. The difference in the construction of buildings.

Third. The difference in the regulations governing hazards and hazardous materials and conditions, and in the enforcement of such regulations.

Referring to the first-mentioned cause of difference it may be remarked that in a portion of Europe a landlord is responsible to his tenants and neighbors for any fire loss due to his negligence, and tenants are responsible to the landlord and to their neighbors for any loss due to their negligence. In this country a whole city might be destroyed by the unmitigated carelessness of some person, and there would not be the slightest penalty incurred. In Europe wastefulness is generally viewed as indefensible and a person who has a fire is regarded in an unfriendly light, since he has endangered his neighbor's property and comfort. In this country everybody is permitted to endanger his own and his neighbor's property almost ad libitum, either by the absence of wholesome regulating ordinances or by their nonenforcement. The reckless wastefulness of our people is nowhere more apparent than in the unnecessary fire drain on their resources. Our people appear to have a very erroneous idea of fire insurance and to think that insurance payments recreate destroyed values; whereas the fact is that insurance companies are in a sense tax collectors and distributors of such taxes among those suffering loss by fire.

The difference in the ideas of thrift, in the view of responsibility to neighbors, in the perception of the real meaning of fire loss or waste, are the cause of the larger number of fires per capita in the United States, and perhaps of the larger loss per capita.

The next principal cause of our excessive fire waste is our faulty construction. Our buildings as a whole are more flimsily constructed and are larger and higher than in the countries of Europe, where the building laws are safer and better enforced.

Our statement of the third cause of the excessive fire loss in the United States, namely, the lack of regulations to govern hazards, is self-explanatory and need not be amplified in this brief address.

The National Board of Fire Underwriters, which this committee represents, devotes its energies and activities to the reduction of the fire waste and the safeguarding of property and life, and has nothing to do with rates of premium. It confines itself to matters in which fire insurance companies have a common interest and most of which also deeply concern the public.

Thus, through a committee on fire prevention, commanding the services of a corps of engineers, the cities of the country are systematically inspected by the National Board of Fire Underwriters with a view of pointing out defects in water supplies and fire department equipments, and copies of these reports, with our recommendations for improvements, are presented for the free use of the municipalities; an extensive laboratory plant is supported for the purpose of testing materials and devices of a hazardous nature entering into the problems of fire protection; a model building code has been adopted, 10,000 copies of which have been distributed to cities and towns in the United States; an arson fund is subscribed, from which over a million dollars in rewards have been offered for the conviction of incendiaries; nearly half a million of standard rules and lists of hazardous and protective devices and materials were during the past year alone circulated to the public free of charge; hundreds of thousands of copies of the rules to regulate electric installations are annually distributed, and in every way possible we have endeavored to create a sentiment which should tend to place some check upon the constantly increasing destruction of values by fire.

The committee believes that the present fire waste in this country is an unnecessary national calamity, and that to reduce it it is essential—

First. That the public should be brought to understand that property destroyed by fire is gone forever, and is not replaced by the distribution of insurance, which is a tax collected for the purpose.

Second. That the States severally adopt and enforce a building code which shall require a high type of safe construction, essentially following the code of the National Board of Fire Underwriters.

Third. That municipalities adopt ordinances governing the use and keeping of explosives, especially inflammable commodities and other special hazards, such as electric wiring, the storing of refuse, waste, packing material, etc., in buildings, yards, or area ways, and see to the enforcement of such ordinances.

Fourth. That the States severally establish and support the office of fire marshal and confer on the fire marshal by law the right to examine, under oath, and enter premises and to make arrests, making it the duty of such officer to examine into the cause and origin of all fires, and when crime has been committed requiring the facts to be submitted to the grand jury or proper indicting body.

Fifth. That in all cities there be a paid, well-disciplined, nonpolitical fire department, adequately equipped with modern apparatus.

Sixth. That an adequate water system, with proper distribution and pressure, be installed and maintained. In the larger cities a separate high-pressure water system for fire extinguishment is an absolute necessity to diminish the extreme imminence of general conflagration.

If the commission can excite the interest of the people, the States and municipalities in the unnecessary and indefensible waste by fire in this country and the remedial measures herein recommended, they may hope to have accomplished something toward diminishing, if not entirely removing, this national misfortune.

There are already signs of an awakening public opinion on this subject. Many of the governors have mentioned it in their messages to legislatures; the insurance commissioners of the various States have frequently pointed it out and urged action, and recently the public press has shown an inclination to print articles on the subject. A law is now upon the statute book in Ohio requiring textbooks to be read in the schools on the "Dangers and chemistry of fires."

As long ago as 1892 a committee of this board addressed the President of the United States on the destruction of life and property by fire. As was expected, it appeared to him a matter for state rather than national legislation; and possibly this direction may now be given it through the connection of the governors of States with your commission. With state and municipal authorities working together many of the reforms herein suggested can without question be effected, and if this presentation should result in accomplishing this, the desire of the interest we represent would to that extent be fulfilled and the welfare and prosperity of the country measurably enhanced.

This report is submitted by the special committee of the National Board of Fire Underwriters, composed of J. Montgomery Hare, A. W. Damon, C. G. Smith, George W. Babb, R. M. Bissell, R. Dale Benson, R. Emory Warfield.

MR. THOMAS F. WALSH, PRESIDENT TRANS-MISSISSIPPI COMMERCIAL CONGRESS.

Mr. Chairman, ladies, and gentlemen, the object which calls you together, the conserving of our national resources, is a question which deeply affects our nation's future. It is the part of wisdom for nations as well as individuals to pause and look the field over, take stock, so to speak, and try to see whither we are drifting. This is not only wise as regards our national resources, but is equally so of all other channels through which wealth is created, and even more so in the sphere of ethics. Thanks to a beneficent Providence, no nation has ever made more rapid progress in the creation of wealth, and, what is of greater importance, in the uplifting and bettering of humanity, than the one to which we owe loving allegiance.

In developing and creating our great wealth, it became necessary to call freely upon our natural resources. Prodigious waste went hand in hand with use until their consumption and destruction—for it is a sad fact that we destroy more than we use—became great. Sounding the alarm and submitting the question to an intelligent and truly representative body like yours of how to stop waste and

conserve these natural resources was one of the wisest of President Roosevelt's many wise acts.

In reviewing the past we must not forget that conditions have materially changed. Much that we condemn to-day was regarded as lawful and right—of sheer necessity in years past. As an illustration, take the consumption of timber. The West never could have been settled without railroads. When these railroads were projected they were looked upon as hazardous ventures, and proved so for their promoters in many cases. In the early days of railroad building the Government gave help in many ways, permitting the use of timber and ties from the forests in their construction. But the end surely justified the means.

The same wise course was followed by the Government in the field of mining. I remember being in Leadville during the winter of 1878-79. The rush to that great camp had commenced. The population increased almost over night from a few hundreds to many thousands. The winter was unusually severe, and as most of the population lived in tents the death rate from exposure and pneumonia was something appalling. The rush continued until the population increased to 30,000. Shelter had to be provided for this great army of human beings. The magnificent forests that spread for miles in every direction from the town, even to the mountain slope, had to be sacrificed to house and shelter them. When comfortable homes were established, the sickness and death rate dropped to normal. Here, as with the railroads, the end justified the means. Leadville has made permanent homes for thousands of our citizens and has enriched the country by hundreds of millions of dollars. It is one of the great productive mining camps of the world to-day. It may be said in passing that if we had had a law in force at that time similar to the laws of France, requiring the planting of a tree for every one cut down, the restoration of those beautiful forests would be almost complete by this time.

The same wise and liberal policy was extended by our Government in the building of homesteads, villages, and towns on agricultural lands and in the development of coal and iron mines. The rapid growth and development of our country was in a great measure due to the encouragement and assistance extended to infant industries by our National Government.

We are apt to bewail the great consumption of national resources, forgetting the magnificent permanent assets which we have to show for it. Trees have been put to better use in sheltering human life; coal and iron has been used in changing our land from desert conditions to teeming industrial and educational activities. Nor should we forget the sturdy pioneers of our civilization and the dangers and difficulties that they had to meet and surmount.

Now, however, the time has come to call a halt to lavish prodigality in giving away the people's inheritance. The time has come to stop giving away the public domain and to devise ways and means to husband our resources. To this end there are two courses to be pursued—one is arrestation, the other development. These should go hand in hand, for one helps the other. By arrestation I mean the stoppage of the terrible wastes that are going on in the mining and using of mineral fuels, and to some extent in other materials.

To preserve public lands for agricultural purposes, for actual settlers, we must stop the awful destruction of forests by fires and prevent the acquisition of vast tracts by greedy corporations and individuals. Let us not forget this fundamental truth, that our welfare as a nation depends upon the justice and consideration which we show for the rights of the masses. This is a truth which the rich and well-to-do should take to heart. Instead of keeping aloof from public interests and exercise of the rights of citizenship as they too often do, they should take personal share in the affairs of government and become the initiators in all great movements that aim to make life easier, happier, and better for those less fortunate than themselves, even though this lays an additional tax upon their fortunes.

The other course, which I believe we should pursue, is that of development. Development is the greatest of all conservers. It creates and brings new wealth into activity. That man is the highest kind of philanthropist who inaugurates a new and honestly conducted industry which gives steady employment to many, with good wages and just treatment. The miner who discovers hidden treasure and causes it to be added to the wealth of the nation is a public benefactor.

The reclamation of the desert wastes, the drainage of miasmatic swamps, and the utilizing of their stored fertility for the support of human life in comfortable independence are the highest and best forms of conservation.

Development creates wealth, and wealth distributed to the widest possible extent and wisely used by its possessors is one of the greatest of blessings to a nation.

This development should be carried on by the Government whenever it can judiciously do so. Individuals and corporations should receive encouragement and fair treatment from both the Government and people. Although much has been accomplished in the past, there is much, very much, to be done in the years to come to keep up our established rate of progress and to meet the pressing needs of our rapidly growing population.

Well-directed development will put all of our idle powers to work. It will utilize waters that are now going to waste, and discover and bring to light new means for saving in the consumption of and the husbanding of our resources. If electricity and heat could be drawn direct from nature's storehouse; if the air we breathe, one of the greatest forces, and one of the most pliant, ductile, and efficient for all the uses of man, could be compressed by and through itself with compensating results—in a word, if nature's materials could be used without waste, these natural blessings would be useful to man in many ways now undreamed of until the end of time. Considering what human intelligence has accomplished, this is not a mere vision.

In the sphere of mining there is much that development can accomplish which will lead to conservation. It is only recently that the world has awakened to the facts about the rare minerals. What little we know of radium leads us to believe that it possesses perpetuality of power, light, and heat. To what extent the production of this miraculous mineral may aid in this conservation is a fascinating field of speculation. The ore, by the way, from which this mineral was first extracted by Madam Curée came from a mine in Colorado, yet no atom of it has ever been produced in this country. The uranium

ore that has been and is now produced from this same mine is all shipped to Germany.

Vanadium is another of the rare minerals the development of which will accomplish a wonderful conservation. It is the greatest alloy ever found for the making of steel. Its use will prolong the life of steel to many times what it is now. Here again, because of apathy, ignorance, and the lack of a governmental institution of guidance, we do not produce one pound of this valuable mineral that would do so much to husband our iron resources.

Gentlemen of the conservation board, a majority of your labors will lie in the field of mining. You will not proceed far before you will find that whilst our good Government has been generous toward all the other great activities of our national life it has been strangely neglectful toward giving a helping hand to what is in many respects the greatest of all industries.

For instance, in the field of agriculture that grand man who presides over its industries has linked science to the plow. You will find a young man at the head of the Forestry Bureau who, filled with patriotic devotion, is bringing science and energy to her aid. The Geological, Reclamation, and Weather bureaus are established on high principles and are rendering great scientific service. This is true of all other departments except that of operative mining, which receives no direct aid of any kind from the National Government.

For development and conservation of our mineral resources two governmental institutes for research are necessary—one for the baser and one for the precious minerals. These should be equipped with every modern appliance and managed by a small, compact force of the best experts and scientists obtainable. These institutes should be located in fields of active mining—one, say, in Pennsylvania and the other in Colorado. They should lead, direct, and instruct in the best methods of saving life, arresting the terrible destruction and waste now going on. They should give reliable data and information for finding and treating new minerals.

The need of such institutes has been forcibly shown recently, when our Government had to borrow scientists from other countries to solve the causes of the terrific explosions in coal mines, with the horrifying loss of life. You, too, will soon see the need of such institutes to go to in your work for information and advice.

Gentlemen, I have taken up much of your time. I ask you not to throw a blanket of sleepy inactivity over these questions of great national importance. Shut out the lawbreaker and the grafter, but encourage the prospector, the homesteader, and the honest investor. Conserve the people's rights. Be just to the present, but do not forget the future. Stand for the people and make them your allies in accomplishing the good work which you have undertaken.

In closing let me express my appreciation for the heads of our departments and their assistants. I know many of them intimately, and believe that no government receives more faithful service than ours.

It has become a good deal of a habit for certain classes to hurl criticism at public men and corporations regardless of whether they are trying to do their duty or not. Honesty and dishonesty are often but the reflex of the status of the body politic. It rests with the masses to make your task easier. It is the people who can create

public sentiment which will not only conserve our national resources but, what is more dear to every lover of his country, uplift and improve the standard of that priceless heritage, American citizenship.

The CHAIRMAN. When I said the governors would be given the right of way I expected they would take it, but they are so modest it seems I must call upon them. There are two governors in this room interested in this matter—Governor Johnson, of Minnesota, and Governor Smith, of Georgia. I will call upon Governor Johnson for an address upon the subject of minerals.

GOVERNOR JOHN A. JOHNSON, OF MINNESOTA.

Mr. Chairman and gentlemen, I am at quite a loss to know exactly how to discuss this or any other question identified with this movement. I certainly am not in a position to discuss the matter of mineralogy or mining from a technical standpoint, either as to the matter of waste or its chemistry or any other particular feature of it. If I were to say anything at all it would be to take rather an optimistic view of the situation so far as the matter of iron mining is concerned. It seemed to me, though, as I listened to the discussions of mining, both at this conference and the one held last May at the White House, that probably we got the pessimistic opinion in our heads somehow that within a very short space of time the iron resources of the country are going to be entirely exhausted. I am quite sure that is not exactly the case and that there is no immediate danger of our running out of iron. I remember in May Mr. Carnegie read a very delightful and very able paper at the White House, in which he said that the Lake Superior country, or particularly that portion of it located in Minnesota, where they originally believed they had five or six million tons of iron ore, had now, they were quite certain, a billion and a half tons of iron ore. The statisticians who are going to present figures here later during this meeting have now items from the Oliver Iron Mining Company, an institution to which Mr. Carnegie is related in at least a very small way—the Federal Steel Company—estimating now from measurement made through the diamond-drill process, that they have two and a half billion tons of ore. If the product has increased a billion tons within a year and the production has decreased from 42,000,000 tons to 26,000,000 tons in the same length of time in the same territory, it seems to me we are going to have too much iron ore in the future. At least the press so far has put too much iron in the souls of Americans because of some of the conditions which obtain.

I am gratified to be able to bring to you—and I am not here to advertise Minnesota especially—my suggestion that we are sufficiently conceited in Minnesota to think we are going to be able to provide iron for the world for a long time to come. As a matter of news, and not particularly because it is of interest, but because it is germane to some extent to your interests here, we say that a few years ago iron was first discovered in Minnesota. The conditions have been materially or completely changed in the meantime. As a matter of fact, when the Mesabi Range was first opened up no one thought the commercial ore was of great value, being what they call 60 per cent ore. Then it ran to 55 per cent ore. That is almost the standard now. Even out on the western part of the Mesabi Range they are

mining very profitably 35 per cent ore, because the steel company understand the conservation of their natural resources. Because of a washing process, they raise the standard of that ore to 50 or 55 per cent for commercial uses.

The great bodies of ore which have been discovered have been made useful by the conservation of their resources. West of the Mesabi Range we are opening what they call the Cayuna Range, and the ore is in very much deeper bodies, not of so high grade, but all new. The most sanguine promoters, if I might use that term, declare that the finding of ore on the Cayuna Range will vastly eclipse the Mesabi Range; so that we have every reason to believe that within a few years we are going to develop sufficient bodies of ore to take care of all the needs of this country for the next two hundred years, and, as Mr. Cole, the general superintendent of the Oliver Mining Company, said something like a year ago, when I was talking with him about it, "We have just begun to scratch the earth." I do not say that in a spirit of boastfulness, so far as Minnesota is concerned, or so far as the National Government is concerned. It is rather a matter of humiliation to me to know that those great iron resources of the country at one time belonged to the Federal Government and later to the government of the State of Minnesota, and by reason of the lack of interest of the people in the conservation and ownership of their natural resources, they have allowed them to pass into the hands of special interests. They are there, and they belong not to the National Government, not to the State of Minnesota, except in small degree. It is very important the National Government and the state government should conserve that which they do own and see to it that it does not pass into the hands of private owners in the future. But it is a matter of humiliation that it has gone as far as it has and into the hands of private parties.

Let me say in behalf, too, of the private individuals who own it, that owning a private enterprise means the conservation of its natural resources. There is no question of the interest of the steel company in the protection and preservation of their own property, and because it is a private enterprise they will look after the details of their business much better and much closer than state or governmental enterprises are looked after. Because of the things they have done, the Federal Government and the state government, too, can learn a very valuable lesson, and that is, in all material things at least, to conduct their business on the same broad lines of business interest which characterize a successful business man in the conduct of his private affairs. When we have divorced our public business from political considerations—and I was much moved by a remark I think by the President yesterday, who said that this should not be made the vehicle for the enhancement of any political fortunes—then the situation will be more desirable. If we will use as a measure of public good, using for our own benefit and our own advantage the lessons which come to us from successful business men's enterprises, we will do much to conserve our natural resources in that particular direction.

Now, this steel company not only owns mines in Minnesota, but mines in Alabama—and when I speak of Alabama I mean the Birmingham district—and has, by reason of experience, learned to conserve natural resources; and I am quite amused, so far as the iron industry is concerned, to hear people talk about the waste.

In the Mesabi country, as a matter of fact, I want to say it is all open-pit mining, not the underground mining; that is still done somewhat on the Vermillion Range. But in the Mesabi Range, the greatest iron range in the world, it is all done by open-pit mining, just as you would strip off a quarry or a sand pit and then start to dig the open ore; and there is absolutely no waste to it at all. There is no waste in the mining in the Mesabi Range. A great waste existed a few years ago because there was no such thing as a by-product, no such thing as coal tar or gas or cement, etc., until to-day, as was suggested this morning, as in the conducting of a great many other private enterprises, those things have become of vast importance and have much to do with the profit of their enterprises.

I am not going to discuss the matter any further than to say that I do take an optimistic view of the situation.

They say while there are billions of tons of ore, possibly the grade is low. The average grade would probably run 50 per cent in that Mesabi Range. The Krupp Works in Germany do business with iron which averages 29 per cent, and if the Krupp industry in Germany uses the average standard of ore in Germany, and that average is 29 per cent, I think there is no particular alarm to be felt about Minnesota ore. But in the country generally, there is no necessity for alarm at this particular time so far as iron is concerned.

I realize iron is a different proposition from what we meet in coal, for instance, because the iron is not, after all, destroyed. It is like some of the other minerals—always with us in some form or another. Where coal is consumed it is gone forever. It is not entirely so with iron ore. We are not particularly alarmed with that particular feature of it in our country. We are interested, so far as the development of iron interests is concerned, and the conservation of the natural resources, because the conservation thereof, in my judgment, if it means anything, means the private development and private exploitation of the industry much along the line suggested by Mr. Walsh.

We say it is kindred to or interrelated with the matter of transportation, and because of the fact it is so in the Middle West, the matter is very important, because with us it is a problem of distribution rather than a problem of mining or the value of the thing itself. For that reason, because we are the greatest iron mining district in the world, because of the fact that we are interested as a mining district, we are interested in this work of an inland waterway and believe that forestry and the inland waterways are kindred and can not be separated from each other.

I believe the great problem for this conference and the great problem for the country in the future is the development of inland waterways. I believe the greatest investment this nation can make to-day, bonded or otherwise, is to construct a canal from Lake Superior to the Gulf of Mexico. It may cost \$500,000,000. Estimates have been made at \$400,000 a mile. A thousand miles would cost \$400,000,000, practically the capitalization of a private enterprise such as the Milwaukee or Northern Pacific, and much less than the capitalization of some of the larger railway systems.

This would solve the matter of rate regulation in the interior of the country and would make unnecessary future discussions between sections or political parties as to whether federal control or state

control is best, because then the matter of competition and the matter of reform or better system of transportation would solve that matter of itself, and because then, too, we would have a great route of transportation which belonged not to private enterprises, but which would always be the heritage of the people of this country not only to-day but in the future, and such a canal as I have spoken of, with lateral and spur canals, possibly, would have much to do with the conservation, in my judgment, of the fuel. I believe it would pay for itself every fifty years in the matter of the saving of fuel alone, and would pay for itself every ten or twenty years in the reduced cost of transportation to the people.

We are interested in these things and we are interested in water particularly.

Minnesota is practically the watershed of the continent. Some of you people who are further south must remember that we start the Mississippi River down your way. We have our streams and our forestry and our mines and all those things up in Minnesota, and we are interested in the public conservation of the resources of this country—forests, water, mines, and so forth.

My own opinion is that the proper conservation consists in the proper exploitation and proper development rather than to discontinue the use of it, as, for instance, in Sweden, where I believe the amount of iron ore is limited to 5,000,000 tons per year. We want all those things to use as we need them, but we must properly exploit them and properly develop them. If the work is to be done, it must be done scientifically. It has always been my opinion that this problem was not a politician's problem at all, but that it was after all an engineer's problem. I realized this morning, as I looked at this conference and as I have watched it from the time I came into this room, that the politician is going to eliminate himself from this conservation work, and that the plodder, the man of whom the President spoke yesterday, using him as a type of man, who sits at his typewriter desk and works overtime without any pay or hope of ever getting any, is the man who will have to take it up and carry it on.

I remember at the conference last year at the White House all the governors of the States were there who could be present. Some of them came in to look over the premises to see whether it was really, after all, a desirable place to live at some time in the future. Having satisfied their curiosity, a great many of them are not here now.

A VOICE. You are still here!

Governor JOHNSON. And always will be on such an occasion.

Many of their conferees, having met in the White House, were satisfied with one experience, and then the politician having satisfied the public as to himself, and having satisfied himself as to the public, so far as he was concerned, however, left the work to go to someone else, and there is not that manifestation of interest which was displayed a little while ago, but it is going to grow just the same. This movement, if I understand it, is bigger than the Government, it is bigger than the conferees, it is bigger than the conference, it is bigger than the nation itself, and I am of the opinion we will all live to see the day when history will write into its pages the greatest achievement in the record of this nation's present chief, who made possible the conference last May, and who made possible this conference,

because out of it and because of the activity of the scientific men of this country will come great good for the future of our country.

As I said at the outset, I am not a pessimist, neither am I unduly an optimist. I want to say to you, however, that if you will give us, by canal or otherwise, as good a mode of transportation as Germany has, for instance, we will guarantee to furnish you all the iron that this country wants for at least two hundred years, and you can husband the resources of Georgia and Alabama and every other section of the country.

GOVERNOR HOKE SMITH, OF GEORGIA.

The CHAIRMAN. We will now have the pleasure of hearing Governor Hoke Smith, of Georgia, whom I now present to you.

Governor SMITH, of Georgia. Mr. Chairman, ladies, and gentlemen, I was not one of those who had the fortune of looking in upon the White House the first and last time Governor Johnson was there. Indeed, this is the first time I have had the opportunity of being with you.

I have felt a deep interest in the objects of this gathering and agree with Governor Johnson that among the many good things our President has suggested, perhaps no one will last longer or produce greater benefit to the entire country than the organization which is here to-day.

We heard yesterday from Judge Taft that he had a splendid speech but would not deliver it for fear someone would recognize its authorship. Unfortunately for me, Mr. Pinchot did not know I was coming, so that I have not even the prepared speech his fertile pen might have furnished, but I wish to express my very great sympathy for the objects of this organization. Great benefit must come from it.

I do not understand your work will be limited merely to the preservation of what we have. Certainly such a course should not be followed to the extent of retarding the use of the resources of our country, and we are not ready in Georgia and Alabama to stop mining just to let Minnesota, which State can not compete with our efforts, have a chance. I believe that as speedily as possible the resources of our country should be brought into active use, provided that use is made without waste.

I believe that we should study our resources, and that one of the consequences of this gathering, and this general movement taking place throughout the country aided by local conservation organization in each State, will be the more complete investigation and comprehension of the material possibilities found in each State, thereby giving a more complete knowledge throughout our entire country of what there is in each one of the States.

This movement has aroused interest in Georgia and adjoining States. We hope to bring into active cooperation quite a large number of men, not only experts employed by the State in connection with such work, but public-spirited business men, men of property who desire to know more fully than they now know just what are the possibilities within the soil and within the mountains of our part of the Union, as they learn also what may be found that is yet undiscovered in other parts of the Union.

This knowledge should stimulate the best possible use of our mineral wealth and material resources. Substitutes will be found for things now wasted by their use. Less expensive and less valuable material will be substituted in use for commodities of larger value. The resources of our nation will be conserved by that knowledge and intelligent use which will make them tell for the most when used.

I do not desire to speak of the special resources of my section. It is not necessary to tell you that my immediate section fixes the price of pig iron the world over. I will tell that to Governor Johnson. We have vast bodies of iron still undeveloped in the State of Georgia. They are not being rapidly developed because in Alabama all the ingredients necessary for the assembling of those commodities required to make steel can be brought together cheaper than in our State. The ore beds of Georgia, therefore, will wait to a large extent for future use. We are making great progress in producing a substitute for steel. We are utilizing slate and lime located side by side to make a cement of the highest quality. Plant after plant of this character is being erected producing vast quantities of Portland cement, which must in structural matters largely relieve the pressure upon our iron-ore beds.

Assisted by the study of our resources, we will find substitutes for many things now used less expensive than those now used. We will learn how to use in the best possible way what we have. Knowing what we have all over the land, conservation will come, not from a lessening of activity, but from a quickening of those forces in the best possible way, with the best results, due to the knowledge of what we have, and how to use what we have. After all, it is not the rich field, but the minds of the people of the State that make the wealth of the nation.

Along with the progress which will come from study of our resources, and an effort to conserve them, must come the better preparation of the boys and girls of our country to handle in artistic style and with the master's hand whatever either may be called upon to do. From the simple handling of the hoe in the field up to the highest mechanical skill it behooves us, as a part of the progress for which we all long, as a part of the power commercially of our nation, which we now have and which we would hand down with growing strength from generation to generation, to see that every child is taught to use his hand with a perfect skill, and we must neither yield in resources nor in capacity of our skilled artists and mechanics to Germany or to any other country in the world.

So it is, Mr. Chairman and gentlemen, we come to you from our part of the country, rich, we believe, in resources of the most varied character, bent upon studying them, bent upon seeing they are utilized in the most profitable way, not alone for the profit of the one who owns them, not alone for advancement of the commercial and financial strength of the locality where they are found, but with the common purpose that our country, our great nation, to-day, to-morrow, and hundreds of years hence, shall fill that place which our patriotism and our love assign to it—absolutely the first among the nations of the world.

RECESS.

Governor BLANCHARD. In accordance with the prearranged program for the guidance of this conference, I now move that the conference take a recess until half-past 2 o'clock this afternoon, after which these interesting discussions by the governors shall continue.

(Motion put and carried.)

(Thereupon, at 1 o'clock p. m., the conference took a recess until half-past 2 o'clock p. m.)

WEDNESDAY AFTERNOON, DECEMBER 9.

The chairman, Mr. Pinchot, called the conference to order at 2.30 o'clock p. m.

The CHAIRMAN. Before we take up the subject of lands, which is set on the program for consideration this afternoon, I have to announce the appointment of the committee on resolutions, according to instructions given me this morning.

The committee on resolutions will consist of governors, past, present, and future; the future governors being limited to those concerning whom we are sure there is no doubt of their being governors, and not those who may likely be governors.

The next order of business is a statement by Senator Nelson as to the subject of lands. I take great pleasure in introducing Senator Nelson.

**SENATOR KNUTE NELSON, CHAIRMAN OF THE SECTION OF LANDS,
NATIONAL CONSERVATION COMMISSION.**

Senator NELSON. Mr. Chairman, ladies and gentlemen, you who were here this morning heard the joint report of the conservation commission and the part of it relating to the matter of our public lands. This question of conserving our lands in this country resolves itself into really two different heads. One relates to the conservation of the lands that are now in private ownership, conserving them against soil erosion, and also against improper use or unwise, improper agricultural methods. That part of the problem is very well covered in the special reports that will accompany this general report. This problem relates more to the care-taking by the States than the Federal Government, for the underlying principle in reference to land matters is that where land has passed out of the hands of the Federal Government, the jurisdiction of it is under the laws and regulations of the respective States. So that whatever is done in the way of conserving lands that have passed into private ownership, the problem relating thereto must be in the main worked out under state legislation and through private efforts.

Indirectly the Government can help out in this matter, at least so far as the matter of soil erosion is concerned and so far as the matter of water is concerned, by the regulation of streams, but in respect to wasteful methods of farming and in respect to these other matters that go to the deterioration and diminution of the value of the land for agricultural purposes in the main, that is a problem either for the States or for the individual citizens.

The question to which I propose to briefly call your attention is the conservation of the public lands that are still in the ownership of the Federal Government, and before I state anything on that subject I want to call your attention to what we still own.

According to the latest statistics on this subject, we had upon the first day of July last 386,873,787 acres of public land that were unappropriated and in the Government's name and not in a state of reservation. We had in addition to that 6,400,000 acres of land in Indian reservations and we had 167,976,000 acres in forest reserves. This relates to the lands that we have within the continental boundaries of the United States and does not include the Territory or district of Alaska.

The great object or purpose which we ought to have in view is to conserve these lands for the benefit of the American people. One of our great safety valves in the past, when we have been in the midst of periods of industrial stagnation and paralysis, when we have found a large army of idle men in our industrial centers and our large cities, has been the fact that many of those people who failed to get work in those industrial centers in the large cities could wend their way to the frontier and take up public land and make little homes of their own. That has been to a large extent our safety valve in the past. The question is to preserve that for future use.

I have figured out that all of the unappropriated public lands which we now have, which are not in forest or Indian reservations, fit for agricultural purposes, would amount to 2,292,000 homesteads of 160 acres each. According to the statistics, we had at the last census 6,000,000 farms of 146 acres each. If all this public land that is still in a state of reservation could be conserved and utilized for agricultural purposes, it would furnish homes to 2,292,000 homesteaders.

One of the great problems, perhaps the greatest problem, we have on hand to-day is the utilization of these lands. Fortunately, we have such a large body of lands in forest reservations. I think that is one of the most fortunate things that has occurred in recent years in respect to our public lands.

Some years ago we tried to repeal the stone and timber law under which so many of our valuable timber lands had been appropriated at a cost of not more than \$2.50 per acre. While such a bill was passed in one House of Congress, it failed to pass in the other body, and as a consequence, if it had not been for the fact that so many of our lands were segregated and put into forest reservations, we would to-day have been in a far more deplorable and precarious condition in respect to our timber lands than we really are.

We are fortunate in having this large body of lands in forest reservations. These lands are in charge of our worthy chairman, Mr. Pinchot, who, as you all know, takes a pride in carrying on this great work of forest conservation and forest preservation. When we come to think of the history of how our public lands have been disposed of in the past, it is perfectly appalling. We began at the outset by selling, aside from filling certain grants to officers and men of the Revolutionary army and some of our other wars, our lands at public sale or auction, auctioning them off in large bodies to the highest bidder, and those lands that were not bid in at public sale were offered afterwards at private sale at a minimum of \$1.25 per acre, and

from that usage we got the terms "offered" and "unoffered" lands. Offered lands were those which had been offered at public sale, when if not so sold they could be purchased at private sale at \$1.25 an acre. Land that had been offered at public sale and not sold was open to private sale, or "private entry," at \$1.25 per acre.

After we had continued under this policy of selling lands first at public sale and then at private sale, the United States took another step, which was to adopt the preemption law. That, for the time being, was of great value and great assistance to pioneers, because it enabled them to get a brief period in which to raise the money to pay for their land. Originally they could go and occupy surveyed and offered land, and file a declaratory statement, in the district land office, and have a year in which to pay for the land. Afterwards that was so modified that they could occupy surveyed and offered lands and have two and one-half years after settlement to pay for it, and on surveyed lands the same period after the plats of the survey were returned to the local land office.

In addition to these methods of disposal, we got (1862) the homestead law, which, in its main provisions, has been one of the great home builders of the country; I mean one of the great instrumentalities through which our western country has been opened, settled, and developed, and, barring some defects, it is one of the best land laws that any country has ever adopted or worked under. The defect of that law was in the "commutation" provision. Under the law as first passed a settler could "enter" his homestead, and after living on it six months could "commute" by making final proof and paying the Government the price. In many cases, however, the man who made the original entry and "commuted" did not become the permanent occupant of the land; he would dispose of it at the first chance, and thus it would pass into the hands of speculators. "Commutation" was subsequently modified so as to permit "commutation" in fourteen months. At first the Land Office interpreted that law so as to allow commutation eight months after the expiration of the first six months in which they were required to settle on the land. Afterwards the Land Office abandoned that construction, and now and for some time past it requires fourteen months actual and continuous residence before commutation can be made.

But even under that modification the records will show that a large number of homesteads are commuted, and as soon as commuted and proved up and paid for they pass into the hands of speculators and middlemen who hold them simply for a rise and not for the purpose of themselves utilizing them for agricultural purposes.

In addition to these land laws which I have briefly mentioned other laws have been passed, not so beneficent. They were no doubt designed for a beneficent purpose, but in practice they worked out unsatisfactorily. We had years ago what they called the "timber-culture law." The object of that was to promote the growth of timber on the prairies of the country, but experience showed that law was almost a failure in that respect. In the Western States, where they made these timber claims, a few trees were raised on some claims, but on many timber claims you can scarcely find a tree growing. That law was repealed some years ago. After the timber-culture act came the stone and timber act, which was no doubt passed for a beneficent purpose, for the purpose of permitting the entry of stone and

timber lands that were wholly unsuited for agricultural purposes, by men who actually wanted the land for their own use. But in recent years that law has been made the vehicle under which the big lumber men have been enabled to secure large bodies of our best timber lands, to such an extent that a monopoly is threatened.

Another law was the law allowing relinquishment of lands in forests and other reservations and the selection of lieu lands in other parts of the country. Some years ago Congress passed an act creating the Mount Rainier Reservation. It was largely within the limits of the Northern Pacific Railway grant, and the land was mostly worthless. A great deal of that land was of very inferior character, with little or no timber on it. The railway company was allowed, under that law, to relinquish that land and select other lands in lieu thereof, and under that law and this right the company transferred to big lumber syndicates, who selected some of the best timber lands in the Western States in lieu of the worthless Mount Rainier lands relinquished.

The stone and timber act provided in terms that the land should be sold at a minimum price of not less than \$2.50 per acre. Until recently, the Land Department has been construing that to mean the maximum price, and the lumbermen or other intermediaries who secured these lands have secured the most valuable of fir and pine land for \$2.50 per acre. The Land Department has recently put a new construction on the law, holding that \$2.50 per acre is merely the minimum limit, and that the Government can charge a higher price in proportion to the value of the land. If that rule is enforced, it will be a great protection for us, but in order to enforce that rule the Government, through its officials, will have to investigate and examine these lands, classify them, and determine as far as they can the quantity of timber, in order to fix the price for which these lands should be sold.

In my opinion, and I speak only for myself, all our timber lands not now included in forest reservations should be retained by the Government and never sold, but the Government should retain possession of them, conserve them, and merely sell the mature timber from time to time as the necessity arises. That is the only possible way in which we can conserve our timber supply.

Now, with reference to the agricultural lands—I mean lands not covered with timber and suitable for agricultural purposes. These lands are chiefly in the western portion of our country, west of the Mississippi, in the arid or semiarid belt. Some of them can be farmed by dry farming, some by irrigation, and some of them can be farmed by careful and prudent farming by the ordinary method.

I have grown up in two frontier States, first in Wisconsin and then Minnesota, and I have noticed one thing, and that is the arid belt and frost belt seem to retire in the face of settlement. I can remember twenty-five years ago, when the earliest settlers went to the neighborhood of Minot, on the Great Northern Railroad in North Dakota. The early settlers who went there in the first instance were literally starved out by the drought. They left and moved back into the timber in Minnesota. Within the last ten years settlers have gone in there around Minot and have raised crops successfully for the last eight or ten years, and that country now is regarded as good for agricultural purposes as any part of the great State of North

Dakota. The same thing is true in the matter of frost. I can remember some eighteen or twenty years ago, when our wheat in northern Minnesota in that territory north of a line through Crookston and Grand Forks was bitten by the frost before the crop was mature. We have not had anything of that kind in recent years. Look at the conditions immediately north of us in Canada. I visited that country last summer, and to me it appears that both the frost line and the arid lines are driven westward and northward in the face of settlement.

I believe a great deal of the land that we considered useless at one time—useless at all events without irrigation—can be farmed successfully by prudent and careful methods.

I noticed as I was passing through that country that those crops of the farmer raised on summer-fallowed land looked much better than other crops. I was told by people in North Dakota that crops raised on summer-fallowed land were considered pretty sure crops, while as to the other lands they were not at all sure, on account of drought and hot wind in the summer.

My idea is that for the welfare of our people, and in order to furnish homes for our future population, we ought to save all this great region of country that has not yet been taken up under our land laws for homestead settlers only. It should all be saved for homesteads for present and future generations.

There are plans pending in Congress to make these homesteads larger. There have been plans and Congress succeeded in passing a law some years ago applying to certain localities in Nebraska, fixing homesteads at 640 acres. I believe bills are pending in Congress now for 320-acre homesteads. It may be that in one sense a 320 or 640 acre homestead intrinsically is not too much, but we must bear in mind the amount of land we still possess and the number of people who will want land in the future, and I think the wisest and safest policy, if we consider our future interests, is to limit our homesteads in all cases to 160 acres.

There is another problem. Of course, where the Government still retains ownership and control of timber lands, the problem can be easily handled by the Federal Government, but when you come to the matter of protecting our timber lands from forest fires and other damage, lands that are in private ownership and within the several States, you will find it to be a problem that appertains to the States and belongs to the police powers of the States. Our forest fires in Minnesota last fall, when one of the prosperous towns up on what we call the iron range was totally destroyed, as well as other fires we have had there, all demonstrate that one of the causes that feeds these forest fires and makes them so dangerous is refuse that is left by the lumbermen when they do their logging. I think that it is entirely within the police power of the respective States, for the protection of the lives and the property of their people, to pass laws requiring lumbermen, when they do their logging, to burn up and destroy the refuse and waste matter, just as is now required by the forestry department of the United States. But we must look to the States for that relief, and all we can do in this convention, my friends, is to give them good fatherly advice and good sensible suggestions.

I think that the two great problems or the two important questions, so far as our public lands are concerned, are, first of all, to reserve

all our agricultural land for homes. In the next place, we should retain our timber lands absolutely in the Government, and sell nothing but the matured timber. In the next place—and I agree with that part of the report—it is well to segregate these different rights. The timber lands should not be sold, agricultural lands should only be sold so far as the surface goes, and the mineral rights should be held separately and disposed of separately. I am free to confess, however, in respect to that question I have some doubt. I can readily see how, in the matter of coal lands—for instance, the lignite coal lands in Dakota—it is quite practicable to give the surface right to one man and the right to the bed of coal beneath to another man, and how the two men could work in harmony and unity; but when it comes to a matter of mineral claims, such as lode claims and placer claims, then there is some question about working out the problem. As a rule, most of the lode claims are on the mountain tops and mountain sides, and very little of the land covered by those claims is fit for agricultural purposes. The same is true in reference to placer gold mines. They are generally found in the ravines and gulches and beds of rivers, land that as a rule is not of much value for agricultural purposes. So it seems to me there is necessarily no conflict, and in making up this general report I felt perfectly safe in agreeing to the general proposition. I think the commission has made a wise and judicious recommendation to the people of the United States. Bear in mind, gentlemen, we can only work out this problem completely and thoroughly by the active work of the Federal Government and by the active cooperation of the several States, as well as the individuals.

When it comes to this matter of policing our forests that are in private ownership, the great work in reference to that must be left to the States. When it comes to protecting our own forests and controlling them, the Federal Government has absolute power in the matter. When it comes to the regulation of our water supply, the Federal Government has control of all these streams so far as purposes of navigation may be concerned. Governor Chamberlin yesterday, in his speech over at the Belasco Theater, announced, in my opinion, the correct rule.

The correct rule was laid down by the Supreme Court of the United States in the Rio Grande case, and that is that even that portion of a stream which is above the head of navigation, if it be the headwaters of a navigable stream, is nevertheless, on account of its effect upon the navigability of that portion of the stream lower down, absolutely under the control of the Federal Government.

Now, gentlemen, I have in the rough stated to you how the problem appears to me. I can only say to you that as a representative of our Federal Government, here in Congress, I shall aim to the best of my ability to work along the lines suggested by this report, so far as the interests of the Federal Government are concerned; but you governors and you representatives of the several States have a greater problem even than we have, and we must rely upon you more than upon anyone else to cooperate with us in this very important matter.

I trust that while we may not all agree as to the details, yet in respect to the great general problem in hand we shall all work together as good patriotic American citizens, not only looking to our own immediate welfare, but to the welfare of the generations to

come, in order that our grand country may continue to grow and prosper in the future as it has in the past.

GOVERNOR EDMOND F. NOEL, OF MISSISSIPPI.

The CHAIRMAN. This subject naturally falls into two parts, the public-land question and the agricultural question. Governor Noel, of Mississippi, has signified his willingness, on my request, to speak on the agricultural side of the question. I take pleasure in presenting to you Governor Noel, of Mississippi.

Governor NOEL. As with Governor Smith this morning, this call comes unexpectedly, and upon a topic to which I have given no recent study. In our section, especially in Mississippi, nearly all public lands, unfortunately, have passed into private ownership, leaving small basis for forest reservations. Originally our fertile soil, mild climate, and large and well-distributed rainfall made almost the whole country woodland. The forests of Mississippi contain about 120 different species of trees, consisting of numerous varieties, there being 15 of oak. The large pine forests of south Mississippi, and of hard wood in the delta, are being rapidly cleared, usually by methods unnecessarily wasteful. The chief consideration with many seems the largest delivery to mills at the smallest outlay, wholly regardless of the effect on other industries or on posterity.

Mississippi is preeminently agricultural, and with over 58 per cent of its population negroes it has a much larger proportion of its wealth and population engaged in or dependent on farming than any other State. In its early days, when the soil was fresh and fertile and much of the forests were undisturbed, almost any method of cultivation produced bountiful harvests. When the soil became thin from unchecked erosion and continuous replanting of the same crops without fertilization, it was often abandoned to gullies, and other and fresh fields obtained by destruction of their valuable timber. Warned by lessening returns for the fruits of their labor, a general effort is now being made not only to check this downward trend, but to reverse its course, and through improved cultural methods and judicious selection of plants, animals, diversification of crops, and fertilization, to fully restore the productive power of land and labor. This movement has been given great impetus by the well-considered and admirably executed measures for the conservation of our natural resources, initiated by the President and ably seconded by various worthy government officials, especially by the Secretary of Agriculture and by our chairman.

Food and clothing, the prime necessities of life, come originally from farms. Therefore every man, woman, and child, at all times and everywhere, are directly concerned in advanced and successful agriculture. In many ways and in all parts of the Union the Department of Agriculture, through its varied activities, has become more and more helpful. By cooperation with States and their subdivisions, surveys, topographical, soil, and surface and underground water, are being made and mapped, instructing the people in the quality and capacity of their natural resources and of the most approved methods of utilization. Intelligent and successful farming and stock raising are manifested by putting land and labor to the most permanently profitable use, profitable in its broadest sense, as affecting both present

and future generations. The Agricultural Department of our Government is ably supplemented by our agricultural schools and colleges and their experimental stations, where the best selections of seed, animals, and cultural methods are accurately and scientifically tested with reference to varied climatic and soil conditions. This information is disseminated in an easily understood form. Steady and rapid advances are being made in the treatment of injuries resulting to plant and animal life from all causes, some being but recently discovered.

In the South the Federal Government is extending effective and greatly appreciated help in our fight for our cattle as against the fever tick, which costs us tens of millions of dollars annually in losses to cattle; and also in our fight against our small but dangerous enemy, the boll weevil, which crossed the Mexican border about sixteen years ago, marching steadily northward and eastward through the cotton belt, never wholly abandoning territory once invaded, and carrying immense damage, if not temporary ruin, to all who do not avail themselves of the new cultural methods tested and taught by the Department of Agriculture and its cooperating agencies. Though I come from a State probably the most united as against the dominant political party, we gratefully acknowledge and cordially welcome the very effective assistance extended to us by the National Government.

About one-third in value, and one-sixth in area, of the lands of Mississippi, and considerable parts of Louisiana and Arkansas, are protected from ravages from floods by levees, which levees also aid river navigation, and are sufficient for these purposes except when extreme high water brings death and destruction to life and property. Those inhabitants and all others of our State and of many other States are vitally interested in whatever affects, especially in the Mississippi basin, the distribution and disposition of rainfall, which are materially modified by the removal or the replanting of forests. The muddier the water the more difficult it is to control and the greater is its power of erosion and of making sand bars. Careless methods of cultivation not only rob the land, through erosion, of more fertilizing properties than is consumed by crops, but also aggravate the evils and reduce the benefits of water courses. In speaking of his State, Minnesota, Governor Johnson announced that it supplied part of the waters that passed through the lower Mississippi. For water of proper quality, free from unneeded sediment, and properly distributed throughout the year, the people of the lower Mississippi Valley are exceedingly grateful, but not so for muddy floods, delivered in such volume as to defy human control. The occupants of the lower Mississippi Valley are the greatest sufferers from the sins of deforestation and of soil erosion of the whole Mississippi basin and should be fully protected from overflows of the Mississippi by the strong arm of our Federal Government, which has the entire control of the waters and the navigation of the Mississippi River.

Kind Providence has been exceedingly gracious in its bestowal of the blessings of a fertile soil, a genial climate, and well-distributed rainfall to Mississippi and other Southern States, bringing prosperity to all who make good use of their opportunity.

The whole Mexican Gulf coast, outside of lower Florida, which is really tropical, can successfully grow almost all kinds of tropical fruits. Mississippi can profitably produce nearly every kind of crop,

vegetable or fruit. For farming and pasturage our lands are almost ideal. Our summers are long, with nights generally pleasant and days not excessively warm. Our winters are short and mild. When not already fertile, our lands can generally be made fertile at a moderate expenditure of time and money. Cattle can thrive throughout the year with little or no shelter, and need be fed only for a few winter months, and in some localities not at all, cane and grass there affording perennial subsistence.

My mission here is not one of speechmaking, but of listening and learning. I have gathered from some of the best posted authorities much valuable data pertaining to the value and location of our natural resources and of the best means of obtaining its benefits without unnecessary exhaustion. The most valuable service that I can render Mississippi is, directly and through various agencies, to bring its citizenship into a full and living realization of the material data affecting the extent and conservation of our natural resources, which have been so wisely and diligently collected and so admirably presented to this conference. I thank our President, the chairman of this conference, and all of those who have rendered this efficient public service, and sincerely wish them godspeed in their useful and patriotic labors.

GOVERNOR MARTIN F. ANSEL, OF SOUTH CAROLINA.

The CHAIRMAN. During the last address Governor Ansel, of South Carolina, has come into the room, and I am sure we shall be glad to hear from him. I take pleasure in presenting to you Governor Ansel, of South Carolina.

Governor ANSEL. Mr. Chairman, ladies, and gentlemen, I do not know whether my friend, Governor Johnson, is in the house this afternoon or not, but it was my pleasure to be with him at the first conservation meeting that was held at the White House in May, and I want to tell him that I am one of the governors here to-day and that I am one of the governors who expect to attend these meetings in the future. It is a great pleasure for me to be at these meetings, not only a great pleasure and privilege, but it has been a great educator so far as I am concerned.

The conservation of our natural resources is something that has been in my mind for some little time, and more particularly since the first meeting was called when so much information was given to each of us of the great possibilities, the great wealth of this great country of ours. I am not a pessimist, my friends. I am an optimist, if anything, and I believe that we have the greatest country in the world; in fact, I know it. I know that our natural resources are equal to those of any of the nations of the world, and even the small State of South Carolina has tin within her borders, and it has been recently mined to a profitable degree. We have also large deposits of monazite, and I believe monazite is only found in the States of North Carolina and South Carolina.

This discussion this afternoon is on the subject of lands, if I am not mistaken. I am sorry I was not here at the beginning of this afternoon's session. The trouble with me is I can not divide myself into two or three people at one and the same time. I wanted to attend the Rivers and Harbors Congress, which is in session on the tenth floor of this building. This morning I was before the Agriculture

Committee of Congress talking about the Appalachian Forest Reserve, one of those things in which we are very much interested in our country; and I wanted to be here at the same time. My heart is in this work.

We had a great flood in August of this year and the loss of land, of ground, of soil was something enormous as the result of that one flood. While crops were devastated, while the corn was carried off, yet that was only a part and a small part of the great injury that was done to our lands by carrying them into the sea by the flood such as we had in August last. That, of course, gets back to the question of the forests and of the waters, and I have not time to discuss those questions this afternoon. I want to say that we feel down in our country a great interest in this question of the preservation and conservation of our natural resources.

Our lands, our waters, our forests, our minerals are things in which each and every State of the Union is interested, in order that we may send down to posterity that which we received from the good Lord when we came here.

I never until recent years fully appreciated that little couplet I learned as a small boy:

Woodman, spare that tree,
Touch not a single bough.

Little did I think then that the tree would become so important; so important as it is to-day in the question of forests and deforestation. Little did I think then that so much interest would be manifested in our forests, so important to our landed interests, that the tree should be protected in order that the floods would not carry away the land; that the forests being denuded would permit the silt to go down the river as it does in these large floods.

I am not here on this program to make any speech to you upon this subject, but I am here to tell you something of the interest we feel in our portion of the country in this great question that is now being discussed from one end of this country to the other. If this great conference does nothing else, my friends, than to make us think and make us act upon the knowledge that we have, these great reserves that we have an interest in, the preservation of these resources for our posterity, our children, and our grandchildren, it will have accomplished a great deal.

I for one wish to thank my friend, the chairman of this meeting, for the great interest he has manifested and shown in the great work of preserving our natural resources. I have had many communications with him upon the subject and I know that he has in his heart the interest not only of one State and another State, but all the States of this Union, in the preservation of these things which make the material wealth of our country and which are to be handed down to posterity. We live not only for ourselves, but for our children. We should preserve to them those things which are necessary in order that they may receive from us what we received from our forefathers.

I wish, therefore, this afternoon just to bid you godspeed in the great work that has been started here and to express the hope that it may be carried forward and result in the preservation and conservation of these great resources of ours in order that the country may go forward as it has been going, continuing to hold her place as the first nation of the world.

GOVERNOR N. B. BROWARD, OF FLORIDA.

The CHAIRMAN. I thought I saw Governor Broward, of Florida, come in while Governor Ansel was speaking. I know we shall be very glad to hear from him, and I now take pleasure in presenting to you Governor Broward, of Florida.

Governor BROWARD. Mr. Chairman, ladies, and fellow-citizens of the United States, I will not undertake to make a speech this afternoon, as I have been so busy since coming to Washington, attending first one conference and then another, that I fear my remarks might be so scattering on this subject, without some study, that I would fail to hit anybody or anything.

I heard a story told once that is apropos of my condition at this time. An old gentleman frequently went out squirrel hunting with his son. The old gentleman was slightly palsied, and it was his province to shake the bush and frighten the squirrel around on the other side of the limb, and the province of the boy to do the shooting. On one occasion the old gentleman had scared the squirrel around on the other side of the limb several times, and the boy had several clear shots at the squirrel but missed him every time. The old man, becoming vexed, and ammunition being scarce and costly, said: "Come here and shake the bush; let me shoot. Let me try it." The boy went over and shook the bush, and the squirrel went around on the other side of the limb, and the old man held the gun up and shook all over, and finally the gun went off and down came the squirrel. The old man said: "That is the way to shoot. That is the way to shoot." The boy said: "Well, no wonder you hit him; you aimed all over the tree."

On this occasion I would have to aim all over the tree and all over the continent, and I would rather reserve the right, if my friend will permit me, to wait until to-morrow or some other time that suits him, when I can better entertain you on this subject. I have a scattering knowledge of it or conception of it, and realize to some extent its great importance, and as I look into the faces of those who have studied it closely, and especially that of the Senator from Nevada, who, next to Mr. Pinchot, has done the greatest work along this line, I feel that the generations yet unborn will appreciate to some extent at least the great things that will be in store for them as the result of the persistent efforts of those two gentlemen who did not live entirely for themselves.

I thank you.

SUGGESTION BY SENATOR FRANCIS G. NEWLANDS, OF NEVADA.

Senator NEWLANDS. May I make a suggestion, Mr. Chairman? The last Conservation Congress emphasized the importance of cooperation between the National Government and the States upon the questions which we have under consideration. The report recently presented emphasizes the importance of cooperation. A year has passed by since the last conference was held. There has been some opportunity for state action upon this subject. I think it would be quite instructive to this conference to ascertain what action has been taken in the various States and also to discuss some method of uniform action by the States upon this subject. I have recently received

a letter from the governor of my own State, Nevada, in which he expresses an earnest desire to cooperate with the National Conservation Commission in this work. He requests information and suggestions upon the subject. Yesterday I was handed a report by the Conservation Commission of Oregon. I have had no opportunity yet to look it over. That report indicated that Oregon has already taken action. This was quite a voluminous report, some 60 or 70 pages.

Let me here suggest that state action can be taken in two ways—one by the passage of a statute by the legislature, the other by executive action. Of course, it is highly important that action should be taken by the legislature of the State, because then some efficient method of action is always indicated. But where that has not been secured, or where it is difficult to secure, it is entirely within the province of the governor of any State, under the power which he has of recommendation to the legislature with regard to legislation, to call to his aid any body of citizens, and he can give such body such name as he may choose, and I would suggest that where States through their legislatures have not taken action, the governors of the various States can appoint, just as the President of the United States appointed, a conservation committee of the State, with a view to preparing a report and making recommendations to him. It will be a very fruitful method of agitating the question, of forming public opinion upon the matter, and the result will doubtless be, in every State, that the merely recommendatory commission appointed by the governor, without constitutional action and without legislative action, will ripen into legislative action which will cover the field of administration as well as the field of recommendation. I would suggest that as the governors and Representatives of the various States are called upon they say something regarding the previous action of each State upon this subject, the action which has already taken place, and the action which may be contemplated.

The CHAIRMAN. I am sure Senator Newlands's suggestion is good. I may say at the beginning that 28 of the States have appointed conservation commissions, and some 30 of the great national organizations are represented here. I, too, have before me the report of the Oregon commission. Other commissions have already prepared reports, and I am certain that the conference will be very glad indeed to hear, from either the governors or the chairmen or representatives of the state commissions, what has been done.

Senator SMOOT. Have we passed from the subject of public lands? Have we said all that is going to be said upon that subject?

The CHAIRMAN. No; the subject of public lands is still before us for discussion.

Governor ANSEL, of South Carolina: Responding to the suggestion of my friend, so far as South Carolina is concerned, we have no statutory provision upon that subject, but since the meeting of the governors last May I have appointed a conservation committee, consisting of our commissioner of agriculture, state geologist, and two other citizens, and they are to report to me, giving me the information they have in order that I may take such action in my message to the legislature as may be thought best, and I believe they have also given Mr. Pinchot data with reference to the matters upon which he desired information.

The CHAIRMAN. I would suggest in this connection that the National Conservation Commission has had a great deal of encouragement and assistance from the governors and their commissions.

HON. W. P. LAY, OF THE ALABAMA STATE CONSERVATION COMMISSION.

Mr. LAY. Mr. Chairman, as to the reports from the States and the conservation commissions appointed for the States, I have the honor of being chairman of the commission appointed for Alabama, and therefore beg to say: We prepared a report and turned it in to your honorable secretary, which report I believe you have before you. The report contains probably 50 or 75 pages and takes up the various subjects, I think, fairly well—in line with the inquiry.

We covered the ground the best we could considering the short time in which we had to work, and considering also that we had no funds at our command to aid us in the work. We found the duties very arduous, yet very interesting, and as we examined into the various subjects we could realize more and more the importance of the work.

We took up each subject in form as the inquiries were made, as the report will show. First, the land laws; second, agriculture; third, waterways; fourth, forestry, and fifth, minerals, and made as complete an inventory of each as our limited time would permit, together with recommendations as to how, in our opinion, some of these could be most economically handled—that the best and most lasting results might be obtained therefrom.

In looking into the subject we found some very interesting questions and the field large, and one that offers very great opportunity for study and research.

One of the conclusions at which I arrived was, that of all our natural resources I do not know of any that promises more results than is promised by the proper conservation, improvement, and development of our waterways. In fact, it occurs to me that the most potent factor in conserving our resources is to first conserve, improve, develop, and utilize our streams. When this is done, in my opinion, the greatest achievement in our efforts for conservation has been accomplished.

To fully appreciate why this is so, we must consider:

First. The use and benefits to which these streams can be applied.

Second. Their possibilities to contribute such benefits when they are improved so as to utilize their natural flow, and when they are improved so as to utilize their practical conserved flow.

Third. The economy and saving which they are capable of accomplishing when so improved.

CHIEF VALUE OF STREAMS.

The chief values of our streams are for navigation and for development of power; therefore, if the plans for their improvement are properly designed with due consideration for conserving both these valuable agencies of human affairs in the most minute detail, their joint development and improvement can be most economically accomplished, with the promise also of the most economic results from their joint operation.

DUAL SYSTEM.

With this end in view, it will be seen by examining our report that we recommend most heartily, for the improvement of our waterways, a dual system of navigation and water-power development, where water power is possible, together with a system of impounding or storing the flood waters of the streams in aid of such navigation and power development and the amelioration of the floods. And we recommended also, very heartily, that the Government of the United States in its improvement of our streams for navigation act in conjunction with private capital in the development of the water powers, where such water powers exist, upon such equitable terms as may be right and just, to both the Government of the United States in its efforts to improve navigation and to the riparian owners of the water-power rights.

WATER TRANSPORTATION.

The benefits of water transportation are too well known to need comment from me, hence I shall not dwell on that part of the subject.

VALUE OF POWER.

To be brief in treating on the value of power in its relations to manufacture and commerce, I shall deal principally in statistics, as compiled by Mr. W. J. Clark for the Niagara Falls Power Company.

The total value of manufactured articles produced in the United States during the year 1900 was approximately \$13,000,000,000. Five million three hundred thousand wage-earners contributed their labor to produce these articles, and 11,300,000 horsepower was used for manufacturing purposes. Thus, for every wage-earner 2.13 horsepower was used to aid him in producing \$2,452 worth of goods during the year. No other country employed power to an extent at all comparable with this, and also, no other country derived such great return in manufactured articles from its workers.

Russia and Spain, which stand lowest in the list of power-using countries (.15 horsepower per wage-earner), produced in value of manufactures only \$440 and \$361, respectively, per wage-earner. Fifteen foreign countries, including Canada, had in 1900 an average of .3 horsepower per wage-earner, of whom each produced an average of \$519 worth of goods.

Pennsylvania during the year 1900 produced \$1,834,790,960 worth of manufactured goods by the aid of 733,834 workers and 1,859,263 horsepower. For each wage-earner, aided by 2.54 horsepower, an average of \$2,500 worth of manufactured articles was produced.

The following figures, being the statistics from which the figures in the preceding paragraphs have been taken, are of interest, as they indicate clearly the relation which exists between manufacturing progress and the use of power.

Countries.	Wage-earners.	Total horse-power used in manufactures.	Value of products.	Value of products per wage-earner.	Horse-power per wage-earner.
United States.....	5,308,406	11,800,181	\$13,004,400,143	\$2,452	2.16
United Kingdom.....	9,000,000	3,000,000	5,000,000,000	556	.33
Germany.....	10,000,000	3,400,000	4,600,000,000	460	.34
France.....	5,000,000	1,500,000	3,450,000,000	690	.30
Belgium.....	1,550,000	630,000	720,000,000	480	.42
Switzerland.....	600,000	320,431	300,000,000	500	.54
Austria-Hungary.....	4,700,000	750,000	2,000,000,000	425	.16
Russia.....	4,500,000	700,000	1,980,000,000	440	.15
Italy.....	3,600,000	900,000	1,700,000,000	472	.25
Norway.....	200,000	80,000	90,000,000	450	.40
Sweden.....	490,000	200,000	280,000,000	572	.41
Holland.....	460,000	130,000	245,000,000	540	.29
Spain.....	1,800,000	250,000	650,000,000	361	.15
Australia.....	550,000	460,000	500,000,000	900	.80
Japan.....	382,298	84,216	220,000,000	566	.22
Canada.....	550,000	750,000	800,000,000	1,455	1.36

POSSIBILITIES OF WATER-POWER DEVELOPMENTS.

A stream, as it applies to water power, is like a chain, only as strong as its weakest link. In figuring on the possibilities of water-power developments on an unconserved stream, we can only figure, practically, on the results obtainable from the minimum discharge of the stream, counting all in excess of this to be wasted, but in reckoning the power possibilities on our streams in Alabama, I shall show both the horsepower possible with the minimum flow and also the power possible with a practical conserved flow, from the fact that on the headwaters of our rivers, like almost all other rivers in the United States, there are found desirable reservoir sites at which reservoirs of sufficient capacity to answer all purposes can be economically constructed when compared to the benefits to be derived from them.

WATER POWER IN ALABAMA.

The following table will show the primary water power possible in Alabama, conservatively estimated:

	Horsepower.
Tennessee, with minimum natural flow.....	162,000
Tennessee, with practical conserved flow.....	396,000
Coosa, with minimum natural flow.....	120,000
Coosa, with practical conserved flow.....	360,000
Chattahoochee, with minimum natural flow.....	115,000
Chattahoochee, with practical conserved flow.....	230,000

It is probable the possible water powers on unnavigable streams will be about 10 per cent of that on navigable streams. This would give Alabama:

	Horsepower.
With unconserved streams.....	436,000
With practical conserved streams.....	1,084,000

This means that it would require, according to standard tables, 4,505,000 tons of coal per annum to produce by steam the power of these streams in their unconserved state, and 11,201,000 tons of coal per annum to produce by steam the power of these streams in their practical conserved state.

Alabama is producing to-day about 14,000,000 tons of coal per annum for every purpose. Thus it will be seen that it will take about 80 per cent of the entire production of coal in Alabama at this time to produce by steam the power of these streams that is now going to waste.

Suppose for a moment that the coal fields of Alabama were sliding down an incline and pouring off over a precipice into fathomless space at the rate of 11,201,000 tons per annum; how long would it take the people of the United States to get busy and try to stop such a waste of a God-given resource? Yet, what else are we doing when we sit idly by and let the water of these streams go to waste over a precipice, while we ourselves burn up the coal?

AID OF NAVIGATION BY STORAGE.

We have been considering in Alabama for a year or two a plan for the improvement of navigation on the Alabama River which contemplates the impounding of the flood waters on the headwaters of the Coosa River in Georgia, from which an increased discharge might be had to aid navigation on the Alabama River during low-water periods, which does not exist over sixty or ninety days at any one time, and this only occurs probably every eight or ten years.

Our studies and investigations looking to this plan of improvement are very interesting and from our present viewpoint promise splendid results, and is probably only typical of what can be done on many other streams.

The extreme low-water discharge of the Alabama River is approximately 2,000 cubic feet per second. This will give with the average slope of the river and the proper channel work, as contemplated over the shallow places, 4 feet of navigation. Six thousand cubic feet of water per second with the same width channel will give 8 feet of navigation. Therefore it follows that 4,000 additional cubic feet discharge per second from a storage system for a period long enough to bridge over the low-water stage of sixty to ninety days will make 8 feet of navigation on the Alabama River possible at all times.

Then, in addition to this, the 4,000 additional cubic feet per second, together with the natural flow of 2,000 cubic feet passing through the turbines over the rapids on the Coosa River, will give the maximum horsepower for power purposes as heretofore explained.

We find also on the headwaters of the Coosa River a number of desirable sites at which storage reservoirs can be economically constructed that will give the requisite quantity of water necessary, we think, to give these results, and at the same time the reservoirs will very materially lessen the impetuosity of the floods.

DR. CHARLES R. VAN HISE, OF THE UNIVERSITY OF WISCONSIN.

Doctor VAN HISE. Representing the Conservation Commission of Wisconsin, I am requested, in the absence of the governor, to speak on one subject of the work of that commission which is apropos to the subject under discussion this afternoon, that of lands.

The subject to which I shall call your attention for a few moments is that of the phosphate of the soil. I select this particular subject because it shows the interrelation of the work of conservation in the

several States. You may wonder why I, in Wisconsin, a State which has no phosphate deposits, should be especially interested in this subject, but the phosphate deposits is a matter in which every State is interested. Of the various elements of fertility in the soil, nitrogen, potassium, and phosphorus are the important ones. Combined nitrogen for the soil may be obtained from the atmosphere by methods which I need not discuss; potassium is present to the extent of 2½ per cent in the original rocks, and in some to three times that amount; and even if the natural concentrations be used up we shall be able, by sufficient expenditure, to use the original rocks as the source of potassium to fertilize the soil.

Phosphorus is present in the original rocks to the extent of only eleven-hundredths of 1 per cent. It is the element which is most crucial in the matter of soil fertility. Mr. Hill, at the conference last spring, told of the decreasing productivity of the grain fields, wherever the lands have been cropped for some time, not only in the Northwest, but in the various parts of the country. The most important chemical factor in the decrease is the depletion of the land in phosphate. You who are familiar with the situation in the upper Mississippi Valley may think that the wonderfully fertile lands there located have a sufficient amount of this element, and yet investigations recently made by the agricultural experiment stations of Ohio, Illinois, and Wisconsin show in these States that the element phosphorus has already been greatly reduced. So far as I know, the only quantitative studies which have been made are in Wisconsin. There Mr. A. R. Whitson has shown that the fields which have been cropped for fifty years have lost one-third of their phosphates. The director of soil work in Illinois is here to speak for the commission of that State and will supplement my statement.

There is absolutely no way of handling the land by which we can increase its content of phosphate. To increase its phosphate requires the addition of a fertilizer containing phosphorus. If the loss for the United States has been as much as one-half as much as it has been for the State of Wisconsin in the cropped fields for fifty years, a simple calculation shows the entire products of our mines at the present rate of production would be required for more than one hundred years to restore to the soils of the country their original fertility in phosphorus; and Mr. F. B. Van Horn, of the Geological Survey, who has made a careful estimate of the deposits of phosphate in Florida, South Carolina, and Tennessee, and a rough estimate as to the probable amount that may become available in the West, calculates that the supply of this element is sufficient to last for only about fifty years, even at the present rate of consumption.

Last month there was an announcement of the formation of the Franco-American Consolidated Phosphate Company, the capital of which is almost exclusively held abroad. This phosphate company has already purchased a large portion of the richest phosphate lands in Tennessee, which contain the largest supplies of phosphate of any State, with the exception of the western deposits. What is the purpose of obtaining these lands? Manifestly it is to ship our phosphates abroad to restore phosphorus to the depleted soils of Germany, France, and Spain, for all three of these countries are represented in the capital of that company. Gentlemen, it seems to me there should be a law which would prohibit the exportation of a single pound of

phosphate from this country. We do not want an export duty in any case. We want prohibition. To allow our phosphates to go out of this country is nothing short of agricultural suicide.

Under modern conditions we are wasting annually enormous quantities of phosphate. A large proportion of the fertilizers produced on the farms which contain much phosphorus is allowed to wash into the streams and thence into the sea. Under our modern sewage system, by which we dump into the rivers the sewage, we are also sending an additional amount of that essential element to the sea. Here in the city of Washington to-day there is going down into the Potomac and into the sea this valuable fertilizer. Upon this point Mr. Whitson has made a rough computation and he estimates that through the sewage systems of the cities of the United States the equivalent of at least 1,200,000 tons of high-grade phosphate is lost annually. If the soil's fertility is to be retained, and upon the soil depends our food and clothing, this waste must be stopped. Of all the great questions which have come before this commission the preservation of the fertility of the soil is the most fundamental. We must in some way stop this criminal waste of our phosphates, for the amount exported is much less than the amount that is wasted by our improper methods of agriculture and sewage disposal.

Here is a great responsibility and a great opportunity for the governors of the States and the teachers of agriculture all over the country. The people must be taught to realize their responsibilities to posterity in this matter. They must be brought to understand that unless this element of phosphorus is conserved, unless soil erosion is controlled, the most fundamental of all our resources, the soil will become greatly depleted and will be able to sustain only a relatively small population.

You may ask the question, if the above statements are true, how is it that the crops grow well in China and Japan? In the densely populated parts of these countries practically all the fertilizing element produced by animals and by man goes back upon the soil. Where this is done the phosphate may be used over and over and over again and the fertility of the soil in phosphorus may be perpetually maintained.

I dwell upon this subject at some length because it seems to me to be one of the great fundamental questions before us. This is one of the questions which the commission in Wisconsin has taken up with reference to the interests of that State, but you can readily see we can not consider this matter in our State without thinking of the situation in the Southern States and in the Western States, where are to be found the natural phosphate deposits. No other subject shows more clearly how the future welfare of all the States interlock; how the nations and the States and the individuals must cooperate in conserving our natural resources.

MR. J. H. RICHARDS, PRESIDENT OF THE AMERICAN MINING CONGRESS.

Mr. RICHARDS. My friends, as I stand here facing you at this moment, I am again impressed with the idea that there is nothing so certain in human life as the unexpected. I had prepared to leave your city, and was about to leave when I was requested to contribute

my mite to the great thought force you are undertaking to set in motion and disseminate throughout the country from this center.

My peculiar relation to the mining thought of this nation within the last seven years is the only justification for attempting to occupy your attention even for a moment. In my efforts as president of that organization to give direction to the mining thought of this country along lines that are in harmony with the purposes of your meeting, I have been impressed with this idea, that we can not deal here with details, but only with those fundamental questions that have been implanted in the human heart from the beginning; that they may be promulgated and sent out to the American people from this important meeting.

We create nothing. We simply discover the true basis of human growth which existed from the beginning, promulgate or set it in motion, then apply it to our needs.

Ideas rule the world, and should rule it. This was impressed upon me when the ideas, implanted in the human heart from the beginning, found expression in the dawn of our country's life, when our fathers promulgated and applied to our needs the great constitutional and legal foundations upon which this country must rest for all future time. It was again illustrated, and showed how deep the roots of those great ideas are planted in American hearts, when the strength of this nation was tested, when the constitutional rights that had been established were tried, and again established and forever. As a result of that contest we came to realize, through personification of American manhood in the form of Abraham Lincoln, that we are a united nation and that we all stand equal before the law. Our country was established and preserved upon that theory. At this time the third important crisis in the history of our nation confronts us, when in order to insure our continued and stable prosperity we must develop our wonderful resources along the constitutional lines that have been laid down for us by those who have gone before.

This development must be nationalized and promulgated from this center of thought. We can then coordinate and utilize these various local resources.

I am impressed that we must send out over the country the thought that we believe the time has come when in meetings of this character we must try to direct, through cooperation, coordination, and conservation, the use of our national bounties.

Nature has been so generous in her bounties that it takes a generous heart to interpret and cooperate with her in developing our industrial possibilities, and at this time we must send out from this center thoughts that are in harmony with the idea of cooperation, coordination, and conservation, but at the same time in harmony with our constitutional and legal basis upon which our development must rest.

As president of that mining organization, these are the things that have been impressed upon me now for seven years. It has been my hope that there may be impressed upon the mining thought of the day the central point of your purpose in meeting here, and that is, all we attempt to do must rest upon the constitutional and legal basis upon which our Government is founded and upon which our national development must rest.

I have received inspiration from your chairman, and I love him for what he is to this nation; and now, since I have had the privilege of meeting his mother in this hall, I have no doubt why he is what he is.

I want to leave this one thought with you, resulting from the experience of seven years in this character of work: That we must nationalize and promulgate this idea of conservation of our natural resources in harmony with our constitutional basis, and then coordinate all of the state and local forces into one grand, harmonious whole; because I am convinced that underneath all the changing scenes of our material development there is the everlasting foundation of scientific truth. Aside from the waste of natural resources, the waste of human life must be considered—and this is a thought that was made prominent at our convention at Pittsburg—the man under ground must have the same legal and constitutional protection as the man above ground. We can not carelessly sacrifice human life longer upon the altar of industry. We must remember that the capacity of the American citizen to achieve and enjoy the fruitage of his industry is the greatest asset the nation has. And out of this great industrial development that is now just beginning to dawn upon the world there will come that moral and spiritual uplift of the American people which will be the crowning glory of American civilization.

EX-GOVERNOR NEWTON C. BLANCHARD, OF LOUISIANA.

GOVERNOR BLANCHARD. Mr. Chairman and gentlemen of the conference, I, too, like our friend who has just addressed the conference, am expecting to take my departure this evening from the city of Washington, and before I go would like to address a few words to the conference.

I have been here now for nine or ten days, hard at work with other members of the National Conservation Commission and the experts in the preparation of the report which was read this morning. It has been to me a work of great interest and instruction.

I was much pleased with the admirable address delivered before this body earlier in the day by the distinguished governor of the State of Minnesota. So optimistic, however, were his views relative to the supply of certain of the natural resources of the United States that it set me to thinking that if he be not mistaken in what he said, why has the National Conservation Commission existed at all? He told us, in direct contravention to the carefully prepared report of the National Conservation Commission—and that report is founded upon information supplied by the government experts—that there is iron ore enough in the State of Minnesota alone to last this country for centuries. The report of the commission declares that, so far as the high-grade ores now in use are concerned, the middle of the present century will see their exhaustion; and that so far as the low-grade ores are concerned (the ores which must come into use after the high-grade ores are exhausted), their exhaustion may be looked for not much later than the end of the present century.

I am informed by the Director of the Geological Survey that the estimates of the supply of iron ores which he and the experts of his bureau submitted to the commission were made after the most careful

and elaborate study, and that the estimates thus submitted were concurred in by state geologists and mining engineers who were called into conference.

I am further informed by the director that in the estimates which were submitted to the commission, and upon which the commission's report is based, there were taken into consideration all of the ore deposits in the State of Minnesota, and that to be on the safe side—that is to say, not to underestimate—a billion tons more were added to the estimates submitted of the quantity of iron ore in Minnesota than the officials of the State of Minnesota themselves placed upon the same.

The tax commission of the State of Minnesota estimated the iron ore in the Mesabi and other ranges in Minnesota at a billion tons less than the figures submitted to the National Conservation Commission by the federal experts.

So that, with due deference to the governor of Minnesota, whose speech, without intending it, challenged the accuracy of the report of the conservation commission on an important point, I beg to submit that it is more likely the reports of the government officials, men who have been giving close study to this matter for years, and particularly so since the appointment by the President in June last of the National Conservation Commission, are more apt to be correct in the estimates they give than are the reports from other sources whence came the information upon which the governor based his statement.

Now, answering in part the inquiry of Senator Newlands, as to what has been done by the several States since this question of conservation has assumed national proportions, I wish to say that in my own State of Louisiana, by authority of law enacted since the President called the governors in conference in May last, a state commission on conservation has been appointed and is beginning its work of taking an account of the natural resources of the State. In that connection I will repeat to the gentlemen who are here in conference with the National Conservation Commission some things about the resources of Louisiana that I stated to the commission itself during its sessions in the last week.

Strange as it may seem for a State lying as low upon the Gulf of Mexico as does the State of Louisiana, she ranks quite high upon the list of mineral-producing States. We have no coal and iron, none at least that have been discovered as yet; nor have we gold and silver. We have no copper, zinc, or lead. But we have what is now thought to be by scientists the most remarkable supply of natural gas yet discovered.

In the Caddo field, in northwest Louisiana, there are gas wells that are attracting the attention of the world. Some of these wells have been burning for three and a half years. A German expert who came over to this country recently, charged with the duty of looking into the natural gas and fuel oil conditions in the United States, visited the Caddo field in Louisiana and reported that there were being wasted there by "wild" wells as much as 70,000,000 cubic feet of natural gas a day—enough to supply each day the needs of ten cities the size of Washington.

Then we have in the same field, perhaps, as great, if not a greater, deposit of fuel oil than has yet been discovered in the United States.

There are individual wells in the Jennings field, in southwest Louisiana, that have a record of having produced more than 3,000,000 barrels of oil each, and are still producing. I have been told by geologists that there are no wells elsewhere in the United States with any such record of production as that.

Since I made that statement to the National Conservation Commission, Congressman Broussard, of Louisiana, whose district includes the Jennings field, tells me that I underestimated the production of some of the wells in that field.

Then, we have in Louisiana the greatest sulphur mine ever discovered in any country in any age. It is a fact that Louisiana sulphur to-day is supplying the needs of the world for sulphur. We are underselling in the markets of Europe—even in Italy—the Sicilian production of sulphur.

And then, in the matter of rock salt, 99 per cent pure, there are deposits in Louisiana through which the drill goes for 2,200 feet without touching the bottom. This salt is found over a large area of the low-lying lands upon the Gulf of Mexico within the limits of the State of Louisiana.

And then, gentlemen of the conference, in the matter of lumber production Louisiana is next to the State of Washington. Our forests of longleaf pine and of shortleaf pine are very extensive. Cotton, corn, sugar cane, and rice grow on our rich lands in equal luxuriance in the same 50-acre field.

So that it is a State just now realizing what it has in the way of bounties bestowed by nature. Public sentiment is being aroused there, and it is not necessary to say to gentlemen of the intelligence of those before me that if we are to carry through this great policy of conservation of the natural resources of the country the first and foremost thing to do is to educate the people as to the facts of the wastefulness of the supply now going on and of the duty of this generation and coming generations to preserve these resources and hand them on down unimpaired to future generations, for it is only by such education that a popular sentiment so necessary to put behind this movement can be developed.

Forestry—how to preserve our forests—is attracting much attention in the Southern States. But very little is known of the subject, and the practice of forestry is next to nothing. Information, facts, lectures, education along these lines are needed. If only the legislatures of the States, when they meet, would extend invitations to the Forest Service of the United States Government to send men skilled in this service to talk to them, to appear before committees, much might be accomplished in pointing the way to useful legislation.

The average legislator has not had the opportunity to know about these things. He has been busy with other matters. He is too busy to read the pamphlets on forestry sent him. He goes to the capital with the idea that something ought to be done, but with no practical plan for the doing of that something. He needs to be told; to have the way pointed out to him.

Of course, the federal authorities would not think of going into a State, or into the capital of a State, when the legislature is in session, in connection with the matter I suggest, without an invitation. They are careful always to avoid the criticism of interference on the part of the Federal Government with state affairs. But if the governors

or the legislatures of States, desiring knowledge about this, wanting lectures delivered giving facts and figures, would suggest the coming of experts or trained men, I do not doubt that the several departments or bureaus of the Federal Government would be willing to respond by sending men who would appear before the appropriate committees and give the practical instruction so essential to the making of progress in forestry.

The report of the National Conservation Commission and the papers forming the appendix thereto should be read by every intelligent man and woman in the land. But how many will read them, or get the chance to read them? Literature of that kind is difficult to get out among the masses of the people. Even when sent out, how many of those into whose hands they come read them?

But if the legislature be in session, and a man who knows the facts and figures and can talk them appears, he will be listened to. All that is necessary to develop the public opinion, so necessary, is for the facts to be disseminated generally among the people.

MR. J. N. TEAL, CHAIRMAN OF OREGON STATE CONSERVATION COMMISSION.

Mr. TEAL. Mr. Chairman, I will make a very brief report. While you all doubtless would be very glad to hear about the resources of Oregon, and I would be delighted to tell you about them if I had time, the hour is getting late and I do not consider that to be the particular purpose of this meeting.

The governor of our State appointed a commission, of which I had the honor to be elected chairman. That commission has prepared a report, printed it, and filed it with the National Commission. There are some of these reports here, and if any of you gentlemen desire copies or have any interest in the method by which we looked into this subject, I shall be delighted to have you take one of the reports, and from a reading of it you will doubtless discover how ignorant we are of the resources of our own State, and, possibly, the reason why I do not care to talk more about them. There is one thing, however, we discovered, which doubtless any commission will discover when it goes into the matter, and that is the enormous and almost wanton waste of our natural resources. Without going into that question, I think it is conceded generally that such is the fact. It is also conceded that this waste must cease. Another question, one of law, which should be conceded (and if not acknowledged sooner or later there is little good of going further) is one upon which we can all work with safety, and that is in dealing with these public resources we are in effect trustees, and we have no more right to dissipate the principal of the fund that has been temporarily placed in our hands than a trustee under a will or a guardian has a right to dissipate the funds of an estate or of children in his charge or control. In my judgment this is fundamental. To illustrate, take a water power, which is certainly a natural resource. To think a legislative body, by its mere ipse dixit, can make it possible for one to acquire a fee-simple title to such a power in perpetuity is shocking. If such is the law as applying to existing rights, then provision should be made to prevent such a condition as to powers which the State and nation still control. I do not mean by this that "powers"

any more than other resources should not be used. I would promote a free use, but it should also be a beneficial one. In my opinion the monopoly of water powers should be made impossible. But I am not discussing these questions now. It is easy to talk of generalities and it is easy to pass resolutions based on them. I believe in the conservation of our natural resources. How are we going to conserve them? In my judgment, before this convention adjourns, some practical scheme should be devised, some basis upon which we can all act hereafter. I would recommend that a resolution be offered by some of the governors and adopted covering the following suggestions:

First. That the National Conservation Commission be made a legal body, resting upon the same basis of authority as any other department of the Government, with sufficient funds to enable it to carry on its work properly.

Second. There should be the closest relationship between the States and the General Government. The States, through their governors, should be the connecting link between the National Conservation Commission and the state conservation commissions, and the powers of the State and of the nation should be coordinated and work together.

If we do that, and follow it up by action, we will have taken an important forward step and will have the consciousness of having made an honest effort to pass down to the future, unimpaired, the trust which has been placed in our hands, and preserve for the future our great natural resources, which should and can be made a source of comfort, wealth, and happiness forever.

PROF. G. E. CONDRA, CHAIRMAN NEBRASKA STATE CONSERVATION COMMISSION.

Professor CONDRA. Mr. Chairman and members of the commission, I will speak briefly for Nebraska as Governor Sheldon's representative.

It has been my privilege and duty during the past fifteen years to study the geography and economic geology of our State. This experience has caused me to reach certain conclusions pertaining to Nebraska's resources and possibilities. Let me refer briefly to some of the Nebraska conditions, because reference has been made to the same by preceding speakers. Our State is large, diverse, and as a rule, rich. It has large areas of both fertile and poor land. Forty thousand square miles of an agricultural region in the east and south countries, being eight times the area of Connecticut, are well developed, with its land ranging from \$75 to \$150 per acre in value. The day of homesteading has long since passed in this part of the State. Now, its landscape presents a continuous view of alfalfa, wheat, corn, and modern farm buildings.

Lying to the north and west of our most prosperous agricultural area are about 20,000 square miles of sand-hill country, covered for the most part with a thin stand of native grasses. I know that 640 acres of the average of this will not support an American family. If this statement is correct, then the Senator who wishes to restrict homestead to 320 acres in this locality is probably wrong. The soil contains little humus; it is not strong. There is a lack of the

necessary elements and conditions for the successful growth of the common crops. Grazing is the leading industry, and for this purpose the region is moderately well occupied, most of the hay flats being deeded land.

The western part of our State, occupying more than 12,000 square miles of the high plains region, is good and bad. It is a place where the influences of rainfall, structure, soil texture, and irrigation water are most marked, and the home of the various forms of reclamation. I can take you to certain localities in this region where good crops of wheat, oats, alfalfa, and potatoes are produced under a low rainfall without irrigation. It is where the soil is close textured and deep. Popularly such cultivation is known as dry farming. Near these fertile places occur sandy soils, underlain by bedrock near the surface, on which crops do not withstand drouth. Some of this land is better adapted to grazing than to any other purpose. Notwithstanding this fact, the native sod on many acres of this strictly grazing land has been turned by would-be farmers. In marked contrast to these high, dry, sandy lands are the many thousands of acres now in successful irrigation, especially along the North Platte.

Gentlemen, it appears to me that our first duty along the line of the conservation of land resources in Nebraska is to obtain a deep insight into the agricultural conditions and possibilities of each of our four soil regions, and that our second duty, sometimes an unpleasant one, is to tell the exact truth of these conditions and possibilities, so that homesteaders and homeseekers, mostly from the East, may come knowingly into their new environs and adapt themselves accordingly. Grave misfortunes result from the settlement of an unfavorable region by an agricultural people. Too many citizens now leave their fertile fields and happy homes, through ignorance and misrepresentation, and find their way to places where the possibilities of disappointment and failure are altogether too great. It appears to me that the Federal Government should investigate and make known both the favorable and the unfavorable conditions that obtain on public domain preceding settlement. And I believe also that each State, in cooperation with the Federal Government, should investigate and publish for the free use of its citizens, something concerning the nature, efficiency, possibilities, and impossibilities of each class of land now occupied, so that farmers may have a proper basis for farm management, leading to the conservation of soil fertility, a thing which is necessary for the future of our agricultural industries.

Having spoken plainly concerning these matters, you will please permit me to say a word on a subject which was discussed at length by the gentleman from Minnesota. It is in regard to the supposed increase in rainfall and the westward movement of the rain belt. This subject comes close home to persons living in western Nebraska. Four times, during periods of heavy rainfall, coming at intervals of eight and twelve years, have the people of Nebraska and adjacent States moved onto high, dry lands, believing in the fallacy of an increasing rainfall. The experiment has proved a costly one, resulting in the establishment of a permanent agriculture only in the most favored places. The facts are, that there is fluctuation in rainfall, but no permanent increase. It returns to about the same mean, if we average the wet and dry periods. However, we have learned that the amount of rainfall is not a complete check or control of

agricultural development. The climate of the soil, not of the air, is more important. This varies with soil type, is related to the quantity of rainfall, and affected by cultivation and the kind of crop. This changed climate of the soil, resulting from cultivation and other conditions, is probably what most people mistake for an increasing rainfall.

Now, the matter of fluctuations of rainfall prevails throughout most, if not all, of the United States, but the effects therefrom are most marked in the drier regions, as in parts of Nebraska, Kansas, Wyoming, Colorado, New Mexico, Oklahoma, and Texas. The phenomenon has a close relation to farm management and to the agricultural practicum on the least drouth-resistant soils of these States. Let us meet the problems of soil conditions and of climate, as such, with a farm management that is suited to the nature of these conditions, for these and other related factors must be reckoned with in the establishment of permanent industry in that part of the country.

As regards conservation work in Nebraska, I wish to state that our governor has decided to appoint a commission to be composed of scientific men actively engaged in a study of the State's natural resources. Most of these men head departments in the State university. They are free from politics and in a position to stand strongly for any policy that may seem best for the permanent good of the State. We propose to work along the line of our leading interests, which are largely agricultural. One of our largest problems appears to be the conservation of soil fertility of the rich farm lands. We expect to investigate soil erosion and to advocate crop rotation. Among our other problems are those of the proper management and utilization of flood lands, steep slope lands, sand-hill areas, bad lands, and the high plains areas. Our farmers begin to realize that they should give more attention to the natural and the proper distribution of forest, grass land, and the cultivated crops if the land resources are to be conserved.

Nebraska is large enough and rich enough in her agricultural resources to stand on her own bill of facts, without any attempt to overdraw her possibilities. Her citizens believe in research. They understand the importance of cooperation and the economic utilization of our national resources, both State and national. To this end they join heartily in the great movement in which we are engaged.

DR. J. T. ROTHROCK, CHAIRMAN OF PENNSYLVANIA STATE CONSERVATION COMMISSION.

Doctor ROTHROCK. I wish to say that the governor of Pennsylvania has responded to your call for the appointment of a conservation commission. There are five of us here ready to cooperate with you in any way that seems possible. But I wish to say, first of all, that this conservation business is not a new thing in Pennsylvania. For more than twenty years the State of Pennsylvania has been on the firing line.

Twenty years ago a forestry association was organized in the State of Pennsylvania. To-day, as a result of that forestry association, we have nearly 1,000,000 acres of land purchased from the citizens of the State and turned over to the State as a forest reservation.

I wish to say the people of Pennsylvania are so thoroughly in earnest about this matter that they have paid more to get that land back in a stripped condition than the State received for it when it was sold with heavy timber on it.

We are in earnest up there. We believe in this conservation work.

I wish to say, furthermore, that we are taking in young men from over the State to make foresters of them. We do not know what their politics may be; we do not care what their politics are. We put those young men through a preliminary examination, first, physically, to see whether they are able to stand the duties of the forest service, then a mental examination, and then at the expense of the State of Pennsylvania we educate them, just as young men are educated at Annapolis and West Point. They are to be the servants of the State. Three years after their graduation they give their time to the service of the Commonwealth. We are in earnest about the education of our corps of foresters who are to care for this state land.

We furthermore recognize that you can not get a people to take up the abstract idea at present of forestry as a thing which is desirable. A great many people do not understand it. A great many do not want to understand it. But we invite the public out into our lands.

There is no prohibition there to keep off of the grass; to keep out of the grounds. We invite them in. You can not get people interested in land, even land that belongs to them through the State, unless they are taken out into it.

We have opened upon our reservation a sanitarium, and this year \$1,000,000 has been invested by the State of Pennsylvania for the erection of a sanitarium for tuberculosis on state ground, ground that belongs to the people of Pennsylvania.

These are just some of the things we are doing there. We have published a little journal in the State of Pennsylvania for over twenty years now. It goes broadcast over the State, and, we may say, almost without subscriptions. It is practically freely distributed.

Mr. President, I do not want to take your time. I simply call your attention to the fact that the State of Pennsylvania is already in line. All its preliminary work is done. Our decks are cleared for action, Mr. President, and we simply await the order to go ahead.

Senator SMOOT. I would like to call the attention of the convention to the fact that it is now five minutes to 5 o'clock, and there are a great many here who may have made arrangements for other meetings, and I would therefore like to move that we now adjourn until to-morrow morning.

The CHAIRMAN. Two or three have been recognized and we might hear from those first. At any rate, I shall ask your indulgence to make an announcement or two before adjournment is taken.

Senator SMOOT. I will withdraw my motion to adjourn, then, for the time being.

The CHAIRMAN. I wish to make two announcements. The request was that the committee consisting of the present governors and the past governors and the governors-elect meet here immediately at the conclusion of this session.

The committee on presentation of the waterway matter to the Senate Committee on Commerce will be appointed to-morrow morning. In the meantime I ask all state delegations to give me the names of their representatives.

I heard from Judge Richards, this afternoon, the only valid reason that has been given in the last two days—the only good reasons—why anybody should have a good opinion of me. I have had far more credit, gentlemen, than ever belonged to any one man, and most of what has been said about me really should have been said about men who have been doing more good work along this line than I have—Doctor McGee, Mr. Price, Doctor Holmes, and Mr. Woodruff, Mr. Shipp, and a lot of others.

They are the men that ought to have had the credit, and not me. Now, it is needless to say that I court your good opinion.

I see but one way that offers a fairly certain route for me to get it; that is, I want you all to meet my mother, and it would give my mother and me very great pleasure if the members of the conference would do us the honor to come to our house to-morrow night at 9 o'clock for a thoroughly informal reception. It is not a dress occasion. I want you to come up there and give her the pleasure of meeting you, and I think I may fairly say, give you the pleasure of meeting her.

I now recur to Senator Smoot's motion. It has been moved and seconded that this conference now adjourn until 10 o'clock to-morrow morning.

(The question was taken and the motion was agreed to.)

(Accordingly, at 5 o'clock p. m., the conference adjourned until Thursday, December 10, at 10 o'clock a. m.)

THURSDAY MORNING, DECEMBER 10.

The conference was called to order at 10 o'clock a. m. by the chairman, Mr. Pinchot.

The CHAIRMAN. Gentlemen, before we proceed with the consideration of the subject of forests, which Senator Smoot, chairman of the section of forests of the National Conservation Commission, is to present, I have to announce the appointment of a committee of this conference to attend the meeting of the Senate Committee on Commerce to-morrow morning at half-past 10 o'clock at the Capitol. I shall ask Governor Deneen, of Illinois, Governor Johnson, of Minnesota, and Mr. William K. Kavanaugh to form the special committee of three which I was directed to appoint. I have received nominations for the general committee from the following States: Rhode Island, New Jersey, Alabama, Colorado, Tennessee, Kentucky, Georgia, Wyoming, Indiana, Pennsylvania, New York, West Virginia, Missouri, Utah, Virginia, Mississippi, California, and Michigan, with other state delegations yet to hear from.

There is a great deal of business to come before us to-day, and I venture the suggestion to the conference, which will do with it as it may please, that you instruct your chairman to limit the speakers to ten minutes. If you do this, I shall take the liberty of disregarding your instructions in the matter of the governors who may address us, but I shall strictly keep everybody else within the limit.

(Upon motion, the suggestion of the chairman was adopted.)

**SENATOR REED SMOOT, CHAIRMAN OF THE SECTION OF FORESTS,
NATIONAL CONSERVATION COMMISSION.**

The CHAIRMAN. I have now the very great pleasure of presenting to you Senator Smoot, of Utah, chairman of the section of forests, who will present that part of the commission's report to you for your consideration.

Senator SMOOT. Mr. Chairman, governors, and members of the state and national conservation commissions: I take it that we are here this morning for the purpose of considering seriously the vital questions affecting the conservation and the proper utilization of the forests of our country. It is a subject greater than any man, greater than any State; it is as great as the nation itself. Every man, woman, and child of to-day, and every one yet to be born, is interested in this great question. You no doubt have noticed that in all the previous discussions of this conference the question of the conservation and the use of the forests has played an important part. In my remarks I do not intend to call special attention to any of the great resources of any particular State, because there is not a single governor here or state representative who could not sing the praises of his own State and speak of the wonders of its natural resources. I wish to present to you and emphasize, if possible, some of the points that have been made in the report of the National Conservation Commission, which report I hope will be approved by this conference and then submitted to the President of the United States.

God has blessed this beautiful land of liberty most lavishly and richly; no country on earth has been given so many natural resources, and it seems to me that in the past we have been lax, indeed, in trying to preserve them not only for ourselves but for future posterity.

Gentlemen, yesterday you heard the report of the committee wherein it was stated that an inventory of our forest resources had just been completed, which is the best we have ever possessed. This inventory is the result of the combined and vigorous effort of all state and federal agencies concerned.

The facts which flow from this great accumulation of knowledge regarding our forests will soon be made common knowledge, as they ought to be. From these facts three great conclusions spring; the first, that the forest problem before the individual, the State, and the nation is grave and urgent; the second, that we can solve this problem if we act unitedly, vigorously, and at once; the third, that if we fail to act, the possibility of a satisfactory solution will be rendered doubtful or even wholly removed. The time is past for us to be content to dabble with the vital internal question which the right handling of our forests presents. It may well be our pride that no nation has a more wholesome and enthusiastic public sentiment for the right use of the forests than our own, but it may well be our shame that no nation takes poorer care of its private forests than our own country.

This is not the time for harsh criticism of the agencies which have brought about the deplorable condition of our forests. But above all it is the time for prompt, effective, and united effort to remedy this condition. The time has long past when the only need for the conservation of our forests was in order that we might fulfill our duty to those who come after us. The time is already here when for our

immediate welfare the conservation of all forests in private as well as in public lands is absolutely essential. Forestry no longer makes its appeal to the American people solely through their sense of public duty. Its appeal now rests upon a firm foundation, not only of public duty, but of urgent industrial and commercial necessity.

I wish at this time to call your attention to some of the special items of that report again, so that you may each be impressed with the importance of this particular fact.

Consider the situation. This nation began with half its area under forest. To-day barely one-fourth of our country is covered by forest growth. Only one-fifth of the standing timber which remains is in public ownership, and therefore belongs to the people. Four-fifths of what remains is in private hands. Year by year we take more and more wood from our forests, and year by year by careless cutting and by fire we lower their capacity to produce again. The yearly production of our forests by growth is 7,000,000,000 cubic feet, a volume of timber so great that the mind can scarce comprehend it; but a volume of timber over three times as large is taken from our forests each year. Nor is this the complete indictment against us as a nation for our misuse of the forest. We invite by overtaxation the destructive handling of forest lands. We should plant, to protect farms from wind and to make stripped or treeless lands productive, an area larger than Pennsylvania, Ohio, and West Virginia combined. But so far lands successfully planted to trees make a total area smaller than Rhode Island.

It seems to me one of the most destructive elements of our forests comes from forest fires, and if the governors can in any way educate the individual who owns the forest upon this point of view, this meeting will not have failed. I was visiting the Appalachian country a short time ago and had the pleasure of inspecting the great Biltmore estate. One of the party asked Dr. C. A. Schenck, the forester in charge, if he had \$5,000,000, the interest on which was to be used by him for the preservation of forests, what he would do with it. His answer was without hesitation, "I would use every dollar of it for a fire patrol." Asked again if he had the interest on \$20,000,000 what he would do with that, he replied, "I would increase my fire patrol just four times."

Since 1870 forest fires have each year destroyed an average of 50 lives and \$50,000,000 worth of timber. Not less than 50,000,000 acres of forest is burned over yearly.

One-fourth of the standing timber is left, or otherwise lost in logging. The boxing of the long-leaf pine for turpentine has destroyed one-fifth of the forests worked. The loss in the mill is from one-third to two-thirds of the timber sawed; the loss in the mill product, through seasoning and fitting for use, is from one-seventh to one-fourth. The damage done by destructive forest insects is enormous and largely preventable. Only 320 feet of lumber are used to each 1,000 feet which stood in the forest.

Nor is the indictment yet complete. By the needless destruction of our forests we impair the value of our streams for navigation, irrigation, water supply, and power. We spend millions of dollars in river and harbor improvements to repair damage which, at the cost of mere thrift and foresight could have been nearly all avoided. We deal with the effects and ignore the cause. We discuss the exact

scientific relation between the forest and the stream, when each year the total quantity of silt carried by our rivers as the result of forest denudation and poor soil management would cover 1 foot deep a surface of more than 900 square miles. In our blindness we have failed to take advantage of the lessons which the history of other nations contains. Most other countries have learned through bitter experience that forests which are not conserved will be used up, and they are taking care of what they have. We are among the last to learn it.

So much for the indictment. Every clause in it is absolutely true. What would you think of the business capacity and the foresight of an individual against whom such an indictment might justly be read? So much for where we stand. Now let us consider what must be done, and where we might stand if it were done.

These are the things which we must do; they involve no intricate machinery of law or practice; they are simply incontrovertible conclusions based upon the conditions which now exist and which must be remedied: First in importance is the conserving of forests in private lands. Private forest owners, which means 3,000,000 men, and individual forest users, which means everyone, must practice reasonable economy in the woods in logging, in milling, and in the use of timber. Above all they must protect their forests from fire. This they can do at an annual cost equal to one-fifth of the damage forest fires do each year, not counting injury to young growth. And it is this young growth which, if preserved, would grow a constant supply of timber for those who come after us. I do not ask of the private owner and user that he apply any economy which is not entirely practicable, and which does not mean present as well as permanent profit. I ask only that he protect his forest from fire, that he log it conservatively, and that he plant uplands suited only to forest which have been so denuded of trees that they now fail even to pay the taxes levied upon them. To justify private owners in applying those measures, two main conditions are necessary, both of which exist to-day: The one, a knowledge of the central fact that these measures are needed and that they will pay; the other, the availability of knowledge as to how these measures may best be applied. If anything I could say to the governors to-day that seems more important than another, it would be to return home to your States and educate the people.

One of the urgent tasks before the States is the immediate passage of tax laws which will enable the private owner to protect and keep productive under forest those lands suitable only for forest growth. In our discussion in committee meeting there was a question raised by a member present as to this recommendation, claiming that it would encourage great monopolies in securing larger holdings of timber, if an annual tax was not required on the timber itself. I have studied this question in foreign lands, particularly in Germany and Switzerland, and I find that the result has been exactly the opposite. It does seem to me that the great monopolies that control vast tracts of our timber land can much better afford to pay an annual tax on their timber than can the individual man with scanty means at his command who believes in reforestation and upon whom such a tax would be a burden so great that it would be almost

impossible for him to carry it. I believe, with all my soul, in the tax laws as recommended in our report. It is a shortsighted policy which invites, through excessive taxation, the destruction of the only crop which steep mountain lands will produce profitably. Taxes on forest land should be levied on the crop when cut, not on the basis of a general property tax—that unsound method of taxation long abandoned by every other great nation.

Another urgent task before every great forest State is not only the passage of adequate fire laws, but their actual enforcement. More is needed to protect the forest from fire than a law upon the statute books. It requires the definite commitment of all the States to their inherent responsibility for the protection of the forests within their boundaries from fire, and that entails, and absolutely entails, the employment of a trained force whose first duty is fire patrol. A few days ago I heard a very prominent gentleman from West Virginia testify before the National Conservation Commission that the forest fires of West Virginia alone this year have cost that State, in the loss of timber, \$5,000,000. A fire patrol that would cost the State of West Virginia \$100,000 would be ample to protect that State against forest fires. Think of it, gentlemen, the loss in this one year in the State of West Virginia was sufficient to patrol that State for its protection against forest fires for fifty long years.

The nation, through the Federal Government, confronts the urgent duty of conserving all, not merely a part, of the public forest lands by use. Until this standing timber is adequately protected and conservatively used, not only as at present on national forests, but on all other public forest lands as well, its very existence is imperiled. Grave injury has already been done. It would be a national disgrace should it continue.

I have recently visited that great and beautiful forest region which lies within the southern Appalachian Mountains, and I have this to say regarding the proposed purchase of a small portion of it by the Federal Government for the permanent use of the whole people. I believe as firmly as I believe that I am standing here on this platform that unless adequate action is taken, and taken soon, the destruction now going rapidly on in the Appalachian Mountains will either become irretrievable, or retrievable only at an expense so vast in time and money that it would stagger this nation. I do not believe that it is necessary or advisable for the Federal Government to acquire all mountain forests in this region, nor half of them, nor a fourth of them. The purchase of one-twentieth of these mountain forest lands; their protection from fire, and their conservation by use, would solve, and solve satisfactorily, this grave and urgent problem. But this entails, as every other effective national measure for the preservation of the forest entails, for its success, the cooperation of the State concerned, through fire protection, and of the private forest owners concerned, through better handling of forest lands in private ownership.

These are the incontrovertible conclusions which flow from the knowledge of how we stand along main lines with relation to the forest. Unless we do these things our forests will inevitably fail, and the failure of our forests means the erosion of soil upon the mountains and a falling off in the usefulness of our streams. Action upon each of these conclusions requires no vast expenditures, no upheaval in present economic conditions, but merely the exercise of reasonable

foresight and thrift by individual forest owners and users, by all the States, and by the nation. No one of these great agencies can alone solve our forest problem. They must work together, unitedly, vigorously, adequately, and at once. If they act together and now, we need not worry greatly about our future timber supply. If they fail to act, it will mean inevitable and grave timber scarcity in the near future and actual timber famine for those who come after us.

We can no more disregard in our use of the forest than in our use of the mine, of the stream, and of the farm the fundamental truth that want follows close upon the heels of waste. But we should be thankful as individual forest owners and forest users, thankful as individual States, and thankful as a federation of States that the time for the application of an adequate remedy is not wholly past. Grave injury has been done to our country, which can not be repaired in a year, nor a decade, nor wholly effaced in a century; but the fact gained by our present inventory, above all other facts in importance, is, that if we act at once we still have forest enough left to produce, under right management, at least what timber we need.

The cause of practical forestry is a just cause. On the one side are established habits of wastefulness and of misuse; on the other side is the doctrine of common sense, of business sagacity, of public duty. Because I believe in the American people, I believe that they will follow the right course and turn away from the wrong in this, as in all other crucial questions upon which depends the permanent welfare of our country.

MR. ROSEWELL PAGE, OF VIRGINIA.

The CHAIRMAN. I will now call upon Mr. Page, of Virginia, for a statement of Virginia's views upon the questions we are considering to-day.

Mr. PAGE. Mr. Chairman and gentlemen, members of this conference, I want to say, as the representative of the governor of Virginia, how sorry he is not to be present at this great conference; but certain engagements, which had been made previously, prevented his being here, and he has done me the honor to send me here to represent him. I desire to say, as a representative of old Virginia, that on yesterday I was a little aggrieved at the tone which was exhibited by the governor of the great State at the mouth of the Mississippi towards the statement made by the governor of the great State at the head of the Mississippi. I felt as if I had a right, coming from old Virginia, which has had such an interest in those two great States, a historical fact to which I need not further refer in this presence, to say, "Remember that ye be brethren." I felt, furthermore, that I would like to say in behalf of this great conference that it would probably be apt if we could understand that each in speaking of his State is a little inclined to be as an old friend of mine said about another friend of mine, "a little paradeful." Therefore I thought it would be just to say to the distinguished governor of Louisiana that I think he was almost as exuberant with reference to that salt and that sulphur of his State as was the governor of Minnesota with reference to the iron in the Mesabi Range.

I am informed of the fact that to-day the subject is that of forests, while on yesterday the whole range of sky and earth and under the earth was taken when the subject was lands. I think to-day,

inasmuch as we only have ten minutes—at least those who are not governors—perhaps we will have to stick to our text. You will remember the old story. Down in Virginia—I have told this story before—an old colored man was asked if he were a preacher. He said “No, I am a ’zorter.” Being asked what he meant by an “exhorter,” he replied: “If you are a preacher, you have to stick to your text, but if you are a ’zorter, you can branch.”

The governor of Virginia has already appointed a distinguished commission. I shall not undertake to give to you the result of the work of that commission, but it will be furnished to the chairman of this conference in order that it may have a fit place among the records of this meeting.*

I can simply say this, that I am perhaps one of the few delegates to this conference who really, from necessity, should be an expert on forests, because I live in the woods. I consider it a great fortune to be able to-day to do that, and I also can say to you that there is great need of the preservation of the forests. I have known it to be the case that an acre of fine walnut timber has been cut down in the mountains of Virginia to enable them to sow buckwheat, and I am reminded of the fact of a distinguished friend of mine who, after forty years, took his wife on a bridal trip and they came to one of the great cities. A young furniture dealer was showing them his stock of furniture, in the hope of making a sale. He said, “This is solid walnut, and that is solid walnut, and this is solid walnut,” and the old gentleman did not seem to be very much impressed by it. The furniture man seemed somewhat surprised, but was overwhelmed when the visitor said: “Look here, young man, by God, I come from a country where folks make fence rails out of walnut.”

You can not make fence rails out of walnut now, but I have knowledge of a telephone line where some of the telephone poles are made of black walnut. Some day some man will come along and buy up that telephone line, but he will not do it because of the money he will make off of the wires, but because of the value of those poles.

I have simply risen to tell you that the governor of Virginia has appointed a State conservation commission and to say that he bids me express to you the fact that this conference can rely upon him to do whatever is within the power of the State—and I think there is great power in the State. As a member of the general assembly of Virginia, I think there is great power in the State for good along the lines for which our distinguished chairman has so well, to use a forestry term, blazed the way.

MR. WILLIAM E. MULLEN, OF WYOMING.

The CHAIRMAN. I take pleasure now, gentlemen, in introducing to you a representative of the governor of Wyoming, Mr. Mullen.

Mr. MULLEN. Mr. Chairman, ladies, and gentlemen, I appear at this meeting as one of the younger States, or rather as a representative of the governor of one of the younger States. I do not know whether our governor was one of those who, having attended the White House meeting last May, concluded that it would not be a

desirable place for future residence. At any rate, he has asked me to appear here and represent him as best I can.

The more I hear of this question of conservation the more deeply I am impressed with the magnitude of the question. Therefore, I do not believe that it would be profitable for me to indulge in a discussion of the local question as applied to our State. Better perhaps to discuss the question in its larger aspects. But there is a thought that I desire to bring before you now, and that is the application of a national policy of conservation in its relation to the settlement and development of the newer States. We have heard a great deal about the older States. Some of them have been held up before us as horrible examples of waste and destruction of natural resources. We of the new States, with undeveloped resources, indulge in the hope that we have a brilliant future before us, and are not in the position of the man described by one of our humorists as a person having a brilliant future behind him. It is perhaps to the advantage of the new States that the idea of conservation has been suggested before they have fallen into the errors of some of the older States in the waste and destruction of nature's bounty.

If you will bear with me for a moment, I will call your attention to a map. This is a map of our State. The green space indicates forest reserves territory; the blue space represents coal lands classified and withdrawn; the yellow represents Indian reservations; the upper corner here represents the Yellowstone National Park; the space in red along the streams represents land withdrawn for purposes of reclamation under government irrigation works.

In the first place we who now reside out there do not assert a claim to all of the unoccupied territory in Wyoming. We have in the State approximately 125,000 people at this time. We have a vast public domain that belongs to the people. It belongs to all of the people of the United States, and we hope that many of them will come to reside in our State in the near future. What I have to say, therefore, refers to the conservation question in such a way that I hope it will appeal to all of you.

The most important thing to insure the success of the conservation movement is, in my judgment, that of state cooperation in the classification of natural resources. I say that for the reason that I have been reliably informed that at least 75 per cent of the territory indicated on this map in blue as coal lands have been classified tentatively by a hurried examination of the surface made by the Geological Survey. It is the opinion of practical mining men that fully that percentage is of no practical value for coal-mining purposes. The opinion may be erroneous, but it is as likely to be correct as any of the conclusions arrived at by a mere examination of the surface. It is not actually known what per cent of this area is valuable for coal-mining purposes, and it will not be known until the lands have been explored by prospecting beneath the surface. And while there may be uncertainty as to the value of these lands for grazing and agricultural purposes under what is known as, in the West, dry-farming methods, and which may be carried on wherever the mean annual rainfall equals 16 inches, many persons have filed claims and settled in this region. Therefore I would suggest, in connection with this question, the great advantage of having local people, who are familiar with the conditions there, who understand

soil conditions, and know something of the value of coal deposits commercially, to assist in the classification of coal lands, to the end that the greatest good for the greatest number may be accomplished, as I understand that to be the ultimate aim of the conservation idea.

There is no reason why this great territory should be withheld for coal mining if it be in fact more valuable for purposes of home making. The same is true to some extent in the case of the forest reservations. About one-ninth of our state territory is within national forest reserves. It is nearly all comprised of mountain lands situated at an altitude of from four to ten thousand feet, and much of it is really not valuable for forest culture for the reason that it contains a growth of lodge-pole pine, willow brush, and grass. Forested areas exist in the upper regions, but forest growth is exceedingly slow in high altitudes for the reason that the growing season is short, and it is said to be a fact that trees grown under such conditions produce a grade of lumber much inferior to that grown in lower altitudes.

Then, as to the real and effective work to be carried on for the preservation of timber, I fully corroborate what has been said by Senator Smoot on the general question of waste by fire. While it is true that a considerable percentage of waste occurs around sawmills and that the breaking of log booms on streams results in much loss where logs pass from control and find their way to the sea, the destruction by forest fires far exceeds any of these, and the loss from forest fires has been appalling. I believe that in our State a careful examination will show that where 1 acre of timber has been depleted by cutting for useful purposes, there have been at least 20 acres swept away and destroyed by fire. Long before the creation of forest reserves at all, vast areas of splendid timber were so destroyed, and it presents a sorry spectacle to witness hundreds of acres covered by dead timber strewn in every direction. Careless campers, travelers, and others, passing through the forests, leave smoldering campfires behind them, which are fanned into flame by the winds, and great forest fires result. Too much emphasis can not be placed upon the necessity of a vigilant fire patrol. More can be accomplished by preventative measures than by organizing to fight fires once started. It is a matter that ought to receive careful consideration.

It is the intention of the governor of our State to urge the passage of a law creating a state conservation commission, with full authority to cooperate with the federal authorities on all questions relating to the conservation, care, and administration of our natural resources. It is our belief that many of the errors which have occurred in our forest administration are the result of misunderstandings and errors of judgment on the part of the ranger, whose duty it is to deal with conditions at first hand.

Therefore, Mr. Chairman, it is a pleasure to give assurance to you of our intention to inaugurate at a very early date a state policy of cooperation which we hope and believe will operate to the mutual advantage of all.

I thank you, gentlemen.

The CHAIRMAN. Gentlemen, I want to emphasize just as strongly as I can what Mr. Mullen has just said about the necessity for cooperation between government organizations, state organizations, and individuals in all matters relating to lands or any other resources,

forests, waters, minerals, or anything else. One of the essential things this conference ought to bring out is the absolute necessity of our stopping each playing alone in his own yard and getting together in one yard.

It gives me great pleasure to announce at this time that we have with us a representative of one of our neighboring governments, Senator Edwards, of Canada, whom I now present to you for an address.

SENATOR WILLIAM C. EDWARDS, OF CANADA.

Senator EDWARDS. Mr. Chairman, ladies, and gentlemen, this is the first time I have ever appeared before an audience of the great Republic of the United States, and it gives me great pleasure, I assure you, to do so on a subject which is very near and dear to me, that of the conservation of our natural resources.

I am here at the instance of the government of Canada, a government having the kindest feelings of regard for everything which means the promotion of the good of the great United States.

Before leaving Canada I asked his excellency, the governor-general, "Have you anything to suggest to me about what I shall say or to which I shall particularly refer?" He said, "No, further than to join with that great and progressive man, Mr. Pinchot, in promoting the object which he has in view in this gathering."

Before I overlook it, in the short time I have to address you, I wish to mention now that I also asked our prime minister if he had anything special to mention. "No," he said; "I think you are full of the subject upon which you are going, but there is just one thing on which it would give me great pleasure, if the congress which is to meet in Washington on the conservation of natural resources would pass a resolution suggesting that the Government make most stringent laws with regard to railways in their prevention of fires, for in my opinion they are great disseminators of forest fires." His reason for making that suggestion is that if it should come authoritatively from this source he would have it in his hand as a lever to enable him to pass a similar law in Canada.

I wish before proceeding to congratulate, in the most hearty terms, your President and your worthy chairman for what they are doing in this respect, in the promotion of the conservation of the resources of your great country. I have heard, during the speeches and presentation of the many addresses here, matters which interested me intensely. I am greatly repaid for coming here, if to have heard nothing at all but the presentation of the first report and inventory of your natural resources, and I would have gone many, many miles to have heard it and many miles to have heard many of the other speeches, particularly the one from the gentleman from Colorado [Mr. Richards].

The question this morning is that of the conservation of your forest resources. Like ourselves in Canada, you have been prodigal with your resources. You have unduly destroyed that great resource, and so have we. A speaker a short time ago said, however, that twenty times as much had been destroyed by forest fires as ever was destroyed by the lumberman's ax. I subscribe to that. That is my opinion. Therefore, the greatest means of preventing that great destruction is the prevention of forest fires.

What is the meaning of preserving our forest resources? Not only the conservation of that very useful product for the people, but also the conservation of our waters for power and the many other purposes to which water may be applied. In Canada we are devoting ourselves to-day to the same objects to which you are devoting yourselves, aided and promoted very largely by our friend the chairman, who occasionally visits us in Canada on this very important subject.

We have heard something of your inventory in other resources, as well as those of lumber. Your country of course is a very large one and your resources in respect of lumber have been greater than ours, but to-day we are supposed still to have 535,000,000 acres of forest lands. Out of this quantity of forest lands, the government has set aside, as forest reserves, 121,000,000 acres. I do not know how that compares with yours, but I will say this: Thanks to forestry, thanks to the initiative which has taken place with regard to the conservation of our resources in that respect, if Canada takes the lessons that it should take from such gatherings as this, and even at this late day awakens to the necessity of conservation and promotion of forestry, Canada, in so far as her own needs are concerned, need never want for a supply of timber. I am not of the opinion that Canada can be a large exporting country for many years to come, but it will be a great thing for Canada if she is able to conserve lumber for her own needs. Let us hope that the great American Republic will do the same thing, and I believe it will do so, if regard is paid to the lessons which are here taught, if the country becomes imbued, as I hope it will, with this great necessity; and if this comes about, I think possibly the United States also need never want for a lumber supply.

In listening to the speeches that have taken place here, two things have very forcibly been impressed upon my mind. I never thought before of the important part water may take in the conservation of your coal supply and in the conservation of our coal supply. Our coal supply and your coal supply may become exhausted. Your iron and our iron may in many years become exhausted—however, we also have a great supply of those two articles—but our water supply, if we preserve the headlands in our forests, never will become exhausted. We are doing exactly what you suggest; we are beginning to impound our headwaters to conserve our water supply. If you do what you can do in that respect, look at the great possibilities that there are of to-day beginning to conserve your coal, which is a disappearing quantity.

Another thing which impressed me was what are we going to do when our iron supply becomes exhausted? I was a little surprised to hear that in the middle of the present century iron, as used to-day, of the quality used to-day, will become exhausted. To my mind there is one article that can be considered in the way of conservation of iron ore to a very great extent, and that is the use of cement. I am a lumberman, and a lumberman on somewhat of a large scale. I do not build one single structure to-day of lumber. Every structure that I build is of concrete and steel—largely of concrete. I built a large mill of concrete this very summer, and built a very large factory establishment also, all of concrete. It sounds strange for a lumberman to advocate anything of the kind, but I am one of these lumbermen who believes strongly in the conservation of our forests.

Just before I part from you there is one thing I desire to say to you. Canada has the advantage—and I am surprised to be in position to tell you so, and you will be surprised to hear it, many of you—Canada has the advantage of having secured a large portion of her lumber supply this year from the United States. I am a lumberman, and it sounds strange to come from me, but I want you to send it on. Keep sending it to us. Our timber will grow in the meantime, and we will profit later on.

Gentlemen, I thank you very much for your attention.

MR. FRANK H. LATHROP, OF ALABAMA.

The CHAIRMAN. I will now recognize Mr. Lathrop, of Alabama, for a short address.

Mr. LATHROP. I am living in Alabama, but was reared in Michigan. My mother was a Canadian, and I can appreciate the remarks of the gentleman who preceded me. I come here, ladies and gentlemen, representing the governor of Alabama in forestry, not in politics, because our politics differ. I do not want to be misunderstood on that question.

On September 23, 1908, in the midst of the presidential campaign, I was notified by the governor of Alabama that I had been appointed one of a committee of five to gather statistics and help compile an inventory of the natural resources of the State of Alabama, in line with and in compliance with a unanimous agreement of a conference of governors of the several States made in Washington, D. C., in May preceding of this year.

After November 3, and as soon as I could get my business matters in line after more than two months of inattention, I became convinced that the subject assigned to me, namely, the timber resources of thirty-five north Alabama counties, would be a Herculean task to form a correct estimate of, in a most crude manner, to say nothing of taking a correct inventory of same, to use the words of our correct and business-like governor, who prides himself on his knowledge of business details as well as the name and residence of every new married couple living on the hills of north Alabama, in whose homes and families his face and name are as familiar at this time as is the family Bible, or more so.

Now as to the inventory, or more commonly called "estimate of timber," to use a lumberman's phrase. I find on consulting the highest authority, such as the editor of the recent Lumber or Timber History of the United States, and some of our largest timber or lumber manufacturers, that the heretofore basis of inventories on this asset of the Commonwealth of Alabama is entirely at fault as to the present status of the case. And to sum up the matter, and at the same time sound the warning that has already been voiced by our national forester, Gifford Pinchot, I am compelled to indorse his statement that our forests are not only being denuded at a rapid rate, but also that I do not find over 10 per cent of the original forest now standing in north Alabama. And while more than three-fourths of the territory above described contains a good growth of wood and timber, much of which is what is termed "immature," trees that would become mature in a period of from ten to twenty-five years, if the present condition of said forests could be conserved and protected

from the wholesale cutting and denuding process now in vogue by the owners of said lands and timber rights. Also, said timber in various stages of maturity could be made a continuous source of income and profit if a system of cutting the same could be inaugurated similar to the methods of forestry now being protected in the older countries of Europe and in Germany, namely, the methods of marking and cutting trees only that have attained a certain size, and the caring for the children of trees that are immature and under size and age. It would seem that this plan should appeal not only to the general public but also to the owners, when it is demonstrated that the natural growth of small timber trees is greatly accelerated by the thinning-out process, and at the present time, under favorable conditions, amounts to more than \$1 per acre per year on reasonably well-wooded land.

I submit herewith my deductions of the entire acreage of 35 counties in north Alabama and the entire amount of commercial timber acreage. Possibly one-third of said timber of acreage showing wood will be cleared and put in cultivation or pasturage during the next six to ten years. The balance, or one-half the lands in said territory, is unfit for cultivation, and can be treated by forestry methods if the denuding methods now going on at a rapid rate should be changed to a more reasonable system of cutting with a view to preserving the future forest area of the State, and the maintaining of a constant and maximum amount of matured annual growth of timber that will command the highest values in lumber and by-products, such as wood for fuel and farm purposes taken from the timber cut and utilized to its fullest extent.

I have submitted to the chairman certain estimates made after my twenty years of observation and operations in manufacturing the timber of north Alabama, which are, in my judgment, not underestimated as to the amount of standing timber that, in its entirety on all the territory, will make lumber of all the forty or more grades and sizes, while the manipulations of grades and sizes of lumber can be added to by using the small trees. As a rule, the matter of cutting small trees is simply a matter of turning a day's value of work into a dollar without profit, hence is termed in lumber terms, "simply a bread and no butter business." That should be a strong appeal to a more liberal and philanthropic method of treating one of the main, if not the main, assets for conservation, of one of the main resources of the State, keeping ever in mind the great fact that the life of the State and nation depends absolutely on our material resources and the conservation of said resources.

MR. ANDREW CARNEGIE.

The CHAIRMAN. Among our distinguished guests to-day is one whom we all know, and from whom we shall be glad to hear. I refer to Mr. Andrew Carnegie, whom I now take pleasure in introducing to you.

Mr. CARNEGIE. Mr. Chairman and gentlemen, circumstances over which I had no control have prevented me from being with you before. I want to tell you how enthused, how elevated, how delighted, how instructed I have been by this meeting. I have not enjoyed a morning like this at a meeting for a long time, and I will tell you why.

The great obstacle to the reforms for which we work to-day, the conservation of our resources, lies in a federal system of government, the General Government. None of us would part with that. The relation of the Federal Government to that of the States is a matter of decided importance, of course. That relation should continue. We must have it. The great obstacle to-day, as you see, is to get the States and the nation to work together. That is the one obstacle we must overcome. I told the waterways commission a story to show how rapidly we are advancing and sinking—not obliterating the State into the nation. We are all members of one or other of the States, Pennsylvania, Alabama, South Carolina, Virginia, Minnesota, or another. But we are something higher and wider. We are all Americans! Let us remember that.

I asked Mr. Blaine once, "What is the most effective speech you ever heard in Congress?" "I will tell you," he said. "It was the first time that it was proposed to appropriate national money for fresh-water improvements, and the House became excited and angry. Governor Ritter, of Pennsylvania, had been elected a Member of Congress. He had never spoken before, but to the astonishment of the Speaker the old gentleman arose. The House hushed in a moment. Every one wondered 'What is coming?' Governor Ritter said:

Mr. Speaker, I do not know nothin particulars about the Constitution, but I know this: I would not give a cent for a Constitution that would not wash just as well in fresh water as it did in salt water.

The House did what you did, gentlemen. It burst into one storm of applause, and that bill was passed, and that is the foundation of our whole fresh-water improvement today. Go on in that direction. Let us go further and further and all will be well.

I wish to say something to the gentleman from Canada. I am a broad American. No lines confine me in that respect. The city of Winnipeg has a library I gave. They founded a historical society, and the first honorary member was your humble servant. I wrote them telling how delighted I was, first, because they were Scotch, and, second, they were our great neighbors; and they were going to record their history as they made it—they were up to date. Then I said that I always felt that Canada occupied with reference to the United States the proud position that Scotland occupied with regard to her southern neighbor, England. Scotland, through its King, annexed England and has ruled it ever since for England's good.

Now, that is the destiny that I predict for North America. Canada will play the part of Scotland; she will annex her southern neighbor and do it incalculable good in giving us more of the strain of that invaluable element which has made North Carolina and South Carolina and not a few other lands so great, the Scotch.

Gentlemen, that is all I wish to say to you, but remember one thing—and it is an audience like this that should hear it—you are loyal people of your States, but thank God for this, that even above your love for your State you have the greatest empire that ever the sun shone upon and you are progressing splendidly, marching forward rapidly. You people here, you ardent reformers, and you, my dear friend, Mr. Pinchot, think we are not marching fast enough. We are driving pretty fast, gentlemen; we are driving well, and there is no limit to what this great continent is to be in the future. Good morning.

The CHAIRMAN. I have one other request to make of the gentlemen who have asked for recognition. I see that Governor Pardee, of California, has come in, and I know as governor he ought to have the right of way, even though he is not the actual governor for the moment. I am sure we shall be glad to hear him.

EX-GOVERNOR GEORGE C. PARDEE, OF CALIFORNIA.

Mr. Chairman and gentlemen, I hope you will all agree with me when I say that three Presidents of the United States stand out head and shoulders above their great fellows: Washington, who created this great nation; Lincoln, who saved it; and Roosevelt, who has done so much to perpetuate the comfort, the progress, and the prosperity of our people and the very perpetuity of the nation itself.

A nation such as ours, with all the great resources that have been and still are ours, can not help but be great. But if these resources be wasted this nation, like others that have gone before it, must crumble and fall into dust. You will remember that in the days of Him who was crucified the Holy Land was a densely populated country. Those of you who have traveled in it in these later days have seen how barren and droughty it is. In the old days its mountains and its hills were covered with forests. Those forests have disappeared and the land, barren and dry, supports only a scattering population of shepherds and nomads.

China in its day was densely forested in its mountainous regions. Every tree of those forests has disappeared. The rivers of China run riot, destroy thousands of human lives every year, and the land is arid because the people of that country have destroyed their forests.

A portion of Spain in the olden days was densely populated by a prosperous agricultural people. They cut from the hills the forests, and those valleys, once fertile and supporting a dense population, are now droughty, arid, and torn by the floods of winter and spring.

Portions of our country have suffered the same fate, and it lies in your hands, gentlemen of the States, it lies in your hands to cooperate with the National Government in order that those forests may be saved and the future prosperity of our children and our children's children may be preserved, in order that the nation may continue to be one of the great, if not the greatest, nations on the face of the earth.

We put on the uniform; we shoulder the musket; we follow the flag in times of war and do not hesitate to suffer and die for the benefit of our country. There are greater problems and crises than those of war. They are the crises and the problems of peace. One of those crises now confronts this country, as we of the West know better, perhaps, than you of the East and South. That crisis is of the greatest importance for the present and the future. It has to do with the salvation of the country through the salvation of its forests, and the salvation of those other great natural resources which have made and are making now, and will, if we save them, continue to make us great.

And that, as has been so well said here upon this floor, can only be done when the people of the States remember that, while the States

are great, the American Republic is greater than them all—greater because the States could not exist free and independent without the nation.

MR. POWELL EVANS, MEMBER OF THE PENNSYLVANIA STATE CONSERVATION COMMISSION AND REPRESENTATIVE OF THE AMERICAN AUTOMOBILE ASSOCIATION.

Mr. EVANS. Mr. Chairman, speaking as an appointee of Governor Stuart, who could not possibly be here, it is the feeling of our state commission that we should like to return with more instruction as to the practical things for us to do as the commission of the State of Pennsylvania.

I called attention to this matter this morning in a resolution which was submitted to one of the members of the committee on resolutions, and he suggested that it be presented here now.

We understand, especially those who were here last May, as I was fortunate enough to be, the necessity of coordination in state work through this National Conservation Commission, but we are somewhat at a loss, as a state commission for the State of Pennsylvania, as to the practical form this effort is to take.

Our thought is that if we had a schedule of the necessities that each State now knows it has within its borders in line with this general movement; of the points at which national bodies asked here as conferees touch with this general movement; of the particulars of the conclusions of the commission itself, it would give us a bird's-eye view of the great conservation movement in its entirety for the United States, from which we could pick out the proper work to be done within our own borders.

Is it in order to read this resolution?

The CHAIRMAN. I am afraid that the chair will be obliged to rule, in accordance with the expressed will of the conference, that all resolutions must be referred to the committee on resolutions without debate. I am sorry that that must be my ruling, but I have been so instructed.

Mr. EVANS. I am sorry. I want to say one word here on a matter which is at present of importance in the State of Pennsylvania and to the American Automobile Association, and that is on the subject of good roads.

As I understand it, good roads are now supported in a measure by forest revenue in some States. The State of Pennsylvania is behind in that movement. I do not want to be considered as pleading for a special interest here in behalf of the American Automobile Association. Its work in this direction is in entire accord with the National Grange, a national organization comprising a million farmer members all over the United States. It is working in accord with the Good Roads Association, another body of private citizens.

We have in this country only about 8 per cent of our road systems that are improved comparably with any one of the western European countries.

It is proposed in our State, we hope in ten years, to spend something like \$50,000,000 on that work.

The State of New York is now spending \$5,000,000 a year—\$50,000,000 totally.

The State of New Jersey has been doing the same work.

A convention of six governors and their advisers, in New England, recently met largely to consider this question. The difficulty is that unless the movement is coordinated through some such agency as this the money is not properly spent when it is provided. There is not a uniform knowledge of how to build good roads in principle. The practice must vary with the minerals and with the character of the soil. There is no uniform legislation regarding road use. It is the feeling of this body which I represent that it is strictly within equitable and constitutional limits that interstate travel over highways should be governed by interstate laws, and not by a different law in every one of the 45 States.

A farmer of the borough of Sewickley, in the State of Pennsylvania, once told me that he "did not object to using four horses to pull a load of milk up the hillside in winter, but it was going too far to use four horses to pull the load down the hill." That is the condition of much of the highway all over the United States.

I hope to see this commission come in touch with the practical necessities of the people in many phases of economic work and thrift like the above, which do not lie strictly within the borders of the great subjects of mining and forest preservation, however important they may be.

I thank you.

COMMISSIONER JAMES S. WHIPPLE, OF THE STATE OF NEW YORK.

Mr. WHIPPLE. Mr. Chairman, ladies, and gentlemen, I am so very much interested in the preservation of the forests of the country that I am not willing that even roads shall interfere with it.

I am very much in doubt whether a plain, practical man ought to take much of the time of a convention like this where there seem to be so many scientific men; but to me it has always seemed that what we call in western New York "common horse sense" is so much better in working out a difficult problem than, sometimes, technical knowledge alone is, that perhaps you can stand for a little just now.

Forestry in this country is very young—practical forestry.

I have listened here for two days, and I listened last spring at the other conference for two days, to splendid things said and great thoughts propounded; but very few men have suggested remedies that seem to me we could apply and do something.

The paper on forestry read this morning is a fine report, but I have to say, Senator Smoot, that you left out the one great, important thing, and I hope you will pardon me for saying it—

Senator SMOOT. Certainly.

Mr. WHIPPLE. You have not said a word about how to reproduce forests, practically.

Now, it is all nonsense to talk about our having forests enough by natural reproduction, and you all admit it. You may say that we are cutting off our forests, some of you say this, three and a half times faster than nature produces them. If that is true, that is the whole proposition, is it not? How long is it going to be before you have no forests, however carefully you handle them?

The gentleman from Alabama thinks that they have forests enough, if practically handled, to take care of the interests down there for some time; but do you not know that we are cutting 40,000,000,000

feet, board measure, each year out of the United States forests, and that 1,500,000,000 feet of that are taken out of my own State's forests? If you will look at the charts you will see that that is a small part of it when we consider the loss by fire and insects, yet that is more than three and one-half times the growth. If you admit that fire is sweeping away more than you cut, and one-third of what you cut is loss, and your population is increasing so fast that in fifty years you will have 200,000,000 people in America, and the demand for timber is increasing faster than your population, and the supply is decreasing much faster than either, what are you coming to in America? The questions I am asking are, what are you going to do about it? How are you going to prevent it? What are your remedies? No one has told us.

You are using 2,000,000,000 feet, board measure, for newspapers alone.

In the State of New York there is standing to-day only about 41,000,000,000 feet of saw timber. We are cutting it five times as fast as it is produced. The State owns 1,600,000 acres of that timber land that must be deducted from the calculation because of our constitutional provision. What is our situation? In twenty years, at the rate we are going, not one sawing stick will stand in the State of New York; and we are getting 85 per cent of our pulp wood from Canada, even if our good friend does insist that some lumber goes back to Canada.

What is the remedy? That is the question. We can not take it out in resolutions and talk; we will have to do something.

We have got to get out, every mother's son of us that has an acre of land that is not good for agricultural purposes, and plant trees. It won't do to set it aside to the National Government and the States as forest reserves alone; we must economize in every way possible; but, above all, we must plant trees.

Germany has planted trees for a thousand years, and all of its forest is a planted forest. The German people produce 100,000 feet, board measure, all told, upon a single acre. The best timber in this country, east and south and west, until you get to the great trees of the far West, will not run over 20,000 feet to the acre. We have got to be practical; we have got to use this common horse sense. What ought you governors to do? Allow me to speak just as plainly as I can, in the western New York way. Go home and establish a commission, if you have not done it already, and put a Pinchot at the head of it.

Then furnish it money, and don't get down on your knees, or anywhere else, and implore the National Government to set aside some state land in a national forest; do it yourselves. You may kneel at this shrine for years and you won't get it done. The way to do it is to do it yourselves. It is in your own hands.

Get a little state forest preserve, and then handle it in a practical way. Don't do it as we are obliged to do under the constitution of the State of New York; that is, let it stand there and rot and burn up, and we not able to take out a single stick. We will have to amend our constitution.

Be practical about it! Then build some tree gardens and put your last dollar into it, that you can raise. Plant every year some millions of pine trees. Hard woods reseed themselves; they come up

from the sprouts; but the coniferæ in this country must be planted, as every practical man knows. You sweep away a pine, spruce, or a hemlock forest and it will never grow again; those trees must be planted. In Canada and some other places they do reforest pretty well, but not in our country. Be practical. Don't do so much wishing and resolving, but do business.

The next thing you want to do is to go among your people; go out as missionaries among the people. Do not get it into your heads that all of our people, not even our legislators, know about this business, for they don't know about it. None of us have known much about it except for a few years.

Just think! In 1885, in the State of New York, the first commission in the United States was organized. At that time not one single educated forester lived in the United States that anyone knew about; not one forestry school existed at any college of the United States. Twenty-three years! It took us twenty years to do the preliminary work, and it is only within the last three years that we have aroused the whole people in the State of New York. How did we do it? We got out among them at their homes and made speeches; told them of this wonderful cut of timber and the great amount it was over the natural reproduction. We told them of the history of China and of France and of the other countries where their timber has been swept from the hillsides and the land denuded and made worthless for agricultural purposes, as the governor from California told us a moment ago.

The CHAIRMAN. You have two minutes more remaining.

Mr. WHIPPLE. I wish I had thirty minutes more, to get some practical things into the heads of the members of the congress. You can not have a country worth living in without forests, and the proof of it is the history of the whole world. You cannot have your water running in even flow from the uplands without forests.

You are talking about conserving forests. New York City is spending \$150,000,000 to build a reservoir at Kingston to get water for the 4,000,000 people in the city of New York. If New York City does not protect the trees upon those historic hills, the Catskills, that reservoir will not do all that is expected of it, and they will have to go somewhere else for part of their water supply. Why? Because when you destroy God's reservoir under the trees man can never build one as good. It takes that natural reservoir to keep and hold the water, and you can only maintain that on the hillsides by keeping the trees there. Therefore their money will be spent in vain unless the trees are kept there.

Some one in the report of this commission has said that there is as much water as there ever has been, and that we could not create water. Those men that drew the original report of this national commission are mistaken. You let a spring dry up on a mountain side because you have taken the trees away. That water is gone. It has disappeared from thousands of our springs to-day. But you reforest that hillside and you will reproduce the water. Those springs dry out because the forests are gone, but you reforest the hillsides and the water will come back. There is too much to the subject for any man to undertake to cover it in ten minutes.

A DELEGATE. I move that the gentleman's time be extended by unanimous consent.

(The motion was numerously seconded.)

The CHAIRMAN. Is the request that the gentleman's time be extended ten minutes?

A DELEGATE. Yes.

The CHAIRMAN. Is there objection to extending Mr. Whipple's time for ten minutes?

(There was no objection, and it was so ordered.)

Mr. WHIPPLE. We have to have forests in the country, ladies and gentlemen, because of a hundred things. First, they affect the climate, they affect the rainfall, they are valuable to the agricultural lands. Without forests in a rolling State like New York or like Pennsylvania you can not have producing agricultural land. Am I not right?

A VOICE. Right!

Mr. WHIPPLE. If water is not absolutely necessary to good farm lands, tell me why it is that the arid lands of the West do not produce without it. Tell me why it is when you pour a little water on the arid lands of the West, where stump cactus grew, and that only, you can produce 50 bushels of wheat to the acre. Tell me why it is that the far-famed, beautiful valley of the Euphrates, which we have heard so much about in song and story, once as beautiful as a dream because of its forests and streams, is to-day a howling waste. Simply because the forest trees were cut away and the waters dried up. We must have water. We must have the forests in order to have the water.

Kansas, Ohio, Indiana, or any level State, do not need the forest trees for agricultural purposes so much as we do in New York and Pennsylvania and the East. Why? Stop and think. In New York State all but four of the great rivers of the State head in the Adirondacks and Catskills—in that 2,000 feet elevation, upland plateau. The streams, when not protected, run rapidly away and the water is wasted. It does not even have a chance to evaporate. But on the level plains of Kansas it falls upon that flat land and it soaks into the ground, it saturates the soil, it produces moisture necessary, for weeks and for months, for the crops to grow upon the land. We must have the forests. You can get along out there if you don't have so much forest.

So it is rather a local question in respect to the farm lands of the country. We have got to have forests because of the healthfulness of a country. Do you not know that the forest trees are constantly pouring off into the air great quantities of oxygen; that they take up the things that are poisonous to your life and grow upon it; and that they furnish that which we must have? Do you not know that they have a wonderful effect upon the temperature of the country? Can anyone tell me why it is 25 degrees cooler in July at Lake Placid or Saranac than where I live in the Alleghenies, in the same altitude, 200 miles farther south? Nothing in the world except that splendid great forest that covers that upland in the northern part of the State of New York.

Let me make it perfectly clear to you by the simplest illustration. If forests are not as valuable to a country as I say, what would be the condition if to-day, through some great force in nature, every tree and shrub should be swept from the face of Pennsylvania or New

York State? Would not chaos reign to-morrow? Would not the home of every wild bird and every wild animal be destroyed; would not every stream be uncovered; would not the surface of the land be like the roof of this building for the water to fall on it and run immediately to the stream and down to the great sea and be lost forever? Would not the price of agricultural land in those two States depreciate in fifty minutes 50 per cent? If it would not, then the history of China is a lie; then the history of France is false. Three hundred years ago France swept its forests from its hillsides; its land was eroded and washed into its harbors. If it is not so, then France has spent \$200,000,000 since then to reforest those mountain sides for nothing.

The country that does not have forest growth is like a house without a roof, uninhabitable and worthless to the people.

You may talk about preparing your Mississippi for transportation of the products of the country. You may talk about the conservation of your coal and iron and gas and oil, and all that. Coal, iron, gas, oil, and other minerals are only created once in the creation of the world, and all you can do is to handle them as carefully and as economically as you can; you can not replace a pound of them. But your forests, the great objective point, it seems to me, may be restored, must be saved, and you can only save them by careful handling and by planting.

Now, go home, get your commissions to furnish the money. Build your tree gardens. Go among the people and encourage them to plant trees and relieve their land that is dedicated to forests from taxation. Encourage your people. Give them the trees free. Let the State furnish its people with the trees free of charge, in order to encourage them, and then relieve them from taxation on the land dedicated to the forests, and you will get every farmer raising trees.

Think of what New York is doing. The pioneer in the work, twenty-three years old, held up sometimes as an example. We are doing a lot of things that we do not ask the National Government to help us in. We know we would not get its help. We are going to take care of it ourselves. We are spending \$500,000 \$600,000, \$700,000, \$800,000, \$1,000,000 a year in buying land, and we are going to keep it up.

But get your farmers to planting. We are building tree gardens all over the State, raising millions and millions of pine trees. We don't plant the poor kinds of trees. We get the best commercial tree, that grows the fastest. The hardwoods will take care of themselves if we let them alone and keep the cattle out. Plant pine trees, plant spruce trees, plant in the South the tree that grows the best there and is the best commercial tree. But all of you have got to plant trees.

As I have said, our State is the pioneer in this, yet we are asleep in America on this question. We have to get practical and get down to business and plant trees or in twenty years our children will curse us for our negligence.

GOVERNOR JOHN A. JOHNSON, OF MINNESOTA.

Governor JOHNSON. Mr. President, I simply want to rise to ask a question. I think I probably grew as enthusiastic listening to the remarks of the gentleman who has just spoken as any other person in the room, and I was impelled to applaud probably as rapidly and as frequently as any other man here, and it is a nice thing to sit here and be told that you don't understand this question and we want to give you the practical results. Now to my mind I want to ask the gentleman what is the remedy? After all—I may have been obtuse myself, and there may not have been any ambiguity in the remarks made—but what is the remedy? Plant trees! I heard that in May last year when we had that conference, until I got black in the face. I have heard it in my country for ten years. And this thing of going back home and planting trees is all right; we have got to plant the trees. But the governor does not own the farms of the people of the State of Minnesota, and the governor of North Carolina does not own the farms of the people there, and it is the same way in every other State. The governor does not own the great lumber areas that have come into the care and watchfulness of the great lumber barons of the country, and he can not plant trees on that land, and he can not go home and make the legislature do anything he wants them to do with the public moneys of the State, because the legislature in the State is the custodian of the public moneys of the State, and that is so in every State in the Union. So it won't do to say you do not need the interest of the National Government, and the gentleman who has just spoken confesses at the conclusion of his remarks that he is going to plant two or three million trees a year, and he says that they are cutting down more Christmas trees in the State of New York than they are planting each year.

We do want these discussions, we do want all the information we can get, and I was very glad that the last speaker spoke of the matter of exemption from taxation as an encouragement to the planting of trees. It is about the only reasonable suggestion I have heard here.

With regard to the matter of forestry, without desiring to introduce his name, I think there was suggested at the White House at the conference there in May the best suggestion in the way of forestry that was made there or here. Unfortunately it introduces a political question. Are we going to avail ourselves of the vast areas of Canada by reciprocal trade relations, or are we going to continue that barrier in the way of an imaginary line, which will not permit us to bring in the Canadian lumber as a means of protecting our own lumber?

I know full well that there are men here attending this conference who are personally interested in the manufacture of lumber in America who are going to do all they can to make this country refuse to take any action looking toward the bringing together of the great Canadian and great American interests, and I hope the conference will be big enough to look over the heads of any men who have a personal interest. What will take the place of lumber? I have formed a great affection and regard for the gentleman who some time lived at Skibo, if that is the proper pronunciation, because I believe that in the introduction of steel he has done more to preserve the forests than any other individual in this country.

We have got to go home and talk to our people, and I am going back to talk to mine. Appoint a commission? That is good. We have got conservation commissions in the national way. This, in a sense, is a commission. Let it go back and reforest America—this handful of people. This discussion is good in the matter of education. No one in my State thought of it ten years ago. No one in my State thought of the enlargement of the Mississippi River ten years ago. No one in my State thought of the erection or construction of canals through the central basin ten years ago. But it is because of the pioneers, if you please, who blaze the trails of public opinion, that all these things are made possible.

I would be glad to have a specific and definite remedy. In my judgment we have got to retrace much of the ground we have already lost. I know something about governmental reforestation in my country. I know something about the preserves where 10 per cent of the trees must remain. In my judgment, Mr. Pinchot, that is absolutely a failure, because the 10 per cent, lacking the protection of the surrounding trees, either dies, breaks down, or eventually gives way.

It seems to me it would be better to preserve great tracts of trees. But there is so little that any of us know—even, I think, the expert from the State of New York, who failed to give us a specific remedy for the reforestation of the country—that we all ought to be willing to learn, and I would like to be able to take home one great big idea and say to the legislature, "Do that." And if the gentleman from New York will give me the opportunity to do it, I will be his servant forever.

Mr. WHIPPLE. A question has been asked. There are so many ideas to give that it is hard to sort out the ones that we can advance and have take effect in so short a time. Let me give the gentleman an idea.

We believe, in the State of New York, and we are going to put it in operation this year, that the State has the power to control the cutting of timber on private land; that is, to prevent denudation, also the clearing up of the débris, and so on. We are going to put that into the statute.

Mr. JOHNSON. I would like to ask whether that is a fact—that the State of New York, or any other State, has the right?

Mr. WHIPPLE. The Supreme Court of the United States has said so, as cited by your President in the May conference. There has been a decision by the state supreme court of Maine to the same effect more recently.

Mr. JOHNSON. I may be wrong, but I did not think the Supreme Court had decided that—that is, the Supreme Court of the United States.

The CHAIRMAN. I think it was the supreme court of Maine.

Mr. WHIPPLE. But underlying constitutions, there is in the police power of the State the power to do that which will protect the whole people—

Mr. JOHNSON. I would like to know what is the actual fact about that decision. Mr. Pinchot says that he thinks that was the supreme court of Maine.

Senator SMOOT. I think the last point the gentleman has reference to was a decision by the Supreme Court of the United States,

as I remember it. The decision of the supreme court of Maine was upon the other point.

Mr. WHIPPLE. There was a question that went to the Supreme Court of the United States on the question of whether the State had the power to regulate the use of private property for public good. It was the case of the Hudson Power Company and arose in New Jersey, in order to protect the people in the lowlands in the matter of the water flowing over their lands, as a general public necessity. That was the case, if I remember the title correctly. There is also a case to the same effect in Massachusetts, where the court said to regulate was not taking.

The practical working out of it in our State, Mr. Johnson, is solved, I think, in this way. We got last year a great many farmers to plant trees. As I said, the State can never plant enough, because the cut is so great you can not keep up; but if you get every farmer to planting trees, and we are giving them trees now at cost and will next year give them absolutely free—if you will do that and then get your foresters to show them how to plant the trees and get every farmer on every farm to take an interest in this work you will be able to accomplish something. Our farmers are getting enthusiastic about it.

Mr. JOHNSON. You speak of getting the farmers to plant trees on their farms. In the States of Wisconsin, Michigan, and Minnesota there are millions and millions of acres of land that have been cut over, and they are not farms at all; it is not farm land, it is a sandy soil. What are you going to do as to that kind of land that is not farmed and will not be farmed for years to come?

Mr. WHIPPLE. There is a lot of land in New York, too, that is poor land and has been worked out. It is sandy, poor land, and not good for farming. We think the State should acquire that land. We have a commission to buy land, which commission is always in session, and we are buying about a hundred thousand acres a year. We have 1,600,000 acres now, and we are going to buy 2,000,000 acres more and reforest it. That is what the State is doing. Some of the poor sand lands are only worth \$1.50 to \$2 an acre, land on the Upper Hudson and in the Adirondack country, but forests can be planted on that land, and forests are growing there now in the finest kind of way. And so with your State. Your State should acquire that land you speak of, in my judgment, and you can raise enough trees on it to support the needs of your State. That is what Germany has been doing. Many of its little villages have been planting trees, and from those trees they are able to pay their taxes and supply all the lumber they want. We must be able to do that if the Germans can do it.

Mr. JOHNSON. There are lots of things we do not know as much about as the Germans do.

Mr. WHIPPLE. Well, we must get at it, then. If there is any other specific question—

The CHAIRMAN. May I ask your indulgence for one moment. There is one suggestion I want to make to Governor Johnson and all the other governors here and perhaps this is a good time to make it. It seems to me that if each State could do what Alabama and Oregon and a half dozen other States are doing, and take stock inside of their own properties, of their own resources, exactly as the national commission has been taking stock of the national resources, we should get a body of information that would be of the utmost value.

I believe that there is nothing more important for the States to do than to make a study of their own situation through their state conservation commissions.

Senator SMOOR. I simply want to say that I hope none of you will rely on being able to get lumber from Canada in order to save our own forests. I have been in Canada, through their forests, and I think if we ever put lumber on the free list, as suggested by the governor of Minnesota, with the idea of getting lumber from Canada—

Mr. JOHNSON. Excuse me. I did not use the term free list. I simply thought there might be some arrangement that might allow us to bring in our Christmas trees, anyhow, while the other trees were growing. Excuse me, I have to leave.

Senator SMOOR. If you will confine it to Christmas trees, all right, I will not have anything to say.

EX-GOVERNOR NEWTON C. BLANCHARD, OF LOUISIANA.

Governor BLANCHARD. Mr. Chairman, on the question that was raised by the gentleman from New York, as to what the power of the States may be in respect to controlling the cut of timber lands embraced in private holdings, I desire to say that that question has occupied the attention of the governors of some of the States, and perhaps all of them, for some years.

In my message to the general assembly of the State of Louisiana in 1906 I recommended the enactment of a law that would prevent the holders of large bodies of timber lands from cutting any trees under 10 inches in diameter. I urged that they be required to cull the trees, cutting only the larger ones, and leave growing the smaller ones, in order to perpetuate the forests.

Before putting that proposition up to the general assembly, I consulted eminent counsel as to whether or not there were constitutional difficulties in the way. When I presented it to counsel, he shook his head and said, "I fear there are such difficulties." I replied I thought not; that in the question was involved a great public policy, and wherever there was a sound public policy involved authority would be found to sustain legislation in aid of it.

The lawyer consulted was asked to examine the question, and in a few days he returned to me saying that my view was correct; that he had found authority to sustain the legislation I had recommended. I had him prepare a bill, which was introduced in the senate of the State, but it failed of passage. The timber lobby was too strong for it.

It will be remembered that when the governors were in conference with the President at the White House in May last, the President stated in his admirable address that the legislature of the State of Maine, having the right under a custom there obtaining, to ask the supreme court for an opinion upon a proposition as to the constitutionality of which they were in doubt, certified to the supreme court of Maine, the very question that we are now discussing, and that court returned an opinion that the authority was in the legislature to do the thing desired.

And in the discussions that took place at the White House upon the occasion of the conference it also appeared that the question was brought up in a New Jersey case that went to the Supreme Court of

the United States, not upon this identical question, but one akin to it and involving the same legal principles, and the Supreme Court affirmed the power to be in the legislature to do that which had been done.

Mr. Chairman, another important question affecting the conservation of the forests is that discussed briefly in the report and alluded to in the speech of our distinguished friend, the Senator from Utah, this morning, and in other addresses. I refer to the policy of taxation looking to encouraging not only the maintenance of growing forests but the reforestation of cut-over lands. The importance of this can hardly be overestimated.

In the report that was read here on the first day of the conference, it was suggested that the lands be assessed for purposes of taxation as though there was no timber upon them, and then when the timber is cut and passed through the saw to tax the output of the mill. That system commends itself to me. Under the present tax laws of many of the States large assessments are put on timber lands, and this is forcing timber holders—the owners of the sawmills—to cut off that timber too rapidly. At least it is having much effect that way. Give them the encouragement to hold back and not force their product upon the markets, and then exempt, by a system of wise tax laws, cut-over lands devoted to purposes of reforestation.

A word or two more, Mr. Chairman, and I will be through. The former governor of California (Mr. Pardee), who a little while ago addressed the conference, referred to three great Presidents, Washington, Lincoln, and Roosevelt. What he said as respects the three I subscribe to, but there is another who is entitled to a place in the front rank. Presidents are to be judged by what they accomplish for the great good of the country they rule. Washington was the grand leader of the forces that founded the Republic. Lincoln was the great leader of the forces that prevented the disruption of the United States. Roosevelt has given magnificent policies to his country, and has pushed it forward enormously in development and added greatly to its prestige and influence among the nations of the earth. He is the President who has exerted that force which is about to realize the dream of Columbus—Columbus, the greatest dreamer of the ages. It is the dreamer that conceives great things. The practical man of affairs comes along and takes them up and works them out. Roosevelt, in this instance, is that practical man. Columbus dreamed of a near passage to the East by way of the West, and inspired by God he crossed the Atlantic Ocean in his three little caravels and landed upon a West Indian island, which blocked his way to the Isthmus. But for that island, and had he escaped the peninsula of Florida on the one hand and the island of Cuba on the other, he would have reached the Isthmus, to cross which was necessary to that “near way to the East by way of the West.” It would have barred his passage. We in this day and generation are accomplishing the dream of Columbus. The great nation established on the continent he discovered is doing it. We are cleaving through the Isthmus a water passage. The completion of the Panama Canal is in sight, and when it is cleft through the Isthmus the dream of Columbus will have been realized and our country and the world pushed forward hundreds of years in civilization.

And some day, after this great work is accomplished, upon the two highest promontories along the line of the canal, the American people should erect two statues of heroic size, one commemorative of Columbus and the other of Theodore Roosevelt.

But, Mr. Chairman, I said that there was another great President entitled to be added to the list. A few years ago I made a pilgrimage to Monticello, near historic Charlottesville in old Virginia, and with uncovered head stood at the tomb of Thomas Jefferson, and on the modest shaft of granite that rises over his grave I read this inscription:

Here lies Thomas Jefferson, the author of the American Declaration of Independence, of the statute of Virginia for religious freedom, and the founder of the University of Virginia.

This epitaph was written by himself. It was found among his papers with directions to place it upon his tomb. He had been the recipient of great earthly honors. He had held high stations—minister to France, governor repeatedly of Virginia, and twice President of the United States. But he discarded all these and chose to rest his claim upon posterity to greatness to the three mentioned.

Mr. Chairman, he should have added another. Certainly one of the greatest of his achievements, and which alone would have entitled him to a position in the front rank of Presidents, was the consummation of the Louisiana purchase, by which territory was acquired now forming fourteen great States of the American Union.

If George Washington founded the Republic, Mr. Jefferson, coming shortly after him in succession, doubled the original area of the Republic, gave it dominion from ocean to ocean, and made it possible for Columbia to become, as she is today, the torch bearer among the nations of the world.

PROF. FRANK W. RANE, OF MASSACHUSETTS.

Professor RANE. Mr. Chairman, I simply rose to say that as chairman of the conservation commission of Massachusetts, we are hand and soul in this work with you. I realize it is impossible to discuss all the various points that have come out in this convention. We are here, however, I am sure, to get the backbone of the whole discussion and take it home and get to work.

Recently we have had in New England a meeting of the New England governors, people interested in the subject of forestry and conservation generally throughout that particular section of the country. Recently a meeting of the forestry officials of the six States of New England was held. At this meeting we have discussed and gone over the matter of doing something that we can take to our various legislatures this year, which we hope will bring results. I think forest fires with us in New England is one of the worst difficulties we have to deal with, the question of having some mandatory conditions whereby we can stop fires being extremely important. That is one of the things we are first to consider.

We have been taking up the subject with the railroads and with private individuals, but more particularly getting a definite system of usefulness. I find that there is just as much trouble between our various towns in Massachusetts as there is between various States, and it is necessary to bring them together. We have a system in our

own State of Massachusetts whereby we appoint forest wardens in each town. These men are appointed by the selectmen of the town, subject to the approval of the state forester.

From one year's experience I believe that that is going to work out well. With 321 men in Massachusetts representing local conditions, if we can educate those men to be public spirited, to represent their towns, to take back the idea of the State's interest and the nation's interest, we have a natural channel of usefulness. Now, if we can stop fires we can stop them by the individual man on the spot. This man has the privilege of appointing his deputies and discharging them. He has police powers, and he is giving to the State data in regard to fires, the number of fires occurring, the amount of damage done.

Through this natural channel I believe we are going to get to the subject of taxation. We are going to get to the subject of reforestation. I think the natural channel will be found in this way whereby we can touch the man that is really going to do the thing. In Massachusetts we have gotten in touch with our railroad people. They are as much interested in the subject, I believe, as any people, and I believe in New England they are going to take hold of this thing, hand in hand.

We had a resolution, passed last week, that I would like to read if I had the time, but it will be published.

I thank you for this opportunity of representing Massachusetts.

(Thereupon, at 12.35 o'clock p. m., the conference took a recess until 2.30 o'clock p. m.)

THURSDAY AFTERNOON, DECEMBER 10.

The Joint Conservation Conference was called to order at 2.30 o'clock p. m. by Chairman Pinchot.

The CHAIRMAN. We will begin what I anticipate will be the concluding session of the conference, so far as any program has been laid out. We take up this afternoon the subject of "Waters," and at some time during the afternoon will probably hear the report of the committee on resolutions.

EX-GOVERNOR PARDEE. Mr. Chairman, permit me to move that the report of the committee on resolutions be made a special order this afternoon at 4 o'clock.

(The motion was duly seconded, put, and carried.)

DR. W J MCGEE, SECRETARY OF THE SECTION OF WATERS, NATIONAL CONSERVATION COMMISSION.

The CHAIRMAN. We will now take up the subject of "Waters." Mr. Burton, chairman of the Inland Waterways Commission, has unfortunately been detained and will not be here to make the opening statement. I will therefore call upon the secretary of the Inland Waterways Commission, Doctor McGee, to take his place.

Doctor MCGEE. Mr. Chairman and gentlemen of the conference, I shall do no more than ask attention to a few primary ideas with respect to our waters.

In the first place, I should like to emphasize, and have you all join me in emphasizing, the great fundamental fact that water is a resource. Hitherto it has not been our custom to regard water as a

resource of a definitely limited quantity. We have been accustomed, after the manner of the ancients, to think of the four elements, of which water is one. We have been accustomed to think of it as free and abundant as the air or the light of the sun, or the wide amplitude of earth. Now, the primary idea which I desire to impress is this, that there is just so much water and no more. In this connection it is necessary also, as I conceive it, and as I hope you all agree, to apply the quantitative method in dealing with water, the same method which we employ in dealing with coal, or iron ore, or any other resource. That indeed is requisite to a clear idea concerning water as a resource—water of which there is only a certain amount and no more. The application of the quantitative method is absolutely essential.

In the report of the National Conservation Commission, which you heard read yesterday, the quantity of water and the sources of the water with which we are blessed were set forth in considerable fullness, I shall not trouble you by repeating the figures in detail. Merely to render clear the primary idea of water as a resource—and I am referring, of course, to fresh water—let us have it in our minds that the sole source is the rain which descends from the heavens. That boon, after reaching the surface of the earth, is divided; half of it is reevaporated, and a portion of this half may be reprecipitated as rain; but we need not follow that half further than to say that after reaching the surface of the globe it is evaporated. One-third of the entire amount flows down to the sea through the rivers, of which many are navigable. There remains one-sixth, and that is consumed or absorbed. On that one-sixth, in the last analysis, depends the habitability and productivity of our country, of every acre of our farm land, and of every acre of our forest land. Nor do we often realize how large a quantity of water is consumed in plant growth and in animal existence. We seldom realize that each average adult man of 150 pounds takes into his system in the course of each year no less than a ton of water; we seldom realize that on the average each bushel of corn requires in the making something like 15 or 20 tons of water. This is an illustration of the fundamental importance of water to the productivity of our land.

Now, to return for one moment to the quantity of water which we receive from the heavens as rainfall. An average of 30 inches over the entire length and breadth of the land, or a quantity equivalent to 10 Mississippi Rivers, is all we have. Without it no acre of our land would be habitable. Without it no industries could exist, and without that one-sixth of it which is largely consumed and absorbed in vital processes the land would be unproductive and sterile, and unfit to form the home of human kind.

The effective fraction of the water descending from the clouds is not that which flows off over the surface during storms; on the contrary, it is that which seeps into the earth in such fashion as to form ground water. Let us have clearly in mind this idea of ground water as a part of the great resources made up of water. How much ground water have we? Of late we have been considering the matter with some care, and we estimate that within the first hundred feet of the surface there is an accumulated body of water, which ought to be but is not quite permanent, equivalent to a reservoir 16 or 17 feet in depth, spreading over the 3,000,000 square miles of the area of our

land. That subsurface reservoir is the value on which we must depend for agricultural production, forest maintenance, and the development and continuation of all our industries.

When we speak of that vast reservoir spreading from the Atlantic to the Pacific and from the Lakes afar north to the Gulf on the south; when we think of that stock as the real source of water supply for agriculture and all other industries; when we think of it as the sole source of all our streams, which are fed slowly by seepage through the ground as springs or otherwise; when we think of this reservoir in its extensive applications and endless relations, we must realize that it is no less a national and interstate possession than the air itself. It belongs to all of us. It is the common property of the entire people. And there are those of us who conceive that it must be so administered, and that, proceeding from the navigable streams which we hold should be so improved as to relieve the traffic congestion of the country, we should deal at one and the same time with every aspect of this great resource on which the value of all the rest depends. It is a national possession, and the possession of the several States jointly. The States hold an undivided interest in this great commodity.

This, Mr. Chairman, may suffice to get before you a great subject. I desire only to add that Governor Noel, who is on this platform, Governor Ansell, Governor Deneen, who will arrive shortly afterwards, and Governor Hoggatt, of Alaska, are among those who have the courage to express the convictions of their respective Commonwealths concerning the value of this fundamental resource; nor may I neglect Governor Stubbs, of Kansas, the central State of the nation. We are hopeful also that the chairman of the Inland Waterways Commission, Mr. Burton, will shortly be with us.

I thank you, Mr. Chairman, for the attention that you and the gentlemen present have given me.

GOVERNOR WILFORD B. HOGGATT, OF ALASKA.

The CHAIRMAN. In the over-richness of our material in respect to governors I find myself embarrassed, and the only ray of light I can see is to pick the governors who have not yet spoken and give them an opportunity to speak before we call on those who have spoken once. I see Governor Hoggatt, of Alaska, and will ask him to favor us with a few remarks on the subject of waterways. I take pleasure in presenting to you Governor Hoggatt, of Alaska.

GOVERNOR HOGGATT. Mr. Pinchot and gentlemen of the conference, this comes somewhat as a surprise, because I am here simply to learn some things that may be of advantage to the country of which I have the honor to be the executive officer and which we may use in the dim future. Most of these questions which are of vital importance to the older States have not yet assumed any importance with us. We have not begun to cultivate the soil, except in very limited quantities, for the purpose principally of furnishing garden truck for our mining camps.

Nature has provided us with a magnificent system of waterways along the coast of Alaska to give us what we need in that respect, and has also given us a river equal in volume, size, and navigability to the Mississippi to bisect the great northern region belonging to the

United States. This river is fed largely from the glaciers remaining in the mountains which divide the coast from the interior valleys, and from those between the Yukon Valley from the Arctic Ocean. Until the glaciers disappear we will have plenty of water in the summer time and lots of ice in the winter. There are some matters which are of great importance to us, which we have taken up and already begun to consider in the line of conservation. The first thing of importance is that of the forests. We have a large area of our country now embraced in forest reserves. We are working out a system by which we can utilize this timber to the best possible advantage and at the same time secure an ample supply for the future. We are confronted with rather a peculiar condition as far as the forests are concerned, and that is that our timber is of such age and growth that a great deal of it has gone to waste from nonuse. One of the most important things is to find some way by which we can use the timber that grows on the coast side of the mountains of Alaska before it reaches the point where it begins to deteriorate. I have noticed in my own experience that the trees grow to a fairly good size and then begin to decay at the heart. We have to find a use for those trees before they begin to decay, or all the strength of the soil will be exhausted by the timber and then no use made of it.

Another thing we have begun to take in hand is the matter of coal. We have found that we have large and splendid deposits of coal. We have it of different grades scattered throughout the whole Territory. In two fields we have bituminous coal that in analysis and steaming qualities is probably equal to anything found in West Virginia. We are endeavoring to find some way by which we can utilize these coals for the present and conserve them for the future without creating any monopolies, and yet reserve all the rights that are proper for the Government without hindering the efforts of our people in developing the field. We are on the road to success in this direction. Of course we all know, as the report of the commission stated, our metal resources are there; and when once used, they are gone forever.

We hope that when the metal resources of the States are largely a thing of the past we will have some left to supply the larger population of the United States.

I thank you, gentlemen, for your attention.

GOVERNOR-ELECT W. R. STUBBS, OF KANSAS.

The CHAIRMAN. Reference has been made by the last speaker to Governor Stubbs, of Kansas. I know we shall be very glad indeed to hear from him, and I will ask him to come forward and address us. I take pleasure in presenting to you Governor Stubbs, of Kansas.

Governor STUBBS. Mr. Chairman, ladies, and gentlemen, when I accepted the chairman's invitation to attend this conference, I did so with the intention of coming here to listen and to learn, and had no idea of having anything to say on the subjects that were to be presented to you.

However, the problems that have been discussed in this conference, in my humble opinion, are of greater import to the American people than any subjects that will be legislated upon in the halls of Congress during this session or the session that is to come.

This subject of waterways and the improvement of the great canals and rivers of this nation has been talked to death. What we need now is action; let us do something. There is not a man in this audience who has considered this subject who does not know that when the States of America ratified the Constitution that we have adopted, they gave exclusive control of these great arteries of trade and commerce to the Federal Government. He knows that this Federal Government, when it accepted this trust, accepted a responsibility from which it can not escape, and that means the development of these arteries, these rivers, these lakes, these harbors, and these canals. For more than one hundred years it has neglected its plain duty and obligation to the people of this great nation. It is no longer a question of knowing what to do or how to do it. There are hundreds and thousands of men who know all about it. It is not a question of material. We have all kinds of material. We have the waterways. We need the money that is necessary to develop these great waterways. It is not necessary for me to talk to you about the benefits that would come to commerce and trade if we had the Mississippi River and its tributaries, including the Missouri, developed with a 14-foot channel—1,500 or 2,000 miles of the Missouri and up the Mississippi as far as we can possibly go.

Such a movement would reduce the cost of transporting heavy traffic at least 70 per cent. The men who have investigated this subject say that the cost would be one-sixth; I will say that the cost would be one-fourth, to be sure to be within proper limits. Waterway transportation means one-fourth of the cost necessary to haul heavy traffic as compared to the present cost by rail. What would that mean against the present condition? What would it mean to Kansas with her 90,000,000 bushels of wheat, sending it down to Kansas City, together with other grain and grain products, if the cost were one-fourth what it now is? What would it mean to Kansas City and Omaha and the cities along the Missouri River, all the way up that great valley, if they could have coal come in from Pittsburg at 50 or 75 cents, or even \$1, a ton, and pig iron from Minnesota for one-fourth or even one-third of the cost at this present time? It would not interfere with railroad traffic.

You have heard Mr. Brass tell how in Germany the great waterways haul millions of tons of heavy freight, and that there are railroads on either side of those great waterways that do more business than under any other conditions, that have more business than they can possibly take care of.

This is the greatest economic problem before the American people to-day. It is necessary only to apply simple, sound, business laws. Do you suppose if a private organization or corporation was going to build a transcontinental railroad, they would build a mile a year or 5 miles a year for one hundred years? Would they ever get anywhere with it in that way? In the name of Heaven, what does it mean that the great American nation, the greatest nation of the world, should dillydally and play like children with the greatest problem that ever confronted them in legislative matters? What shall we do, you ask? Ask me whether we can control the Missouri River—and I want to tell you briefly what I saw there.

I have been in the railroad-construction business for twenty-odd years before I blew into politics about four or five years ago. I had a

minor part in building a great dike where the Missouri River was cutting pell-mell into the south bank of the river there in Kansas. The water was 40 or 50 feet deep and was cutting under that black soil and coming up toward a great railroad track. What did we do? We threw out a lot of willow mats and sunk them with rock and built up a dike that has stood for nearly twenty years, and the great flood of 1903, during which occurred the highest water ever known in the Missouri River in fifty years, only made it stronger and filled it up on both sides.

I say to you there is no trouble about doing this work. It is not a question of how to do it. It is a question of getting the money to do it. You ask, How shall we do this great work? I say you can improve the Mississippi River all the way that it is navigable and the Missouri River for 1,500 miles and all of the tributaries of both of those rivers. You can improve your eastern rivers and your western rivers in eight years just as easily as in eighty years and then get some benefit out of them. How will you do it? Issue bonds at 2 per cent, and all you need to do is to authorize this broad-gauged, big-hearted Secretary Taft, who will be President next year, to go ahead and do this work like a great railroad company would do it. Do what the Congress of the United States did when they started to build the Panama Canal! They would have been a hundred years building that canal if they had put in a piece here and a piece there, and had no plan, no organization, no method.

You can establish a commission, you can put a chief engineer in charge of this great work, you can separate it into divisions, and it will be a mighty poor stick of a man who can not improve a thousand miles of the river, who can not improve all the necessary waterways to the Atlantic seaboard—and that is what we ought to have, right from the Mississippi up through this drainage canal to Chicago and on out to the Atlantic seaboard, as well as down to the Gulf of Mexico. I say to you this is a great problem which confronts the American people, and it must be solved.

What would it cost? Suppose you invest in this proposition a billion dollars, it would be a mere bagatelle in comparison with the benefits that would accrue. I heard Andrew Carnegie say yesterday morning that the benefits would be tenfold greater than the investment. Suppose you invest a billion dollars in the development of these great rivers in the Middle West, the Mississippi and her tributaries, at 2 per cent for fifty years; what would it cost? It would cost \$30,000,000 a year for fifty years to pay off this debt. What would this great waterway pay in the way of return? Andrew Carnegie says the income would be \$300,000,000 a year, or ten times as much as it would cost, and I believe he stated it conservatively.

What would be the result? It would build up great industries all along the banks of those rivers, develop our country naturally, and give us natural competition in the way of transportation. Are we going to do this thing in a businesslike way, as business people? Or, are we going to play politics and give every Congressman \$50,000 or \$100,000 for a public building, and give every man a job who wants one, and dole out the billion dollars or two billion dollars without any concrete results? I say to you I expect to see this nation go ahead under the administration of Mr. Taft—one of the greatest men who ever sat in the Presidential chair. I expect to see him finish up

the greatest work that has ever been undertaken in the lifetime of the present generation, and that is the work that Theodore Roosevelt has promulgated.

It is a simple business proposition and there is no politics in it, and there ought not to be any politicians in it. It ought to be put on a sound business basis and under the control of good, sound, business men. It ought to be divided up into sections. It ought to be where the men who are now clapping their hands, cheering those sentiments, could see the great boats going up and down those waterways. It would interest us very much to know whether they might have waterway development in one hundred years from now, but I want to see it in my lifetime, and I expect to see it. I have two of the best-looking boys in this whole country, and I am willing to let them help pay the bills in forty or fifty years from now, and they will be glad to have the chance to pay the bills. I think Mr. Taft made a very happy remark the other day when he said it would do these youngsters good to have something to keep them under proper self-restraint. I think we could leave no better legacy to the American people than this great project at least partially completed, and if we do that, it will make this the greatest epoch in the history of the United States.

I thank you, gentlemen.

GOVERNOR CHARLES S. DENEEN, OF ILLINOIS.

The CHAIRMAN. I now take pleasure in introducing to you, gentlemen of the conference, Governor Deneen, of Illinois.

GOVERNOR DENEEN. These internal waterways of the United States which rise in the Mississippi Valley and find their outlet in the Atlantic Ocean or the Gulf of Mexico were, in their natural state as known to the white settlers of the country, divided near the point where Chicago now stands by "one-half a league of prairie." So wrote Joliet, in 1764, after exploring "the Chicago divide." The importance of this fact did not escape the attention of this early discoverer, for in describing a water route from the Great Lakes to the Gulf of Mexico, he continues:

The route to be taken is this: The bark should be built on Lake Erie, which is near Lake Ontario, and it could easily pass from Lake Erie to Lake Huron, from which it would enter the Lake of Illinois [Michigan]. At the extremity of this lake would be the cut or canal of which I have spoken, to have a passage to the St. Louis [Des Plaines] River, which empties into the Mississippi. The bark, having entered this river, could easily sail to the Gulf of Mexico.

The observations of this early explorer, so natural to one who had penetrated into the heart of the continent by means of its Great Lakes and water courses, were the forerunners of the many others which are to be found embodied in our state papers, beginning with the ordinance of 1787 for the government of the Northwest Territory, which provided for the free navigation of the waters leading into the Mississippi and St. Lawrence, down to the latest report which the present internal-improvement commission of Illinois submitted to the general assembly of that State on April 10, 1907, which demonstrates the feasibility of uniting the waters of those two great systems.

Various causes, however, have intervened from time to time to delay the removal of the slight barrier thus dividing the eastward and southward flowing waters of the interior of the American continent. Lack of means and the transfer from the rivers to the railroads of the bulk of the great freight and passenger traffic of the country have been among the chief causes to contribute to this result.

With the enormous and rapid development of our railroad transportation systems, the navigation of our internal waterways has declined to such an extent that what has been accomplished along the line of waterway construction and improvement has, until recently, been rather of local than of general advantage and significance. An illustration of this is found in the early canal projects which were undertaken in Illinois.

Of these, the first to be constructed was the Illinois and Michigan Canal, extending from Lake Michigan at Chicago to the Illinois River at La Salle, a distance of $97\frac{1}{2}$ miles. This canal was constructed under the authority of a statute of the United States enacted in 1822, followed by a grant of land made in 1827 by the Federal Government "in aid of a waterway from Lake Michigan to the navigable waters of the Mississippi River." Construction work was begun in 1836. Its depth is 6 feet, with a width at the surface of 60 feet and at the bottom varying from 36 to 48 feet. Its locks are 110 feet long, 18 feet wide, and 6 feet deep. Its limited dimensions, together with prolonged low-water periods in the Illinois River, have prevented the canal from developing its full utility. But its incidental effect upon freight rates in its vicinity have been so pronounced that in 1885 Canal Commissioner Brainerd estimated that it had saved the people of the State within reach of its service not less than \$180,000,000 in freight charges.

In 1837 the general assembly of Illinois passed "an act to establish and maintain a general system of internal improvements," under which liberal appropriations were voted for the development of river and railway transportation facilities, but, owing to the financial stringency of 1837, no substantial results were accomplished, and in 1840 the act was repealed.

From that time forward numerous projects for the improvement of local navigation in Illinois streams were formulated and surveys made, but no important work was accomplished until the construction of the Illinois and Mississippi, or Hennepin, Canal was entered upon in 1890 for the establishment of waterway communication between the Mississippi River at Davenport, Iowa, and the Illinois River at Hennepin; also affording, through the Chicago Drainage and Ship Canal, whose construction was begun two years later and of which I shall speak hereafter, communication with the Great Lakes. By the natural water route along the Mississippi and Illinois Rivers the distance from Davenport, Iowa, to Chicago is 610 miles. That distance has been reduced by the construction of this canal to 190 miles, a saving of 420 miles between Chicago and all points on the Mississippi River above Davenport, Iowa. This canal has a depth of 7 feet, is 80 feet wide, and has locks of 170 by 35 feet. It is available for boats 140 feet long and of 600 to 800 tons burden.

In more recent waterway construction, however, our State has shared in the awakening to the larger possibilities of waterway development with which the country has entered upon the study of our

internal waterways, with a view to their development, extension, and unification upon the broadest scale. This has been evidenced by the interest which the citizens of Illinois have taken in waterway questions in which our State has only a joint interest with others. The Illinois general assembly in February of this year appropriated \$10,000 for the investigation of the Mississippi River between Cairo and St. Louis, an appropriation made solely with a view to procuring information which would enable the State to conform its domestic waterway developments to any proposed developments of the main channel of the Mississippi.

The new attitude which we have assumed toward the problem of waterway development has been largely forced upon us by the necessities of our growing internal commerce. The railroads, which for a time provided an adequate, and later a more or less adequate means of transportation for our domestic produce, have now clearly become incapable of meeting demands. In this situation we find ourselves confronted, according to the view of those best qualified to pass upon such matters, with the alternative of a practical duplication of our present railway systems or the transfer to our rivers and lakes of a larger part of the transportation work of the country.

Both the experience of other countries and our own matchless natural facilities have turned public attention toward the waterways in seeking a solution of this problem. Not only is the Federal Government entering upon the task of formulating a general plan of waterway construction which shall treat the work of developing our entire internal waterways system in a comprehensive and systematic way, having regard to the possibilities of intercommunication between and, so far as possible, the unification of its interdependent parts; but the States and localities contiguous to our internal waterways, and which will receive special benefit from their development, are now considering their local projects with due reference to their relation to the general plan.

I think that no feature of waterway development is of greater importance. Other countries, notably France, have had the experience of building independently constructed parts of a general water transportation system upon different scales of magnitude, only to discover with the completion of the system the enormously increased difficulties thereby occasioned and to be forced to correct the mistake by a reconstruction of the work upon a uniform scale. Fortunately for us, we have been forewarned of this danger, and at the inception of a general waterway policy for the country are "getting together" for the consideration of the best methods of carrying out the work with the largest possible local and general advantages.

Great advancement was made in this important direction through the tour of inspection made by President Roosevelt along the course of the Mississippi River from Keokuk, Iowa, to Memphis, Tenn., and the convention at the latter city which brought to a close the President's visit. That gathering brought together the advocates of nearly every local project and those whose interests lay in the development of the internal waterways system as a whole. The mutuality of benefits was there made manifest and discussed and some advancement was made in the recognition of the necessary cooperation between the States and the Federal Government and of the principle

that States and localities should contribute to the general program in some proportion to their exceptional benefits.

As I have said, the citizens of Illinois have recognized the larger meanings of local developments. They are also fully aware of the special benefits to be conferred upon their own State through the general development of commercial waterways, and are now carrying forward local waterway work of the most extensive and expensive character upon a scale of magnitude commensurate with any probable future projects of national scope or benefit.

When the sanitary necessities of Chicago demanded the diversion of the sewage of the city from Lake Michigan and the project of constructing a drainage channel was entered upon it was stipulated in the act creating the sanitary district of Chicago, passed in 1889, that—

when such channel shall be completed and the water turned therein to the amount of 300,000 cubic feet of water per minute, the same is hereby declared as a navigable stream, and whenever the General Government shall improve the Des Plaines and Illinois River for navigation, to connect with this channel, said General Government shall have full control over the same for navigation purposes, but not to interfere with its control for sanitary or drainage purposes.

The channel constructed under this act by the sanitary district of Chicago is the largest artificial waterway ever constructed by man. At a cost of \$44,000,000, it has extended the navigable waters of Lake Michigan southward 36 miles to Lockport, establishing water communication between the Great Lakes and the Mississippi and the Gulf of Mexico.

This work has made the establishment of practical commercial navigation between the Mississippi River and the Lakes merely a question of the extension of this artificial channel and the deepening of portions of the Illinois River. For the prosecution of the former work the citizens of Illinois, at the general election held November 3 last, approved a constitutional amendment permitting the legislature to issue \$20,000,000 in bonds. One of the most important questions, therefore, which will occupy the attention of the general assembly of Illinois at its forthcoming session will be that of the construction of an additional link in the waterway joining the Great Lakes and the Mississippi. There had been much discussion of this project, of course, prior to the submission to the people of the recently approved constitutional amendment. The internal improvement commission of Illinois, in its report to the general assembly, and in other publications, had called public attention to the possibilities of water-power development in connection with the proposed waterway construction. Its report to the general assembly has shown that between Lockport, the present terminus of the Chicago Sanitary District Channel, and Utica on the Illinois River, a distance of $61\frac{1}{2}$ miles—the stretch of channel to be constructed with the proceeds of the \$20,000,000 bond issue just authorized—there could be developed 130,000 electrical horsepower worth \$25 per horsepower per annum, an amount capable of retiring the bonds in a period of seventeen years from the inception of the work and thereafter producing a perpetual annual revenue to the State of approximately \$2,750,000.

This commission also, in conjunction with the state geological survey commission, is investigating, as an incident to waterway con-

struction and stream development and correction, the resulting reclamation of lands in the Illinois Valley now subject to overflow.

The reclamation of submerged lands, in which the Illinois internal improvement commission will cooperate with the state geological survey commission and the United States Department of Agriculture, is one of the principal items of collateral benefit which are to flow from stream development for navigation purposes. Surveys have already been made by the geological survey commission of the overflow lands adjacent to the Kaskaskia, Big Muddy, and of portions of the Sangamon, Little Wabash, and Embarrass rivers. The submerged lands of the State susceptible of reclamation amount to nearly 5,000 square miles, an area greater than that of the State of Connecticut or the island of Porto Rico, and are, of course, among the richest alluvial lands of the State. It has been estimated that over \$100,000,000 will be added to the land values of the State by the reclamation of submerged lands, and that in addition thereto certain portions of the improved streams will be rendered navigable.

In this direction work of a very important character has been entered upon in various Illinois River valleys by local associations formed for the purpose. The possibilities of valley organization for the development of local navigation water power and other collateral utilities are very great. An organization of the character mentioned has been formed in the Rock River Valley having for its ultimate object the development of the water power and other resources of the valley in conjunction with a waterway which shall traverse the valley from the Mississippi River at Rock Island and be eventually extended to Lake Winnebago, to Milwaukee on Lake Michigan, and to the Wisconsin River. The water power capable of development in this valley amounts to 100,000 electrical horsepower, to be developed in part by the aid of storage reservoirs. This power should be worth not less than \$40,000,000 as a going concern and represent in industries and growth of population an increased wealth eight to ten times greater. The valley has an area of some 11,000 square miles, located in part in the State of Wisconsin, and its full development involves the cooperation of the people of the two States. Happily, the federal Constitution has provided for such cooperation after securing the consent of Congress and the passage of a federal enabling act.

Another valley which has been given preliminary investigation is the Fox River Valley, almost wholly within the State of Illinois, which has a watershed about one-fourth that of Rock River, capable of developing water power and other collateral utilities of proportionately the same value. I expect to see this movement for valley organization extend, as it should extend, until it comprehends the watersheds of our main streams, and thus through the detailed development of the valleys, in response to local motives, the main streams will themselves receive a large measure of improvement in the form of increased water supply and be furnished with commercial feeders through these tributary valleys. In this manner the policy of conservation and waterway development will be gradually extended by local and state effort, in cooperation with that of the United States, until it will affect every town site in valleys where a stream bed exists large enough to be adapted to waterway development.

The possible and proposed extensions of navigation along some of these streams bear close relation also to another phase of the work of the Geological Survey Commission, that of the development of the mineral resources of the State. The restoration or creation of navigable conditions in many of these streams will carry water transportation into some of the most extensive coal fields of Illinois. I mention this as an illustration of the widening circle of benefits which are incidental to the extension of our domestic waterways. It is not my intention to speak at length upon this subject. I may, however, advert to one other instance of the avidity with which local projects in our State are seeking to avail themselves of whatever advantages may be made to accrue to adjacent communities from the construction of the great commercial waterway from Chicago to St. Louis.

Through the city of East St. Louis, which lies on the eastern bank of the Mississippi River opposite St. Louis, a small stream called Cahokia Creek flows, carrying off the surface water from the adjacent low-lying flatlands. The sudden floods to which this creek is subject have proven a great inconvenience to the city, and plans have been devised for diverting the waters of the creek from their course through the town into an artificial channel 16 miles long, 300 feet wide, and 20 feet deep. This will carry the waters of Cahokia Creek around East St. Louis and discharge them into the Mississippi River 6 miles below the city.

The estimated cost of this work is \$6,500,000, and for its prosecution a sanitary district has been formed embracing portions of the counties of Madison and St. Clair, comprising an area 27 miles long and from 1 to 7 miles in width. This sanitary district includes a large and populous manufacturing area and extensive railroad properties, and has an estimated value of \$75,000,000. The district was created on September 22, 1908, and the election of trustees will occur on December 16 next. The work of surveying and construction has been placed in charge of engineers of national and international reputation. They are Gen. O. H. Ernst, of the United States Engineer Corps, who for many years had charge of the Mississippi River work between St. Louis and Cairo; Maj. B. H. Harrod, at the time of his appointment and now a member of the Panama Canal Commission, and Maj. D. B. Dabney, of Vicksburg, Miss., who is also in charge of the Vicksburg and Yazoo levee and drainage district.

From these experienced men none of the possibilities involved in the local situation was hidden, and one of the results confidently looked forward to by them and the citizens of East St. Louis is the connection of their surface water channel with the channel of the deep waterway, and the use of the former as a commercial water course. This result will be made possible in the event the plan of the United States Board of Engineers is carried into effect. It is recommended by that board that, instead of using the Mississippi River between Alton and St. Louis, a canal paralleling the river be dug. This will avoid the stretch of river at its intersection with the Missouri, whose cross current deposits an enormous quantity of material in the bed of the Mississippi, demanding constant dredging to maintain a navigable channel. Should this canal be dug, the city of East St. Louis proposes to connect its local channel therewith, giving the city a commercial waterway upon three sides, and furnish-

ing extensive wharfage upon the water side to many of the large manufacturing plants of the city.

No-doubt it was the existence of these and other collateral benefits in various localities which reconciled the people of Illinois to the expenditure of so large an amount of public money in waterway construction. In this connection it may be said that there are probably few, if any, localities upon which will fall the burden of waterway construction entirely unrelieved by collateral benefits. In almost every instance the question of waterway development is also a question of the acquisition of water power, of land reclamation, of fisheries improvement, of the betterment of health conditions, of the extension of industrial areas, and the utilization of other incidental benefits, frequently aggregating many times the direct outlay for waterway construction.

This feature of waterway development has received additional exemplification and emphasis of late through the conference held in the city of Washington upon the invitation of the President for the discussion of means for the conservation of our natural resources. The correlation of the different forms of conservation became manifest the moment that representatives of distant and extensive areas, having a great variety and apparent diversity of interests, undertook their joint discussion. The mutuality of interest and the immense possibilities of collateral benefit furnished one of the most hopeful aspects of the waterway question. Whatever the cost of it, the country must perforce, I believe, undertake the improvement and extension of our domestic waterways, and in this situation it is most reassuring and encouraging to find that the necessary initial expenditure will be largely repaid from sources incidental to the main undertaking, and that this will, in addition, provide, through the water power developed, a permanent revenue which may be advantageously devoted to the further extension, improvement, and maintenance of our waterways.

This is especially gratifying in view of the fact that the waterway, as such, will not be a revenue producer. It will be maintained at public expense as an open highway for the free and unrestricted use of the citizens of the country. When we consider what an enormous traffic has been developed upon our lakes we may appreciate the effect of an extension of these magnificent bodies of water through the construction and improvement of navigable channels communicating with them at one terminus and with the ocean at the other, and traversing the rich mining, agricultural, and manufacturing regions of the interior. That the area available for manufacturing enterprises will be thus greatly extended is evident from what has already occurred where water navigation has been naturally available. Many of these enterprises depend for their prosperity upon the cheapness of transportation facilities and these facilities the improvement of our waterways will furnish in abundance.

In this connection I may say that I do not for a moment believe that the development of waterway communication offers the slightest menace to the future prosperity of our railroads. On the contrary, I am of the opinion—now held, I believe, by those who are best informed upon the subject—that in the present congested state of our railroad transportation systems the transfer of a great deal

of the heavier, coarser, and slow-moving freight would be a distinct advantage. There is, I believe, a natural and marked distinction between the transportation uses which can be best subserved by the swift-moving railroad service and those which are fully met by the slower but cheaper water transportation.

Statistics show that, in round numbers, one-third of the freight moved by rail is worth less than \$1 per ton at the point of production; another one-third exceeds in value \$5 per ton; and one-third ranges between \$1 and \$5 per ton. It is apparent from any study of the cost of transportation of primary products that if these could be handled more cheaply than now, the output of high-class freight would be greatly increased and the railroads would receive a double benefit. They would be relieved of low-grade freight, which they now find it necessary to move in order to maintain the output of high-class freight, and the production of high-class products, which furnish the most profitable class of freight traffic would be greatly stimulated. It will be found further that there are vast resources in our domain which will not bear railway transportation and for which waterways are a necessity if they are to be developed.

It is not my intention, however, to dwell upon particular phases of this broad subject. These will be discussed doubtless by those more familiar with their details than I profess to be. In what I have had to say I have attempted to deal only with some of the general aspects of the waterway question as they have presented themselves to me. It seems to me that in any policy to be adopted for the conservation of our natural resources, the preservation of our navigable waterways for the public benefit must occupy a foremost place, and that the discussion of this very practical and pressing question is of the utmost importance at this time.

GOVERNOR N. B. BROWARD, OF FLORIDA.

The CHAIRMAN. I will call on Governor Broward, of Florida, to address us briefly on this question.

Governor BROWARD. Mr. Chairman, ladies and fellow-citizens from every portion of the country, it is very difficult for one to undertake to speak after others have preceded him, not one or two, but by the dozen, who have carefully studied the problem that we are attempting to solve, and for one to come at this late hour and undertake to talk about something that every one present is perhaps better informed about than he, is to undertake the impossible. It is always poor policy to undertake to make excuses. Persons are not interested in excuses, but I will make the excuse that I have been exceedingly busy since I have been here, and have not had the privilege of listening to those who have already spoken, and who have given this matter careful consideration. Therefore, I approach the subject as a boy might approach the side of the ocean when he is commanded to cross it without boat or oars.

It is fortunate for us that Mr. Pinchot and his splendid coworkers have done so much to place before us the facts that provide us with so much food for thought. Those who first came into this country thought that the forests were exhaustless, that the mines were inexhaustible, and it seems that even up to now there are many of our people who believe that we are on a wild-goose chase, that we

are afraid of something that there is no real reason to be afraid of, and that to talk about conserving the forests, or the water supply, or the coal supply, or the iron supply, and all of that kind of thing, is folly.

But if one will only travel over this broad land from one ocean to the other, from the Lakes to the Gulf, he will soon be impressed with the fact that the forests are disappearing rapidly and that those who own them say they are receiving but a very small compensation for the value of the property they are parting with.

In the State of Florida, covered as it once was with tall yellow pine, so that a single acre of land would provide to the miller, perhaps, 10,000 feet of lumber, it has been cut off very largely over the whole State, so far as that State is concerned. The turpentine man has come in and is boxing the trees down to such a size that sometimes cutting a box on one side will cause the tree to fall in a moderate wind. Sometimes fire gets in and destroys many more, and this, with turpentine selling for 35 cents a gallon, which is no price at all for the value of turpentine, even not taking into consideration the great value of the trees to the State in which they are and to the owner of the trees.

We look around the headwaters of our streams and we see the hill-sides along the rivulets and branches being denuded of the timber and even the vegetation disappearing in many instances. We can see that the time is near by when that section of the country must suffer from first a drought and then a flood, as there is no foliage to retain the moisture in the land, and therefore it is just as though you would throw a cup of water in a tin basin that will not absorb or retain moisture and then tip it so it will run out; you would have a drought almost as quickly as you would a flood by throwing the water down and letting it run to the sea, unused in many instances, and not retained long enough to be of much use to anyone.

The fact that these gentlemen have gone out into this country and have made these careful investigations, have estimated the value of our water, if used as power, and the many uses to which both the power and the water can be put on its way to the sea, is not only a great credit to them, but will become a great blessing to the people of this country. If the people will act in concert and take advantage of the situation while they may, great good will result. To preserve the forests is necessary. Reforestation is necessary. It matters not whether it comes at a large or small cost, we must provide for the years to come; the not far distant years, but years almost in sight. At the present rate of cutting in the State of Florida, the vast timber areas that I see so graphically described by some man in Michigan as existing in Florida will disappear within twenty years, and twenty years is a short time. I am 52 years old now, and I expect to be here that long. In many instances we cut the timber down, oak scrubs spring up and grow in place of the trees that are gone—not trees with great leaves falling from them to retain the moisture and to fertilize the soil, but a species of bush that does not retain much moisture and does not fertilize the soil by its falling leaves. As a result, the land grows poorer instead of richer.

In the next place, our State has been burned over every year by forest fires. The man who has cattle sets fire to the weeds and grass as early as February and burns the old grass off with a view of having

a "new burn," as he calls it, or new grass for his stock. The young pines are burned off that are only a year old, and you can find some sections of the State entirely denuded now. In some sections where by good fortune it has not been burned over regularly you will notice saplings two years old as tall as this room is high, showing how quickly we could reproduce our forests if we would only stop the waste.

I have twice recommended to the legislature that action be taken to protect our forests; that fire districts be laid off and keepers be put upon them to protect the forests from fires, with a view to reproduction of our forests, but so far it seems that the doctrine is that everyone will do all he can to make the dollar in sight and never think of the waste that is taking place. In many instances the man can not afford to consider that. He owes the bank, and the bank has loaned him somebody else's money, and he must go on, though he knows that it is waste, and cut his timber.

That some general plan should be entered upon, understood by the representatives in every State, and some uniform action be taken, goes without saying. It is well for us to be here to consider these things and see what can be wrought out of such work as this. There is not a State in the Union, unless it be out in the Far West, but in my section of the country especially, where the country is not getting dryer all the time, and particularly is that applicable to Florida. Not only do we vote our State dry, but less water is retained there as well. We are getting dryer all the time. It is true there is one portion of our State that has more water than it ought to have. You will notice by the reports that on the east coast of Florida, toward the southern extremity of the State, known as the Everglades, 81.66 inches of rainfall has come to us this year, up to the 12th day of November, beginning at the 1st day of January. I have no doubt we will have fully 8 feet of rainfall by the end of the year. In spite of that the territory is gradually becoming dryer in the upper portions of the State. In many instances the farmers are irrigating their farms. Bankers at Gainesville do not hesitate to lend money to the farmer who will irrigate his crop, and will not lend money to the farmer who does not irrigate his crop, unless he has property other than the crop expected to be produced by the money loaned, which shows the importance of irrigation in one portion of the State of Florida. In the other portion of the State we have now already entered upon a plan to dig 250 miles of canal through what is known as the Florida Everglades, with a view of lowering the level of the water in the land so it may become cultivatable, and with a view also of offering to these people in this country an opportunity for planting sugar cane. With an area larger than Connecticut, Rhode Island, and Delaware combined, almost as level as this floor, covered with a few inches of water most of the year, lying idle with scarcely a tree upon it and nothing but coarse grass, unless the water is reduced from the surface and the land thereby be made sufficiently dry to cultivate, it will never be of any value to us or to the State. It is land which, when drained as we hope to drain it, is as rich as any other in the world. There are a million acres of that land that would produce more than the 30,000,000 acres of other ground in the State, so far as valuable crops are concerned.

We have entered upon this work of drainage in the last four years. Though the land was patented to the State nearly sixty years ago, to aid the State in draining and reclaiming this territory, nothing effective was done with it until recently. In searching the records of the Senate you will find that Senator Breeze, of Illinois, recommended the passage of a similar bill to the one that was passed without amendment, granting to that State all the land lying south of the north end of Lake Okeechobee and between the Gulf of Mexico and the Atlantic Ocean, on condition that the State should drain and reclaim the land and apply the residue to purposes of education. So long ago as fifty-five years, the state legislature created trustees to carry on this work, but the only effective work has been begun within the past four years. Political bodies move slowly. It is necessary that the people shall get behind their representatives and impress them with the fact that they propose to have their work done. All kinds of obstacles are found in the way of an attempt to do any work of this character. As the President suggested the other evening, you will find many difficulties to overcome before you conclude the solving of the problems that are considered here.

We want men with intelligent minds and with strong will. We want to offer one prayer for the people of this nation, if we offer no other, and that is that they will trade off spareribs for more backbone.

We should conclude in the outset that God made this country for the people who are in the country, and not the people for the country. We should appreciate another fact, that this is our country, all of it, and that all of the highways should be used for the people, for the benefit of the commerce of the people, and that the people should not be used simply as a means by which the owners of the highways make money for themselves.

Sometimes when I look this problem duly in the face I see why the bravest of us dodge the problems, and I have really walked around some of the problems until some one discovered me and I had to face them. It is necessary, I believe, that all of us get discovered sooner or later. We must enter upon some plan with reference to these problems. I heard the governor of Louisiana make a speech this morning here. He suggested a plan that he thought feasible. I will not venture a plan upon this occasion, but will make suggestions that we may consider.

I believe our State should retain as much of its own public domain as possible. A small portion of our once proud public domain is left to each of the States. Though Florida was granted by the National Government all of the swamp and overflowed lands within it, and there has been patented to it 20,150,000 acres, yet 17,000,000 acres of that land have been given to railroad and canal companies, so that we now have left only 2,260,000 acres. Every contract made with a company to build a railroad, every grant of land wound up with this language, "and drainage," providing that they should build a railroad on certain specifications, and conclude with the provision, "and drainage," because the legislature thought they had to say something about draining the lands, or they had not a right to give it away, as the land act of Congress expressly required that the land or its proceeds be used exclusively for that purpose. When the statutes were compiled there was included therein this language: "Provided that the lands herein granted shall remain

subject to the control, management, and sale of the trustees of the internal-improvement fund for the purpose of said trust under the said act," which trustees were created by the legislature to carry out the contract with the Federal Government to drain the lands. As soon as they would undertake to consider a straight course, then one proposition and another would be offered. Contracts were entered into, but out of all the contracts to drain land less than 20,000 acres were ever truly drained. Now we have entered upon a plan of really reclaiming by drainage the 2,200,000 acres that the State still owns, and about 2,000,000 acres of adjacent land of the same character.

I do not know what the other States have done with their lands. I am afraid that if stock was taken of the public land in those States they would find that the men who were more ambitious than others and who had some special interest to conserve got more than their share. A too liberal policy prevailed in our State; no dishonesty, but they simply got to giving the land away, and it seems we could not stop it. When I was elected governor I declared we would not deed away more land, and proposed to retain what we had and reclaim it according to the former contract with the nation, when great opposition sprang up. Twelve different lawsuits were brought in the federal courts and some in the state courts, and some of them still exist, though we have won at nearly every stage of the fight. Therefore, my countrymen, you can rest assured now that there are obstacles in your road. There are many difficulties to overcome. But, I say to you, overcome them and do not protect the interests of a few selfish people who are endeavoring to obtain the advantages for themselves regardless of the interests of all the other people.

While I am suggesting these difficulties and obstacles which you will have to overcome, I do not want to get in the position of the good old minister, to whom I listened on one occasion. He invited everyone to join his church. He wanted every sinner to come into the fold, sign the roll, and become a member of his church. He impressed the audience with this thought, "It is hard to be a Christian; it takes a man or a woman to be a Christian." And I looked at the little children in the audience and the young people who were about to get married, and wondered what would become of them. He kept on until a Christian looked as heavily laden as does Atlas with the world on his shoulders, and then invited every person to walk up and sign the roll loaded down in that way. The result was that nobody walked up. I do not want you to get too heavily laden, but we must all realize at all times that if we are to succeed we must succeed by individual effort. Everyone should act along some well-defined lines. Write letters, talk to your neighbors, talk to your governor, to your member of legislature, petition Congress. The reason we complain so much of our Representatives in Congress not doing so well for the public generally, but doing well, as we claim, for the special interests is because we do not stand by them. If they stand up and fight for us, we do not stand up and fight for them. The result is they must take the middle course and become very conservative, lest they be left at home entirely and not be permitted to come back to Washington again. We are men and women.

We are human beings, and we are controlled largely by the same influences. The firmest body will turn out of its way any other body of less weight. We are bound as we go along to yield to forces superior to our own, but if all the people will think together, and if the great majority of the people will act together, every other weight or influence must give up to them. We must think. We must be proud of our Representatives. Stand behind them, and if there is one of whom we can not be proud, keep him at home, guard him carefully, and do not let him come up here to harm himself or to harm us. Agitation is necessary to succeed in carrying out any great policy. Cooperation is necessary, and to become acquainted is necessary. You know a great many of our people in the South and in the North and in the West are afraid that we might get too close together and that the Federal Government might get too great a hold upon the hearts and minds of the people of the different sections. There are those who are afraid that this safeguard will be knocked down, and as a result the sovereignty of our States disappear, and all that kind of thing. In all probability there is some danger along that line, but it is not imminent; it is not close by. So far as I am concerned, coming from the far southern portion of this country, I want to say this to you: All of this country looks good to me, and I propose to have any piece of it that I set out to get. I do not know but what I would have it all if I could. In a jocular sense, we have tried one experiment and it did not work. The folks up this way loved us so much they would not let us go; they held us back. I do not think there is anybody down our way who wants to break loose any more, but we propose to come up here and take what you have. We are willing you should come down and take whatever you can find down our way that is not nailed down.

However, while we may speak of sectional lines, let me say to you that there are none. The fellow who talks about sectional lines here, there, or yonder, is a man who has not traveled very far. The more we get about our country and the more we understand each other, the more we think of each other and the less we think of ourselves. It has been said, "If a man would be joyous, look without; if he would be miserable, look within."

Sometime ago I was in the State of Nebraska, and I was impressed with this thing, which shows that when our people think, great good will come from their thinking. The governor and his wife took me out to the asylum first, and we took lunch there. From there we went to the penitentiary and took dinner. After getting inside of the walls of the penitentiary, I said to the warden, "What is your death rate here?" He said, "I have only been here four years. We have had an average population of 408 for the four years, and the only death we ever had during that time was caused by hanging. We hung one man." I said, "Tell me the secret." He took me out to where the prisoners were required to work, thence to the bath-rooms, thence to where they slept and lived. The sanitation was perfect. Sanitary conditions could not have been better. The rules were enforced rigidly and good health resulted. No person died in the four years of any disease. The only man who died came to his death from hanging, and of course he could not help that.

Now, my countrymen, this is an indication. This points toward what can be accomplished for the good of humanity, for the health

of humanity, and if we will only think and act in the same way, we will have no difficulty in conserving our products. There was an example of the conservation of human life. We can in some similar way conserve our waters. The coal and iron and all of the other riches that bless this country, can be conserved in some way; but it will require careful thinking, careful acting, and when we have careful thought and careful action, the battle will have been won, and we will not only be benefited by it, but our names will be revered by those who come after us; and as I said yesterday evening, of Mr. Pinchot and Doctor McGee and Senator Newlands and all the others who were appointed and who went out to take up this great work of considering the conservation of these natural resources and the purification of the waters and all that kind of thing, their names will be preserved on parchment and hung upon the walls throughout this land, and they will be appreciated throughout all the years to come as persons who looked forward, who thought not only for themselves, but thought that those who were to come after them were entitled to some of the good things of the earth, as well as those of us who are living in this day and age.

When we have each done his full duty in this life, each one will leave it feeling that this work was not half done; that he had only accomplished a small portion of what he would like to have accomplished. I saw the other day a man in declining years and in declining health. When some one asked him how he had enjoyed life, what he had to say, he made this declaration:

I feel that I have done my best. I did not start early enough, it is true, but for the last twenty years I have worked every hour that I could. I have done well every piece of work that it was my duty to do and that I undertook to do, and I can look up at the planets in their course and say I, too, have done the work that was allotted to me, and I challenge you to do more.

I say this to every person present, that it is the duty of all of us, if we would enjoy that consciousness which a good citizen ought to enjoy, to feel as he goes toward the grave, "I have done all that was in my power, not only for the glory of the God who created me, but for the joy of the people, of my neighbors, for the sake of Him who blessed the world and with whom I expect to dwell throughout all eternity."

I will not keep you here any longer making a rambling speech. My heart is with you. I will do everything in my power in the section of the country in which I live to preserve the forests, to have the water courses properly utilized, to insure to the people of the country the completest use of these natural riches that were put within their reach by the Creator himself; and whether successful or not I shall go out of the fight proud of the opportunity, proud of the part that I took in it, and having no regret except that I had not accomplished more.

I thank you for your kind attention.

GOVERNOR ROLLIN S. WOODRUFF, OF CONNECTICUT.

The CHAIRMAN. I now take pleasure in presenting to you Governor Woodruff, of Connecticut, and I know we shall all be glad to hear the message he has for us.

Governor WOODRUFF. Mr. Chairman, ladies and gentlemen, I have enjoyed all of the exercises of the past two days exceedingly from

the very fact that my name has not been on any of the programs, and I have not been obliged to think that I was going to be called upon to say anything. I am, however, glad to appear before you to represent our little State of Connecticut. We are a small State. We are a manufacturing State. We have no mineral resources. We have no waterways that need developing. We have, however, Long Island Sound, which helps our manufacturers to get raw material at moderately low prices. We are simply a producing State. We have the reputation of manufacturing some things, but that reputation is not well founded. We have been accused of manufacturing wooden nutmegs, but I assure you, gentlemen, that is not true. We have, however, in the past produced many things and a great many things that have been produced for the first time.

We produced a constitution, the first written constitution, and the United States Government copied after it. We have produced a great many men who have been prominent in this country. We are proud to say that we have a living example right here of our own product—Mr. Pinchot.

We concur in everything that has been brought out here in all these great questions which are being discussed. There is no State which will receive greater benefit if these projects are carried through than will our little State of Connecticut. We need raw material because we are producers, we are manufacturers, and none of you, no matter from where you came, can go into any hardware store or agricultural-implement establishment where you will not find some of the products of our Connecticut.

We stand ready with the other States to take any action that may be necessary to bring about all of these good things which you are considering. It is simply a question of education, gentlemen. You can not expect to wake up to-day, walk up to the National Government and present your case, and expect that they will open the strong boxes of the Treasury and hand over to you the necessary funds to carry out these projects. The people must be educated. They must be so thoroughly educated in all these questions that these Representatives in Congress will absolutely be forced to give you what you want in a reasonable way. All this takes time. Mr. Pinchot, in his forestry work, has done a remarkable work. It is only a few years that he has been at it, and he is responsible for bringing out all that has been done in the way of forestry.

We have no forests in Connecticut. We have a few wood lots. Our State appropriates a very small sum to our state forester to-day to enable him to do some things, and he has done them in a small way, mostly in an experimental way, but he has shown what can be done.

Within the last two weeks our New England governors have come together and considered certain common laws which were for the benefit of all of our New England States. We had a conference week before last similar to this, in which the question of forestry, the question of the cultivation of the lobster, the question of good roads, and the question of a uniform automobile law were considered. We propose to have in New England a uniform automobile law, so that when you gentlemen wheel into New England you will know that the law throughout New England is the same. I believe that the States can come together in this way and accomplish a great deal. It is right

along the same lines that we are considering here, and a great deal can be brought out of it. I do not know that I have anything more to offer at this time, Mr. Chairman. I am highly pleased to have been called upon to represent our State at such a meeting as this.

I thank you very much, gentlemen.

Mr. PAGE, of Virginia. Mr. Chairman, I rise to a question of personal privilege. I am perfectly willing to accord to the great State of Connecticut all the wonderful work she has done, and I am willing to say in behalf of the country that in the production of Mr. Pinchot she has done probably her greatest work, so far as that may be concerned. But I must say, in behalf of Virginia, that I do not admit that Connecticut was the author of the first Constitution of this country.

EX-GOVERNOR SAMUEL R. VAN SANT, OF MINNESOTA.

The CHAIRMAN. I will now call upon Governor Van Sant, of Minnesota, for a few remarks. I take pleasure, gentlemen, in presenting to you Governor Van Sant, of Minnesota.

EX-GOVERNOR VAN SANT. Mr. Chairman and gentlemen, it has seemed to me since I came to Washington that every person I met was either an officeholder, an ex-officeholder, or willing to be an officeholder. I was introduced as governor—I can not for a moment sail under false colors. Minnesota can have only one governor, Governor Johnson. So you see I am not a distinguished statesman, but an extinguished one—only an ex-governor, if you please.

For more than thirty years I have been actively interested in the waterways of our country. I am a steamboat man, and had thought until I came to this meeting that I was the only steamboat captain who was ever the governor of a State, but I have since learned that the governor of Florida was also a master of steam vessels, so I have to divide that honor with him.

I have just come from the River and Harbor Congress. It is a great gathering of splendid, determined American citizens. I predict a speedy improvement of our waterways. Those men mean business, and in time will get what they have so long contended for.

There has been such an aroused public sentiment that practically every commercial body, chamber of commerce, board of trade throughout the length and breadth of the land favors this great movement; and I doubt if any candidate for Congress, in either party, in any State of the Union, would have the temerity to stand up before election and say to the voters in his district that he was opposed to the improvement of the waterways of our country.

In my judgment, when we have a perfected and completed system of waterways, it will do more to solve the rate problem—in fact, the whole vexed transportation question—than all the laws that we may be able to put upon our statute books.

I am glad to look into the faces of my coworkers in their efforts to conserve our forests, for I am also a delegate here. I promise you that so far as my ability and my strength go I am with you heart and hand, and will aid you in every measure that will help to preserve our forests; for in doing this I feel that we are advancing the interests of our waterways, for forests are essential if we are to have a sufficient water supply.

Yes, I will join hands with you and do all that I can; but we must remember that if we want anything we must not only ask but fight for it. This is a fighting age. Yes, we must not only ask Congress for aid, but we must fight, and fight hard. This is a representative government, and we send men to Congress to represent our views, and if we do our whole duty and make our wants known the Members of Congress will be only too glad to carry out our wishes. I think I know what I am talking about. No one has his ear to the ground and keeps it there longer than the officeholder, and no one is quicker to discern public sentiment than he, and to trim his sails accordingly.

I am not a pessimist; I am an optimist. I have no fear of the result. When I read the history of my country, I learn that we have met and overcome every obstacle in the past, and I am sure we will meet the difficulties which confront us now, and master them, too.

It is very gratifying to be here for another reason. It is a pleasure to meet the delegates from Florida, Georgia, and Louisiana, and from other portions of the South. We are united now for a common purpose and have no North, no South. I am glad indeed to meet so many ex-Confederates. The war is over and if these ex-Confederates will fight as hard to preserve our forests as they fought when I was in the Union Army and pitted against them, I am sure we will win, especially as we are all fighting for the same cause. United we can get anything we want.

Yes, the war is over, and I am glad to say in this presence that the warmest greetings and heartiest handshake that an old soldier gets is when he goes south and meets an old grizzled Confederate veteran. With the old soldiers on both sides there are no longer any animosities. The asperities of that great struggle have passed away. So I say it is a great pleasure to see so many public-spirited men from the Southland, who join with us in the effort to bring blessings to millions yet unborn.

Other gentlemen have spoken gloriously of their States, but it is not necessary for me to tell you of the glories of Minnesota. Governor Johnson has undoubtedly done that, and in the best possible terms. I can not, however, resist the opportunity to say a word about the North Star State. It is most fortunately situated in the center of the North American continent and midway between the Atlantic and Pacific and the farthest point toward the setting sun reached by tidewater navigation. It has two great waterways to the ocean; one via the Mississippi River, the other from Duluth via the great chain of lakes, and still another, if ever made necessary by a greatly extended commercial trade, via the Red River of the North and Hudson Bay. We raise the wheat to feed the world, have the largest mills in the world to grind it into the best flour ever made. We have iron ore enough to supply the wants of mankind for a century to come: Our forests for half a century have enriched our people, and have supplied surrounding people with lumber to build their happy homes. We have ten thousand beautiful lakes, and from this fact Minnesota received her name, the land of sky-tinted water. We also have numerous rivers, and our lakes and rivers teeming with fish and our forests alive with game make Minnesota the paradise of the sportsman. We have a vast area, the State being larger than all New England, New Jersey, and Delaware, and have more square

miles than England and Ireland combined. Our climate is unsurpassed. The afflicted people of all States come to Minnesota to breathe her exhilarating air and to renew their youth. Yea, Minnesota ozone is famous the world over. A story will illustrate: A man from Florida, Georgia, or some other State, was very near death's door. His physician told him he could not live unless he changed climate and suggested Minnesota as the best place to go. He followed the advice, and after remaining in our State a few weeks he wrote back to his friends that he was getting along finely and that he felt twenty years younger. In due course of time his improvement was so great he wrote that he felt thirty years younger, and still later that he felt forty years younger. The next they heard from him, he had died with cholera infantum.

These conditions, however, do not constitute a State. Better, and above all, we have 2,000,000 happy, contented, and prosperous people, and these are Minnesota's greatest asset. But I must not tell you all the good things about our great Commonwealth; I fear I would do you a great wrong, for you might be induced to leave your present abodes and move bag and baggage to the great Empire State of the West.

GOVERNOR MARTIN F. ANSEL, OF SOUTH CAROLINA.

The CHAIRMAN. I am going to call upon Governor Ansel, of South Carolina, to give us a short address on this subject. I know we shall all be glad to hear from him about this matter.

Governor ANSEL. Mr. Chairman, ladies, and gentlemen, I have had one chance at this audience, I do not know why I should be called upon again this afternoon unless it is for the reason that I am a water man, interested in salt water, interested in fresh water, and am on the water wagon. You all know what the governor of North Carolina said to the governor of South Carolina. The last message that I have received from my distinguished friend, Governor Glenn, is that we want water, water, more water.

I represent in this body primarily the State of South Carolina, but also the whole United States. We are here to devise ways and means for the best interests of every State and of each State and of all the States. As you know, in South Carolina we have on one side the Atlantic Ocean. Therefore we are interested and greatly interested in navigation. We have in the other portion of the State the mountains, where they do not make sunshine, but sometimes they do make a little moonshine. We have fresh water there and we are beginning to take measures at this very time to utilize this great commercial asset that has been going to waste for years and years, and we are churning our waters from their very source until they get nearly to the Atlantic Ocean, and then we make ice out of them. One hundred and seventy-five thousand horsepower of that water is utilized at this very day for the purpose of making electric power, and we have 375,000 horsepower of water still to be utilized and to be used. That is in the nonnavigable streams of our State. Are we not interested in water?

We are interested in forests as well, because the sources of many of our rivers are in our mountainous country, where the trees are being cut down. I do not know when I have felt as badly as I did last summer a year ago, in looking at one of the mountain sides that I

used to see covered with forests when a boy, large and small trees, and I asked, "What is the matter with that mountain side?" It was bare. I was told that a little sawmill had been put up there, and instead of having that loam soil that we have upon our mountain sides, it was going down into the creeks and into the rivers and into the sea, causing this great Government to have to spend money in dredging the navigable streams of our country, in order that the ships may float and carry the produce that is raised in this great country of ours.

I just wanted to say a few words by way of exhortation, but fear I might do as I have often heard done—spoil a good sermon by a very poor exhortation. I want to say that I am with you in this great work of preserving all of these bounties that have been so largely bestowed upon us, preserving them for our posterity—the waters, the forests, the lands, the minerals, which are the great riches of this country. Whether they be used in the next century or the two centuries or the next three centuries, let us preserve them for our posterity, in order that they may rise up in later years and call us blessed.

REPORT OF COMMITTEE ON RESOLUTIONS.

The CHAIRMAN. Gentlemen, the hour has arrived for the special order of business, and we must proceed to that business. It is a matter of very sincere regret to me that our time is so short, as I know it is a matter of regret to all of you. Possibly there may be a chance that some of the gentlemen who certainly ought to be heard may have an opportunity after we consider the report of the committee on resolutions.

I will ask Governor Pardee to present now the report of the committee on resolutions.

EX-GOVERNOR PARDEE. Mr. Chairman and gentlemen, your committee on resolutions has had two or three meetings, and the opinion prevailing among the members of the committee was that the prime object of this meeting was for the purpose of either indorsing or refusing to indorse the report of the National Conservation Commission, which was appointed by the President, and has been holding its meetings during the last week or ten days here in Washington. Various resolutions on other matters specific in their nature were presented to the committee; some of them have been withdrawn by the gentlemen who introduced them, others have been considered of such specific importance by the committee on resolutions that they resolved to refer them to a committee which is called for in a resolution here to be presented, and others will be presented by us at this time. As I say, the report of the committee on resolutions embodies primarily the indorsement of the report of the National Conservation Commission, which will be presented to the President. The report of the committee on resolutions reads as follows:

This joint conservation conference in session assembled in the city of Washington on this 10th day of December, in the year 1908, representing the several States and Territories of the United States through governors of States, state conservation commissions, delegates, and representatives of state and national organizations dealing with natural resources, does hereby resolve and declare:

Having heard the report of the National Conservation Commission read, and having fully deliberated thereon, we hereby indorse the said report as a wise,

just, and patriotic statement of the resources of the nation, of the thoughtless and profligate manner in which some of these resources have been and are being wasted, and of the urgent need for their conservation in the interests of this and future generations, to the end that the prosperity and perpetuity of the nation may be assured.

We especially approve of the principle of cooperation among the States and between these and the Federal Government laid down in that report and in the earlier report of the Inland Waterways Commission, and urge both state and federal legislatures to enact such laws as may be necessary to extend and apply such cooperation in all matters pertaining to the use and conservation of our resources.

We especially commend and urge the adoption of the policy of separate disposal of the surface rights, timber rights, and mineral rights on the remaining public lands of the United States; and we approve the disposal of mineral rights by lease only, and the disposal of timber rights only under conditions insuring proper cutting and logging, with a view to the protection of growing timber and the watersheds and headwaters of streams used for navigation and other interstate purposes.

We also especially approve and indorse the proposition that all the uses of the waters and all portions of each waterway should be treated as inter-related; and we emphatically urge prompt and effective legislation providing for the immediate and proper development of the waterways of the country for navigation, water supply, and other interstate uses, preferably by direct federal appropriations; otherwise by the issue of bonds.

Approving those portions of the report pointing out the need for continued investigation and more extended scientific research, we also urge that this policy of gaining more definite and specific knowledge relating to our resources be adopted by the several States no less than by the Federal Government.

Especially commending the portions of the report dealing with diminished national efficiency due to disease and premature death among our citizens, we urge the adoption of the policy of protecting life and health by States, municipalities, and communities no less than by the Federal Government; and we urge further investigation of all other means whereby the efficiency of individual citizens, and hence of the States and nation, may be increased.

We favor the maintenance of conservation commissions in every State, to the end that each Commonwealth may be aided and guided in making the best use of those abundant resources with which it has been blessed.

We also especially urge on the Congress of the United States the high desirability of maintaining a national commission on the conservation of the resources of the country, empowered to cooperate with State commissions, to the end that every sovereign Commonwealth and every section of the country may attain the high degree of prosperity and the sureness of perpetuity naturally arising in the abundant resources, and the vigor, intelligence, and patriotism of our people.

Ex-Governor PARDEE. I move the adoption of the report of the committee.

(The motion was duly seconded.)

Senator SMOOT. Mr. Chairman and gentlemen of the conference, I wish at this time, as I did in the committee, to reserve the right in voting upon this report to say that I am rather doubtful in my mind as to whether a law can be passed that would be successful in the United States, especially in the western parts of this country, in the separation of the surface rights from the mineral rights. In saying this I simply refer to lode claims and placer claims. I approve of the principle, if it can be carried out successfully, but in my opinion, knowing the country as I do, where lode claims are numerous and especially as to the placer claims, the surface itself is the ground which contains the mineral, and I reserve the right at this time, as I have suggested, to make this statement, so if I am ever called upon at any time to act upon this I will not have my action or vote here pointed out as my position on the matter.

Senator NEWLANDS. I would like to ask the Senator from Utah whether he thinks this report covers lodes and placer claims? Was it not only intended to apply to consumable minerals, such as coal and iron, and not to the precious metals, gold and silver.

Senator SMOOT. I thought that the report was rather sweeping in its statement, because it says, merely, "mineral rights," and is not specific as to what minerals are included, and I therefore took it for granted that in adopting it, it would mean all of the minerals.

EX-Governor PARDEE. As many in the committee thought it was almost if not quite impossible to make any reservations, the general idea of the committee and also of the commission was and is that this should refer particularly to these great bodies of consumable minerals, and that whatever portion of the surface of the land may be necessary for the working of the nonconsumable minerals of the country would be freely granted to those people who are working the resources of the country for the purpose of securing those minerals, but that no agricultural land should be given to miners and held by them in great tracts for the purpose of holding and controlling at the same time the gold and the iron and other minerals lying beneath the surface.

Senator SMOOT. Mr. Chairman, I presume Governor Pardee knows I am in full accord with that, and the only suggestion I had at this time was that I wanted a record of this, so that no technical matter could be brought up in the future, but that we in this gathering here virtually understand the question and that we are more particularly referring to minerals that can be consumed rather than precious metals.

Senator NEWLANDS. Mr. Chairman and gentlemen, I should like to say a few words regarding the machinery which, in my judgment, legislation should provide for this constructive work regarding the waterways.

In my judgment, the period of agitation is nearly over and the period for actual construction is come. Public opinion is now formed upon the subject of the development of the waterways throughout the country. It has so impressed itself upon the action of political parties of the country that both parties, in recent national convention, have declared themselves unequivocally for the full development of all waterways for every use to which civilization can put them. You will find clear, unequivocal statements upon this subject in both platforms, and it remains now for Congress to carry out the pledges which the great parties have given to the people. This is the real question now before us.

You have appointed a committee consisting of a representative from each State in the Union to appear before the Committee on Commerce of the Senate and urge the views of this conference regarding the development of our waterways. There is not a man on that committee who does not favor the development of our waterways, but the question of the machinery under which that development shall be accomplished is an open question. It is that question upon which they will wish to hear from you. Are you satisfied with the machinery which thus far we have had? The views presented by Members for particular projects are freely aired at the committee meetings. The bills concerning the matters are referred to the Engineer Corps of the Army for their opinion, are then later acted upon by the com-

mittees of Congress, and then by Congress itself. Those methods of course have been improved in late years under the admirable administration of Mr. Burton, of Ohio, as chairman of the Rivers and Harbors Committee.

But the energies of Mr. Burton, I imagine, have been directed more in the line of preventing pernicious projects than of advancing real constructive projects. We all realize that Mr. Burton has been an overworked man, so much so that he proposed to withdraw from the chairmanship of that committee at the last session of Congress, because he found that his time was exclusively taken up in its work. He desired to apply himself, as he is well fitted to do, to problems of general statesmanship. If Mr. Burton should retire from that committee, how long will it be before we can get another man who will acquire the same experience and who will manifest the same interest in his work that Mr. Burton has? The difficulty has been thus far that Congress has been endeavoring to do not only legislative work but executive work, and we have not had the assistance in the execution of a great work of a great number of government experts who could furnish us all these various projects in an uncompleted form, determine their merits and their relative importance, and weave them all into one connected and comprehensive plan, and when a project was determined to be feasible, immediately enter upon the construction of the work.

We have been engaged in river and harbor work ever since this Government was formed over one hundred years ago. We have expended over \$500,000,000 in river and harbor improvements, and outside of the harbor improvements, many of which have been admirable, we can hardly find any appreciable results so far as the navigable rivers of the country are concerned. We have witnessed the development of the pork barrel, under which process each of the Members of Congress scrambles for position upon these committees, with a view of securing the advancement of his project in his particular district, not engaged in the formation of comprehensive plans, not looking out for the interests of the entire people, but simply looking at the particular project in which the particular district may be interested, and that particular district content provided a large amount of money is expended, whether the project be meritorious or not.

I heard the Speaker of the House of Representatives before the Rivers and Harbors Congress this morning speak upon this subject. He gave the history of legislation upon this subject and showed the advances that have been made, and among other advances declared that in the Fifty-first Congress, nearly twenty years ago, the Government had entered upon the contract system in river improvement, and he held up his head and said, "Thank God for the contract system." Think of a government which has been in existence for nearly one hundred years engaging in river and harbor improvements without seeing the merits of the contract system; and if it takes the Congress of the United States nearly one hundred years to ascertain the advantages of that system, I ask you how long it will take Congress to frame a connected and comprehensive plan regarding the development of our waterways?

I am a Member of Congress, and I do not wish to belittle the capacity and usefulness of that body, but I do say that it has seized upon and held powers for years that do not properly belong to it.

It is the disposition of every person and of every organization to seize as much power as it can and to exercise it, and Congress has been jealous of giving up any portion of its power upon these questions, and will be in the future.

The other day a prominent Member of Congress asked me what I thought as to the advantages of having a commission. He said, "I feel that I can get more from a committee of Congress than I can from a commission." He did not realize the significance of his utterance. He was an advocate of the system that enables a Congressman to get as much as he wants for his particular district or for his particular State, whereas the advantage of a commission is that it does not yield at all to political interests, but it determines those questions according to the scientific relation of them and the scientific importance of the projects, and it knows no district, knows no State, knows no section. I do not believe we can ever enter upon a constructive plan properly that involves this collision of interests that a legislative body will necessarily be involved in.

So the contest which we have before us is not one as to the advisability of entering upon the improvement of our waterways, but as to the methods under which this great work shall be conducted. I wish to say just a few words upon that subject, particularly with a view to impressing certain considerations upon the minds of the committee of this body that is to meet the Committee on Commerce of the Senate to-morrow.

The men who have given most thought to this subject have concluded—and I think they are supported by the judgment of the country—that in order to enter upon this great work it is necessary to have an ample fund provided, and a fund that is not subject in the future to the contingencies of legislation; a fund which, if not kept good by legislative appropriation, will be kept good by bond issues, so that the commission which enters upon this work can plan a long way ahead and can see before it the means with which to engage in consecutive work. Consecutive work is a most important element in this matter; not the disjointed work that we have had in the past; not work here and work there, interrupted now and then by intervals of one or two or three years.

It is also important that we should have a board or a commission—it is frequently styled an inland waterways commission—and the President should be given the power to appoint such a commission and remove the members thereof whenever he sees fit. The responsibility of this great work should, in my judgment, be put upon some one man, and obviously that man should be the President of the United States, in whom all the executive power of the United States is vested. I would allow him to select the officials through whom this work is to be done, with requirement that reports be made to him, with requirement for frequent reports to Congress and submission of plans and estimates and expenditures both to the executive and legislative bodies of the country. I would also provide—and I say I, but I think this is a sentiment indorsed by the Inland Waterways Commission and by the men who have thought upon the subject—for coordination in this work through this commission of the various bureaus of the Government whose work in any way relates to water, such as the Forest Service, the Reclamation Service,

the Geological Survey, the Weather Bureau, so that the accumulated experience of all those bureaus and the officials connected with them and the accumulated capacity of all those bureaus and officials can be compiled in the constructive work upon which we are about to enter. Then it is desirable, of course, that that board or commission should have the power of cooperation with States and municipalities and individuals, for we will find that we will have to deal with all in the development of a river to its highest usefulness. In addition to this, we must have provision for bond issues. The fund should be kept good. That fund should be not less than \$50,000,000 at the start, set aside in the Treasury for that purpose, with authority to the President of the United States, whenever the fund is reduced below \$25,000,000, to issue 2 per cent bonds in order to make the deficiency good, so we will have a continuous fund which can be kept good, by Congress through appropriations, if it so desires, but it must be kept good, if Congress does not act, by the action of the executive department.

These are the essentials : An ample fund, power given to the President to act, full responsibility put upon the President, power given to him to appoint a commission, power to bring into coordination with this commission all the related services of the Government, power, whenever the fund is lessened by expenditure below \$25,000,000, to increase the fund.

You will find great objections to this among the Members of Congress. You will find unwillingness to relax power. You will find unwillingness to relax their power of determining what the project shall be; but it seems to me that this commission should be given the full power, with the approval of the President, whenever the project is determined by them to be feasible, to immediately commence the construction of the work. We have had this experience in the irrigation service. There were 15 States and 3 Territories interested in irrigation. After public sentiment throughout the country had determined that national irrigation should be commenced, we found that the sentiment of those States was so divided as to the methods of operation as to where the first project should be commenced, as to what the amount of the appropriation should be, that we finally, in order to avoid conflict among ourselves, which would injure the cause before the entire country, created a reclamation fund out of the sale of public lands and put the entire fund under the control of the Secretary of the Interior, giving him the power to employ engineers and experts, and, whenever he deemed a project to be feasible upon such reports, to immediately enter upon construction, and the result is that after five years of operation the irrigation service to-day can show more effective work than can be shown by the rivers and harbors forces of the country during the entire history of the United States.

The irrigation service has entered upon work with reference to 23 separate projects. It now has in its funds, from the sale of lands, over \$40,000,000. Every State in which these works are being conducted is a State that has progressed. The entire service has been taken out of the politicians' hands, and in this respect the pork barrel does not exist.

I will not take more of your time upon this subject when time is so precious, although the subject itself is one that is a constantly

broadening sphere of suggestion. I simply wish to impress this upon this conference and upon this committee that is to meet the Committee on Commerce to-morrow. Let them not waste any time upon the general advantages and the general importance of the waterway transportation and of waterway development. Let them address themselves simply to the practical work of organizing a great constructive commission, composed of engineers and experts who can investigate, and after investigation and the approval of a project by the President of the United States, can enter upon immediate construction.

(Thereupon, without further discussion, the resolutions offered by the committee on resolutions were adopted as submitted.)

FURTHER REPORT OF COMMITTEE ON RESOLUTIONS.

Ex-Governor PARDEE. The committee on resolutions further desires to offer the following:

Resolved, That a joint committee be appointed by the chairman, to consist of six members of state conservation commissions and three members of the National Conservation Commission, whose duty it shall be to prepare and present to the state and national commissions, and through them to the governors and the President, a plan for united action by all organizations concerned with the conservation of natural resources.

Mr. Chairman, I move the adoption of that resolution.

(The resolution was unanimously adopted.)

Ex-Governor PARDEE. The committee on resolutions has instructed me to present the following:

Resolved, That the question of the desirability of and ways and means for publishing the proceedings of this conference be referred to the joint committee of nine provided for by a previous resolution, with power to act.

Mr. Chairman, I move the adoption of that resolution.

(The resolution was unanimously adopted.)

Senator NEWLANDS. Mr. Chairman, at the suggestion of Doctor McGee, I desire to offer the following resolution and move its adoption:

Fully approving the policy of improving the waterways of the country for navigation and other interstate uses of the waters, we urge the prompt adoption of the broad plan recommended by the Inland Waterways Commission for waterway development under an executive board or commission appointed by and acting under the direction of the President of the United States.

(The resolution was unanimously adopted.)

Mr. CUTTLE, of California. Mr. Chairman, I understand the committee on resolutions considered and recommended with reference to the report of the national conservation committee only. I have been asked to present the following resolution:

Whereas the destruction of the timber on the watersheds of the rivers of the United States causes the flow of water to fluctuate between floods which cause incalculable damage, and extreme low water, which destroys the utility of the rivers for navigation, water power, and water for domestic use and irrigation: Be it

Resolved, That we recommend that the several States enact laws regulating the cutting and removal of timber and slash on private lands to the end that the continuity of the forests of our country may be assured; that damage from floods may be prevented; that a more uniform flow in rivers may be maintained for the benefit of navigation, water power, and water for domestic use and irrigation.

Mr. Chairman, I move the adoption of this resolution.

(The resolution was unanimously adopted.)

Mr. EVANS, of Pennsylvania. Mr. Chairman, I desire to bring out in this national conservation work these seventy-odd national bodies, at least national in scope, which were thought worthy of being invited here as conferees. We of course desire their good will. They are worthy of consideration in forming a national policy for this work. I move you, therefore, that these conferee bodies be invited to send in, to be incorporated in the proceedings of this meeting, their suggestions and views as to how they can cooperate in this conservation work.

Mr. RICE. Mr. Chairman, I would like to suggest that that motion include the proposition of sending from some central source to these separate organizations the information that may thus be contributed. Let the National Conservation Commission receive the advice and suggestions from the organizations throughout the United States, and then that advice should come back to them in a compact form.

The CHAIRMAN. AS I understand the suggestions, they are that the national organizations invited to attend this conference be asked to give their advice and suggestions to the committee of nine which is to be appointed as to how they may best join in this movement, and that the committee of nine thereupon communicate with them in turn, transmitting to these various organizations the suggestions and advice thus received and tabulated by the committee of nine.

(The suggestions were unanimously adopted.)

Governor NOEL. Mr. Chairman, I move that the chairman and secretary of this conference be added to the committee of nine and constitute a part of that committee.

(The motion was unanimously carried.)

The CHAIRMAN. By the courtesy of the meeting, I have an announcement to make.

I take upon myself the liberty of suggesting to the conference that it authorize all members who have papers or discussions, which they have not been able to submit, to send them in for incorporation in the final report. That matter has been submitted to this committee of nine, and it seems to me that the conference itself ought to take action upon that matter. Without objection, the chair will assume that the secretary of the conference, pending the action of the committee of nine, will be empowered to receive these communications and hold them.

Second, I desire to suggest that you allow your chairman to suggest to the authorities of the hotel the appreciation which undoubtedly you have, as I have, of their courtesy and the way they have treated us while we have been here.

Governor ANSELL. I offer that as a motion, Mr. Chairman.

(Motion carried.)

Mr. LAY, of Alabama. Gentlemen, I move that we extend our thanks to our worthy chairman for the many courtesies and the patient and able manner in which he has handled this meeting, and for the energetic work that he has done in behalf of the cause for which we are here assembled.

Mr. CUTLE, of California. I second the motion.

(Motion carried.)

ANNOUNCEMENTS.

The CHAIRMAN. I have two more announcements to make, and then there are one or two gentlemen who ought to say a word before we adjourn.

In the first place, the Vice-President, Mr. Fairbanks, has requested that I give notice that all members of this conference are invited to a reception at his house this afternoon between 5 and 6 o'clock, at 1701 K street.

Second, may I ask you not to forget my mother's invitation and my own at 9 o'clock this evening, at 1615 Rhode Island avenue, it being understood that this invitation is not only for the gentlemen who are members of the conference, but to the ladies who are members and to the ladies who may have accompanied the gentlemen members. We greatly hope to see all of you there.

Will you, for two or three minutes apiece, listen to two or three gentlemen who have been trying to get recognition, provided they limit themselves to that time?

MR. EDWARD G. ACHESON, PRESIDENT OF THE AMERICAN ELECTRO-CHEMICAL SOCIETY.

The CHAIRMAN. The first gentleman I shall call upon to address you will be Mr. Edward G. Acheson, president of the American Electrochemical Society.

Mr. ACHESON. Mr. Chairman and fellow conferees: I appear before you as president of the American Electrochemical Society, and I am very grateful for the opportunity to bring to your attention a few facts that justly entitled electrochemistry to be considered one of the most important factors in the conservation of our exhaustible natural resources by the utilization of water power.

Since this conference convened we have had it impressed upon us that we are the first to take an active national attitude toward the conservation of our great resources. We have been told the lives of some of our most valuable assets, as the coal, oil, and iron, are to be measured in one-half, one, two, or three centuries. A century may be long when measured by our lives, but quite short in the life of a nation or in the span of life on earth. It is indeed rather startling to me when I think of the fact that my own short life has covered the one thirty-eighth part of the period since the beginning of the Christian era, and it is within this relatively short period that much the greater part of the consumption, destruction, and waste of the valuable and most essential resources have occurred.

I believe I am correct in stating that the most important of all the elements to man, or at least the one that enters the most frequently into his manufacturing and commercial life, is carbon. Nature provided a certain amount of carbon in fixed chemical combinations, as our natural resources, coal and oil, which we have been consuming and wasting in a prodigal manner. The total amount supplied by nature is limited. Our experts now know approximately the amounts we have in stock and how long they will last, for end they surely will.

These two resources are mainly being consumed in the production of what the scientific people call wave motions—light waves or heat

waves—both of them essential to our way of living, either for the production of light to our eyes, warmth for our bodies, or heat for our domestic, manufacturing, and transportation uses. There are other and perhaps unavoidable uses for our fixed carbon, as, for instance, a reducing agent in metallurgy, the making of carbides, for the making of our arc-lamp carbons, etc. For that portion of the carbon consumed in producing wave motion, and it represents a large part of the total, a ready and everlasting substitute is to be found running to waste in all sections of our great country—our natural resource, water.

It has been so willed and provided that men, while consuming the store of fixed carbon provided for them, have learned to produce these all-important wave motions at will from any source of mechanical motion, and by the utilization of our everlasting flow of waters we can readily produce light or heat and conserve the carbon in our coal and oil for those purposes for which we have not, as yet, discovered a substitute.

To attain this desired end we must begin with conservation of our forests in order that we may have this everlasting flow of the water, and the water must be enslaved to do the work that has been borne by our fixed carbons.

In the carrying out of this work a threefold object should be in view—the production of power for railway transportation, manufacturing and electrochemistry, transportation by waterways and irrigation. Such a project carried to completion would usher in the electro-chemical age, and I predict it would receive an enthusiastic reception.

Electrochemistry, in its more modern form and especially as applied to metallurgy, is still young, taking form in 1888 at the time of the beginning of what is now one of our largest electrochemical industries—the manufacture of aluminum by electricity. Within the twenty years since that date, great strides have been made, a number of chemical and metallurgical processes have been converted into electro-chemical and electro-metallurgical ones in a very successful way and to the advantage of the industrial world, while at least five new materials, previously unknown, are now sold in the world's markets, they having been made possible of production by electro-chemistry.

Electrochemistry is in fact a creator. It transforms the cheap and perchance useless wastes into products of value. It works either with the silent invisible electric current, or by the stress of heat. It lends itself to the ready adjustment of temperatures from that of the atmosphere to the highest attainable on earth, one in which the metals, rocks, and all things earthly disappear in vapor. It tears asunder the elements as joined by nature and rearranges them under man's guidance. Thus it has made ordinary sand unite with carbon and form the well-known product "carborundum." In another instance it converts "culm"—the waste material of the anthracite coal mines—into graphite of wonderful purity. In another case it has enabled us to extract from sand metallic silicon, a beautiful silver-colored body, which, although very new, has found a place in our arts and manufactures. As another example, it fuses in the electric furnace the soft amorphous bauxite into a condition suitable for use as an abrasive and refractory material and known as "alumundum." And in still another case lime and carbon are made to unite in the electric furnace

to form the valuable product, carbide of calcium, now well-known as the source from which our familiar acetylene light is obtained. In this last mentioned example, the world is not only furnished a new and convenient light, but with greater economy of our natural resources. And all this without calling upon our exhaustible natural resources, but by the utilization of the energy of a waterfall.

Electrochemists are now earnestly at work on problems of even greater magnitude than any I have mentioned, as, for instance, the electro-metallurgy of iron and steel, and the fixation of the nitrogen of the air. The commercial fixation of nitrogen gives us a ready and inexhaustible source from which to draw the world's future supply of fertilizer, thus averting the great calamity that has stood specter-like before us—the exhaustion of the earth's fertility. The commercial fixation of nitrogen is now being carried out in Norway, where cheap and abundant electric power can be had. Indeed, Europe is now preparing to use 400,000 horsepower, developed by water, in this line of manufacture, and not to be outclassed, plans are now about perfected to build a very large plant in America, not, however, within the United States, but in Canada at Niagara Falls, where power is more abundant and cheaper than on our side of the cataract, and even then it is twice as costly as in Norway.

Electrochemistry is a power consumer. It requires not only much power, but cheap power. The first hydro-electric power plant of considerable magnitude in this country was put into operation at Niagara Falls in the fall of 1895, since which date quite an electro-chemical center has sprung up at that point, and there is now approximately 125,000 horsepower being utilized in the work of producing phosphorus, carbide of calcium, alundum, caustic alkali, bleaching powder, metallic sodium, aluminum, metallic silicon, carborundum, artificial graphite, chlorate of potash, and other products, the united values of their annual production amounting to many millions of dollars. These Niagara Falls products may, to the great industrial world, seem small, but let me impress on you that they have been developed within thirteen years, that they cover a varied field and they are but a promise of the future development when we have cheap power, they being produced with power costing three to four times the price of similar power in Norway. And when it be remembered that the conservation of the water in Norway is in the interest of power only, we may hope for much when the expenses are carried by power, transportation and irrigation.

To the optimistic electrochemist, it seems possible for his profession to transform many of the chemical and all or practically all of the present metallurgical processes into electrochemical and electro-metallurgical ones, and to vastly extend the list of products employed by the industrial world, thereby conserving our fuels by the utilization of water power and conserving our natural minerals by the substitution of artificial ones.

In order that we may obtain the benefits possible of being derived from electrochemistry, it is essential that the art be not crippled by having our natural resources—the water powers and minerals needed by the art—monopolized and held in the selfish interests of a few. The remarkable progress we have been making has been due, to a large extent, to the inducements held out by our beneficent and more or less efficient patent laws, in rewards to the inventor for his

labors. A private monopoly is guaranteed him, covering a period of seventeen years, in return for original work he has accurately described to the public, and at the termination of this monopoly, he is presumably, well on the road to permanent success, and decidedly in advance of any possible competitors; still there are men, and particularly those who have taken over the interests of the inventor, who would perpetuate this original monopoly by laying hands on the natural resources of the country that are vital to the inventor's methods or processes, and by monopolizing them prevent others from competing by later and even more efficient processes, and thus they thrive at the expense of their fellow men, at the same time largely defeating the intent of the contract between the inventor and the Government, as contained in the Letters Patent.

In conclusion, I would say no one is, probably, more keenly alive to the possible advantages that should accrue to the world, from this great conservation movement, than the electrochemist, nor should any other profession render more valuable services, following as he will the hydraulic and electrical engineers and putting to work the power they develop for the better conservation of our natural resources.

MR. E. W. WICKEY, REPRESENTING THE FARMERS' NATIONAL CONGRESS.

Mr. WICKEY. Mr. Chairman and gentlemen, I would feel indeed a very weak representative of the great producing class of this country did I not take advantage of this opportunity to assure this convention that you have the hearty cooperation and sympathy of the farmers of this country.

The day of the bewhiskered farmer is passed, as he has been represented in the press up to recent times. The farmer of this country is no longer the man who buys the gold bricks. They are now sold to the man on Wall Street. The farmer of this country is a man to-day who is progressive; one of the most progressive of this age. No great movement of this country has succeeded unless it has been endorsed by the farming class.

It has been suggested here by the governors that there is no North, no South. I want to say to you that the Farmers' National Congress, which I have the honor to represent, was the first national organization in this country to begin to wipe out sectional lines. It was organized by the planters of the South and the farmers of the North, and our officers have alternated between the different sections of the country. We meet one year in the North and the next year in the South, the third year in the West, and the fourth year in the East. Our last session of this year was at Madison, Wis. The committee to-day decided to accept the invitation of North Carolina, and we will meet next year in the city of Raleigh.

We were recognized by both the presidential candidates of the two dominant parties, and Mr. Bryan and Mr. Taft addressed our congress this fall, and we have reasonable assurance that Mr. Taft, as President of the United States, will address our congress when we meet next year.

The farmer is coming to his own. He is being recognized as a power in this land. We no longer think in dollars; we think in hundreds of thousands, as does the banker. The expenditure of mil-

lions of dollars in improvement of our natural waterways is no longer alarming to us. The products of the fowls of our farms would improve all the waterways of the land and provide all the money that the National Rivers and Harbors Congress is asking the Congress of the United States to appropriate. The hens of our country would furnish these \$500,000,000 in one year and leave enough over to replace the money, Mr. Chairman, that has been spent up to this time on the Panama Canal!

I say to you that the farmer is coming to his own. I want to say that this is largely due to the chairman of this conservation commission and to the President of the United States and to our many great men who are recognizing to-day the power of the farmer. We do not say much. We are not long-winded, but back in our own districts the Congressmen of the United States are beginning to recognize that we speak at the ballot box, and we do not do much kicking; but the man to-day who fails to pass progressive legislation demanded by the farmer soon finds his place at home and not in Congress.

I say to you in conclusion, and repeat it emphatically, that the farmers of the country are in favor of this great movement for the conservation and development of our natural resources. We believe in the development of our waterways. We to-day are spending money for automobiles, for pianos, for improved heating appliances in our houses, for bath rooms, and all of these luxuries of life. We are keeping our money back in our home towns and not sending it to Wall street. Gentlemen, when you want to accomplish the big things, remember the farmer. We are with you on this proposition, and we care not how it is carried out, so the policy and plan is an honest one, as we believe it will be if left to the President of the United States, as has been suggested here. I thank you.

MR. BERNARD N. BAKER, CHAIRMAN OF THE MARYLAND STATE CONSERVATION COMMISSION.

I have listened with great interest to all that has been said at this meeting, and I would like to add, as the representative of Governor Crothers, of the State of Maryland (at the same time expressing to you his regrets that he is not able to be present), that you can count upon the hearty cooperation of our State in the magnificent work you are doing. We would like to do our part, and stand ready to do what we can. Maryland occupies a unique position, at least in forestry, as, I think, it has a larger forest area, in proportion to the total area, than most of the older States. It also has but few water courses that have not already been developed in the way of their powers. If you could conserve to us our terrapin and canvas-back duck you would give a lasting blessing to all our citizens. But this, unfortunately, you can not do.

It has occurred to us that possibly we might be of more assistance in trying to forward the educational features of this great work, and with this object in view, I would most respectfully ask of this commission the consideration and adoption of the following resolution:

Resolved, That a committee of five be appointed by the chairman to consider and report the best way to place before the boys and girls of our country, by educational methods, the necessity for the conservation of our national resources."

I was very much interested in hearing from our friends of the great men of this country—Washington, Jefferson, Lincoln, and Roosevelt. Where are the future great men of our country except among the boys of our schools to-day?

Whatever practical measures be inaugurated in the conservation of national resources, there will be no particular effect save as popular support, which is sincere and intelligent, is secured for such measures. Opposition to practical measures will arise, if any, from those who would gain personally by the exploitation of these national resources. Those who will gain especially by their preservation will be the men and women of future generations; that is, those who are boys and girls at the present time. If firm and intelligent support for practical measures can be secured from these boys and girls, and from them as they grow to manhood and womanhood, by enlightening them as to the purposes of the commission, and awakening their sense of obligation to the nation, then a permanent work can be accomplished. The high schools of the country are becoming very powerful in their influence over their young people, and explanations illustrated by lantern slides showing the national resources and explaining the necessity for their preservation and the practical measures therefor, can be made for these high schools throughout the length and breadth of the country, winning the active sympathy and support of their students. Emphasis can be laid upon the duty of these young men and young women to take personal interest in and to exert themselves in an honorable way toward the enforcement of whatever laws may be passed for the preservation of these national resources. The photographs taken by the government departments will be ample in many ways for the purposes of these illustrated lectures for high schools. The necessity for replanting forests, for preventing pollution of streams, for retarding exhaustion of minerals and prevention of waste, and the success of other countries in such matters can be explained from photographs. The important work already inaugurated by the Department of Agriculture, looking toward the importation of the most important seeds for utilization of the varied soils and climates, can be dwelt upon. The work of experiment stations and agricultural colleges in the improvement of methods of farming and gardening can be noted. The appeal to the high-school boys and girls for co-operation with the Commission in its important work can be made overwhelmingly convincing, and can be laid upon them as a matter of patriotism that they be energetic and wide awake in their support of the cause. It can be made a duty that they take their part in the campaign for national thrift, and it can be shown clearly that national thrift and personal thrift are but one and the same thing.

The practicability of such an educational campaign as outlined is apparent, if one considers the high-school organization. Most high schools have large assembly halls, equipped with electric lanterns, and are in the habit of having general lectures of educational value. A proposal that an illustrated lecture on national thrift and the preservation of national resources be given would probably be accepted by the great majority of the high schools of the country. That such a lecture could be made intensely interesting and effective in its appeal to the boys and girls seems quite certain, in view of the natural personal interest which could be aroused.

A second gain from such an illustrated lecture would be the arousing of interest in country life as contrasted with city life. A portion of the lecture could be devoted to the explanation to city high-school boys and girls of the great opportunities open to many of them, if they would but leave the great cities and devote themselves to country enterprises. Assistance thus could be rendered in the campaign for the prevention of congestion in our cities. The agricultural high schools throughout the country would welcome assistance in their efforts to keep the country boys and girls on the farms.

Inasmuch as sincere patriotism lies at the foundation of the work of this commission, and the effort is to establish practices in the conservation of national resources which will benefit future generations, it is clearly wise to enlighten the high-school boys and girls on this whole matter, since they are the ones who, as men and women grown, will profit by the policy, and upon whom will rest the responsibility for its enforcement and continuance.

Many of us here to-day are men, who, in the natural course of events will not personally enjoy these benefits; the boy and girl to-day in our schools will. Let us show them what we are trying to do for their benefit, and secure their hearty sympathy and cooperation in our work.

MR. HENRY A. BARKER, CHAIRMAN OF THE RHODE ISLAND STATE CONSERVATION COMMISSION.

Rhode Island, though the smallest in her area, is not the least among the United States in her recognition of the great doctrine of conservation. Always has she been foremost in her support of new methods and new principles, destined to promote advancement in the course of civilization. Traditionally she has held up the beacon light, guiding the world toward constitutional government and to the precious doctrine of religious liberty. The first of all communities to formally declare herself as a sovereign State; the first among the American colonies to back up her asserted principles by force of arms.

The name of Rhode Island is written large in the victory of the emancipation of mankind.

Rhode Island, therefore, may not consistently stay out of the procession now marching onward toward conservation and national development, nor can it occupy a rear rank in a movement so enormously significant in its effect upon the welfare of the nation through all the years to come—a movement mightier than most men now foresee—mightier, perhaps, than any man may dream.

Rhode Island, which has been first in war and first in her assertion of the sovereign right of man to constitutional government, must rejoice in her opportunity to be among the first in a splendid enterprise of peace.

DR. CYRIL C. HOPKINS, OF THE UNIVERSITY OF ILLINOIS AND MEMBER OF THE ILLINOIS STATE CONSERVATION COMMISSION.

I beg to urge upon this conference that larger consideration be given to the preservation of the fertility of the common American soil. You have heard it stated here that by means of irrigation it is

possible to reclaim hundreds of thousands of acres of land in the arid or semiarid States. It can also be said with equal truth and it should be said with greater emphasis that under our most common farm practice we are reducing the fertility of not merely hundreds of thousands of acres, but of the great body of American farm lands, upon the preservation of which depends absolutely the prosperity of the United States.

Within a hundred miles of the spot where the first permanent English settlement was made in our country, you can to-day buy hundreds of thousands of acres of arable land for \$10 an acre, land that was once valued at \$50 an acre, and would now be worth \$100 an acre if its fertility had been maintained. And I do not include in this statement any reference to lands that have seriously suffered from soil erosion, but I refer only to great areas of nearly level or gently undulating farm lands whose productive power has been almost destroyed by a hundred years or more of common cultivation by American farmers.

The great material problem of the United States is not in the development of the waterways, not in the preservation of forests, and not in the conservation of our coal and iron, important as these all are, but the problem that is vastly greater than all of these is to bring about the adoption of systems of farming that will maintain or increase the productive power of American soils.

We must not deceive ourselves with general statistics which show some increase in average crop yields in some States. Thus, in my own State of Illinois the average yield of corn has increased in the past ten years, but does this prove that Illinois soils are growing richer? No. Let me tell you that during the past ten years the annual corn area of Illinois has increased from 7,000,000 to 9,000,000 acres, and the added 2,000,000 acres are the richest black soil of the State, reclaimed by dredge ditching and tile drainage, while the 7,000,000 acres are producing smaller crops than ten years ago.

The practice of the present art of agriculture tends toward land ruin. If any of you know anything of American agriculture, you know that as a general rule old land is poorer than new land. Therein lies the fact that points toward future poverty for our children. The United States is one of the great agricultural countries, and without agriculture America would be nothing. Without agriculture our coal and iron would remain in the earth, our forests would be uncut, our factories, railroads, and waterways would be abandoned, and our cities depopulated.

If the art of agriculture has reduced the productive power of American soil, then the science of agriculture must restore it; and the key to the problem for our most common agricultural land is the element phosphorus. Phosphorus is the only element of value contained in the mineral called phosphate. There are three elements of plant food that have recognized market values—nitrogen, phosphorus, and potassium—and the inventory of our natural resources must include the supply of each of these three elements.

The nitrogen can be gotten from the air, not only without expense, but with profit in the getting, because such crops as clover and alfalfa, which by means of symbiotic bacteria have power to utilize atmospheric nitrogen, are valuable crops to raise for their own sake, and

where these are plowed under liberally, either directly or in manure, nitrogen is thus supplied for the production of any other crop.

Potassium is one of the abundant elements in the earth's crust, and consequently in all normal soils. Thus, several hundred analyses by the Illinois Experiment Station have shown that the average corn-belt land contains sufficient potassium in the plowed soil for a hundred bushels of corn per acre every year for as long as the time since Christ walked among men—or sufficient potassium for the average corn yield of the United States every year for as long as since Adam began to till the soil.

One hundred bushels of corn contains 19 pounds of potassium and 17 pounds of phosphorus; and, while the average crust of the earth contains 2½ per cent of potassium, it contains only one-tenth of 1 per cent of phosphorus; and the most common agricultural lands of the United States contain in the plowed soil no more total phosphorus than would be required for a crop of a hundred bushels of corn per acre during the full life of one man.

For the adoption of systems of permanent agriculture under which our common lands shall grow better instead of poorer, the nitrogen problem is to secure it from the absolutely inexhaustible supply in the air, and the potassium problem is to draw it as rapidly as necessary from the practically inexhaustible supply in the soil, while the phosphorus problem is to get all we can and keep all we get.

But what are we doing? We are exporting every year for less than \$6,000,000 sufficient phosphorus for the production of \$600,000,000 worth of corn, while the scarcity of the element already limits the yield of corn on the commonest corn-belt land.

I close with a single illustration to show the possibility of increasing the productive power of the land with proper treatment and the certainty of soil depletion even under a good crop rotation without the addition of plant food.

For sixty years at Rothamsted, England, the oldest agricultural experiment station in the world, a four-year rotation of turnips, barley, clover (or beans), and wheat has been grown on Agdell field, where the soil is of normal composition. There are three sections in this field; no plant food has been applied to one, minerals, including phosphorus, to the second, and the same with nitrogen added to the third.

As an average of the last twenty years, corresponding to the average yield just fifty years from the beginning of the experiments, the following results were obtained:

Average crop yields per acre in Rothamsted, four-years' rotation, after fifty years.

Soil treatment.	None.	Minerals.	Minerals and nitrogen.
Turnips.....pounds..	963.0	25,278.0	40,947.0
Barley.....bushels..	13.7	22.2	29.2
Clover.....pounds..	773.0	3,898.0	3,450.0
Beans.....bushels..	15.9	28.3	19.6
Wheat.....do....	24.3	38.4	36.4

Beans were grown where clover failed.

When the American farmer had depleted most of the lands of the Eastern States he moved into the Central States, and he is practicing the same ruinous systems there, and if these systems are continued, wherewithal shall America feed her own people a few years hence?

I say to you famine in America is easily possible. There may be no need for sensation, but there is need for sense.

I say to you if we are ever to adopt systems of permanent agriculture in America it must be done while we are prosperous, for an impoverished people is at once helpless and soon ignorant. Only the prosperous can afford education. It is impossible for a poor farmer on a poor farm to invest in the permanent improvement of his land if he has nothing to invest—if it requires every dollar he can secure from the sale of every salable product to support his family and pay his taxes.

Whenever the hundreds of thousands of acres of level or gently undulating depleted or abandoned farm lands of New York and old Virginia are redeemed and made equal to the newer lands of the Central West, which are now in their prime, paying good interest on \$200 an acre, then, and not till then, can there be any other material problem of the United States that compares with this in reference to the future welfare of America.

MR. EDWARD E. TAYLOR, CHAIRMAN OF THE CONSERVATION COMMITTEE OF THE AMERICAN ELECTROCHEMICAL SOCIETY.

Mr. Chairman, ladies, and gentlemen, I address you as chairman of the conservation committee of the American Electrochemical Society.

In the wastes referred to in the introductory part of the very able report of the conservation committee to President Roosevelt I wish had been included the waste of running water. This waste in the State of Alabama alone was admirably shown by Mr. Lay yesterday to be equivalent to the running over a precipice of 11,000,000 tons of coal, and if saved and applied as it should be is capable of saving that much coal to the State, at the same time making navigable several of its rivers the year round.

The great bulk of our people in this great country live on the most valuable land near the level of the sea, and very few such realize the immense possibilities for water storage by lakes and reservoirs in the hill country.

About two weeks ago I visited a farm on the headwaters of the Delaware River through which runs a brook from which the farmer derives 25 horsepower and lights his building and house with the electricity generated therefrom. He could also do the cooking, heating, and lots of other things about his place with the same power. This is now the only power developed on that brook, which, he told me, formerly ran 89 sawmills. If each of these sites could develop 25 horsepower, which is a fair assumption, that little brook alone represents a waste of 2,206 horsepower and represents the running to waste of 26,460 tons of coal; and yet those very families are drawing coal from the railroad 5 miles away and letting all of this power go to waste.

But by storage reservoirs in this same hill country the above-estimated power could easily be doubled or trebled, or made even five times as much. Multitudes of other streams in the same vicinity could be similarly treated and the electricity generated at every site fed to a common center, every farmer and resident supplied with all he wants to use and the remainder used to run electric cars for their benefit and for lighting and heating the buildings in the near-by towns and for manufactories that could be built up, or sent on high-tension wires to large cities within reach. From 100,000 to 300,000 horsepower could be developed near the center where this creek joins the Delaware River, the buying of coal practically cut off, and new pleasure added to life for the inhabitants; at the same time flood waters restrained from spoiling the more valuable land near the sea and navigation improved. This farm is about 1,600 feet above sea level, and every cubic foot of water per minute from that level, passed properly through water wheels to the sea, would represent 3 horsepower or the saving of 36 tons of coal per year. May each State develop one or two such centers of power as object lessons and to show what can be done. Do not say it is small; it is big when we aggregate the possibility.

This is by no means an exceptional possibility, but a typical illustration of multitudes of opportunities in the hill country throughout our broad land, and, if generally so used, would develop millions of horsepower, make year-through navigable rivers and reduce to minimum flood damages. Every lowland State in the Union is directly interested in the remote hill States that are the source of these mighty rivers, and should insist that water that can be impounded into lakes there and converted into power of great value shall not run to waste and overflow their valuable lands. Truly our brotherhood is wide and large. Therefore even this is a work for the whole country, and the General Government should aid in making some illustrative developments on small streams. "Look not every man on his own things, but every man also on the things of others."

But I have a much larger subject to speak of. The level of Lake Erie is 565 feet higher than the Hudson River at Albany, and is downhill all the way except a sag of about 20 feet between a little east of Rochester and a little west of Rome. This can be overcome either by raising the level of Cauga Lake and changing the course of the canal to higher levels than now contemplated or cutting down the Rome level to make a complete lock down ship and power canal from Lake Erie to the Hudson River.

New York State is committed to a barge canal which takes no cognizance of power developed in this electrical age even for the haulage of its own boats.

A ship and power canal thus constructed through the State of New York is estimated to be worth, for power alone, by Engineer McClinck, at \$500,000,000, and he made earnest protest against committing the State to the barge canal it is now building. Niagara Falls is the seat of power that it is to-day because of the utilization of about 140 feet head of water. But what would it mean to utilize 500 feet head of water distributed through the grand State of New York, and three-fifths of that within 175 miles of New York City, with a harbor for large vessels all along the way, and the

conversion of western wheat in transit into flour, and the manufacture of crude materials into higher values. The commerce of the Great Lakes is stupendous and should be continuous to the sea, and is a suitable work for our National Government to make possible. For navigation purposes a canal through there can be used but about eight months per year, but its power can be used the whole year through. Selfish interests in Buffalo and New York City committed our State to a barge canal exclusively for navigation; but even so, our great Inland Waterways Commission should step in and right the wrong and give us a ship and power canal commensurate with its great earning power, and the stupendous transportation interests of the West crying for an adequate outlet to the sea, a thing they are bound to have.

MR. JOHN B. ATKINSON, OF KENTUCKY.

Mr. Chairman and gentlemen of the Conservation Conference: As a representative of Governor Willson, of Kentucky, who greatly regrets his inability to be present on this occasion, I can tell this meeting that much interest in the conservation of the forests is being manifested in my State.

Women's clubs have become greatly interested, and good work is being done by them. It was my good fortune to address recently the Alumnae Club of the Girls' High School, of Louisville, on "How we plant trees in Kentucky," illustrating with photographs and transparencies the young planted forests at different ages. The ladies of the club will give talks on practical forestry in all the public schools of the city, and illustrate with photographs what can be done in the way of making new forests, thus reaching 27,000 school children in one city alone.

Women's clubs in many cities of the State are asking information and pictures for the use of the clubs and schools. When the women take up any great subject, we all know that great good will follow.

Nor are the women and children alone interested. Large corporations owning forests and coal properties are gathering information, and slowly, perhaps, imbibing the fact that there is money saved in the more careful cutting of timber. One large company has planted this autumn and winter 1,000 bushels of walnuts (over 300,000 nuts) on 1,000 acres of woodland that had been partially cut off, and is inclosing the tract with a fence to keep off cattle and other stock. The railroad companies are planting trees in large numbers also.

Kentucky was one of the best timbered States in the Union, and still has more than half its area covered by forests in various stages of preservation and offers at this time an opportunity that few States possess of rebuilding them to a high condition of efficiency and perpetuity.

A close partnership exists between the forests and the mines. Timber is as necessary in mining as is labor. Hence the mining man is especially interested in having perpetual forests. It now takes the annual growth of at least 6,000 acres of forest to raise 1,000,000 tons of coal in Kentucky.

The mining company with which I am interested began planting trees twenty years ago. It came into possession of many acres of worn-out farm lands as well as of large areas of forest. Corn and

tobacco had been the principal crops grown by the farmers and when the soil became so poor it would not grow corn the fields were turned out and new ones made from the forest; the trees girdled and finally burned and a new start made with tobacco and corn.

By judicious fertilization and cultivation 2,000 acres of the worn-out lands were brought back to fertility and now produce excellent crops. It had become evident to the management of the property that judicious cutting of the timber for mining purposes was necessary to perpetuate the forests, and it was also determined to plant the vacant cleared land with trees. The black walnut was selected, because of the value of the wood and the readiness of planting. The ground was prepared as for corn, and the walnut with the hull on was planted in the autumn when the nuts matured. The nuts were planted 4' by 4' or 2,722 nuts to the acre, being covered by 1 inch of soil. The young forest was cultivated the same as corn for three or four years, and then sown down with blue grass. The spacing of the walnuts 4' by 4' was to get a growth upward and also save pruning; the trees to be thinned out from time to time, which was done by cutting down the tree, it being found that it was not profitable to transplant. Far better to plant a nut where a tree was desired. Blue grass always grows under walnut trees, and when the young walnut forest gets to be 10 or 12 years old the trees are high enough and strong enough not to be injured by cattle grazing, and we have walnut trees, blue grass and Jersey cattle growing together. While this is not the rule of forestry to have cattle and trees together, the walnut forest may be considered the exception.

When we began planting trees twenty years ago we had little knowledge of the ages of forest trees, or how long it took nature to produce a forest. A study of stumps was taken up, and the ages of the various trees cut for mining purposes determined. From the facts collected during the twenty years past is made a table of the time it takes certain trees in Kentucky to grow to a diameter at the stump of 12 inches. This is not an infallible table, but is based on actual tree growth as observed in the forests, and has no reference to isolated growth or unusual conditions.

The pin oak will grow 12 inches diameter in forty years.

Black locust will grow 12 inches diameter in forty-five years.

Tulip will grow 12 inches diameter in fifty years.

Black oak will grow 12 inches diameter in fifty years.

Black walnut will grow 12 inches diameter in fifty-six years.

Texas red oak will grow 12 inches diameter in fifty-eight years.

Sweet gum will grow 12 inches diameter in sixty-two years.

Ash will grow 12 inches diameter in seventy-two years.

Hickories will grow 12 inches diameter in ninety years.

White oak will grow 12 inches diameter in one hundred years.

The trees so far planted for forests are the black locust (*Robinia*), catalpa speciosa, walnut, and tulip (*Liriodendron*). Since 1887 this company has planted over one million black walnuts on 170 acres of farm land, and in vacant places in the forest. Since 1905 we have planted 110,000 black locusts on 162 acres of land. The seedlings are planted 8 by 8 feet, the same as locusts. We have planted 20 acres of tulip trees (*Liriodendron*), or 435 trees to the acre 10 by 10 feet. All the young forests are cultivated for three or four years and are always under fence. This company will plant in the spring of 1909 over 60,000 catalpas and 40,000 locusts. It has already planted this

year 100 bushels of walnuts (30,000 nuts) in vacant places in the forests.

The question arises, How can landowners be induced to plant trees?

To me the answer is, take off all taxes on land growing young forests, and when productive, tax the product only. I believe this same rule should apply to all forests.

If the legislature of a Commonwealth can protect quails and rabbits with its game laws, it surely can protect the trees. If the owners of forest lands in Kentucky could be induced, or compelled, to fence them against all kinds of stock, and then cut healthy trees, not less than 16 inches in diameter, there would be no question of the perpetuity of its forests.

DR. GEORGE F. KUNZ, PRESIDENT OF THE AMERICAN SCENIC AND HISTORIC PRESERVATION SOCIETY.

The beautifying of the country village or of the farm; the utilizing of the land by the roadside, in place of allowing it to degenerate into a weed bed; the building of proper roads, and the fencing in of attractive points, will do much to keep the young man of the farm where he belongs, where he will be most happy, and where his labor will increase the annual sum of our agricultural production, the greatest asset of the nation. To attain this end there should be some concerted action on the part of the National Government, through the Department of Agriculture, cooperating with the Grangers, the board of state fairs, the county fairs, the Epworth League, and the many organizations which are working to make farm life attractive, and which by their efforts have raised the intellectual level of the farmer, stimulated his interest, and increased the productiveness of his labor. Either the Department of Agriculture, or the National Conservation Commission can easily come into direct contact with all these organizations.

For the realization of these aims, brief pamphlets, or, better still, a few pages issued monthly—to be so short that they may be read at the meeting of every Grange or public gathering of farmers, and to treat, one month in advance of the planting time, of the care of stock, new fertilizers, farm products likely to be in demand, and the abundance or shortage of crops in the various parts of the country—will do more good than millions of scientific and complex works that only specialists can understand, and yet will lead to an appreciation of the latter in the course of time. This will prepare the way for the elaboration of some system whereby every village throughout the entire land will be enabled to set aside a number of acres for a village park or green, the amount of land to be dedicated to conform to the resources of the village. It frequently happens that a most unproductive tract is the most beautiful from a scenic point of view. In proximity could be located the village cemetery; and if such a tract were beautified and planted with typical trees, supplied either by the Nation or the State, or else by the local committees or private enterprise, it would do much to educate those who lack the facilities enjoyed in cities.

In addition to this certain flower seeds and plants could be furnished and—what would also be of great value—a small tract could be assigned for the children to cultivate as a garden. Thus, in a community where there are thousands of acres of land, 10, 20, or 50 acres

could be set aside for the furtherance of village improvements, and parcels of land suitable for the purpose could often be obtained from town-tax sales, as a gift or as a united contribution. There should be the wood lot for the poor and needy; the playground and other places for recreation; the small botanic garden, with its typical trees and plants; and the small experimental garden for the children, where they could be taught the principles of gardening and at the same time have the opportunity to earn some pennies for pocket money, something a farmer spares with such difficulty and often so grudgingly that the child becomes only too willing to leave home and try his fortune elsewhere. Besides this, however, the children should be taught to suppress the weeds along the roads so that grass or productive plants may replace the wild luxuriance of unsightly weeds. The children should also be encouraged to gather up the stones from the highways, making the roads more sightly, easier to ride over, and also safer, thus saving many lives in the course of the year.

But we must not forget the power of historic associations in fostering interest in the town or village. Gatherings should be held on historic days, addresses delivered by the best talent the town affords, and the local children should take part. There should be placed in every part, or reservation, or village tract, a signboard of wood or of stone, bearing the date of the settlement of the district, and the record of any historic happenings connected with it, and also a simple map, showing its distance from other neighboring places. If there are any prominent historic points within the limits of the village or country, such as old milestones or houses of notable people, these should be marked in a very simple manner on tablets made of terra cotta, for instance, which could be manufactured at the nominal cost of a few dollars each. Furthermore, as an object lesson in road building, it might be possible to have specimens in the shape of small roads, or a road running around the border of the village park, so constructed as to illustrate the various types of road building best adapted to the region, using only the materials at hand for their construction and thus showing the extent of the local resources. The tract could also be fenced with various forms of fencing, from the most inexpensive to the more costly, so as to lend variety to the fenced-in sections, and at the same time educate the people, from childhood up, in the best and simplest forms of making a fence. If the reservations should be situated at county lines, or even village lines, pillars of history could be erected, stating the history of the place as briefly as possible. This would not only serve to educate those who live in the various communities, but those who pass through could not fail to find interest in noting facts that are often either forgotten or ignored. Incidentally, if all these suggestions are acted upon, the land and taxable value will be increased.

Last but not least, if there are any water supplies, such as springs and brooks in the vicinity, the proper establishment of water troughs or of fountains along the road would greatly benefit the passer-by as well as the resident, and would frequently help to educate the children as to the importance of conserving a good water supply, a consideration that was fully recognized two thousand years ago in Roman times, and caused the erection of those splendid aqueducts which reflect such credit upon ancient Roman civilization.

HON. GEORGE W. KOINER, MEMBER OF THE VIRGINIA STATE CONSERVATION COMMISSION AND STATE COMMISSIONER OF AGRICULTURE.

Mr. KOINER. I present here the statement promised by Mr. Rosewell Page in his address as the representative of the governor of Virginia.*

The area of Virginia is 40,125 square miles (27,168,000 acres), of which 2,325 square miles are water. Its greatest dimensions are from the Atlantic southwesterly to Kentucky, 476 miles; the longest line north and south is 192 miles. The boundary lines of the State aggregate about 1,400 miles.

The estimated population in 1908 is 2,253,284, an increase of 5.3 per cent over that of 1900. In 1906 the estimated population of the leading cities was: Richmond, 87,246; Norfolk, 66,931; Newport News, 28,749; Lynchburg, 22,850. The colored population of Virginia has for years been rapidly decreasing owing to migrations of negroes to the north and to the south. In 1900 the foreign population was only 19,461.

The surface of the State is diversified, rising in a series of six terraces from the southeast to the northwest. The tidewater Virginia is penetrated by the Chesapeake Bay, and has a shore line of 1,500 miles. The middle section of the State is an undulating plain with an elevation of from 200 to 600 feet and extends to the foothills of the Appalachian Range. The western part of the State is mountainous, the Blue Ridge and the Piedmont ranges crossing the State in a southwesterly direction, and the Alleghanys forming the boundary line of West Virginia. The valley section is a broad belt of rolling country, diversified by hills, ridges, and river valleys, lying between the Blue Ridge and the Alleghany Mountains. This region contains the sources of the Shenandoah, Roanoke, James, Kanawha, and Holston rivers. The most important rivers are the Potomac, separating Virginia from Maryland, navigable as far as Washington, and the James, with its extensive network of tributaries, navigable to Richmond. Both of these rivers empty into Chesapeake Bay, as do the York River and the Rappahannock. Along the mouths of these rivers and large portions of the bay are the State's priceless oysterlands. About the heads of these streams is her wealth of forest and water power. Lake Drummond, in the Dismal Swamp, is the only lake in the State.

Archean granites, syenites, metamorphic rocks of a greenish hue, and gneiss form the oldest geological deposits in Virginia. These stratifications are found in the Piedmont plain. The coastal plain to the eastward shows Tertiary and Quaternary deposits, indicated by the presence of sand, gravel, and clay. Coal deposits in several counties of the State, located east of the Piedmont plain, are Triassic in origin. Paleozoic strata predominate in the Appalachian plateau. Cambrian deposits are found in the Blue Ridge. Devonian sandstones and limestones appear in other ranges. The valleys of Virginia are paved with limestone of the Silurian system. Conspicuous among the remarkable geological features of the State are the Natural Bridge, the caverns of Luray, and Weyers Cave.

* Page 196.

The following mineral products are found in Virginia: Asbestos, barytes, clay, coal, cobalt, copper, gold, granite, graphite, gypsum, iron, kaolin, limestone, manganite, marble, marl, mica, mineral waters, nickel, ocher, pyrites, salt, sandstone, and zinc. The most important are coal, iron, granite, clay, and mineral waters. The bituminous coal output of Virginia in 1904 exceeded 3,500,000 tons. Coal mining at present is chiefly carried on in Tazewell, Buchanan, Dickenson, and Wise counties. The State's product of brown hematite iron ore in 1904 exceeded 500,000 long tons. Iron ore is plentiful in the Piedmont and Appalachian regions. The value of the granite output in 1904 exceeded \$500,000; limestone, \$400,000. The building stone deposits are widely distributed. The value of clay products in brick and tile in 1904 exceeded \$1,500,000. Manganese is found in the Shenandoah Valley. Gold is mined in Louisa and Spottsylvania counties. Saltville is the center of the salt producing industry. The annual output of coke is 700,000 tons; Portland cement, 60,000 barrels; gypsum, 12,000 short tons; mineral waters, 1,000,000 gallons; slate value, \$200,000. The total mineral output for 1908 was about \$35,000,000.

East of the Blue Ridge the climate is mild or temperately warm, with mean temperature in January of 37° and 77° in July. In winter the minimum temperature seldom exceeds 10°; the maximum in summer is 102°, but generally about 100°. The climate is dry and salubrious. The summers west of the Blue Ridge are cool, and the winter, particularly in the mountains, cold, the temperature falling, as at Staunton, in the great valley, to 8° below zero. The rainfall is evenly distributed and sufficient for agriculture. In the central portion the average is 48 inches; in the great valley it is 38 inches.

In tidewater Virginia the soil is light alluvial, but the mildness of the climate favors garden farming, which is largely followed. Middle Virginia has a subsoil of dark red or yellow clay with rich loams, and along the streams decomposed rock. In the Piedmont division the soils of decomposed sandstone are more fertile than the yellow and grayish soil. The Blue Ridge region has a soil like that in the Piedmont region, but richer in decomposed rock, and particularly adapted to the culture of rich grasses, vines, and fruits. The limestone soils of the great valley produce large crops of grain and grass.

Virginia has great forests with a variety of timber, including pine, oak, hickory, elm, poplar, willow, beech, birch, walnut, maple, cedar, mulberry, locust, sycamore, juniper, cypress, chestnut, etc.

The farm area of Virginia is about 19,907,883 acres, of which about 9,900,000 acres are improved. The following figures show the yield in 1908: Corn, \$30,000,000; wheat, \$8,000,000; oats, \$1,500,000; hay, \$10,000,000; tobacco, \$8,000,000; potatoes \$3,200,000; peanuts, \$2,500,000; all trucks, \$12,500,000; orchard fruit, \$5,000,000; dairy products, \$7,000,000; forest products, \$10,000,000; miscellaneous crops, \$1,300,000; live stock, \$70,000,000; total \$204,000,000.

The church denominations are: Methodist, Baptist, Presbyterian, Episcopal, Disciples of Christ, Lutheran, Roman Catholic, Dunkards.

The present school system of Virginia, begun in 1870, is under the supervision of a superintendent of public instruction, chosen by the general assembly and the board of education. Separate schools are provided for white and colored children. In 1908 the number of schools were 9,382; pupils, 375,878; teachers, 9,468. Number of state

normal schools, 5; high schools with special normal departments, 20; state agricultural colleges, 2; high schools with special agricultural departments, 10. The state and local appropriations for public free schools were \$3,519,739.57. Three normal schools for young women, viz: State Female and Normal School, Farmville; State Normal and Industrial School for Women, Fredericksburg; and State Normal and Industrial School for Women, Harrisonburg, Va.

William and Mary College, Williamsburg, founded in 1693, with 20 instructors, 225 students, and 15,000 volumes in library; Washington and Lee University, Lexington, founded 1749, 31 instructors, 500 students, 50,000 volumes in library; University of Virginia, Charlottesville, founded 1819, 83 instructors, 750 students, and 60,000 volumes in library; the Virginia Polytechnic Institute at Blacksburg, and the Virginia Military Institute at Lexington, are great institutions where work of the highest value is being done.

Other colleges are Richmond, at Richmond; Randolph-Macon, at Ashland; Roanoke, at Salem; Virginia Union University, Richmond; Emory and Henry, at Emory; Bridgewater, at Bridgewater; Hampden-Sydney, at Hampden-Sydney; and Fredericksburg, at Fredericksburg. There are women's colleges of high order in Richmond, Lynchburg, and Danville.

The CHAIRMAN. Gentlemen, I desire to express my most heartfelt thanks to all of you who have formed this great movement. Whatever happens here in Washington is of small account unless it is the expression of what happens away from Washington. The center of this conservation movement, in the sense of the active center, is not here in Washington at all, but is scattered all over the country. I want you to appreciate that that is the feeling here. We who are at work under the National Government understand fully that nothing we do is of any consequence except as it meets with the approval of the States and the organizations and citizens of the United States, and just so long as the interest grows and the activity continues in other parts of the country, just so long will the movement succeed, and not otherwise.

Cooperation was the keynote of this meeting, cooperation between the States and the nation, between the States themselves, between the States and the great national organizations, and if this meeting succeeds in establishing, as, since these resolutions passed, I hope and believe it will, a coordinated effort, including all these agencies, directed to one great end, the conservation of our natural resources, it will have done more by itself than all the other things that have ever happened in this movement up to this time. When we get together effectively we shall get together to win. Until we get together effectively, whatever agitation we may have, whatever education we may carry out, will not be brought to the point of action. It is the getting-together side of this movement that impresses me so tremendously at this congress.

Finally, I want to thank you for myself for your kindness to me. I have never supposed that any such kindness as has been exhibited to me during the last two or three days would ever come to my lot. It has come, and I am glad of it, and proud of it. I want every one of you to come to-night to 1615 Rhode Island avenue and see the reason for it—my mother.

Senator SMOOT. Mr. Chairman, I believe it would be a good thing to call the attention of the governors here to-day to the fact that there is one class of men which ought to receive our most hearty thanks, for it was that class of men that made it possible to have this inventory taken so completely as it is. They have worked early and late. This work has been done outside of hours with no pay whatever for it, and it would have cost at least half a million dollars if the services had been paid for; not only would it have cost that, but it would have been absolutely impossible to have it within two or three years' time if it had been gathered through any other channel or by any other men.

Mr. Chairman, I wish to offer this motion, that this conference give its most hearty thanks and appreciation to the secretaries of all four of the divisions of the National Conservation Commission, and also to the experts who have worked so hard from all the departments of this Government.

(The motion was unanimously adopted.)

ADJOURNMENT.

The CHAIRMAN. Is there any further business to come before this meeting?

Governor ANSELL. Mr. Chairman, I move that we do now adjourn sine die.

(Motion carried.)

(Thereupon the joint conference adjourned sine die.)

INDEX

	Page.
Abandoned farms	18, 78
Acheson, Edward G., address of	249
Agriculture, losses by animals and insects	18
persons engaged in industry	75, 76
production of	17
statistics of	75
use of water in	43
Aluminum, production of	95
Animals, losses by insects	81
losses by mammals	81
total losses	82
Ansel, Martin F., addresses of	171, 240
remarks by	174, 248
Appalachian forests	71
Areas, burned-over and cut-over lands	57, 59, 62, 75
coal fields	97, 98
cultivated lands	18
farm lands	17, 75
forest lands	19, 52, 75
impoverished lands	77
natural-gas fields	101
open range	82
original forest lands	53
petroleum fields	100
swamp and overflow lands	23, 83
total lands	17, 75
treeless lands	62
Atkinson, John B., address of	260
Baker, Bernard N., address of	253
Barker, Henry A., address of	255
Black, William H., question by	145
Blanchard, Newton C., addresses of	182, 214
remarks by	139, 141, 163
Bogert, Marston Taylor, address of	145
Broward, Napoleon B., addresses of	173, 230
Burned-over forest lands	57, 59, 62
By-products of lumber	66
of peat	100
Canada, iron ores of	103
Canals	22, 41
Carnegie, Andrew, address of	202
Cement, consumption of	108
production of	95
resources of	16
value of production of	15
Chamberlain, George E., address of	128
Classification of public lands	86, 93
Clay products, resources of	16
value of	15, 95
Coal, consumption of	108
distribution of fields of	97
duration of supply of	98, 99
estimated contents of fields of	97

	Page.
Coal—Continued.	
production of	15, 95, 98
resources of	15, 95
wastes of	99
Coal lands, withdrawn	90
laws concerning	91
Commutation clause of homes ead act	87
Condra, G. E., address of	186
Conservative logging	64
Conservative turpentinig	64
Cooperage stock	55, 56
Copper, consumption of	108
production of	95, 105
resources of	104
Crops, exports of	80
necessity for increasing	75, 79
production of	17
yields of	76
Cuba, iron ores of	103
Cut-off	40, 43
Cut-over forest lands	59, 62
Cuttle, Francis, motion by	144
remarks by	247, 248
Damon, A. W., address of	150
Deneen, Charles S., address of	223
Desert-land act	88
Diseases of live stock	18, 81
Disposal of public lands	86
Disposal of rights on public lands	27
Distillation woods	55, 56, 66
Dry farming lands	88
Education in forestry	69, 72
Edwards, William C., address of	199
Evans, Powell, address of	205
remarks by	248
Evaporation	21, 40
Executive order	119
Exports, foodstuffs	80
lumber	59
mineral products	96
petroleum	101
phosphate rock	106
Farms	17, 18, 75, 78, 84, 88
Fertilizer	77, 78
Fire laws, forest	69
Fires, forest	20, 57, 59, 61
losses by	17, 20, 57, 61, 62, 95
Fish and fisheries, products of	18
propagation of	47, 82
Flint, Frank P., address of	142
Floods, damage by	22, 42
reduction of	45
reduction by forest cover	46
reduction by proper cultivation	45
Foodstuffs, decline in exports of	80
demand for	79
Forests, Appalachian	71
areas of	19, 52, 53
care of young trees	65
consumption of	58, 59
contents of	52, 53
cut-over and burned-over lands	59
fire laws	69
fires	20, 57, 59, 61
functions of	51
national	54, 70
necessity of preserving	20

	Page.
Forests—Continued,	
planting of.....	62
President's message to Congress.....	7
privately owned.....	19, 54, 61
protection in general and cost.....	70
provision for seed trees.....	65
public lands.....	54, 70
publicly owned.....	19, 54
reproduction.....	65
saving of immature trees.....	65
species.....	53, 55, 59
stand of timber.....	53, 54, 70
statement by secretary of section.....	51
taxation.....	21, 59, 68
uses.....	55
wastes in logging.....	19, 55
yearly growth.....	19, 54, 73
Fuels	55, 95, 97, 101
<i>See</i> COAL, PEAT, PETROLEUM.	
Fur-bearing animals	18, 82
Game	18, 82
Gannett, Henry, detailed to take charge of compilation of inventory	119
Gold, resources of	104
value of production of.....	15, 95, 105
Grazing lands	89
Ground water	23, 42
Growth of forests	19, 54, 73
Hale, Edward Everett, invocation by	123
Hammond, John Hays, remarks by	145
Hoggatt, Wilford B., address of	219
Holdings	75, 84, 85
Holmes, Joseph A., statement as secretary of section of minerals	95
Homestead act, commutation clause of	87
Hopkins, Cyril G., address of	255
Imports, iron ores	103
lumber.....	59
mineral products.....	96
Improvement of navigation	45, 47, 48
of waterways.....	24, 27, 45, 47, 48
Indian reservations	54, 70
Inland Waterways Commission, approval by Joint Conservation Conference	27
letter of reappointment from the President.....	117
Insect losses to agricultural products	18, 81
to animal products.....	81
to lumber.....	58
Iron ores, consumption of	108
duration of supply of.....	95, 103
estimated supply of.....	102
estimated foreign supply of.....	102
imports of.....	103
production of.....	15, 95, 103
resources of.....	15, 95
wastes of.....	104
Irrigation	22, 40, 46
Johnson, John A., addresses of	157, 211
Joint Conservation Conference	27
committee on resolutions.....	163, 241, 247
meetings of.....	123, 138, 190
personnel of.....	28
proceedings of.....	121
report of National Conservation Commission.....	139
Koiker, George W., address of	264
Kunz, George F., address of	262
Lakes and ponds, water stored in	23, 42
Land grants	71
Landholdings	75, 84, 85

	Page.
Lands, areas of	17, 75
crop yields of	75, 77, 79
cultivated	18
cut-over and burned-over	57, 59, 62, 75
dry farming	88
farms	17, 18, 75, 78, 84
fertility of	18
impoverished	77
national estate	75
President's message to Congress	7
productivity of	76, 77
statement by secretary of section	75
swamp and overflow	23, 42, 83
treeless	62
yields	17
<i>See PUBLIC LANDS.</i>	
Lathrop, Frank H., address of	201
Lay, W. P., address of	175
remarks by	141, 248
Lead, production of	95, 105
resources of	104
value of production of	15
Legal status of water	44
Live stock, losses by diseases of	18, 81
production of	17, 76
Logging, conservative	64
wastes in	19, 20, 55
Losses to agricultural products by insects and mammals	18, 81, 82
by fire	17, 20, 57, 62, 95
of life in mining industries	109
of live stock by disease	18, 81
of lumber by insects	58, 67
of waters	21, 40
Lumber, by-products of	66
consumption of	55, 58, 59, 63, 73
cut by States	56
cut of	19
imports and exports of	59
insect losses to	58
preservative treatment of	67
wastes of	19, 20, 55, 57, 66, 67
McGee, W J, statement as secretary of section of waters	39
address of	217
Mammal losses to agricultural products	18, 81
to animal products	81
Manufactures, use of water in	46
wastes in	55
Measures of capacity—equivalents	39
Metallic products, value of	95
Military reservations	54, 70
Milling, wastes in	57, 66
Mineral lands, holdings of	84
laws appertaining to	91
nonmetallic—laws appertaining to	92
Minerals, consumption of	16
imports and exports of	96
metallic (rare)	107
nonmetallic	107
persons employed, killed, and injured	95, 109
President's message to Congress	8
production of	15, 95
resources of	15, 16, 95, 96, 109
statement by secretary of section	95
wastes of	15, 16, 95, 99, 101, 104
Mullin, William E., address of	196
Municipal supplies of water	22, 40, 46

	Page.
National Conservation Commission, date of first meeting.....	119
letter of creation from the President	115
organization and proceedings of	113
personnel of	116
report by Joint Conservation Conference.....	139
report of	13
National efficiency	25, 28
National estate	75
National forests	54, 70
National organizations	119
National parks	54, 70
Natural gas, area of fields of.....	101
duration of supply of	95
production of	101
resources of	16
value of production of	15, 101
wastes of	101
Naval stores	57, 64
Navigable streams.....	22, 41, 47
Navigation, improvement of	45, 47, 48
Nelson, Knute, address of	163
Newfoundland, iron ores of	103
Newlands, Francis G., remarks by	139, 141, 173, 243, 247
Noel, Edmond F., address of.....	169
remarks by	248
Nonmetallic minerals.....	95
Open range	82
Original forests.....	53
Overflow lands.....	23, 42, 83
Ownership of forests.....	54
Page, Roswell, address of.....	195
remarks by	238
Paper and pulp mills.....	56, 67
Pardee, George C., address of	204
presentation of report and remarks by	241, 242, 243, 247
Parks, national	54, 70
Peat, by-products of.....	100
distribution of supply of	99
estimated supply of.....	100
resources of.....	16
value of production of	100
Personnel of Joint Conservation Conference.....	28
of National Conservation Commission.....	116
Petroleum, area of fields of.....	100
distribution of fields of	100
duration of supply of	95
estimated supply of	100
production of	15, 95, 100
resources of.....	16
Phosphate rock, duration of supply of	95
estimated supply of	106
production of	95, 106
resources of.....	16
Pinchot, Gifford, announcements by.....	249
letter to the President by	11
opening address of	123
remarks on Committee on Resolutions by	163, 241, 247, 248, 266, 267
remarks by	138, 139, 141, 144, 145, 174, 189, 190, 198, 205, 209, 213, 217
Planting of forests.....	62
Poles, posts, props, rails, etc.....	55, 56
Pollution of water supply.....	46
Ponds and lakes, water stored in	23, 42
Preservative treatment of timber.....	67
Price, Overton W., statement as secretary of section of forests.....	51
Private forest lands.....	54, 61

	Page.
Private land holdings	75, 84
Productivity of the soil	76
Protection of fish	82
of fur-bearing animals	82
of public forest lands	70
of wild game	82
Public domain	54, 71
Public land laws	84, 85
commutation clause of homestead act	87
desert-land act	88
mineral	91
nonmetallic mineral	92
rights of way	92
swamp-land act	83
timber and stone act	87
Public lands	18, 19, 85
classification of	86, 93
coal areas withdrawn	90
control of timber on	92
disposal of	86
disposal of rights on	27
forested	54, 70
grazing on	89
national estate	75
President's message to Congress	7
public range	82
rights in	90
separation of rights in	90
<i>See</i> LANDS.	
Public Lands Commission	85
Public range	82
Pulp woods	55, 56, 67
Rainfall, amount of	43
mean annual	21, 39, 40
Rane, Frank W., address by	216
Reclamation of swamp lands	83
Reproduction of forests	65
Reservations, Indian	54, 60, 70
military	54, 60, 70
Resolutions, Committee on, appointment of members of	163
reports of	241, 247
Rice, Calvin W., remarks by	248
Richards, J. H., address of	180
Rights in public lands	90
of way	92
separation of	90
Roosevelt, Theodore, special message to Congress	1
address of	124 ✓
executive order of	119
letter from Gifford Pinchot	11
letter creating National Conservation Commission	115
letter reappointing Inland Waterways Commission	117
Rothrock, J. T., address of	188
Run-off	40
Salt, production of	95
Sawmills, economy in	66
Seasoning, wastes in	58
Secretaries of sections, statements by	37
section of forests, statement by	51
section of lands, statement by	75
section of minerals, statement by	95
sections of waters, statement by	39
Separation of rights	90
Shingles	56
Shipp, Thomas R., designated secretary of commission	118
statement of organization and proceedings of commission	115

	Page.
Silver, production of.....	105
resources of.....	104
value of production of.....	15, 95
Smith, Hoke, address of.....	161
Smoot, Reed, addresses of.....	191, 214
remarks by.....	141, 174, 189, 243, 267
Soil erosion.....	22, 42, 77, 79
Soil, fertility of.....	18
productivity of.....	76, 77
Species, forest.....	53, 55, 59
State conservation commissions.....	119
State forests, duties of States.....	69
stand of timber in.....	54
States, cooperation of.....	72
crop yields in.....	76
duties of.....	68, 69
lumber cut by.....	56
Stone, resources of.....	16
value of production of.....	15, 95
Streams, navigable.....	22, 41, 47
Structural materials, fire losses in.....	17, 95, 108
value of.....	107
wastes in.....	107
Structural operations, value of.....	17
Stubbs, W. R., address of.....	220
Substitutes for timber.....	60, 68
Swamp and overflow lands.....	23, 42, 83
Swamp-land act.....	83
Taft, William H., address of.....	136
presentation of President Roosevelt.....	124
Taxation of forest lands.....	21, 59, 68
Taylor, Edward R., address of.....	258
Teal, J. N., address of.....	185
Ties.....	55, 56
Timber, control on public lands.....	92
cut of.....	19
cut by States.....	56
insect losses to.....	58
preservative treatment of.....	67
stand of.....	53, 54
substitutes for.....	60, 68
uses of.....	55, 65
value of.....	63
wastes of.....	19, 20, 55, 57, 66, 67
Timber and stone act.....	71, 87
Timber land holdings.....	85
Transportation, losses in.....	66
Trees, care of young.....	65
planting of.....	62
saving of seed and immature.....	65
Tuberculosis, mortality from.....	25
of live stock.....	81
Turpentine.....	57, 64
Van Hise, Charles R., address of.....	178
remarks by.....	138
Van Sant, Samuel E., address of.....	238
Walsh, Thomas F., address of.....	153
Wastes of lumber (general).....	67
in lumbering operations.....	19, 20, 55, 57, 66
in manufacturing.....	55
in milling.....	57, 66
in mining.....	15, 16, 95, 99, 101, 104, 108
in seasoning.....	58
in standing timber.....	57
in structural materials.....	107
in waters.....	21, 40

	Page.
Water power	22, 47
developed and undeveloped	41
Waters, cut-off	40, 43
evaporation	40
ground	23, 42
irrigation	22, 40, 46
legal status of	44
losses of	21, 40
navigable streams	22, 41, 47
President's message to Congress	6
run-off	40, 42
scarcity of	43
sources and resources of	21, 43, 44
statement by secretary of section	39
stored in lakes and ponds	23, 42
use for agriculture	43, 46
use for manufacturing	46
used and wasted	40
Water supply, municipal	22, 40, 46
part put to use	21
pollution of	46
Waterways, improvement of	24, 27, 45, 47, 48
navigable	22, 41, 47
Whipple, James S., address of	206
remarks by	212, 213
Wickey, E. W., address of	252
Wood, substitutes for	60, 68
Woodruff, George W., statement as secretary of section of lands	75
Woodruff, Rollin S., address of	236
Yields, by States	76
of United States	17
Zinc, production of	95, 105
resources of	104
value of production of	15

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