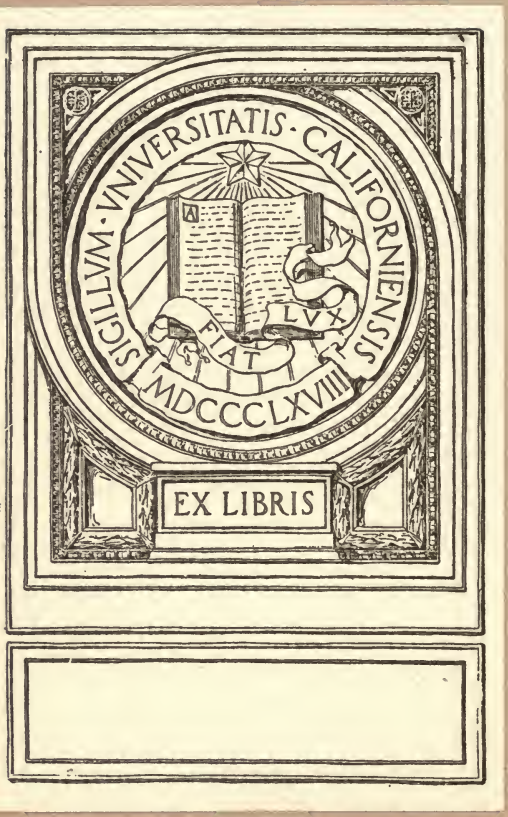
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REPORT

PROCEEDINGS FOURTH ANNUAL SESSION

International Mining Congress

BOISE, IDAHO
JULY 22, 24, 25
1901

OFFICIAL PROCEEDINGS

OF THE

FOURTH ASSEMBLY

INTERNATIONAL MINING

CONGRESS

HELD AT

BOISE, IDAHO, JULY 23, 24, AND 25, 1901.

IRWIN MAHON, SECRETARY,
CARLISLE, PENNSYLVANIA.

Additional Copies of this Report will be furnished on application to E. L. Shafner, President, Cleveland, Ohio, Fred R. Reed, Vice-President, Boise, Idaho, or Irwin Mahon, Secretary, Carlisle, Pennsylvania.

Butte Miner Co., Printers, Engravers and Binders
Butte, Montana

OFFICIAL ROSTER

OF THE OFFICERS OF THE

INTERNATIONAL MINING CONGRESS

FOURTH SESSION MEETS AT BOISE, IDAHO, JULY 23, 24 AND 25, 1901.

OFFICERS.

President, Hon. L. Bradford Prince, Santa Fe, N. M.
Vice-President, Hon. A. P. Swineford, Ketchikan, Alaska.
Secretary, Irwin Mahon, Carlisle, Penn.
Treasurer, E. C. Atwood, Empire, Colo.
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EXECUTIVE COMMITTEE.

Hon. L. Bradford Prince, Chairman, Santa Fe, N. M.; Hon. A. P. Swineford, Vice-Chairman, Ketchikan, Alaska; E. C. Atwood, Treasurer, Empire, Colo.; Irwin Mahon, Secretary, Carlisle, Pa.; Hon. Philo A. Orton, Darlington, Wis.; J. W. Adams, Dahlonega, Ga.; Mrs. Ella Knowles Haskell, Helena, Mont.

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Georgia—Walter P. Andrews.....Atlanta
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Indiana—U. Gulbert.....Michigan City

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Kansas—H. F. Brinkham.....Dillon
Michigan—A. L. Flewelling.....Crystal Falls
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Missouri—Geo. P. Paxton.....Joplin
Montana—L. S. Woodbury.....Great Falls
Maryland—Henry Shriver.....Mt. Savage
Nebraska—H. M. Rice.....Lincoln
New Mexico—R. C. Hatton.....Las Cruces
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Ohio—E. L. Shafner.....Cleveland
Oklahoma—Ex-Gov. W. C. Renfrow.....Oklahoma City
South Dakota—Angus MacKay.....Deadwood
Tennessee—E. C. Camp.....Knoxville
Texas—Roger Q. Mills.....Corsicana
Utah—R. C. Chambers.....Park City
Washington—James M. Ashton.....Tacoma
West Virginia—Capt. Thomas Page.....Ansted
Wisconsin—M. H. Richards.....Platteville
Wyoming—Will Reed.....Rawlins
Washington, D. C.—Dr. W. Lee White.....Washington
British Columbia—George Alexander.....Kaslo
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Tennessee—H. V. Maxwell.....Knoxville
Texas—Charles B. Edy.....El Paso
Utah—Hon. D. O. Rideout.....Draper
Washington—J. T. Thompson.....Seattle
West Virginia—T. E. Hutson.....Elkhorn
Wisconsin—M. D. Kelly.....Milwaukee
Wyoming—J. M. Thomas, Jr.,.....Battle Lake

Washington, D. C.—Dr. A. McKnight.....610 F St., N. W.
British Columbia—F. W. Kirby.....Rossland
Virginia—Geo. W. Miles.....Radford
Province of Ontario—Hon. Thomas W. Gibson.....Toronto

SESSIONS OF THE CONGRESS HAVE BEEN HELD AS FOLLOWS:

	DATE	CITY	PRESIDENT	ADDRESS	REMARKS
1st	July 1897	Denver, Colo.	Hon. Alva Adams	Pueblo, Colo.	Temporary
"	" "	" "	Hon. L. Bradford Prince	Santa Fe, N. M.	
2nd	" 1898	Salt Lake, Utah	" " "	" " "	
3rd	" 1899	Milwaukee	Col. M. B. Montgomery	Cripple Creek, Colo.	Passed to
"	June 1900	"	" " "	" " "	June 1900
4th	July 1901	Boise, Idaho	Hon. L. Bradford Prince	Santa Fe, N. M.	

Boise, Idaho.

Boise, Idaho, where the fourth annual session of the International Mining Congress was held, is the capital city of the State of Idaho, and the county seat of Ada county. It is a most beautiful, and in every way a most attractive city of homes, sustained by extensive sheep and cattle interests, large and prolific farms, magnificent orchards and gardens, and surrounded by the richest mining sections to be found anywhere between the Rockies and the Sierras.

At least $2,000,000 yearly in gold and silver finds its way to the United States assay office of Boise, a large portion of which comes from the mines and placer diggings in surrounding camps, and this in itself is but an insignificant portion of the output of the mines of southern Idaho, as the greater part of their production finds its way to the smelters in Salt Lake City, Kansas City, Denver, Pueblo or San Francisco in the shape of crude ore. To the north of Boise is the famed Boise Basin, which has a record of over fifty millions in gold since its discovery, and its auriferous deposits are still being worked on a large scale. To the southeast of the Boise gold belt is a large area of country rock rich in deposits of the precious metals, while along the course of the Boise river, above and below the city, there is almost an unbroken chain of placer diggings. In the eastern portion of this same mineral belt are to be found the splendid camps of Dixie and Neal. Within twenty-five miles east of Boise, Willow and Rock Creek districts are located, and at Pearl, within this district are located, such noted mines as the Red Warrior, the Checkmate and others, while along the Snake river, forming the head waters of the Columbia, the bars of gold-bearing gravel are innumerable. It is along this river that many big mining enterprises are now being successfully inaugurated.

In Owyhee county are some of the greatest bonanza propositions ever developed in the West, such as the Trade Dollar, DeLamar, Blaine, Black Jack, Poorman and Alta, with many others producing millions annually. In the Seven Devils district alone there are hundreds and thousands of developed and undeveloped mines and prospects that will, on the opening of the Idaho Midland railroad, astonish the world with the vastness of their mineral wealth. Then there is Thunder Mountain, said to be one solid body of gold ore. Professor Mead in speaking of this mountain, says: "It is simply a great mountain of ore," that so far as his investigations go, he could find no end, top or bottom, of the deposit, with ore enough in sight to keep a 100-stamp mill running for years on ore simply quarried out.

OFFICIAL ROSTER

OF THE OFFICERS OF THE

INTERNATIONAL MINING CONGRESS

FIFTH SESSION MEETS AT BUTTE, MONTANA, SEPTEMBER 1, 2, 3, 4, AND 5, 1902.

OFFICERS.

President, E. L. Shafner, Cleveland, Ohio.
Vice-President, Fred R. Reed, Boise, Idaho.
Secretary, Irwin Mahon, Carlisle, Penn.
Treasurer, E. C. Camp, Knoxville, Tenn.

EXECUTIVE COMMITTEE.

E. L. Shafner, Cleveland; Col. J. T. Grayson, Baker City, Ore.; Hon. L. Bradford Prince, Santa Fe; E. C. Camp, Knoxville, Tenn.; Fred R. Reed, Boise, Idaho.; Mrs. Ella Knowles Haskell, Butte, Mont.

Irwin Mahon, Carlisle, Penn., Secretary.

PROCEEDINGS OF

FOURTH ANNUAL SESSION OF

INTERNATIONAL MINING CONGRESS

BOISE, IDAHO, JULY 23, 24 AND 25, 1901.

July 23, 1901.

10 o'clock A. M.

The meeting was called to order by Hon. L. Bradford Prince, president.

Prayer was offered by the Right Rev. A. J. Glorieux, as follows:

In the name of God, amen: It is truly meet and just that we at all times and in all places give thanks and praise to Thee, Holy Father, Eternal and Almighty God, to whom we now raise our hearts and voices, praying Thee to shower Thy blessings upon this assemblage, but especially upon those who are to take part in the deliberations of the International Mining Congress, its officers and delegates, that they may be enabled, by Thy powerful protection, to discharge their respective duties with ability and honesty, and for the good of their people. Let the light of Thy divine wisdom direct the deliberations of this Mining Congress, and shine forth in all its proceedings and the framing of its laws, so that those laws may tend to promote the mining industry, our national prosperity, and the temporal, spiritual and eternal welfare of the people.

Oh, God, who, by the light of Thy holy spirit, instructs the hearts of the faithful, granting them, by Thy spirit, to have right judgment in all things, and forevermore to rejoice in His salvation, through the grace of our Lord, on this great auspicious day we pray Thee also, oh God of might, wisdom and justice, direct the deliberations of our National Congress so that they may frame laws for the development of our mining industry. We pray also that the government may take our mining interests into its special care and protection. We likewise recommend to Thy divine bounty all our brethren and fellow citizens throughout the United States, and especially the officers and delegates of this Mining Congress, that they may be preserved in union, peace and mutual brotherly love, and after enjoying the blessings of this life, through Thy infinite bounty, and through their own industry, they have been admitted to life eternal. Amen.

PRESIDENT PRINCE: The Congress meets this year in this great States of Idaho, in the midst of its wonderful natural resources, and in view of the evidences of its prosperity and the industry of its people.

It is a pleasant thing that we should receive greetings from those among

whom we meet, and especially from the chief magistrate of the State, and I have the pleasure of introducing to you, to the members of the Congress, to whom he, perhaps, needs no introduction—not to the people of the State itself—His Excellency, Governor Hunt. (Applause.)

GOVERNOR HUNT: Mr. President, Ladies and Gentlemen of the Mining Congress:—The duty delegated to me today to greet you in behalf of the State is a pleasant one, and I wish to assure you that this meeting of the Mining Congress is one of the pleasantest and most interesting events that has ever occurred in this State.

Last year we sent our delegation to Milwaukee not only to take part in the proceedings of the Congress and to guard and advance the interests of the mining industry, but also hoping to induce the Congress to locate its next annual meeting in this State and in this city, which, by reason of its geographical location we consider the heart of the great Rocky Mountain region, that produces the bulk of the gold, silver, copper and lead of the world.

We have but a small city here, but our delegation, sizing up the crowd at Milwaukee, thought that we could accommodate a smiilar number here, and if by chance the attendance here should be doubled, we would still do our best to provide for you and extend you what comfort we could in this arid region—arid no longer, I hope, while you are with us—though it could not be done as comfortably as in some of the larger cities asking for the Congress.

Through extreme good fortune and the aid of some very warm friends, our delegation was successful.

We have undertaken to secure as large an attendance as possible. We have tried to interest, not only the United States, but the world, in this Congress. The city has availed itself of the professional services of Mr. Mahon, the secretary of your Congress. He has given us valuable aid and it is under his intelligent direction that the world knows that the International Mining Congress is deliberating in session today. I believe the International Mining Congress is a body of gentlemen that thoroughly represents the mining industry, and by that I mean the promotion, capital investment, production and marketing of ores.

These sessions are growing in importance. We are here to consider and recommend needed legislation, so that our mining laws may be made more uniform, and I take it we are also here to again recommend and urge the creation of a Department of Mines to be located at the seat of our government, and with an officer to sit in the Cabinet of the President of the United States, and care for the growing mining interests of this country.

We have brought together this body of men who are interested in their profession and all that pertains to it. We have with us today the laborer, the mechanic, the engineer, the operator, the owner, the capitalist and the promoter, and the last of these is not the least by any means. Scripture tells us that upon that last day the first shall be last and the last shall be firs. At some time in his career the promoter will assuredly be first; and when he does reach that position we are ready to give him a hearty cheer. In my own heart I have a warm spot for the promoter, for I know that sometimes he is unnecessarily regarded with suspicion. We have here today the representatives of some of the great commercial bodies; we have members of the law-making power of the Federal Government, who are here to derive what information they can that shall be of benefit in future legislation, and we have the representatives of some of the greatest and most advanced foreign governments. We have also the man whom we cannot overlook—the prospector. Next to the Creator, he is the man who makes the mines, and we have him with us today and honor him. He it is who blazes the trails for us to follow; who is the pioneer in exploration, and although he may be discontented or visionary, yet he is at all times ambitious. When these high mountains shake their white locks and their piles of snow come tumbling down the gulches in pure crystal streams, it is then the prospector packs his cayuse or his burro and strikes for the hills; and if his rusty bacon or flour gets low, he is the one man in the world who can live cheerfully on hope. We have all these men with us today; a body of men who are earnest and sincere; who are ready to touch elbows and brush up against new ideas; who want information and want to advance. These sessions of the Congress bring its members together to meet new ideas; to come in contact with new principles and to meet new forces in the science

of mining; to exchange valuable information; acquire a personal knowledge of new country and of recently discovered districts, and I know they are a relaxation and vacation to many of you from most arduous duties.

We had some hesitation in taking this Congress, even after we had accepted it, but it was only through fear that perhaps accommodations of our city might not be sufficient to provide for you comfortably, but we wish to assure you that what we lack in quality of modern conveniences we will try to make up in the heartiness of our welcome to you.

I wish to let you know that we appreciate the great honor this Congress is to us. We are proud to have you with us, for over and above everything else we are a mining state, in full sympathy and accord with the purposes and objects that you are trying to secure.

Some of you are from far eastern and southern shores, English, German, French; of Spanish blood; of almost every race and nation, but all miners. Even the laborer who digs in the bowels of the earth is a traveled man. They reach out all over the world, from the frozen rivers of Alaska and Siberia to the torrid belt that encircles the world, and from there on to the southernmost confines of the two hemispheres, so that I judge there are very few of you here who do not know something about the West, and perhaps this State is not new to you.

The trip here at this season of the year is not very pleasant, coming either from the east or west. It is a veritable desert apparently, with here and there an oasis upon the panorama of sagebrush and sand. The dust seethes through your closed train on those hot days, and you wonder where the air is, which we claim to be so long on in this country. But when water is brought upon this soil, when it is cultivated and reclaimed, the sagebrush of the plains give place to the hardiest fruits, and the sifting sands are changed to velvet lawns. We, who have seen these changes take place slowly and gradually; who believe that our State is destined for the best; that our climate is the healthiest and purest, and that we have here what is fairest and happiest, and yet we are glad to share it and wish a little more of the salt of the earth upon this fair spot, and that is the reason we have you with us to abide for a few days, or as long as you will, footsore and weary though you may be with the regular labors of your lives, yet here to refresh yourselves with an intercourse that must be of value to each and every one of you, and of great benefit to the industry that you represent.

I have spoken of Idaho, but merely with the intention of letting you know that we love our State and believe in it, and that we are not ashamed to ask people to come into it and share it with us, and I wish to assure you that deep down in the hearts of our people lies a welcome for you that is more cordial than any words of mine can express.

We hope that after this Congress has adjourned, many of you who have journeyed here hundreds, even thousands of miles, might still be pleased to wander a little further into the interior of our State, among the mountains which stretch in one unbroken chain for three hundred miles to the north and nearly as far to the east, the best and most delightful part of Idaho. So far, you have seen its outskirts; its least attractive part, and I assure you that if you will but enter the State, you will not only be pleased with your experience, but you will find gentlemen ready to accompany you, and you will be received with a true western welcome. I know that many of the other Western States are also waiting to show you their country. California, Oregon, Washington, Montana, Utah—in fact, all the mountain States will be glad to have you look them over.

I am here today in my official capacity as Governor of Idaho, to welcome you to this State. No words that I could say would tell you so more cordially than is revealed by the interest and pleasure manifest upon every face among our citizens who are here today. Upon the lintel of our door you may read in the letters of light the word "Welcome." Our streets and buildings are ablaze with it. It means that we are of one purpose and in full sympathy with the objects of your organization.

Sometimes words become fulsome in their endeavor to express ideas, so perhaps the best welcome we can give you will be by our actions while you are in the State, and the impression we leave with you of the pleasure and honor of this occasion. When we break these ties I hope we shall all appreciate the value of this experience and the good results that shall flow from it, and that next year many of us may renew this acquaintance wherever the session of the Mining Congress may be.

PRESIDENT PRINCE: All of us who have never before been in this city of Boise have certainly been struck by the beauty of the surroundings, and by the warmth of welcome of its people.

I have now the honor of introducing to you His Honor, Mayor Alexander, mayor of the city of Boise.

MAYOR ALEXANDER: Mr. President, and members of the Mining Congress: In behalf of Boise City I present to your President the keys of Boise (applause), and offer you the freedom of the city, and ask you to partake of its hospitalities without stint. Boise City is proud of the presence of the fourth International Mining Congress, and, for once, we ask you all to forget that you are citizens of any other State than the State of Idaho, but inhabitants of our proud little town called Boise. We feel proud of the honor and the privilege of entertaining you. Boise knows well the interest of mines and mining. The foundation of our prosperity is mining. Upon that foundation we have raised a great superstructure, agriculture, and we have beautified it with stock raising and sheep raising; and, gentlemen of the fourth Congress, you are assembled in a little town, which for its prosperity is unequaled anywhere in the United States. (Applause.) These mines and these rich hills have poured forth their riches and wealth into our laps, until today educational institutions, churches, and all the good things of earth that go to brighten the dawn of the twentieth century are ours, and our people ask you, one and all, to partake of our good things, to make yourselves at home, and assimilate with our city and its people, so that your stay among us may be happy and contented, and long to be remembered with pleasure. Boise City offers you everything in its power to make you comfortable and happy. While it may not be as large as some of the towns in which former sessions of the Congress have been held, within our hearts, there exists in our hearts a large affection for you which will turn the balance in our favor. If our buildings are not as high as in some other places, our aim is higher than any building that was ever erected. We accept the Congress because Idaho is a state of mines, and Boise, as the center of the State of Idaho, receives a benefit from the mines that cannot be estimated.

During your stay in our midst we expect to treat you as one of us, and that your deliberations will redound to the benefit of the State of Idaho, and of every state in the union.

The work for this Mining Congress has been done by my predecessor. He has worked hard and faithfully to bring forth the result that we have now accomplished; that gentleman is Hon. J. H. Richards, ex-mayor of Boise City, whom I now have the pleasure of introducing to you.

MR. RICHARDS: Mr. Chairman and Gentlemen of the Congress: It has fallen to my lot, as a citizen of our State and city, to say to you a few words of greeting. I assure you that I appreciate more than I can adequately express the honor and privilege of addressing you on such an occasion as this. International conventions, of the importance and representative character of the gathering here present, are not yet such commonplace incidents with the people of Boise and Idaho that we have become accustomed to welcome them with what I may term conventional politeness merely. We extend to you the liberty of our city in the fullest sense of the word. We do not invite you to our firesides—it is a little too warm for that—but we do welcome you, cordially and sincerely, to our homes and our hearts. We shall endeavor during your all-too brief stay with us to make it pleasant for you. We trust that when you go hence you will want to come back again some time in the near future, and that all your recollections of this occasion will be agreeable and profitable. While you sojourn with us we shall have no other business or pleasure but yours.

Others better qualified for the task than myself will attempt to interest you in the great extent and diversity of our mineral resources as a state, and we hope that those of you who come here as entire strangers will come to understand more clearly what at first blush may no doubt appear like an unwarranted enthusiasm on our part. We want you to enjoy and appreciate with us the display of natural wealth which the hand of nature has so lavishly bestowed upon our state, and we want you to profit thereby, either intellectually, materially or aesthetically—or all together. In short, we just simly want you to understand us.

Fortunately perhaps, for you, I am not myself professionally a mining man. I shall not pretend even a superficial familiarity with all the subjects which this Congress proposes to consider, though some of them are subjects in which I take a very great interest. For many years before coming to this state I lived in a community where the only interest was mining; where all my friends were interested in mining; where I had important interests in mining, too. I have never lost that sympathetic interest—though I have lost other things—but it is not now so much a matter of dollars and cents to me personally as the consideration of general ideas, and a few of these I shall try to express to you as best I can on this occasion.

Mr. Chairman, as a nation we stand at the portals of the new century with all its possibilities, and when we stop to think of those possibilities we must admit that they are not less marvellous than the accomplished facts which we have already written into the history of the race. At one bound, as it were, we have taken a position in the very front rank of the great industrial nations. We are now ready, as we never have been before, to compete for the trade of the world. We have an abundant and practically inexhaustible supply of all the minerals which are commonly used in human art and industry, while new and hitherto unsuspected resources are being disclosed daily. We can lay all these products at the door of the manufacturer and consumer with astonishing cheapness. We possess the genius to meet every demand for new and more economical methods. We have irresistble battalions of skilled labor—the best on the planet, because it is the most intelligent and self-respecting. American machinery is now reaching all parts of the world. Our bridges and locomotives, literally and not figuratively, carry the competitive war with England into Africa. All these things mean an enormous impetus to every industry connected with mines, and it is an impetus that has only just begun to be felt.

For, gentlemen, the gates of the Orient are opening to us—the portals of the dawn. We here on the Pacific coast are watching this new industrial development in the far east with the keenest interest. It means a great deal to our whole country, but it particularly concerns us. For the region which has already been planted the seeds of this development lies tributary to the Pacific, a region in vastness of territory, wealth of resources and bulk of population comparable only to the almost illimitable waters which wash its shores. Therefore these waters of the Pacific are destined to bear upon their bosom a commerce such as the world has never seen before, and to meet the demands of that commerce beautiful and opulent cities will spring up all along our Pacific coast, and, as so many times in the past, the splendors of architecture, the refinements of art and the triumphs of intellectual and moral power, will again flourish in the shadow of the marts of trade.

Pardon me this seeming disgression, which is not wholly a digression, for I want to say to you that the products of the mine are going to be very prominent factors in this mighty onward march to the tune of twentieth century idea. It has been the proud distinction of our sister state California that the stream of gold which she poured into the lap of trade and industry during the crucial period of the civil war contributed in no small measure to our financial stability at that time, and a similar distinction in the future will be shared by all of our states in which the mining industry is prominent. The great contest for which we as a nation are to gird our loins in the near future may not be one which involves the use of battleships and long-range guns. It may be, and most likely will be, one which will be very largely determined by the financial stability assured by a large production of the precious metals, cheap and abundant manufactures of iron, steel, lead and other metals, unrivaled efficiency of labor, and legitimate industrial combinations, based primarily not upon selfishness and greed, but upon justice to labor and saving to the consumer.

The mining industry since the early morn of civilization has ever been the handmaid of the advancement of the human race. First the flocks and herds, then the tilled field, and with the tilled field the products of the mine from which to forge tools for agriculture and weapons for the defense of the home, from which to draw the life-blood of commerce and supply the plastic material of art. Agriculture and mining have always gone together, hand in hand; the most powerful civilizations of antiquity were reared upon their broad foundations. The Athenians early acquired a great advantage as traders on account of the rich silver mines of Africa. The Carthagenians built up a lucrative commerce with less advanced nations by their large product of metals and proficiency in metal manufacture. The Ro-

mans fostered with the greatest care mining in silver, copper, iron and gold. And I venture to say, gentlemen, that the production and manufacture of the useful and precious metals is even more important today, relatively speaking, than ever before in the history of the race. Metal manufactures as we all know, are extending into fields never before occupied by them, and the products of the mine are coming forward to take the place of our fast vanishing forests; are being used instead of wood in the construction of houses, bridges, ships and articles of general utility to a degree never dreamed of even so late as twenty-five years ago.

Therefore the time is now here, as we hope, when this government is going to grant a more intelligent recognition to this great primary source of material wealth upon which human advancement so much depends. Agriculture has within the last few years been recognized by the establishment of an agricultural department at Washington, and we all know how richly the wisdom of what many then considered to be a foolish innovation has been justified by the results. The energetic and far-sighted labors of the agricultural department of the government have already added untold millions to the wealth of this country. They have enlarged our markets, they have been the means of introducing new and profitable staple crops, to the great advantage of our farmers, they have popularized more scientific methods of cultivation. Now we intend—and I earnestly hope that this Congress, before it ceases its deliberations, will give emphatic expression to this idea—we contend that mining, or that source of material wealth held in the miserly clutch of the insensible rock, shall be recognized by the establishment at Washington of a Department of Mines, and Mining, co-ordinate in all respects with the department of agriculture. For each of these sources of supply supplements and inspires the other. Both together are the bedrock upon which all human endeavor rests. Agriculture and mining are the two great primary means by which mother earth provides for and enriches her children. All other forms of material development and progress rest their hopes on these twin fountains of natural supply. When the department of agriculture was established it was because it was discerned that we could easily produce enough to feed and clothe the world; that wider markets were all that we needed, and the situation in mineral production is precisely analogous. That production has now become so stupenduous that this country brings every year from the storehouse of the rock mineral wealth to the amount of one billion dollars. Would it not be well, then, to have this production regulated, fostered and stimulated by the guiding hand of our national government? Why should the people's money be appropriated to help introduce American corn and the American hog in Germany, and denied to help introduce American silver or American locomotives in China?

It sometimes seems to me, gentlemen, that western mining, inasmuch as in many phases it seems to be characteristic of a wild and woolly stage of civilization from the standpoint of our eastern friends, has never yet had proper justice done to its merits and achievements. Only when we consider the far-reaching effect of mining upon the general development and prosperity of a people, and observe what an impulse its healthy growth gives to human activity, and become aware of the sustaining force it supplies to a nation in the hour of national trial, do we begin to comprehend its importance. Subtract from the mighty economic force of the eastern and middle states of this union the impulse given to commerce and industry by the production of coal, oil, iron, copper, lead and zinc, and tell me how much will be gone. Take from the west its mineral production and you sap its vitality. It is the boast of mining in the west that it has succeeded in reversing the order of nature, for mining all over this coast came first in sections apparently so inhospitable to the agriculturist that many believed they could never be redeemed to cultivation; and yet the irrigation canal, the plow and the pruning hook followed from the very necessity of feeding the early miners, and it was discovered at last that the wilderness could be transformed into a smiling garden and support millions of happy homes.

Mr. Chairman, the east and the west are inter-dependent. I would be the last to underrate the generosity of the east. I admit with gratitude what we here in the west owe to her confidence in us. I hasten to concede how lavishly she has given of her substance in order to make the west what it is today. I profoundly deplore the poor judgment she has shown in some of her investments. But I always feel that the people in that section owe more than they generally realize, perhaps, to the great

value and utility of western products and to those stout-hearted pioneers who, in what was so long known as the great American desert, touched the forbidding rock with the magic wand of energy and intelligence and brought forth perennial streams of gold and silver, the means of vitalizing our financial system, the means of adding real value to all our commerical and industrial life.

This is what mining has done for our common country. It was those pioneers, mostly sons of the east, miners in search of the precious metals who crossed the trackless desert, marking their course by the final resting places of comrades who fell by the wayside, braving the enmity of the savage hordes, scaling the almost inaccessible mountain side, penetrating the gloomy and dangerous ravine—it was these men who opened up the treasure vaults of nature to the use of man; it was their labor that sent a thrill of fresh life-blood through the minutest artery of the world's commerce; it was their energy that helped fill the national strong-box with hard cash at the time when we needed it most.

Gentlemen, with the change and ferment of the last three years in the political and economical world, new ideas have come into our American life. The America of today is not the America of a generation ago, nor even of three years ago. The conservative ideas of the past can only serve us now in the new light of the present.

New occasions teach new duties;
Time makes ancient good uncouth;
They must upward still and onward,
Who would keep abreast of Truth.

The America of yesterday will hold its place only in history; it will make history no longer. The America of today in the general affairs of the world has that assured predominance which belongs to the absolute proprietor of more than a vast continent. What America can now do in the world is limited chiefly by what it feels inclined to undertake. I say to the mining men of the west: you must not forget that at this very hour you, too, are standing face to face with new conditions and with a new world, that until recently you never dreamed would confront you as hospitably as now. You, like the rest of us who live on the Pacific slope, must not forget that the Orient, with her teeming millions and awakening desires, wants your minerals and your metal manufactures just as much as she wants flour, lumber and cotton goods.

The nineteenth century has gone into history. We stand at the threshold of the new century, with new prospects and new hopes and a fuller realization of our power and our possibilities. The new century will be dominated by the new idea that whatever we do should be distinctively American in spirit, which means: demand our own, protect our own, pay for what we get, require pay for what we give; the American flag on the American ships; help the oppressed, enlightenment for the ignorant, recognition of the rights of other peoples to work out life's problems according to forms suited to their conditions. In other words, with this nation from now on all our endeavors and all our aspirations should be distinctively American. We are getting too big to copy Europe any longer. Less than ever do we need to imitate her armed camps; more than ever do we possess the opportunity of vanquishing her in the paths of peace.

Gentlemen, in this American spirit now dominating our hopes, with eager anticipation of the pleasure of meeting you, both individually and collectively, with sincere appreciation of the honor you have conferred upon us by assembling here, we welcome you, one and all, to our midst.

PRESIDENT PRINCE: We all, I know, appreciate the fact that we have with us today the distinguished senator from the State of Idaho, Senator Dubois, who is known far and wide, and has been from the time he entered upon the duties of official life, as the friend of the mining industry. It is certainly a pleasure to introduce to this Mining Congress Senator Dubois of Idaho. (Applause.)

SENATOR DUBOIS: Mr. President, Ladies and Gentlemen: I am here somewhat as a stranger, or more as a guest, than as one of the speaker with a place upon the program, and I should find it very difficult to add anything to the very warm and hearty greetings which you have received from Governor Hunt, the Mayor and the ex-Mayor. I could

not do it if I wanted to, because the Governor has given you the State, the Mayor has given you the city, and he has presented the keys to your presiding officer, with instructions to unlock everything good in Boise to the delegates, and we all know that the Mayor has the authority.

I came through from the East with some delegates from that section —got on the train at Pocatello, rather—and they all had the opportunity of looking at the country. I told them that the country around here is the empire of the country. It certainly is the most populous part of Idaho. It is our great agricultural section. Pretty soon one of them, an old friend of mine from Illinois, said he would enjoy exceedingly visiting the country around Boise. I said: "When you get to Boise you will be in the midst of the greatest fruit growing region on earth, I don't even except California." Well, he had heard something about the Clear Water, up north. I said, "Oh, yes; that is the only place on earth where any wheat of any consequence is raised. He said: "You seem to think you have quite a state out here." I said: "No; I am recognized generally as one of the most modest and unassuming men in Idaho. When you get to Boise some of our citizens will tell you something of the resources of Idaho." (Laughter.)

I would not have been called upon, but my colleague is now engaged in a philanthropic mission up north. Some of you will recall, perhaps, that the Rivers and Harbors Commission, which was created at the last session of Congress is now in the northwest engaged in examining the Columbia and Snake rivers. My colleague is with them, and we hope that they will open the Snake river, and reclaim the land of the entire country. (Applause.)

If you gentlemen want to see mining you may go in any direction from this beautiful fruit section and see it in perfection, and if you go to the Coeur d'Alenes you will see the greatest mining camp on earth. It has not an equal on the globe. That camp alone produces more than one-half of all the lead produced in the United States, and the mines are conducted with all the modern appliances. I think your president will arrange for low transportation, so that you can go to the Coeur d'Alenes and see the greatest lead camp on earth, and from there to Butte and see the greatest copper mining camp on earth, and from there to your own National park and see the greatest wonders that the world has in its store. (Applause.)

I will close by saying that any citizen of Idaho will tell you something of the beauties of our State.

I can but echo the sentiments of the Governor, the Mayor and the ex-Mayor, and bid you a most cordial welcome to our city. (Applause.)

PRESIDENT PRINCE: These cordial and gracious words of greeting from the representatives of the State and the City certainly deserve a fitting response; and that response, I think, should come from different portions of the territory that is represented here by the mining community.

I will call upon Mr. Shafner, of Ohio, coming from what we call here the eastern part of the country, to express on behalf of that section our sentiments on this occasion.

MR. SHAFNER: Mr. President, Ladies and Gentlemen: It gives me great pleasure to meet the people of Idaho, and to meet those from other states who are assembled here. I am deeply gratified with the warm and cordial reception that has been extended to us by the Governor of this State, and by the Mayor of this City.

I come from the State of Ohio, which I believe to be one of the grandest States in the Union. We have turned out some very noble men, who have become Presidents of these United States; and I believe that if the Pilgrim Fathers had landed on the shores of the Pacific that the State of Idaho would have been the Ohio of the West. (Applause.)

I believe your resources here are great. We, in the city of Cleveland, on the shores of Lake Erie, where the iron from the great Superior region, and the coal from Ohio, Pennsylvania and Virginia meet, build ships that are sent to all parts of the world. Your inland conditions will not permit you to do that, but your valleys and your hills are full of minerals, of gold and silver, which should make your State and its citizens rich.

I do not intend on this occasion to make a speech. I will only express in behalf of the delegation from Ohio the warmest appreciation for your kind words of welcome, and for the arrangements you have made for our comfort. (Applause.)

PRESIDENT PRINCE: We have now heard from the East. Taking the Philippines into account, Utah is just about in the middle of the country, and we would be glad to hear from Dr. Talmage, of Utah.

DR. TALMAGE: Mr. President, Ladies and Gentlemen: It is only since this assemblage came together that I learned of this honor reserved for me, but I embraced it most heartily, and perhaps I can say nothing more appropriate than this: That the hospitality of the State of Idaho, and of the City of Boise is in the spirit which prompts it. I believe, indeed, coming from a State immediately to the south, that we of Utah are such close neighbors to the good people of Idaho that we could almost aspire to share the pleasures of host, rather than accept your hospitality as guests, in the sense of strange guests. (Applause.) We being such close neighbors, often drop in upon you and see you when perhaps you do not know we are looking on, and call upon you at times that are odd, and at irregular intervals. But we will forego the pleasures of acting as hosts on this occasion, and with the others share your generous hospitality.

We realize that your State is one of incalculable resources, we realize the blessings that will accrue to you, and we are selfish enough to say to you that we also will receive some of the benefits that arise from the presence of this Congress. We are heartily in accord with your efforts to promote the mining interests in this region, for what are your interests are ours also. And when we look about us and see what you have done for this association in making it what it is we think you are capable of anything that you may care to attempt. (Applause.) And I believe I am hardly speaking for the Utah delegation alone—it is true that we are separated into sections here, and properly labeled, so that those looking may know from what quarter we come; but I believe I may safely take to myself the honor of speaking for the entire assembly when I say I do not believe sectional feeling or interest will prevail here. (Applause.) Indeed, I have had no intimation that such feelings are entertained at all; and, being of one heart and one mind, I believe that the delegates and all members of this Congress will work together for the purpose of making this Congress all that it was designed and intended to be, and more.

In accordance with some quaint old custom the Mayor has graciously handed the keys of the city to our respected president, and, therefore, to us. I was led to wonder for what this was, and what was meant by it. Surely not to let us into the city, for we are here. We have not learned, perhaps what good things of Boise may be unlocked for us with that bunch of keys; but we have been so heartily welcomed that we could hardly expect very much more.

Therefore, to His Excellency the Governor, to His Honor the Mayor, and to the Senator from Idaho, who have addressed us in such pleasant terms on behalf of the people of Idaho and of the city of Boise, we return our most hearty thanks, and say to you that we appreciate your welcome, and we hope to continue to feel ourselves most thoroughly at home. (Applause.)

PRESIDENT PRINCE: The delegations from the extreme West from Hawaii and the Philippines, have unfortunately been detained a short time and will not arrive until the afternoon train. But perhaps

you will not feel badly on that account, because it brings to us as the representative of the West the western portion of this great country. the eloquent voice of Colonel Ewing. I have the pleasure of introducing Colonel Ewing. of California. (Applause.)

COLONEL EWING: Mr. President, Ladies and Gentlemen of this Congress: I did not come here today for the purpose of making a speech. The distinguished gentleman from Utah who has been before you has expressed all that we could express here. Although coming from the golden shores of California, we there recognize Utah as one of us. We have long known Utah, long seen the results of her great work in mining. I once had the good luck to be identified with Idaho, and I am proud of it. If they are anything they are a hospitable, progressive people. They have been so kind in welcoming us here that we can only thank them from the bottom of our hearts, and say that we will do all that is in our power to make it pleasant while we are here. (Applause.) We thank you very much for your kindness.

PRESIDENT PRINCE: This brings to a close this pleasant part of the ceremonials, the welcomes and and the responses, and on the program brings us down to what is called the president's address, which in this case will be short.

I do not know that I can add anything on behalf of the whole Congress to the words that have been so well said in response by those who come from the different parts of the United States. Perhaps it would be proper to say something in appreciation of the confidence that was shown to be reposed in us by the presenting of these keys. It shows that in Idaho, at any rate, the phrase "honest miner" is regarded as a fact rather than a simile, and that it is appreciated in an honest mining community.

Some of us, of course, have been here before, and are familiar with the wonders of this part of the country. We live in a great country, every portion of which has its individual wonders. But those who have not been here before, and I am one of them, I am sure have been surprised to see the great variety of resources that are here before us, and that have been spoken of in the addresses that have been made. The agricultural and horticultural area of this State is like an oasis in a desert. The orchards and gardens—I do not know when I have seen a more beautiful garden than I passed on the way to this building this morning, with its variety of evergreens towering above its velvet carpet of green grass. I have a great interest in coming to this city and to this State, which, if you will pardon me a moment of personal remark, I will speak of. You have all heard the story of the old lady in a town, who, meeting a young man who had grown up in the next block to about the age of fourteen, said to him one day, "Henry, you and I ought always to be very good friends, because we come very near being extremely close relatives." The boy said, "Why, how?" "Why," said she, "if I had only said 'Yes' to your father instead of saying 'No' sixteen years ago, I would have been your own mother." (Laughter.) Now, something over twenty years ago, through the kindness of the president who presided over this nation at that time, I was offered the governorship of the then Territory of Idaho. I am not today going to express vain regrets, but I must say that if I could have seen Idaho then, and if it had looked as it looks today, the "No" of that time would have been "Yes," and, while I would not have been the mother of the community, I might have been considered among the old settlers here. (Laughter.) So that I have naturally felt a great interest in coming to this State, and to this city at this time. Pardon this much of personal allusion.

This body which meets here today is the great representative body of American mining interests. It is called international, and such it is; because at some of its sessions there have been present representatives from no less than nine foreign countries. I do not know that there are such today, but I believe that such will be here during the progress of

this Congress. At any rate, it represents the whole of the United States. We have representatives on the floor from the great coal and iron interests of the East, as well as those in the West, with which we are more familiar.

In the Congress which met last year in the city of Milwaukee, naturally, from the geographical situation of the Congress the delegations from the eastern part of the country were far larger, those from Wisconsin, Michigan and Illinois predominating. It is a national institution, if not international. It has before it subjects of great importance and great weight. It is not proper that I should occupy your time with more than an outline of these. Some have been spoken of in the addresses that you have already heard. The most important, perhaps, has thus been brought to your attention already; the most important, because we think that if successful in that it will make very easy of accomplishment all the others. We are asking for that recognition of the mining interests of the United States which would be found in the establishment of a department of mining, with a secretary, who would be a member of the Cabinet (applause) at its head. We believe that this is not only a proper recognition of the vast extent and importance of the mining interests, but that it will be of advantage to those interests and through them to the whole United States, which will far more than compensate for any objections which may be found to it. We ask simply for the same recognition which has been given to the interests of agriculture; and we ask it the more earnestly on account of the success which has followed the establishment of the Department of Agriculture. That, you might say, was an experiment in its day. I remember very well the opposition that was made to it. For long years it was simply a bureau in the Department of the Interior before it achieved the dignity of a Cabinet position. But it has shown by its work, by the value of its own achievements, that it came none too soon. Those of you who are familiar with the operations of that department and know how much it has done for agriculture and horticulture would think it a strange thing if we did not have a Department of Agriculture today. Go to the owners of these orchards here and ask them with regard to the experiments that are made as to the varieties of fruits, as to insect pests, as to the methods of eliminating those pests when they have overrun portions of our country, a thing which could not be done by individual effort, which can only be done by a national institutions, and which have been done by them to the very great benefit of the people.

Now, not to go into this further at this time, what we ask is for a department of mining analogous to the Department of Agriculture, which will do work that it is impossible for individuals to do; which will make investigations, which no man and no community can make, for the whole country. Let it conduct a series of experiments, which will not only aid the prospector, but which will reduce the cost of production and treatment of ores in such a way that vast quantities of ore which today are useless and thrown on the dumps, or not taken out of the earth at all, may be made available for the interest of the whole country. Every one in this audience knows that the lower the grade of the ore the greater its extent. Of very high grade ore there is very little. It comes down like a pyramid, so to speak; but the lower the grade the more the amount of it is extended. If the line should be across here (indicating) above which the ore is sufficiently valuable to be dug from the earth and be made into metal, while that below is of too low a grade, and if by new discoveries and new processes the cost of production could be reduced, so that you bring that line further down on the pyramid, and a lower grade of ore could then be utilized, you would extend enormously the mining industry. It is those things which cannot be done by individuals, but which can be done by a government like that of the United States; and this is one of the things that we desire and hope for from a department of mining.

There is another thing which is analogous to this, to which I beg

to draw your attention, as I do not remember that it has been spoken of in any of your Congresses, and it is something which, in mining, is analogous to the experimental stations which are now attached to the agricultural colleges. You know the United States government pays $15,000 a year each to forty-eight experimental stations, $720,000 in all. In each of those stations are skilled men, who are employed in experimenting in matters relating to agriculture and horticulture, and the result of their experiments is given to the whole country in the shape of bulletins. Now, if we could have something analogous to that in mineral experiments, where men learned in their professions should carry on experiments connected with the mining industry, and having the same amount so expended in that, either scattered over the forty-eight States and Territories, or concentrated in two or three or four, or half-a-dozen places, the mining interests would receive an enormous benefit from that expenditure. (Applause.) There is no reason that I can see why it should not be done, the same as with the Department of Agriculture.

Then, there is the matter of the revision of the mining laws. Those laws, you know, were made long ago. It is one of the wonders of our national legislation that the mining laws of the country have continued unamended from almost the earliest time that the mining industry came into public prominence. Conditions have changed. Circumstances have arisen which require their revision, and yet nothing has been done in that direction. Recommendations of a body of this kind, if they could be made with unanimity, I have no doubt would receive the very respectful consideration of the Congress of the United States; and it is only by such unity of action, and such unity of recommendations, that we can hope to achieve the desired result.

Now, there is much business to come before this body. There are a number of papers that have been carefully prepared by experts in their different lines which will be read to you, and which, I believe, will be profitable to us all. There are discussions to take place here in which every one will take part who chooses, which will bring about an interchange of ideas which cannot but be profitable; but the time is short and we will have to utilize every moment of it. So far as I can, by your aid, I will endeavor to see that it is not wasted. I simply ask on the part of the members of the Congress that so far as in each of them lies he will give to the business of the Congress all the attention in his power; that each will act for the benefit of all, so that at its end we may all recognize it as being the most useful as well as the most successful of these Congresses that has ever been held.

The Secretary will now read the call for the Congress.

Secretary Mahon read the call, as follows:

The Fourth Annual Session of the International Mining Congress will assemble at 10 A. M., Tuesday, July 23, 1901, in Columbia Theatre, Boise, Idaho, and continue thereafter at the pleasure of the Congress during July 23, 24 and 25.

A new commerce, a new policy, a new destiny, and a new purpose for being and living confronts eighty-seven millions of people and the greatest factor in promoting the wealth, the growth and the power of this country is the mining industry. It is therefore urged that all earnest scientists, metallurgists and practical mining and mill men, manufacturers of mining machinery, and all others interested in advancing the welfare of this nation, attend and participate in the deliberations of this coming session of the International Mining Congress, and by their presece, instruction and advice make the proceedings of this assembly of so interesting and educational a character as to command favorable consideration throughout the civilized world.

There is every reason to believe that the era of national prosperity, upon which the United States has entered will steadily expand and be permanent in its nature.

The spirit of the times the world over is in favor of a greater ma-

terial development and progress, and against all unnecessary disturbing elements that will interfere with such a consummation.

Of the 1,500,000,000 consumers of the world, 825,000,00, or more than one-half of this total of 1,500,000,000 are mainly in countries resting upon and directly opposite our Pacific seaports, and in developing American interests in our home and foreign markets, it is in the fostering and maintaining of the higher advancement of our mining industry that we will secure the power that will most easily, naturally, and permanently build up our home and foreign trade, restore general prosperity among the people and lay a firm financial foundation for present and future generations.

It is not the object of this Congress to confine its consideration alone to that of mining for gold and silver and their by-products, but that of iron, coal, marble, stone, the various fire clays, asphaltum and all kindred interests of the mineral and metallic classes.

To secure better recognition of the mining industry by the National Government.

To bring about needed changes in the Federal Mining Laws.

To cultivate acquaintance, fraternal feeling and hearty co-operation among the various mining, manufacturing, transportation, commercial and labor bodies represented.

To exchange practical ideas covering the various phases of the mining business: an interest embracing every branch of the mining industry, which affects more than one-third of the people of the United States, producing in 1900 more than a billion dollars.

Its influence will be potential, and to those who participate in its deliberations or avail themselves of its results, its benefits will be immeasurable.

Proposals are invited of subjects and papers on mines, mining, mining machinery and kindred topics to be embraced in the program now being prepared, and on adjournment of the Congress, to be published with its proceedings in book form.

The perfect success and influential effects of the three preceding meetings, together with the wonderful expansion of the mining industry during the years 1898-99 and 1900, and the special importance of the subjects to be discussed and passed upon, will beyond all question bring together a large delegation of earnest, well-informed, thinking men, insuring a most instructive and successful session.

Special rates will be given for the occasion, and all delegates and visitors are assured of ample accommodations and a cordial welcome by the citizens of Boise, and the great state of Idaho.

Governors of States and Territories, all friendly nations, Mayors of cities and towns, mining exchanges, chambers of commerce, boards of trade, real estate exchanges and all commercial, trade and labor organizations, who have not to date appointed delegates, are urged to do so at once and send the name and postoffice address of each delegate to the Secretary.

MINING PRODUCTS.

Metals—Iron, Gold, Silver, Copper, Lead Zinc, Quicksilver, Manganese, Aluminum, Antimony, Nickel, Platinum.

Fuels—Anthracite Coal, Bituminous Coal, Petroleum, Coke.

Structural Materials—Building and Ornamental Stone (Granite, Sandstone, Marble, Onyx), Soapstone, Clays, Fuller's Earth, Cement.

Abrasives—Whetstones, Corundum, Emery, Carborundum.

Pigments—Mineral Paint, Barytes.

Miscellaneous—Asphaltum, Asbestos, Infusorial Earth, Phosphate-Rock, Gypsum, Salt, Sulphur, Graphite, Mica.

Present indications and assurances are sufficient to guarantee an at-

tendance of at least two thousand delegates and this number will be greatly augmented by friends of delegates and other visitors.

The exhibition hall, the State Capitol building, is delightfully situated and appropriate. The mineral display will be one of the largest, most attractive, and educational ever placed upon exhibition, and well worth a trip across the continent to see.

BASIS OF REPRESENTATION.

The Governor of each State and Territory to name 30 delegates at large.

The Mayor of each city and town to name 5 delegates at large.
And one additional for each 10,000 population or fraction thereof.
Each Real Estate Exchange to name 5 delegates.
Each Chamber of Commerce to name 5 delegates.
Each Miners' Union to name 5 delegates.
Each Board of Trade to name 5 delegates.
Each Mining Bureau to name 5 delegates.
Each Mining Exchange to name 5 delegates.
And all other commercial bodies to name 5 delegates.

PRESIDENT PRINCE: The Executive Committee has instructed me to present the following order of business for your consideration, which I will read and ask your pleasure upon:

ORDER OF BUSINESS.

1. After the address of welcome and responses and president's address three committees shall be appointed, consisting of one member from each county, state and territory represented, as follows: Credentials, resolutions and permament organization. The roll of states represented shall be called, and each shall send to the secretary the names of its members of above committees.

2. The roll of delegates in the office of the secretary shall be prima facie the list of members of the congress and shall be recognized as such until the report of the committee on credentials shall be adopted.

3. The report of the committee on permanent organization shall be made on the third day of the session and the new officers shall be installed at the conclusion of the congress to make arrangements for the ensuing congress, and hold office until its conclusion.

4. The executive committee shall be the committee on order of business and shall report from time to time as to the time for reading of papers and the consideration of other questions; but this shall not interfere with the right of the congress to establish such special order as it sees fit.

5. All resolutions may be read when introduced and shall be referred to the committee on resolutions without debate. This doesn't refer to ordinary motions, resolutions of thanks or compliment, which can be acted on without reference. The rules may be suspended by a two-thirds vote.

6. The selection of the place for the meeting of the succeeding congress shall be the special order of the afternoon session of the third day, at its opening.

7. Delegations shall report to the secretary the names of the local vice-presidents and secretaries during the morning of the third day.

The Executive Committee simply presents these propositions as a report, and asks your action upon it.

Upon motion duly seconded and carried the above order of business was adopted.

PRESIDENT PRINCE: You will observe, ladies and gentlemen, that each civil division represented here, that is, each state and territory, is entitled to one member on each of the three standing committees: Credentials, Resolutions and Permanent Organization. On the call of the roll

of states you are requested to send up to the secretary the names of delegates selected for those committees.

MR. WHITE (of Idaho): Mr. President, in view of the fact that there are many delegations here from different states, and the members of the delegations have not as yet become very well acquainted with each other, I move you, sir, that the reporting of those names be deferred until the next session.

Seconded and carried.

Secretary Mahon then read the following communication from the Rocky Mountain Telephone Co.:

Boise, Idaho, July 23, 1901.

To the International Mining Congress:

The Rocky Mountain Bell Telephone Company desires to tender the free use of its toll lines to the officers and delegates of the Mining Congress during the session. The privilege will extend to Huntington and the Seven Devils on the west; the Basin to the north, Silver City and De Lamar to the south; Mountain Home and Soldier to the east, and all intermediate points. Conversations to the Coeur d'Alene and Pacific coast points will be free over the sections of line belonging to this company.

Respectfully,

D. S. MURRAY.
General Manager.

On motion of Mr. Tarrant, of Indiana, duly seconded and carried, the Congress accepted the thanks of the offer of the Telephone Company.

Mr. Moore, of Colorado, read the following resolution, which was referred to the Committee on Resolutions:

By C. J. Moore, Colorado:

Resolved—That the International Mining Congress, assembled at Boise, Idaho, extends to the President and Directors of the Louisiana Purchase Exposition its fraternal greeting, and promises for it an active and continued interest and support.

We also urge up on the legislatures of the several states such a generous financial recognition of the coming exposition as shall contribute materially to its already assured success.

Upon motion of Mr. Hutchinson, of Idaho, the Congress took a recess until 2 P. M. today.

The Congress reassembled at 2 P. M.

The secretary read to the Congress the following communication:

Executive Mansion, Washington, June 25, 1901.

My Dear Sir:

Your favor of the 21st instant with enclosures has been received, and in reply I beg to express the President's regret that arrangements already made for the summer will preclude him from accepting your kind invitation to attend the fourth annual session of the International Mining Congress to be held in Boise in July.

With assurances that your thoughtfulness and courtesy in this matter are warmly appreciated, believe me, Very truly yours,

GEO. B. CORTELYOU,
Secretary to the President.

Mr. Irwin Mahon, Secretary International Mining congress, Boise, Idaho.

The Vice-Presidents Chamber, Washington, D. C.
Oyster Bay, N. Y., July 8, 1901.

Mr. Irwin Mahon, Carlisle, Penn.

My Dear Sir: I thank you sincerely for your invitation of the 1st inst., and greatly wish I could accept, for I have a very keen appreciation of the immense importance of our mining industries, and it is a matter of real regret to me that my engagements render it physically impossible for me to get out to Idaho on the date you mention. I am exceedingly sorry.

With all good wishes for a successful meeting, I am,

Very sincerely yours,

THEODORE ROOSEVELT.

Department of the Interior,
Washington, July 12, 1901.

Hon. L. Bradford Prince, President International Mining Congress, Santa Fe, New Mexico.

Dear Sir: Secretary Hitchcock directs me to acknowledge the receipt of your very courteous invitation to be present at the coming session of your Congress, and to return his sincere thanks for the same. He regrets, however, that the pressure of public business is such as will prevent him from accepting the invitation. The Congress has his best wishes for a successful and harmonious meeting. Very truly yours,

W. SCOTT SMITH, Private Secretary.

Tacoma, Wash., July 11, 1901.

Mr. Irwin Mahon, Secretary International Mining Congress, Boise, Idaho.

My Dear Sir: Your cordial invitation, extended on behalf of the International Mining Congress, to participate in the fourth annual session—to be held at Boise, July 23, 24 and 25—is very much appreciated. If it is at all possible I shall be present during at least a part of the session, but whether I do or do not attend permit me to assure the Congress, through you, of my desire to render assistance, either in a private or official capacity, in providing suitable and satisfactory laws and regulations of interest to its members and the large and important mining centers of the great gold, silver, copper and lead producing West.

Kindly enter my name for a copy of the proceedings of the Congress particularly with reference to such action as is taken regarding desired national legislation or the expressions of the representatives of mining interests present touching on the important subject of providing cabinet representation. Any action taken by the Congress on these or other subjects I shall be glad to give careful and continued attention and any aid or assistance which it is within my power to render on behalf of proper recognition by our government or in the enactment of all just and warranted legislation you may tender to the gentlemen assembled at the coming session, provided I am unable to be present and do so in person.

Again thanking you for your cordial invitation, and with sincere assurances of my best wishes, believe me, Faithfully yours,

A. G. FOSTER,

Department of the Interior, United States Geological Survey.
Glenora, N. Y., June 26, 1901.

Mr. Irwin Mahon, Secretary I. M. C., Boise, Idaho:

Dear Sir: I wish to thank you for the invitation to attend the fourth annual session of the International Mining Congress, and to express my sincere regret that it will not be practicable for me to do so. I am at work on a long deferred volume which will keep me employed until October.

Truly yours,

CHAS. D. WALCOTT.

I have yours of 3rd instant conveying an invitation on behalf of the International Mining Congress to participate in the proceedings of the latter's fourth annual session to be held at Boise, Idaho, on July 23rd, 24th and 25th, and after thanking you for the courtesy of the invitation, I beg to advise that in the event my engagements will permit, it will give me pleasure to be present.

Yours truly,

BOIES PENROSE.

United States Senate, Washington, D. C., May 10, 1901.

Mr. Irwin Mahon, Secretary, Boise, Idaho:

My Dear Sir: I beg to acknowledge receipt of your kind invitation of the 3rd inst., addressed to me at Dallas, Texas, to attend the meetings of the International Mining Congress at its fourh annual session, to be held in Boise, July 23rd, 24th and 25th; to thank you for the

courtesy, which is much appreciated, and to express my regret that previous engagements covering that period will deny me the pleasure of accepting.

Very truly yours,

C. A. MASON.

PRESIDENT PRINCE: The direction of the Congress this morning was that at the opening of the afternoon session the roll of states and territories be called, and the names of the members of the three committees be then handed in by the different delegations. The secretary will call the roll.

The roll was then called by the secretary, and the following names were presented as members of the committees:

California—Credentials, F. M. Townsend; permanent organization, J. B. McNab; order of business, E. P. Newton.

Colorado—Credentials, Fred C. Cooley; resolutions, Charles J. Moore; permanent organization, Victor G. Hills.

Georgia—Credentials, P. M. Swift; resolutions, E. S. Mumford; permanent organization, Frank Weldon.

Idaho—Credentials, F. J. French; permanent organization, W. H. Petitt; resolutions, James H. Hutchinson.

Iowa—Resolutions, J. A. Green; credentials, J. P. Reese; permanent organization, Thomas Bourke.

Indiana—R. S. Tennant will serve on all three committees.

Massachusetts—Credentials, C. N. Drake; permanent organization, Willard White; resolutions, A. P. Chittendon.

Missouri—Credentials, C. E. Mathews; permanent organization, G. H. Berkshire; resolutions, J. W. McAnter.

North Dakota—E. J. Babcock, Grand Forks, to represent on each committee for the state.

Utah—Credentials, Warren C. Bogue; permanent organization, J. T. Talmadge; resolutions, F. C. Richmond; vice president, H. G. Heffron.

New Mexico—Oragnization, Prof. J. C. Correra; resolutions, J. Turley; credentials, C. M. Brown.

Nevada—Credentials, J. H. Marriott, Oscela; resolutions, J. H. Marriott; permanent organization, George D. Louderback.

Oregon—Credentials, W. B. Dennis; resolutions, Frank V. Drake; permanent organization, John T. Grayson.

Ohio—Credentials, E. L. Shafner, Cleveland; permanent organization, W. L. Kendall; resolutions, A. B. Roberts.

Pennsylvania—Credentials, Edwin N. Carpenter; permanent organization, Calvin F. Heckler; resolutions, Thomas B. McKaig.

Vermont—Credentials, Judson Spofford; permanent organization, S. G. Langlaid; resolutions, R. B. Wright.

Washington—E. S. Sessions to serve on all committees.

Montana—Credentials, G. O. Freeman; permanent organization, Albert Kleinschmidt; resolutions, Edwin Norris.

Wisconsin—M. J. Regan represents the state on all committees.

Wyoming—J. P. Hassett represents the state on all committees.

Illinois—Credentials, J. A. Ede; permanent organization, L. D. Boyd; resolutions, L. M. Bradley.

Michigan—Credentials, R. L. Edwards; permanent organization, C. G. Brown; resolutions, M. L. Davis.

New York—Organization, J. T. Gard; resolutions, W. H. J. Johnson.

MR. REED, IDAHO: Mr. President: It is my very pleasant duty to first send you a message, and then send you the material of that message. This beautiful gavel that I hold in my hand is made from the mahogany of Owyhee mountains, in Owyhee County, Idaho, where dwells that bright young silver-tounged orator—I refer to my friend, Joe Hutchinson.

A week ago a telephone message was sent there by James Pinney, who owns this opera house, for the material for a gavel, and this gavel was made from the mountain mahogany, and the silver upon it is from the Trade Dollar mine. It was sent by Lieutenant-Governor Hutchinson, and I am the instrument, sir, to convey it to you, as a token of their affection —I may say the affection of all of us; and it is, indeed, a proud moment to have the pleasure of handing you this beautiful gavel. (Cheers and applause.)

PRESIDENT PRINCE: In the name of the Congress, I accept this gavel with thanks to its donors, and to all who are interested in its production; and with thanks, also, to the gentleman who made the presentation for the kindly words in which he expressed the sentiments that accompanied it.

No gavel, however, interesting, no gavel, however beautiful and valuable it is made, is too good for the use of this Mining Congress. (Applause.) That this represents the products of this great State, that it represents both the mineral and the vegetable kingdoms, that it represents those products in which it especially excels, renders it the more appropriate and the more valuable. I trust that it will be used here in this Congress, with all moderation and all kindness at the same time that it is used with the intent simply to promote the carrying on of the business of the Congress. I thank you in the name of the Congress.

The next matter on the program is an address by the Hon. Joseph Hutchinson, of Silver City, Idaho, "In the Pavilion of the Setting Sun."

Mr. Hutchinson read the following paper:

IN THE PAVILION OF THE SETTING SUN.

Members of the Fourth Session Mining Congress:

On July 3rd of this year, the French ambassador to the United States, in an Associated Press interview said: "I have just returned from Chicago, and the Great Lakes, and find that the Western people are not acurately judged by their fellow countrymen; the East I think holds itself above the West, and feels the West is not quite its equal in learning, enterprise, in fact I might say of good manners. If I were asked to make a prediction as to where the center of influence would be years from now, I would point out the region from Pennsylvania in the East to the Mississippi on the west."

Over one hundred years ago, we had an American minister to France who thought differently. This man was watching events at the court of Versailles, and incidentally helping John Ledyard to get a foothold on the shores of the water discovered at Balboa—

> "Where the Rockies turn toward the wooing West
> And slope to the sunset sea,
> God planted a garden of loveliness,
> A garden of destiny.
> Beauty of blossom, and tree and stream,
> Dower of silver and gold,
> And circled it around with Columbia's arm,
> The treasure to keep and hold.

Afterwards this far-seeing statesman as president of this republic fresh from the scenes of revolution in Paris, secured the mouth of the Mississippi from Napoleon, and immediately thereafter the Lewis and Clarke expedition started to explore the country, in part of which this Congress is now assembled. George the Third may have found "England an empire and left it an island," but it is surely true that "Thomas Jefferson found the United States a province, and left it a continent."

With all respect to the present French ambassador, he has never been West; he has simply visited the province that was, at the time of John Adams. The time is here now, when a man cannot be elected president of this republic unless he has been west of the Mississippi. The speaker of the house is from there now, and he has more power than any King. The vice-president of this republic owes his fame to the heroism of Western rough riders, and the courage of Western soldiers. The Trans-Mississippi west has an area of 2,835,500 square miles compared with which the country east of the Mississippi is as an island in Puget Sound to the State of Washington. The Pacific Slope West has an area of 1,500,000 square miles. We have places in Idaho absolutely unexplored, larger than Delaware. Boston may be the "Hub" in Massachusetts, but we have enough land to give away in the Pacific West to make fifty such States. We understand out here that the blue jay birds of the Northeastern States are now born with knapsack pouches, in order to carry enough food to live, while migrating across their deserted farms, to build their nests in the only timber remaining, and be near teeming fields of growing grains. We are a healthy, strong, cultured, and patriotic people, and we are going

to live long and prosper. Any citizen of this Republic has three chances to one to live here to what he has in the East. That seems like exaggeration It is true. The Surgeon-General of the U. S. Army places the death rate among troops stationed at various places as 1 to 529 in the Pacific Northwest, 1 in 67 in Texas, and 1 in 65 in New York. Census statistics show that to the 1000 yearly death rate Idaho is 6.6, Oregon 8.7, Washington 9.6, while Massachusetts shows 19.6 and New York 16.5. These are Donan statistics and are reliable. We have old fossils in every community, and a funeral occasionally does a power of good. In mining camps they must hang or shoot men to start a graveyard.

The complete history of this pavillion of the setting sun extends over 300 years. We think that the "Star of Empire" has ceased to move westward. We believe that it has set. You are now in part of it. It must be where the sons of Shem and Japet meet. We are proud of our early history, and we hold to the thought that the worn, emaciated and ragged pioneers of this country are entitled to a place in history along side of the Pilgrim Fathers, and that the Indian treaty of peace with Governor Lane and Chief Joseph is as worthy of recording as is that of William Penn.

"A tale half told and hardly understood,
The talk of bearded men that chanc'd to meet,
That lean'd on long quaint rifles in the wood,
That look'd in fellow's faces, spoke discreet
And low as half in doubt, and in defeat
Of hope; a tale it was of lands of gold
That lay toward the sun—

"Then long chain'd lines of yoked and patient steers;
Then long white trains that pointed to the west;
Beyond the savage west; the hopes and fears
Of blunt untutor'd men, who hardly guess'd
Their course; the brave and silent women, dressed
In homely spun attire, the boys in bands,
The cheery babes that laughed at all and bless'd
The doubting hearts, with laughing lifted hands—
What exodus for far untraversed lands!"

I believe that it was Victor Hugo that said "A few drops of rain changed the destinies of Europe," and Corwin said "That it was handful of snow at Moscow." On August 19, 1836, one of these early pioneers and home-builders arrived at Snake Fort, Boise. The character of this man is of interest to us, whether he saved this territory or not. Neither rain nor snow, or icy wintry blast, stopped his efforts to save it, and Western heroes like Whitman must have their place in history. Some men like the smile of a King, and nowadays cross the Atlantic to get it. The men that made history on this coast, not only had the face, the frown of one, but the Indians were lurking in hiding places, with powder and shot, furnished by a King to prevent the American line from advancing north of the Columbia. Strange to say, an Indian by the name of Twisted Hair was a better friend to us than any of the beloved cousins of Prince Rupert, to whom the charter of the Hudson Bay Company was issued. The struggle between this corporation and our early pioneers was long and violent. It amassed such wealth, and became a monopoly of such strength, that it took the British Parliament 100 years to break its power, and it was only in 1872, that the German Emperor finally decided our rights in the Northwest. This country that was to be a part of a game preserve for Prince Rupert and "Gentleman Adventurers of England" from the Columbia to the Straits of Fuca, is now American territory, thanks to the courage of our early pioneers, and within two weeks I have seen the "Queen" and "Roanoake" steam into the harbor of Seattle, loaded with nearly four million in gold. I was an invited guest at the official visit of the Rivers and Harbor Committee to the Puget Sound Navy Yard, and while the lunch was being prepared under the shadow of the pines, a large brown-painted battleship turned into dry dock after the longest trip in the world. As she hove in sight Consuls, Senators, Congressmen, Mayors, Presidents of Chambers of Commerce, men, women and children, stood uncovered. Oh what thoughts! Oh what inspiration! Three years ago she had left the same spot. How we watched her as she made that 15,000-mile trip. When

Captain Clarke stopped to coal, he told the civilized world that we built ships on the Pacific Coast that needed no repairs, and he arrived in Santiago just in time to pass the Brooklyn, turn the Colon upside down, and Spanish tyranny was driven from the Western world. Truly our pioneers were repaid for holding on to the name "Oregon."

Remember that it is only 58 years since Thomas Benton, who was our greatest friend in National councils, closed his speech in favor of the Linn Bill, saying, "It is a measure that would soon place 30,000 or 40,000 rifles beyond the Rocky Mountains." A single State of this mighty domain has since then added to the wealth of this Republic over three billion dollars, one-half of which was in gold. It might be said that the stream of gold from the West, saved this Republic, and made possible a united Nation. Idaho was created a Territory in 1863; received the baptism of a Star on Old Glory in 1890, and today produces more wealth to the inhabitants than the State of New York.

In the mad rush of these commercial days, it is fit and proper to refer incidentally to the sacrifice, suffering, loyalty and patriotism of the early home-builders. We will need their manhood as an inspiration to give the best of our lives for our country, and if we have it, it will never be said of this Nation "That the ocean was dug for its grave, or the winds woven for its winding sheet, the forest for its coffin, or the mountains reared for its monument."

This vast territory means still vaster physical and material resources. Mines and fertile soil, and favorable climate, and raw material are as necessary to the development of a people as are busy hands, active brains and mighty genius. Here are millions of acres full of the bread of life; here are grand sky and salubrious climate; here is the best of all zones. Here are superb inland and the finest shoreland; here are massive mountains for reservoirs and rivers and lakes as irrigators. The State of Idaho alone has enough water powers to turn the machinery of the world. Buried in its bosom is untold wealth of wood and stone, and coal, iron, silver, gold, copper, lead and oil. We have enough to give us work, vitality and strength.

Colorado and California are thoroughly advertised as to their mineral possibilities; how about Idaho? Last year she produced $18,300,000 worth of gold, silver, copper and lead; that is about $115.00 for every person in the State, or $600.00 for the average family. Add to this the product of our farms orchards, forest and grazing land, and in proportion to her population her sister States are distanced, and she is so bashful, she hangs back like Cinderella, waiting for someone to present her with a Golden Slipper.

Copper is not a better metal than gold; that is it surpasses gold and silver mining from a profit standpoint; and copper mining seems to have more durability, and the ore bodies are much larger and more uniform in character. For instance, the following are the published declared dividends for 1900 in Montana. Amalgamated, $6,000,000; Anaconda, $4,800,000; Butte & Boston, $1,000,000; Boston & Montana, $6,500,000; Parrot, $1,300,000. The Calumet & Hecla paid $7,000,000, and the United Verde of Arizona, $1,875,000. While the largest gold profit earning mine was the Stratton Independence, which paid $2,000,000. Take the average grade ore of Michigan dividend-payers and it is only 3 per cent copper or about 60 pounds to the ton. The Calumet & Hecla has paid a total of sixty million in dividends out of ore carrying 4 per cent copper, which at 18 cents per unit is $14.40 per ton. The United Verde, it is said, carries from 10 to 12 per cent. The Anaconda from its official report last year averaged 4.64 per cent, and the Copper Queen yields ore carrying less than 8 per cent. How about Idaho? We can show the delegates from Missouri, and we ask investors' attention to our copper fields in general. We want you to examine for yourselves the different districts. Take the Blackbird district in Lemhi, and developments will show and do show from 10 to 30 per cent copper. Within three hours' ride of this place is the county seat of Washington county, and I'll pay the fare of any investor who goes up to the Seven Devil copper district, and does not find, when he gets there, that there is ground open to location that gives up as large a per cent copper per ton as the Calumet & Hecla average the past five years. You will also find all kinds of fluxing ores, and water powers away ahead of Pueblo, and not even surpassed by Pittsburg.

"Cows far away wear long horns." Millions are being paid to go to

Cape Nome and Klondike. The bonanza land is really right here. At one spot in Lemhi County, within 100-mile radius, the ground has yielded $150,000,000 in gold. In Boise Basin you will find a yield greater than all of Alaska. Where did this gold come from? It certainly did not come as rain. Come and help us find it. We may have a deposit of gold greater than the Rand, where the trains are now rolling by at 50 miles per hour, and if we do you will have to come early to avoid the rush, as if recent tests hold good within five years Boise will be the Johannesburg of America. If you are looking for large bodies of low grade ore, we invite you to Hailey gold belt, and you will find a spot to live in that is far prettier than Aspen, Colorado.

Idaho produces nearly half the lead of the United States, and it is nearly all from Shoshone County; one mine produced one-third of the total; it might be said of this mine that it could, if it were pushed, yield enough lead daily to furnish bullets, in case of war, to whip the world. Take a map of Idaho, look up toward Butte, Montana, a city of (and vicinity) 75,000 people and producing $50,000,000 a year, mainly in copper, then run your eye to the left and see Wallace, around which center comes half the lead of the world, and then ask yourself, if you believe in mineral zones, what is in this unexplored region between these two deposits. If this interests you, then you can take a pack train and go into Idaho's interior, pass the Hump, go down Salmon, and listen to the Thunder roar, pick up cucumber gold, find float worth $60 per ton in gold, pass on into Custer County, as I have done, and when you get back you will have visions that there somewhere is gold enough and land enough to make in itself a Nation greater than France. Come join us and the gold is yours for the effort, and for want of it other Nations have faded and passed away. You can have rich garments, costly edifices, and ornaments of gold and silver. If you refuse it, we will give you our best hospitality, as it stands, but we will stay and work out the destiny that we all feel is here.

It would pay the State of Idaho to offer a fabulous sum for a process that would treat Snake River gold. It is estimated that there is $100,000,000 of flour gold within the boundaries of Idaho. Genius is going to find it. We see a snowplow, backed by sufficient power, clear a track of snow six miles an hour. We see a steamship cutting her way through the water. Why not have a machine cut into the mountain fifty feet per day? Why not sink a shaft fifty feet a day? A diamond drill will bring out a 6-inch core 25 feet a day now. We have the power going to waste in drops of water to the sea, and some genius is going to make it possible to take out a 6-foot core.

It is not for me to speak of the fruits and grains of Idaho, except to say that the hope of every miner is to some day live under his own vine and fig tree, and that the finest farming in the world can be found in Idaho, giving the largest yield per acre in cereals and fruits. We never talk about our neighbors, but the City of Spokane is built up from Idaho farms and mines, and Idaho's timber and stone give her the architectural beauty of a Denver.

Now there is something holding us back. What is it? To hold a Congress of any kind and not mention it would be cowardice. In my judgment it is transportation facilities solely. We need capital here, and when we get it, we want a fair division of the profits of what is here. A well-known Scotchman, who is trying to give away a million dollars a week for the rest of his natrual life, says, in a recent article, that capital, labor and business ability as as a three-legged stool. The transportation lines out here are using the old one-legged kind. Idaho seems to be the prize milch cow, but the milkers are in Jersey. That is they hatch there. Capital is entitled to and should have a fair interest on its true investment, but the water the Jerseys have used the past year has made the farmers in the Mississippi and Missouri valleys pray for rain. I am an Individualist, but in order to remain such, all means of making a profit, or of personal advancement must remain open. It looks now like competition had appendicitis. If large combinations shut off the means of getting the individuals food products and minerals to the markets of the world, by placing such a rate on the individual output for transportation (over so-called PUBLIC HIGHWAYS) as to be prohibitory, and give to the combinations of capital a rate or rebate equal to the price the individual receives for his product, then this appendicitis will be fatal and competition is dead. I am speaking for the miners and farmers as a class, and not

for large companies. Why, because the large companies in a mining way at least see the trend of events, and are governing themselves accordingly. What made Butte? The Butte & Anaconda railroad. The mining companies there, as elsewhere, that can live and make a profit, own their own gold, copper and coal mines; run their own electric plants and railroads; and own their own lumber mills, smelters and refineries. The only mining company in North Idaho not at the mercy of corporate greed,own their own smelter on Puget Sound and get their dry ores from the Treadwell mine in Alaska. Prospectors have been driven to prospect near where ships can be loaded. I can show in this State idle smelters, idle because of coke rates; the railroads must get the ore haul and for that haul the profit vanishes to the miner. You show me a gold mine from "Mt. Morgan" to the "Independence," a lead-silver mine from the Bunker Hill & Sullivan to the "Jesu Maria," a copper mine from the Anaconda to the United Verde, that is making a profit for itself, and I'll show you, at each and all points, either a self-owned transportation line, smelter reduction works or refinery. The field of placer gold now being exploited in the frozen north will soon be exhausted; placer fields soon disappear, at least they always have, and if the people do not awake from their lethargy, the companies now ammassing wealth will be the only ones that can operate in our unexplored fields.

Something must be done, and it is worthy of the attention of the business man, who is not in a position to give away a million dollars. What are we going to do? Denounce by resolution the trusts? Certainly not. Why? Because that would be silly and avail nothing. It requires a different kind of resolution. It will require the kind that possessed the souls of men at the mouth of the Columbia in the '40's. The fight in the end will be one for existence. For an opportunity to make something better than a living. Already the power of these combinations crushes the business and political aspirations of many who refuse to do their bidding. We have now a "Community of Interests." Our traffic and transportation facilities for the ten million people covered by the companies that cover the West, are in the hands of two men. Are they going to build up your section? If so, why do you think so? Don't you know they are taking now all the traffic will bear. These rates must be equal to all, and special privileges to none, and if we get equal rates, in my judgment, the trusts will fall of their own weight. We want better rates for the interior States. For instance, why isn't this beautiful City of Boise a manufacturing city? One example will answer. Coming in on the train you passed thousands of sheep grazing, so why not a woolen mill? Simply and solely because if the wool was scoured, the railroads would lose the freight on the dirt and grease, and the rate on the scoured wool is so much higher than the unscoured, that we cannot even have a scouring plant. The profits in the end must go to men who expect to live in history, by endowments, when it should be paid for labor and homes in this bountiful valley. Justice can be done to the Inter-Mountain West, decent dividends be paid, and the land that has been granted to these companies, will increase enough in value to pay the necessary velvet for their historical purposes. Take the item of stamp mill shoes and dies; they can be shipped from Brooklyn to Portland, and then local rate paid back from Portland cheaper than they can be shipped direct. Take the item of salt; a mining man in this country must buy his salt at the same time a sheepman buys his stock salt, in order to save $50 per car. He must lay in a year's supply. Salt in Salt Lake is worth $5 per ton; it costs in the Owyhees $25. It is unnecessary to illustrate at this time cyanide, bluestone, cement, machinery, belting, mine cars or ores. What we want and all we want is justice. Let this "Community" of the few become in service, at least, the "Community" of the many. The profits like the "kitty" are all going into the same hole, and we want the checks issued at the same rate. The per cent rake-off is killing us. There is something in a name. If we get together out here we "fuse," if they get together in the Jerseys it is a "Community of Interests." If results are alike they divide the pie.

The enormous profits of combinations already formed are worthy of the attention of all good Americans. To those who want this commonwealth preserved from the selfishness of plutocracy, or the bomb of the nihilist. The prospector suffers the hardship and endurance; the mine operator takes all the risk, pays high wages and high prices for goods, and the modern "Community" (of five men) gets a dollar profit to the mine operators 25

cents, and that in the face of the fact that there is more money invested in the mines than the smelters. The lead trust has things in such shape in North Idaho there is but one company that is not at their mercy. They fix the price to the producer and the consumer. Look at the price of lead in the morning, and then go to the hardware store, and see what the difference is between what is paid the miner for his product and what they charge him if the pipe line in the mine leaks, and he needs rd lead, or if he desires to paint his little home, and wants the white product. The miner in the meantime has passed the transportation company and paid his tribute there. Then he was compelled to give the password, cross his heart, promise to be good to the smelter trust. They find his ore is full of water, deduct 10 per cent for moisture, give him a song and dance about silver fluctuating, and they must take 5 per cent more off for fear the market will change before they know it, and then if the price of silver goes above 65 cents they assume a George Washington phrase, say, "I cannot lie, I did it," and because of it the smelter trust takes one-third off the advance above 65, and if you kick, they, together with the lead trust, will refuse to buy buy your product at all. Then we wonder at the increase of crime. If this thing keeps up the producers of copper, lead, silver and gold must accept the price fixed for their product, or take the price of these "Jerseys" for their mine. If there ore Cripple Creek miners here they know the list should include gold, because outside of Alaska there is very little placer or free gold, and the base gold ores must run the gauntlet with the rest, and then you are lucky if you get $19 for the gold.

Let us be brave men. All that it requires to accomplish the reforms is sufficient courage. We are like the Incas. We have gold and silver; we have the base metals, and we have the precious metals in nearly every house, but we are not looking for any Pizarros, and we must say like the Inca, "What tribute are we to pay to you; we desire to be vassals to the Gods alone, and as to renouncing all our rights, it will be time to do that when you have proved the truth of yours."

If we get any concessions we must fight for them. Let the people take the moisture out of some of the stocks. Let the community of the people say we are entitled to and must have better rates for our product of the mines and farms. Let us form a business protective association, composed of all classes. The miners cannot win the fight alone. Let us say now that transportation rates in car lots shall be equal to all. We want a chance to live in the interior; we want even coal and coke rates. Give us a chance to haul our ores downhill to Portland. Give us a chance for independent smelters. Give us a chance to use the opportunities that God has placed here. We are shipping our cattle East and our beef West. The railroads have a coon's bear trap set for every producer, that is they "catch us a-comin' and a-goin'." Give us a chance to market our iron ores. Give us an even break with the men that think they have the world cornered, and we will turn the world around and make it go the other way if necessary. Give us a chance to market our wheat. This epochal expansioin we have entered on was made possible by the pioneers of the Pacific West. If the Oriental races are to change their diet from rice to flour, we will furnish them enough wheat with Lewistown as a shipping point to fill the vessels of the world. If the great market of the future is to be Siberia, so that we can do business with our own race, we will furnish enough timber from Idaho to do all the possible development in Siberia for a generation. The strength of an army is its commissary; it moves on its stomach. The strength of the world is the same. Idaho is worth any five States east of the Missisippi for this purpose. Give us a chance to manufacture glass, watches, cement, steel and clothing. Give us a chance to ship our fruits, and don't let fruit-raisers 2,000 miles from here ship their fruit to a point only 300 miles from here, as cheap as we can haul the 300 miles. A fruit-raiser in Payette last year shipped his fruit to Chicago, and after he sold the fruit, he was $30 in debt to the railroads and they have brought suit for the $30. We do not want at any stage the best of it. Just give us a square deal. We cannot possibly win now, as a so-called terminal point knows the cards are stacked and at the proper time we will be put to sleep. The railroads carry a stock of knock-out drops, that has paralyzed every interior shipping point. We dig in the ground like badgers, live on bacon and beans, furnish the sinews and muscles of war, and as the fast train rushes by, lit up by electricity, "wonder how such things can be and overcome us like a summer dream." Then we are not envious, but we do say, make

us the equal of other shippers, and we will build palaces from the marble in our back yards, compared with which the beauty and texture of the marble in the Halls of the Montezumas will fade into insignificance. You can take the miners, commencing with Mackay, Stanford, Flood, and go down the horizon and include Haggin, Hearts, Daly, Clark, Tabor and Stratton and Tom Walsh, and there is not one of them but can step in a night from a country store to a position in Paris surrounded and petted by the Kings, Princes and Royal bloods for a generation.

You mining men from other States know that the conditions here are the conditions in your own place; I am simply using illustrations common to all. We must all bump up against the steel trust more so than the farmer. We must all face the cap and powder trust, and yet with equal railroad rates I think one-half of them would dissolve; certainly the most objectionable would. If any delegate thinks some other plan more feasible, I hope he will present it. The subject matter is one that this Congress, in my judgment, must help remedy.

The principle laid down in the Monroe Doctrine was first asserted in regard to this then Oregon country, viz.: "That we should contest the right to any foreign territorial establishment on this continent." It looks like if we had the proper faith and courage; if we are of the same stock as Monroe and Adams; if we believed with John Jay, "That the right to take one pound implied the right to take a thousand;" that we would declare ourselves commercially, as well as politically, FREE. To sit idly by and protest and not act means annihilation. The harvest of these combines means outrageous dividends; to think otherwise means to forget Leadville, Gunnison, Wood River and Bingham. The Utah delegates representing that magnificent commonwealth know that there are many Mercurs on Deep Creek. Many Park Cities, and wealth galore for all of her people. A miner has only one crop from a mine; it can never be replanted. It goes to swell the wealth of the world. If his part of that one crop is to be confiscated by syndicates, it is farbetter that that crop remain in the bosom of mother earth, and be harvested at a time when the patriotism of the people is sufficiently aroused to act. Let us commence here to do something tangible.

Four and a half cents per hundred pounds, a hundred miles, is an extortionate price to pay for a wheat haul; especially when the road bed is right alongside of the Columbia. Compare that price with the Chicago and Mississippi haul. If this Government can make it possible for one man to give five million for a library, it can for the price of one library make an open river from Lewistown to the sea. This will be a starter and help make States. Let this Congress pass a resolution, and an urgency one, and telegraph it to the Rivers and Harbor Committee, now in this State, that this Congress demands an appropriation for the purpose of blasting out a few rocks, so that the ships of the world can get into the Inland Empire, and that this appropriation is the most important of the Pacific West. Then let the people follow that up. If that fails I would like to see the three States affected open the river themselves. If the people are in earnest it won't fail, because as our friend Dooly says, "The constitution may follow the flag, or the flag follow the Constitution—but the court follows the election returns." The appropriation will be made if the men in Washington think we are sufficiently in earnest. Second, in some manner or form we must curb the power of the railroads, who are gaining strength by favoritism. Third, we must never cease fighting for the Nicaragua canal. If this canal is built railroads will be compelled to recognize interior towns, because the ocean places will have water transportation, and in order to get the haul the different lines will strive to build up their own shipping points in the interior.

Will you do it? I am not a pessimist; I am an optimist. This can be done with one-half the ease the Hudson Bay Company was beaten. This is a Nation for the people. Everything will give way if we can get that avalanche—public opinion—started. Don't wait like Marc Antony "to let slip the dogs of war." Who was the great power here at the time of the Hudson Bay Company? The head of the Astor family now has sworn allegiance to a King; a King who recently found frock coats so thick around his throne he trembled, while the names of Lewis and Clarke and Stevens and Whitman and others are engraved in the Halls of Fame, and in different towns in the Northwest children gather around their public monuments and are taught the lessons of heroism and courage. All history

teaches us the same. Napoleon knew as he walked around the crater of an extinct volcano that in the end wealth and power will pass away. France is celebrating the fall of the Bastile. Alexander sighed for more worlds to conquer. Cortez and Pizarro confiscated the wealth of Peru and Mexico, yet near us there is another Republic. And only a few rough stones on the sand and earth tell us of the Pharoahs of Egypt.

In this land of marvelous and unlimited resources, backed up by a percentage of illiteracy less than anywhere else in the known world, humanity is free from superstition and awe; respect for labor and respect for capital, and rspect for ourselves, we are going to do that which we were taught to do. Here Irving placed Captain Bonnville; here Bacon placed his Atlantis, the place of Utopians; here in the Straits of Fuca was the scene of Gulliver's travels; here, where a noted lecturer said, "The Finite prays, the Infinite listens, and Immensity Looks on," here with our fruits and wines; here with our fish and seals; here with our horses, sheep and cattle; here with our gold and silver; here with the treasure vaults of the world; here with the finest harbors in the world; here with our schools, churches and opera houses; here with our tabernacles, whose accoustic properties are so fine that pilgrims come hither from the civilized world and wonder if its architect was inspired. No, these things are for future generations; they are for the many and not the few. In this pavilion of the setting sun, when the sun disappears behind yon mountains, so high that they are never tainted with the earth's dust, the sky will be lit up by the glare of light from foundaries and smelters, and in the morning the only smoke to dim the sky will be the smoke from the chimneys of thousands of contented and happy people, who will be engaged in the happy task of adding to the wealth of the world. And they will say to the founders of this State—

"As for you, you are gray, and the thunder
Of the battle has smitten each brow,
Where the freshness of youth was turned under
By Time's immemrial plow;
But the pictures of memory linger,
Like the shadows that turn to the East,
And will point with tremulous finger
To the things that are perished and ceased;
For the trail and foot-log have vanished,
The canoe is a song and a tale,
And flickering church spire has banished
The uncanny red man from the vale;
The cayuse is no longer in fashion—
He is gone with a flutter of heels,
And the old wars are dead, and their passions
In the crystals of culture congeals;
And the wavering flare of the pitch light,
That illumines your banquets no more,
Will return like a wandering witch light
And uncrimson the fancies of yore—
But you builded a State in whose arches
Shall be carven the deed and the name,
And posterity lengthens its marches
In the golden starlight of your fame."

PRESIDENT PRINCE: The next matter on the program is a paper on the "Mineral Resources of Georgia," by Prof. S. W. McCallie, assistant State Geologist, of Georgia.

Prof. McCallie then read the following paper:

All of the great divisions of geological history are represented in Georgia with the exception probably of the Jura-trias. The northern and central parts of the State, knowns as the Crystalline area, are made up largely of gneisses and schists, which are supposed to represent the southern extension of the old Archean continent. To the northeast of this ancient land surface and comprising the greater part of ten counties in the extreme northwestern part of the State, occur the Paleozoic rocks; while to the south, extending over an area of 30,000 square miles, are the widespread deposits of the Cretaceous and the Tertiary periods. A State thus endowed with such a diversity of geological formations must necessarily possess extensive and

varied mineral resources. In the discussion of these resources, many of which are in a large measure at present in an incipient stage of development, only those will be considered whose economic importance cannot be questioned.

The redand the brown iron ores constitute one of the most important mineral resources here to be considered, and one that has been a continuous source of revenue to the State for more than half a century. These ores are confined mainly to the Paleozoic area of Northwest Georgia, where they occur in large quantities.

THE BROWN IRON ORES, or more properly speaking, the limonites, are most abundant in Polk, Bartow and Floyd counties. Nevertheless, workable deposits are also to be found in every county in the northwestern part of the State with only one or two exceptions.

The brown iron ores are confined chiefly to two different geological horizons, viz., the Weisner quartzite, and the Knox dolomite, the former of Cambrian, and the latter of Silurian age. The Weisner quartzite which corresponds to the Potsdam sandstone of New York, is an extensive deposit of mountain-making metamorphic sandstone, forming the eastern boundary of the Paleozoic rocks. At many points the formation has been subjected to intense pressure during the process of mountain-making, and as a result, its strata are frequently much folded and brecciated. Along the line where the dynamical forces have acted most energetically is a great displacement in the strata known as the Cartersville fault, near which all of the main iron ore deposits of the Weisner quartzite are located. These ores, which always run high in metallic iron and low in sulphur and other impurities, often occur in well-defined fissure-veins, but generally they are found in the form of irregular deposits in the residual clays, or as thick sheets, or blankets, overlying the metamorphic sandstone. The fissure-veins vary from a few feet to several yards in width and frequently continue for a quarter of a mile or more in length. They always dip at a high angle and apparently extend to a great depth. The ore of these veins is generally more or less porus and is usually of an excellent quality.

The blanket deposits are not so plentiful as the residual or the fissure deposits; nevertheless they are of special economic interest on account of the large quantities of ore which they contain. These deposits in the extreme northeastern part of Bartow county, in what is known as the Sugar Hill district, often mantle the mountain side to the depth of many feet. One of the deposits of this district has been producing daily for the last few years from twenty to thirty cars of high grade ore, and yet there still remains large quantities of the ore in sight. It is questionable whether there is to be found anywhere in the South brown iron ore deposits which will surpass, or even equal in extent, the blanket deposits of the Weisner quartzite of Bartow county.

The brown iron ores of the Knox dolomite formation occur chiefly in the forms of pockets or irregular deposits in the residual clays. These deposits are quite variable in size. Sometimes they produce only a few carloads of ore but generally they are far more extensive and cover a considerable area. Some of the individual deposits in the vicinity of Cedartown have been worked on an extensive scale for more than twenty years without exhausting the supply of ore. It is not an uncommon thing to find the deposits extending over six or eight acres, but in such cases the deposit is not equally rich in all parts. The depth to which the ores of the Knox dolomite formation extends, as well as its surface dimensions, is variable. In some instances the deposits are very superficial, extending only a few feet below the surface, while in other cases they have been worked to the depth of eighty feet or more without reaching their limit.

In addition to the above brown iron ore-bearing formations there are two others, viz.: The Deaton limestone and the Fort Payne chert, which have also produced considerable ore. The ore from these formations is similar to the ore occurring in the Knox dolomite series, though, as a general rule, it does not run as high in metallic iron.

The total amount of brown iron ore produced from these several deposits last year aggregated more than 400,000 tons, thus making Georgia the third in the list of brown iron ore-producing States in the South.

THE RED IRON ORES.—The red, or fossil, iron ores of Georgia are confined chiefly to three counties in the extreme northwestern part of the State. These ores occur in what is known as the Rockwood formation, which is the northern extension of the Red Mountain, or the Clinton iron

ore bearing series of Alabama. Stratigraphically, the Rockwood formation occupies the same position in the geological scale as the fossil iron ore bearing rocks of New York and Pennsylvania.

The Rockwood formation in Georgia is made up of shales, sandstones, and thin-bedded limestones with from one to three beds of fossil iron ore. The formation, though not necessarily ridge forming itself, always outcrops along the side or at the base of the mountain and ridges. It is exposed at the base of Sand, Lookout, Pigeon and Dirt Seller's Mountains and also along the slopes of Taylor's Ridge, where it attains a total thickness of several hundred feet.

The workable iron ore is found usually near the center of the Rockwood formation, where it occurs in continuous beds varying from a few inches to several feet in thickness. Each of the beds, which usually dip at a low angle, generally carries two varieties of ore, viz.: the soft ore and the hard ore. The soft ore, which forms the weathered part of the bed, rarely ever extends to a depth of more than ten or fifteen feet below the surface. It differs from the hard ore mainly in having little or no lime present, and as a consequence, always runs higher in metallic iron than the hard ore. The relative chemical composition of the soft and the hard ore is shown by the following analyses:

Hard Ore.—Metallic iron, 32.19; lime, 23.19; phos., 0.804.

Soft Ore.—Metallic iron, 59.00; silica, 9.11; phos., .092.

Some idea may be had as to the abundance of the red fossil iron ores of Georgia when it is stated that the aggregate length of the outcroppings of the beds, which average more than two feet in thicknes, is about 150 miles, and that in places the ore can be economically mined to the depth of more than 200 feet.

The output of the red iron ores of Georgia last year was not so great as that of the brown iron ores. Nevertheless, should the price warrant it, the output of these ores could be increased to meet almost any demand.

COAL.—The coal measures of Georgia, which occur in the northwestern part of the State, form the northern extension of the Warrior Coal Feilds of Alabama. They are confined chiefly to Sand and Lookout Mountains in Dade, Walker and Chattooga counties, where they cover a total area of about 200 square miles. The coal formation of Georgia, as elsewhere in the great Appalachian coal fields, is divided into upper and lower measures. The upper measures are best developed on Lookout Mountain in the vicinity of Durham coal mine, where they attain a maximum thickness of about 900 feet. This division of the coal formation carries seven different coal seams, but only one is worked at present.

The lower coal measures are not so thick by many feet as the upper. However, they carry a greater number of workable coal seams. In the vicinity of Cole City, on Sand Mountain, as many as three different seams have been worked in the lower measures more or less extensively. In addition to the three workable coal seams here mentioned, the lower measures contain two other seams which are probably also workable in places.

The coal obtained from both coal measures is an excellent quality of bituminous coal, well suited for coking and steam purposes. At present, there are three coal mines being operated in the State, two on Lookout, and one on Sand Mountain, with a total output of about 14,000 tons per day, the greater part of which is used for coking purposes. Two of the mines, here referred to, are in the upper coal measures of Lookout, and the other is in the lower measures of Sand Mountain. The mines on the latter mountain have been worked almost continuously for more than half a century, and were among the first coal mines opened south of the Ohio river.

MANGANESE.—The manganese ores, like the brown iron ores, are confined chiefly to Bartow, Floyd and Polk counties. The largest and most productive deposits are found in Bartow County, in the vicinity of Cartersville, where the ores occur as irregular deposits in the residual clays derived from the Knox dolomite and the Weisner quartzite. The ores are usually in the form of nodular concretions, varying from a fraction of an inch to a foot or more in diameter. In places these concretions become so abundant that they form beds of considerable thickness. Deposits of this character, which have been extensively worked, occur in the vicinity of Cave Spring, Polk County.

The manganese deposits of Georgia have been worked continuously for many years. During their early workings the ores were shipped to

England, but at present, they find a ready market at home, where they are used in the manufacture of steel and for bleaching purposes. In 1898, Georgia produced nearly 7,000 tons of manganese ore, which was approximately one-half of the manganese produced in the United States. With the exception, probably, of Virginia, Georgia easily stands first in the list of manganese producing States in the Union.

OCHRE.—Ochre deposits of commercial value are found at a number of points throughout Northwest Georgia, where they are always more or less intimately associated with the brown iron ores. The most extensive deposits are confined to the Weisner quartzite in Bartow County, near Cartersville. These deposits occur mostly along the western margin of the quartzite, where it has been much crushed and broken. According to Dr. C. W. Hayes, of the U. S. Geological Survey, the ochre forms a series of irregular branching veins, which intersect the fractured quartzite in all conceivable directions. At some points the veins become greatly enlarged and contain large quantities of excellent ore. Deposits of this character, which have been worked for some years, are to be seen at the eastern end of the county bridge across the Etowah River, near Emerson; and also at a number of points along the western margin of the Weisner quartzite north of that point. The ochre of these deposits, which is really only a pulverulent form of brown iron ore, is quite free from impurities, and well suited for making linoleum and paint.

The output from the ochre mines in the Cartersville district last year was nearly 4,000 tons, about one-fourth of the ochre output of the United States. The greater part of the ochre now being mined in Bartow county is said to be shipped to England, where it is used in the manufacture of linoleum. In addition to the above named ochre, which is known as yellow ochre, Georgia also produces a considerable amount of red ochre, which is the pulverized, or ground red fossil iron ore, obtained chiefly from Walker County.

BAUXITE.—Bauxite, a hydrate of alumina, first discovered in America near Rome, Ga., in 1887, is a clay-like mineral used principally in the manufacture of alum and the metal aluminium. The Georgia deposits of this mineral are found mainly in Floyd, Polk and Bartow counties, where they occur in more or less extensive pockets associated with the residual clays of the Knox dolomite. The size of these deposits, like those of the brown iron ores, is quite variable. In some instances they have been known to have produced several thousand tons, but as a rule the deposits are not so extensive. The pkysud appearance of the mineral bauxite which varies from 30 to 70 per cent alumina, is often amorphous, resembling kaoline, but generally it has a concretionary or oolitic structure.

The first bauxite mined in the United States was from Hermitage, Floyd County, in 1889. Subsequent to this date, other mines were opened in Floyd, Bartow and Polk counties, so that in a comparatively short time the mining of bauxite in Georgia became a very important and lucrative industry.

The annual output from the Georgia bauxite mines in the last few years has varied from 1,000 to 7,000 tons, the greater part of which has been shipped to Philadelphia, where it is used in the manufacture of alum. Previous to the opening of the bauxite mines of Arkansas in 1899 Georgia and Alabama produced all the bauxite mined in America.

CORUNDUM.—Corundum was first discovered in Georgia on Laurel Creek, Rabun County, about 1871. This mineral has since been found in greater or less deposits in a number of counties throughout the northern part of the State. It occurs associated with peridotites, and other basic igneous rocks in the form of irregular veins and pockets. The corundum found in Georgia is usually pink, gray or blue. It is rarely transparent and as a consequence the gem sapphire or ruby is seldom met with. In a few instances these gems are reported to have been found, but they are probably of rare occurrence. The commercial value of the Georgia corundum may therefore be said to depend upon its use in the arts as an abrasive material.

Between 1880 and 1893, the corundum mines of the Laurel Creek district were extensively worked and became one of the main sources of supply to the corundum trade of the country. About the same time, corundum was successfully mined at Track Rock, Union County, and favorable prospects were later exposed in Habersham and other counties.

In recent years the corundum mines of Georgia have remained inactive,

due chiefly to the low price of corundum, and not as might be supposed to the exhaustion of the deposits.

ASBESTOS.—For the last few years the chief supply of asbestos mined in the United States has been obtained from Georgia. The mine supply this material is located on Sal Mountain, White County, in the northern part of the State. Asbestos, like corundum, is always associated with peridotites and other basic rocks. It exists in many localities in the northern part of the State, but at present it is worked only at the above-named mine. The asbestos of Georgia has never been investigated and as a result but little is known of the extent and commercial value of the deposits.

MARBLES.—Previous to 1884, the marbles of Georgia were practically unknown as building and ornamental stones, but at present the output of the quarries exceeds that of any State in the Union, with the exception of Vermont.

The most valuable marbles of Georgia are those of the Crystalline area, confined to Pickens, Cherokee, Gilmer and Fannin counties. These marbles occur in a narrow belt which runs parallel to the Atlanta, Knoxville & Northern Railroad, from near Canton, Cherokee County, to the Georgia-North Carolina State line, a distance of more than 60 miles. The main marble industry of the State is located in the vicinity of Tate, Pickens County, just north of the southern terminus of the belt where the deposit attains a thickness of nearly 200 feet.

The Pickens County marble has a coarse texture, but admits of a very fine polish and is admirably suited both for building and ornamental purposes. In color the stone varies from white to almost black. A flesh-colored variety is also found in considerable abundance. The physical and chemical properties as shown by the numerous tests made by the State Geological Survey demonstrates that its durability equals or exceeds that of any other marble now being put upon the market. The stone is remarkably free from fissures and seams, so that monoliths suitable for huge columns can be quarried with ease.

At present seven different marble quarries, having an aggregate annual output of several hundred thousand cubic feet of stone, are being operated in Pickens County. The product of these quarries is shipped to nearly every State in the Union, where it is used in the construction and decoration of some of the most costly buildings. The State capitols of Minnesota and Rhode Island; the United States Government Building, Boston; St. Luke's Hospital, New York; and the Corcoran Art Gallery, Washington, with numerous other handsome buildings throughout the United States are constructed wholly or in part of the Georgia marble.

In addition to the marbles here described there are also valuable deposits to be found in Whitfield County. These marbles belong to the same deposits that traverse East Tennessee and are extensively worked in the vicinity of Knoxville. The stone has a dark chocolate or light gray color and a rather fine texture. The light gray variety which is always quite compact and highly crystalline is traversed by dark zigzag lines that give to the polished surface a very pleasing effect. The Whitfield County marbles are well suited for building material, but they have not yet received the attention which their economic importance demands.

GRANITES.—The granites of Georgia, together with the gneisses, constitute the most extensive and important building and ornamental stone in the State. They occur in inexhaustible quantities and are profusely distributed throughout the Crystalline area. One of the most interesting and probably the largest granite mass in the world is that of Stone Mountain, located only a few miles northeast of Atlanta. This mountain, whose barren summit attains an altitude of several hundred feet above the surrounding country, has long been the seat of a very important granite industry. The stone obtained from these quarries is a light-colored muscovite granite possessing remarkable strength and is quite free from all chemical and physust defects. The stone has extensive use as a building material and is also largely employed in street improvement. There is likely no granite in the south more widely known and more generally used than that furnished by the Stone Mountain quarries. It not only has an extensive local use but much of it is shipped beyond the borders of the State.

Another granite, or rather a granitoid gneiss, of almost as much economic importance as the Stone Mountain granite itself, is the Lithonia

gneiss. This stone, which differs chiefly from the Stone Mountain granite in being laminated, covers a considerable area in the eastern part of DeKalb and the contiguous parts of Rockdale and Gwinnett counties. The Lithonia quarries are very extensive and furnish large quantities of stone for street improvements as well as for general building purposes. Granites and granitoid gneisses similar to the above are found in many localities in North Georgia, but only at a few points have they been quarried to any extent.

In addition to the granite and granitoid gneisses here named there are other granites of superior quality used for monumental stone. Some of the granites of this character which in the last few years have become quite popular as decorative stone are those obtained from the Elberton, the Oglesby, the Lexington and the Meriwether quarries. These monumental granites are fine-grained biotite granites unusually free from injurious minerals and admitting of a very brilliant polish. They have but few equals if any superiors in the United States as a decorative stone, and it is only a question of time when the Georgia monumental granite industry will be of very great commercial value to the State.

SANDSTONE.—Sandstone has been quarried to a considerable extent in Catoosa County near Graysville. The stone which is of Silurian age, has a dark brown color and resembles very closely the brown sandstone of the Connecticut Valley. It makes a beautiful building-stone and appears to be quite durable. This stone is found in great abundance in Taylor's Ridge, White Oak, Horn and other mountains in the northeastern part of the State. Corboniferous sandstones of a light color and well adapted for building purposes occur in Lookout, Sand and Pigeon mountains.

SERPENTINE.—This is one of the most beautiful decorative stones found in the State. It occurs in workable quantities in Cherokee County, near Holly Springs, where it was quarried to a limited extent a few years ago. The stone thcugh difficult to work admits of an excellent polish and is very desirable for ornamental purposes. It is of a dark-green color, mottled and streaked with white and black. The larger part of the stone obtained from the Holly Springs quarry is reported to have been shipped to Chicago where it was used for interior deoration. Georgia serpentine used for similar purposes may be seen in the Prudential building of Atlanta.

LIMESTONE.—Silurian and carboniferous limestone suitable for lime, fluxing and building materials, exist in great abundance in Northwest Georgia. The most extensive of these calcareous formations is the Knox dolomite, a magnesian limestone of great thicknes. This formation furnishes much of the lime used in the State, as well a large amount of stone for general building purposes. The different beds of the formation vary greatly in texture and chemical composition, so that almost any variety of stone can be procured. Other calcareous formations of scarcely less commercial importance are the Bangor and the Chickamauga limestones. The latter stone in the last few years has had an extensive use in constructing the foundations for monuments in the Chickamauga National park. The stone is also of considerable local importance as a building material.

CEMENT ROCK.—Hydraulic cement of good quality has been manufactured in Georgia since 1845. The location of this industry is at Cement, on the Western & Atlantic Railroad, in the western part of Bartow county. The cement rock found in this district is an impure magnesian limestone belonging probably to the lower diision of the Knox dolomite formation. It occurs in beds several feet in thickness intercalated with the purer limestones. The cement manufactured from this stone is slow setting, but it forms a bond of great strength and hardness. Maj. M. T. Singleton, late Assistant U. S. Engineer, in speaking of this cement says: "My experience with the cement has been entirely satisfactory. In fact for general purposes and especially for heavy cut stone masonry, I prefer it to any cement I have used."

Hydraulic limestone of good quality is reported at numerous other points throughout the Paleozoic area of North Georgia, but the extent and quality of the stone has not yet been investigated.

SLATE.—Slate suitable for roofing purposes occurs at a number of points in Northwest Georgia along the line of contact of the Paleozoic

and Crystalline areas. The most important deposits are those of the Rockmart district in the eastern part of Polk County, where slate has been mined on a more or less extensive scale for a great many years. The Rockmart slate, which is of Silurian age, has a deep blue-black color and a fine, even texture. It splits with a smooth surface into thin slabs and is quite free from pyrites and other impurities. The chemical analysis of the Rockmart slate shows it to be a first-class stone for roofing purposes.

The only slate quarries now operated in Georgia are those in the vicinity of Rockmart. A few years ago a small amount of slate was quarried near Cedartown, but these quarries are now abandoned. The slate at the latter quarries belongs to the same formation as the Rockmart and is of similar character. The slate now being quarried in the Rockmart district is quite generally used throughout Georgia and a number of the other southern States, where it has a high reputation as a roofing slate.

CLAYS.—The clays of Georgia are abundant and widely distributed. There is scarcely a geological formation of any extent that does not furnish clays of commercial value. Residual and alluvial clays, well adapted to the manufacture of brick and the cheaper grades of crockery, abound in every county in the northern part of the State. Associated with these impure clays are often found pockets or irregular deposits of porcelain and fire clays of greater or less extent. The latter clays are confined chiefly to the Knox dolomite formation of Northwest Georgia, but they are also occasionally met with in the crystalline area further to the east and south.

The most valuable and extensive clay deposits in the State are those of sedimentary origin belonging to the Cretaceous formation of central Georgia. They occur in a belt several miles wide, extending from Columbus to Augusta. The Cretaceous clays differ greatly in their physical and chemical properties, so that almost any desired variety may be found. Some of these clays have an extensive use in the manufacture of wall paper, while other varieties are used in making porcelain, terra-cotta, tiling, sewer-pipe, pottery, etc. Besides the varieties of clays here mentioned, fire-clay also occurs in the Cretaceous formation in commercial quantities. Dr. George E. Ladd, Director of the Missouri School of Mines, in speaking of the Cretaceous fire-clays of Georgia, says: "Some of these kaolins suitable for fire-clays are more refractory than any of the noted fire-clays of the United States."

The clay industry of Georgia, although in its infancy, has already become well established. The value of the clay product of the State last year exceeded that of any of the southern States, with the exception of West Virginia and Maryland.

GOLD.—Gold has been mined in Georgia for nearly three-quarters of a century. The first discovery of the precious metal within the limits of the State was made on Dukes Creek, White County, in 1829. Previous to the disovery of gold in California, the mines of Georgia furnished the greater part of the gold produced in the United States. As early as 1838, the output of the mines of the State had become so important that the United States government found it necessary to establish a mint at Dahlonega, the center of the main gold-mining district.

The gold deposits of Georgia belong to the Appalachian gold fields, an auriferous belt extending from Nova Scotia to Alabama. The belt, which consist of highly crystalline rocks probably of Archaen age, varies in width from 10 to 75 miles. In Georgia, the belt breaks up into a number of minor parallel belts, having a northeast-southwest trend. The most important of these are the Dahlonega and Hall County belts. The former, which takes its name from Dahlonega, the county seat of Lumpkin County, is the most important. This belt enters Georgia from North Carolina in the northwestern part of Rabun County, where valuable placer deposits have been worked at the Smith and the Moore Girls' mine. Further to the southwest in White County, the belt increases in width and the mines at the same time become more numerous. As the auriferous belt enters Lumpkin County it again increases in size, reaching its greatest development in the vicinity of Dahlonega. In Dawson County the Dahlonega gold belt becomes more or less broken up, but upon entering Cherokee County it again regains its economic importance and continues with but few interruptions through Bartow, Cobb, Paulding and Haralson counties to the Georgia-

Alabama State line. The entire length of the Dahlonega gold belt thus outlined is about 150 miles, while its width varies from 1 to 5 miles.

The Hall County gold belt lies some 10 miles east of the Dahlonega belt and runs more or less parallel with it for more than 100 miles, stopping short in Fulton County, only about 10 miles north of Atlanta. A third belt, which inludes the Acworth, the Villa Rica and the Bonner mines, traverses Cobb, Paulding and Carroll counties. This belt is best developed in the neighborhood of Villa Rica, where in former years much gold was mined. Another belt including some very important mines traverses Lincoln, Columbia, McDuffie and Warren counties in the eastern part of the State. Beyond the limits of the belts here mentioned are found a number of isolated localities where gold occurs in paying quantities. Such isolated deposits as here referred to are found in Towns, Union, Fannin, Gilmer, Meriwether and other counties in the northern part of the State.

The individual auriferous belts of Georgia are usually made up of a great number of veins or ore bodies running parallel to each other and conforming in dip and strike to the gneisses and schists, the country rock. They vary in thickness from a fraction of an inch to several feet or rods, and often continue without interruption for long distances. In places the veins, which consist largely of quartz, become greatly extended, forming huge shoots of excellent ore. A vein of this character at the Creighton mine in Cherokee County has been worked continuously for years and has produced large quantities of gold. Ore bodies of somewhat similar nature are quite abundant in the Dahlonega district, where in the last two years extensive developments have been carrid on which no doubt will soon result in a large increase of the gold output of the State.

COPPER.—Previous to the Civil War copper was successfully mined in Fannin and Cherokee counties, in the northern part of the State. The deposits of the former county are located near the Georgia-Tennessee line, and form the southern extension of the deposits so largely worked just across the State line in the Ducktown district. One of the Fannin county mines, known as the Mobile mine, at one time was quite extensively worked and is said to have produced a large amount of high-grade ore. The copper deposits of Fannin County, although practically undeveloped at present, are thought to be of considerable economic importance. Other copper deposits, which from time to time have excited considerable local interest, occur in Fulton, Paulding, Lumpkin, Haralson, Lincoln and other counties in North Georgia. The most important copper ore met with in the counties here named is chalcopyrite (copper pyrites). It occurs mostly in irregular veins, associated with schist and highly metamorphic slates.

PYRITE.—Pyrite, an iron sulphide employed in the manufacture of sulphuric acid, is widely distributed throughout Georgia, but only in a few localities has it been found in sufficient abundance to be of commercial importance. Probably one of the most important deposits of this mineral known at present in the State, occurs in the eastern part of Lumpkin County, on the Chestatee River, about six miles northeast of Dahlonega. This deposit is quite extensive and the ore is of good quality. The commercial value of the deposits has long been known, but the great expense of hauling the ore by wagon to Gainesville, the nearest railway station, twenty miles distant, renders the mining of the ore unprofitable. Other deposits of pyrite of considerable promise occur in Paulding and Haralson counties. The deposit in Paulding County was worked to some extent a few years ago and the ore was shipped to Atlanta where it was used in the manufacture of sulphuric acid. This ore, which runs high in sulphur, is said to carry from 4 to 5 per cent of copper and a small amount of gold.

No systematic study has yet been made of the pyrite deposits of the State, and as a consequence little is known of their extent and commercial importance.

SOAPSTONE.—Soapstone, or talc, has been mined to a limited extent in Murray and Fannin counties. It also occurs in Cherokee and Gilmer counties and, is reported in other localities in North Georgia. The soapstone mines of Fannin County, which have been worked for some years, are located at Mineral Bluff, only a short distance south of the Georgia-North Carolina State line. This deposit is probably the southern extension of the North Carolina deposit, which is extensively

worked just north of the State line. The Fannin County soapstone is compact and of a dark gray or blue color. It occurs in veins varying from a few inches to a yard or more in thickness. The Murray County soapstones, which are found on Fort Mountain, a few miles east of Spring Place, are of similar nature.

MICA.—This mineral is quite generally distributed throughout the Crystalline area of North Georgia. It usually occurs in veins associated with pegmatites and coarse-grained granites. The veins are often of large size and occasionally contain mica crystals eighteen inches or more in diameter. Many of the mica deposits of the State have been prospected to a limited extent, but no systematic mining of any importance has been attempted. There is little doubt, however, that the mica deposits of Georgia are of commercial importance and demand more attention than they have heretofore received.

GRAPHITE.—Both massive and foliated varieties of this mineral occur in considerable quantities associated with the highly metamorphic slates and schists along the western margin of the Crystalline area. It is quite abundant in the neighborhood of Emerson, Bartow County, where it is now mined and used in the crude state as a filler for commercial fertilizers. Promising prospects of graphite are also reported to occur in Pickens, Elbert, Hall, Madison, Douglas and Cobb counties. The Pickens County deposit is at present being developed and it is thought that in a short time it will become an active producer.

MARLS.—Marls of good quality abound throughout the Cretaceous and Tertiary formations of South Georgia. There is probably no county in the southern part of the State which does not possess marl deposits of more or less agricultural value. They are well exposed along the Chattahoochee and Flint rivers, as well as along other streams of South Georgia. In addition to the common calcareous or shell marl, greensand marls are also plentiful. The latter are especially well developed along the Chattahoochee River south of Columbus, where they often form beds many feet in thickness. Analyses of these greensands show that they carry a considerable amount of phosphoric acid and potash, two of the most important plant-foods. The use of the Georgia marls as a natural fertilizer has so far been quite limited, but in all cases where they have been given a fair test the result has been entirely satisfactory. Associated with the marls in the extreme southern part of the State frequently occur deposits of phosphate of limited extent. A deposit of this character was worked some years ago in Thomas County, near Boston, but the phosphate was not of sufficient abundance to be of commercial value.

TRIPOLI.—A light, porous, silicious stone occurring in Murray, Chattooga and other counties in Northwest Georgia has locally been known for some years as tripoli. The material, although quite different in origin from tripoli, has a similar use in the arts. The so-called Georgia tripoli is a residual product derived from certain impure silicious beds of the Knox dolomite formation. The stone, which is usually found associated with chert, is quite porous and is easily pulverized into an exceedingly fine grit or polishing powder. A small amount of this material is at present being mined in Chattooga County and is used by an Atlanta firm in the manufacture of polishing soap.

SAND.—Sand suitable for building material is widely distributed throughout the State. In North Georgia it occurs chiefly as alluvial deposits along the numerous streams, while in the southern part of the State it is found in stratified beds often of wide extent. In addition to that used for general architectural purposes, sand well adapted for molding and glass-making also occurs. The pure sands are confined mainly to the Cretaceous deposits of South Georgia, where they are frequently intercalated with beds of pure kaolin.

ROAD MATERIALS.—There is probably no State in the South that has a greater variety of road materials than Georgia. The supply is inexhaustible and of the best quality. Besides the limestones, granites, and gneisses heretofore spoken of, trap, diorite, chert, and gravel abound in great quantities.

MINERAL WATERS.—The number of mineral springs in Georgia to which public attention has been directed on account of the medicinal properties of their waters is very large. There is scarcely a county in the northern part of the State which does not possess one or more

of these springs of greater or less repute. Many of them are so far only of local interest, but in some instances they have a national reputation, and are a source of much profit to their owners.

The commercial value of the mineral waters of Georgia in the last few years has exceeded that of any other southern State with the exception of Virginia. The main supply of these waters now put upon the market is shipped from Lithia and Austell, a noted mineral water district on the Southern Railway, 20 miles west of Atlanta. The waters shipped from the Lithia-Austell district are among the best lithia waters found in the country. Their curative virtues are widely known and they are now shipped to all parts of the south in large quantities. Other springs having an excellent local reputation occur in North Georgia, but only in a few instances is the water put on the market.

Besides the minerals above described there are many others found in Georgia which at some future time will probably become a source of revenue to the State. Among the most important of these may be mentioned silver, lead, zinc, baryta, gypsum, etc.

The annual output of the mineral products of Georgia is shown by the following table:

Iron Ores	$ 578,526.00
Coal	450,000.00
Manganese	60,201.00
Ochre	73,095.00
Bauxite	35,274.00
Asbestos	10,300.00
Marble	812,070.00
Granites	790,000.00
Sandstone	2,000.00
Limestone and Lime	125,000.00
Cement-Rock	75,000.00
Slate	13,125.00
Clays—Brick, Pottery, &c.	1,062,213.00
Gold	129,246.00
Soapstone	4,054.00
Graphite	12,000.00
Tripoli	500.00
Sand	200,000.00
Road Material and Ballast	350,000.00
Mineral Waters	42,000.00
Total	$4,824,604.00

PRESIDENT PRINCE: Going back to the western part of the continent again. I will call on Dr. Talmage, of Salt Lake City, to speak on the subject of the "Geology of Utah."

Dr. James E. Talmage, Professor of Geology in the University of Utah, read the following paper:

"THE GEOLOGY OF UTAH."

First, permit me a word by way of introduction. It is gratifying and encouraging to note the recognition accorded geology in the program of the present session of the International Mining Congress. Without the means of discovering and working mineral deposits there could be no mining industries, and no such organization as this Congress would exist. The work of the founder and the metal-smith is preceded by that of the metallurgist; and this in turn follows that of the miner, whose path is blazed, whose camp is fixed by the prospector.

In this train of laborers, each taking the product of his predecessor's toil, and passing it on, enriched and improved by his own treatment, to the next in order, the geologist appears to have no place. The practical value of his science has been but tardily and imperfectly recognized. He has been regarded as a man of dreams and theories, a collector of specimens, a lover of fossil shells and plants, of bits of bone and leaves of fern, that have long lain shut up between the stony pages of the book of earth. He has been looked upon as one who is more concerned in hypotheses as to how the earth was made than in the facts of its present state of existence.

The culture value, and even the ethical worth of geology has been admitted; the science has been voted to be a good one for a place on the college program of expectant bachelors of arts and science; but for the practical man of affairs, for the prospector and the miner, for him who delves into the earth's crust for the sole purpose of extracting therefrom as many dollars as possible, the opinion of the geologist has been held as of little service. Of late years, however, let me say within the last quarter of the nineteenth century, geological knowledge and skill have been accorded increasing recognition as a guide to intelligent prospecting and mining. Many of the theories of geology have served the purpose of all sound and worthy theories—as a scaffolding upon which the builder stands while placing the building-blocks of truth in position as part of the growing edifice of Science. Geology has done much toward transforming the unclassified accumulation of facts and inferences, which once formed the foundation of the miner's skill, into an orderly arrangement, in which the relation of part to part has become plain, and in consequence of which a true science of mining has arisen to the advantage of mankind.

The half-tamed Indian of the wilds possesses a wealth of knowledge as to the habitat and seasonal change of the plants and animals that serve the purposes of his life; but he is not thereby entitled to the distinction of a botanist or a zoologist, for his facts are unclassified and disconnected. They are thrown together as a pile of building material on the site chosen for a house. So in the province of mining there was much gathering of facts, much in the way of accumulating valuable knowledge, before classification became possible. I think I do not overstate the service rendered by the science in question, in saying that geology has been one of the chief agencis in thus collating th knowledge gathered with such toil, and of shaping it into a structure of beauty and service.

It is true that we have rot yet learned all there is to learn regarding the origin and distribution of mineral deposits, but geology has aided in the accumulation of facts bearing on this important suject and in rendering of use the knowledge long possessed. It is a pleasant proof of the liberal spirit actuating the progress-movement represented by this Congress, and a pleasant promise of the permanent good to be expcted, that geology has found a prominent place in your plan of procedure.

The subject assigned me is "The Geology of Utah;" I would prefer to restate it thus:

"NOTES CONCERNING CERTAIN GEOLOGICAL FEATURES OF UTAH."

The title of my address was chosen for me, doubtless with the expectation that I would narrow it to some particular phase. I would consider myself bold to recklessness to stand before you of my own volition and to undertake to address you upon the broader subject, within the time-limits allotted.

In common with some other of our western and newer States, Utah has not as yet established a geological survey. Through the liberality of a generous government, much has been done under federal auspices; and the youngest of the States has perhaps received as full a share of attention from the United States Geological Survey as she could properly ask. The results of much of the work so done have appeared as parts of reports of general surveys, though several monographs on particularly attractive and valuable features of Utah geology have appeared.

THE GREAT SALT LAKE.

It is from the field work of the national surveys that the story of Utah's famed salt sea has been given to the world. This feature of the State topography may perhaps with propriety receive passing mention. It is now well known that the briny lake, though commonly named with the prefix "Great," is but a shrunken and diminutive remnant of a water body once occupying the valleys of Western Utah, comparable to Lake Huron in area. This inland sea, to which the name Lake Bonneville has been given, in honor of one of the early explorers of this remarkable region, was a feature of Pleistocene times; and the untiring process

of erosion has not yet obliterated the shore lines and terraces then formed at the different levels; many of these inded are traceable for miles along the mountain sides, and the deltas constructed at the mouths of the larger streams are broad plains in the present topography. These levels and boundaries have been so clearly followed, that it is doubtful if any existing water-body is more accurately mapped than is the area of Lake Bonneville.

When at its maximum height, this inland sea stood a thousand feet above the average level of the present lake. It had an extreme north lowlands of Utah and reached across the boundary into the Nevada, and south extent of 300 miles, a greatest east and west breadth of 180 miles, and a surface area of 19.750 square miles. It filled the western closely approached the Arizona line on the south, and stretched into Cache Valley, 25 miles north of the Idaho boundary. It was at this northern extremity that the flooded lake found an outlet, and therefore a regulator, enabling it to maintain its level sufficiently long to carve in some places and to build up by deposition in others, so constructing its great terraces, now gashed by canyon streams. There is a record of two periods of maximum flooding with a period of recession intervening; and attempts have been made to correlate these with two periods of maximum glaciation and an interglacial period, in the eastern part of the continent.

At Red Rock Pass in Idaho, through which the Oregon Short Line Railway now runs, the waters escaped, and in so doing cut away the sill of yielding rock which for a time formed the barrier, and rapidly lowered the lake nearly 400 feet. The Bonneville River thus formed made its way through the Port Neuf Valley into the Snake, thence to the Columbia and on to the Pacific.

At this seond level, approximately 400 feet below the highest terraces, the lake stood for a long but undetermined period, giving ample time for the construction of shore terraces and for the building of enormous deltas. Today we traverse these ancient deltas, covered in part with orchards and farms, and examine the delta-structure at leisure, and all dry-shod. From this lower level, called the Provo level on account of the unusually well developed deltas near the mouth of Provo Canyon in Utah County, the lake has shrunk to its present insignificant proportions by desiccation alone; and through all the time of its recesion the dissolved solids have been accummulating, until today the lake is one of the most concentrated natural brines known.

By far the greater part of the dissolved matter is common salt; and by efficient methods this may be separated from the water through solar evaporation alone, in quantities sufficient to supply the world with its salt for the next geological epoch. The Salt Lake, devoid of any outlet, fluctuates in level according to the varying conditions of aridity or humidity, and the solid contents diminish or increase on the same scale. The earliest analysis of the lake water on record shows 22.28 per cent dissolved solids, of which 20.22 per cent was common salt. This result was that of Gale, obtained on a sample collected in 1850. After that time the lake rose and its brine was correspondingly diluted, so that in 1873, according to Basset, there was but 8.85 per cent salt and but 13.42 per cent total solids. According to the writer's analysis, the water contained in 1885, 13.50 per cent salt and 16.71 per cent total solids dissolved; and in 1889, 15.74 per cent salt and 19.55 per cent total solids. At present the lake is undergoing a cycle of shrinkage and the solid contents are in proportion greater than that shown by any previous analysis.

The largest company now operating in the extraction of salt from the lake water reports that with the ponds already prepared an annual crop of a million tons is possible. The purification of the salt is partially accomplished in the ponds by the careful removal of the mother-liquor at the density indicated by experience. The coarse salt is sold on the cars at the works at a dollar per ton. For table use the salt is further purified by artificial desiccation and winnowing.

Besides common salt, other chemical products are obtained from the lake brine. Every winter, when the critical point of temperature is reached, sodium sulphate, or mirabilite, separates from the water in enormous quantities. This is cast up upon the shores and may be collected with ease, and a further supply of the sulphate is found as a bed a few feet below the lake bottom, which deposit is continuous with a

similar bed of the material inshore beneath a shallow covering of shore drift.

Freight cost alone prevents the exportation of these and many other products from the salty lake. The manufacture of sodium carbonate has been successfully accomplished, but the want of a market killed the industry.

The importance of the topic is my excuse for this disgression.

The most prominent feature of Utah topography and surface relief is the central ridge or highland which runs as a continuous wall with a continually increasing westerly trend through the middle portion of the State. On most of the old maps, and even in some of the newer atlases, this is represented as the Wasatch range in unbroken line. As a matter of fact it consists only in part of the Wasatch, which range terminates at a point about 75 miles south of Salt Lake City, and is succeeded by a series of plateaus, scarcely less imposing and massive, and classed as mountains by all except the geologist.

This elevation marks the eastern boundary of the Great Basin and separates somewhat sharply the eastern from the western drainage systems of Utah; the latter is that of the basin affording no escape for the water except through evaporation; the former is a typical river drainage forming part of the Colorado system.

In its greater elevations the state presents practically all the commonly recognized types of mountain structure. There are colossal heaps of volcanic ejectamenta that have accumulated about prehistoric events; there are mountains of circumdenudation, carved by the chisel of time from yet greater plateau masses and now set like gigantic cameos on the valley floor. There are the Henry Mountains, neither an ordinary group nor a typical range, but each an independent solidified cauldron of once liquefied lava, which, however, never reached the surface through crater or fissure, but heaved and arched the stratified crust overlying and so made room for itself beneath the surface. Then by rapid denudation the covering strata were removed except a vestige here and there clinging to the sides of the igneous mass now exposed in all its craggy nakedness. These are the laccolites or cisterns of lava now solid—a structure first recognized in this region.

The typical mountain range consists of strata folded and twisted, contorted and overturned, like the leaves of a book crumpled by some powerful hand. This is represented by the Wasatch, a range with more than a common history, inasmuch as it represents a comparatively modern series of deformed strata which were laid down, or a much more ancient and deeply eroded range. In traversing the Wasatch from north to south, one passes over the upturned edges of Paleozoic strata fully 30,000 feet in thickness; and in place the unconformable contact between the Cambrian, or lowest members of the series, and the underlying Archaen, is exposed from canyon floor to mountain peak.

The western front of this majestic range is so precipitous and steep as to attract the attention of even the least observant. This abruptness is due to one of the most profound faults or vertical displacements of crust-blocks ever described. According to King, the throw is not less than 40,000 feet; nevertheless the range appears to be still rising, and at different points along the base the fault scarp is so fresh as to suggest the most recent fracture. This bold face of the Wasatch looks west across the State of Nevada, over the crests of the intervening basin ranges, the first of which occur within the Utah lines as a string of ranges embracing the Promontory, the Oquirrh and the Tintic mountains.

The Uintah range, abutting almost at right angles against the eastern slopes of the Wasatch with an exceptional trend to the east and west, presents a structure of striking simplicity. Here we find a single great anticlinal fold, the regularity being broken only by a fault on the north side.

All the mountain ranges properly so-called show themselves to be strongly impregnated with metalliferous deposits. The powerful compression and folding to which they have been subjected have produced numerous large fissures, which in the majority of cases, have been filled by slow deposition of metalliferous material. While the colossal Wasatch, considered in proportion to its mass, is less productive of mineral wealth than are its smaller neighbors to the west, the famous Park City and Cottonwood regions alone are sufficient to insure it lasting fame as a producer of valuable metals. The Oquirrh and Tintic ranges have

yielded fabulous returns; and the mere listing of their mines would exceed the time limits allowed me.

All the mountain ranges, as well as the plateaus of Utah, are deeply cut by transverse stream courses, and canyons of surpassing grandeur are the results. There are canyons of every type, some veritable valleys, others considered in their relation of width to depth mere cracks in the crust, thousands of feet deep. Most of the canyons are of the kinds characteristic of new topography, and the streams they carry are mountain cataracts, or an encussion of water falls. This condition has been turned to good account in the utilization of water-power for the production of electric energy, and numerous plants of great capacity are now in successful operation. For a time the area of distribution from the Ogden power station surpassed that of the world-famed plant at Niagara.

Scarcely less imposing than the mountains referred to are the magnificent erosion forms of the plateau region and the high plateaus themselves. The greater part of Utah east of the rim of the basin and south of the Uintahs belongs to the Plateu Province, in which are revealed enormous uplifts, generally with monoclinal folds and exposed fault scarps. The Mesczoic rocks have undergone erosion on a prodigious scale, and the remaining remnants of these formations present a variety of forms whose beauty is beyond description. The deep red Triassic sandstones of the desert regions of Central and Southeastern Utah as seen from the distance appear as magnificent castles, fortresses and palaces, temples, synagogues and tabernacles. Nor does closer inspection destroy the illusion. Vestiges of the overlying Jurassic roof, the greater structures, and the color contrast between its gray and the red of the Triassic intensifies the resemblance to works of artificial construction.

In these beds are found extensive deposits of gypsum in all varieties, running from amorphous plaster-stone to crystals of pure selenite. among which, individual prisms have been found ranging from two to seven feet in length, and reaching a weight of 200 or more pounds apiece. The finest of these huge crystals occur in great geodes and spring from the walls as tiny prisms of quartz line the smallest of cavities.

Where the Cretaceous and still later Tertiary rocks are still in place, outrops of coal are common and not infrequently thick beds of lignitic and bituminous coals are exposed to full view. The State is particularly rich in coal, practically all of which is of Cretaceous or later age. Though considerable thicknesses of the coal measure are exposed in the Wasatch and elsewhere, but small and insignificant traces of Carboniferous coal have been found.

It is mostly in the Tertiary basins south of the Uintahs that the rich and varied deposits of hydrocarbons have been discovered. Rising like great dykes through comparatively undisturbed strata, or saturating the sandstones and limestones, occur hydrocarbon minerals ranging from tarry liquids to compact and dense solids. Among such are gilsonite, elaterite , ozocerite, numerous grades of asphaltum, besides mineral oils and waxes. At the present time excitement runs high concrning the probability of petroleum occurring in this region of hydrocarbon deposits, and field examinations and boring operations are now in progress.

Of the solid hydrocarbon minerals only the gilsonite has profitably been exported from the State thus far. The asphaltum and allied kinds find a limited local consumption; but the seemingly inexhaustible stores of these materials are awating an application and a market.

The geological products of economic importance within the State have as yet been but imperfectly listed, and no systematic exploitation or survey has been attempted.

In the NON-METALLIFEROUS GROUP, a few have been already named.

COMMON SALT and MIRABILITE from the Great Salt Lake itself, to which should be added the great deposits of "rock salt" within the regions of desiccated lakes.

GYPSUM in all varieties.

COAL, lignitic and bituminous.

ASPHALTUM, GILSONITE and allied hydrocarbons.

To these should be added:

SULPHUR in regions of recently suspended volcanic activity and in connection with deposits from certain mineral springs.

PUMICE from the rhyolitic lava flows within the Bonneville area.

PYRITE, which though a mineral of iron derives little value from the contained metal and is of worth mainly on account of its sulphur; it may therefore be classed in this group; this occurs in abundance, widely distributed throughout the State.

PORTLAND CEMENT materials, already applied on a large scale in the manufacture of this commodity at Salt Lake City.

CLAYS already in use for brick and pottery, and others which laboratory tests prove to be adapted to the manufacture of the white wares; also "refractory clays" in variety and of excellent quality.

BUILDING STONES, comprising the granitic group, and a wide range of sandstones, limestones and marbles; also pure white oolites now in service for the erection of some of the most imposing residences in the capital city.

PRECIOUS STONES, including opals, agates, hyalite, prase, topaz, Utahlite—the name proposed by Kunz for what appears to be a variety of variscite of unusual mode of occurrence, and so closely resembling turquois as to find a ready market among the dealers in that gem stone; prosopite—still more closely approaching turquois; garnets, rhodochrosite, and many others of minor importance.

Of the "metalliferous mineral deposits," data already published and now common property, testify to the State's wealth of gold, silver, copper, lead and iron. Recent discoveries of extensive accumulations of pyrolusite and associated minerals, bid fair to develop an industry in the mining of manganese ores.

Even this hasty and incomplete enumeration calls for a brief mention of the enormous deposits of iron ores in Southwestern Utah. There occur in Iron County, within Pinto mining district. The principal outcrops are grouped within an area of about 20 miles in length by six miles in width. These outcrops are not mere surface indications, but extensive exposures of great ore bodies above the general level. The ores occur in well-defined and continuous beds, bounded by Crystalline rocks, presumably of pre-Cambrian age. The dislocation of these early rocks, followed by the general denudation of the region, has exposed the ore in a series of projecting masses, which in general appearance suggest to the casual observer projecting dykes, and in particular cases mountain masses of volcanic origin. As to the amount of ore there present, the quantity actually in sight above ground is practically incalculable. For example—the single occurrence known as the "Big Blowout" is a projecting mass of magnetite, 1,000 feet in length, from 400 to 500 feet in width, and with a mean height of nearly 300 feet. The summit crags are so highly magnetic that a handful of tacks thrown against them are held in contact. All the stream courses of the neighborhood are lined with magnetite and hematite, and taluses of the same material skirt the cliffs. In the work of systematic mining on the largest practicable scale, decades would elapse before the necessity of extensive underground workings would appear. In the work requisite to the securing of land patents, tunnels have been driven and shafts sunk, rather in compliance with the letter of the law than through any necessity for actual development. Thousands of tons of ore have been piled on the several claims ready for immediate use.

The ores are almost wholly of the class of anhydrous oxides of iron, including hematites and magnetite. In the ore proper there is but a trifling admixture of gangue. The analyses show a close approach to the theoretical amounts of iron for the several minerals, with unusually small quantities of deleterious ingredients, such as sulphur and phosphorous.

Limestone and coking coal abound in the neighborhood, and it would appear that Nature has provided all the essentials for an iron and steel plant on the largest conceivable scale. The lack of transportation facilities has been the main hindrance to the development of these enormous resoures.

I refrain from apologizing for the incompleteness of this brief and disconnected outline of the geological features and mineral resources of the youthful State of Utah. The need of systematic examination, the imperative necessity of an efficient State survey, are so strongly felt that

one may reasonably feel confident of an early beginning in this important labor. Then more definite information will be available, and I doubt not Utah will vindicate her claim to a place among the regions most attractive to the geologist, the prospector, the miner and the metallurgist.

PRESIDENT PRINCE: The chair desires to introduce the following resolutions:

By President Prince:

Resolved, That the Congress of the United States be respectfully requested to provide by law for the locating and working of mines of the reserved minerals—gold, silver and quicksilver—on Spanish and Mexican land grants.

By President Prince:

Resolved, That the magnitude and importance of the mining industry which has now reached over a billion of dollars of annual product, call for the establishment of a national Department of Mining, the chief officer of which shall be a member of the president's cabinet.

PRESIDENT PRINCE: The next business in the regular order is a paper by Mr. Frederick C. Semmec, of Iowa, on the subject of "Mining as a Business Compared with Commercial and Manufacturing Enterprises."

Mr. Semmec, civil and mining engineer, read the following paper:

Mr. President and Gentlemen of the Congress: It is not my intention at present to give anything but a generalized statement in comparing mining with commercial and manufacturing enterprises. The field is so wide that it would take considerable time and the services of a statistician to compile "data" were we to consider the subject from a point of figures. I will, however, endeavor to show that mining is a legitimate and can be carried on as legitimately as commerce or manufacturing. At the same time there is likely to be no field of operation so productive of worthless and fraudulent ventures as that of mining.

There is no section of the country where some people are not holding worthless mining stocks, bought under this or that scheme, under promise of making a bonanza investment, and not one in a thousand of these schemes ever get beyond the beautiful pictures which are painted to those who buy stock. Yet, this fact does not impair the possibilities of legitimate mining, distinguished from mining stocks when carried on under proper safeguards and on lines of actual and systematic development.

Mines are made by putting labor and means into the property itself and not into the pockets of the promoters. Few mining properties, indeed, which show any possibilities of becoming mines with development and which in fact justify exploitation, disappoint the miner upon his outlay.

There is today a greater demand for good developed mines than heretofore in the history of the mining states, and larger developing projects are constantly being undertaken. Brought down to a true economic basis, mining, not speculating in mines, offers greater returns upon the capital invested, and is upon the whole no more hazardous than any ordinary mercantile venture.

To develop any kind of a mine, capital is necessary. There are those who have the means to individually accomplish this, but such instances are few. It more often requires the united capital of several to accomplish anything in this line.

How to associate a number of people in an enterprise to raise the necessary amount required for a developed proposition, has been a stumbling block in the way of many ventures. Stock propositions have been resorted to, and are the means by which it is usually accomplished. They are safe and convenient means to the end, if lawfully and judiciously employed. The provisions of statutes, however, are in the most cases evaded, rather than followed, and the stockholder left without protection from liability on his stock or recourse from his losses.

Again, the stock is too often manipulated in the interest of the few, to the prejudice of the many. The property of the company, if of

any value, oftentimes runs into debt, is sold out and bought up in the interest of the few, but these methods are perhaps less to be condemned than the more vicious practice of floating large stock schemes upon worthless property, merely to market the stock for what it will bring, or speculate in it on the boards.

The capital is fixed at a figure to give ample paper for the transactions and while it represents in the eye of the law the amount which is actually put into the corporation in money, property or services at a fair and reasonable valuation, it is found in the hands of the promoters, fully paid up and non-assessable, and offered in most cases, at a fraction of a cent of its par value.

While such propositions in most cases bear the stamp of fraud upon their face, too many have been unwittingly entrapped into dealing with them, hoping for large gains on so small an outlay, or to gain something for nothing, failing in which, they condemn all mining ventures.

Notwithstanding all this, there have been many great mines, gold, silver and semi-precious metals, which have produced many millions of dollars in wealth for their owners, many of which are today swelling the world's stock of metals, and many more discovered yearly and made to produce great wealth. All had first to be developed, for mines are made, not found. They are the result of expensive exploitation and economic engineering, not the result of stock speculations.

As to the development of a mine through the sale of stocks, I believe the following, quoted from the Mining Reporter of Denver in the issue of May 31, 1901, covers the subject to the fullest extent: "In fact we believe that through small holdings in honestly conducted mining enterprises the greatest amount of development can be accomplished. It is against stock propositions in which, through misrepresentation, an effort is made to sell stock in a producing mine for an amount largely in excess of any reaonable conception of its value or in a prospect and use the money for any other purpose than the development of the prospect. The sale of prospect stock for any other purpose than development is a swindle. The sale of prospect stocks for purposes of development is the most sensible and practical means for mine-making.

Not every business venture in any line will succeed, no bank will loan all its money to one individual, no insurance company will risk its whole capital on the burning of one building, no prudent investor will stake his whole capital on the development of one prospect unless, perhaps, he is a practical miner himself. There is a risk in every line of business. The risk in legitimate mining is no greater than in any other line of business.

Again as a legitimate business mining has the peculiarity of affording better present opportunities than ever before. It is this that now distinguishes mining from any other business. In nearly every line, competition, trusts and other forms of trade conditions do not tend to make greater the probability of profitable investment of capital, great or small. But in the mining business closer study of ore has made possible the profitable treatment of much that was formerly rejected, and modern methods successfully develop good properties in districts once thought to be worked out. No matter how thoroughly a country may appear to have been prospected or developed, it is now desirable for present exploitation. Some of the best strikes are being made in old camps, and no miner or prospector is perforce compelled to go to new or almost inaccessible localities to find a good prospect. Intelligent development and proper treatment of output is the main requirement.

There are risks in mining investments as in any other form of investment. It is, however, the business of the intelligent investor who understands his business, to see that those risks are reduced to a minimum. But as against the risks common to all commercial ventures may be set the fact that the mining investment is relieved of many enormous elements of risks attendant on mercantile investments. Buying goods to sell again, notwithstanding competition, taking chances on bad debts, etc., are things that do not concern the mine operator, but are among the many attendant risks that must be taken by the merchant.

The contention is made that mining is a gamble. A mining investment is no more a gamble than is any other investment, excepting when the investor is a gambler who attempts to get something for nothing. While there is an element of uncertainty about every investment, and

mining, of course, shares this uncertainty, with all other kinds of business, the trouble is not nearly so often with the investment as with the investor, who in very many cases has only himself to blame for the foolish and unbusinesslike way in which he has disposed of his money.

It is also true that many investors are not competent to look into and decide the technical questions arising in connection with a mining investment or venture, any more than he is able to cope with the problems of any commercial or manufacturing enterprise he puts his money into. The intending purchaser has much to learn of his intendent purchase. It does not make a particle of difference whether a man is engaged in the manufacture of any article or in the sale of a commodity or in mining, the questions arising in conducting any of these undertakings are identical.

The claim is often made that the investor in mining property is dependent solely upon the judgment of someone else, and that he does not have it within his own power to thoroughly investigate the subject. While this objection is valid to a certain extent, it is not nearly to the extent taken for granted. As to the technicalities arising and details as to mining the investor will necessarily have to depend upon expert opinion, but there is still considerable that he can learn for himself. It is advisable that the district, in which the intended purchase is located, be visited and the general business conditions which any business man can appreciate be studied at close range. Then if such personal investigation is satisfactory have a closer technical examination of the ground made by a professional mining man.

There are two classes of persons through whose influence money is being constantly lost in mining investments. First—The uninformed, well-meaning, honest man, who induces his friends to invest money in properties solely upon his judgment, upon a subject of which he is perfectly ignorant. Second—The informed dishonest man, who is a shark or sharper. Although it seems unfair to place these two classes of men in such close connection, their influence upon the good name of mining is the same, and if anything, the influene of the former is much worse than that of the latter. Investigation has disclosed many misguided investments in so-called mines. Such investments are the result of overenthusiasm on the part of the promoter and the weakness or cupidity of capital in its almost ungovernable desire to obtain something for nothing.

In the present day there is no excuse for investors entering the mining field blindly. The same careful business consideration should be given an enterprise in mining that is extended to enterprises of manufacturing or mercantile pursuits. All men cannot be all things. In manufacturing the advice of experience in the line under consideration is sought. In real estate transactions the advice of a lawyer is sought, and in mining the advice of a mining engineer should be sought. The mining engineer may not be able to see further into the ground than the miner or promoter, but he will see all there is to see, state what he has seen and no more, determine the value of ore exposed, detail the surrounding economic conditions and demonstrate what a ton of ore so located will yield as profit to the operator. If the examination of the property include consideration and advice relative to the purchase price and proposition made by owner to prospective purchaser, the mining engineer will pass upon same and advise according to his convictions, having no interest in the transaction beyond his professional standing and the fee agreed upon for his services. Good advice may seem expensive, but it is far better and wiser to start right or not at all.

The purchase of a mine, in the full sense of the word, or a prospect, is an entirely different proposition. A mine is an established business. The engineer determines the amount of stock on hand, its gross value and net value, and value of plant as a whole. The difference between these determinations by the engineer and the price asked for the mine by the owner may be termed the price asked for the good will of the business. Fewer investments are safer than those judiciously made in developed mines. For this reason holders of large capital only seek mining investments of this character. The successful mining man, however, is constantly in the field for more mines or holes in the ground or prospects having promise. He does not anticipate that all of his

enterprises in mining will prove remunerative, but by exercising care and judgment does expect that the final balance between the producers and the non-producers will show a good profit. He does not pay a big price for a prospect, however promising. Its value cannot be accurately determined until developed. Development costs money, and he absolutely refuses to pay out cash for the privilege of expending still more to determine whether or not he may have invested wisely.

Under present conditions old or abandoned properties are being made productive. Old dumps that were worthless at the time they were made, owing to economic conditions, are now being worked over at a profit. Energetic miners are procuring working leases in all sections of the country, and are adding their production to help swell the grand total. It may be confidently stated that the mining industry of the country is in better condition today than at any period since its inception. While alleged mines are being sold, and always will be, for fabulous sums, based upon ridiculous expectations, the generally accepted value of mining property today is based upon the knowledge of what it will pay and not what it may pay, and a fair allowance for future possibilities. Modern appliances, intelligence and business management are gradually displacing the happy-go-lucky methods of the past.

There is still some so-called luck in mining, but in the main success is attained by careful attention to mining business and mining methods. The mining of the earlier days was attended with great expense and only the rich veins could be drawn upon with any possibility of profit. With the advent of railroads, county roads, reduction works and mills, ores valueless only a short time in the past are today valuable and yield a profit when managed with the same prudence and intelligence granted other industries. There are a great number of prospects or undeveloped lodes throughout our entire mining country. They are mainly owned by the original locators, who, for lack of means, are unable to develop them. The possibilities for capital in this direction are practically unlimited. It is but natural for the owner of a prospect when a sale is being considered to endeavor to obtain all he may, but he of all others appreciates his inability to develop his prospect into a mine, although he is thoroughly imbued with the belief that with development it will become a mine. He may therefore be easily induced to give capital an opportunity to develop it and take his chance of the prospect developing in accordance with his convictions. All prospects are more or less valuable and subject to great possibilities. All mines were at one time prospects. Comparatively small investments may change a prospect into a mine. The percentage is so great when backed by judgment ability, and persistence, as to offer great inducement to capital. Every dollar injudiciously invested in mining is to a limited extent an injury to the industry. In general, a few hundreds of dollars invested in a prospect, with the expectation of developing a mine, is an injudicious investment. Those who follow mining as a business expect when taking hold of a promising prospect to systematically exploit it so as to enable them to determine whether or not the property may be developed into a mine by the expenditure of more money. With several such propositions some develop into mines, and the profits accruing, if only one mine is obtained, generally far exceed the outlay on the whole.

Nearly all mining sections have good transportation facilities or with other easy means of access, and many factors that were in the past unfavorable to successful mining have been eliminated. The opportunity for judicious investment is almost unlimited.

Upon motion of Mr. Demming, of Idaho, duly seconded and carried, the Congress adjourned until tomorrow, July 24, 1901, at 9 o'clock, A. M.

July 24, 1901, 9 A. M.

The Congress met pursuant to adjournment. The secretary read the following telegram from Mrs. E. C. Atwood, the treasurer of the Congress:

San Francisco. Cal., July 23, 1901.

Irwin Mahon, Secretary International Mining Congress, Boise, Idaho.

Regret unexpected unavoidable delay prevents attendance; mailed report yesterday. Hearty wishes for successful Congress.

E. C. ATWOOD, Treasurer.

PRESIDENT PRINCE: The report of the treasurer, when received will be presented to the Congress.

Secretary Mahon then announced that the following named gentlemen, whose names are on the program for the reading of papers, were not present, and could not be at this session of the Congress:

Prof. Samuel Calvin, of Des Moines, Ia., "Geology of Iowa;" Dr. J. C. White, Morgantown, W. Va., "Geology of West Virginia," and Dr. C. L. Herrick, of New Mexico, "Application of Geology to Economic Problems in New Mexico."

There being no objection, the chair directed that the papers prepared by the above named gentlemen be printed in the report of the proceedings of the Congress.

The papers are as follows:

THE GEOLOGY AND GEOLOGICAL RESOURCES OF IOWA.

By Samuel Calvin.

The geological formations of Iowa embrace a fairly complete series from the pre-Cambrian to the Pleistocene. The taxonomic relations of the formations present are shown in the following table:

GROUP	SYSTEM	SERIES	STAGE
Cenozoic	Pleistocene	Recent	Alluvial
		Glacial	Wisconsin
			Peorian
			Iowan
			Sangamon
			Illinoian
			Yarmouth
			Kansan
			Pre-Kansan
Mesozoic	Cretaceous	Upper Cretaceous	Colorado
			Dakota
Paleozoic	Carboniferous	Upper Carboniferous	Missourian
			Des Moines
		Lower Carboniferous	Saint Louis
			Osage or Augusta
			Kinderhook
	Devonian	Upper Devonian	Lime Creek
		Middle Devonian	Cedar Valley
			Wapsipinicon
	Silurian	Niagara	Gower
			Delaware
	Ordovician	Trenton	Maquoketa
			Galena-Trenton
		Canadian	Saint Peter
			Oneota
	Cambrian	Potsdam	Saint Croix
Eozoic	Algonkian	Huronian	Sioux

PRE-CAMBRIAN.—The only pre-Cambrian rocks native to the State and exposed at the surface, are of Algonkian age. These occupy but a small area in the northwest corner. In the adjoining States of Minnesota and South Dakota, however, they are more extensively developed. The pre-Cambrian rocks of Iowa are, in the main, hard vitreous quartzites. While the area in which they appear at the surface is small, they are known to underlie the later sediments everywhere throughout the State; and they re-appear at the surface east of Iowa in the Baraboo ranges of Wisconsin. In Wisconsin the formation is called the Baraboo quartzite; it is known as the Sioux quartzite in Iowa.

CAMBRIAN.—Strata belonging to the Cambrian system are seen in the northeast corner of Iowa. In this locality the formation is composed almost wholly of sandstone. It contains a small amount of shale; and there is a band of impure dolomite, forty feet in thickness, which occurs about one hundred feet below the top; but otherwise the whole body of the deposit, through its entire thickness of 1,000 feet, is composed of sandstone varying in texture, color and the degree to which cementation has taken place. Speaking of it in general it may be said that the formation is coarse and imperfectly consolidated. Ripple marks upon the surface of many of the strata unite with cross-bedding and the generally coarse characters of the sediments in proclaiming the Cambrian of this part of the Mississippi Valley a shallow water or beach deposit accumulated on a subsiding sea margin. The formation is sometimes known as the "Potsdam," sometimes as the "Saint Croix sandstone." So far as relates to Iowa, it appears in the bluffs of the Mississippi River and its tributaries from New Albin to McGregor. Only the upper part of the Saint Croix sandstone is exposed in Iowa; the main body of it everywhere lies below the level of the floors of the valleys. At New Albin it rises 400 feet above the water in the river; at Lansing it rises 300 feet; a short distance below McGregor, owing to its southward dip, its surface disappears below the level of the stream.

ORDOVICIAN.—The Cambrian sandstones are followed by a body of dolomite, the "Oneota limestone." Transitional beds along the plane of contact between the two formations are conspicuous in the bluffs bordering the stream valleys throughout Northeastern Iowa. Nowhere in this region does the Saint Croix rise to the summit of the bluffs; and so the upper part of the walls of the valleys presents picturesque crags and towers and mural escarpments due to the presence of the cliff-forming Oneota dolomite. One hundred feet of the Oneota ovrlie the sandstone at Lansing, and a greater thickness of this formation appears in the rim of the valleys farther south. The whole thickness is about 250 feet.

Resting upon the Oneota is the "Saint Peter sandstone." This is a clean quartz sand almost as incoherent as when it was originally deposited. It is exposed in all the valleys and over some of the uplands in Northeastern Iowa. It is well developed at the "Pictured Rocks," a short distance below McGregor. Normally it is white as comminuted fragments of clean, clear quartz ought to be, but in places it is fantastically stained with metallic oxides carried into the porous deposit by descending waters. The thickness ranges from 60 to 100 feet. The Oneota and the Saint Peter, partly on stratigraphic grounds, but more particularly on paleontologic evidence, are referred to the "Canadian Series."

THE TRENTON SERIES, which lies next above the Canadian, is represented by two formations, the "Galena-Trenton" and the "Maquoketa." The first of these is largely limestone, but it varies in lithological characters in different localities. In the northern part of the State the formation contains a comparatively large amount of shale; and the limestone beds, which alternate with the shale, are not especially magnesian. In Dubuque County, near the southern margin of the area in which the Galena-Trenton is exposed, the formation is practically free from shale throughout the greater part of its thickness, and the upper 240 feet has been altered to a heavy-bedded dolomite. The non-dolomitized portion of the formation has usually been called the Trenton; while the dolomitized phase, so well represented at the city of Dubuque, is known in geological literature as the Galena limestone. No strati-

graphic line can be drawn between the Galena and the Trenton, however, for beds which are heavy dolomite in one locality are represented by unaltered limestones in another. The dolomititized Galena is the principal source of the lead and zinc ores of this part of the Mississippi Valley.

At a number of points in the city of Dubuque and the region adjacent, the abrupt change from Galena limestone to Maquoketa shales may be observed. The Maquoketa formation is almost wholly argillaceous. The lower sixty feet is composed of lean, worthless shale, but the rest of the formation, about 140 feet in thickness, is made up of beds which weather into a smooth, plastic clay. The lower division, in fauna and lithological characters, resembles the Utica slate; the upper member carries a fauna identical with that of the Cincinnati shales.

SILURIAN.—The Silurian is represented in Iowa by a single series which is generally referred to as the "Niagara limestone." The formation has a thickness of more than 300 feet. Certain parts of it are very rich in chert, but taken as a whole the Niagara of Iowa is singularly free from shale. Throughout its entire range, the calcareous constituent has been altered to dolomite. Notwithstanding the general uniformity of the material composing the formation, the characteristics of the beds vary within quite large limits. Some parts break into shapeless masses of coarse grained, crystalline dolomite; others are very regularly and evenly bedded and furnish the best of quarry stone. The Niagara limestone occupies a large irregularly shaped area extending from Clinton and Scott counties on the Mississippi River, northwetward into Fayette.

DEVONIAN.—At Davenport the strata are non-dolomitized limestones of Devonian age. The Devonian area trends northwest-southeast, beginning at Davenport and Muscatine, and extending to the north line of Howard, Mitchell and Worth counties. The formations are largely limestones, but shales are not uncommon. One division, the Lime Creek shales, 90 feet in thickness, is almost wholly an argillaceous deposit, furnishing the raw material for some of the most flourishing clay manufacturing enterprises in the State. Toward the north some of the limestone portions of the Devonian become dolomitic.

CARBONIFEROUS.—The carboniferous system is well developed in Iowa. It begins with the lower carboniferous series, an assemblage of sandstones, shales and limestones which were laid down under conditions similar to those which prevailed during the Devonian. Limestones predominate, and quite a proportion of them is made up of the remains of crinoids. Before the lower carboniferous came to an end, however the general uplift of Northeastern Iowa, which had been in progress from about the close of the Cambrian, carried the region so high that the sea was completely drained from the surface of the State. Had this condition been permanent, Iowa would have had no coal. The elevation persisted until the surface was deeply carved and trenched by erosion. But subsidence followed; and after Upper Carboniferous conditions had been inaugurated, the sea advanced upon an extensive area which had for a long time been subject to subaerial denudation. Coal was accumulated along the margin of this encroaching Carboniferous sea. The earthy sediments were at first sands and shales, but later, as the waters deepened, Southwestern Iowa was covered with shales and limestones. The marginal deposits of shales and sandstones with which the bulk of the Iowa coal is associated, constitute the Des Moines stage of the Upper Carboniferous; the shales and limestones of Southwestern Iowa, laid down in clearer and deeper waters somewhat remote from shore, make up the Missourian stage. A few thin layers of coal occur in the Missourian. With the close of the Missourian the Paleozoic sea retreated, a second time, from Iowa.

CRETACEOUS.—After a lapse of time represented by the Permian, Triassic, Jurassic and Lower Cretaceous, the sea again invaded a part of Iowa. This time it approached from the west and northwest. The sediments laid down during this invasion are of Upper Cretaceous age. The Dakota sandstone, rich in leaves of the late Cretaceous forests, is well developed at Sergeant Bluff and Sioux City. The Cretaceous sea extended eastward almost to the longitude of Des Moines. Before it retired shales and soft chalky limestones of the Colorado stage were distributed over the western border of Iowa to a thickness, approximately,

of two hundred feet. It was about the close of the Colorado stage that this last marine invasion of Iowa came to an end.

THE GLACIAL EPOCH.—Beneath the drift in some parts of Iowa there are some old and well cemented gravels which have been doubtfully referred to as the Lafayette formation. Apart from these gravels, all the known beds younger than the Upper Cretaceous belong to the glacial series. The glacial deposits of Iowa are complex. There are records of at least five distinct invasions of the region by northern glaciers. The sheets of drift left by the successive invasions of ice differ greatly among themselves so far as Iowa is concerned, in the extent of surface covered in the composition and characteristics of the constituent materials, and in the evidence of age which they respectively present. Named in the order of age, the drift sheets which may be readily discriminated are pre-Kansan, Kansan, Illinoian, Iowan and Wisconsin. The first, second, fourth and fifth came into Iowa from the northwest, from the Keewatin center west of Hudson Bay; the third advanced from the northeast, probably coming from the gathering grounds in Labrador. Between the deposits of drift and separating them one from another are remains of forests, beds of peat, definite bands of soil and zones showing long exposure to the weather. Some of the interglacial intervals were much longer than all postglacial time.

THE GEOLOGICAL RESOURCES OF IOWA.

The geological resources of Iowa embrace coal, natural gas, quarry stone, lime-burning rock, gypsum, materials for the manufacture of Portland cement, clays suitable for a large variety of purposes, together with the ores of lead, zinc and iron. But in addition to these and far transcending in value all other sources of wealth, are the matchless soils of the State.

The coal is bituminous, excellent for steaming and heating purposes. The coal fields cover nearly one-third the entire area of the State. The supply is assured for many years to come. The natural gas is small in amount; all productive wells so far known are limited to the drift, and the supply is beyond doubt derived from the ancient forests entombed in the glacial deposits. Quarry stone of marketable quality is obtained from the Canadian, Trenton, Niagara, Middle Devonian, Upper Devonian and Lower Carboniferous series. The most important shipping quarries are in the Gower stage of the Niagara at Stone City and Cedar Valley, and in the Kinderhook stage of the Lower Carboniferous east of Marshalltown. The dolomitized formations—the Oneota, Galena and Niagara—furnish lime-burning material of unsurpassed excellence, as the prosperous lime manufacturing enterprises in Allamakee, Dubuque, Jackson and Cedar counties so well attest. Large bodies of gypsum, probably of Cretaceous age, occurring in Webster County, afford the raw material for a number of stucco mills which give profitable employment to capital and labor on a large scale. Clays of commercial importance and inexhaustible in amount, occur in nearly all the geological formations from the Trenton to the Glacial series. Among the most important clay-working plants are those using the Lime Creek shales in Cerro Gordo County, the Kinderhook shales in Des Moines County, the Des Moines shales in Polk, Dallas and Webster counties, the Missourian shales in Montgomery, and the Cretaceous shales in Woodbury. Brick and tile plants which use clays of Pleistocene age, are found in almost every county. Lead and zinc ores are mined successfully in the counties of Allamakee, Clayton and Dubuque, while iron ore is mined on a commercial scale in Allamakee. The Saint Peter formation, in parts of Allamakee and Clayton counties, is a pure, clean, clear quartz sand, ideal material for the manufacture of glass.

The following table shows approximately the annual value of mineral production of Iowa, so far as statistics of output are available:

ANNUAL VALUE OF MINERAL PRODUCTION IN IOWA.

Coal	$ 6,250,000
Clay	2,500,000
Stone and Lime	1,000,000
Gypsum	600,000
Lead and Zinc	55,000
Iron Ore	5,000
Total Value	$10,410,000

The wealth of Iowa lies in the possibility of her splendid soil. According to the latest report of the Iowa Weather and Crop Service the direct products of the soil for the year 1900 amounted to the enormous total of $229,865,058. The profits of stock raising and feeding would swell this great sum by about one-half its amount, while the product of the dairy, the poultry yard and the apiary would add at least $100,000,000 more. The average Iowa farm is more profitable and more reliable than the average gold mine. The soils of Iowa produce more wealth annually than all the gold mines of the world taken together.

THE GEOLOGY OF WEST VIRGINIA.

By I. C. White, State Geologist.

The detailed geologic history of West Virginia is a long story, but summarized it can be briefly told.

Its rocks begin with the old volcanic series of the Blue Ridge on its extreme eastern border, and extend upward through the Cambrian, Silurian, Devonian and Carboniferous, ending with the Permian beds of the latter, along the central and western portions of the State. Metamorphism of sedimentary beds, great faults, veins, and extensive mineralization of sediments, are comparatively unknown in her strata, hence those who would seek gold, silver, platinum, copper, tin, lead, etc., should give West Virginia a "wide berth." Traces she may have of all these, but none in paying quantity. Precious stones, gems and metals have been denied to the little mountain State, but generous nature has so richly dowered her with common stones, common minerals, and other common things that her natural wealth is unsurpassed by any equal area on the continent.

Passing in brief review the main features of the West Virginia geologic column of strata from the oldest to the most recent, we find them distributed as follows:

The Blue Ridge at the extreme eastern line of the State contains the oldest rocks, and according to the researches of the lamented Prof. Williams of Johns Hopkins, and his talented pupil, Miss Bascom, consist largely of metamorphosed ancient volcanic outflows. Within the limits of West Virginia, at least, they do not appear to contain any minerals of especial value.

Succeeding these ancient volcanic rocks of uncertain age, and resting against them in a vertical or even overturned condition come the Siluro-Cambrian, or Shenandoah limestones. These crop to the surface in only a few counties of the State, viz., Jefferson, Berkeley, Hardy, Hampshire and Pendleton, along the border of Virginia. Their thickness has never been exactly measured, but is probably somewhere between three and four thousand feet. They make the great wheat belt of the Shenandoah Valley. Much of the rock is highly magnesian, but at a few hundred feet below the top of the series, occurs a stratum of very pure carbonate of lime, 75 to 100 feet thick, being low in phosphorous and silicious matter; it is highly prized for the manufacture of iron, glass, plastering, etc. The B. & O. Railroad runs across this belt of limestone for a distance of 25 miles between Harpers Ferry and North Mountain, furnishing excellent facilities for shipment from its quarries.

The dissolution of some ferruginous limestones in this series has given origin to a few extensive iron ore pockets, notably the Virginia mine on the Potomac River, a few miles above Harpers Ferry.

The Martinsburg shale (corresponding to a portion of the old Hudson River group) succeeds the Shenandoah limestones, but while it makes

an excellent soil, it contains nothing else of mineral value. The thickness of these beds is probably not far from 2,000 feet.

The Oneida and Medina beds of the New York series succeed the Martinsburg shale, the lower half consisting of sandy beds and red shales, while the upper half is a very hard white sandstone, 500-600 feet thick. It makes the North Mountain along the western side of the Shenandoah Valley, and also comes up in the great folds of the Appalachian system at Hancock and Keyser. This white sandstone is valuable for railroad ballast and glass sand.

The Clinton, with its fossil iron ores, succeeds the White Medina, and extends through Morgan, Mineral, Hardy, Hampshire, Berkeley, Grant, Pendleton and Eastern Monroe counties, in a series of shales and impure limestones (500-600 feet thick), which according to the late Dr. Edward Orton contain very valuable iron ores in Pendleton.

The Clinton shales are succeeded in West Virginia by the red marls and yellowish, flaggy gypsiferous magnesian limestones of the Salina formation, capped at the top by the same water lime rocks as found in New York. The Salina beds foot up 700 to 800 feet in thickness, and crop to the surface only in Berkeley, Hampshire, Mineral, Morgan, Hardy and Pendleton counties.

The Lower Helderberg limestones succeed the Salina beds, beginning at base as they do in New York, with the water lime which along the Potomac in Maryland and West Virginia has given rise to an important industry, viz., the manufacture of hydraulic cement.

The water lime proper has a thickness of 50-100 feet and is practically non-fossiliferous. The upper divisions of the Helderberg are highly fossiliferous, and many of the beds furnish a most excellent lime. These rocks have a thickness of 500-600 feet, and like the older formations below, are found only east of the Alleghanies, where the great folds of the Appalachian system have brought them to daylight in steeply inclined layers through the counties of Berkeley, Morgan, Mineral, Hampshire, Hardy, Grant and Pendleton, and possibly small areas in Eastern Greenbrier, Pocahontas and Monroe.

The Oriskany Sandstone caps the Helderberg, and with its typical fossils, and characteristic lithology passes entirely across the eastern border of the State through the counties of Mineral, Morgan, Berkeley, Hampshire, Hardy, Grant, Pendleton, Pocahontas, Greenbrier and Monroe. It retains the same dirty yellow, coarse and rugged aspect seen from New York across Pennsylvania, and has a thickness varying from 75 to 150 feet. It posseses no economic value in West Virginia, except as a repository of iron ore occasionally derived from the overlying shales (Marcellius).

The Coniferous limestone of the New York series does not crop to the surface in recognizable form anywhere in the State, but has been found by the drill at Huntington, Cabell County, where it underlies the Ohio River at a depth of 2,700 feet, and is filled with its characteristic black flinty nodules exactly the same as seen where the formation comes up to the surface on the eastern slope of the Cincinnati arch, near Vanceburg, Kentucky, 50 miles below Huntington. A limestone is often found near the base of the Marcellus black shale in Eastern West Virginia, but it is so different from the Coniferous type that it is believed to be simply a limy horizon in the Marcellus. Hence the Coniferous is believed to exist only in the western tier of counties in West Virginia, which border Ohio and Kentucky.

The Marcellus black shale of the New York series lies directly upon the Oriskany, and the decomposition and oxidation of its pyritiferous layers have given origin to some important deposits of iron ore in Greenbrier, Pocahontas and adjoining counties along the Virginia border. This is also the source of the sulphur water at the famous White Sulphur Springs in Greenbrier County. The thickness of the black slates is 200 to 300 feet, and they are found only in the counties enumerated as holding Oriskany outcrops.

The Hamilton dark gray shales, and sandy beds, filled with fossils of typical New York Hamilton type, succeed the Marcellus beds, and continue the rock column upward at least a thousand feet further, where they merge so gradually into the Portage of Basal Chemung beds that no satisfactory division line has yet been drawn to separate them.

The Portage and Chemung rocks succeed the Hamilton and extend

entirely across the eastern counties of the State from the Maryland line in Preston, Mineral and Morgan counties to the New River in Monroe. They consist of a series of gray shales, flaggy sandstones, and one or more massive conglomerates, in the Chemung divisiion which is also filled with the fossils that characterize these rocks in New York and Pennsylvania. These beds are finely exposed in Preston, Tucker, Grant, Mineral, Morgan, Hampshire, Hardy, Pendleton, Randolph, Pocahontas, Greenbrier and Monroe counties. They, of course, underlie all the other western counties of the State, but crop to the surface only in those mentioned. Aside from flagstones, these beds furnish nothing of economic value, since the natural gas and petroleum horizons so far developed within the State are believed to end at the top of this series. The thickness of the Portage and Chemung is 2,500 to 3,000 feet.

The Catskill red beds, consisting of massive greenish and red sandstones and conglomerates, interstratied with much red shale make several broad red bands along the eastern portion of the State through the counties of Preston, Tucker, Randolph, Grant, Mineral, Morgan, Hampshire, Hardy, Pendleton, Pocahontas and Greenbrier, beyond which the red beds disappear, but the greenish sandstones continue on into Monroe. This group is interesting from the fact that its sandstones, or conglomerates rather, are the repository of so much natural gas and petroleum in the northern half of the State where the beds are buried by 2,500 to 3,500 feet of higher rocks.

The Venango oil sand group of Pennsylvania, beginning with the Gantz and including the fifty-foot Gordon, fourth, fifth and sixth or Elizabeth sands, the whole having a thickness of about 500 feet, all belong to the Catskill formation. These beds furnish probably two-thirds of the 15,000,000 barrels of petroleum now annually produced in the state. It is all of the highest grade of Pennsylvania or paraffine base oil, with a gravity varying from 41 degrees to 49 degrees Baume. Aside from the boundless stores of oil and gas held by these beds (when sufficiently buried by an impervious cover of other rocks), they contain nothing else of economic value. The thickness of the Catskill in the eastern portion of the State is between 3,000 and 4,000 feet, while in the centrol and western portions it has thinned down to only 500 to 600 feet.

The Lower Carboniferous with its triple division of Pocono sandstone, Greenbrier limestone, and Mauch Chunk red shale, succeeds the Catskill formation, and like it, holds extensive deposits of petroleum and natural gas. The "Big Injun" oil sand of the Pocono has been hardly less prolific in these precious hydrocarbons than any single horizon in the Catskill, while the Maxton sand horizon of the Mauch Chunk series has produced a large quantity of oil. The series crops to the surface in Preston, Barbour, Tucker, Mineral, Grant, Randolph, Pocahontas, Webster, Nicholas, Summers, Monroe, Raleigh and Mercer, and at two or three points in Eastern Monongalia.

The hard Pocono beds are also found in the summits of the synclinal mountains in western Berkeley, Morgan, Hampshire, Pendleton and Hardy.

In Berkeley, Morgan and Greenbrier some thin beds of anthracite coal have been exploited in the Pocono series, but nothing in paying quantity has yet been developed. The Pocono is also the source of the brines which give origin to the salt and bromine industries on the Ohio and Great Kanawha rivers.

The Greenbrier limestone, entering the State from Pennsylvania in Monongalia and Preston counties, with a thickness of about 100 feet, increases in thickness to the southwest, attaining 1,000 feet in Pocohontas, Webster and Greenbrier, and 1,400 feet on the New River in Summers, and forms the famous blue grass lands of the counties named.

The drill of the petroleum seeker has proven that the Pocono and Greenbrier series underlie every portion of the State west from the Alleghany Mountains, though the Mauch Chunk red beds are not always present in the southwestern end bordering Ohio and Kentucky.

The Pocono has a thickness of 300 to 600 feet; the Greenbrier of 100 to 1,400; while the Mauch Chunk varies from nothing at the Ohio River to 2,000 feet in Greenbrier, where interstratified with its red shales and impure limestones, it holds several massive conglomerates.

The coal measures which succeed the Mauch Chunk shale appear to conform to the latter in dip and stratification, but the conformity is

only apparent, since there is a greater lost link in the chain of life at this horizon than at any other point in the Paleozoic column of the State, for a new flora and comparatively new fauna make their appearance with the first layers of the Pottsville conglomerate.

The coal measures of West Virginia subdivide naturally into four groups, viz.:

The Pottsville.
The Allegheny or Kanawha.
The Conemaugh.
The Monongahela.

The Pottsville beds, the basal member of the series, consist of massive conglomerates, interstratified with dark shales, which hold the celebrated New River and Pocahontas smokeless coals. All of these coals are of the soft columnar coking variety, low in volatile matter, ash and sulphur, and high in fixed carbon, being the only fuels in the United States that have the same chemical composition as the Cardiff coals of Wales, and that rival them in steam-producing power. The Cardiff coals being harder, go into market in larger blocks, and thus present a more attractive appearance, but the two coals have practically the same fuel value.

The area which holds these smokeless coals in West Virginia is not large. It is practically confined to the region between the heads of Elk and Gauley rivers and the Tug Fork or Big Sandy on the southwest. Along this line the New River coals occupy a belt of country about 30 miles in width through the counties of Webster, Nicholas, Greenbrier, Summers, Fayette, Raleigh, Mercer, Wyoming and McDowell, while to the northward, erosion has reduced the area through Randolph, Tucker and Preston to a long narrow strip only one-half to one mile wide, and holding but a single bed of commercial thickness (three feet). In the larger area to the southwest, often two and sometimes three commercial coals exist in these measures.

With this expansion of the coal beds to the southwest, there is a corresponding expansion in the combined thickness of the rock series. It enters the State from Pennsylvania with a thickness of only 300-400 feet, but this gradually grows to 1,400 feet on New River, and swells still further to 2,000 feet at the Kentucky line on the Big Sandy, according to the U. S. Geological Survey estimates.

These coals appear to have accumulated in commercial thickness only around the eastern rim of the great Appalachian basin, since as their horizons dip under the higher measures, to the west, the coals thin away and disappear. Conversely they thicken eastward, since the Pocahontas bed has a thickness of 8 to 9 feet where it escapes into the air from Flat Top Mountain on the border of Virginia.

The Pottsville conglomerates are important oil and gas horizons where deeply buried in Central West Virginia, the "Cairo," "salt," and other productive oil sands belonging in this group.

The Allegheny-Kanawha series of coal measures come next above the great massive white conglomerates of the Pottsville. They consist of a series of shales, clays, sandstones and limestones, holding four or five distinct coals, the thickness of the whole increasing from 250 feet at the northern line of the State to 1,000 on the Kanawha River.

Mr. David White, the eminent Paleobotanist of the U. S. Geological Survey, claims on the evidence of fossil plants that the Kanawha series is entirely below and intermediate between the Pottsville and Allegheny beds; that it supplies a link hitherto missing between the coal measures of Europe and America. The stratigraphy and lithology of the beds would appear to controvert this conclusion, and to indicate that the thin (250 feet) northern series swells southwestward in about the same proportion as the underlying Pottsville, though, of course, the basal members of the thick series (1,000 feet) at the southwest may have no recognizable corresponding representatives to the northeast. These measures crop to the surface in Monongalia, Marion, Preston, Taylor, Tucker, Mineral, Grant, Randolph, Barbour, Upshur, Webster, Nicholas, Clay, Kanawha, Fayette, Raleigh, Boone, Lincoln, Wyoming, Logan, Cabell and Wayne, on the eastern side of the Appalachian trough, and also come up to daylight in Brooke and Hancock on the western side of that great basin.

Under all the intermediate counties of the State they are buried from sight by from one to several hundred feet of higher measures, so that we know them only through the drill of the petroleum seeker.

There are two (the Upper Freeport and Lower Kittanning beds) important coals in this series in the northern portion of the State, of the soft, coking variety, and also esteemed for general fuel and domestic purposes, the Kittanning being especially valued for smithing purposes, and shipped all over the country for such uses.

In the southwestern end of the State, or on the Great Kanawha, the coals develop a harder type and have the character of splint coals, especially in the upper half of the Kanawha series, while those in the lower half are softer and coke well. There is also much cannel in that portion of the State. The "Kanawha splints" are justly celebrated for their great fuel value.

The Conemaugh beds succeed the Allegheny-Kanawha, and constitute the old Barren Measures, No. XIV., of the Rogers brothers. Its lower portion consists of massive sandstones and gray shales, containing two important coal beds, the Mahoning and Masontown, while the middle holds a great red marbly shale zone and contains the last marine limestones (Crinoidal) of the Carboniferous. Above the middle red bands, come shales, sandstones, other red beds, with two or three thin coals and limestones, the whole Conemaugh having a thickness of 500-600 feet at the northern line of the State, 700 feet in Upshur County, and 800 on the Great Kanawha. The basal beds of this group are important oil horizons, the "Dunkard" and "Cow Run" oil sands being the Mahoning sandstone members of the same, while the Morgantown sandstone higher up is one of the numerous "shallow sand" oil horizons of West Virginia and Southern Ohio.

Next above the Conemaugh beds just described come the Monongahela River or upper coal measures, the basal member of which the Pittsburg-Connellsville coal seam is the richest and most important mineral deposit of the Appalachian basin, if not of the continent. Unrivaled for coke, rich in gas, excellent for steam and general fuel purposes, this great bed extends from Pittsburg up the Monongahela to its head, and across West Virginia to the Great Kanawha, through Monongalia, Marion, Harrison, Doddridge, Lewis, Barbour, Upshur, Gilmer, Braxton, Clay, Kanawha and Putnam counties, while westward it stretches through Wetzel, Marshall, Ohio and Brooke to the Ohio River at Benwood, Wheeling and Wellsburg.

With a thickness seldom less than six feet, and often exceeding eight, with practically no parting slates or waste material, this important coal has formed the basis of Pittsburg's commercial supremacy, and has placed the markets of the world for the products of iron and steel at the command of the Monongahela Valley for an indefinite period.

The only other important coal of the Monongahela series is the Sewickley, or "Mapletown" bed of the oil drillers, which lies about 100 feet above the Pittsburg, but it is of valuable thickness only in Marion and Monongalia counties.

The group is capped at the top by the Waynesburg coal bed, but it is so high in both ash and sulphur, that it is rarely mined except for local domestic use.

The Monongahela beds in the northern end of the State consist largely of fresh or brackish water limestones, interstratified with gray shales and sandstones, and the thickness varies from 400 feet in Western Monongalia, Marion and Harrison to 250-300 on the Ohio River. In the southern end of the State the limestones have nearly disappeared, while red shales and massive sandstones make up most of the 300 feet of rocks which intervene between the Pittsburg and Waynesburg coals.

One of the sand rocks of this series, the Sewickley, appears to be petroliferous at Cairo, Ritchie County.

The Carboniferous rocks of West Virginia end with the Dunkard Creek beds which cap the Monongahela, in the central portion of the Appalachian basin with a thickness of about 1,000 feet of brown friable sandstones, slightly gypsiferous shales and limestones, and a large amount of red shale. Five to six thin coal beds are also found, only one of which, the Washington, ever attains to commercial thickness. The fauna

is of fresh or brackish water type, and nothing is known of its comparative age, but the flora has been referred by Prof. Fontaine and myself to the Permian horizon.

This ends the rock history of West Virginia, since at the close of the Permian or Dunkard Creek epoch, the Appalachian revolution took place, elevating the whole State above the area of rock deposition into the region of erosion or rock-destroying agencies, so that aside from the Quaternary deposits found along the older valleys of our rivers, no newer rocks than the Permian exist anywhere in the State.

From this review it will be seen that West Virginia's mineral wealth consists principally in coal, limestone, building stone, glass sand, clays and iron ore, along with vast supplies of petroleum and natural gas.

Situated as she is, in the center of the great Appalachian coal field, where it is richest, widest, and possesses the greatest variety of fuel products, the Little Mountain State is rapidly becoming a manufacturing center. Already she has taken third place in the galaxy of coal-producing States, and bids fair soon to grasp the banner from Illinois and occupy the second place alongside of her sister on the north, Pennsylvania.

With her vast and virgin resources in timber, clays, building stone, limestone, coal and natural gas, no other State in the Union has a brighter outlook for future growth and development, nor a more inviting field for capital to invest in the mining and manufacturing business.

I. C. WHITE.

Morgantown, West Virginia, July 15, 1901.

APPLICATIONS OF GEOLOGY TO ECONOMIC PROBLEMS IN NEW MEXICO.

By C. L. Herrick, Ph. D., Director of the University Geological Survey.

Gentlemen of the Mining Congress: When I consented, at the request of your honored president, to prepare a paper for this occasion, it was not with the expectation that in its preparation I should be deprived of the assistance of my library as well as the stimulus of personal presence before such an audience as this. But perhaps it may be a partial compensation for the lack of critical accuracy and enthusiasm that the paper, such as it is, emanates from an engineer in the active practice of his profession, surrounded by every incentive to remember that practical success rather than theoretical perfection is required of him.

Under these circumstances a plea for more of the geological foundations in the structure of a technical education may seem less "ex parte" than would otherwise be the case.

Most of my colleagues here must have encountered the prevailing prejudice against "theorizing" among self-styled practical men. Some of us, no doubt, share in it. It must be confessed that there is reason for such prejudice and it is too often the case that the school man is to some extent unfitted for his routine work by a too implicit trust in, or emphasis upon, the canons of the books. It has been the writer's privilege for some years to be contemporaneously engaged upon a geological survey of New Mexico and in the practical work of a mining engineer, so that he may presume to speak from experience of the way in which the work in these fields mutually aid and supplement each other.

I recall with amusement the disdainful way with which a surveyor-general of one of our mining districts declaimed against "fossil geology," as he contemptuously called it, but also recall that the same critic was very glad to secure the evidence of fossil geology to ascertain the possibilities of a certain coal field in which he subsequently became interested.

In a similar way the writer recalls the general incredulity manifested in a certain important mining camp as to the value of stratigraphical investigation in connection with the important lead-silver mines on which the prosperity of the camp rested. But after the system of faults had been worked out and the ore-bearing zones in the Carboniferous limestone had been identified, one stope after another was opened with a minimum of "dead work" till hardly a working property in

the camp has failed to secure the help of just this kind of geological advice.

I venture therefore to call your attention to a brief statement of some of the applications of geology to economic problems in New Mexico.

It is true that a great deal of prospecting has been done in the Territory, and it is also a fact that the U. S. Geological Survey and the expeditions of many learned societies have investigated its enormous area, but it remains true that of the kind of minute and detailed work that accrues to the direct profit of miners there has been almost none.

In this respect the published work of the University Geological Survey is no exception, and it remains a question whether there can be found the means to publish the results of its studies in this direction.

The following notes are collected almost at random from the records of the survey.

ECONOMICS OF THE RED BEDS.

One of the most interesting theoretical results of the stratigraphical work of the survey has been in the direction of recognizing the subdivisions of this extensive formation so characteristic of the southwest. It has been quite generally customary to lump the great series of red and greenish shales, marls and sandstones following the Carboniferous as "Jura-triassic" in spite of the fact that numerous suggestions of the presence of the Permian formation have been presented. In Central and Northern New Mexico the great massive limestones of the Carboniferous era show gradations of fauna into what has been called the Permo-Carboniferous and the presence of the great characteristic fossils (especially bryozoa, "Fusulina robusta, Meekelia," etc.) makes the identification certain, but till recently almost no characteristic fossils have been found either in the cap of sandstone which we have called Manzano sandstone or quartzite, or in the red beds above. It was found possible to divide the series into three approximately equal divisions on a lithological basis, and it was suspected that the lower of these, containing a considerable number of lime strata interbedded with marly shales and sandstones and capped by a gypsiferous shale, which at times supports enormous beds of gypsum, might be equivalent to the missing Permian. Full confirmation of this suspicion was secured when we found near Tulawsa in Otero County a magnificent series of characteristic Permian fossil. Another locality east of Albuquerque has also yielded confirmatory evidence. As yet no Paleontological method has been found for discrimination between the Jurassic and Triassic, though it seems probable that the missing evidence will soon be forthcoming.

Practically the red beds are among the most important formations in the Territory as they yield copper, gypsum, salt and petroleum.

COPPER.—It hardly seems too much to say that the red beds are the original source of nearly all the copper of the Territory. This statement may seem somewhat sweeping, and it must be confessed that it rests upon a theoretical basis to some extent. First, "as a direct source." The primitive condition of the copper is in the form of sulphides and oxides replacing vegetable matter in the shales and sandstones of the Permian and Jura-triassic. This condition is beautifully displayed in Mora County; for example, where for many miles the beds of Permian and Jura-triassic are tilted to a perpendicular position west of the Mora anticline, which is itself chiefly formed of Cretaceous strata. In the carbonaceous shales lying between beds of quartzite sandstone nodules of copper ore are found in such abundance as to have long served as a source for copper. In many cases the organic nature of the original mass is perfectly in evidence. In the sandstone layers trunks of trees are often partly carbonized and partly cuprified. This occurrence of "tree copper," as it is usually called by miners, is general over a large part of the Territory. Unfortunately in this widely disseminated state the copper is not often sufficiently segregated to be profitably worked except perhaps on a very small scale.

THE SECONARDY ACCUMULATIONS of copper are in reality much more important, for it seems certain that the greater portion of the copper mined within the territory is derived from the material pre-

cipitated by organic matter in these sedimentary strata. The primal source of the metal remains in any case unexplained.

A very interesting object lesson as to the secondary accumulation of copper may be seen in the San Andres, Caballo or San Cristobal mountains or, for that matter, in any of the mountain ranges where the contact of the superimposed stratified rocks upon the granite is well seen. In the San Andres, for example, the entire thickness of the Carboniferous and part of the Permian is found lying conformably on the granite, and warping fissures extend through the entire thickness to the granite contact. These fissures have been filled from above and rarely extend to any distance into the granite. At the granite contact is a zone, where iron leechings from above have formed a ferruginous bed and wherever the fissures extend to this belt of iron-impregnated conglomerate or quartzite there is copper precipitation. Often fine masses of copper glance or oxide occur here, but the extent of the deposit is usually strictly limited and not extensive. It is not hard to read the chemistry of the deposition of copper in the presence of iron and sulphuric acid.

Where the granite bed rock forms a basin the same principle applies to a much more important accumulation, as may be seen in the Santa Rita district.

Let the practical geologist ask himself what would occur in case cupriferous sandstone and shale of the red beds were caught up and incorporated more or less fully in the flows of andesite and aegerite-syenite, which are the gold and silver-bearing intrusives of the region, and he will be prepared to appreciate the conditions in such mining camps as those of Chloride or San Pedro. In Chloride particularly it is easy to see that both the red beds and the underlying Carboniferous limestones have been not simply penetrated and disturbed by andesite flows, but in many places the original sedimentaries have been broken into fragments from the size of a pea to that of a city block and have been most intimately mixed with the intrusive. Quartz and spar dykes and segregation contacts under these circumstances have secreted the copper and silver often in ores of great richness, but the very violence of the proceeding has militated against the uniformity and constancy of the result. In one place the vein can be ascertained to have extracted galena-silver from a lime fragment and in another copper-gold from the mixture of andesite and cupriferous sand-rock. A proper understanding of the method of origin of these ores would have saved great disappointment in this district and would revise the valuation upon many properties. In the San Pedro district the same principle is exemplified in a different way. Less violent disturbance has permitted the andesite and aegerite-syenite to interpenetrate the Carboniferous and Permian. The cupriferous sandstone has been greatly metamorphosed and, with the shales, has given rise to great masses of garnet rock in connection with which the copper and gold has been excreted. The adjacent Carboniferous limestone has collected its lead under the continued influence of the slow metamorphism, as has happened in the Magdalenas and other lead-silver districts.

TURQUOIS.—In the adjacent Cerrillos district the effect of the metamorphic action of the syenite on the cupriferous sandstone has been even more interesting, for there can no longer be any doubt that the turquois of these famous mines, worked in prehistoric times to an almost incredible extent, is due to the metamorphic action of the aegerite-syenite on the shaly beds in sandstones of the red-bed age.

The curiously divergent reports that have been made on the geology of this district illustrate the need of a minute survey made in the light of the entire environing country. Prof. Blake seems to have been the only one who recognized the sedimentary series, but he considered it Carboniferous. The igneous intrusive has been identified as trachite, but this is because only the altered material was examined. It is a most remarkable syenite whose iron-magnesian mineral is an undescribed pyroxene with the optical characters but not the chemical composition of aegerite-augite.

The same rock is responsible for the Ortiz gold belt and the placer material upon which the Edison Company experimented behind closed bars.

SALT AND GYPSUM.—But probably of much greater importance to the Territory than the copper or turquois is the great salt and gypsum industry that one day may place New Mexico in the lead in these directions. Especially interesting from a geological as well as an economic point of view are the circumstances which transformed the deep sea conditions of the Carboniferous in the west to a time of shallow water and lagoons of salt and gypsum. The great fields of white gypsum sand collected by the winds from off the salinas of Dona Ana County and the bottomless crater conduit filled with supersaturated brine in Western Socorro County are simply two marked instances of the conditions accompanying the transition period between the Permian and the Jura-triassic all over the Territory.

OIL.—The recent interest in oil has brought to light the unexpected fact that in some places the sands of the red beds are saturated with asphalt over large areas. While no productive wells have so far been found and the lack of suitable cover may prove an insuperable difficulty to collection of oil in this horizon on a large scale, there is abundant proof that the vegetable masses of the late Permian or early Jura-triassic have been productive of quantities of oil in Eastern New Mexico.

CRETACEOUS CORRELATIONS.—An interesting result of the paleontological work of our survey has been to show that a large group of lignites long supposed to be of Laramie age, and actually containing such well-known Laramie fossils as "Ostrea glabra," is followed by a thick series of marine Cretaceous with fossils like those of the Upper Fox-hills group. Below the shales in question in McKinley County extensive oil indications have been found that have given rise to the oil excitement in New Mexico. The oil so far seen is of very high gravity and has an asphalt base, but in no case so far has the oil been reached by deep boring, and the character of the deeper oil is a matter of conjecture solely. In the shales of Northeastern New Mexico, immediately beneath the Trinidad coal measures (supposably of Laramie age) oil sign is found associated with marine fossils like "Inoceramus fragilis." This is undoubtedly the same zone as that which furnishes the oil of Florence, Colorado, and will no doubt furnish good supplies within the Territory also.

CARBONIFEROUS.—More practically remunerative than the above mentioned have been the geological applications from a study of the Carboniferous lead-silver horizons, but here one treads perilously near the present day problems where conflicting interests are concerned, and moreover it must be remembered that the time of the Congress is too precious for anyone to monopolize a large share of it. I venture to hope that the instances cited may afford fresh evidence of the desirability of a closer union between theoretical geology and technical economic training in the work of the practical mining engineer.

C. L. HERRICK.

PRESIDENT PRINCE: The next order of business is a paper by Mr. Robert Bell, of Salmon City, Idaho; subject, "An Outline of Idaho Geology, and of the Principal Ore Deposits of Lemhi and Custer Counties, Idaho."

Mr. Robert Bell, of Idaho, read the following paper:

AN OUTLINE OF IDAHO GEOLOGY AND OF THE PRINCIPAL ORE DEPOSITS OF LEMHI AND CUSTER COUNTIES, IDAHO.

Delegates to the present session of the International Mining Congress approaching Boise, as most of them do, over the various lines of railroad, will receive a poor impression of the geology of the State, for about the only character of formation observable from the car windows, in passing through the State, is tertiary lava, which presents the most unlikely condition for the occurrence of ores yielding valuable minerals.

"The broad topographical features of Idaho are the drainage system of the Snake and Columbia rivers, with a vast arid lava plain along the former stream; a lybyrinthine mass of rugged mountains northward

from the plain, and a succession of desert ranges along the southern border of the State between the Snake River and the Great Basin."

These great lava fields cover up a remarkably interesting condition, and the formation to the north and south, beyond their borders, offer a wide field for the investigation of the geological student, of matter as interesting, perhaps, as any that can be found upon the American continent.

The State of Idaho contains one of the largest, if not the largest, connected granite gold-bearing area of any State in the Union. It is approached in extent only by similar areas in California and Colorado.

This great Archaen land mass starts from the mountain uplift which borders the north side of the Snake River Valley between Boise and Shoshone, and extends northward 300 miles to the Coeur d'Alenes, and has an average width from east to west of fully 75 miles. In pretertiary times it was much more extensive than at present, as indicated by the numerous outlying islands of granite that crop up above the lava, and the fact that great areas of the lava beds are known to rest directly on the granite, or upon sediments derived directly from the granite.

Idaho has been a large producer of placer gold. It has at least a dozen important old placer camps, and they are confined almost exclusively to its granite formations. These camps have all been discovered since 1860, and have produced in the aggregate $250,000,000 worth of precious bullion.

The placer gravels of Idaho are proven to have ante-dated the Columbia and Snake rivers lava flows. All the outlying granite islands have proven rich in gold, and it is more than likely that large tracts of gold-bearing gravel have been covered up by the molten streams, and that future investigations may develop drift diggings equally as rich as some of the famous gravel beds already mined.

Next in importance as producers of precious metals have been the igneous intrusive rocks which traverse the granite regions of the State. These rocks abound in great profusion and variety, and among them there has been developed some remarkably rich and productive veins of gold and silver ore. The most notable districts in which these formations occur are Silver City and Delamar in Owyhee County, Atlanta and Rock Bar in Elmore County, and Bonanza and Custer in Custer County.

The veins of these three districts are contained in, or in contact with, intrusive igneous rocks and granite, and their aggregate production has yielded to the commerce of the world fully $100,000,000 worth of the precious metals since their discovery.

Flanking the shore line of othe great Archean land mass of Idaho, there is a remarkably well-developed series of Cambrian, Silurian and Carboniferous formations, which contain some of the most extensive and important deposits of the baser metals to be found anywhere in the United States.

The Coeur d'Alene district at present holds the palm over every other silver-lead district, but it is by no means secure in its position of leader. It is no exaggerated prediction for me to suggest that other silver-lead districts will be developed in the Paleozoic series of some of the eastern and central counties of the State that will in time equal, and perhaps surpass, the present magnificent record of the Coeur d'Alene in the matter of silver and lead production.

Copper ores also abound in great variety in several districts of the State in such quantity and under such geological conditions as to make a most favorable comparison with the principal copper-producing districts of the world. Among the most prominent districts may be mentioned the Seven Devils in Washington County, Lost River in Custer County, and Black Bird District in Lemhi County.

Active work of railway construction is at the present time being very rapidly pushed into these remote districts, and when they have been tapped and railroad transportation established, Idaho is destined to occupy a very prominent place in the list of copper-producing States.

GEOLOGY OF SOME OF THE PRINCIPAL ORE DEPOSITS OF LEMHI AND CUSTER COUNTIES.

The geological formations of these two counties are confined, with some very limited exceptions, to the Archean and Paleozoic formations, together with a great profusion of igneous rocks of all ages.

They are situated in the eastern central part of the State and are drained almost entirely by the Upper Salmon River, which rises in Sawtooth Range, near the south side of Custer County, and flows in a Z-shaped course 240 miles, passing out of Lemhi County at its junction with the Middle Fork.

A complicated system of high mountain ranges and deep rugged canyons, together with a few small intermountain valleys, character the principal topographical features.

The range systems embrace portions of the Rockies, Sawtooth and Big Lost River Mountains. The Salmon River Range, coursing north and south between the canyons of the main river and its middle fork, also two more important mountain uplifts, called the Little Lost River, and Birch Creek or Pahsimaori Mountains.

These last mentioned ranges originate west of the Salmon River and trend southeast roughly parallel with the main Rocky Mountain range for a distance of 150 miles, where they suddenly drop off in sharp hog backs or a succession of isolated buttes in the western edge of the Snake River desert.

These ranges carry numerous elevations of over 11,000 feet and rise very abruptly from the narrow valleys that intervene between them, and like all the other ranges of this region show extensive evidences of recent glacial action.

GOLD MINES.

About one-third of the area of Lemhi and Custer counties overlaps the eastern shore line of the great Archaen land mass of Central Idaho. To this strip of territory are confined three placer districts that have been large producers of placer gold, and are credited with an aggregate production of $20,000,000. The three principal camps being Leesburg in Lemhi County and Loon Creek and Stanley Basin in Custer County.

The bedrock of each of those three districts is a soft friable granite usually reticulated with dykes of igneous rock. These deposits were comparatively shallow and easily worked by primitive methods, and have been pretty well exhausted with the exceptioin of some quite extensive tracts of flat ground in Stanley Basin and at McNutt, near Leesburg, which are now being very successfully worked by dredging.

At Shoup, twenty miles north of Leesburg, on the rugged slope of the Salmon River canyon are located the Kentuck and Grunter mines.

THE KENTUCK.

The Kentuck carries a fissure vein in rather coarse blue granite. It has an east and west strike, and dips to the south at an angle of 45 degrees. The vein is from five to ten feet wide, of white quartz, well sprinkled with iron pyrites. It has been faulted by two vertical cross dykes of quartz porphyry, also by a parallel dyke of greenish diabase which pitches at a different angle. These faults were only slight and did not much interfere with the working of the vein, which has been developed to a depth of 800 feet by a series of cross cut tunnels driven through the hanging wall formation.

The property is equipped with a ten-stamp mill run by water power, and has produced $500,000. The ore yielded $5 to $20 per ton in free gold, and about an equal value in concentrates, which were allowed to run to waste in the Salmon River with tailings.

THE GRUNTER MINE.

The Grunter mine is on the same vein as the Kentuck, but a little lower down the mountain; its apex being only 500 feet vertically above

the river. This property has produced $50,000 in free gold which was worked out by a light five-stamp mill on the bank of the river just below the mine, where there is now piled up 3,000 tons of rich tailings.

The principal feature of this mine is a shoot of white quartz well sprinkled with iron pyrites. The vein is exposed for 400 feet in length to a depth of 100 feet, and is from ten to thirty feet wide, and in it there is blocked out at the present time 50,000 tons of ore that is said to carry an average value of $10 per ton. About one-half of this value can be recovered by free-plate amalgamation, and a high percentage of the balance by cyaniding.

ULYSSES MINE.

At Indian Creek, the Ulysses mine is being worked in a formation of crystalline schist. It is equipped with a five-stamp mill, which has been running steadily for the past eighteen months, producing a net profit of about $2,000 per month.

The vein is ten to fifteen feet wide and carries a contact dyke of gray quartz porphyry of the same width. It occurs east and west, and dips south at a very flat angle, and shows considerable evidence of faulting and disturbance. There is about 700 feet of tunneling on the vein. One of the tunnels exposes a continuous ore body of granular brown honey combed quartz, 250 feet in length, an average width of ten feet and an average value of $10 per ton; 70 per cent of which is saved on the plates, the balance going into the tailing pile for future treatment by cyaniding, to which the values yield easily.

The Ulysses contact can be traced for two miles in either direction to the east or west, showing a succession of ore shoots carrying the same class of ore and disturbed conditions throughout. Deeper development along this contact promises to open up a string of very valuable gold mines.

At Gibbonsville, 25 miles east of the Ulysses, the American Development and Mining Company is operating a group of mines covering a system of nearly vertical fissure veins in blue magnesian slate, filled with white quartz and massive arsenical pyrites. These veins are small but rich, and, although very much troubled with short faults, are persistently continuous with depth.

The average value of this ore is about $30 per ton, and selected lots run over $100 per ton. The company operates a ten-stamp mill supplied with frue vanners. It is run by water power, and the concentrates are treated with cyanide with good results. Their principal veins have been followoed down to a depth of 900 feet, and the mines have yielded gold bullion amounting to over $1,500,000.

ANDERSON GROUP.

Adjoining this property to the southwest, and covering a portion of the same system of veins, the Anderson group of claims is quite extensively developed, and has produced fully $250,000 in gold since its discovery, most of which was ground out with an arastra. A few shipments of rich concentrates have been made to the Butte smelters.

There are several other interesting producers of the same class of ore in the vicinity of these mines, and Gibbonsville has been a steady contributor to the world's wealth for a number of years past. The pay veins of this district are intersected by two vertical dykes of igneous rock, one of which is diorite and the other one quartz porphyry.

THE ORO CACHE MINE.

The Oro Cache mine, situated at the head of Carmen Creek, 15 miles from Salmon City, is opened on a steep, pitching fissure in white Cambrian quartzite. The vein is five feet wide and filled with shattered granular quartz and talcy gangue worth $5 per ton. It courses east and west and dips north at an angle of 60 degrees, and has been located upon its course for a mile on each side of the continental divide.

The Oro Cache is on the Idaho side, and has been developed by

a succession of adit tunnels driven on the vein, one of the lower ones being 900 feet long and gaining a face depth of 600 feet, at which point the ore is still completely oxidized and free. This property offers a fine example of economical mining and milling practice under most adverse conditions.

It is equipped with a ten-stamp free-gold mill, run by steam power. The mill is situated at an elevation of 9,000 feet in a narrow gulch between two high mountain peaks, where the snow actually averages ten feet deep for six months in the year. The mill has been run steadily for two years past, and the total average cost of mining, tramming the ore 1,100 feet and milling it, including all expense of repairs and management, has been one dollar and seventy-five cents per ton in making an average saving of 80 per cent of the assay value of the ore.

THE SHOO FLY MINE.

On the opposite side of the Salmon River from this mine, and right on the summit of the Leesburg Range, there is located a very interesting gold mine that produced some remarkably high grade gold bullion. It is called the Shoo Fly, and consists of a mass of loose boulders of granular quartz of all sizes up to twenty feet each way. These boulders were all located on about two acres of ground. They were broken up and worked in a five-stamp mill and yielded $130,000 in bullion at an average rate of thirty dollars per ton. When properly cleaned the gold from this mill minted for $19.75 per ounce. A vein was found beneath where the float boulders were thickest that contained the same character of quartz, but not quite so high grade. It was contained in a formation of siliceous slate with talcose cleavages very near a granite contact. This vein was followed down about 100 feet to where it was cut off by a dyke of rhyolite, when its further development was abandoned.

THE YELLOW JACKET MINE.

The Yellow Jacket mine, situated on Yellow Jacket Creek, 50 miles west from Salmon City, is developed on a large vein of granular quartz ten to forty feet wide, following the bedding of a quartzite schist that is intersected by eruptive dykes of altered diabase and syenite. It strikes northeast and dips northwest at an angle of 35 degrees.

The average ore mills about $7 per ton, but the vein carries lens-shaped shoots of ore worth $20 to $30 per ton. Some very rich blocks of copper ore have been found occasionally in the working of this mine, chiefly high grade red oxides, sprinkled with native copper.

This property is equipped with a sixty-stamp mill, and has a tailing dump containing ten thousand tons worth $10 per ton gold.

THE COLUMBIA HILL MINES.

The Columbia Hill mines, a mile or two southwest from the Yellow Jacket, appear to be a series of zones of highly fractured material in width from a few feet up to seventy-five or a hundred feet, that course northeast and dip 30 to 90 degrees west.

The foot walls are frequently syenite or diorite; while the hanging walls may be either shattered quartzite, quartz porphyry or some other eruptive rock. The eruptives generally parallel the veins in strike.

There are three groups of claims covering these zones on their strike, owned respectively by Governor Hunt, the Armstead Mining Company, and by Mr. Dan Steen of Boise.

These properties have considerable development, in all of which the oxidized surface ores rapidly change to copper iron pyrites, which make a rich concentrate ranging in value from $100 to $150 per ton in gold, silver and copper, and the future of this district, as an important producer of copper-gold ores is established beyond question.

THE SINGISER MINE.

Ten miles south of Yellow Jacket on Silver Creek, there is a district that shows evidence of intense volcanic activity, in the center of

which is located the Singiser mine, which is developed on a vein of brecciated quartz and porphyry conglomerate cemented with silicia. The vein is thirty feet wide and is said to carry an average value of $12 per ton in gold and silver. A pay streak that usually follows the foot-wall is from one foot to six feet wide, and carries an average value of $60 per ton. The proportion is about 60 per cent gold and 40 per cent silver. Specimen ore occurs occasionally that runs several thousand dollars per ton, the only mineral shown in the ore being finely disseminated sulphurets of silver and iron. The vein is in a contact of bluish gray trachyte and white rhyolite tuffa. The weathered surface of the trachyte resembles phonolite and has the same ring.

Mixed with the placer gold gravels of Silver Creek and a parallel stream called Panther Creek there is found a considerable sprinkling of high-grade stream tin, the amount running as much as one pound of 60 per cent tin stone to the cubic yard of gravel in some of the pits. The source of this mineral is probably in a wide belt of rhyolite tuffa that crosses the course of both these streams, as no tin ore has been found above that point.

GEM OPALS.

In this same vicinity some very beautiful specimens of gem opals have been found in boulders of gray trachyte. They were of the hydrophane variety and were valued at $10 per carat.

YANKEE FORK DISTRICT.

South of Singiser about 25 miles, in Custer County, following a succession of igneous outbursts that pierce and overflow the gray and pink granite of the region, we come to Yankee Fork Mining District, which is entirely occupied by igneous formations, including rhyolite, trachyte, andesite, quartz-porphyry, diorite and syenite with their accompanying tuffs and breccias.

A great system of fissure veins, of which the General Custer Mine is the central feature, traverse the formations of this district in an east and west direction.

THE GENERAL CUSTER VEIN.

The General Custer vein dips north at an angle of 50 degrees. It is from ten to thirty feet wide, and cuts the bedding planes almost at right angles, of a heavy series of blue syenite porphyry and rhyolite.

The main ore shoot of the General Custer was found exposed with the hanging wall formation slipped or scooped off to a depth of 400 feet. The ore thus exposed was ten feet wide and very rich, supplying the company mill at the foot of the mountain with twenty-five tons of ore per day for months at a time, and which gave average battery samples of $300 per ton in gold and silver. At 500 feet depth this ore shoot in its downward course passed from a syenite porphyry into a sandy rhyolite, where the vein widened to thirty feet, and the values faded so low as to be unprofitable to work. The bedded edges of the same syenite porphyry are well exposed below the rhyolite, and if the vein is followed on down a few hundred feet into that formation again its rich values may be resumed. The General Custer vein has produced gold and silver bullion to the value of $9,000,000.

THE LUCKY BOY MINE.

On another parallel fissure vein, 600 feet southeast of the General Custer in the same blue syenite porphyry, the Lucky Boy Mine has been developed to a depth of 800 feet. This property is being very successfully operated at the present time. The vein is four to eight feet wide of white quartz, carrying an average value of twenty dollars per ton, mostly gold, and the ore shoots show greater strength and better quality as the vein is followed down.

This mine has yielded $1,600,000, and has a very promising future, as only a very limited section of the known lateral extent of the ore bodies has been explored.

THE BADGER, LITTLE GIANT AND BLACK MINES.

The Badger, Little Giant and Black mines are each opened on a separate fissure vein, belonging to this same system; they have the same general course, dip and inclosing formation, and each has considerable development. The three have an estimated production of near $1,000,000.

A magnificent tunnel site is offered by the canyon of Yankee Fork. If a tunnel was started near the Lucky Boy mill and extended southeast for a mile and a quarter, it would cut this whole system of fissure veins at vertical depths from 1,500 to 1,900 feet below their apexes, and afford a very convenient avenue for their further exploitation.

THE CHARLES DICKENS MINE.

The Charles Dickens mine is situated southwest of the General Custer about one mile, on nearly the same strike and dip. It is contained in a formation of andesite and quartz-porphyry, and has been developed to a depth of 250 feet. This mine was famous for the production of very rich specimens of blended wire silver and wire gold. It has a bullion record of over $1,000,000, and made several small shipments of ore that were paid for at the rate of $10,000 per ton.

ESTES MOUNTAIN MINES.

These properties are situated seven miles west of Bonanza and Custer City, on the east slope of Estes Mountain. They cover another large system of fissure veins, that course north and south and dip west at angles varying from 30 to 80 degrees. The inclosing formations of this system of fissure veins are varied. The Yankee Fork and Golden Gate mines are in a contact of cream-colored felsite on the hanging and a dark green diabase footwall.

The Montana vein is in the fine-grained felsite rock, both walls, and the Arcade vein, above the Montana, is in a contact between a coarse rhyolite and a blue clay dyke 100 feet wide, heavily impregnated with bright iron pyrites.

The Montreal mine on this system is a mineralized zone fully 600 feet wide, consisting of siliceous porphyry conglomerate, which is said to carry good pay values in gold throughout its entire width. It also contains defined shoots of clean quartz worth $20 to $30 per ton. Active development is in progress on thi mine, and its equipment with a 100-stamp mill is one of the probabilities.

GOLD-BEARING MINERAL SPRING.

While not quite as rich as Mark Twain's famous gold-bearing spring of Calistoga, there is in fact on the lower edge of this great zone a live spring of iron water that has deposited a great bed of boggy iron precipitate.

The spring has been conducted through a wooden trough into a big tub. The tub fills up with the rusty iron sediment in a few months and has to be cleaned out. By careful handling a few filmy crystals of bright native gold can be panned out of this sediment, and an assay of the material shows it to contain an average value of about $13 per ton.

Mining development in this section has been carried to a very limited extent. That on the Montana is the deepest. It has an inclined shaft which was put down on the original discovery ore shoot to a depth of 518 feet. From this shaft was taken $535,000, of which $325.000 was net profit.

The run of the mine showed about an equal proportion of gold and silver, but the richest ore was a black argentite. There were several twenty-five and fifty-ton lots of ore shipped from this mine that were paid for at the smelter at the rate of 50 cents per pound.

THE YANKEE FORK MINE.

The Yankee Fork Mine, adjoining the Montana, has several hundred feet of shallow tunnels driven on the vein, which is four to six feet wide; carrying an average value of $30 per ton in gold or silver, its

best strength and values are shown in the lowest level. The high-grade shipping ore of this mine runs to ruby silver and copper sulphides, carrying values of from $500 to $10,000 per ton. This mine has produced $200,000. It is being actively developed at the present time, and is turning out some remarkably fine ore in which copper values are commencing to cut quite an important figure as depth is attained.

There are a dozen other fine claims on the Estes Mountain system, all of which carry high-grade gold and silver values. They promise to develop some very valuable mines.

The Yankee Fork District is accessible by a good wagon road from the railroad terminus at Ketchum, Idaho, 75 miles distant.

AN IDAHO CRIPPLE CREEK.

Stanley Basin, situated 20 miles southwest of Yankee Fork, has some geological resemblance to Colorado's famous gold camp. It is a high mountain basin, 7,000 feet above sea level, near the foot of the great Sawtooth Range.

It presents a condition of broad flat gulches and low rounded grassy hills made up of soft crumbling mineral-stained granite. The whole surface of the basin is covered with a light glacial debris, all of which carries placer gold. In some of the gulches very rich pay streaks have been found, which yielded an occasional boulder of very rich free gold ore, also heavy chunks of cinnabar, and rough sapphires have been found in the sluices.

The district is ribbed up with great dykes of quartz porphyry and diorite and is dottted with conglomerate buttes of similar igneous material. Numerous veins of curly agate quartz occur, some of them richly impregnated with green and purple fluorites and banded streaks of honey combed quartz, carrying values of from $50 to $75 per ton in very fine rusty gold, pointing to a source from tellurium compounds.

Near the head of some of the best placer gulches rocker diggings have been followed up to and into several of the big dykes of quartz porphyry; the joints and cleavage planes of which were found to be rich in coarse free gold, producing occasional specimens that would assay several thousand dollars per ton.

An open cut, fifteen feet long, ten feet wide and ten feet deep, was made in one of these dykes, from which three tons of talcose screenings were obtained that yielded ninety dollars per ton when run.

EAST FORK MINES.

The canyon of East Fork of Salmon River is cut through massive eruptive formations almost its entire length of 45 miles, that rise in great mountain masses on either hand to elevations 8,000 to 9,000 feet. These formations consist of andesite, trachyte, rhyolite, with dykes of basalt and great masses of tuff and breccian, and it is only in the rugged aggregations of still higher mountain peaks among which this stream takes its source that the metamorphis formations appear.

The East Fork Mountains carry some of the loftiest peaks in the State. Standing on a known elevation of 10,250 feet at Croesus Peak, Castle Mountain, seven miles distant, seems to tower to a sharp pyramid point fully 3,000 feet still higher, and is probably the highest mountain in Idaho. It has only been scaled by one man, Mr. Ed. Chamberlain, the present sheriff of Custer County, who had a very perilous experience which he has no desire to repeat.

Most of the higher summits are rusty, red-stained granite, probably of igneous origin; but some of the peaks, over 10,000 feet high, are capped by several hundred feet of white silurian marble and thin bedded blue lime. These altered sedimentaries are cut by small fissure veins of high-grade lead-silver ore, that carry good gold values.

The J. D. Wood group of mines in these formations have yielded $500,000. The ore had to be packed on mules, 50 to 75 miles, and it contained an average value of over 50 per cent lead, 150 ounces silver and $20 gold per ton.

There are a number of other mines carrying this class of ore, also some great bodies of concentrating lead ore with good, noble values in the same vicinity.

In the granite formations of the higher peaks of basins of this district there are numerous mammoth fissure veins of honey combed quartz, carrying good pay values in free gold.

The district is well watered and timbered, and offers fine natural advantages for rapid development. It will well repay an investigation by either the prospector or the capitalist.

SILVER MINES.

The largest producers of silver ore in Custer County have been the mines of Bayhorse district.

The canyon of Bayhorse Creek, which enters the Salmon River 12 miles above Challis, cuts the formations of the Salmon River at right angles to their trend, and presents ideal geological conditions for the occurrence of rich ore bodies, which are in fact here found.

Commencing with the granite axis of the main divide, between the waters of Yankee Fork and the main Salmon River, the district is overlaid with a heavy bedded series of Cambrian quartzite, and above the quartzite, folded, faulted and intruded by great dykes and masses of igneous rocks, is a wide belt of dark metamorphic slates; leaning on the slates is a series of blue, gray and dolomitic limestone, 700 or 800 feet thick. Overlying the lime belt is another series of slates and shales, then two miles of foothill formations, consisting of dykes, beds and bosses of andesite, basalt, breccia and tuffs.

THE RAMSHORN MINE.

The Ramshorn mine is opened in the slate formation. It is a true fissure vein that courses due north and south and dips west at an angle of 50 degrees, cutting the bedding of the slates and includes igneous rocks at a sharp angle. It has produced $2,000,000 to date, and has at the present time $3,000,000 worth of ore blocked out.

The mine has been opened by a series of adit tunnels or drifts, started and driven on the vein as it courses down the precipitous slopes of the canyon. The longest tunnel is in 3,000 feet, and has gained a face depth of 2,000 feet, and shows a succession of handsome ore shoots throughout its entire length. This tunnel is still 500 feet vertically above the bed of the canyon.

The gangue of the Ramshorn is nearly clean siderite (spathic iron), sprinkled with gray copper and chloride of silver, and it is from one foot to six feet wide.

The average ore runs about 100 ounces of silver and 5 per cent copper. Pay streaks six to eighteen inches thick of clean gray copper occur that run 1,000 to 1,200 ounces of silver and 20 per cent copper.

This mine has between 30,000 and 40,000 feet of open development, and it is being put in condition now for active production, which is to commence as soon as the new Salmon River Railroad shall have advanced sufficiently near to justify it.

THE SKYLARK MINE.

This mine adjoins the Ramshorn on the west. It is also a true fissure vein in the same formation, but has not so steep a pitch, and courses a little east of north, intersecting the Ramshorn vein at a point near the summit of Ramshorn Mountain, 10,000 feet above the sea level.

The character of the ore, size of the veins and values are almost identical in the two mines. The Skylark is also opened by a series of adit tunnels, and has over 20,000 feet of connected underground development. It has produced $2,700,000, and has a larger showing of high-grade ore in its lowest level at the present time than ever before in its history.

REDEMPTION GROUP OF MINES.

At Poverty Flat Mountain, 10 miles south of the Ramshorn and Skylark, in the same slate belt, the Redemption group of mines have a flat pitching fissure vein which produces the same class of silver chloride and gray copper, and is credited with a production of silver bullion,

estimated at $700,000, all of which has come from the first 150 feet of vertical depth in the mine.

LEAD-SILVER ORES.

This class of ore has been quite extensivelyy produced by the mines in the limestone belt in the immediate vicinity of Bayhorse, three miles below the Ramshorn mine. The limestones at this point have been excessively fractured, faulted and silicified. They are apparently devoid of igneous intrusive rocks in the immediate vicinity of the mines, with the probable exception of two nearly horizontal dykes of white quartz porphyry, or porphyrite, that issue directly from underneath the blue lime bluffs at the mouth of the canyon below the town; their actual contact being obscured by about 100 feet of debris.

If these great dykes of porphyry should prove to be intruded into the lower blue limestone, this district may develop the same character of great bedded ore deposits for which Leadville was so famous.

THE BEARDSLEY EXCELSOIR MINES.

The Beardsley Excelsoir mines at Bayhorse were opened on a nearly vertical fault fissure which cut the horizontal blue and gray limestone in a northwest and southeast direction.

The principal feature of this property was a bonanza ore shoot, 100 to 200 feet long and one foot to 20 feet wide, that was filled with high-grade sand carbonate ore, running 60 per cent lead, 60 ounces silver and a small amount of gold and copper.

The silver was largely in the form of chloride, and the copper a carbonate stain that increased with depth. This main ore shoot was followed down 500 feet, and produced 1,500.000 ounces of silver, together with about 1,500,000 units of lead. At 500 feet deep the rich ore body expanded into a mammoth shoot 50 feet wide and 400 feet long, of ore containing about 5 per cent lead and 5 ounces silver. When this stage of development was reached silver dropped so low that the further exploration of the mine was abandoned.

THE DEMOCRAT VEIN.

On Silver Brick Mountain, one-half mile south of the last-mentioned property, the Democrat vein is a well-defined fissure, four feet wide, that courses northwest and southeast, pitching steeply to the east. The gray lime wall of this vein is very silicious, and the vein is filled with a gangue of brecciated lime spar and quartz and makes strong shoots of very rich ore.

This mine is now producing about a carload of ore a week that averages 50 per cent lead, 100 ounces of silver, 4 per cent copper and $3 in gold per ton. The necessary labor is all done by two men. There are also cross courses cutting the main fissure at intervals of two to three hundred feet, which have been productive of quite a large tonnage of the same class of ore.

The Democrat fissure courses through an adjoining mine called the Pacific, in the workings of which there is a fine body of a like character of rich ore exposed. The Pacific group carries also a large flat vein, five to ten feet wide, of brecciated gangue well sprinkled with pebbles, kidneys and boulders of high-grade galena, as well as rich carbonate ores. It is worked by lessors, and has seven carloads of ore on the dump at the present time. This ore, which is now ready for shipment, will sample 65 per cent lead and 90 ounces of silver per ton.

RIVER VIEW MINE.

Southeast of the Beardsley Excelsoir, the River View mine is extensively developed. It is a steep, pitching fissure, cutting the bedding planes of the lime. It has produced lead-silver ore to the value of $500,000, mostly massive galena with high silver values and about 5 per cent zinc.

The development of the mines in this last-mentioned lime belt is all comparatively shallow and they offer exceptional inducement for deeper exploration. They have been held back by lack of railway trans-

portation, a condition likely to be soon relieved, when this district will doubtless again become an active producer of high-grade smelting ore.

CLAYTON DISTRICT.

Just above the town of Clayton, 20 miles south of Bayhorse, the Salmon River cuts at right angles through a great anticline of heavy bedded Cambrian quartzite, which courses north and south and forms a high dividing ridge between Kinnikinick and Squaw creeks. It is flanked on its east and west slopes by steep, pitching strata of silicious slate, blue lime and gray lime shale, that are intruded with dykes of greenstone and a variety of recent igneous rock which very much resemble the monzenite of Tintic, Utah.

THE ELLA.

Following the lime quartzite contact on the east slope, the Ella mine has been opened on a vein of brown hematite ore, five to ten feet wide, that can be traced almost continuously for 10,000 feet. The general average of these croppings carries from five to fifteen ounces of silver, and there have been several fine bodies of rich lead ore opened up in shallow development along the course of this vein. The principal ore body worked was a pipe of steel galena, sprinkled with gray copper, that was followed down to water level and produced 2,000 tons of ore that averaged 200 ounces of silver and 60 per cent lead; and explorations now being carried on in this mine below water level are turning out a very handsome quality of ore that runs high in copper and silver values.

THE RED BIRD.

On the west slope of this anticline, the Red Bird mine is developed on a zone of blocky, brecciated blue lime. It consists of a succession of pipe-shaped shoots, or geyser holes, filled with rich galena and lead carbonate mixed with soft limonite iron. It is a very remarkable and interesting deposit. The pipes of ore sometimes round, sometimes oblong, of various sizes from ten feet in diameter to thirty by sixty feet. They usually stand at a high angle, but are very erratic, and are liable to flatten off and reverse their pitch in a very irregular manner, but they have been persistently continuous in depth. In fact several blind shoots have been developed in the mine that did not come to the surface.

The Red Bird is developed to a depth of 400 feet by short crosscut tunnels driven through the gray lime shale of the hanging wall, and these ore bodies can be opened in the same manner to a further depth of 400 feet.

From the surface to the 400-foot level this mine has produced $700,000, and it has reserves left above this level amounting to $300,000 more. Great bodies of clean galena are occasionally met with that run 65 per cent lead and 90 to 175 ounces of silver per ton; but the average run of the ore mined is about 30 per cent lead and 30 ounces of silver. Everything under 10 per cent is sorted out and thrown over the dump, or, where convenient, is left standing in the mine.

MINERAL SPRINGS.

The Red Bird ore shoots and contact can be traced along the side of the mountain for several miles. The lime contact is well exposed in the steep walls of the Salmon River canyon, four miles south of the mine at Sullivan's hot springs, where there has been a neat little hotel and bathing resort built up. These springs issue directly from a large shoot of soft carbonate of iron and lime spar containing a little lead and silver, and they are only fifty feet above the river and fully 1,000 feet lower than the Red Bird mine. The springs may be of considerable interest as indicating the origin of these ore bodies. Their waters are highly charged with sulphur and are constantly depositing a tufaceous residue that contains pronounced specimens of all the usual gangue minerals found in the ore deposits of the vicinity.

MINERALIZED WOOD.

Another striking evidence of rich ore in solution was found at the Livingston group of mines on Slate Creek, fifteen miles southeast of Clayton. Near the croppings of one of the veins of this group there were found several tons of stumps and roots of mineralized wood, showing all the grains, knots and fiber of a fir tree. This unique ore was shipped to the smelter and sampled at the rate of 50 per cent lead, 60 ounces of silver and $5 per ton gold.

The Livingston mines consist of two systems of flat fissure veins in a series of black or dark colored carboniferous slate, and quartzite beds that have been intersected with dykes of rhyolite and birdseye porphyry. These veins are from six inches to ten feet wide. The wider veins run 50 per cent to 60 per cent lead and about 20 to 50 ounces silver and $5 gold. The smaller veins strike at a little different angle and carry very much higher values. Several shipments have been made that returned 250 ounces silver, $25 in gold and 60 per cent lead per ton. They are quite well developed and have about $200,000 worth of shipping ore in sight at the present time, awaiting better transportation facilities.

AN EMBARRASSED INDUSTRY.

Since the fall in silver values, the lead-silver producing districts of Custer County have been seriously embarrassed for want of cheap transportation, and a large number of them have been practically abandoned for several years. This is especially true of Seafoam, Sheep Mountain, East Fork and Big Lost River districts, each of which contains very expensive bodies of rich concentrating lead-silver ores that will in time justify the establishment of large mining enterprises.

RICH LEAD DISTRICT IN LEMHI COUNTY.

One of the richest bodies of lead ore ever mined in the State was found in the Viola mine at Nicholia, in Lemhi County. It was contained in a contact between a great series of white quartzite and overlying blue lime beds, pitching east, and unconformable to the granite axis of the main range of the Rockies. This great ore body coursed north and south. It was 1,200 feet long and about 200 feet deep on the dip, and 5 to 70 feet thick. The ore was nearly all clean sand carbonate, and averaged 60 per cent lead and 12 ounces of silver per ton. It was worked out in about three years of active production, and yielded lead and silver to the value of $10,000,000. This great ore body was exhausted during the Cleveland administration, when lead values dropped so low, and the further exploration of the mine beyond the shallow depth of 300 feet was discontinued; and nothing has since been done except the gouging out of remnants of the best ore by lessors.

THE CLIPPER MINE.

This property adjoins the Viola on the same contact. It contains a mammoth body of soft brown ore, that has been developed for a length of 400 feet, a depth of 200 feet and a width of 250 feet. This great mass of mineral is said to carry an average value of 5 per cent lead, 5 ounces silver and 50 cents gold per ton. The lead is disseminated through the soft iron in the form of fine sand carbonate, and it is more than likely that exploration of the body to greater depth will open up other large bodies of concentrating lead ore.

SPRING MOUNTAIN AND BANNISTER DISTRICTS.

On the opposite side of the valley of Birch Creek from Nicholia, the Birch Creek range of mountains, composed almost entirely of paleozoic and igneous rock, rise in a succession of bare, rocky peaks, trending in a southeast direction parallel to the main range, some of which exceed 11,000 feet in height. A section of this range between Spring Mountain and Bannister has been subject to great dynamic disturbance, faults, folds and flexures of the strata occurring in rapid succession for fifteen miles along the east slope of the range, together with great bosses and dykes of grano-diorite and quartz porphyry. The limestone beds of this

district, exposed by faults, show a development of 5,000 feet in thickness. There are some very handsome lead-silver properties in this district. The veins occur as bedded deposits in the lime, also as true fissures cutting the lime, also as contact deposits with the lime and porphyry, or lime and quartzite. The richest values seem to favor the blue lime beds. The shipping ore of this district runs about 50 per cent lead, 50 ounces silver, $3 gold and 3 per cent copper. The district has probably made a total production of 10,000 tons of ore of that grade. Several of the mines are producing ore now of such quality as to justify hauling by wagon freight 85 miles to Dubois to be shipped to Denver for treatment. The gold and copper values in these ores are a very interesting feature.

BRUCE MINE.

The Bruce mine, in the center of the Spring Mountain district, is located on a body of high-grade magnetic iron ore, that is 300 feet long and 100 feet wide, and is said to carry an average value of 3 per cent copper and $2 in gold and silver. This body of ore lies between white dolomite and greenish gray diorite. On an adjoining claim the same contact carries a smaller body of similar iron containing 20 per cent copper and $10 gold per ton. There are quite a number of similar prospects in this vicinity, and it is more than likely that a rich copper gold-bearing zone may be developed along this belt.

COPPER DISTRICTS.

Two of the most promising new copper districts are situated in Lemhi and Custer counties, which are attracting the attention of some of the wealthiest and most conservative of Eastern investors at the present time.

The Blackbird Copper district is situated 30 miles west of Salmon City, the county seat of Lemhi County. Blackbird Creek, on which the principal mines of the district are at present located, is a small side tributary of a large mountain system called Big Creek. (Misnamed Napiers Creek on the recent government map.)

This district was discovered in 1893, and since then there has been fully 1,000 locations filed with its deputy recorder.

The general course of the copper-bearing belt is north and south, parallel to and about half way between the summit of the Middle Fork range and the bed of Big Creek canyon.

There are several deep canyons and larger tributary streams putting into Big Creek from the west that cut the formation at right angles to their trend and expose an excellent cross section of the geology of the district.

She Big Deer Creek canyon cuts the belt at about its center and following up the course of this stream west from its junction with Big Creek, the first two miles of formation passed through is coarse granite; the bedding of which stands nearly vertical but it pitches a little west up stream, contains great shear zones and larger fissure veins of quartz and gosson iron ore that show fair copper gold values at the surface.

The granite is overlaid with about half a mile of gneiss well sprinkled with iron gainets and also containing numerous fissure veins. Above the gneiss are several mines of steep pitching dark quartzite and micucous schists that extend nearly to the summit, where they are succeeded by lighter colored quartzose formations.

The whole series have been very much disturbed but the general strike is north and south and dip very steeply to the west.

Great dykes of diorite, rhyolite and quartz porphyry occur throughout the entire district. They usually follow the general strike and pitch of the formation or run in contact with the ore courses.

The principal development of this district is on the property of the Blackbird Copper Gold Company. This company owns the Brown Bear, St. Joe and Uncle Sam groups.

Covering a connected area of about 800 acres of patented lode claims, th ore deposits of the Blackbird district are of two classes, impregnation zones of great width, that follow the general strike and dip of the wavy schists, also typical fissure veins that cut the bedding of the schist or granite formation at a sharp angle.

The Brown Bear mine is developed by a shaft 300 feet deep from which levels and crosscuts have been run at each 100 feet drop.

The crosscuts from the mine show a zone of black quartzose mica schist 100 feet wide, impregnated with thread kidneys, bunches and lenticular masses of copper iron pyrites, and carry an average value across its entire width of 5 per cent copper and $2.50 in gold.

The ore of this quality already developed in this mine is estimated at 400,000 tons. It concentrates to excellent advantage, and with railroad transportation should show a handsome margin above cost of mining and reduction.

The St. Joe mine, 2,000 feet south of the Brown Bear, is developed by a vertical shaft 150 feet deep on a nearly vertical fissure vein that has been drifted on 100 feet to the north from the 150-foot level.

The walls of this vein are also dark, sandy mica schist, and the vein from the 50-foot level to the face of the present north drift at the 150-foot level is from 6 to 12 feet wide of massive copper iron sulphide ore sprinkled with a little quartz and spathic iron. This ore averages about 8 per cent copper and $4 gold per ton.

The St. Joe shaft is equipped with a fine hoisting plant, and preparations are now being made to sink it 500 feet deeper as it is centrally located and offers excellent advange for developing the adjoining mines of the company.

The Uncle Sam mine is opened on another fissure vein, which parallels the St. Joe to the east. It has about 1,000 feet of adit tunnels and contains the richest ore in the camp.

The upper tunnel of the Uncle Sam is 300 feet long and exposes two handsome ore shoots. The first one is 50 feet long and about 2 feet wide of blue bomite ore, containing an average value of 30 per cent copper and $29 in gold. The second shoot is 150 feet long and 3 to 6 feet wide of massive sulphide ore worth 16 per cent copper and $8 gold per ton. These two shoots are connected by a narrow vein of the same class of ore, four inches to a foot wide.

The lower tunnel of the Uncle Sam mine has been run in 700 feet and it follows the course of the vein for 500 feet, which shows a continuous paystreak of bright chalcopyrite, 4 inches to 4 feet thick, worth 16 per cent copper and $8 gold. This tunnel is 200 feet vertically below the upper tunnel, but has not been extended in far enough to undercut the big ore shoot exposed above.

The Uncle Sam mine carries a parallel dyke of mica hornblende diorite 40 feet wide, and 100 feet east of the vein the walls of this dyke are both impregnated with rich copper ores, and crosscutting in depth may reveal some rich contact ore bodies.

West of the Big Brown Bear ore zone, at a distance of 800 feet, the Katherine vein, owned by the same company, has been cut at a vertical depth of 100 feet, exposing another parallel fissure that pitches directly opposite to the bedding of the schist. It is nine feet wide, of granular quartz, worth about 9 per cent copper and $6 gold per ton.

The surface croppings of most of the veins and ore-bearing zones of the Blackbird district is usually a sprinkling or solid mass of sandy brown honeycombed quartz. This oxidized condition changes to sulphide ore at depths varying from 20 to 150 feet below the surface.

The ore shoots in the fissure veins lenzy but large, and so far have proven very strong and held their size and value going down. With the big zone deposits, it is simply a question of finding the ore sufficiently concentrated to pay to work. There is no scientific reason why their values should not go down indefinitely.

The Brown Bear zone has been followed north along its course through the Daisy group to the Blue Bird and Tinker's Pride mines, on the opposite side of Big Deer Creek canyon, three miles distant, where the same character of sulphide ores are found within 50 feet of the surface.

At the Tinker's Pride mine the zone is 300 feet wide and is well sprinkled with copper mineral throughout its whole width, with bands of high-grade sulphide ore cropping through to the surface. These croppings are 2,000 feet vertically below the Brown Bear shaft. The foot wall of the zone at this point is only 200 feet west of the gneiss or granite contact and its hanging wall is a huge dyke of rhyolite.

Copper sulphide ores can be found scattered through the schist formations of this district for miles in width and are sufficiently con-

centrated at several points to indicate some enormous reserves of pay ore. This is especially true of the Copper Queen, Jefferson, Hawkeye, Lone Star and Rainbow group.

The Blackbird district is very extensive in a north and south direction. Rich sulphide ores are found in big fissure veins that cross the Musgrove Creek canyon, ten miles south of Blackbird Creek, while north the belt has been followed 15 miles to Clear Creek, where a number of surface prospects have produced rich specimens of bomite and red oscide ore, some of them showing great slatters of wiry native copper.

Nearly all the ores of this district carry low silver values, but proportionately high gold values. The average for the whole district will run about 50 cents in gold for each unit of copper.

There are a number of other copper districts in Lemhi County of considerable promise.

The Torney group of mines on Shoup Creek, six miles southwest of Salmon City, has several hundred feet of development on a contact vein, 2 to 10 feet wide, that courses eastward and dips north at a steep angle in walls of quartzite and porphyry. This vein carries oxides of iron and copper at the surface, that pass into sulphide at 100 feet deep and carries average values of from 5 to 25 per cent copper and about $10 gold and silver per ton.

The Copper Queen mine at Agency Creek, 30 miles east of Salmon City, has shipped a dozen carloads of bomite ore worth 20 to 30 per cent copper and $20 to $30 gold and silver from a well-defined contact vein in wall of crystalline slate and diorite. This mine is noted for occasional rich specimens of native gold set in soft copper sulphide.

The old Paymaster and Valley View mines at Birch Creek have produced several hundred tons of red and brown oscide ores, well sprinkled with native metal and carrying an average value of 30 per cent copper from a flat contact vein with walls of blue lime and red quartzose sandstone.

There are numerous other fine evidences of copper mineral throughout Lemhi County. Great croppings of gosson iron ore occur at several points well sprinkled with oscide and carbonate of copper and light values in gold and silver. This is one of the best watered and timbered sections of the State, and with the rapid advance of the Oregon Short Line's new branch line from Blackfoot, some important copper mining developments may be anticipated in the near future.

THE WHITE KNOB COPPER MINES.

This property is situated near Houston in Custer County, Idaho, 95 miles northwest of Blackfoot, from which point a new branch of the Oregon Short Line Railroad is being constructed and is to be completed by October 1, 1901.

The high mountain range in which these mines are located forms to the south the watershed of Wood River and to the northeast that of Big Lost River.

The range is an anticline with a core of gray granite, overlaid with quartzites, slates, conglomerates, calcareous shales and limestones, and carries a succession of very lofty peaks, among them being Mount Hyndman, 12,000 feet, and White Knob Mountain, 11,500 feet above sea level.

The mines of the White Knob Copper Company in contrast with the Blackbird district more resemble in geological setting the big copper bonanzas of Arizona.

They are situated on the northeast slope of White Knob Mountain, half way between the summit and the valley of Lost River, in a series of pure lime and a sandy calcareous rocks interbedded with thin dykes of quartz porphyry, the whole resting on a base of eruptive gray granite and pitching at an angle of about 45 degrees towards the valley.

The most conspicuous features of the deposits at the surface are great shoots of brown hematite and spongy gosson iron ore, 30 to 60 feet wide, running 3 to 6 per cent copper and several dollars in gold and silver. Interspersed between these bodies of iron and especially along the contact line, the sedimentary beds overlying the granite are richly impregnated with copper carbonate and oxide ores over an irregular area fully forty acres in extent.

This great surface deposit of copper mineral has been developed by

several thousand feet of open cuts, quarries, shallow shafts, drifts and tunnels, and the mineralization has been found to extend down from 50 to 200 feet, exposing, according to conservative estimates of parties fully competent to judge, fully 1,000,000 tons of copper ore, worth an average value of 5 per cent copper and $5 per ton in gold and silver.

For the permanent development of this property, a vertical shaft has been sunk 700 feet deep near the granite contact and a cross-cut driven from the bottom to the vein at a point under the big iron hat, where it is currently reported that a great body of high-grade sulphide ore has been encountered.

The mines are equipped with a 50-ton smelter with which, under the management of Mr. John L. Evans, of Baltimore, one of the most competent copper metallurgists in America, some very elaborate test runs have been made, and with an unlimited quantity of the purest kind of fluxing material right on the ground. These low grade ores were found to yield a very high percentage of their value to direct smelting.

The only problem left to be settled for their profitable handling was that of getting the rates on the necessary coke fuel reduced from $32 per ton by wagon freight, to ordinary railway rates.

This is rapidly being solved by the construction of the Short Line branch from Blackfoot.

The White Knob Copper Company is headed by Mr. John W. Mackay of Comstock fame. This company owns a very extensive tract of proven rich copper, gold and silver-bearing territory. They have let a contract for the erection of a smelting plant of 500-tons daily capacity, which is now under course of construction, and within a few months they promise to become very active producers of copper bullion well seasoned with noble values.

South of the White Knob mines, higher up the mountains, on a contact of white dolomite and granite, the Baker Claim is a new discovery, showing a ten-foot vein of high-grade magnetite, associated at shallow depth with rich blue copper sulphide ore and high values in gold and silver.

In the Rio Grande gulch, immediately adjoining the White Knob Company's property, to the southwest, there are a number of fine copper prospects, carrying the same class of ores in the same general formation, and this belt can be readily traced in a southeast direction for 10 miles, showing occasional good croppings and copper-tainted springs all along the line to Copper Basin.

The Copper Basin group of claims carry considerable shallow development and cover a zone 400 feet wide of similar formations to the White Knob mine and accompanied with a dyke of conglomerate.

This zone is sprinkled with carbonate and oxide ores throughout its entire width and makes in strong shoots of clean ore, 2 feet to 20 feet wide, worth 5 to 30 per cent copper, also high values in gold and silver. This mine was equipped with a small test smelter a year ago, and a carload of pig copper run out. But the excessive cost of coke at this point, $35 per ton, precluded the possibility of profit, and the operation was discontinued.

THE BRONZE GOD AND CAVE CLAIMS.

The Bronze God and Cave claims, covering a contact vein 10 feet wide in the gray granite of the Sawtooth range, near Cape Horn, are interesting prospects. The ore makes copper pyrites within 10 feet of the surface and lies in contact with a dyke of quartz porphyry. The vein is continuous for a considerable distance and carries average values for several feet in width of from 6 to 19 per cent copper and up to $20 in gold and silver.

There are numerous other copper prospects of a similar caliber throughout Custer County that are well worth investigation.

COAL DISCOVERY.

An important discovery of high-grade lignite coal has recently been made at Pollard's ranch, two miles west of Salmon City.

The vein is 16 feet wide. The total development so far consists of a tunnel 100 feet long with a face depth of 40 feet.

The underlying formation is a thick bed of gray cretaceous sand-

stone resting upon the granite and metamorphic rocks of the main Leesburgh Mountains, near the foot of which the discovery was made.

The true roof of the vein has not been cut yet, the crosscut at the face of the tunnel being still in coaly shale. The vein dips at an angle of 45 degrees east toward the valley, but will probably flatten to conform to the horizontal beds of tertiary sandstone shale and clay exposed in high bluffs near Salmon City.

At present the vein shows two bands of clean merchantable coal, one of them three feet and the other five feet thick, that is well adapted for domestic and steam purposes. A recent analysis of this fuel shows its quality to compare in close detail with the best lignites of Utah and Dakota.

The sedimentary beds of the Salmon City Basin are at several points found banded with interclary beds of igneous rock, and if the coal measure is found to underlie the whole basin, which is likely, development may prove areas where contact metamorphism has produced a much higher quality of fuel, probably coking coal.

CONCLUDING REMARKS.

In the foregoing description, the object of this paper has been to show the varied character of, and conditions under which the ore deposits of this part of Idaho occur, and space only permits mention of a very limited number of the principal properties.

There are dozens, yes, hundreds of mines and prospects in the vicinity of these described that promise, in numerous instances, to develop a very interesting resource of mineral traffic.

Central Idaho offers one of the largest and richest fields for railroad and mining development left unoccupied in the United States today.

This is especially true of Lemhi and Custer counties. These two counties have already yielded to the efforts of the pioneer miners, under the most adverse and isolated conditions, gold, silver, lead and copper bullion to the value of $50,000,000, and yet the surface has merely been scratched.

Challis, Idaho, July, 1901.

PRESIDENT PRINCE: The next order on the program is the reading of a paper by Prof. E. A. Babcock, of Grand Forks, North Dakota, subject, "The Value of Science and Training in the Mining Industry:

Prof. Babcock read the following paper:

"THE VALUE OF SCIENCE AND TRAINING IN THE MINING INDUSTRY.

By E. J. Babcock, Director of School of Mines and Geological Survey, Grand Forks, North Dakota.

Could the red man who pitched his tepee on this beautiful spot and in these fertile fields only two generations ago now return and look over the same lovely valley and along the same beautiful streams once so familiar to him, we can imagine his bewilderment at the changes which so short a time has wrought in his quiet hunting grounds. Or even as the early settler of three or four decades ago looks over this beautiful State and our whole western country and traces the wonderful changes which the hand and brain of man has effected in this vast region from the Golden Gate to the Mississippi, he becomes impressed with the thought that, grand as may have been the progress of our great nation, few spots have done more toward realizing the dreams of the founders of our nation, the dreams of those men who, but little more than a century ago, laid so well the broad foundation and established so well the policy and principles which have built up and bound together so great and glorious a land, and under which we are now working and striving together to build up a greater, a better and a nobler nation.

In what region could they see their hopes and aspirations more per-

fectly realized than in the illustration which we have here of our western cities springing up among the wilds of mountain and forest, and attracting from every direction the sturdy workers and the strong-hearted, clear-headed captains of commerce and industry, and raising wealth in enormous quantities, almost as if by magic, from the depths of the earth; building railways and factories, and covering the green acres of mother earth with prosperous farms and orchards and giving profitable and honest labor, comfortable homes and the privileges and benefits of education and refinement to thousands of earnest, intelligent, industrious and thrifty men. Thousands of honest hands are engaged all about in raising from the bosom of mother earth and from the great reservoirs of wealth those almost enexhaustible treasures which, countless ages ago, a kind and bountiful God stored up here for the benefit of man. Great railroads have been laid over wide praries and through forests and mountains formerly considered impenetrable, till now they reach our very doors to bring in exchange for our mineral wealth the products of other regions and all the comforts and luxuries man needs. Along the valley through which winds this beautiful pituresque stream we can already hear the roll of mills, the hum of machinery and the shriek of the engine; while the beautiful homes and the prosperous city tell of the manner in which this rich region rewards labor, industry and skill.

But what, we may ask, has caused this wonderful transformation? The answer comes quickly. It is due to the courage and perserverance of the men who settled the great West, to the clear heads and strong hearts of our captains of industry and the builders of the great railway systems, and to the forward march of civilization which has been made possible, in a large measure, by a truer, more thorough and more practical educational system.

The education which is demanded today is one which will give a higher ideal of social and individual life and which will give its possessor such a power over nature that he will be able to get and to give to his fellows more of all the good things which a bountiful God has intended for the uplifting of man. Prosperity brings to men not simply wealth, comforts and luxuries, but great duties and tremendous responsibilities; and every good citizen seeks to know and to fulfill these duties, so that when he leaves to others the activities of life he can feel that he has done something to make the world, richer and better for his having been in it.

It is with such a thought for our own lives and for those to follow us that we seek to become more thoroughly familiar with a world in which man is constantly striving to bring to his aid more fully all the material and power that nature has to offer, and that we seek to secure such system of education and such a knowledge of science as will bring these results. A comprehensive education must be one which will make it possible for the young man gradually, though efficiently, to gain knowledge, the use of hands, and a skill which, as he grows to manhood, will fit him to pursue successfully his life's work.

It is my purpose to consider the subject which has fallen to me not so much from an educational as from a utilitarian point of view. The people of our land who are interested in the great industry of mining, in its various forms and with its large number of associated occupations and requirements, look to such assemblies as this for suggestions, plans and helps of every kind which will render more pleasant and more productive the great and honorable life work in which they have engaged.

With the growth of civilization and education and the development of a keener and stronger mental perception, mining is rapidly changing from an aimless, luckless, blind grasping for hidden treasures to a systematic, scientific business, I might say a truly technical, professional business. To meet most fully the demands of such a business as mining and to grasp and solve the great variety of problems constantly presenting themselves to one engaged in such a work there is a rapidly growing demand for men of clear perception, good judgment, wide extent of knowledge and a thorough scientific training. We owe it to ourselves, to our children and to our nation to foster in every possible way, by personal effort and by state and national legislation every means which can encourage the more perfect development of one of the greatest sources of individual and National comfort, wealth and power, the mineral industries.

Our friends engaged in agricultural work have developed a very strong and a wonderfully helpful educational and experimental system, beginning with the rural schools and running through the agricultural college and the experiment station to the United States agricultural laboratories at Washington, and finally ending with the Secretary of Agriculture.

We who are especially anxious to develop our great mineral resources must help to build a similar system, which, beginning early, will insruct our youth relative to the subject of mineralogy and geology, so that they will realize their importance and use. Then we must construct a system which will provide for more advanced instruction and skill similar to that which is secured for agriculture from its schools and experiment stations.

In considering such a subject we naturally ask what are the general advantages which may be derived from such a science as geology. All the way from boyhood to old age we should be learning something of the wonderful and beautiful story of the world on which we are born and live and die. No one, certainly no one in a mining region, should go through life without knowing something of the grandly inspiring and intensely practical subject of geology. It is true that the occasional one who goes through a long college course may have the opportunity to take up this study, but what about the ninety and nine who do not? It is for these that our system of education must provide. The college man will take care of himself. It is for the mass of our people that care must be taken. Give them the best; give them the opportunities to widen their spheres of usefulness, and inspire them with higher and more beautiful views of life.

Fortunately, we do not all have the same desires or thoughts or ways of doing. The result of this difference is the development of literature, industries, science, arts; in short, that wonderfully diversified thought which has brought about the civilization of today and made life really worth the living. It has not come home to us with sufficient clearness that, just as a knowledge of a foreign language is essential to one who is to spend his life in a foreign land, so in like manner is a knowledge of such a science as geology or mineralogy of direct practical value to all in our life-long, daily intercourse with nature. In fact, judged from a purely utilitarian standpoint, the advantages derived from the most elementary acquaintance with what may be termed a science of daily life are so manifold that, if once appreciated, they would readily be accepted as a general need.

How many of those who go out into the world, sometimes even from our public schools, pass through life deaf and blind to the wonderful things around them. How often men live pitiable slaves to nature rather than rejoicing masters simply because they know nothing of her laws, have no experience in working with her, and have not been trained to do. Huxley says, "Knowledge of nature is the guide to practical conduct. Anyone who tries to live upon the face of the earth without attention to the laws of nature will live there but for a very short time, most of which will be passed in exceeding great discomfort; a peculiarity of natural laws as distinguished from those of human enactment being that they take effect without summons or prosecution. Thousands of us are dying daily and living miserably because we have not yet been sufficiently zealous to learn the code of nature."

But on the other and even higher grounds, we should give more attention to such a practical science as that of geology. It tends to develop a side of the human intellect which I believe I am justified in saying is left largely uncultivated; namely, the faculty of observing and reasoning from observation.

A strong argument for giving more attention to such a science as geology is seen in the fact that it affords mental training of a particular character, and at the same time inculcates useful knowledge, which is rendered more forceful and attractive because of its direct reference to the familiar objects and operations of nature. We cannot afford to live ignorant of all that is going on around us and without learning to use our eyes of our reasoning powers. We cannot afford to be unacquainted with the wonders and beauties of the material universe about us.

No effort should be spared in giving our young men a training which will be an effectual preparation and truly adapted to the exigences of

practical life as well as to fit for a higher and nobler plane of living. Such a science as geology beautifies labor and makes the laborer a more thrifty bread winner. But a higher value rests in its power to quicken the observation, broaden the conceptions, strengthen the reasoning powers and develop a love for the beautiful and a reverence for the infinite.

Contrary to the common notion, the science of geology is a power in expanding and elevating the imagination. Where can one find a wider field for its exercise than that opened through the revelations of geology? As the mind wanders over a vast expanse, crossing boundless spaces, dwelling in almost illimitable time, witnessing the display of measureless power, studying the wonderful adaptations of nature and the evident working out of an infinite design, one lives in a realm of beauty, of wonder and of grandeur such as the poet cannot express by word, the musician by sound, nor the artist by color or form. It is by such a subject that man is made to feel his dependence and to reach out toward the infinite. Such a science elevates and enriches the imagination, ennobles the intellect and induces lofty aspirations. It also develops the aesthetic nature of man, for only as we ask of nature will her wonderful beauty be unfolded to us. The grand ocean, the snow-capped mountain, the majestic cataract, the lovely valley, reveal more of their beauty to one who knows the mysteries they conceal.

And thus we might continue to show the general importance of this grand science which among others is at the very foundation of our vast mining industries, but time forbids. We must not forget, however, to encourage whatever will better fit man to act his part as a citizen of the world and to live in a higher and purer mental and spiritual atmosphere. We must remember that if the life of a nation depends upon its citizens then the proper training of the individual becomes an all important problem. Open to our young citizens so much of science and power that it will place before them a new world of possibilities and put into life new meaning and deeper inspiration. It will enlarge the capacity, not only for higher pleasures, but for material profit. Such a training will go far toward giving our young men control over the great industries we are considering, while with a high ideal of individual, industrial, social and civil life.

We need to provide for a wider dissemination of knowledge of the earth on which we live and the wonderful treasures of wealth, power and comfort which are stored up for us, but now we need still more to provide for deep and exhaustless study and experimentation upon the fundamental principles underlying our mineral industries and the many intricate and perplexing problems which are confronting the miner and metallurgical manufacturer of today. It is encumbent upon our commonwealths and upon the national government to unite in building up the most thoroughly equipped technical mining and metallurgical industrial schools. That Congress has not already provided such means for research and experimentation to aid our mineral resources as it has for agriculture is due in a large degree to the fact that it has not realized the gigantic proportions to which our mineral resources have grown and the untold wealth to be yielded up to us as, by new scientific discoveries and more skillful methods, we get more perfect mastery over nature.

No industry requires for its success higher technical skill than does that of mining and metallurgy in its various phases; and next to agriculture no industry contributes so largely to the growth and prosperity of the nation. The growth and magnitude of our mineral productions is astonishing. It has now reached annually the enormous sum of over a billion dollars, a large part of which, unlike agricultural products, is a permanent contribution to the nation's wealth.

Yet because of a lack of knowledge of our resources and of the best methods of utilizing the powers of nature we have as yet only begun the development of our boundless wealth. As our knowledge, skill and interest are developed there will constantly be added new resources. Indeed, we may safely say that what we have gotten is but the shadow of what we may expect. In no other industry has such rapid and substantial growth been made and in no other are there such grand opportunities for the reward of genius and scientific training as well as for the profitable investment of capital.

Ten or twenty years ago mining was universally considered a reckless venture. Today it is beginning to be regarded as a profitable busi-

ness, one which, though requiring good judgment, care, technical skill, time and capital, will, under such conditions, very surely bring good returns. Success in mining operations requires intelligence and scientific training. Iron ores of many localities which were previously considered worthless are now, by new methods of treatment, made exceedingly valuable. In many of our western States abandoned mines can now be worked successfully because of the development of more scientific methods of concentration and of the cyanide and similar processes.

There are yet before us a large number of important problems the solution of which will many times revolutionize the mining industry. Among these are such as that of more efficient furnace work, more perfect extraction, the use of electricity in mining, deep mining and many others of equal importance. We have already learned that many of our deep mines are the richest, and when we have more fully solved the problem of deep mining we shall realize that we have now, so to speak, only scratched the surface of our mineral deposits.

To what other industry, then, could Government aid be of such immediate and great benefit? As a result of systematic and scientific experimentation the miner would be directed so as to save much time, labor and money in seeking results otherwise impossible. It would result in bringing out new processes of mining and ore treatment which would make it possible to work with profit vast deposits of ore now worthless. By the provision for growth in knowledge and scientific experimentation which such schools would afford there would soon result a large increase in mineral production and saving.

Genius, education and training are doing much for this industry, but what they have done is only the beginning of what will be accomplished if Congress comes to our support so as to make possible more perfectly equipped technical and experimental mining schools. Such schools would be wonderful aids, by uniting science and skill, in lifting the occupation of mining to a higher level and insuring a grander success than has yet been dreamed of.

The Government investment in educational training pays well. The great naval achievement of Manila harbor did not come so much from the superiority of naval equipment as from superiority of our men. It is to the men commanding those vessels and behind those guns to whom we are indebted. They were brave men, but they had been well trained. The years of instruction through which they had passed and which the Government provided proved on the day of conflict that the expenditure had been a wise one, for it was their skill and accuracy which saved the honor and supremacy of the nation. No less profitable will be the provision for the training of our citizens in the peaceful pursuits of industry.

The prosperity of a people does not depend upon the natural resources alone, but as much upon integrity, enterprise, industry and skill. With reasonable natural resources on which to base the industries of life, that state or nation which possesses these characteristics in the highest degree is certain in the end to attain the highest prosperity.

It is therefore the duty of every citizen and every such organization as this, acting through legislative assemblies and through Congress, to foster whatever will promote the strongest character in its people, cultivate habits of industry, develop skill, stimulate intelligence and impart the most useful knowledge; in short, whatever can make our civilization and our industries stronger and better. No legislation should be neglected which would encourage natural enterprise, aid in the diversification of occupations, or in training the people so that they can secure greater rewards from their industries. We need not hesitate to ask of any administration or party such legislation. And it is such that we are seeking when we ask Congress to aid us in the development of our schools of mines and metallurgical industries.

The National Government has wisely established under the Department of Agriculture a well-endowed system of agricultural schools and experiment stations for the purpose of giving instruction in agriculture, investigating rural regions and solving the difficult problems of agriculture What this magnificent system has done for agricultural advancement within the last few years we all know. How it has extended the agricultural domain over vast areas known until recently as great desert regions; how the farmer has been taught that he can raise many dif-

ferent products where formerly he was dependent upon a single crop. Many such examples might be cited. The good work still goes on and our agriculturists are becoming stronger and more independent, and under this grand system the benefits will continue until our farmers become the masters of the agricultural world.

It is a similar system which we want Congress to aid in building up for the purpose of encouraging our mineral industries. We are constantly learning what study and thorough scientific experimentation can do for the development of mining, metallurgy and manufacturing. And when in time what we are seeking shall have become a strong part of our industrial and educational systems then we shall realize more fully the enormous advantages to be derived from a training which gives a knowledge of the laws of nature and a skill and power capable of mastering difficulties and problems previously beyond our comprehension. Then we shall see that, great as have been our attainments, still the mission of science has made only the beginning of what it is capable of doing toward aiding us to secure wealth, comfort and refinement; in short, that power over mind and matter which lifts man above the beast and renders possible that growth of mind and soul which makes life strong and noble and grand.

I trust that this assembly will express in no uncertain manner its wish to have Congress foster our mining and metallurgical industry, as it does the agricultural interest, by granting aid for mining schools as provided for in the bill known as the Mondell Bill, H. R. 982, which was before Congress at its last session and was favorably reported upon by the Committee on Mines and Mining and also the Committee of the Whole. The system thus started may be made to end in a division of mines and mining under the geological survey, or in a department of mining. The establishment of such a system will not only be giving proper recognition of the importance and needs of this great industry, but it will prove an inspiration and an aid to knowledge and industry which will result in unfolding from the hills and valleys of our broad land treasures, gifts of a generous God, far beyond all we would dare to ask.

MR. ROBERTS, OF OHIO: Mr. President, I would ask that the Committee on Resolutions be requested to make a report of their work up to this time.

THE PRESIDENT: Is the Committee on Resolutions ready to make a report at this time?

MR. RICHMOND, OF UTAH: Mr. President, the Committee on Resolutions will report the following:

Resolution introduced by the gentleman from Colorado:

Resolved, That the International Mining Congress, assembled at Boise, Idaho, extends to the president and directors of the Louisianna Purchase Exposition, its fraternal greeting and promises for it an active and continued interest and support.

We also urge upon the Legislatures of the several States, such a generous financial recognition of the coming exposition as shall contribute materially to its already assured success.

The Committee on Resolutions beg leave to report this back to the Committee of the Whole, with the recommendation that it be adopted.

On motion of Mr. Goodsell, of Illinois, duly seconded and carried, the report of the Committee on Resolutions was adopted.

MR. RICHMOND: Resolutions introduced by Mr. Prince, of New Mexico:

Resolved, That the Congress of the United States be respectfully requested to provide by law for the locating and working of mines of the reserved minerals—gold, silver and quicksilver, on Spanish and Mexican land grants.

Resolved, That the magnitude and importance of the mining industry, which has now reached over a billion of dollars of annual product, call for the establishment of a national department of mining, the chief officer of which shall be a member of the President's cabinet.

The Committee on Resolutions begs leave to report these resolutions back to the Committee of the Whole, with the recommendation that they be adopted.

On motion, duly seconded and carried, the report of the Committee on Resolutions was adopted.

Secretary Mahon read the following resolution, which was referred to the Committee on Resolutions:

Resolved, That, in the opinion of this International Mining Congress it is not to the best interests of mining that undeveloped mines or prospects be placed on the "boards" or "lists" of mining exchanges and offered for sale to the general public, but only mines which have been so fully exploited as to be well established propositions should be offered on the boards.

Secretary Mahon then read the following preambles and resolution:

Whereas, The past experience of the officers of this organization in attempting to secure proper railway rates to the meetings of this Congrss; and

Whereas, Said officers have been looked upon as lacking the proper authority to demand such concessions; therefore, be it

Resolved, That a committee of three be elected to serve during the coming year, to be known as the Committee on Transportation, whose duty it shall be to handle the above question in time for the next meeting.

THE PRESIDENT: What is your pleasure with regard to this resolution? It is scarcely of a character to go, under the rules, to the Committee on Resolutions. It might, perhaps, be referred to the Committee on Permanent Organization.

On motion of Mrs. Haskell, of Montana, the foregoing resolution was referred to the Committee on Permanent Organization.

Secretary Mahon read the following resolution, presented by Mr. Goodsell of Illinois:

Whereas, The National Secretary and also the Vice-President for Illinois worked together for two months to obtain recognition from the various railway passenger associations of the country in order to obtain special round trip rates for the delegates to this Congress, and

Whereas, These repeated applications were repeatedly refused to us by the passenger associations, before such rates were allowed, and

Whereas, Such desirable rates were finally secured only through the personal assistance of the following named railroads; therefore, be it

Resolved, That the thanks of this Congress be extende dto the Chicago & Northwestern Railway, the Colorado Midland Railway, Union Pacific Railway and the Oregon Short Line Railway, for the good will and assistance rendered by them to enable delegates to secure satisfactory rates to this Congress. It is also

Resolved, That the members of this International Mining Congress do, as far as possible, remember these lines when routing their freights, and extending passenger favor, thus expressing proper credit for their courtesies.

It is also known that had the other passenger associations granted

a fair rate to this meeting, it would have quadrupled the attendance to this Congress.

THE PRESIDENT: This goes to the Committee on Resolutions, as it contains other matter than simply the thanks of the Congress. It is so referred.

The next matter on the program is an address by Mr. Charles J. Moore, of Colorado, on "The Geology of Cripple Creek," illustrated on the blackboard.

THE FORMATION OF THE CRIPPLE CREEK MINING DISTRICT, TELLER COUNTY, COLORADO.

By Charles J. Moore, Mining Engineer of Cripple Creek, Colorado.

Mr. President, Ladies and Gentlemen: My only excuse for bringing this subject before you at this time is the fact that the Cripple Creek mining region, as found today, is the most important gold mining section in the United States. As a matter of American patriotism each of us ought to know something about the resources of every portion of our country—more especially of those portions which enter into competition with the other mining regions of the world.

It has often been said that the Cripple Creek mining region is the largest and most important in the world. This is not so, but it is the most important in the United States. And it is unique in several features, some of which I purpose to show you this morning.

I thought it would be more interesting to you, especially in view of the temperature, to sketch before you the manner in which the formation occurs—in other words, the actual geological processes by which the district was formed, and the veins and the values deposited therein, as we have it at the present day.

The chart on the lower portion of the board represents in graphical form, platted to a scale, the actual production of the Cripple Creek mining district from the year 1890, in which the first discovery was made, shown at the summit of the pyramid upon the lower chart, to the end of the year 1900, which is the lowest line on the chart. Each one of the vertical intervals between the horizontal lines represents on year's time. Each one of the horizontal lines represents the total production of the district, platted, as I said before, to one uniform and accurate scale.

You will thus see that starting in the year 1890, the summit of which being a point shows no production whatever, and continuing downwards to the end of the year 1900, we have a production increasing from nothing to twenty-two and a half millions, as the total production of last year. In other words, in ten years the Cripple Creek mining region has arisen from an unknown quantity to the largest individual gold-producing region in the United States. One of the wonderful features of this region is the fact that the whole of this production comes from an area measuring not more than five miles from north to south, by three and a half miles from east to west.

It is located upon the site of a typical volcano. I might continue with regard to this lower chart to say that, contrary to the statistics of most regions, we have not failed, with some degree of accuracy, to ascertain the profits that have been made, both by organized mining companies, whose stock is on sale to the general public, and by individuals, from the working of these mines.

The red shaded portion upon the left-hand side of this lower chart represents the total amount that has been actually distributed in dividends among the organized corporations or companies. The yellow, or orange-colored, shading adjoining that represents the amount that has been made in addition to those dividends by private individuals. So that, starting in the year 1890 to 1891, at this point the first profits begin to show, as made by private individuals, not by organized companies. In the year 1892 to 1893, and towards the close of the year 1893, the profits began to be distributed in the form of dividends by organized companies. From that time forward, organized companies became the favorite method of realizing the values of the district. Fol-

lowing down the point of my cane, you will see that the average line of profits distributed increases very rapidly after the year 1897, until in the year 1899, and down to the close of 1900, the percentage of profit was increasing, and is increasing very largely. By noting with your eye the relative proportions of the shaded part of any one horizontal black line with the remainder, you will see at a glance the percentage of profit that was made out of the total production.

Without going into detail, I may state that, as an example, we will take the total production for the year 1895, which was $6,970,000, of which 36 per cent was distributed in the form of profit, 17 per cent going in the form of dividends to the stockholders in organized mining companies, and the remaining 19 per cent, as nearly as we can estimate, as profits to private individuals.

Coming down to the year 1899, the total profit made by the organized companies and distributed in the form of dividends was 21 per cent, the total for the year being 27 per cent, showing that the private individuals, who were chiefly lessees, without capital, working mainly by their own muscle, had made 6 per cent of the total, as their share of the profits of the district.

Coming down to the lowest point, the yeor 1900, we find as against the total production of twenty-two and a half millions, the amount of $6,863,674 as profits in dividends; at the rate of 30 per cent of the entire amount to the organized companies. I estimate that 4 per cent additional is what was made by private individuals, namely, lessees, making the total profit on the whole production for the year 1900, 34 per cent. You can see for yourselves the individual profits made in the different years by comparing the figures which represent the published dividends of the different companies, with the total amount in black figures upon the right-hand side of the board. I would say in passing, that there are very few businesses in the world, I do not care whether it is manufactures, or any other form of enterprise, which can show any such continuous profits, and such a tendency as you will notice at the lower part of the chart to still further increase, as those of the mining industry. We do not claim for the Cripple Creek mining district that we make a larger amount of money per capita than any other mining district, but we do claim that the work we are doing in Cripple Creek in adding to the wealth of the country shows as favorably as any throughout the United States; and that we are still increasing at such a rapid rate that it will retain the supremacy of Cripple Creek as the leading gold region for years to come, in spite of its small area.

Passing now to the chart on the upper portion of the board, we have a sketch to represent a typical volcano. Through the central vent, the red lines represent the volcano in active eruption, and at the summit of the ejectament, you will observe the typical cloud, which always rests over a volcano. It is not one of that class of volcanoes which throw out large sheets of lava, covering the country, as you have it a short distance below here, with immense beds of dense basalt, traps or lava flows. It was a volcano very active, very rapid and very sudden in its action. The consequence was that the materials thrown out from the throat were a series of fragmentary portions of rocks. They were not thrown out in a molten condition, and afterwards consolidated by cooling on the surface of the earth, but thrown out unmelted in fragmentary condition, and then consolidated on the earth's surface into the rock which we have today, locally known as porphyry, more properly as a "breccia," breccia being rock composed of pre-existing angular fragments cemented together by silicious waters. The material of which this rock is composed varied in the size of the fragments, from a fine, almost impalpable dust, to fragments which would weigh, say, 150 to 200 tons. The larger fragments are rare, but are still to be found in places throughout the district. The greater portion of the rock thus formed upon the underlying granite is composed of fragments from perhaps one-half, to the full size of an ordinary man's head.

Now you will notice that out of the cloud there is a continual rain of this fine volcanic dust falling. I will erase the cloud, and show you the condition which existed after the active portion of the eruption ceased, and these various materials, which you might almost say dropped from the skies, became the superincumbent rocks upon the earth's surface. The throat of the volcano was still filled with a molten mass,

and partly with these fragments of which I have spoken, imbedded in the mass.

The result of all that material thrown out from the central crevice, and from a few subsidiary or side crevices, was to place on top of the granite a series of fragmentary rocks of that character, finally consolidated into the surface as we find it today, something like that (indicating); there is no bedding, or evidence of bedding; but it is a solid, generally hard and homogeneous rock, formed by all these individual fragments cemented together with the quartz deposited from a flow of silicous waters.

Now the central throat, or main vent of the volcano, has never yet been discovered by actual underground developments; but from the fact that there is a certain rock in a certain position, known as syenite, which required for its formation a long time of cooling in a heated envelope, we infer that that rock actually occupies the throat of the volcano. So I will place that rock in the middle of the throat. That rock we will call syenite.

You will notice that up to this time I have said nothing about veins. The condition of affairs after the heavy eruption ceased is indicated now upon that chart. The next operation was in the final throes of the volcano, creating numerous fissures, or cracks. A peculiarity of the Cripple Creek district is the fact that there are very few faults, or displacements, along the line of the fissures. The cracks seem to have been created or originated very largely by the general contraction of the rock in cooling. These were extended afterwards by dynamic forces, but to a great extent they were mere cooling cracks; so that the fissures extend through every rock without displacement, where they pass from one to another.

I will now indicate the general form in which these fissures come up through the country. You will notice, as a peculiarity, that in passing through the granite to the surface, there is no displacement of any kind where they enter from the lower into the superincumbent rock. That is another respect in which this differs from any other mining region. Of course you know that in other regions you may have branches running off from a fissure, and as you go downwards you will find a union of fissures on their dip. You will have occasional crossings, though there are fewer crossings than unions, and the unions are not very many, compared to the total number of veins.

These fissures were not immediately filled with mineral-bearing values after their creation. Many of them were filled with dykes. There seems to have been a later series of erupta, which consisted entirely of molten rocks; and there we come to another peculiarity of the Cripple Creek district. It differs from most of the other mining districts of the world in the fact that the principal molten rock injected into these fissures was what is known as phonolite. The only other mining region in the United States in which this has developed to any great extent is in the Black Hills, in South Dakota, and there it is also associated with a high-grade ore.

I will now draw with the green chalk the dyke coming up through certain of these fissures. Still, I have said nothing of ore deposits; this was subsequent to the formation of these dykes, which you will notice I have drawn coming through the fissures from the underlying granite through the superincumbent rock, formed from the volcano; and you will observe there is no evidence of any veins as yet. The last process in the formation of the Cripple Creek mining district was the deposit in these fissures, in some cases in the dykes, in many cases in fissures, where no dykes existed. Sometimes the dykes themselves are entirely mineralized throughout. There are a number of interesting phenomena in the district, in reference to veins and other formations, which I have no time to enlarge on now; but with the red chalk I will draw the veins which finally gave us the economic values which we are today extracting. Occasionally veins will come like the one I am now drawing, retaining its own individuality, from great depth to the surface, crossing everything in its path without displacement. There are several diagonal and cross veins differing from each other, but the ones on the right hand side show the most important characteristics.

The sketch, letter "A" shows a typical Cripple Creek vein, entering from the granite below, through the superincumbent rock, in a series of parallel cracks, or fissures. You will notice that the shading in the

central portion of that sketch is heavier than that on the side. There is always one narrow fissure which contains much more value than any of the rest of the vein. But every other parallel fissure also contains value, sometimes not thicker than a sheet of paper, but carrying a very great percentage of gold, extending from 40 per cent to a sheet of almost free gold. The result of that character of mineralization is that the country rock existing between all those small fissures is mineralized, so that in extracting the vein we mine the entire width, as far as we find values by assays, and this has led to the expression that in Cripple Creek there are no walls to the veins. It is the truth that in the width of the vein there is very often no physical wall developed, as in the rest of the country, but there is a division, which is found by assaying, between that which is profitable and that which is unprofitable to extract. In some cases the veins, by reason of that shape of structure, attain a great width. In the Portland mine, which is the leading mine of the district, in one place today we are mining a total width of 106 feet. It is true that not the whole of that 106 feet in width is payable ore, that is, ore that can be smelted at a profit, but the whole of it can be treated; the low-grade portion can be treated in chlorination or cyanide mills, and is being put up on a separate dump to be treated by a chlorination mill which the Portland Company is now constructing.

Sketch No. 3 represents the next most common type of vein in Cripple Creek. In that you will see a dyke that is colored green, entering from below upwards from the underlying granite, into the superincumbent breccia, and after the dyke was formed it was mineralized, somewhat in the same way you see by the red lines. Tracing that a little further, you will see the mineral placed along the boundaries of the dyke, occasionally passing through, and running lengthways of the dyke through the center, passing diagonally across in various places, thereby rendering the whole dyke profitable to extract. That dyke might be either phonolite, basalt or andesite, those three being the main dyke rocks of the region. The grade of the Cripple Creek ore is not equalled anywhere throughout the whole world, except in West Australia, in the Kalgoorlie region. It is a double telluride of gold and silver, in which the gold occupies in the mineral crystals an average of 40 per cent of metal. It would sound extraordinary if I were to tell you the values that are obtained. In some cases ores have been mined, not in lots of many carloads to be sure, but still in quantities which made a very respectable fortune for a single carload; as much as $80,000 to $90,000 to the carload of eight and a half tons has been shipped, not infrequently, from the Cripple Creek district. In some cases ores have run up, by actual assays, and in quantity, to as much as $160,000 to the ton in gold. Such extraordinary values, of course, are more or less irregular in their distribution, both in the veins themselves, and throughout the district; but the average of the total production last year was $45.67 per ton for all grades of ore; and I venture to say, that throughout the United States—nay, throughout the world—that cannot be equalled. Taking all the grades that we ship out, the greater portion of which, of course, are low grade, which run below $15 to the ton, and is sent to cyanide and chlorination mills for treatment, —including all that vast mass, and adding to that the higher grades, and taking the general mean, not an arithmetical average, but a true mean of the ore, produces that result—$45.67, as the average in value per ton for last year's production. As we have gone deeper below the surface we have found no decrease in the average value of the ore, but on the contrary, the same, or nearly the same grade has been maintained as we had in the superficial ores, and we have reached now a total depth of 1,150 to 1,200 feet below the surface of the ground.

I will call your attention once more to the fact that the first shipment was made in the year 1891; the total gross production of that year was only $200,000. Now, if you carry in your minds the fact that in those nine years from the close of 1891 to 1900, the district has produced and added to the country's wealth over one hundred millions of dollars, and that the grade has not decreased as we have gone downwards, but has maintained its high value, even in the lowest levels today—in fact, I may say that the average of the lowest levels that we have developed, at 1,150 feet below the surface, is greater than the

average 500 feet above, you will get some idea of the magnitude of this district, and its importance to the whole of the United States.

I see that I am booked to talk to you about the Leadville formation, and it seems to me that on account of the heat I have tried your patience long enough, but would be perfectly willing, if it is agreeable, to resume this evening, or at some other time, and give you an account of the Leadville mining district in the same way, by sketches on the blackboard. (Applause.)

The address was delivered entirely without notes, and illustrated by charts and chalk sketches on a large blackboard. The following table contains the statistics of production and profit referred to in the address:

CRIPPLE CREEK STATISTICAL MAP.

Year.	Total Production in Dollars.	Dividends by Companies		Percentage of Profit by Individuals Outside of Companies. (Estimated)	Total Profit in Percentages.
		Dollars.	Percentage of Total Production.		
1891	$ 200,000	.....	..	37	37
1892	587,310	.....	..	26	26
1893	2,010,400	88,940	4	16	26
1894	3,250,000	843,876	25	10	35
1895	6,970,000	1,232,000	17	19	36
1896	10,000,000	1,178,744	12	12	24
1897	12,500,000	1,271,395	10	10	20
1898	15,735,757	2,598,456	16	9	25
1899	20,000,000	4,332,494	21	6	27
1900	22,500.000	6,863.674	30	4	34
	Total $93,753,467	$18,409,579	Average 19.6		

Men employed in 1900, 4,500. Mines working, 75. Mills supplied, 7. Smelters, 5. Average gross value per ton of ore shipped for 1900, $45.

Revised and corrected August 13, 1901.

CHAS. J. MOORE, Mining Engineer.

Cripple Creek, Colorado.

MR. DERN, OF UTAH: Mr. President, Dr. Talmage, of the Utah delegation, is a member of the Legislature, and is unable to remain during the entire session of the Congress. Therefore I wish to announce the name of Mr. J. H. McChristie as a substitute for Dr. Talmage on the Committee on Permanent Organization.

THE PRESIDENT: The next on the program is a paper by Mrs. Pauline L. Holland, of Galena, Ill.; subject, "Why Mining Men Should Be Politicians."

Mrs. Holland read the following paper:

SHOULD MINING MEN BE POLITICIANS?

However much our individual judgments may differ regarding the correct and proper answer to this question, in this we will probably all be agreed: that, hitherto, mining men, as a class, have conscientiously held aloof from politics and cannot be accused of fermenting the political leaven, to any large extent, with their own troubles. Whether wisely so or not remains to be seen. The advancement of the industry has, without doubt, been steady, and is in the aggregate enormous. But it is attributable, almost wholly, to tenacious and unaided individual effort. The mining man has been a mining man, pure and simple, first, last and all the time. He seems to have had no time to be anything else. He has asked for nothing and has received nothing. With uncomplaining patience he has applied

himself strictly to his business. Animated by a rugged, and almost stubborn independence, engendered by his peculiar calling, he is, no doubt, capable of ultimately working out his own salvation. Even though left entirely to himself his progress will be in the future, as it has been in the past, onward. Still he must feel that his labors have not yielded unmixed success. The net result has not been the best possible nor the most satisfactory. The advance seems to be only by slow and painful degrees and with many a drag. It is achieved at the expense of many a hardship and dearly-bought lesson. The pathway seems to be almost as arduous today, as years ago, when it was blazed by the pioneers of the industry. We feel that we are beset with obstacles and that, on all sides we meet the resistance of nature and of man.

And yet, strange to say, many of these difficulties have not been unavoidable and our attitude towards them has been one of surprising indifference. We have felt the heavy burden of unwise legislation, in some instances unreasonable and oppressive, in others mischievously lax. Yet, we have taken but little or no pains to seek relief. We have been hampered by the almost entire want of official recognition, aid and encouragement. Still we have remained silent and did not complain. Like unto every other industry in the land, we have been caught in the whirlpool of recent economic changes and disturbances and have not escaped the consequences of a keen industrial warfare. Yet we have stood by, with masterly inactivity, passively contemplating the field of action, in which others struggled. In a word, we have been so absorbed with the immediate pursuit of our industry that we have remained almost completely out of touch with the political and economic life around us, as if we failed to realize that we, too, are an important and vital part of the economy of the nation.

The proper administration of public affairs for the advancement and prosperity of our whole people concerns us all and demands the cooperation of all. It is not sufficient that the citizen play his part, high or low, in the great scheme of our political existence; but the material interests of the country, being a part of the economic whole, must claim a voice and take a hand in the affairs of government, through their best and ablest representatives.

And, therefore, I say, with confidence, that an industry, which has gained the proportions and importance of the mining industry, is not doing itself justice, nor subserving its own best interests, if it goes unrepresented and unchampioned in our public economy; and, mining men, not alone should, but they must, in some measure, be politicians if we aspire to the highest degree of industrial development. Not politicians in the vulgar sense; meaning an intelligent and active interest in public and political affairs, so far as they are applicable to the needs and requirements of our industry.

To the unthinking mind, of course, politics and mining may have very little in common, except perhaps, that they are both very uncertain. But when we reflect that the strain of politics runs through the entire woof and web of our industrial fabric; that its mechanism is of the most delicate structure and the disturbance of any one part produces an inevitable reaction on all the others: that the doings of politics can effect every industry in the land to the quick; and when, furthermore, we reflect that judicious governmental neglect can interpose most discouraging obstacles to the industry, it behooves us to concern ourselves with this aspect of the question.

We should know, and I have no doubt we do know, what our industry wants and needs, both for itself and in its relation to all the other industries of the nation. But knowing it is not sufficient. It is our duty to assert our wants. It is idle to wait for others to take up our cause. The initiative must come from us, who are primarily interested. It is true, the American nation is today striving for universal progress in every direction. And development in every line of human pursuit and in every section of the country, is the watchword of the day. The people want to see every furnace in the land aglow, every wheel in every workshop and factory humming, every pick and shovel employed, every sail spread to the wind. But at the same time the public mind is slow to understand and slow to act. The great majority are so preoccupied with their own immediate concerns that they have little time and little inclination to study the requirements of the industries of our great country or the important relation each bears to the general

welfare and prosperity. It is a fact, too well known for contradiction, that every important issue that has ever been submitted to the judgment of the American people has required a preliminary campaign of education. No great reform was ever inaugurated, no advance step taken in our political and domestic economy, which has not been preceded by persevering and earnest agitation. And, agitation, particularly in the domain of an industry, so technical and scientific as mining, must come in the first instance from those who best understand its necessities. The foremost economists of the age can only speculate and theorize. They are helpless without the aid of those who have grappled with the vexing problems of our industry, through a life-long experience in its pursuit. From you, therefore, must come the suggestion, the agitation, until success crowns your efforts.

And in thus entering the lists of politics, you will not be pioneers. In fact you will be in the wake of a long procession that has gone before you. You will have the encouragement of many successes that have already been achieved by others. There are practical examples, within the experience and memory of us all, of the startling and tremendous impetus which our material progress gains when it feels the breath and pulse of politics. Not so many years ago the complaints of the manufacturing interests in this country were loud and long. But their grievances went unheard and their interests unheeded, till they carried them into the arena of American politics. Early and late they bespoke the attention of the American people. They clamored for Government aid and recognition until the entire country was alive to their demands. Their needs and requirements became the absorbing economical question of the day and formed the pivotal issue of two great national campaigns. Everyone knows how fierce and protracted the battle was, but the manufacturing interests won, and today the McKinley act and the Dingley law stand as living monuments of what the manufacturing industry could accomplish for itself when it chose to take a hand in politics. How wise and fostering governmental legislation has, through long years, aided the upbuilding of the great transcontinental transportation interests of this country, is but recent history, fresh in the minds of all, and needs no recounting. And it is not to be denied that they have thrived and grown healthy and strong under its protection. In the immediate present politics is giving its most solicitous attention to our merchant marine. For weeks past a congressional party, representing the Rivers and Harbor Committee, have been employed upon the North Pacific coast and Alaska, gathering information and statistics, examining waterways and commercial ports, ready to recommend new improvements and to provide new appropriations, in order to accommodate our ever-expanding ocean commerce. Its needs have also obtained the official recognition of the Republican party, in its national platform, wherein they say: "Our present dependence on foreign shipping for nine-tenths of our foreign carrying, is a great loss to the industry of this country and a serious menace to out trade * * * which supplies a compelling reason for legislative action, which will enable us to recover our former place among the trade carrying fleets of the world." And it is safe to predict that the next Congress will carry out this suggestion by passing a ship-subsidy bill that will materially assist us to recover this lost place. In still another direction the potency of politics appears in the Kansas City platform, wherein the Democratic party raises its voice on behalf of American labor and the upbuilding of the working man as the cornerstone of the prosperity of the country; and, to that end, recommends that Congress create a department of labor, in charge of a secretary, with a seat in the cabinet.

But it is needless to multiply examples. In fact there is hardly an industry or line of pursuit, except mining, which has not, in some way, sought and, in some degree at least, experienced the vivifying governmental touch. But, let it be remembered, that in no case has it come of itself and unsought. Nor has it come easy. Politics, like fortune, needs to be courted for its favors. And if we wish that politics should interest itself in us we must first interest ourselves in politics. With this reservation, I dare say, it will depend wholly on us to be up and doing, in order to come into our own.

Nor can we be at a loss to discover a field in which our political energies may be profitably exerted. Indeed, these energies have lain

dormant so long that the work has piled up on all sides of us, and the real difficulty consists in knowing where to lay hold first.

Unfortunately the lack of time and space forbids to do more than make suggestions. Our fundamental necessity is to awaken a just sense of national wealth, but as an essential element in the progress of civilization. Each of the three great productive industries exploits a natural kingdom for the benefit of man. What agriculture does for the vegetable, and the raising of cattle, poultry and fish for the animal, mining does for the mineral or inorganic world. Yet there is one respect in which mining differs from all the others. Its resources of supply are not perpetual land; once exhausted cannot be renewed. Hence, vigor in the development and economy in the use of mineral resources have always been urged as a national duty. All civilized governments have recognized, in a greater or less degree, the necessity for encouraging the mining industry; but the methods employed have, by no means, been adequate to its needs nor commensurate with its importance. The first step usually taken in this direction consisted in the collection and publication of mining data and statistics. In this country the several states have performed this work most irregularly. Pennsylvania, New Jersey, Ohio, Indiana, Nevada, California, Colorado and perhaps some others, at present keep up more or less complete statistical bureaus. The Federal Government began by doing it very imperfectly, in the Census and in the Statistical Bureau of the Treasury; later, more carefully, for the public lands in and west of the Rocky Mountains, through special commissioners, reporting to the Secretary of the Treasury (1866-76); still later trrough the reports of the Director of the Mint at Washington and of the various topographical and geological surveys of the Interior and War Departments. Recently there has been a perceptible tendency on the part of especially those States which have done the least in developing heir own resources and industries, to extend into the States the national geological and statistical work, heretofore confined chiefly to national lands. But, withal, it will be readily seen the work has been spasmodic and lacking in uniformity, and but little has been accomplished towards the prevention of waste or the securing of permanence in mining.

To the writer, it would seem, that the best results will not be obtained until these scattered and fitful efforts are concentrated and centralized. And this can only be done through the instrumentality of a national department of mining. The time is ripe for it. The advance of recent years has made it possible. We have grown to be a powerful industry and our interests lie in almost every State of the Union. In mining and metallurgy we surpass all nations. In the year 1899 the ore and mineral output of the United States was to exceed five hundred and eighty million dollars, not including the metal output and secondary mineral and chemical products, which would easily swell it up to a grand total of over twelve hundred million dollars. Iron, steel, copper and coal are now firmly in the list of our great exports and the moneyed and business interests of the whole country are now closely allied with the mining industry, so that its wealth and importance and votes should be able to obtain for us a representative in the President's official family. In 1899, when grain, cattle and cotton had become great export staples, the business interets representing them secured the establishment of a department of agriculture. Some idea of the efficiency of this bureau may be gained from the completeness and thoroughness with which it is organized. It pays to its secretary and his assistants and the various chiefs of divisions alone, not including clerical help, the splendid sum of $73,000 per year in salaries. And among the heads of its numerous divisions may be found experts in such highly scientific and technical branches of learning as agrostology, vegetable physiology and pathology, forestry, chemistry, entomology, botanay, pomology and various others. I will leave it to you to picture to ourselves the incalculable benefit your industry would reap from the labors and researches of a department of mining, so splendidly equipped as this now is. Then, indeed, the time will hasten itself when mining will come to be recognized, as it ought to be, as a commercial business and a most exactly organized industry.

If your efforts in politics produced no other results than this your pains would be well repaid. But I know your enthusiasm would be aroused by your success and you would be eager for new conquests in

the political domain. And the field is large. A complete revision of the mining statutes and perhaps a codification that would unify and harmonize many conflicting judicial declarations, is "a consummation devoutly to be wished for." Yet this reform would be so gigantic and so sweeping that it could only be brought about by gradual degrees. For the beginning we could accomplish much for the benefit of the industry by securing some of the most necessary changes. I might instance as one of the most important and desirable of these, the adoption of "square locations." As long ago as 1880 a special public land commission, appointed by the President, and consisting of the Commissioner of the General Land Office, the Director of the Geological Survey and three civilians, made a sweeping recommendation of this change. But no legislative action was ever taken thereon. The present law of lode locations, with extra lateral rights, has been aptly described by a writer as "a peculiar right, which may be summed up as the ordinary common law right to the surface and all beneath it, plus a certain addition and minus a certain deduction—the addition being the right of the locator to follow veins of which his land contains the apex, downward, between the end plains of his location, into his neighbor's land, and the deduction, being a similar right possessed by the adjoining neighbor." That this "peculiar right" has been productive of much mischief is our almost universal experience. It has given the opportunity to unscrupulous miners to prey upon bona fide mining by the location of fractions, which have no value and were never intended to have any value save for the purposes of blackmail. And the large amount of costly litigation under the present system, as compared with the almost total absence of mining litigation proper, in the older States, under the common law system of location, is a striking and unanswerable fact. A recent and conspicuous illustration of this is afforded by the celebrated Pennsylvania mining case, which occupied the attention of the court at Butte, Montana, for fully two months in 1899. A small fortune was paid out in lawyer's fees alone, to say nothing of models, plans and diagrams that cost thousands of dollars, and experts, kept in attendance on the court for weeks at the rate of one hundred dollars a day and expenses; and, in the end, $147,000 costs were taxed up by the winning side against the losing. And mark you, this is only the initial stage. The figures will be appalling after the case has dragged its weary length through all the successive courts to which it will be appealed. It is apparent that only the richest of mines, backed by almost unlimited capital, can stand such a drain or afford to pay such a tribute to the "apex" idol. Thus, while we may not interfere with right already vested under the existing law, judicious and timely action will at least help to protect the future discoverer and locator.

Besides those already mentioned there are numerous other directions in which your concerted political activity might expend itself, to the production of much good for the industry. In fact we will have occasion to haunt the legislative halls and congressional committee rooms many a day, before we have exhausted the measure of our needs. The entire industry would welcome more stringent legislation for the eradication of an evil, which has grown to be a canker on the body of the mining industry—I mean the illegitimate or so-called "wildcat" mining ventures. I doubt whether any other industry was ever afflicted with a similar pernicious growth. Of course these parasites appeal to one of the ruling passions and weaknesses of mankind—the instinct of gambling and the desire to get something for little or nothing—and they can perhaps never be entirely suppressed. But for the good of legitimate and deserving mining enterprise, from which capital might otherwise be frightened off, it is well worth our time and thought to seek, and after we have found, to press a remedy against this evil.

Then again, the entire abolition of mining districts and district officers; changes in the issuing of patents to public lands, so that minerals beneath the surface shall at all times remain open to exploitation, independently of the patent to the surface; provisions, tending to force possessory owners to become purchasers within a reasonable period; a fair system of mining valuation, assessment and taxation—all these are questions that interest us vitally in their bearing upon the prosperity of the entire industry. And while they are questions that have been

many times mooted before, they have never received earnest attention, with a view to getting action and results.

Lastly, if current reports prove true, our recently acquired possessions in the far East are likely to prove an inviting and profitable field to the mining man. The mining laws will have to be extended over the Philippines. It is our business for the sake of the whole industry to see to it that the development of that new country and the establishment of industrial occupation shall not be hampered by unwise congressional legislation, as it has in the case of Alaska. The people there, owing to improvident legislation, have been subjected to many petty exactions and indirect government spoliation, all of which has fallen portionately harder on the shoulders of the mining industry than on any other. And the practical result has been to impose a tax upon capital which capital is not earning. We may, of course, none of us, ever be individually interested in mining projects in the far-off Philippines; still, we owe it as a political duty to the industry at large to insist upon wise and benevolent legislation for it in every section of our country, so that the disastrous mistakes of the past will not be repeated.

Thus far I have dealt solely with what I might call "domestic politics"—politics as it is directly and visibly connected with our industry and having for its object direct and immediate results for it. But there are deeper and more intricate problems affecting us, which have a scope and sweep altogether beyond the reach of ordinary politics and broaden out into the domain of statesmanship. Time will not permit to extend this brief essay into a treatise on political economy, as applied to the mining industry. It will suffice to give one illustration that will point the way and make the moral clear.

The steady decline of silver, for many years past, has been a discouragement and a blow to the silver-producing industry of this country. Its hope and prayer has been for a restoration of the bullion price of silver to the rates that prevailed prior to the year 1873. How this can be accomplished interests us deeply; but all the science and all the research of our industry does not offer the key. Of course we all know that the want of a sufficient demand for silver is responsible for its fall in price. But to discover a way to increase the demand. There's the rub. Enlightened political economy alone will find the remedy, if there is one. It is the opinion of the foremost economists that the ultimate salvation of silver will come from the building up of a large and ever-increasing commerce with the silver-money using countries, such as India, China, Central and South America, which, together, represent about three-fifths of the population of the world. Being countries of still comparatively low prices and limited exchanges, silver is their natural coin medium of exchange and standard of value. Civilization in these countries, through the advent of better means of production and exchange, is rapidly advancing, thereby necessitating a continually increasing demand for silver as money. Even a comparatively small per capita increase in the use of silver, by such vast numbers, would not only rapidly absorb any existing surplus but possibly augment the demand in excess of any current supply. The true economic policy of our country, therefore, which is a large producer and seller of silver, would seem to be to remove all obstacles in the way of commerce between itself and these countries, in order that through increased traffic and consequent prosperity, the demand for silver on the part of the latter may be promoted. If this is the true solution of this absorbing question, it behooves us to manifest all possible interest in such a policy and by word and deed to facilitate and hasten such a result.

Thus it will be seen that by neglecting to observe and study the complicated orbits and oftentimes perplexing mazes, in which move the economic conditions of the whole country, we may often fail to justly understand our own true situation or to know how to advance our own interests.

These are only a few random suggestions, out of an almost countless number that might be made. They are not intended as anything more than hints, and will have fully served their purpose if they awaken in our minds a realizing sense of how many of our needs are referable to, and how many of our hopes are centered in politics and statesmanship. If we desire to achieve the highest measure of industrial success, it is

plain we must come out of our isolation into the busy hive of politics and statecraft, where men are at work day and night, shaping the policies and destiny of the nation.

Having arrived at this conclusion, it is essential to a complete discussion of this question to consider briefly, how best to obtain the results so obviously desirable. Shall it be left entirely to our individual effort? Shall each take up the fight single-handed and alone and plan and act according to his best understanding and enlightenment? Or shall the scheme of our future political activity be formulated here, in Conpress; and not alone formulated, but completed in every detail, except the execution? The answer is clear. By every principle of good politics, this Congress is the proper vehicle through which alone we can make the beginning for concrete results in political and legislative action. It is composed of representative men of the mining industry from almost every State in the Union, and, as such, its utterances will command the attention of the entire country. In its combined intelligence, it is safe to say, the Congress is in a position to know best the needs of the whole industry and of every part of it, as well as to devise ways and means for action. It should be, by every right, the initiative and referendum of all legislation relating to the mining industry. If it will only assert itself and be properly backed up by the subsequent patient and persistent efforts of its members there is no valid reason why it should not be a power in politics—not for the sinister manipulation of public affairs to private ends, but for the great and lasting good of the industry.

Now is an opportune time to take our bearings and then follow a new tack. The United States has entered, with might and main, upon a career of commercial and industrial world supremacy. It has gone into a contest for control of the markets of the world, and this includes the output, product and manufactures of our industry. Great events will transpire in the theater of the world's industry and commerce, in which we will be expected to play an important part. Let us set to work to clear the field of all these things that shackle and bind us, and which are nothing but hindrances to success.

Let the Congress set the pace, and I am confident the whole industry will follow with enthusiasm, to final success.

PRESIDENT PRINCE: The next order on the program is a paper by Prof. C. C. O'Harra, of South Dakota, on "Black Hills Ore Deposits," which will be read by Prof. Todd, the State Geologist.

Prof. Todd read the following paper:

BLACK HILLS ORE DEPOSITS.

By Prof. C. C. O'Harra, Ph. D., of State School of Mines, Rapid City, and Assistant Geologist South Dakota Geological Survey.

The first quarter century of mining operations in the Black Hills has just closed. Considerable prospecting was done within the region in 1875, but operations of a permanent character did not begin until the opening of the following year. From an isolated and practically unknown mountainous, wooded island in a vast, treeless plain and within the confines of an Indian reservation, the Black Hills region has during its brief history become one of the most important precious metal producers of the United States. Railways have brought the region to the threshold of older communities; beautiful scenery, peculiar to the country, annually attracts its thousands, permanent homes, prosperous towns and productive ranches prevail and mining facilities are in many ways unsurpassed.

Gold found throughout the region, but obtained mostly from the northern hills, is pre-eminently the chief mineral product—a total of approximately $100,000,000 having been obtained during the last 25 years. Silver has been of importance in the annual output, while many rare ores already productive or capable of production add much to the variety of the mining interests and not a little to the mineral wealth of the region.

Gold was first discovered in the Black Hills in the present stream gravels, and here as in many other gold-bearing localities such deposits

were the earliest producers. Rich placers were worked in various parts of the hills, but those of greatest importance were found near Deadwood. Within three years the richest placers, after having yielded $4,500,000, were practically exhausted. Meanwhile, the so-called ancient placers or cement (conglomerate) ores of Cambrian age near Deadwood were found to carry free gold in quantity. The pay streaks in the conglomerate ores carried the gold in such condition as to admit of its easy amalgamation and consequent cheap extraction, hence these were worked for a time with much success.

Almost coincident with the development of these valuable but short-lived placer and conglomerate ores came the discovery of the gold-baring quartz veins of the central and southern hills and of the impregnated zone near Lead, now widely known as the Homestake belt. These latter deposits, together with the tellurium-bearing sicilious ores of the Siluro-Cambrian and Carboniferous series of the northern hills now afford practically all the gold produced in the Black Hills.

Auriferous deposits, differing in manner and time of formation from those already mentioned, occur locally, but the chief sources of gold are or have been those given, namely:

First—Recent placers—formerly productive in many parts of the hills.

Second—Cambrian cement or conglomerate ores—formerly productive in the northern hills.

Third—Auriferous quartz veins in the Algonkian—productive chiefly in the central and southern hills.

Fourth—Impregnated zones in the Algonkian slates and schists—productive chiefly in the northern hills.

Fifth—Silicious ores of the Siluro-Cambrian and Carboniferous series—productive only in the northern hills.

The first two, as stated, have been practically exhausted. The third, that of the gold-bearing quartz veins have, in the past, and are now receiving much attention. Although less certain in the regularity of their values than some of the other ores and holding a minor position as to the entire gold production, they have, nevertheless, in many instances yielded handsome returns and will, doubtless, continue to grow in importance.

The first discoveries of the mineralized zones were made in February, 1876, on what is now known as the Homestake belt. During the following year California capitalists became interested in the locality, and on November 5 the Homestake Mining Company was incorporated. This company, although hindered by lack of railroad facilities, immediately arranged for the erection of a mill, and in July, 1877, eighty stamps began crushing ore. In December the first dividend was declared. Since that time the milling plant has been greatly enlarged and dividends have been paid regularly; the total amount paid up to date being more than $9,000,000.

The Homestake mine, in many respects the greatest gold mine of the world, is the just pride of the Black Hills people. Its heavy dividends on low-grade, free-milling ores during a time when little profit could be obtained from higher grade refractory ores, held the interest of mining men until processes suited to the needs of the refractory ores could be developed.

The gold of the impregnated zones is associated with pyrite, the upper portions of the deposits being free milling, but passing into more refractory sulphurets with depth. These ores, particularly on the Homestake belt, where most extensively worked, average approximately $4 per ton. It is worthy of note that these ore bodies, being largely free milling in those portions subject to disintegrating influences, have furnished much of the material for the later deposits, especially the Cambrian conglomerates and many of the recent placers.

The refractory or silicious ores were discovered in 1877. The first attempt to utilize them was made in 1879, the result being that little or no gold was saved. Later, various methods, more or less extensive, were tried without success and not until about the year 1890 did the ores begin to profitably yield their values. During the ten years which have since elapsed, these refractory ores have been carefully studied and advantageously developed so that at the present time they produce as much or more as all other ores combined.

The ores are found chiefly to the southwest of Deadwood, around

Bald Mountain, within an area much affected by post-cretaceous eruptives. A second and smaller area lies to the southeast of Deadwood, known as the Galena district. The ores of this district carry considerable lead and silver, as do likewise the ores near Carbonate.

The ore bodies occur as greatly elongated lenticular masses, running in a general north-south direction, having a thickness up to 12 or 15 feet, a width sometimes reaching 150 or 200 feet, with occasionally a length of more than a mile. Narrow vertical fissures, filled with ore, continually follow the general trend of the flat ore bodies and extend frequently into the shales above and into the quartzite below.

The chief horizon of the main bodies is immediately above the quartzite, near the bottom of the Cambrian series, and is known locally as the "lower contact." Bodies of ore, sometimes of considerable value, lie at various horizons above the lower contact, but these show little regularity of position and have been less extensively worked than the lower bodies.

The ore bodies are elongated layers or lenses among the calcareous sandy shales of the Cambrian, and are supposed to be most prominent just above the basal quartzite, because of the easily replacable shales at this horizon. These peculiar facts agree with observations made by Mr. J. D. Irving, who states that the ore is in all cases a replacement of the calcareous material of the shales and sandstones by silicious solutions. He says, "The deposition has, in all cases, been a metasomatic," Irving, J. D., A Contribution to the Geology of the Northern Black Hills, page 309. "Interchange of silica and pyrite for carbonate of lime, in which the latter has, in all probability, acted as the precipitating agent." Whether or not these solutions were in a heated condition, it is not possible to say, but it is very probable that such was the case. That the chemical activity of the solutions was due to the eruptive activity, seems probable, because at a distance from the eruptive centers ore bodies are not found. The gold remote from the eruptives is either in places or in finely disseminated colors in the Cambrian, and has been derived in all probability by erosion from the Algonkian schists. The ore shoots can, invariably, be traced to a so-called "vertical" or crevice, now filled by silica of the same character as the ore body itself. Prof. F. C. Smith, who first studied the ores, auguments this by stating that, "Wherever mineralization of the Potsdam beds has occurred, it can almost always be traced to a quartz-porphyry or rhyolite dyke, or "vertical," which itself is usually mineralized, stained with oxide of iron, and so much broken and decomposed that its rock character is distinguished with difficulty."

That the deposition has been in all cases a replacement of carbonate of lime as indicated by Irving, seems doubtful. Prof. Smith considers them as generally thoroughly reorganized sandstones. In view of the fact that the quartzite below, the ore bodies carry more or less gold, it being mined in some places to good advantage, and that in places other country rock is auriferous, it would seem that the one manner of replacement will not explain all occurrences. Prof. Smith refers to the ore bodies as eccentric and widespread in their occurrence and "the ores may be said to exist wherever mineralizing solutions permeated susceptible beds."

Concerning the history of the formation of these ore bodies, we quote again from Mr. Irwing's paper, page 311: "First occurred the intrusion of the older quartz porphyries, which produced much shattering. Contemporaneous with these, there may have been a certain amount of ore deposition, but not that to which the main silicious ore bodies owe their origin. Later the eruption of the phonolites took place, cutting and shattering the older eruptions, and adding to the number of fissures in the sedimentary rocks. Subsequent to all of these intrusions and probably separated from them by only a brief interval of time, came a long period during which heated solutions, containing fluorine and silica and other powerful mineralizers, gradually replaced the carbonate of lime in the more soluble strata of the Cambrian. The chemical activity of these solutions was increased by the heat and mineralizers derived from the newly injected phonolites. They passed up through the Algonkian slates and schists; becoming much enriched by the leaching out of the gold from these rocks. Finally they reached the very calcareous and porous rocks of the Cambrian, and by a metasomatic interchange, produced the horizontal ore bodies that are found today."

The silicious ores of the Carboniferous are in the main much the same as those of the Siluro-Cambrian, except that the former are generally masses of more or less brecciated limestone, stained with iron oxide and carrying high values, running frequently up to $150 or more.

The value of the Siluro-Cambrian ores ranges from practically nothing up to $60 or more in gold and generally some silver. The average yield is from $15 to $20, and ore running less than $10 is generally not worked.

The annual production of gold in the Black Hills has continually increased during the past several years, the output now hovering near the seven or eight million-dollar mark, while some estimates for the past year have indicated still higher figures. The increase is due to two causes: First, the increased development of the silicious ores both in the Siluro-Cambrian, where most extensively worked, and in the Carboniferous where most recently discovered, this having been brought about largely by the development of the cyanide process for treating the ores; and second, by the considerable enlargement of the Homestake plant, at which place a bountiful water supply has been secured, more stamps introduced and the largest cyanide plant in the hills has been erected and is now operating on the tailings formerly allowed to waste.

The silver output remains much the same as formerly, the amount for the past year being approximately $100,000. The chief localities are those of Carbonate, Galena and Spokane, the latter not now producing. Carbonates, chloride and sulphides are the chief ores.

Considerable activity is shown in undeveloped properties, and in some rarer ores recently found to be of value. Several copper prospects are being extensively developed, but none are yet steadily producing ore for shipment.

Wolframite, found in various parts of the hills, and especially in connection with the silicious ores in the vicinity of Lead, has been shipped in considerable quantity at a good price. The increased price of mica has caused the reopening of several mines, and many carloads have been shipped. Spodumene, of which there are large quantities in the central hills, has been extensively mined for its lithia contents and several hundred tons of the ore sold. Graphite is produced in small quantity, and is said to give promise of better development in the future.

Read before the Mining Congress by J. E. Todd, State Geologist.

A DELEGATE: Professor, what is the color of the ore of the Homestake?

PROF. TODD: From my knowledge concerning it, which is not very great, it is hardly distinguishable from common shale.

DELEGATE: About what is the average width of the vein?

PROF. TODD: About 600 feet, I think. It has been some time since I have looked that up, but I remember that figure from a few years ago.

DELEGATE: How deep are they?

PROF. TODD: I will call upon Mr. Baird to answer that.

MR. BAIRD: I will answer the question by stating that the deepest shaft in the Homestake is 1,200 feet.

DELEGATE: How wide a vein have they?

MR. BAIRD: There are no stopes opened at that depth. They simply sink a shaft, and in doing so they struck an ore that carries very little gold—practically valueless. But, on going through that, a distance of about 150 feet, they struck better ore than they have above. Above the iron rock their workings have an average width of a little over 600 feet.

DELEGATE: Is the ore in the bottom of the shaft better?

MR. BAIRD: It is a great deal better than on top of the iron rock.

DELEGATE: Is the vein in blanket form, or is it a regular ore?

MR. BAIRD: The vein is strongly defined by rock walls. The iron

comes in a flat formation, cutting the vein; but they have found by experience in sinking that the vein continues in depth.

DELEGATE: What is the formation? Granite, limestone, or what?

MR. BAIRD: The ore is classed as slate; there is very little quartz in it.

DELEGATE: What are the country rock walls?

MR. BAIRD: The country rock is porphyry.

DELEGATE: Is the ore free-milling?

MR. BAIRD: Practically free-milling.

DELEGATE: Is the vein a contact or fissure vein?

MR. BAIRD: It is a fissure vein.

DELEGATE: What is the dip of the slate? How does it lie in the vein?

MR. BAIRD: It dips to the southeast. The angle I can't give, because I do not remember it; but the dip is not very sharp.

PROF. TODD: We are especially fortunate in having Mr. Baird with us; he has been with the Homestake for many years, and is perfectly familiar with its workings.

PRESIDENT PRINCE: This concludes the papers that were on the program for this morning. Any miscellaneous business is now in order.

MR. ROBERTS, OF OHIO: Mr. President, I wish to call the attention of the Congress to a matter now before the Committee on Resolutions. A resolution was read before the Congress, and is now before the Committee on Resolutions, asking for the establishment of a department of mining. This is a matter of the greatest importance. The Committee on Resolutions merely pased upon it and referred it back to the Committee of the Whole, and it was adopted with scarcely a comment. I believe it is a matter of sufficient importance to warrant the appointment of a committee of three or five to draft a resolution or something of that kind addresed to Congress, asking Congress to act upon the question and establish a bureau of mining and mining interests as a part of our governmental machinery.

I will make a motion that you appoint a special committee to draft some paper relative to that subject, for us to act upon, and on which we can all express ourselves, and send to Congress an expression that is more than merely an incident of this Congress, as it now stands.

I therefore move you that you appoint a special committee for that purpose.

Motion seconded.

PRESIDENT PRINCE: The chair, at the time that this matter came before us, suggested that it might be well to discuss it further, in order to emphasize the action. Of course, it is competent for the Committee on Resolutions, of which the gentleman is a member, to formulate anything they choose on the subject and present it. That, perhaps, would be the most appropriate course. At the same time, the motion is entirely in order.

MR. CARRERA, OF NEW MEXICO: Mr. President, would it not be more emphatic if the chair appointed a committee, and then have the Committee on Resolutions pass upon it afterwards?

MR. CAMP, OF TENNESSEE: Mr. President, the gentleman is entirely out of order. Until the committee reports we have a right to presume that they will pass upon that, because everybody knows that it is the most important thing before this Congress. It would be

a reflection upon the committee to appoint a special committee at this time.

PRESIDENT PRINCE: The motion to appoint a special committee is entirely in order, although the more usual course would be that suggested by the gentleman from Tennessee.

MR. STEVENS, OF MONTANA: Mr. Prsident, I would suggest that the motion should prevail, and that the committee so appointed be instructed to confer with the Committee on Resolutions, and if that committee has taken it up, then there will be nothing left for the special committee to do. That will save any possible question of conflict, and leave the regular committee to look after it.

MR. ROBERTS, OF OHIO: Mr. President, I would say for the information of the Congress that the Committee on Resolutions have given no time to the subject. They referred it back to the Congress for their adoption, and it was adopted without any discussion. I believe it to be in the interest of the matter that we have some further action upon it. I suggest to the Committee on Resolutions that we have a special committee. We cannot act upon that matter intelligently in the limited time that we have in which to handle the subject. Therefore, I think a special committee should be appointed.

MR. CAMP, OF TENNESSEE: Mr. President, that committee has already appointed a sub-committee of their own to report upon the subject. I was not present, but a gentleman, who was present, has so stated.

MR. MOORE, OF COLORADO: Mr. President, it seems to me that the matter can best be left to the Committee on Resolutions. They were appointed for that purpose, to do that kind of business, to take it out of the hands of the Congress and relieve them of the general discussion. If the various members of the Congress will hand to any member of the Committee on Reolutions their own ideas upon this subject we will undertake, I think I may say with the consent of the gentlemen, that we will undertake to draft them in business-like form, and bring in such resolutions as we wish to address to the Congress of the United States.

PRESIDENT PRINCE: The only motion before the house is that of the gentleman from Ohio that a special committee be appointed—of how many?

MR. ROBERTS: Of three, Mr. President.

PRESIDENT PRINCE: Of three, to draft resolutions, or a memorial, on the subject of a department of mining, to be submitted to the house. Are you ready for the question?

MR. MARTIN, OF SOUTH DAKOTA: Mr. President, it seems to me that we are in danger of getting into conflict. We have a Committee on Resolutions and it is but courtesy to that committee that all resolutions should be referred to them. If this house now undertakes to appoint a special committee the only way to avoid a conflict will be to confer with that committee; and it seems to me that it will facilitate the business of this Congress if we leave that subject to that committee.

As I understand the proceedings they have already reported a general resolution upon that subject, and we passed it this morning. Now, if anything further is needed in the way of memorials to Congress it seems to me it should emanate from that committee.

MR. STEVENS, OF MONTANA: Mr. President, it appears to me

that we have got where something should be done to get out of this tangle. Therefore, I offer as an amendment that this subject matter be referred absolutely to the committee that is already in existence.

Amendment seconded.

MR. ROBERTS: Mr. President, I accept the amendment.

PRESIDENT PRINCE: There is really nothing to refer. I presume the desire expressed would be met by a request to the Committee on Resolutions to formulate a more lengthy memorial, or resolution, on this subject, and present it to the house. There is nothing before us to refer.

MR. STEVENS: No; but there is a motion.

PRESIDENT PRINCE: There is a motion, and the gentleman has accepted the amendment. The motion has not been acted upon.

MR. STEVENS: There was a motion that a special committee be appointed to act upon this subject. That is the condition of things before the house now. It appears to be the opinion of the house that this thing will conflict with the work of the general committee. Now, the only way out of the difficulty, with that motion before the house, is something in the form of an amendment.

PRESIDENT PRINCE: The motion is to refer the entire subject to the Committee on Resolutions. Are you ready for the question?

The motion was put by the chair, and declared carried.

MR. FREEMAN, OF MONTANA: Mr. President, the Committee on Credentials is prepared to report at this time.

I will say, Mr. President, and gentlemen of the Congress, that the committee has been compelled to consume a greater amount of time than it anticipated in the first instance. The list of delegates, owing to the appointive power conferred by this Congress, is so great that our report naturally will be voluminous. There have been a great many conflicts, which we have found it necessary to adjust, and we believe that we have as comprehensive a report as it is possible to make, under the circumstances.

The following is the report:

Boise City, Idaho, July 24, 1901.

International Mining Congress:

Gentlemen—We, your Committee on Credentials, beg leave to submit the following as the list of persons entitled to seats in the Congress as appears from credentials presented to your committee, viz.:

OFFICIAL ROSTER.

HON. L. BRADFORD PRINCE, President,
Santa Fe, New Mexico.
HON. A. P. SWINEFORD, Vice-President,
Ketchikan, Alaska.
E. C. ATWOOD Treasurer,
Empire, Colorado.
IRWIN MAHON, Secretary,
Carlisle, Pennsylvania.
W. H. SAVIDGE, Assistant Secretary,
Boise, Idaho.

EXECUTIVE COMMITTEE.

Hon. L. Bradford Prince, Chairman, Santa Fe, New Mexico.
Hon. A. P. Swineford, Vice-Chairman, Ketchikan.

Irwin Mahon, Secretary, Carlisle, Pennsylvania.
E. C. Atwood, Treasurer, Empire, Colorado.
Hon. Philo A. Orton, Darlington, Wisconsin.
J. W. Adams, Dahlonega, Georgia.
Mrs. Ella Knowles Haskell, Helena, Montana.

STATE BOARD.

Governor F. W. Hunt, Chairman.
Hon. Jules Bassett, Secretary of State.
Hon. John J. Plumer, State Treasurer.

CHAIRMAN CITY COMMITTEE.

Judge B. F. Olden, Boise, Idaho.

CHAIRMAN CITY RECEPTION COMMITTEE.

Hon. J. H. Richards, Boise, Idaho.
Hon. J. A. Lippincott, State Commissioner, Boise.
Hon. Fred H. Davis, Assistant State Commissioner, Boise.
Hon. Martin Jacobs, State Mine Inspector, Boise.

STATE VICE-PRESIDENTS.

Alaska—A. Hollis White.....Ketchikan
Arizona—George P. Blair.....Mammoth
Arkansas—J. S. Hanford.....Batesville
California—Col. Thomas Ewing.....Los Angeles
Colorado—W. S. Montgomery.....Colorado Springs
Georgia—Walter P. Andrews.....Atlanta
Idaho—Frank Steuenberg.....Boise
Illinois—B. W. Goodsell.....33 S. Canal, Chicago
Indiana—U. Gulbert.....Michigan City
Iowa—Dr. H. G. Knapp.....Dubuque
Kansas—H. F. Brinkham.....Dillon
Michigan—A. L. Flewelling.....Crystal Falls
Minnesota—N. C. Westerfield.....St. Paul
Missouri—George P. Paxton.....Joplin
Montana—L. S. Woodbury.....Great Falls
Maryland—Henry Shriver.....Mt. Savage
Nebraska—H. M. Rice.....Lincoln
New Mexico—R. C. Hatton.....Las Cruces
North Carolina—J. Frank Wilkes.....Charlotte
New York—William E. Gray.....1343 Broadway, N. Y. City
Oregon—I. B. Hammond.....Portland
Ohio—E. L. Shafner.....Cleveland
Oklahoma—Ex-Gov. W. C. Renfrow.....Oklahoma City
South Dakota—Angus MacKay.....Deadwood
Tennessee—E. C. Camp.....Knoxville
Texas—Roger Q. Mills.....Corsicana
Utah—R. C. Chambers (Deceased).....Park City
Washington—James M. Ashton.....Tacoma
West Virginia—Capt. Thomas Page.....Ansted
Wisconsin—M. H. Richards.....Platteville
Wyoming—Will Reed.....Rawlins
Washington, D. C.—Dr. W. Lee White.....Washington
British Columbia—George Alexander.....Kaslo

Virginia—Gov. J. Hoge Tyler.....Richmond
Province of Ontario—Hon. E. J. Davis.....Toronto

STATE ASSISTANT SECRETARIES.

Alaska—J. A. Bradley.....Revilla
Arizona—C. E. Bowers.....Kingman
Arkansas—Percy Fitch.....Smithton
California—J. Irwin Crowell.....Los Angeles
Colorado—W. MaK. Barbour.....Colorado Springs
Idaho—J. M. Haines.....Boise
Georgia—George Seiple.....Atlanta
Illinois—D. J. Delong.....90 Washington St., Chicago
Indiana—L. P. Newsby.....Knightstown
Iowa—J. W. Miller.....Des Moines
Texas—Charles B. Edy.....El Paso
Utah—Hon. D. O. Rideout.....Draper
Washington—J. T. Thompson.....Seattle
West Virginia—T. E. Huston.....Elkhorn
Wisconsin—M. D. Kelly.....Milwaukee
Wyoming—J. M. Thomas, Jr.....Battle Lake
Washington, D. C.—Dr. A. McKnight.....610 F St., N. W.
British Columbia—F. W. Kirby.....Rossland
Virginia—George W. Miles.....Radford
Province of Ontario—Hon. Thomas W. Gibson.....Toronto
Kansas—James Bastgen.....Atchison
Michigan—Edw. N. Breiting.....Marquette
Minnesota—E. C. Gridley.....Duluth
Missouri—J. W. Marsteller.....Jefferson City
Montana—John P. Schmidt.....Helena
Maryland—Charles Matt.....Baltimore
Nebraska—J. T. Dorgan.....Lincoln
New Mexico—C. J. Gavin.....Raton
North Carolina—A. H. Isbell.....Murphy
New York—W. L. McCabe.....P. T. & C., N. Y.
Oregon—Paul Baumel.....Portland
Ohio—W. L. Kendall.....Cleveland
Oklahoma—Henry E. Glasier.....Guthrie
South Dakota—James Czizek.....Lead City
Tennessee—H. V. Maxwell.....Knoxville

ALABAMA.

William J. Sanford, Governor.

Dr. P. H. Mell.....Auburn
Dr. Eugene A. Smith.....Tuscaloosa
J. de B. Hooper.....Birmingham
John McDonald.....Birmingham
Some M. Meigs.....Birmingham
John Harkins.....Birmingham
L. W. John.....Birmingham
James Hillhouse.....Birmingham
James Schools.....Birmingham
Robert Stevens.....Birmingham
Thomas Kelso.....Birmingham
Sampson Alsop.....Birmingham

William Grady.....Birmingham
J. P. Christian.....Shelby
J. L. McCanoughby.....Montevallo
John E. Morris.....Ganadarque
J. E. Rufflin.....Helena
George F. Peter.....Maylene
W. E. Knox.....Anniston
John B. Lagarde.....Anniston
R. H. Cobb.....Anniston
A. H. Quinn.....Anniston
D. B. Lacy.....Anniston
J. J. Gray.....Sheffield
F. R. King.....Leighton
W. B. Allsbrook.....Allboro
John A. Edwards.....Childersburg
J. E. Stone.....Talldega
George W. Chambers.....Talldega
Hon. W. W. Lavendar.....Centreville
A. P. Howison.....Randolph
J. B. Wadsworth.....Woodstock
J. N. Campbell.....Bocton
H. C. Reynolds.....Bocton
Dr. George Wilkins.....Tuscaloosa
F. G. Blair.....Tuscaloosa
Frank Lester.....Brookwood
T. H. Moore.....Tuscaloosa
J. B. Carrington.....America
Henry McArdle.....Horse Creek
H. L. Smith.....Gamble Mines
James Nichols.....Galloway
A. W. Reed.....Corona

APPOINTED BY MAYOR OF BIRMINGHAM.

W. M. Drennen, Mayor.

A. W. Haskell
P. Toulmin,
E. Ramsey
L. W. John,
J. F. Carrington.

ILLINOIS.

Richard Yates, Governor.

F. O. Wyatt.....Chicago
H. N. Taylor.....Chicago
A. L. Sweet.....Chicago
S. M. Dalzell.....Chicago
C. L. Scroggs.....Chicago
Herman Justi.....Chicago
P. H. Donnelly.....Chicago
J. H. Geraghty.....Chicago
Richard Newsam.....Peoria
Isaac Wantling.....Peoria
James Taylor.....Edwards
W. G. Halbert.....Danville
W. R. Russel.....Danville
W. R. Jewell.....Danville
John Rollo.....Herrin

J. D. Peters.....Herrin
George C. Simpson.....Mt. Olive
A. J. Moorehead.....Glen Carbon
William Scaife.....Springfield
Frank Godley.....Springfield
David Ross.....Springfield
W. D. Ryan.....Springfield
J. W. Moore.....Springfield
Thomas Burke.....Springfield
J. M. Hunter.....Streator
Charles Rathbun.....Streator
F. B. Harcourt.....Rochester
Hugh Murray.....Nashville
Walton Rutledge.....Alton
Thomas Hudson.....Galva
J. H. Allen.....Southboro
Joseph Pope.....Belleville
Thomas Reynolds.....Collinsville
C. C. Davis.....Centralia
T. A. Wilson.....Lebanon
G. W. Traer.....Chicago
F. C. Peabody.....Chicago
Marion C. Wright.....Cairo
E. C. Donk.....Belleville
L. M. Bradley.....Mound City
Frank T. Day.....95 Dearborn St., Chicago
William R. Everett.....95 Dearborn St., Chicago
Stuart Goodrell.....1103 Ashland Block, Chicago

APPOINTED BY MAYOR OF CHICAGO.

Carter H. Harrison, Mayor.

C. L. Luigs,
J. C. O'Neill.
B. W. Goodsell,
Miss P. L. Holland,
J. A. Ede

INDIANA.

W. T. Burbin, Governor.

Hon. Crawford Fairbanks.....Terre Haute
Hon. Thomas Taggart.....Indianapolis
Hon. S. E. Morss.....Indianapolis
Hon. A. M. Ogle.....Indianapolis
Hon. Charles McCulloch.....Fort Wayne
Hon. R. S. Hennant.....Terre Haute
Hon. J. J. Higgins.....Clinton
Prof. T. H. Hicks.....Fort Wayne
Hon. W. S. Bogle.....Chicago, Ill., Plymouth Bldg.
Hon. Richard Townsend.....Fort Wayne
Hon. John H. Bass.....Fort Wayne
Hon. Hugh Shirkie.....Clinton
Hon. James McClellan.....Brazil
Hon. C. A. Eastman.....Brazil
Hon. W. H. Hubbard.....Indianapolis
Hon. David Ingall.....Oakland City
Hon. W. D. Van Horn.....Terre Haute

Hon. James Epperson.....Lindon
Hon. W. G. Knight.....Terre Haute
Hon. Job Freeman.....Lindon
Hon. James Fielder.....Ayrshire
Hon. George Purcell.....Terre Haute
Hon. William Malton.....Lindon
Hon. W. S. Little.....Evansville

APPOINTED BY MAYORS.

TERRE HAUTE, INDIANA.

Henry C. Steeg, Mayor.

Dan Bogle, Crawford Fairbanks,
J. C. Kolsem. J. Smith Talley.
W. W. Ray,

LA FAYETTE, INDIANA.

Noah Justice, Mayor.

Libman Sparks, G. H. Hull.
H. H. Lancharter, Fred Myer.
George Timberlake,

IOWA.

L. M Shaw, Governor.

James W. Miller.....Des Moines
William E. Ballard.....Des Moines
Floyd Davis.....Des Moines
Joseph M. Christy.....Des Moines
James E. Stout.....Des Moines
Thomas A. Harding.....Des Moines
H. Foster Bain.....Des Moines
James G. Berryhill.....Des Moines
Thomas Burke.....Des Moines
William J. Miller.....West Liberty
James A. Campbell.....Ottumwa
H. L. Waterman.....Ottumwa
John Verner.....Oskaloosa
Alexander Dargavel.....Centerville
William W. Oliver.....Centerville
James Wilson.....Centerville
S. T. Meservey.....Fort Dodge
William T. Chantland.....Fort Dodge
John Owens.....Beacon
Joseph W. Lewis.....Hiteman
H. L. Byers.....Lucas
Prof. Samuel W. Beyer.....Ames
Prof. Samuel Calvin.....Iowa City
Prof. William H. Norton.....Mt. Vernon
Calvin W. Doop.....Casey
Prof. John Littlefield Tilton.....Indianola
J. A. Green.....Stone City
Frederick C. Semmek.....Davenport
Henry H. Canfield.....Boone
H. G. Edmundson.....Bedford
John P. Reese.....Albia
Henry Augustus Collin.....Northwood

APPOINTED BY CHAMBERS OF COMMERCE.

Sioux City Commercial Club appointed F. L. Eaton, Secretary of the Sioux City Stock Yards Company, chairman of the delegation, with power to select four others to attend this Congress.

Sioux City, Iowa. Clarinda, Iowa, Improvement Association.

V. Graff.....Clarinda
J. R. Burrows.....Clarinda
F. W. Parish.....Clarinda
I. Weil.....Clarinda
G. William Richardson.....Clarinda

KANSAS.

W. E. Stanley, Governor.

C. J. Delvin.....Topeka
J. H. Durkee.....Weir City
A. E. Winter.....Blue Rapids
W. H. Mahon.....Coffeeville
L. Ainsworth.....Lyons
Louis Matignon.....Scranton
H. F. Pinkman.....Dillon
John R. Morrison.....Midway
John R. Braidwood.....Weir City
George Richardson.....Weir City
Robert Gilmour.....Pittsburg
Edward Keegan.....Pittsburg
John T. Stewart.....Weir City
Thomas McManus.....Weir City
Erasmus Haworth.....Lawrence
A. M. Shermerhorn.....Galena
Hon. E. C. Weilep.....Galena
Hon. S. J. Crawford.....Topeka
Charles K. Holliday.....Topeka
Hon. J. W. Orr.....Atchison

APPOINTED BY MAYOR OF TOPEKA.

J. W. E. Hughes, Mayor.

Frank E. Wear,
S. S. Ott,
E. W. Poindexter,
J. E. Frost,
C. K. Holliday.
Frank Little,
R. H. Dihle,
Charles L. Sampson.
W. W. Watson.
Oscar Seitz.
E. W. Tuttle.

MAINE.

John F. Hills, Governor.

George H. Morse, Esq.....Pittsfield
Elmer D. Smith.....Pittsfield

MARYLAND.

John W. Smith, Governor.

Frank Ehlen.....Baltimore
John B. Sisson.....Baltimore
William Bullock Clark.....Baltimore

Jesse Tyeson.....Baltimore
C. K. Lord.....Baltimore
Alexander Shaw.....Baltimore
W. G. Cassell.....Baltimore
W. G. Cassell.....Baltimore
J. L. Murrill.....Baltimore
August Hoen.....Baltimore
B. F. Star.....Baltimore
John Waters.....Baltimore
T. J. Mehan.....Baltimore
J. P. Carroll.....Midland
John Milholland.....Cumberland
C. C. Coffin.....Muirkirk
John Sheridan.....Mt. Savage
J. McClenahan.....Port Deposit
R. K. Wood.....Sparrow's Point
Lloyd Lowndes.....Cumberland

MASSACHUSETTS.

C. F. Drake, A. P. Chitterton.
Willard White,

MICHIGAN.

Hon. N. T. Bliss, Governor.

C. M. Boss.....Bessemer
W. A. Cole.....Ironwood
S. G. Cole.....Ironwood
William Bond.....Vulcan
William Kelley.....Vulcan
J. E. Jopling.....Ispheming
E. F. Bradt.....Iron Mountain
C. E. Breitung.....Ispheming
Walter Firch.....Beacon
W. Goldworthy.....Iron Mountain
William Werder.....Bessemer
Will A. Childs.....Calumet
J. D. Cuddihy.....Calumet
James McNaughton.....Calumet
Capt. W. E. Parnell.....Calumet
Capt. Josiah Hall.....Calumet
Capt. James Chenoweth.....Calumet
Capt. William Daniels.....Calumet
John Duncan.....Calumet
Capt. Johnson Vivian.....Houghton
Phillip Carroll.....Houghton
Z. W. Wright.....Houghton
R. R. Goodell.....Houghton
Will Calverly.....Houghton
James Pryoe.....Houghton
A. F. Rees.....Houghton
A. R. Gray.....Houghton
William J. Wren.....Houghton
William J. Van Orden.....Houghton
Dr. L. L. Hubbard.....Houghton
Capt. S. B. Harris.....Hancock

E. L. Wright.....Hancock
R. H. Shealds.....Hancock
C. A. Wright.....Hancock
James H. Seager.....Hancock
A. J. Scott.....Hancock
F. McM. Stanton.....Atlantic
F. J. Coggins, Jr.....Red Ridge
Fred Smith.....Wolverine
George Froney.....Jacobsville
J. B. Cooper.....South Lake Linden
Tom A. Hanna.....Iron Mountain
James Hoar.....Lake Linden
George W. Orr.....Lake Linden
Samuel G. Higgins.....Sagniaw
C. B. Shaefer.....Sagniaw
R. M. Randall.....Sagniaw
F. G. Benham.....Sagniaw
W. T. Chappell.....Sagniaw
Thomas B. Jones.....Sagniaw
Arthur Barnard.....Sagniaw
Arthur D. Eddy.....Sagniaw
C. R. Campbell.....Sagniaw
Peter Herrig.....Sagniaw
M. L. Davies.....Bay City
W. A. Knapp.....Bay City
E. B. Foss.....Bay City
Charles Coryell.....Bay City
Charles W. Handy.....West Bay City
Robert Gage.....Jackson
Charles Chynoweth.....Calumet
Ernest Bollman.....Calumet
Robert L. Edwards.....Houston

MINNESOTA.

S. R. Van Sant, Governor.

Capt. J. H. Hearding.....Eveleth
Capt. S. E. Helps.....Eveleth
Capt. Glen R. Brown.....Eveleth
C. E. Bailey.....Eveleth
Capt. C. W. Kimberley.....Eveleth
Capt. P. Mitchell.....Hibbing
Capt. Redfern.....Hibbing
A. P. Stillman.....Hibbing
Capt. E. C. Mills.....Virginia
J. D. Lamont.....Virginia
Capt. J. W. Wallace.....Duluth
Capt. J. D. Shilling.....Biwabik
Capt. C. H. Munger.....Sparta
Capt. M. S. Hawkins.....Mountain Iron
Capt. John Pengilly.....Ely
C. H. Pratt.....Boise, Idaho
Fred J. Bowman.....Minneapolis
C. W. Hall.....Minneapolis, care U. of M.
B. H. Evans.....St. Paul

N. C. Westerfield.....St. Paul
J. C. Riebe.....Minneapolis

APPOINTED BY MAYOR.

ST. PAUL, MINNESOTA.

Robert A. Smith, Mayor.

Dennis Ryan, W. W. Price,
J. C. Stout, H. B. Willis.
Dr. Rudolph Schiffmann,

DULUTH, MINNESOTA.

T. M. Hugo, Mayor.

O. L. Young, Clinton Markell,
W. P. Hurlbut, Edward Silberstein,
C. D. McEachron, R. C. Mitchell.

MISSOURI.

Alex. M. Dockery, Governor.

V. L. Beshears.....Vandalia
I. N. Page.....Bonne Terre
J. J. Funk.....Webb City
J. J. Nelson.....Webb City
J. C Stewart.....Webb City
T. J. Shelton.....Centerville
Dan Collins.....Joplin
H. H. Gregg.....Joplin
Andrew Donan.....Joplin
T. W. Cunningham.....Joplin
Fred Norton.....Carthage
J. W. Halliburton.....Carthage
W. B. Williams.....Rich Hill
S. H. Minor.....Aurora
A. H. Scholes.....Granby
C. E. Davidson.....Neosho
J. H. Waltman.....Lamar
James Hughes.....Richmond
P. S. Adams.....Fulton
Price Gunn.....Higginsville
W. R. Carter.....Wellington
J. W. Marsteller.....Jefferson City
W. S. Allee.....Olean
W. E. Murlin.....Bevier
August Setz.....Bonne Terre
George B. Paxton.....Joplin
D. W. Shackleford.....Jefferson City
S. D. Gordon.....Columbia
B. F. Auger.....Moundville
William Ballew.....Corder
W. J. Teeman.....Montrose
Harry Ward.....Moberly
Dr. F. R. Newberry.....Fredericktown
W. P. Ruffel.....Glasgow
Joseph Daylor.....Shelbyville

APPOINTED BY MAYORS.

MARSHALL, MISSOURI.

John Blair, Mayor.

R. B. Ruff.
E. D. Martin,
R. P. Spencer,
Charles Potter,
J. W. Carter.
R. M. Reynolds,
J. Herdnal Harvey,
John O Nling,
J. R. Phillips,
G. S. Hardin.

JEFFERSON CITY, MISSOURI.

Alfred C. Shoup, Mayor.

Louis C. Lohman,
Henry Bockrath.
G. Masonhall.
Dr. George W. Tainter,
S. D. Donnell.

JOPLIN, MISSOURI.

John C. Trigg, Mayor.

W. W. Petraeus,
Burt W. Lyon,
E. N. Perry,
Jason S. Frye,
John W. McAntire,
D. K. Wenrick,
George G. Bayne,
J. E. Aldrich.

APPOINTED BY COUNTY COMMISSIONERS.

COLE COUNTY, MISSOURI.

Albert Pfunder.....Hickory Hall
Frank Distler.....Elston
Dodge Durham.....Elston
J. R. Edwards.....Jefferson City
George C. Ramsey.....Jefferson City

APPOINTED BY CHAMBERS OF COMMERCE.

Commercial Club, Carthage, Missouri.

T. T. Luscombe.....Carthage
Oscar DeGraff.....Carthage
J. W. Grounds.....Carthage
H. H. Beckwith.....Carthage
T. K. Irwin.....Carthage

Commercial Club of Jefferson City, Missouri.

F. W. Roer,
L. D. Gordon,
F. M. Brown,
Dr. J. P. Porth,
W. W. Wagner.

Aurora Business Men's Club, Aurora, Missouri.

Louis J. Minor.....Aurora
M. L. Coleman.....Aurora
C. C. Playter.....Aurora
Bert Gardner.....Aurora
J. B. Miller.....Aurora
Jared R. Woodfill, Jr.....Aurora
S. E. Loy.....Aurora
C. E. Matthews.....Aurora
J. A. Borsman.....Aurora
J. M. Burgner.....Aurora

O. J. Raymond.....Aurora
C. R. Jones.....Aurora
G. H. Elmore.....Aurora
J. H. Berkshire.....Aurora

MONTANA.

Joseph Toole, Governor.

Thomas Cruse.....Helena
R. A. Bell.....Helena
William Mayger.....Helena
Alex. Burrell.....Helena
William Morris.....Pony
Paul A. Fusz.....Philipsburg
J. C. McLeod.....Philipsburg
L. C. Parker.....Garnet
F. G. Higgins.....Missoula
W. J. Stephens.....Missoula
L. S. McLure.....Neihart
J. T. Armington.....Armington
J. E. Barker.....Great Falls
F. C. Berendes.....Boulder
Ed. Ryan.....Boulder
J. A. Savage.....Livingston
John P. Barnes.....Lewistown
J. C. Tipton.....White Sulphur Springs
Edwin Norris.....Dillon
A. W. Spriggs.....Townsend
W. E. Eversole.....Townsend
H. L. Frank.....Butte
Michael Deevey.....Butte
T. W. Buzzo.....Walkerville
W. W. McDonell.....Butte
Joe Bryant.....Butte
Carl Galligher.....Butte
George Robinson.....Butte
J. H. Vivian.....Butte
Henry Addoms.....Butte
Mrs. Ella Knowles Haskell.....Helena

APPOINTED BY MAYOR OF HELENA.

Frank J. Edwards, Mayor.

T. E. Collins,
A. A. Lathrop,
Carl Kleinschmidt, Jr.,
R. A. Bell,
E. A. Whetmore,
George O. Freeman.

BROADWAY COUNTY, MONTANA.

John A. Keating.....Radersburg
Ham Richardson.....Townsend
W. S. Dosge.....Winston
A. W. Schreiber.....Diamond City
Julius Berg.....Townsend

MEAGHER COUNTY, MONTANA.

J. B. Galliger.....Copper
F. A. Sisely.....Minden

Ira Allen.....Fort Logan
Joseph Graham.....White Sulphur Springs
William Short.....Castle
L. C. Parker.....Granite County

J. H. Trerise,
R. W. Barry,
C. W. Goodale,
G. W. Winter,
George D. Cochrane,
N. R. Leonard,
T. P. Newton,
A. N. Winchell.
Tom Bryant,
Albert Kleinschmidt,
F. J. Rowlands,
J. H. Heilbronner,
L. O. Leonard.

NEBRASKA.

Charles H. Dietrich, Governor.

Thomas H. Benton.....Lincoln
John F. Coad.....Omaha
Henry W. Yates.....Omaha
G. J. States.....Lincoln
James H. Van Dusen.....South Omaha
S. H. Rice.....Milford
O. A. Abbott.....Grand Island
Robert Ross.....Omaha
J. W. Dolan.....Arapahoe
Edward Bignell.....Lincoln
John A. Creighton.....Omaha
Frank Castetter.....Blair
W. B. Creek.....South Omaha
Frank Hammond.....Fremont
J. Sterling Morton.....Nebraska City
Adam Breede.....Hastings
Isaac D. Clarke.....Papillion
John C. Sprecher.....Schuyler
Patrick Miles.....Sidney
Jefferson Stone.....Minden
C. M. Hunt.....South Omaha
Charles Wooster.....Silver Creek
J. A. Harris.....Broken Bow
Taylor Flick.....Broken Bow
Guy C. Barton.....Omaha
R. C. Patterson.....Omaha
E. H. Barbour.....Lincoln
George Brooks.....Norfolk
G. N. Hicks.....Omaha
G. M. Hitchcock.....Omaha

APPOINTED BY MAYOR OF HOLDRIDGE.

F. A. Dean, Mayor.

E. W. Beghtol,
E. D. Eainsel,
W. P. Hall,
C. A. McCounaughy,
Gus Abrahamson.

APPOINTED BY COUNTY COMMISSIONSERS.

A. B. Allen.....Tecumseh
H. T. Ward.....Tecumseh

William H. Campbell.....Tecumseh
C. M. Linn.....Tecumseh
George Warren.....Tecumseh

NEW JERSEY.

Hon. F. W. Voorkees, Governor.

Hon. Frederick A. Canfield.....Dover
M. D. Valentine.....Woodbridge
James Tonking.....Franklin Furnace
S. B. Patterson.....Philipsburg
George W. Maynard.....Morristown
John C. Randolph.....Morristown

NEW YORK.

B. B. Odell, Jr., Governor.

Charles Kirchoff.....New York City
Hon. E. G. Gary.....New York City
Cleveland H. Dodge.....New York City
Augustus Heckscher.....New York City
Benjamin Nicall.....New York City
Hon. J. Sloat Fassett.....Elmira
Hon. Smith M. Weed.....Plattsburgh
A. E. Tower.....Ploughkeepsie
James A. Burden.....Troy
C. H. Cady.....Mineville
Capt. George F. Roth.....Rochester
Coker F. Clarkson.....New York City
W. J. Johnston.....New York City

NORTH DAKOTA.

E. J. Babcock.....Grand Forks

OREGON.

Hon. T. T. Geer, Governor.

F. V. Drake.....Portland
Arthur Conklin.....Grants Pass
J. O. Booth.....Grants Pass
R. G. Smith.....Grants Pass
J. W. Virtue.....Leland
W. B. Dennis.....Cottage Grove
George A. Dyson.....Blue River
W. B. Hawley.....Eugene
George W. Lloyd.....Eugene
W. J. D'Arcy.....Salem
W. T. Wright.....Union
Dunham Wright.....Union
J. H. Pomeroy.....Weatherby
W. A. Thatcher.....Geiser
F. S. Bailee.....Bourne
Aliene Case.....Cornucopia
George Barin.....Granite
Albert Geiser.....Baker City
William Smith.....Baker City
H. C. McCallum.....Sumpter

H. A. Himes.....Canyon City
Ira Sprawl.....Canyon City
J. W. Larkin.....Granite
William Miller.....Ontario
J. D. Voss.....Express
William Harris.....Cottage Grove
LeRoy D. Walter.....Carson
John T. Grayson.....Baker City
J. K. Romig.....La Grande
William Huntley Hampton.....Grants Pass
E. J. Godfrey.....Portland
T. H. Crawford.....Union
F. L. Evans.....Medical Springs

APPOINTED BY MAYORS.

PORTLAND, OREGON.

H. S. Rowe, Mayor.

G. W. Johnson,
A. Hoofer,
H. S. Harcourt,
I. B. Hammond,
J. R. Clark,
F. J. Hard,
Isaac H. Bingham,
Angus D. McQueen,
Walter McKay,
Dr. Andrew C. Smith,
H. H. McCarty.

BAKER CITY, OREGON.

W. H. Bentley, Mayor.

H. S. Bowen,
James Barton,
P. Bache,
John T. Grayson,
J. A. Panting.

SUMPTER, OREGON.

J. H. Robbins, Mayor.

Emil Melzer.....Bourne
J. A. Flood.....Sumpter
A. J. Trimbee.....Sumpter
J. W. Carr.....Alamo
Francis Clarino.....Alamo

APPOINTED BY COUNTY COMMISSIONERS.

Business Men's League, Sumpter, Oregon.

Daniel Jarger.....Sumpter
J. J. Hennesey.....Sumpter
Seymour H. Bell.....Sumpter
Joseph A. Mikel.....Sumpter
Roy H. Miller.....Sumpter
P. C. Phelps.....Sumpter

PENNSYLVANIA.

William A. Stone, Governor.

Peter Quinn.....Wilkesbarre Township
Llewellyn Price.....Wilkesbarre Township
Thomas Harris.....Lattimer Mines
David Davis.....Avoca
S. R. Morgans.....Wilkesbarre

Morgan R. Morgans.....Wilkesbarre
T. D. Nichols.....Nanticoke
Edmund Evans.....Pittzton
Stephen Charles.....Hazelton
Thomas B. McKaig.....Pittsburg
Mordacai Dando.....Edwardsville
Hon. D. J. Reese.....Plymouth
Edmund N. Carpenter.....Idanha Hotel, Boise, Idaho
Hon. William Jeffreys.....Hazelton
Hon. B. F. Myers.....Harrisburg
Lemuel Smith.....Export
Charles E. Porter.....Baggaley
H. D. Penman.....Adamsburg
John Clark.....Irwin
James Hall.....Dubois
Richard George.....Winburne
Alexander Stewart.....Anita
James Hamilton.....Eleanora
John Bell.....Big Soldier
Andrew Beveridge.....De Lancey
Edward Mannix.....Bernice
James H. Spence.....Bernice
John White, Sr.....Bernice
William Brown.....Bernice
James C. Johnson.....Phillipsburg
Thomas James.....Phillipsburg

APPOINTED BY MAYORS.

EASTON, PENNSYLVANIA.

B. Rush Field, Mayor.

H. A. Sage, Jr.,
E. J. Richards,
Chester Snyder,
Horace Lehr,
W. B. Newberry,
Charles Rodenbough,
James McK. Young,
Capt. Fred R. Drake.

MALDEN, MASSACHUSETTS.

C. L. Dean, Mayor.

Enoch Perkins,
Henry A. Bascom,
George S. Mansfield,
C. F. Hickler,
Harold C. Buckminister,
C. Henry Knapp,
Charles B. Waterman.

SOUTH DAKOTA.

Charles M. Herried, Governor.

Congressman E. W. Martin.....Deadwood
Prof. James E. Todd.....Vermillion
Thomas Gregory.....Lead
Walter E. Smead.....Lead
Ernest May.....Lead
J. C. McLemore.....Lead
Hon. K. G. Phillips.....Deadwood
N. E. Franklin.....Deadwood
W. H. Bonham.....Deadwood
Otto P. T. Grantz.....Deadwood

R. L. Billings.....Deadwood
G. G. Dennis.....Deadwood
George Hendy.....Terry
Thomas J. Kean.....Terry
James Sorvinder.....Spearfish
R. B. Hughes.....Spearfish
John Gray.....Terraville
Titus Corkhill.....Central City
Nick Treweek.....Terry
C. B. Harris.....Galena
George L. Griggs.....Galena
H. E. Perkins.....Sturgis
A. T. Feay.....Custer City
Charles Caton.....Hill City
Hon. Charles Baldwin.....Keystone
Prof. R. E. Slagel.....
J. B. Gossage.....Rapid City
George Atwater.....Yankton
D. O. Baer.....Lead City
Joseph Hinton.....Central City

SOUTH CAROLINA.

Delegates Appointed by the Governor of South Carolina.

Dr. James McIntosh.....Newberry
Alonzo Iler.....Union
James G. Galbreath.....Newberry
O. M. Jamison.....Newberry
W. B. Smith Whaley.....Columbia
Augustine T. Smythe.....Charleston
A. B. Calvert.....Spartanburg
Col. J. B. Cleveland.....Spartanburg
Col. Wilie Jones.....Columbia
Col. LeRoy Springs.....Lancaster
Maj. J. F. Hart.....Yorkville
Col. A. C. Latimer.....Belton
Col. J. L. Black.....Blacksburg
F. C. West.....Spartanburg
Earle Sloam.....Charleston
L. M. Jordan.....Union

TENNESSEE.

Benton McMillin, Governor.

Lucius P. Brown.....Nashville
John F. McNutt.....Crossville
R. A. Shiflett.....Knoxville
S. A. Wood.....Dyersburg
T. C. Looney.....Memphis
J. L. Dibrell.....Randolph Adams
A. H. Wood.....Petros
F. P. Clute.....Glenmary
E. C. Camp.....Knoxville
W. S. Duckworth.....Nashville
Col. A. M. Shook.....Nashville
P. E. Blow.....Knoxville

Henry C. Jackson.....Jonesville
Ben L. DuLaney.....Bristol
H. C. Kerber.....Mooresburg
D. B. Anderson.....Gallatin
John Carpenter.....Columbia
H. D. Ruhm.....Mt. Pleasant
Hon. J. M. Graham.....Pinewood
J. H. Lory.....Cumberland City
P. J. Tinsley.....Nashville
W. G. Sadler.....Nashville
Robin Jones.....Nashville
Charles A. Weller.....Knoxville
C. G. Popp.....Deposit
Randolph Adams.....Ducktown
Hon. E. L. Bullock.....Jackson
J. M. Head.....Dayton
James Woolridge.....Woolridge
H. H. Buquo.....Grayville
W. W. Wallace.....McMinnville
G. H. Crozier.....Whitwell
R. J. Moscrip.....Monterey
D. P. Montague.....Chattanooga
John A. Rule.....Chattanooga
H. S. Chamberlain.....Chattanooga
C. B. Sevier.....Harriman
Roy V. Myers.....Dayton
J. D. Raht.....Tullohoma
A. J. Kenny.....Hartranft
J. I. D. Hinds.....Nashville

APPOINTED BY COUNTY COMMISSIONERS.

COFFER COUNTY, TENNESSEE.

Col. J. G. Aydelott.....Tullohoma
James Neal.....Tullohoma
Charles Heidenburg.....Tullohoma
Dr. C. M. Farror.....Hillsboro
B. P. Bashaw.....Manchester
Dr. N. McNabb.....Beech Grove
J. F. Thomas.....Tullohoma
R. C. Messick.....Gooosberg
J. B. Shrader.....Manchester
F. M. Wammok.....Hillsboro
W. P. Hickerson.....Manchester
E. W. Smartt.....Viola

APPOINTED BY CHAMBERS OF COMMERCE.

CHATTANOOGA, TENNESSEE.

Newell Sanders, President Chattanooga Chamber of Commerce.
J. W. Adams.....Dahlonega
William Cummings.....Chattanooga

Weber Club, or Chamber of Commerce, Ogden, Utah.

J. D. Carnahan,
C. A. Henry,
A. A. Steed,
Fred J. Kiessel,
Ad. Kuhn.

Nashville Chamber of Commerce, Nashville, Tennessee.

Frank S. Washburn.....Nashville
G. N. Tillman.....Nashville
E. C. Andrews.....Nashville
Henry Sperry.....Nashville
J. W. Braid.....Nashville

TEXAS.

Joseph D. Sayers, Governor.

I. H. Burney.....Fort Worth
S. H. Cowan.....Fort Worth
J. A. Peacock.....Fort Worth
A. M. Carter.....Fort Worth
Hon. J. M. Presser.....Comanche
Phillip Hockensmith.....Butterfield
Dr. W. H. Westfall.....Burnett
W. Evans.....Austin
Maj. T. H. Lee.....Grandview
James Mills.....Indian Gap
Dr. W. R. Sedburry.....Clifton
Hon. W. W. Turney.....El Paso
Hon. William Van Sickle.....Alpine
Hon. J. B. Dibrell.....Seguin
S. E. Watson.....Clarksville
W. R. King.....Rosebud
J. A. Caton, Sr.....Detroit
Robert W. Barker.....San Antonio
W. C. Schriver.....San Antonio
J. A. Lamb.....Jonesboro
Capt. W. D. Donaldson.....Headsville
A. B. Blevins.....Rusk
R. L. Coleman.....New Birmingham
Prof. N. J. Baden.....Llano
Del Dewes.....Del Rio
John W. Maxey.....Houston
T. U. Taylor.....Austin
Prof. J. C. Nagle.....Cottage Station
Josh Halbert.....Corsicana
Hon. A. E. Atlee.....Laredo

UTAH.

Heber M. Wells, Governor.

John Dern.....Salt Lake
Thomas Kearns.....Salt Lake
Clarence E. Allen.....Salt Lake
Victor M. Clement.....Salt Lake
J. E. Bamberger.....Salt Lake
W. C. Higgins.....Salt Lake
J. W. Neill.....Salt Lake
W. J. Bogue.....Salt Lake
J. E. Talmage.....Salt Lake
L. E. Camomile.....Salt Lake
Joseph T. Jenkins.....Salt Lake
Angus M. Cannon, Sr.....Salt Lake

C. C. Goodwin.....Salt Lake
W. W. Armstrong.....Salt Lake
W. G. Filer.....Salt Lake
E. A. Wall.....Salt Lake
A. H. Tarbet.....Salt Lake
C. E. Loose.....Provo City
Lafayette Holbrook.....Provo City
Jesse Knight.....Provo City
Andrew P. Mayberry.....Bingham
W. I. Snyder.....Park City
D. C. McLaughlin.....Park City
Fred J. Kiesel.....Ogden
Don McGuire.....Ogden
E. M. Allison.....Ogden
N. B. Dresser.....Mercur
S. Hazelton.....Murray
L. E. Riter.....Silver City
Robert C. Lund.....St. George

APPOINTED BY COUNTY COMMISSIONERS.

SALT LAKE COUNTY, UTAH.

Ezra Thompson.....Salt Lake City
W. F. James.....Salt Lake City
Charles H. Schew.....Salt Lake City
J. D. Wood.....Salt Lake City
A. H. Tarbet.....Salt Lake City

MORGAN COUNTY, UTAH.

Samuel Campbell.....Morgan
William Croft.....Peterson
Martin Guarder.....Milton
A. Van Patten.....Peterson
M. Gardner.....Peterson

PIUTE COUNTY, JUNCTION, UTAH.

W. G. Filer.....Kimberley
Floyd Weed.....Kimberley
A. D. MacLean.....Kimberley
Lee Bertholamen.....Marysoals
F. J. Lyon.....Marysoals

JUAB COUNTY, UTAH.

C. V. Wheeler,
John T. Hayes,
J. M. Wheeler,
Hans J. Hassell,
Richard Guntler,
Watson M. Nesbit, Sr.,
George C. Whitmor.

WEBER COUNTY, UTAH.

Don Maguire.....Ogden
A. B. Patten.....Ogden
C. M. Brough.....Ogden
Ernest E. Stevens.....Ogden
J. J. Brummitt.....Ogden

SALT LAKE CITY, UTAH.

Ezra Thompson, Mayor.

William Hatfield,
James Ivers,
Henry Newell,
J. C. Lynch,
J. D. Woods,
Joseph Jenkins,
Clarence K. McCornick,
J. E. Bamberger,
Frank Morehouse,
H. G. Heffron,
John Dern.

OGDEN, UTAH.

M. S. Browning, Mayor.

Fred Shields,
Thomas D. Lee,
Don Maguire,
John H. McCrystal,
D. J. Carnahan,
C. L. Peebles,
F. C. Richmond,
Joseph T. Jenkins,
William H. Tibbals,
V. C. Heikes,
P. C. Kittle,
W. O. Bridgman,
H. L. Thomas,
Frank C. Chapin,
Mark Lessinger.

VERMONT.

William W. Stickney, Governor.

N. S. DeMary.....Boise
A. C. DeMary.....Boise
W. C. Cleveland.....Boise
Mrs. W. C. Cleveland.....Boise
Rev. R. B. Wright.....Boise
Hon. Willis Sweet.....Boise
Inez V. Spofford.....Boise
Stephen G. Langmaid.....Boise
Judson Spofford.....Boise
Prof. George H. Perkins.....Burlington
Hon. Thomas M. Deal.....St. Albany
Hon. Frank D. White.....Rutland
James W. Tyson.....S. Strafford
R. B. Godfrey.....Bennington
Prof. N. F. Merrill.....Burlington
C. W. Scarff.....Montpelier
George E. Moody.....Waterbury
George Westinghouse.....Copperfield
Hon. J. C. Enright.....Windsor
Hon. C. F. Smith.....West Topsham
F. C. Kennedy.....Burlington
C. L. Stewart.....Rutland
J. K. Fullerton.....Waterbury
E. C. Jacobs.....Burlington
Dr. W. F. Minard.....Waterbury
F. A. Goss.....Vergennes
R. B. Perkins.....Ridgewater Corners
G. W. Bradley.....S. Wallingford
T. C. O'Neill.....Waterbury

VIRGINIA.

J. Hoge Tyler, Governor.

T. C. Jones.....Iron Gate

Tom L. West.....Richmond
C. R. Boyd.....Wytheville
Henry Froehling.....Richmond
Horace M. Engle.....Roanoke
Robert F. Morris.....Richmond
John S. Fleming.....Richmond
L. M. Johnson.....Longdale
Charles A. Catlett.....Staunton
F. H. Lewis.....Craigsville
William M. Fontain.....Charlottesville
C. F. Z Caracristi.....Granite
R. M. Bibb.....Roanoke
George L. Carter.....Bristol
John W. Echman.....Pulaski
George M. Holstein.....Pulaski
Robert L. Parrish.....Covington
J. W. Wallace.....Covington
P. D. Camp.....Franklin
J. D. Pretlow.....Franklin
Joseph J. Johnson.....Windsor
H. C. Cline.....Front Royal

WASHINGTON.

John R. Rogers, Governor.

Col. Carl Kleinschmidt.....Seattle
E. A. Sessions.....Toledo
W. A. Gray, Esq.....Cowlitz
Joseph Merchant.....Walla Walla
Francis H. Cook.....Mead

APPOINTED BY COUNTY COMMISSIONERS.

ASOTIN COUNTY, WASHINGTON.

Simon Adams.....Clarkston
George S. Bailey.....Clarkston
James Justus.....Clarkston
S. D. Hollister, Jr.....Clarkston
L. A. Woodward.....Clarkston

WHATCOM COUNTY, WASHINGTON.

H. A. Compton.....Fairhaven
E. A. Boblett.....Blaine
R. S. Lambert.....Sumas
Ed. H. Thomas.....Whatcom
John Siegfried.....Whatcom

APPOINTED BY MAYORS.

PULLMAN, WASHINGTON.

Theo. T. Davis, Mayor.

Frank L. Burgan.....Pullman

EVERETT, WASHINGTON.

Charles K. Greene, Mayor.

S. S. Gardner,
W. C. Butler,
J. C. Denny,
N. Rudebeck,
E. M. Egbert.

APPOINTED BY CHAMBERS OF COMMERCE.

Everett Chamber of Commerce, Everett, Washington.

W. C. Butler.....Everett
D. C. Johnson.....Everett
Nick Rudebeck.....Everett

Spokane Chamber of Commerce, Spokane, Washington.

John A. Finch.....Spokane
C. H. Weeks.....Spokane
C. M. Fassett.....Spokane
P. A. Daggett.....Spokane
George A. Black.....Spokane
C. M. Thompson.....Spokane
F. H. Howe.....Spokane

WEST VIRGINIA.

A. B. White, Governor.

Dr. I. C. White.....Morgantown
Maj. W. N. Page.....Anstead
T. E. Houston.....Elkhorn
Dr. G. A. Newlon.....Buckhannon
L. E. Tierney.....Elkhorn
T. L. Henritze.....Welch
John Cooper.....Coopers
Enoch Carver.....Charleston
R. B. Cassiday.....Charleston
J. E. Dana.....Charleston
A. J. Ruckman.....Monogah
F. S. Landstreet.....Davis
James W. Paul.....Charleston
Samuel Dixon.....MacDonald
J. B. Jenkins.....Parsons
W. H. H. Toler.....East Bank
B. D. Spilman.....Parkersburg
Clyde D. Hutchinson.....Fairmont
A. D. Hemmings.....Raymond City
W. W. Snoch.....Rowlesburg
J. W. Dawson.....Mammoth
C. Tibbetts.....Piedmont
Col. T. B. Davis.....Keyser
A. J. Bonadfield.....Tunnelton
C. M. Watson.....Fairmont
R. L. Sommerville.....Farmington
Phillip Goodwill.....Goodwill
Fred Paul Grosscup.....Charleston
J. A. Fickinger.....Monogah
A. J. Stone.....Fairmont

WISCONSIN.

R. M. La Follette, Governor.

Thomas Bardon.....Ashland
Richard Kennedy.....Highland
Jefferson Crawford.....Hazel Green
Henry Ragge.....Benton
J. W. McLaughlin.....Benton

Thomas Williams.....Hazel Green
R. B. Luckey.....Cuba City
James McCormack.....Cuba City
James W. Murphy.....Platteville
J. J. Williams.....Platteville
Calvert Spansley.....Mineral Point
James Hoskins.....Darlington
T. B. Ennor.....Potosi
O. C. Davidson.....Commonwealth
Prof. Clements.....Madison
Thomas J. Law.....Shullsburg
George W. Watson.....New Diggings
M. J. Regan.....Madison
Frank J. Kipp.....Milwaukee
Win J. Morgan.....Milwaukee
M. D. Kelly.....Milwaukee
Martin Patterson.....W. Superior
Kirby Thomas.....W. Superior
J. B. Arnold.....W. Superior
Mathew Richards.....Platteville
J. E. Malone.....Juneau
John Thauer.....Florence
H. D. Fisher.....Florence
John W. Groves.....Madison

WYOMING.

DeF. Richards, Governor.

I. C. Miller.....Rawlins
J. B. Hassett.....Saratoga
J. M. Thomas, Jr.....Battle
L. A. Godshall.....Encampment
Malachi Dillon.....Rawlins
Charles Kuster, Jr.....Laramie
W. B. Roberts.....Laramie
I. R. Swigert.....Laramie
Fred A. Miller.....Laramie
George W. Munkins.....Buffalo
T. G. Smith.....Hazelton
R. M. Kenedy.....Buffalo
G. Frank McLaughlin.....Sheridan
Felix Kennedy.....Dietz
William Corrard.....Wolf
J. Boardman Cann.....Lewiston
Charles L. Tewksbury.....Kirwin
George T. Beck.....Cody
W. H. Kilpatrick.....Newcastle
Augustine Kendall.....Rock Springs
Matt Muir.....Rock Springs
C. H. King.....Casper
E. J. Wells.....Glenrock
John Foxton.....Spring Hill
Frank A. Hoyt.....Cheyenne
William Sturgis, Jr.....Cheyenne
John Charles Thompson.....Cheyenne

Theophilus Grout.....Hecla
Thomas Sneddon.....Diamondville
F. M. Foote.....Evanston

ALASKA TERRITORY.

Hon. John G. Brady, Governor.

H. A. Bauer.....Sitka
E. O. Smith.....Sitka
William Meydenbauer.....Douglas
Frank Bach.....Douglas
Joseph MacDonald.....Douglas
George E. Bent.....Rodman Bay
B. M. Behrends.....Juneau
John G. Heid.....Juneau
John F. Malony.....Juneau
H. E. Hoggatt.....Juneau
John N. Tisdale.....Juneau
W. M. Ebner.....Juneau
George Garside.....Juneau
L. L. Williams.....Juneau
Dr. C. D. Rogers.....Juneau
Carl C. Mouler.....Sitka

ARIZONA TERRITORY.

N. O. Murphy, Governor.

W. F. Staunton.....Congress
J. L. Giroux.....Jerome
James Douglas.....Bisbee
S. A. Parnall.....Globe
James Colquhoun.....Clifton
D. M. Riordan.....Phoenix
Samuel Huntington.....Phoenix
Dr. J. M. Ford.....Phoenix
Hon. P. P. Parker.....Phoenix
Hon. James A. Fleming.....Globe
Hon. George P. Blair.....Mammoth
John Brockman.....Pearce
Hon. C. M. Shannon.....Clifton
Paul Jones.....Prescott
E. A. Haggott.....Prescott
G. W. Middleton.....Prescott
Thomas Farish.....Phoenix
Hon. C. L. Houston.....Globe
G. W. Harrington.....Crowned King
A. L. Grow.....Tombstone
Jesse Grant.....Nogales
W. A. Hendrix.....Prescott
Prof. William P. Blake.....Tuscon
Charles R. Drake.....Tuscon
Thomas Ewing.....Kingman
A. G. Hubbard.....Harrisburg
H. W. Blaisdell.....Yuma
E. L. Loy.....Chloride
Joseph G. Saeger.....Helvetia

P. C. Bicknell.....Williams

NEW MEXICO TERRITORY.

Miguel A. Otero, Governor.

A. R. Graham.....Silver City
M. W. Porterfield.....Silver City
J. B. Gilchrist.....Fierro
A. G. Hood.....Fierro
W. S. Hopewell.....Hillsboro
W. W. Williams.....Hillsboro
A. W. Harris.....Kingston
W. H. H. Llewellyn.....Las Cruces
R. C. Hatton.....Las Cruces
A. B. Fall.....Las Cruces
F. B. Schermerhorn.....Jarilla
W. A. Hawkins.....Alamodorde
A. B. Fitch.....Magdalena
G. T. Brown.....Socorro
J. C. Carrera.....Las Cruces
John R. DeMeir.....Las Cruces
George W. Prichard.....White Oaks
J. T. McLaughlin.....San Pedro
Saly Raunheim.....San Pedro
Jay Turley.....Santa Fe
Gus Mulholland.....Gallup
T. J. Curran.....Albuerquerque
H. B. Fergusson.....Albuerquerque
Christ Weigand.....Las Vegas
T. B. Mills.....Bland
W. H. Greer.....Deming
C. J. Gavin.....Raton
T. A. Schromberg.....Raton
Brigham J. Young.....Red River
J. K. Turner.....
A. R. Gibson.....
F. A. Reynolds.....
Jay Turley.....

OKLAHOMA TERRITORY.

Cassius M. Barnes, Governor.

F. E. McKinley.....Guthrie
Col. H. E. Glazier.....Guthrie
W. H. Cleveland.....Mountain View
K. C. Cox.....Granite
C. B. Adams.....Guthrie
Guilford Chappil.....Newkirk
Henry McGraw.....Ponca City
Frank McMasters.....Oklahoma City
Prof. C. N. Gould.....Narman
C. M. Cade.....Shawnee
William Frazier.....Guthrie
N. D. McGinley.....Guthrie
Prof. John Field.....Stillwater

William Cooley.....Mountain View
John P. Renshaw.....Enid
James Robb.....Kingfisher
E. J. Simpson.....El Reno
Ex-Gov. W. C. Renfrow.....Oklahoma City
James D. Maguire.....Narman
S. W. Murphy.....Waterloo
H. S. Emerson.....Stroud
E. T. Donohue.....Perry
P. S. Nagle.....Kingfisher
Robert Ray.....Alva
J. W. Lawton.....Arapahoe
J. H. Dillon.....Weatherford
L. A. Wikoff.....Kenton
Charles H. Thacker.....Mangum
J. B. Harrison.....Cheyenne
R. C. Brownlee.....Taloga

DISTRICT OF COLUMBIA.

APPOINTED BY CHAMBERS OF COMMERCE.

WASHINGTON, D. C.

William Tindall, Secretary, Commissioners of the District of Columbia.
Mrs. Elizabeth M. Candee.....District of Columbia

Respectfully submitted,
G. O. FREEMAN, Chairman.

ARKANSAS.

Jefferson Davis, Governor.

Randale Silverman.....Hamberg

APPOINTED BY CHAMBERS OF COMMERCE.

Little Rock Chamber of Commerce, Little Rock, Arkansas.

H. H. Myers, Frank J. Taylor,
C. H. Dadue, Horace G. Dale.
Albert D. Cohn,

Arkansas State Board of Trade, Little Rock.

Randale Silverman.....Hamberg

CALIFORNIA.

Henry T. Gage, Governor.

Milo M. Potter.....Los Angeles
Thomas Ewing.....Los Angeles
J. Baruch.....Los Angeles
E. T. Stimson.....Los Angeles
F. L. Craig.....Los Angeles
M. W. Stewart.....Sacramento
George Kistlingbury.....Sacramento

APPOINTED BY THE MAYORS.

LOS ANGELES.

Charles J. George.....Sacramento

M. P. Snyder, Mayor.

J. Irving Crowell, John Llewellyn,
E. T. Newton, J. R. Smith.

OAKLAND, California.

C. Barstow, Mayor.

J. B. Treadwell, Prof. Samuel R. Christy,
Robert M. Mein, Thomas C. Mayon,
Ross E. Browne, E. H. Benjamin.

APPOINTED BY CHAMBERS OF COMMERCE.

Sacramento Chamber of Commerce, Sacramento, California.

J. H. Neagle.....Sacramento

Los Angeles Chamber of Commerce, Los Angeles, California.

Dr. Wilbur A. Hendryx.....Los Angeles
A. H. Naftzger.....Los Angeles
T. B. Ellis.....Los Angeles
F. M. Townsend.....Los Angeles
J. J. Fay, Jr.....Los Angeles

Santa Ana Chamber of Commerce, Santa Ana, California.

John Mitchell, William W. Halesworth,
C. H. Morse. John W. Shirley.
Guiles Otis Pearce,

Los Angeles Board of Trade, Los Angeles, California.

R. H. Herron, H. T. Duff,
James A. Haskett, Henry D. Thompson.
James G. Warren,

Santa Barbara Chamber of Commerce, Santa Barbara, California.

Dr. Wilbur A. Hendrix.....Santa Barbara
A. H. Naftzger.....Santa Barbara
Monroe Markham.....Santa Barbara
F. M. Townsend.....Santa Barbara
J. J. Fay, Jr.....Santa Barbara

South West Miners' Association, Los Angeles California.

P. R. Stuart.....Los Angeles
H. B. Kjiox.....Los Angeles
Frank S. Gordon.....Los Angeles
E. G. Ivains.....Los Angeles
J. B. McNab.....Los Angeles

Appointed by the California Miners' Association, Los Angeles, Cal.

Dan Murphey, H. Z. Osborne,
F. M. Townsend, G. O. Pearce,
P. B. McCabe, C. A. Burcham.

APPOINTED BY COUNTY COMMISSIONERS.

SAN BERNARDINO COUNTY.

Frank Monaghan.....Needles
R. S. Brandon.....Normandy

MADERA COUNTY, CALIFORNIA.

John F. McLennan.....Madera
Return Roberts.....Madera
J. F. Joyce.....Medea
John Hoxie.....Medea
C. M. Ward.....Medea

PLACER COUNTY, CALIFORNIA.

H. T. Power.....Michigan Bluffs

W. S. Graham.....Auburn
John Haenny.....Lincoln
Ivan H. Parker.....Colfax
E. J. Kendall.....Auburn

COLORADO.

James B. Orman, Governor.

Senator Thomas M. Patterson.....Denver
Ex-Gov. Alva Adams.....Pueblo
Ex-Gov. James B. Grant.....Denver
Hon. John F. Campion.....Denver
Hon. Simon Guggenheim.....Pueblo
Senator S. I. Hallet.....Aspen
Senator W. S. Buckley.....Telluride
Senator Hume Lewis.....Pueblo
Hon. James F. Burns.....Colorado Springs
Hon. B. F. Montgomery.....Cripple Creek
Hon. Joseph H. Maupin.....Canyon City
L. J. Marks.....Denver
Miss Delia A. McCarty.....Denver
Hon. David F. Day.....Durango
Hon. Charles Henkel.....Pueblo
Senator Casimiro Barela.....Trinidad
Hon. George W. Trimble.....Leadville
Hon. Harry A. Lee.....Denver
Hon. George C. Martindale.....Creede
Hon. A. E. Reynolds.....Denver
Hon. A. M. Welles.....Denver
Hon. W. W. Rowan.....Ouray
Hon. B. J. O'Connell.....Georgetown
Hon. John C. McShane.....Central City
Hon. D. A. Farrell.....Hinsdale
Hon. S. R. Fitzgerald.....Telluride
Hon. C. E. Robin.....Silverton
Hon. W. F. Forman.....Breckenridge
Senator Charles B. Ward.....Boulder
Senator T. J. Ehrhart.....Centerville
Hon. J. Wellington Finch.....Victor
Hon. W. S. Stratton.....Colorado Springs
John Maderia.....Denver
Jerome B. Frank.....Denver
Peter J. Quinn.....Crestone
George Riley.....Idaho Springs
Charles Moore.....Cripple Creek
N. T. Mansfield.....Telluride
Hon. Joel W. Smith.....Leadville
Hon. W. W. Booth.....Cripple Creek
P. A. Leonard.....Denver

APPOINTED BY MINING EXCHANGES.

Cripple Creek Mining Stock Exchange Association.

S. T. Miller.....Cripple Creek
C. A. Gill.....Cripple Creek
T. P. Airhart.....Cripple Creek

W. M. Broyles.....Cripple Creek
A. L. Arnold.....Cripple Creek

Business Men's Association, Pueblo, Colorado.

William Hogg, Judge M. J. Galligan.
E. L. Moses, Ex-Gov. Alva Adams.
John Morton,

Cripple Creek Mining Exchange, Colorado.

T. P. Airhart.....Cripple Creek
S. T. Miller.....Cripple Creek
C. A. Gill.....Cripple Creek
A. L. Arnold.....Cripple Creek
W. M. Broyles.....Cripple Creek
William Hills.....Cripple Creek
R. A. Sidibotham.....Cripple Creek
A. M. Donaldson.....Cripple Creek
G. E. Alexander.....Cripple Creek
W. F. R. Mills.....Cripple Creek
R. J. Cory.....Cripple Creek
J. George Leyner.....Cripple Creek
V. M. Caine.....Cripple Creek
Charles J. Moore.....Cripple Creek

GEORGIA.

Allen D. Chandler, Governor.

S. W. McCallie.....Atlanta
I. H. Hawkins.....Rome
H. R. Jaquish.....Gainesville
Alexander Hamilton.....Etna
D. G. Purse.....Savannah
J. D. Taylor.....Summerville
T. M. Swift.....Elberton
George T. Barnes.....Augusta
T. E. Artope.....Macon
J. W. Singleton.....Columbus
J. J. Calhoun.....Cartersville
J. R. Van Buren.....Griswoldville
L. S. Mumford.....Cartersville
Joel Hurt.....Atlanta
H. M. Smith.....Rome
J. O. Robertson.....Canton
H. W. Hill.....Greensville
C. E. Bass.....Clarkesville
John Martin.....Nacoothee
R. T. Asbury.....Cleveland
F. H. Richardson.....Atlanta
Ed. Schaefer.....Toccoa
Frank Weldon.....Atlanta
R. K. Reeves.....Athens
W. C. Cooper.....Atlanta
H. D. Ingersoll.....Dahlonega
H. M. Van Devender.....Cedartown
R. P. Beecher.....Marble Hill
Thomas Cummings.....New England City
W. H. Venable.....Stone Mountain

MACON, GEORGIA.

Bridges Smith, Mayor.

James L. Baker, Hepward M. Smith,
W. W. Williams, R. C. Hazlehurst.

IDAHO.

F. W. Hunt, Governor.

Col. William H. Dewey.....Nampa
William H. Felkener.....Challis
Warren Helm.....Warrens
Paul Clagstone.....Granite
J. H. Hutchinson.....Dewey
Phil Shennon.....Salmon City
C. O. Broxon.....Pocatello
Lawrence Green.....Clayton
C. S. Mark.....Albion
A. F. Arker.....Grangeville
Robert Bell.....Challis
Charles E. Harris.....Montpelier
Capt. Rupert Winters.....Idaho City
D. W. Ross.....Boise
Fred H. Wood.....Pierce City
Gen. George H. Roberts.....Boise
Louis Hall.....Weiser
Hon. W. B. Heyburn.....Wallace
Hon. A. H. Alford.....Lewiston
Dr. William F. Smith.....Mountainhome
J. J. Bennett.....Grangeville
Joseph A. Clark.....Idaho Falls
Prof. A. S. Miller.....Moscow
Hon. Charles E. Mullen.....Horse Shoe Bend
Hon. James H. Forney.....Moscow
R. W. McBride.....Salmon City
Hon. W. H. Watt.....Hailey
D. B. Huntley.....DeLamar
E. K. Hays.....Atlanta
Marcus F. Whitman.....Montpelier
George Wise.....Glenn's Ferry
Newton Hibbs.....Lewiston
D. H. Andrews.....Boise
Mrs. M. A. Hutton.....Wallace
J. A. Jones.....Boise
J. Spofford.....Boise
Thomas F. Terrill.....Pocatello
J. R. Sovereign.....Wallace
Daniel Swinehart.....Pocatello
F. M. Stamper.....(Blaine Co.) Boise City
George T. Burrows, Jr.....Minidoka
J. H. Brady.....Pocatello
E. McBroom.....Grangeville
Frank Roberts.....Grangeville
Martin Jacobs.....Boise
Thomas L. Greenough.....Mullan
E. H. Moffett.....Wallace

Frederick Burbridge.....Wardner
A. G. Kearns.....Wallace
Bernard McGill.....Idaho Falls
Walter Hovey Hill.....Grangeville
David Falk.....Boise
Baron M. Rosencrands.....Salmon City

APPOINTED BY COUNTY COMMISSIONERS.

ADA COUNTY, IDAHO.

J. D. Flenner.....Boise
Joseph W. Murphy.....Boise

APPOINTED BY MAYORS.

BOISE, IDAHO.

J. H. Richards, Mayor.

J. A. Czizek, W. E. Borah.
F. R. Reed, N. M. Ruick.
Henry M. Ryan,

MONTPELIER, IDAHO.

J. S. Banete, Mayor.

Charles Nager.....Montpelier

APPOINTED BY CHAMBERS OF COMMERCE.

Boise Chamber of Commerce, Boise, Idaho.

W. E. Pierce.....Boise
Nathan Falk.....Boise
Calvin Cobb.....Boise
J. H. Richards.....Boise
J. H. Hawley.....Boise

Weiser Board of Trade, Weiser, Idaho.

T. E. Kelly, R. E. Lockwood,
W. D. Lovejoy, C. S. Fosselman.
L. L. Feltham,

Commercial Club, Orofino, Idaho.

I. D. Cleek.....Orofino

MOUNTAINHOME, IDAHO.

F. W. Boyd, Chairman Board of Trustees.

W. Arthur Davis.....Atlanta
Daniel B. Horton.....Rocky Bar
Augustine M. Sinnott.....Glenns Ferry
James Purtill.....Mountainhome
Samuel G. Rhoades.....Mountainhome

APPPOINTED BY MINING EXCHANGES.

Elmore County Mining Association, Mountainhome, Idaho.

Ralph A. Goodliffe.....Glenn's Ferry
George McCormick.....Pine Grove (P. O. address), Mountainhome
Charles M. Brown.....Atlanta
Will H. Petit.....Atlanta

Idaho Mining Exchange, Boise, Idaho.

David Heron.....Boise

M. Alexander.....Boise
B. F. Olden.....Boise
Thomas Manning.....Boise
B. S. Howe.....Boise

Boise Stock and Mining Exchange.

C. H. Tretheway.....Boise
Charles Fifer.....Boise
H. N. Elkington.....Boise
John W. Cage.....Boise
Dr. S. W. Burson.....Boise

John T. Morgan,
John Kinkaid, Boise Co.,
C. C. Glenn,
August M. Sinnott,
George M. Snow,
William Alley,
G. B. Baldwin,
Helen M. Daugherty,
J. J. Denning,
W. C. Whitwell,
W. P. Carter, Pearl, Idaho,
A. S. Miller,
William F. Smith,
E. F. Phelan,
Martin King,
W. H. Petit,
D. Falk,
J. A. Nicholson,
H. C. Auchor,
George S. Wheeler,
F. R. Brace,
Roy Herndon,
C. F. Drake,
T. E. Kelly,
F. J. French,
Alex Honlahan,
John A. Jucos,
J. F. Smith,
Edw. A. Ford,
W. Welsh,
R. Banderson,
J. Warren,
A. A. Fraser,
R. V. Cozier,
J. W. Wheniallen,
Max Arouson,
W. M. Morgan,
D. S. Elder,
John Ridenbaugh,
William Alley,
H. J. Rossi,
Charles Balback,
J. J. Story,
Gus Ehrenberg,
J. A. Lippincott,
Charles E. Jones,
H. W. Dorman,
L. R. Walters,
Sam T. Davis,
W. F. Hiatt,
James McDevitt,
James McKay,
C. C. Fairchild,
John Merrill,

Delegates Appointed by Mayor Theo. Turner, of Pocatello.

Col. George A. Hannaford,
Rev. George H. Perry,
Samuel C. Winters,
W. W. Paling,
A. Pierce,
James M. Ingersoll.

Headquarters, City Hall, Boise, Idaho, July 23, 1901.

The following is the list of delegates and alternates from Elmore County, Idaho, entitled to seats in this Congress, to wit:

Appointed by Gov. Hunt.

Dr. W. F. Smith.....Mountainhome
Hon. Martin King.....Glenn's Ferry
E. F. Phelan.....Atlanta
Gen. W. H. Petit.....Atlanta

Appointed by the Mayor and Council and the Village of Mountainhome.

Atlanta, by Albert Rosenheim, alternate.
Rocky Bar, by Dr. J. W. Nieukirk, alternate.
Dixie, by R. P. Chattin, alternate.

Appointed by the Board of Commissioners of Elmore County.

Rocky Bar, by Constantine C. Glenn, alternate.

Appointed by the Elmore County Mining Exchange.
Mountainhome, by Nels P. Nelson, alternate.
William J. Turner, Mountainhome.

SAMUEL G. RHOADES,
Chairman Elmore County Delegation.

AUG. M. SINNOTT,
Secretary.

MR. FREEMAN (CHAIRMAN): I would say, Mr. President, in this connection, that an investigation of this list will demonstrate the fact that it will take a whole day to go through the entire list, and if the method suggested by the committee is adopted it will expedite the matter, inasmuch as a comparison of the names presented can be made with the list made by the committee, to determine whether or not the names thus presented by the chairmen of the various committees are correct. Otherwise, the roll call would have to be made every time, and that would consume too much time.

PRESIDENT PRINCE: The question is on the acceptance of the report.

On vote the report was accepted.

PRESIDENT PRINCE: The question now is on the adoption of the resolution accompanying the report. What is your pleasure?

On motion of Mr. Roberts, duly seconded, the resolution was adopted.

On motion, duly seconded and carried, the Congress took a recess until 2 P. M. today.

The Congress re-assembled at 2 o'clock P. M.

PRESIDENT PRINCE: The next order of business on the program is the reading of a paper by Prof. N. H. Winchell, of Minneapolis, subject, "Geology of Minnesota."

In the absence of Prof. Winchell his paper was read by his son, as follows:

SKETCH OF THE IRON ORES OF MINNESOTA.

By N. H. Winchell, of Minneapolis.

The first published references to iron ore of commercial value in Minnesota were by geologists in the employ of the State, or of the United States. Charles Whittlesey, of Ohio, was connected with the United States Geological Survey of D. P. Owen in 1848 to 1850, and examined the region now containing these ores. Hypothetically, he stated that the geological structure warranted the expectation of iron ore north of Lake Superior, but he did not see it, and his opinion was not published till 1866.* after the State of Minnesota had instituted its own survey under Hanchett and Evans.

Dr. Hanchett in his report for 1864 states that he had seen samples of rich hematite from the vicinity of Vermilion Lake, and had made an ineffectual effort to see the ore in place.* Mr. H. H. Eames, however, in 1865 succeeded in reaching the spot, and his report for that year contains the first description of the Vermilion iron range at any point.** Nothing further was known of this locality till it was reported on again by the State Geological Survey in 1878.*** From that date to the ex-

*Report of explorations in the mineral regions of Minnesota, 1866.

*Report of the State Geologist, August H. Manchett, M. D., St. Paul, 1865.

**Report of the State Geologist, Henry H. Eames, on the metalliferous region bordering on Lake Superior, St. Paul, 1866, page 11.

***Geological and Natural History Survey of Minnesota, ninth annual report, 1880, pages 103 and 104.

amination of Prof. A. H. Chester (published in 1884) no further public knowledge was possessed of the Vermilion range, although Prof. Chester's examinations were made in 1875 and 1880. Being for private parties the information was not published until 1884.* Thereafter the Minnesota reports contained almost annually some report on the Vermilion iron range.

The Mesabic iron range was first noted by J. G. Norwood, of the survey of D. D. Owen, near Gunflint Lake, in 1850. It was noted and reported by H. H. Eames at Prairie River, near the western extremity of the range, in 1865.** Midway between these extremes this range was discovered by the United States land surveyors, by reason of the magnetic character of the ore there contained in it. Explorations, however, did not turn out well at this point. The examinations of Prof. Chester, in 1875, under the instigation of Mr. George H. Stone, were directed to this part of the range, and his examination of the Vermilion range at this time was incidental, and was done by George R. Stuntz and John Wallmann, who had been sent out by him. Prof. Chester's report on that part of the Mesabi range was unfavorable, and nothing has transpired since to invalidate his conclusions. Other explorations followed, viz., in 1886 at Gunflint Lake, and in 1888 at Mesabi Station. Capitalists also entered upon the range eastward from Prairie River, where experimental test-pits and shafts were sunk under direction of Mr. Eli Griffin. In the fall of 1890 the first important discovery of iron was made, viz., the Mountain Iron mine. As with the Vermilion range, the Minnesota survey followed all the developments and sometimes guided them, and prior to this date had mapped the range from Gunflint Lake to the Mississippi River. This map was published in the spring, 1891,* and was widely distributed. After the publication of this map, and the report which accompanied it, explorations were more systematic and less expensive.

Attention should be called at this point to an important fact bearing on the utility of geological surveys. It will be noted that both iron ranges were discovered by geologists connected with official surveys, and that in their reports they called attention to the probable future value of these deposits. When the lately-closed survey of Minnesota was engaged in that part of the State the annual reports repeated and emphasized the importance of these ores, describing them as fully as the circumstances would permit, and urging the citizens of the State to take necessary steps to retain their wealth within the State, rather than have it diverted to Eastern capitalists. Elsewhere the writer has made use of the following language:* "Geological surveys are sometimes accused of not discovering anything. Their function is described to be to estimate and map out and describe discoveries made by others. They cannot go into the field equipped with the necessary tools for digging and blasting. The practical explorer and the actual miner must do that. The explorer is a scout who usually precedes all strictly geological surveying, and the miner is the rank and file of the regular army which opens up the mining industry and leads to the advance of other modern industries. The geological survey of a State may be considered, in general terms, a corps of 'sappers and miners,' or skilled engineers, ready to move in any emergency, to guide in explorations, to construct or repair bridges, or to conduct the whole campaign, as occasion arises. At least that has been the function of the Minnesota survey in respect to the development of the iron ores. They were discovered on both ranges by the State Geological Survey under Mr. Eames, who made the first known description of them. They have been repeatedly published by the present survey, and the trend of the Mesabi range was

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*The Geological and Natural History Survey of Minnesota. Eleventh annual report, 1884, page 160.

**Geological Reconnoissance of the northern, middle and other counties of Minnesota, by Henry H. Eames, State Geologist, St. Paul, 1866; pages 35, 56.

*The Iron Ores of Minnesota. Bulletin VI., Geological and Natural History Survey of Minnesota, Minneapolis, 1891; page 112 and map.

*Discovery and Development of the Iron Ores of Minnesota. Collections of the Minnesota Historical Society, Vol. VIII., page 33, 1895 (1898.)

actually mapped prior to the discovery of any of the great ore bodies that are now known at Biwabik and Virginia.* The geological survey has been in the heat of the campaign from the beginning to the present. It has seen every test-pit, and has noticed the result. It has advised every mining company, at least its advice was asked. It has urged explorations in certain places, and it has had the unpleasant duty to discourage it in others, sometimes after many thousands of dollars had been invested. It has been a constant attendant, and sometimes a leader, in every important phase of this march."

Since the commencement of shipments of iron ore from Minnesota the State has steadily advanced in rank amongst the iron-producing States. The first shipment was made in 1884. Last year the amount shipped was 9,834,399 long tons, and that of Michigan, the leader in this industry, was but 92,328 long tons greater. These two States furnished more than one third the total output of the United States.

GEOLOGICAL RELATIONS.—While the ores now exploited are derived from two formations, there are four formations in Minnesota that contain notable amounts of iron ore, and these all may in the future become productive in commercial amounts. These formations are as follows, the oldest at the bottom:

1. The Cabotian gabbeo.
2. The Animikie taconyte.

Taconic.

3. The Upper Keewatin jaspilyte.
4. The Lower Keewatin jaspilyte.

Archean.

Of these, Nos. 2 and 4 are at present the only productive formations. The former (No. 2) is found in the Mesabi range, and the latter (No. 4) on the Vermilion range. They both furnish hematite, that from the Mesabi range being "soft," and that from the Vermilion range being usually hard. The Chandler mine at Ely, however, on the Vermilion range, supplies an ore that is easily mined, and is sometimes denominated "soft." Some of the largest mines on the Mesabi range are simply great open pits from 50 to 150 feet deep, into which steam cars and steam shovels are run on a gentle grade, the ore being scooped up by the steam shovel and dumped, without assortment or washing, upon the ore cars standing adjacent, and thence carried direct to the shipping point on Lake Superior. But the mines on the Vermilion range are deep, underground, many-chambered excavations. She enclosing rock of the Vermilion range is a greenstone, usually alternating somewhat with the iron ore sheets or strata, and varying to a stratified, water-laid rock showing plainly its oceanic origin. Alternations of strata of jasperoid silica with but little iron, with a green schist, the whole varying to a silicious schist, or slate, are not an uncommon feature of the Lower Keewatin. The ore itself is a form jaspilyte, a banded silicious rock that occurs as lenses of greater or less size in the greenstone of the region. These bands are usually much contorted, varying from pure, white silica in very fine grain, to brown, purple and black in proportion as the ores of iron share in their composition. Hence they present a handsome outward aspect. Being firmer than the surrounding rock such jaspilyte lenses frequently stand isolated high above the surrounding surface. These contorted lenses, which are the most valuable as ore bodies, seem to have the structure of rhyolitic lavas, the banding being due to an original fluidal structure, and it is in the periphery of these primary lenses that occur interlaminations of the fine silica with the green schists, denoting the action of sedimentation. Still, very large amounts of banded jasperoid silica are apparently wholly of sedimentary origin, so far as the same is indicated by the straight banding and by admixture with the green schists. On the Mesabi range the ore is in lenses, as on the Vermiliion range, but these lenses are of soft ore, and have a tendency to retire from observation. The lenses, moreover, are not composed of contorted laminations, but of straight or but slightly wavy strata, which can be seen to extend from one end to the other. In these lenses the ore ceases to the right or left, or up or down in the stratification, by gradual change in the nature of the rock. This is not always by an increase in silica,

*This map, however, was not published till June, 1891, shortly after the first important discovery, the Mountain Iron mine, was publicly known.

which is the gangue impurity on the Vermilion range, but by the encroachment of an impure ore known as taconyte. This taconyte is of two sorts, viz., (1) a silicious granular rock, essentially like the ore itself, but worthless as ore because of the high per cent of silica; and (2) a gray or brownish amorphous rock, which is neither ore nor silica, but which still contains both substances. The transition to this rock is not always abrupt, but sometimes it is quite gradual, there being a gradation or alteration from the rock to the ore. Underlying the ore horizon is almost always a sandstone or quartzite, although this is wanting at the eastern end of the range and the ore comes directly on the granite of the Archean. Overlying the ore is a black slate, and this black slate is also somewhat interstratified in the ore at a few points. This black slate becomes more silicious and coarse, making quartzite, and develops into a great thickness. Unconformably over the whole country the cretaceous ocean deposited its own sediments, but these have as yet been found only in isolated places, and they present no obstruction to the prospector or the miner. The drift deposits are heavy and reach in some places a thickness of a hundred feet. In the productive part of the range the iron-bearing rock and the ore are wholly hid by the drift sheet.

The most interesting points in the history of the iron ores of Minnesota are connected with their origin. Iron ore, like all ores, has had a cause for its existence; some cause, however, inherent in the operations of nature, which has promoted its accumulation at certain places in greater amount, for all the ores, and especially iron ore, are widely disseminated. There is probably not an ounce of natural water on the face of the earth, unless it be freshly fallen from the clouds, that does not contain a small amount of iron in some form. The problem has been to learn the factors that have collected this iron in large amounts at certain places.

The late R. D. Irving supposed it to have resulted from the oxidation of a carbonate operien. He postulated therefore a great primordial vegetable age whose characteristics could be compared to those of the carboniferous, and whose function was to store up carbon, and secondarily also iron ore. Carbon and iron ore are frequently associated, as in the coal measures, the former taking the chemical combinations of limestone and of kidney iron ore. In the application of this theory the kidney iron ore and the silicious carbonate of lime are supposed to have combined to produce a "cherty carbonate," and from this last the present ores resulted by simple oxidation and concentration. The fortuitous positions of the strata, their inclination, their alternation in composition and their having been broken and penetrated by igneous dikes, have had much to do, according to this hypothesis, with the localization of the chief iron deposits.

Dr. M. E. Wadsworth advanced the idea that the jaspilyte seen at Marquette, Michigan, which there constitutes the ore-bearing rock, is of igneous origin, the direct result of igneous intrusion amongst the other rocks of the region. He appealed to certain structural features which to him indicated such forcible fracture and intrusion.

Mr. J. E. Spurr, working for the Minnesota Geological Survey, with minute microscopical inspection and by means of a combination of field observation with chemical and petrographical research, traced the iron oxide back to greensand, which he took to have been glanconite. This supposed glanconite was compared to that formed of foraminiferal remains in the cretaceous formation, and it led naturally to the supposition that the sea in which the ore was formed was one that swarmed with microscopic organisms.

The latest hypothesis of the origin of the iron ores of Minnesota is that of the writer, published in the fifth volume of the Minnesota report. Accepting the greensand of Mr. Sparr as the immediate source of the Mesabi ore, this hypothesis assumes that such greensand is not of the nature of glanconite, but of volcanic glass or basic obsidian. It presumes that an epoch of igneous activity began at or near the commencement of the Taconic, not only in Minnesota, but throughout the Lake Superior basin. This was accompanied by igneous eruption and lava flows. Such lavas were frequent near the ancient ocean shores, and gave rise to much obsidian. They were also submarine, and heated the ocean adjacent, giving it more powerful attack on the pre-existing shores as well as on the lavas themselves. The result was the distribu-

tion of glass sands along the ancient shores in the same manner as silica and other sands accumulated along the shores of Lake Superior at the present time. Such sands, more or less mingled with the traps from which they were derived, constitute at the present the soft ores and the two sorts of taconyte mentioned above. The same explanation is applied to the ores of the Vermilion range, but it is necessary to understand that in the Vermilion range the chief ore bodies are composed of the altered obsidian lava masses instead of sands of detritus derived from them. In both ranges the chemical attack of the oceanic waters on the lavas resulted in the silicification of the obsidian, and the concentration of the contained iron locally in the lenses mentioned. Along with this chemical change in the obsidian the ocean itself deposited in the near vicinity a large amount of chemical silica and probably of iron; these substances, especially the former, forming the stratified jaspilyte associated with the ore bodies, and furnishing also the fine silica which permeates the fine schists of the region. The details of the evidence of this hypothesis cannot be given. Suffice it to say, that it satisfies all the conditions and depends on long examination in the field and on microscopical examination of the ores. It also throws light on some unsolved structural problems connected with the eastern end of the Mesabi range. It appeals to the well-known tendency of silica to replace all non-crystalline substances when it is in solution in alkaline water, preserving their forms. Whenever these lavas became crystalline prior to cooling, they seem to have maintained their composition, in the main, only having been penetrated by interstitial silica and reddened by the entrance of a small amount of iron. When they were incipiently crystalline they have been changed to the masses of hard grayish-brown taconyte which replaces the ore on the Mesabi range.

If, with this hypothesis in mind, we attempt to forecast the future of the Mesabi iron range, we can restore in our mind's eye the ancient shore-line of the Archean across Northeastern Minnesota. We can see the sands resulting from the combination of the lavas, drifting westward along that shore, ever increasing toward the west, as the shore sands of Lake Superior at the present drift westward and accumulate in greatest amount in the col at the western end of the lake. The Archean lands of Northern Minnesota and of Northern Wisconsin may have formed a shallow strait, or even a Taconic col somewhere to the westward from Duluth, and into that col the Taconic waves must have driven the sands in question. If we could remove the drift from Northern Minnesota and could see the lines of the old Taconic shore, we could doubtless see the location of the greatest amount of these sands. In case the same chemical process attacked these sands throughout their extension, we would doubtless find the greatest deposits of the Mesabi ore in the western extension of this Taconic col.

There is, therefore, no theoretic reason to expect that the Mesabi ore is near its exhaustion. On the contrary, the present productive area can hardly be expected to be its greatest, but new discoveries are likely to greatly enhance its volume and its geographic range.

Minneapolis, July 20, 1901.

Prof. Hall, of Minnesota, offered the following resolution, which was referred to the Committee on Resolutions:

Resolved, That this Congress request its Committee on Resolutions to prepare a resolution regarding Federal appropriations for the establishment and maintenance of mining and metallurgical education in the United States.

Secretary Mahon read the following resolution, which was referred to the Committee on Resolutions:

"We, the members of the fourth annual session, in convention assembled, do very earnestly and respectfully memorialize the Congress of the United States to establish a home or homes, as may be necessary, at one or more points in the Rocky mountains, for the aged and infirm mining prospector, who has worn out his body and mind in prospecting mountains for mines and finds himself at an advanced age afflicted with rheumatism and other ailments, and totally unable to provide for him-

self even the necessaries of life, or the comforts of a home after devoting a lifetime to opening and developing mines, which, in many cases, have proven a source of great wealth to the general Government and the people. Oftentimes this benefit accruing immediately after this prospector's death, or he is unable to realize its benefits."

MR. TRUE, OF IDAHO: Mr. President, I offer the following resolusions:

1. Establish a bureau of mining with a secretary having a seat in the cabinet, and provide for the appointment of a commissioner of mining for each State and Territory in which there are any Government lands.

2. Complete the system of public surveys at once over all unsurveyed lands, however mountainous.

3. Limit the size of all new locations of quartz, placer or other mineral claim, including coal and iron to 1,320 feet square, conforming to a 40-acre tract of the system of public surveys. Require locators to conform to the legal subdivision lines upon surveyed lands, and require locations upon unsurveyed lands to be staked off with north and south and east and west lines irrespective of lodes or deposit lines.

4. Require no discovery, but require an excavation five feet deep, measuring 100 cubic feet as a pre-requisite to recording from which, as an initial point, all measurements must be made for describing locations upon unsurveyed ground.

5. Allow but one location a year for each citizen in each township upon surveyed ground, and allow no citizen to locate more than one claim within a radius of five miles of his initial point upon unsurveyed lands, and allow no locations by attorney.

6. Grant locators full possession and enjoyment of all rights of occupancy such as pertain to title in fee, so long as they expend $100 in actual work upon and within the lines of each claim, each and every year from the date of record, or as an equivalent pay the sum of $150 into the United States treasury to constitute a fund for the promotion of the mining industry, to be expended as nearly as practicable within the districts to which it is credited.

7. Withdraw from the market all lands not occupied and claimed except such as may be proven more valuable for agriculture, by the proper non-mineral affidavits. Sell timber under proper restrictions but not the land, unless it be such that the farmer will want it and can make non-mineral affidavits before filing upon it.

8. Repeal the law of the dip and apex and bound all claims by vertical planes drawn through the exterior lines.

9. Let Congress call for the repeal of all State and local laws, in the interest of simplicity, and treat all questions between mining claimants the same as disputes between other public land claimants should be treated, in the proper courts.

PRESIDENT PRINCE: It will be referred to the Committee on Resolutions.

MR. TRUE: Mr. President, I have prepared a paper in the form of a discussion of these resolutions, which I would like to have printed in the proceedings.

PRESIDENT PRINCE: That would probably be more appropriate at the time of the report of the committee, would it not?

MR. TRUE: I simply ask, Mr. President, that it go in the pro-

ceedings. I would not ask to occupy the time of the Congress by reading it.

MR. MOORE, OF COLORADO: Mr. President, with reference to the subject upon which the gentleman has just spoken, and his resolutions, I understand that Judge Heyburn is to read a paper this afternoon upon this very subject, the question of the revision of the mining laws. I understand also that Judge Heyburn's position is likely to be antagonistic to the sentiments of the resolutions. Therefore, I think it well that the Congress be prepared, as soon as Judge Heyburn's address is over, to undertake an active discussion upon the leading questions which he will present; and in that view I would very gladly hear this gentleman present the other side, or, at least, a portion of what I deem to be the other side, in opposition to Judge Heyburn's position.

I wish to remind the Congress at this time that we took up the question of the revision of the mining laws at the very first session of the Congress at Denver four years ago, and as chairman of the committee then appointed to consider the question, I did a great deal of work for a year in connection with a number of active and influential members from eight or nine States west of the Missouri, and we gave that question the greatest consideraion possible.

At the second session in Salt Lake City Judge Heyburn led the opposition to our report, and at that time did not approve of the subject of square locations. I presume that, as the leopard cannot change his spots, Judge Heyburn comes here with his original views, and therefore I think the Congress should be advised of all these points, in order that when the discussion does come up we can conduct it as intelligently and rapidly as possible; and the discussion should follow, in my judgment, the reading of Judge Heyburn's paper.

Therefore, also, in order that the Congress may express clear and distinct views upon the question of square locations versus the apex question, I think the gentleman who has just taken his seat should be allowed to read his paper, if it is sufficiently condensed for the whole Congress to understand it, immediately after Judge Heyburn's paper, and the two be taken up together in the general discussion.

I therefore, if it is in order, Mr. President, make a motion to that effect; that this gentleman's paper follow Judge Heyburn's paper, immediately after which we have the general discussion on the whole question.

Motion seconded.

PRESIDENT PRINCE: The next matter upon the program is Judge Heyburn's paper. The gentleman from Colorado moves that the gentleman from Utah, who has just presented the resolutions, be given time at the conclusion of Judge Heyburn's paper, to present another paper upon the same subject. That is the motion, as I understand it.

MR. MOORE: Yes: that is my motion.

MR. WHITE: Mr. President, before that motion is put I desire to offer a substitute motion, if I am in order.

PRESIDENT PRINCE: There are no substitute motions in this body, sir. It is in order as an amendment. We are acting under Cushing's rules, under which there are no substitutes.

MR. WHITE: I can hardly offer it as an amendment.

PRESIDENT PRINCE: I think almost anything that would be a substitute would be proper as an amendment. If the gentleman will state what it is that he desires to do, I think we can find a way to do it.

MR. WHITE: I move you, Mr. President, that the resolutions offered by Mr. True, of Idaho, be laid upon the table.

PRESIDENT PRINCE: They are not in the possession of the house. They have been referred to the Committee on Resolutions, and are now in their hands. They can be withdrawn from the further consideration of the committee, which will bring them before the house, if that is the desire of the gentleman.

Are you ready for the question, on the motion of the gentleman from Colorado?

The motion was put by the president, and declared carried.

PRESIDENT PRINCE: I think it would be well, before the discussion arise upon any of these papers, that some rule should be made to govern these discussions, as to the length of speeches, and matters of that kind, in order that we may understand exactly how they are to be conducted—something that would limit the debate, to some extent.

MR. EVANS, OF OREGON: Mr. President, I move that the speeches during the discussion be limited to ten minutes.

Motion seconded.

MR. BURKE, OF IOWA: I move, Mr. President, that the words "ten minutes" be stricken out, and "five minutes" be inserted in lieu thereof.

MR. MOORE, OF COLORADO: Mr. President, I know that the gentleman's amendment is not seconded, that it is not now ready for discussion, and I am going to ask him to withdraw it; because, as I understand it, there are nine complicated subdivisions of the paper just offered, and the amendment would hold the speaker down to a fraction less than a minute on each one of those subdivisions. They are each questions that are worthy of the attention of this Congress, and I will ask him to withdraw that, and let it stand at ten minutes.

MR. BURKE: Mr. President, I would state to the gentleman on the other side of the house that a man has no right to put eight or ten subjects into one paper. Let the committee to whom that conglomeration of subjects has been referred divide it, and send about nine of them to the graveyard.

MR. MULLEN, OF IDAHO: Mr. President, there will be three propositions; one by Mr. Heyburn, one by Mr. True, and a proposition in opposition to them both. This thing occurred two years ago at Salt Lake City, and it will be repeated here; so don't tie the gentlemen down to five or ten minutes discussion. At Salt Lake City, you recollect, the principals had plenty of time. The principals here should be allowed sufficient time to place the subject properly before the house, and then in the discussion that follows the speakers should be restricted to a reasonable time, but not to five minutes.

MR. FRAZER, OF IDAHO: Mr. President, has the amendment of the gentleman from Iowa received a second?

MR. STEPHENS, OF MONTANA: Mr. President, I hope this amendment will not prevail. It appears to me that if there is anything important to come before this Congress, that it is almost impossible to have an intelligent discussion on that matter in five minutes. On an important matter of this kind it appears to me that five minutes is too short a time for some of us to fully express our ideas, and we should not be cut off without an opportunity to be heard fully. What did we come to this Congress for? We came here to give and receive information. Any of the gentlemen present may be able to give some valuable information

upon some portion of this subject which will be of benefit to the whole Congress, not only now, but hereafter. Some may be able to do so in five minutes, and some may not. Another minute might put you in possession of valuable information, and I don't believe we ought to be cut off in that way.

(Cries of "Question.")

MR. EVANS, OF OREGON: Mr. President, my object in making this motion was not to insert the gag rule into our organization, but it was for the purpose of giving every man and woman interested in our business a chance to express his or her sentiments. Ten minutes time is short; it is too little. One man can gather his ideas and say something along that line in that length of time; another will think of something after he has taken his seat that he has omitted. To cut us down to five minutes is not fair. The question at hand is one of vital importance. We need a revision of the mining laws of this country. Let us discuss it fairly, and without prejudice.

MR. DENNIS, OF OREGON: Mr. President, I move to amend the amendment by saying that the principals in the discussion shall not be limited by this rule—that applying to Judge Heyburn and the gentleman who will respond to his arguments.

PRESIDENT PRINCE: As the chair understands it, each of these gentlemen will read a paper, and they are not limited as to time at present. Do you desire to press your amendment under those circumstances?

MR. DENNIS: Mr. President, my amendment would apply to their subsequent discussion on this question.

PRESIDENT PRINCE: Very well. It is moved as an amendment to the amendment that Judge Heyburn and Mr. True be not limited in the remarks with which they will follow their papers.

JUDGE HEYBURN, OF IDAHO: Mr. President, I would say to the gentleman making the motion that I shall not require any more time than any other member of the house, and it is not necessary to give me any more time.

MR. DENNIS: Mr. President, I will withdraw the amendment.

MR. MULLEN, OF IDAHO: Mr. President, should the principals both be limited to ten minutes?

PRESIDENT PRINCE: The amendment to the amendment having been withdrawn, that question is not before us, unless some other motion is made.

MR. MULLEN: I move you, Mr. President, that the principals in opposition to the original speakers be allowed the same time as the gentlemen presenting the papers.

PRESIDENT PRINCE: That the principal speakers in opposition to both Judge Heyburn and to Mr. True be allowed the same time as they are allowed for presenting their papers.

MR. FRAZER, OF IDAHO: Mr. President, as a question of information, I will ask the gentleman who made the motion to state who the principals will be.

PRESIDENT PRINCE: The question is on the amendment to the amendment, that the principal speaker in opposition to both the views of Judge Heyburn and of Mr. True shall be allowed a time equal to that occupied in the reading of either of their papers.

MR. MOORE: Mr. President, is another amendment in order?

MR. FELTHAM, OF IDAHO: Mr. President, there is no way of determining at this time how many persons in this Congress may ad-

vance original ideas or opinions upon this question of the revision of the mining laws. There may be as many new opinions and different ideas as there are individuals in the Congress; consequently such an amendment can have no force, for no one can say that he is the self-constituted leader of the opposition to the ideas presented, or that will be presented by the readers of the two papers.

But, as to the amendment to the motion, I want to say a word. There is no question that interests the prospector and the mining investor more deeply than the question of the laws with reference to the location and operation of mining claims. It would not be justice to this assembly, it would not be justice to those who have come long distances, to use the gag rule, and prevent the discussion of a question of so great importance. As intimated by one speaker, this question has been before this Congress before, and it is meet and proper that it should be here again. It is a question of so great importance that we want to discuss it; we want to learn every phase of it; and if these two gentlemen who will present papers here today are thoroughly prepared on it, and I doubt not they are, they will present, possibly, very antagonistic ideas, and ideas that we will need to discuss. It may be that we will adopt the ideas of neither, but in part. So it requires a cool and full discussion, and while there may be many here that do not care to discuss the matter elaborately, still if one does desire to discuss it, I think he should be allowed at least ten minutes.

MR. FRAZER: Mr. President, I move you the previous question.

Motion seconded and carried.

The question of the amendment to the amendment was then put to the house by the president, and declared lost.

The question of the amendment was then put to the house, and was declared lost.

The president then declared the question to be upon the original motion, limiting speeches to ten minutes. Upon the vote being taken, the president declared the motion carried.

PRESIDENT PRINCE: The next in order on the program is an address by Judge Heyburn, of Wallace, Idaho; subject, "Revision of Our Mining Laws."

Judge Heyburn addressed the Congress as follows:

REVISION OF OUR MINING LAWS.

By Hon. W. B. Heyburn, of Wallace, Idaho.

Mr. President, and Members of the International Mining Congress: It has been stated under a misapprehension that I would read a paper upon needed revision of the mining law. I have not prepared a paper on the subject because I did not think that the best method of presenting what I have to say in regard to the question. I shall present it to you more in the nature of a discussion, or, of the opening of the discussion of the question. Knowing that there are many differing views entertained by members of this Congress, and by men interested in mining throughout the country, and that those views should be presented to this convention, I will so shape my remarks as to give an opportunity to those who wish to do so to come back with such arguments as they may desire to present; and I will endeavor to make my opening remarks as short as is consistent with a fair presentation of this question.

Mr. President, it is not possible by the enactment of any code of laws to entirely obviate or avoid the contentions that arise over the location and ownership of mines. All that we can hope to do is to reduce these possible controversies to the minimum.

Whatever value the mines of the country have, so far as the title is concerned, and I refer more particularly to those mines which are

located under the general mining laws of the United States, depends upon the location of the mining claim. The title is initiated by the locator. These men, often unlearned and sometimes unable to speak or understand the language of this country, go out into the mountains for the purpose of initiating titles, upon which shall rest our mineral wealth. Now the first requisite is that the law under which the locator acts shall be so simple, so free from intricacy and complication that he will be able to make such a location as shall stand the legal test when the property becomes a valuable mine. It will be conceded that this is the first consideration. Much has been said, and perhaps will be said during the consideration of this question, about expensive litigation; about great contentions that have arisen, which have finally terminated only by the decision of the Supreme Court of the United States, always unsatisfactory to one side or the other. It is that we may avoid these controversies that we should investigate this question carefully, and that our action should be as conservative and as wise as possible. It is not possible during the sessions of this Mining Congress to consider and discuss these questions with that fullness and care that should precede the enactment of any law. Congress would be derelict in its duty if it wre to attempt to enact a law upon the meagre discussion and consideration which it would be possible to give it in this body. These are great questions, they are far-reaching, and are more or less complicated. Our mission is to rid the subject of these possible complications.

The law in regard to the location of claims, the manner in which a prospector shall acquire title to them, is the subject of our primary consideration. How shall he do it so that his title may ever afterward be free from the possibilities of entanglement and controversy?

Fortunately for the consideration of this question, a few minutes since a resolution was introduced by Mr. True, of Idaho, a man of wide experience in mining, a man who stands high in this and other States as a civil and mining engineer, and whose judgment is always worthy of respectful consideration; in that resolution it is declared that the question of extra-lateral rights should be eliminated from the mining law, and that the claims should be laid off so that a man may follow his ledge only to the exterior boundaries of his claim. With your permission I will briefly present the proposition suggested by that resolution. It is commonly known as the square claim theory.

Ledges do not stand perpendicularly up and down in the earth. They were not built with the regularity of work of the skilled mechanic or mason. They are often crevices that were formed by the convulsions and contortions of the earth's surface. These crevices are filled by varying processes with mineral and vein material, and it is within them that the value exists. The prospector goes into the mountain in search of mines, and he finds cropping out upon the surface of the ground evidences of a ledge or vein. It may be iron slag, or it may be only discolored rock, discolored with iron, lead or any other mineral substance; but to him it is the evidence that somewhere beneath it there exists a ledge of value, carrying valuable minerals. Based upon this evidence he makes a location. Under the existing law he is entitled to locate 1,500 feet along the ledge after such discovery. He may make no location until after he has discovered such a ledge of mineral-bearing rock in place. That is the existing law. The first thing for the locator to determine after making such a discovery is the direction of the ledge, because it is along the course of the ledge that he is entitled to locate his claim of 1,500 feet, and it is obvious that he must determine the direction, or course, of the ledge, as nearly as may be done. It is not requisite that he should determine it with absolute accuracy, but as nearly as it may be determined. He then measures off 1,500 feet, either all in one direction from his discovery, or partly one way, and partly the other. Then he establishes his boundaries by marking his claim upon the ground so that its boundaries can be readily traced; that is the requirement of the law. That is so that the other men may know what he claims, and be governed accordingly in selecting what they will take if they desire to locate a claim.

All of the difficulty in regard to extra-lateral rights, or nine-tenths of it, arises out of the manner of the location of the end lines of the claims. We all know as a familiar principle that two parallel lines never come together, however far you may produce them in their own direction. If the end lines of all claims upon a ledge were parallel, there

would be none of these extra-lateral contests, or overlapping of planes.

The question then is, how are we going to bring that about in the location of claims? The difficulty arises from the fact that the outcrop of ledges does not lie in straight lines. Ledges, as a rule, are reasonably direct and straight in their course on a horizontal plane; but you will readily see that a ledge dipping in a mountain with a dip, of, say for convenience, 45 degrees, does not present its true course on the surface. Erosion has cut away part of the ledge, and as it rises in the mountains the apparent apex comes back, as shown on the picture of the Bunker Hill ledge, at Wardner, which is marked "Exhibit A." This is a casual photograph taken looking up the gulch to the south, and the ledge is dipping to the southwest.

The exposure of the ledge which, to the prospector, is the outcrop, is as shown by the red line upon diagram A, and represents in some parts rather the exposure of what might be termed the end of the ledge than the apex. Were it not for the gulch which has torn its way through the ledge, the apex of the ledge would be represented by a straight line between the points where it is shown to intersect each side of the picture. The ledge, dipping away from the point of view, recedes up the gulch because of the fact that it stands at an angle of 45 degrees, pitching away from the point of view to the southwest. The condition in which the ledge is left by the erosion, or tearing out of the gulch, may be very well illustrated by taking a sheet of paper and placing it on its edge at an angle for 45 degrees, dipping from you. Tear out of the paper a V-shaped piece representing the gulch. You have then the ledge as it would appear if it could be drawn out of the mountain, the notch representing the erosion which left the gulch, and the mountain on either side. Placing this paper on the table as directed, you will find that that portion of the ledge represented by the sides of the notch torn out would have a course differing very much from the true strike of the ledge which would be represented by the base line of the paper or the original top of the paper before the notch was torn in it. If the locator takes the outcrop along the side of the notch to represent the course of the ledge and locates his end lines practically at right angles to this apparent course, in following his ledge downward on the plane between these end lines, he would not be following on the dip of the ledge, but diagonally along the dip; and if another locator had made a location along a part of the apex where the outcrop was in conformity with the true strike of the ledge on the top or turn of the mountain, there would necessarily arise a conflict between the two locators.

I have drawn a diagram showing the surface line outcrop of a ledge located in a mountain intersected by gulches where the ledge comes to the surface as indicated upon diagram A. I have indicated the end lines intersecting this outcrop and apparent course of the ledge, each claim located with end lines practically at right angles to the course of the vein as shown by the outcrop, but not the true course of the vein upon a horizontal plane. The conflicts that would ensue are apparent upon this diagram B. It is as to the best method of avoiding these conflicts that I am directing your attention. It is apparent that the first locator, while locating his end lines at right angles to the outcrop, did not locate them at right angles to the true course of the ledge. Had he done so the first location would have been made as indicated by the broken lines intersecting the lines of his location. He would still have had a segment of the vein 1,500 feet in length, and the direction of the plane drawn on his end lines would have carried him down on the dip of the vein instead of diagonally along it, and if every other location subsequently made upon the same vein had been located with end lines parallel to those of the first locator, as indicated by the dotted lines, there would have been no conflict between these several locators upon the vein in following down upon the plane of their end lines. Diagram B shows the several locations made upon this vein which resulted in numerous conflicts upon the dip. Diagram C represents the locations made upon the same vein, all having parallel end lines as they should be made. The problem I desire to present is as to the best method of securing parallelism of the end lines of the several claims located upon the same ledge, and at the same time having the locations so made that in following down upon the ledge the miners will be following down upon the dip rather than upon the strike of the ledge.

The ledges being more or less irregular in their course, it will not

be possible that all of them, even if their lines are parallel, will be following exactly on the dip, neither is it essential that they should be, provided that each have a segment of the vein of a certain number of feet along the vein, and the directions of the end lines of the locations is established so as to intersect the ledge practically at right angles with its general course, and the most desirable results will be obtained as near as may be and conflicts in pursuing extra-lateral rights will be entirely obviated, so far as claims on that vein are concerned.

It is suggested that by reason of spurs, cross-veins and other irregularities the rule may not work. Under the law the locator is entitled to all veins throughout their depth the top or apex of which lies within the lines of this location. This does not apply to cross-veins. The rights of cross-veins are as well established by existing laws as those of the original vein discovered, and, while in some cases complications might arise because of extraordinary geological conditions, no law could be framed which could anticipate every possible geological phenomena, and we are not attempting to lay down a rule that would meet with such a requirement. Nine-tenths of the controversies that have arisen and passed through the adjudication of the courts which involved or turned upon extra-lateral rights, have been controversies outside of these geological exceptions and have resulted from locations being made along the course of the vein as it outcropped rather than along the true course of the vein.

I propose as a remedy for the extra-lateral conflicts in a great majority of the cases that when a locator has discovered a vein he shall post his notice at the point of discovery, state the number of feet he claims along the vein, and go to the recorder's office of the county or district, and notify the recorder in writing that he has discovered a new ledge and desires to have the direction of his location established by a deputy mineral surveyor. The recorder will then notify a properly designated officer, who shall at the expense of the county go on the ground with the discoverer, examine the discovery, determine the true course of the vein as nearly as may be, establish by actual survey a line at right angles to the true course of the vein from the discovery, erecting three monuments, one at each end of the line and one at the discovery. He shall record this line, its direction and length, in the recorder's office immediately after recording the discovery claimed. **This line might be one** thousand or fifteen hundred feet long, as they deemed best. That after the establishing of the base line by the deputy mineral surveyors, all other claims on that ledge should be located with their **end lines parallel** to this base line. Their lines would then necessarily be parallel one with the other. They would each have the segment of the vein located by them to the extent of the number of feet claimed. As before suggested, these lines being parallel could not approach or diverge from each other; there could be no conflict for that reason.

Neither the occasion nor the time which I have allotted to the discussion of this subject will permit entering into the minute details for the carrying out of this idea, but such details would be readily furnished by an intelligent legislator. For the purpose of illustrating the method of the working of this system, we will suppose that Mr. Kellogg, when he discovered the Bunker Hill claim, had reported a first discovery upon a new ledge to the recorder, and the recorder had proceeded as above suggested to establish a base line that should govern all locations thereafter made as to the direction of their end lines. The result would have been as shown upon diagram C, and the great conflicts and the litigation for the settlement thereof which have extended through a long period of years could not have existed.

It has been suggested that the proposed parallel end line theory would not be applicable to all possible and imaginary conditions. This would doubtless be true of any system of laws that could be enacted governing the location of claims, but the objection is not a serious one. The following diagram will illustrate the objection and the application of the proposed law to such conditions. It will be observed that the location "A" in this instance was made upon what proved to be a spur, and the location "B" was made upon what proved to be the main ledge. Other locations are shown upon irregularities of the ledge. It will be observed that the location, whether made upon the spur or the main ledge, would secure the locator the segment of the vein located and the extent of the number of feet claimed in all ledges having the top or apex within the

location without serious conflict. By an examination of the geological maps of the Leadville camps, of the Comstock mines, of the Black Hills mines, of the Cripple Creek, Georgetown, Coeur d'Alene, Grass Valley, Silver City and other great mines you will see that with a few exceptions, such as Fryer Hill and some unimportant geological eccentricities, the remedy suggested would have secured to the locator the best possible results.

SQUARE CLAIMS.

It sounds plausible to say that you will give a man just what is within his lines. Those of you who are familiar with mining know that all ledges have more or less dip, and you also know that few mines ever paid until after they had passed out of their own boundaries. The prospector would get practically nothing if you confined him to the values that lay within his own lines. In the great Coeur d'Alene country, in Idaho, which has produced more than two hundred millions of dollars since I went there, there are but two or three claims that became paying mines within their own lines. Many of the great mines in that country have not been within their own lines for years, and the great mines in other camps did not pay for the development work until after they had passed out of their own lines. The value of these ledges lies in the depth. It takes all that they will produce within their own lines to pay for the development work.

Then, again, on the practical question, Mr. True suggests that we abolish the law making it requisite that a discovery be made before location. I think that would be unsafe, because if men should make locations without the trouble of making a discovery, and take up a piece of land, that would amount to nothing more than mortgaging the public domain. They would not develop it; many of them perhaps non-residents would pay the $150 per year, as proposed, year after year, in the hope that their neighbors would by actual exploration and development make their location valuable for them. I do not think it is good political morals (applause) to allow a man to locate a piece of land without first making a discovery. He should be required, as at present, to discover a ledge of mineral-bearing rock in place before he places a claim upon one foot of the public domain of the United States, before he says to the great army of seekers after this hidden wealth "You shall keep off of that forty acres of ground." (Applause.)

The question to be answered by those who are in favor of what we call the square claim theory, that is confining a man to what lies within his own lines, the question to be answered by them is what would become of the vein after it has passed outside of those lines on its dip downward?

I have drawn a diagram showing a cross-section in a mine in the Coeur d'Alene country, in which one or more of the cross lines shown upon diagram "B" are located. The ledge pitches at an angle of 38 degrees from the horizontal, the mining being far below the point of discovery. That section is taken through the Bunker Hill discovery, and accurately, or as nearly so as may be, represents the section drawn through the discovery in the northeast and southwest direction, which is at right angles with the general course of the ledge. You will readily see that the Bunker Hill mine would not have had much value if it had been confined to the portion of the ledge lying within its own lines.

These lines shown on the diagram represent the exterior lines of square claims, such as are proposed by the gentleman who will agitate the square claim theory. These other lines represent other claims that would have to be located in order to get the vein after it passed the boundaries of the original location. I repeat, the enquiry to be answered, the question to be solved here, is: What will you do with that vein? How will you get that vein and who will own it after it has passed out of the lines of the original location? That question must be answered before you can dispose of this question, because it would not be in keeping with good policy, neither would it be common sense to allow that portion of the vein lying beyond the exterior lines of the first claim to go without a responsible owner, or a responsible means of acquiring title to it.

We will suppose that such is the law and that the rights of the discovery claim stop at the line on the dip, because the vein passed

out of the claim there; this claim into which the vein dipped would be valuable only to the man who could sink a shaft from the surface 1,000 feet. It is 1,000 feet from the surface down to where he would intersect that vein after it passed out of the lines of the first claim. That bars out the man with capital. Great mining companies, men with plenty of money, might avail themselves of that ledge after it had passed out of the first claim, but none of the great army of miners could do it; no prospector could acquire title to that vein after it had passed beyond the first claim. You say he could go down below and run a tunnel. He would have to go the same distance. The locator of the second claim on the dip would have to sink 4,000 feet on the Bunker Hill vein before he could make a discovery on that ledge, and then he would have to raise the ore 4,000 feet to the surface or he would have to construct a tunnel to the surface in the valley below. On the next claim he would have to sink 6,000 feet from the top of that mountain to where the ledge would be intersected. He would have no choice between a shaft and a tunnel, because he would intersect that vein at a point below the valley, or the possibility of running a tunnel.

Now, there is the problem that you have got to solve before you can adopt the resolution offered by Mr. True, or before you can adopt the proposition suggested by Mr. Moore, of Colorado. And I shall await with a great deal of interest the explanation that the gentlemen will make as to how that vein is to be available after it leaves the first claim on the dip.

I repeat that the great values or profits above expenditure in all of these mines lies outside of the surface lines of the claims. If you make it forty acres you only reduce the measure of damages; that is all. You only make it more difficult for the second man to get the vein, because he has to go that much further into the earth to avail himself of it.

Now I am going to content myself with merely outlining these propositions, because it is very evident, from the remarks that were made before I came upon the platform, that there is going to be a general discussion of this question, and I am very glad of it. Of course we can do nothing more than express our views here, but those views will be regarded with some interest by those who make the laws for us governing these matters.

Some gentlemen seem to take it for granted that I would oppose their views before we began the discussion. I suppose it was because they knew my views on the subject. But I repeat, when the questions which I have submitted are satisfactorily answered they may take up the single claim theory for further consideration. Until that time we can best devote our attention to obviating such evils as exist under the present laws. If the base end line upon each ledge, which I have suggested, is not the best solution I hope some one will suggest a better one.

Now, I have here an accurate survey of the Coeur d'Alene mining country. These are official surveys and they are absolutely accurate. You will observe that the ledges are all practically parallel. This (Group "A") is known as the Sunset ledge, on which W. A. Clark and others are mining extensively. The next one is a parallel ledge generally called the Manhattan-Amazon ledge. You see they are exactly parallel. Then we come to the Tiger and Poorman ledge, which is one of the big mines of the Coeur d'Alene country. You will see that it varies but little in its course from the others. That was the original important galena discovery in the Coeur d'Alene camp; that was the first lead-silver mine that was opened, the Tiger and Poorman mine. The Tiger mine was located on the 4th of May, 1884, and the Poorman on the opposite side of the gulch a few days later; the Standard and Mammoth next. I have drawn blue lines showing the course of this ledge within the Helena, Frisco, Hunter and Morning combination. These mineral ledges, you see, have the same general course. There is the Wardner district with the general course of the ledge passing through the Bunker Hill, the Empire State, the Last Chance and all those mines constituting the Wardner group. That is as nearly as it can be determined. The discovery of the Bunker Hill was made on the 10th of September, 1885, at the junction of the red and blue lines. If the locator had gone to the recorder's office, reported his discovery of a new ledge, and requested the deputy surveyor to go upon the ground and determine its course and

dip he could have determined it in a few hours. It crops out on the side of the mountain, and the discovery was close to the foot wall. Any engineer running a level on the foot wall or the hanging wall of the ledge could have determined its course, on a horizontal plane of the ledge, always excepting the local variations which will occur in any rock formation. He would have established the line of the ledge as indicated upon the map in blue. He would have established the base line at right angles, as indicated in red, and then every location upon that ledge would have had parallel end lines to conform to the red line, and there could have been none of that vast litigation which has been so profitable to myself and to my employers. (Laughter.) I have been trying those cases for sixteen years; I have been trying them since 1885, determining, or trying to determine, one after the other the rights of the conflicting owners of those claims in the Wardner district, and they are far from being determined yet. So you see I am not speaking from a selfish standpoint when I am trying to relieve mine owners of these difficulties. I am perhaps doing an injustice to the younger generation of lawyers that will come along, but they will have to stand it.

But, Mr. President, this is a solution of the difficulty; whether it is the only one or the best one let us try to determine.

Now, there is just one great, big ledge running through that Wardner camp. There are spur ledges thrown up to the surface, so that in some of these claims if the location was originally made on one of the spurs, of course, as the law now stands, when they came to the main ledge they would probably take it as the first locator. If you revise the mining laws as to how a location shall be marked on the ground, how it shall be recorded, and then fix the lines so there can be no conflict as they follow down into the earth upon the plane of certain lines you will have relieved the courts of a great amount of work, capital of a great deal of apprehension, and will have made the prospector's claim valuable to him.

The prospectors deserve a high place among our pioneer citizens. (Applause.) The honor due to them is as great as that due to the heroes in war. They are the men who laid the foundation for the civilization and development on the Pacific Coast. It was the gold, silver, lead and copper hunters that went into the mountains and searched out the rich mines. These men, as the resolution that was introduced here this morning very wisely suggests, should be taken care of. Just as we take care of the maimed and crippled heroes of our wars, so should we take care of those men who have laid the foundation of the wealth and prosperity of our people. In the avalanches of the mountains, in the swollen streams that rush down their deep gorges, or in the lonely cabin, their lives have gone out in solitude and poverty, forgotten save by perhaps some distant waiting ones who will never know their fate. Marshall, who discovered the gold in California, Comstock, who found the greatest mines in Nevada, the little coterie of men who discovered the bonanzas in Leadville, Andrew J. Pritchard, who discovered the Coeur d'Alene mines, in Idaho, and a long list of others, none the less entitled to honorable mention because I have not named them here, did more for the permanent wealth and prosperity of the people of this country than the great statesmen and law-makers whose statutes adorn statuary hall in the national capitol. The prospector is the creator of wealth; these only direct and control its distribution and management.

PRESIDENT PRINCE: Mr. E. B. True, of Idaho, will now present his paper upon the same subject.

Mr. True read the following paper:

Mr. President, Ladies and Gentlemen: The object of this paper is to suggest certain changes in the mining laws of the United States, which will tend to develop the mining industry and prevent future litigation. Vested interests will not be affected by the proposed changes, but the law will be so simplified that all newly-established claims will be much less likely to become involved in litigation than those located under the present laws.

The experience of the past thirty years as shown by the records of the General Land Office and the court decisions proves that our mining laws need revision. While it was intended to be simple and liberal in its provisions in order to encourage the development of our vast tracts

of mineral lands, and it has met with great success in this respect, yet it has often been confronted with unforeseen conditions requiring an adaption of the laws to fit particular cases. This construing or interpretation of the law has resulted in a large volume of rulings of the General Land Office, which have the effect of law until they are reversed by a different commissioner and instead of defining the law and making it plainer it tends to invite new litigation with each new ruling.

That the law has served us so well is remarkable when we consider how crude was the knowledge of the occurrence of mineral at the command of its authors. They read in the Bible that: "Surely there is a vein for the silver and a place for gold where they find it," and they constructed the law upon the basis of a well-defined, regular mineral-bearing vein. They recognized such accessions as "dips," spurs" and "angles," but dwelt mainly upon the hypothesis that a well-behaved vein would have well-defined walls, run straight, crop throughout the claim and contain pay ore; that it might dip at such an angle that would cause it to pass in depth through a plane dropped vertically from a side line, but they did not dream that it would be at all difficult to identify it sometimes after it had passed that point.

They were certain that veins must dip, because they made no provision for the location of a horizontal vein or a vein inclined upward from its croppings, nor did they specify what should be considered the apex of such veins.

We have learned, however, by experience in the last 30 years, that valuable mineral deposits are more often erratic than well ordered, in regard to strike, dip and composition; that the apex is frequently a myth; that often a so-called vein may have but one wall, and yet be valuable, or no walls at all and yet produce dividends, and furthermore that of all land west of the 100th meridian there is not one foot of ground in regard to which a non-mineral affidavit means anything more than "non est inventus," or that the mineral is not yet found.

Our law-makers insisted upon the discovery as a prerequisite to valid location upon the assumption, presumably, that a well-behaved, valuable mineral deposit would inevitably raise its head above the surface or "crop out" plainly for the benefit of the locator. Unfortunately for the theory, but perhaps fortunately for future generations, the fact is that many valuable ore deposits are not so plainly indicated upon the surface as to be found while riding, as it often occurs, that it requires as much labor to discover a vein as to sink an oil well.

There is no valid reason why location should wait upon discovery, because the locator shows good faith by his works, even in attempting to make a discovery.

For this reason all public lands should be open to exploitation so that if one should wish to prospect a tract of lava beds he could first make a valid location upon any unoccupied portion.

The United States law requires a discovery, but is much more liberal than our State law which literally requires a prospector to become a miner before it will allow him to record a claim; and yet the requisition is not in conflict with the United States law in the opinion of some courts.

One of the most serious objections to the present law is in regard to its manifest injustice to those seeking to acquire title to quartz claims as compared with those seeking title to agricultural land.

The applicant for patent to arable land goes to the Land Office and files upon 160 acres of the best land on earth, and after complying with a few simple instructions in regard to improving said land, he is permitted to buy it for $1.25 per acre, or even at a lower price, under certain conditions. He has the land surveyed for him by the Government, and is not compelled to hire a lawyer to steer him through the Land Office.

But if a prospector wishes to acquire title to 20 acres of the poorest land on earth—so poor, indeed, it may be that even the sheep herders avoid it, and which may not contain even a good quality of building stone—when he goes to the Land Office he is told that whether the land is surveyed or not he must go first to the Surveyor General and have a special survey made. He goes to the Surveyor General, who gives him permission to hire any mineral deputy to survey his claim for him, and charges him $1.50 per acre, in advance, for the work in his office.

The deputy surveyor charges him from $2.50 to $5.00 per acre for

the survey, depending upon the locality of the claim and the business ability of the contracting parties. About this time the applicant for patent learns that it would be well for him to engage a lawyer at the usual rate of $2.50 per acre, to inform him what other expenses are necessary.

The lawyer sets the County Recorder at work making certified copies of the recorded history of this pet rock pile. The Surveyor General must have a copy, and the Land Office another, and also an abstract of title at date of entry. He also sets the notary at work upon affidavits, first of citizenship then of proof of labor, proof of improvements, proof of no suit pending, proof of posting of plats and application for patent, proof of plats remaining posted during sixty days of publication, agreement of publisher, proof of publication, and finally makes a statement of fees and charges which the applicant swears to—if not at.

Meanwhile the lawyer has filed in the Land Office an application for patent at a cost of half a dollar an acre, and about two months thereafter, if all the proofs are gathered and no one else disputes his title to the claim, and he has shown that he has spent $25 an acre upon the claim, he is recognized at the Land Office and allowed to pay $5 an acre for the ground and get a receipt which will bring him a deed from Washington as soon as the papers go through the circumlocution office and provided some clerk does not hold them up.

These expenses foot up from $12.50 to $15 an acre, besides the $25 an acre expended in improvements upon the claim, and many claims have cost more than $350 per claim beside the $500 improvements in the State of Idaho during the past 20 years. And this as against $1.25 per acre for good arable land that may contain oil.

Moreover, after our prospector has patented his claim he goes at work sinking a shaft upon his vein, which we will assume goes downward vertically into the earth. After sinking one hundred feet or more he is served with injunction papers in a suit brought by his neighbor on the south, who has a vein running parallel with his, but dipping northerly, so that it might intersect the vein upon which our prospector is sinking at a depth of 300 feet. After settling this dispute by buying the southern claim or giving up half of his claim, he sets at work vigorously sinking his shaft again. He finally attains a depth of 500 feet, and one day breaks into an opening which proves to be an old stope on a vein coming down from the north, and which has been worked out above and below where his vein intersected it.

He then learns that the ground which he had been at so much trouble and expense to acquire title to had been sold or granted to two other parties, and that one of these parties had, in pursuance of the provisions of that beneficent law of the dip, worked out his ground for him. Stranger things than this imaginary case have actually occurred.

The idea of requiring improvements as a pre-requisite to patent is evidently carried over bodily from the arable land law, into which law it was incorporated, in order to favor small holdings and prevent the acquisition of large tracts for speculative purposes. But if it is necessary to make the cost of mineral land high in order to prevent the acquisition of large tracts, why not make the charge direct and fixed in order that the Treasury may profit by it or else withdraw such lands from the market. It is the best kind of good faith, so far as the miner is concerned, when he shows his willingness to pay $5.00 per acre for the poorest land the Government has to offer, and he is not buying much. The State of Idaho has been mining largely for 40 years, and more than two-thirds of the State is mining ground. But the total patented mineral land is only 40,000 acres; less than two townships out of two thousand townships; one-tenth of 1 per cent.

The changes that seem most urgent are here presented briefly in the hope that this Congress will, after due consideration, take definite action thereupon and authorize a committee to urge upon Congress its adoption and immediate enactment:

"1. Establish a bureau of mining with a secretary having a seat in the cabinet, and provide for the appointment of a commissioner of mining for each State and Territory in which there are any Government lands.

"2. Complete the system of public surveys at once over all unsurveyed lands, however mountainous.

"3. Limit the size of all new locations of quartz, placer or other mineral claims, including coal and iron, to 1,320 feet square, conforming to a

forty-acre tract of the system of public surveys. Require locators to conform to the legal subdivision lines upon surveyed lands, and require locations upon unsurveyed lands to be staked off with north and south and east and west lines, irrespective of lodes or deposit lines.

"4. Require no discovery, but require an excavation five feet deep, measuring 100 cubic feet as a pre-requisite to recording from which, as an initial point, all measurements must be made for describing locations upon unsurveyed ground.

"5. Allow but one location a year for each citizen in each township upon surveyed ground, and allow no citizen to locate more than one claim within a radius of five miles of his initial point upon unsurveyed lands, and allow no locations by attorney.

"6. Grant locators full possession and enjoyment of all rights of occupancy such as pertain to title in fee, so long as they expend $100 in actual work upon and within the lines of each claim, each and every year from the date of record, or as an equivalent pay the sum of $150 into the United States Treasury to constitute a fund for the promotion of the mining industry, to be expended as nearly as practicable within the districts to which it is credited.

"7. Withdraw from the market all lands not occupied and claimed, except such as may be proven more valuable for agriculture, by the proper non-mineral affidavits. Sell timber under proper restrictions but not the land, unless it be such that the farmer will want it and can make non-mineral affidavits before filing upon it.

"8. Repeal the law of the dip and apex and bound all claims by vertical planes drawn through the exterior lines.

"9. Let Congress call for the repeal of all State and local laws, in the interest of simplicity, and treat all questions between mining claimants the same as disputes between other public land claimants should be treated, in the proper courts."

The first change suggested needs no comment here, further than to claim that the mining industry is as justly entitled to a place in the cabinet as the farming industry.

The second suggestion requires no change in the law, but a more vigorous application of its precepts. The cause of the delay in surveying the mineral lands is the extra expense entailed by running lines in mountainous country and the fact that there is a poor market for that kind of land; also because at present they are making the applicants pay the expense of surveying—and there are not many applicants.

The third suggestion has in view the location of mineral lands in square tracts, conforming to subdivision lines as agricultural lands are located and irrespective of the known presence or character of the mineral contents. It is intended to render the location of mining claims more simple, by avoiding classification, and to avoid as much as possible fractional locations and to prevent boundary disputes and infringements. There would be no lapping of claims nor cross locations nor irregular and unsightly maps of new mining districts and no more litigation than over farming locations.

The fourth change proposed is in accordance with the hypothesis that all land is mineral land until proven otherwise by actual exploitation. That any land may contain valuable mineral deposits and that a prospector should be protected while making a discovery as well as afterwards. The excavation required is partly to show good faith, but mainly to mark the initial point from which all measurement must be taken in defining claim lines upon unsurveyed land. A hole is preferable to a monument for this purpose.

The fifth suggestion is an innovation but will prove a simple remedy for much trouble that has arisen from attempts to secure large holdings of possibly valuable ground. It is a limit that will operate somewhat as does the land limit in regard to agricultural lands. It will give the poor man and the late comer a chance, and its evasion will be as expensive as the evasions of the present law. It will be claimed that a locator ought to have the right to locate a claim in addition to cover the possible dip of his lode. But if he finds his vein good enough to be worth following on its dip to the limits of a forty-acre claim with vertical boundaries, it certainly would be good enough to divide with his neighbor, or when he first found the dip would lead into his neighbor's ground, he has the advantage of first knowledge in acquiring that ground by purchase.

Also he can locate a new claim each year. Forty acres of mineral

ground gives elbow room enough for a poor man to work in—a rich man can buy more. A good ledge will make an ore chute once in forty acres or a poor man does not want it.

The sixth suggestion proposed is intended to allow a commutation of the assessment work into a cash payment into a Government fund, to be expended in building roads, and in other community interests for the development of the districts paying in such money.

The seventh consideration calls for careful and studied consideration. Our Government has been selling mines for more than 30 years to citizens and foreigners, and giving them absolute title to not only the ground included within the deed lines, but also, under certain considerations, to the ground of their neighbors; thereby granting rights to these individuals to explore and mine out the ground deeded to them, and also any other ground near by into which they can trace the semblance of a vein. It is true that they may deed the adjoining ground to another individual and grant him the same privileges, but it is manifest that any clash of interests would certainly invite litigation. The proof of this is already on record in the court decisions, and its fruit is not half ripe.

It is a serious question whether the right to mine ought to be included in a Government grant to the soil.

There was wisdom in the old law and custom which, in the Old World, ruled, "That all gold and silver mines of right belonged to the King"—"The King" meaning the people.

Gold and silver mines ought to belong to the people for the benefit of the people, and should be given to individuals only for the purpose of working them and held by them only so long as they work them to the end that as much gold and silver will be produced as possible, because we cannot have too much gold and silver. But mining includes much more than gold and silver mining; and while the chief use of gold and silver is to mint them into actual money, so it is true that the more money there is the more demand there is for the other products of mining—the base metals and all other valuable minerals that lie hidden below the surface of the earth. Therefore it is a question worthy of serious consideration as to whether or not all mining should not be conducted under such control of the Government that when the parties to whom the privilege of mining is granted do not work in a manner calculated to develop the best results or refuse to work at all, then they shall forfeit their privilege and others may, at their option, take up the work.

Some States have laws in regard to mineral lands which are founded upon this idea, as for instance New York and Texas. But these States own their lands, while the public lands of the West are owned, in the main, by the General Government, and these are the lands under consideration.

In regard to this idea, and bearing directly upon the subject, we find in Lindley on Mines, Vol. 1, Page 14, as follows:

"The theory of the civil law is thus plainly stated by Mr. Halleck: 'All continental publicists, who have written upon the subject, lay down the fundamental rule that mines, from their very nature, are not a dependence of the ownership of the soil; that they ought not to become private property, in the same sense that the soil is property; but that they should be held and worked, with the understanding that they are by nature public property, and that they are to be used and regulated in such a way as to conduce most to the general interest of society.'"

It is certainly in the interest of society that the mines shall be developed, and the chief objection to private ownership is that mining property owned by individuals is so often held for years unworked and undeveloped.

The eighth suggestion confining mining privileges within vertical planes drawn downward through the boundaries will work no hardship upon anyone and will eliminate a great deal of costly and vexatious legislation. Under the present law those who attempt to follow valuable veins outside of vertical boundary planes nearly always find it cheaper to acquire the full title to the land covering the dip than to trust to the roving title given by the law.

The status of mining claims, if these proposed changes were made, would be practically the same as that of claims now held under possessory rights. Claims would be twice as large, and all boundary lines would be practically end lines; an individual or company could locate

but one claim in the same camp each year, instead of, as at present, locating the earth in one day. There would be no patenting of claims, but there is very little now. There would be no more litigation and no more hogging of claims than there is in regard to agricultural land. It would be no more difficult to locate a mine than to locate a ranch; and in fact it would be easier, because the would-be rancher must file his non-mineral affidavits before he began to fence up any land.

MR. MULLEN, OF IDAHO: Mr. President, I want the members of this Congress to understand that the object of the attorney and surveyor is to protect the prospector. I have held credentials for 35 years as a prospector. Now, Mr. President, and ladies and gentlemen, at the commencement of Judge Heyburn's remarks he spoke of prospectors who come into the country who can hardly read English. I am one of them, but I am going to talk English, and I am going to talk fast, for I am limited to ten minutes.

This is a question for the people of the mining States to consider carefully before they go to work and overturn the laws under which the mining interests of this country have grown to such enormous proportions. Now they come along with a new idea, labeled the square location, and propose to do away with extra-lateral rights.

We have listened to two eloquent speeches on this subject; one a lawyer, pleading for the protection of the prospector; the other a surveyor—he is the Surveyor General—and every one of their efforts are for us poor prospectors, and they pay glowing tributes to the services of the prospectors in the development of the country. Judge Heyburn presents to you the proposition as it exists in the Coeur d'Alenes. The titles to their property, as in all other parts of the country, rest in the laws of the United States. In the superior courts in the United States today but a small percentage of the mining property is affected by litigation. In the last 30 years the mining interests of the different States have grown and flourished under the laws of the United States, and the laws and customs of the States and local districts, and they have been very liberal. In addition to this we have a long list of decisions, which are the foundation of our mining laws; and the great majority, nearly the entire people of the United States that own producing mines, are happy and satisfied. The prospector must make his discovery in the center, and if the vein pitches he has only one-half the area of his claim, under the square claim theory. He may have 40 acres, and he may only have 20 acres, but he cannot go beyond his perpendicular lines.

This question has been agitated at every session of the Congress that I know anything about; and I hope some young lawyer will stand up and plead for these customs which are now thoroughly established, and have given the citizens from this source millions of money.

When men want to tinker with the laws they go to Congress and try to get them to do it. There are men who would like to amend the laws of the kingdom of Heaven, if they thought they could do it. (Laughter.)

I want to say this, Mr. President; Judge Heyburn is one of our best friends, and so is Mr. True; but the trouble is this: You have established laws, of 20 or 30 years' standing; every young lawyer is studying them, and every judge renders his decision by them, and now you want to overturn established laws and customs and start new laws, and have a new lot of lawyers and mining experts educated at the expense of the prospector and miner. We can't afford to do it. (Applause.)

MR. VOSS, OF OREGON: Mr. President, I agree with the sentiments of the last speaker, and I do not approve of the position taken by some of the gentlemen with regard to locating the 40-acre, square mining claim; because in a great many mineral-bearing sections the veins lie very close to one another. That at Cripple Creek, for instance; suppose it was located in 40-acre tracts, how many mines would there be in Cripple Creek today? You go to Cripple Creek and you can go through rock from one mine to another; you can jump from one dump to another without jumping on the ground. They have, I think, 40 mines in Cripple Creek, and if that section was located by 0-acre tracts there would be but four or five, and they would be plutocrats. That condition exists not only in Cripple Creek, but here in Oregon, in Idaho, and in every mining camp. I believe the speaker who just had the floor is perfectly right; the mining claims should be 20 acres, with plenty of

room to work upon. In Cripple Creek they only have 300 by 1,500 feet, and they seem to have ample room there to work in. Moreover, if this 40-acre proposition should become a law it would cover all the veins which lie parallel, and it would keep everybody but the original locator off. It would result in another trust, only in a little more compact form than they usually do it. (Applause.)

MR. FELTHAM, OF IDAHO: Mr. President, I want to say a few words upon this question, from the standpoint of the lawyer and the prospector.

Now, I agree with the speaker who said that the important proposition is to simplify the law, so that the prospector can understand what is required of him in order to properly and legally locate a ledge, and to acquire rights in which he will be protected by the courts of the land. The simplest form of law, then, one that he can interpret, is the best. The men who go out into the wilds and search for minerals are not usually men of letters; they are not usually very deeply learned in the law, and do not understand its ramifications, and the nice little distinctions that come up, and that requires that our laws shall be so simple that he can read and understand readily what he is required to do, and can conform to those requirements. Now we have in this State quite an elaborate plan laid down by our State law for the prospector to follow. It is an elaboration of the ideas set forth in the United States Statutes, not in conflict with them, and it is an easy matter as the law now stands for a man to take a little pamphlet that he can readily secure, and go out into the wilds and seek mineral in place, and when he has found it locate a claim in accordance with the law. These specifications laid down in our statute—in fact, they were copied from Colorado, I think, almost verbatim, and the Western States generally are following the same plan—it is an easy matter for him to go out and follow the directions contained in this simple law. Now, of all things in this world that are harassing and annoying, it is the constant change of rule. And I believe there is no class of men in the world who appreciate that more than the lawyer; for he is constantly beset with complications and difficulties in the interpretation of the law; and so it is his desire to have the law so plain and simple that it can be readily understood, and so stable that it does not change. Having once learned what the law is, he can follow it year after year. It is a mistaken idea, too prevalent among the people, that lawyers seek to complicate the law. I want to say on the floor of this Congress today in defense of the alwyer, that all the simplification that you have in this land today you owe to the lawyer. (Applause.) No man should sneer at the man who labors over the midnight oil trying to evolve simple rules of action. No man should sneer at the man who has sought, from Judge Payne down to the present time, to eliminate the difficulties of mineral location and simplify it so that any man can go out into the mountains and locate mineral ground. The lawyer is pleading just as hard for you, trying just as hard to help you in the simplification of the mining laws as you are trying to help yourselves, and you owe to him the greatest respect, I think, because he has given to you hours, days and weeks, months and years of labor gratuitously.

I am not in favor of the square mining claim. I think it is wrong in theory and wrong in practice; that every man who locates ground should locate it upon a proper discovery of mineral in place. That is a thing that develops the intelligence of our nation. A man who seeks mineral in place seeks it intelligently. The man who would be permitted under the law of this land to locate ground, expecting to find mineral in place, would do it in a blundering, blind and meager way. It is not theoretically correct, and it is not practically correct, because it is of no use for him to expend labor upon any piece of ground unless he has found something upon which to expend that labor; unless he has found mineral in place. So the law very naturally and very correctly provides that before a location can be made he must first find mineral in place. It does not mean that he must find a claim that shall pay from the grass roots down, because he rarely ever does find such a claim; they are very rare, very far between. But he must find that which is mineral; he must find that which is of value, and he must find it in place, in contradistinction with that which might be floating and drifting around upon the face of the earth, washed hither and thither by the storms and snow-slides. He must find it in place, in the position where nature de-

posited it. It is right in theory, and proper in practice; and then when he develops it, he develops it intelligently, as a miner should.

The matter of lateral rights has been agitated so long, and my friend, Mr. Heyburn, has had a very prominent hand in the matter; he has been an attorney in cases that have gone to the Supreme Court of this land, in which the question of lateral rights has been defined, until today we have an abundance of decisions of the Supreme Court defining what are lateral rights. Let it alone. Let it alone. It is good enough as it is. Nature does not work in straight lines. Ledges are not necessarily straight along their strike—in fact, they are rarely ever straight. Any man who has had practical experience in the field seeking ledges knows that they form all sorts of angles, and lie in all sorts of positions. They are not usually deposited in blanket form. Usually they have a dip, and usually they are irregular in their surface lines. Even though they are found upon the surface of a level country, they are crooked. I remember a short time ago a prospector described to me a ledge that formed a right angle, a sort of parallelogram—a box, as it were—enclosing a section of country, commencing and ending at the same point.

This question has been defined as far as it can be defined by the law of the land. The law says you shall locate it in parallel lines. It tells everything that the prospector neds to know for the location of his claim. It gives him a rule to work by; it is an easy and simple rule. It is not necessary that one shall find mineral above ground. There are iron mining camps where men have been required to sink shafts hundreds of feet in depth before they struck mineral at all. The location could not be made until the mineral was found, and then it was a race between the parties who found it first. The one who found it first made the location, and it was a proper reward for his effort. There was nothing wrong in that; and there is no proper reason why because ledges do not always run straight that you must square your section of earth, and locate it in that form. It is a hardship on miners to have to locate mineral lands oftentimes indefinitely. The Supreme Court has prescribed the method of locating the discovery stake and the location notice with great particularity, and it would be a good thing for the miner if the surveys of all mineral countries could be sectionized, so that the miner could locate his stake with reference to the section corners. I would be heartily in favor of that, and it would be a wise thing to ask Congress to pass that kind of a law; to have a survey made as soon as the districts were formed, so that prospectors could make their locations by permanent monuments, and there would be no difficulty in fixing the location of his claim.

MR. FRAZER, OF IDAHO: Mr. President, since there have been so many bouquets thrown at the prospectors by lawyer and engineer, and every other gentleman who has spoken upon this floor, I desire to make a few remarks in behalf of the prospector. I remember the time when my friend, Judge Heyburn, came out of a prospect hole in the Coeur d'Alene country to try his first case in that celebrated country; and he won it, and he has been winning cases ever since. He found that there was more money in litigation over mining claims than there was to the actual prospectors of the country. (Applause.) I have watched Judge Heyburn's course ever since, and I believe today, when he made the statement about the Coeur d'Alene country that he believed what he was talking about. I am satisfied of the facts that he knows he was telling the truth. Of course, the lawyers in this State, perhaps in every other State in the Union, are always looking after the poor prospectors, the men that ply the drills, the men who develop the mining claims. We are satisfied with the law.

Now, when we come down to the fundamental proposition in regard to prospecting, we might say that Adam was the first prospector. When he was driven out of the Garden of Eden he went out prospecting for new lands; and when his sons, Cain and Abel, were sent out to another land they went into the land of Nod and prospected for wives. The Scripture says that they found them. We have also another great prospector, Noah. When the waters subsided he went out of the ark and took his flocks, two of a kind, and hunted for new fields. We also have Lot, that poor unfortunate Lot, who, with his wife and daughters, was driven out of Sodom and Gomorrah, with instructions not to look back,

but his wife did look back, and was turned into a mineral. Lot was prospecting for new fields.

Now, I want to say to the delegates who represent the great Eastern States of this Union that I would like to meet every one of them, from the great State of Iowa, the great State of Illinois, the State of New York, and every other State in this Union, and shake hands with them, and let us take them into the mining fields of Idaho and show them that the prospectors of this Northwestern country are men that are ready to take the hand of Eastern capital, and take their capital, too, and enjoy life with the fruits of their labor, as well as ours. (Applause.)

MR. FITZGERALD, OF COLORADO: Mr. President, I had the honor of helping to organize this association—at least, I attended its first meeting. At that time, I believe, the importance of such an association was considered to be for the purpose of, if possible, amending the mining laws of the country.

Now, I must say that I thought at that time that we had pretty good laws upon the subject, but there were some things that needed amendment. Now, I want to be like the young man that was asked to make a speech, and he said he wanted somebody to plead with him to let well enough alone; that it had stood the test for a good many years. It is true that there are some inconsistencies in the mining laws; there are some things that should be changed.

Now, the gentleman who first entertained us suggested that we make the end lines parallel. The statute says that the end lines must be parallel, but it does not say that the next man must make his lines parallel with those. Now then the gentleman has carried the idea a little further, and says that the first man makes his lines upon the vein as discovered, and he suggests a way that he should be assisted by the Government in establishing his line, and then he says that all others should conform to that. He has made a suggestion in advance of anything that we have heard upon this line, that if we could compel the second locator to make his end line conform to that of the first locator, and the third to the second, and so on, down the line, we will have eliminated the difficulty arising from extra-lateral rights. I believe that the suggestion is worthy of consideration, to see if some good will not come of it; because, as stated by the gentleman, the greatest difficulty, the greatest amount of litigation is brought about because the end lines of adjoining claims are not parallel. If the lines were parallel upon the same vein the work upon each could be carried on indefinitely without conflict. But when you come to revolutionize the entire laws of this country, make 40-acre claims, and change the entire system that we have been studying for the past 30 years, it seems to me it is ridiculous. It seems to me that this Congress should not recommend such radical changes. We have not been asked to make them.

I have been listening to hear somebody tell, as the gentleman said, how you are going to answer the questions he asked. What you are going to do with the rest of the vein. Nobody can get at it. Will you locate one mining claim in a district, and none within five miles of it? When a man finds that his vein goes outside of his lines he must go and locate another claim. But the suggestion has been made that we don't want a man to locate as many claims as he chooses. But, Mr. Prospector—and I don't say it to cast reflections upon the prospector—I have done prospecting myself, and made a little money and spent it, but I have done it, am still at it, and intend to continue. Now, if this suggestion is correct, that you are only going to let a man have one claim in a district, how is he going to protect his claim? He knows he is going outside of his lines in a few hundred feet. How is he going to protect his claim? Is he going to get some one to locate it for him?

Now, the mining laws, it seems to me, are pretty good. They say to every man who wants to go upon the public domain, to go out and find a mining claim. Go out and find something and then locate it. It don't say, "Go out and put a stake down, and then when somebody else develops that section you will have something." But the Government says, "Go out upon the public domain and find something, and when you have found it put a stake on it; and that something must be something of value; it must be mineral in place; something to initiate a title." Then they tell you that is his location. There is a good deal of nonsense about the rules as to how the development shall be done. They should be simplified. But if you have something that is a mining claim the Government

tells you how much of the public domain you can segregate. If you go out and put your stake upon 40, or 20, or 10 acres in a square of 300 feet by 300 feet, and then put your stake down, and if you pay in the taxes from year to year, that is all right. But it does not seem to me that there is anything unjust about the proposition now that you stake a claim when you have found it, and work it from year to year and develop it, and when you want title to it I believe in getting an absolute title. It has been suggested that it belongs to the Government, that you simply want to work it, and when you lie idle for a while somebody else comes along and works it. When you get a mine developed you get an absolute title to it. You do as you please with it, the same as with your orchard or your ranch.

If this change can be made, if some system of location be adopted by establishing a base line for the district, then it will obviate 90 per cent of the litigation about extra-lateral rights, and it seems to me that something of that kind is about as far as we need to go.

I presume the resolution of this Congress will be that we send someone to Congress to demand a change of the law, and to tell how we want it changed. If that is the idea. I presume we should crystalize our ideas into the form of a resolution, and we will carry it forward and change it. But it seems to me if we are going to make so many changes, revolutionize everything that has been done under the mining laws, as has been said by the gentleman from Cripple Creek, a great deal of expense has been gone to in decisions in establishing rights and titles to mining claims. It is true these things must rest somewhat upon questions of fact.

Now, it has been said that you have no extra-lateral rights unless you have an apex vein. If it is a blanket or flat vein you haven't got an apex, and you have to go off like you do at Leadville when you get to your side lines; you have no extra-lateral rights unless you have an apex. You don't need any amendment upon that question. The great Smuggler mine that has made the Telluride district in Colorado what it is, is at least a thousand feet off from the side line now. If that vein had to be protected by locations along the side of it, it seems to me it would be nonsense. Our Supreme Court lately, in a case from Colorado, said that you get everything within your side lines, taking it downward vertically, you get everything off the end lines of your claim, and you get the cross veins, everything of value within your lines. This decision was made by the court of Colorado. At first Colorado followed Montana, and decided that there was an exception in the case of cross veins, which was nonsense; but the Colorado Supreme Court reversed itself, and the United States Supreme Court has sustained it. So that a man gets everything in the side lines, wherever it goes, from the apex, taken vertically downward. It seems to me that is all right.

Outside of the suggestion made by the gentleman from the Coeur d'Alenes, it seems to me we ought to let well enough alone. It is not so much what the law is, as to know what it is in this case. (Applause.)

MR. MOORE, OF COLORADO: Mr. President, there are a few points that have not been brought out that I should like to bring before the Congress. With Judge Heyburn's permission, I will use one of his sketches to show one of the fallacies upon which he has based his remarks. I will draw with red chalk lines representing what the prospector might find in the first, which he would suppose to be the vein, but which later development might prove to be one of the spurs of the main vein or ledge in the hill. Now, suppose the prospector in the first instance discovers mineral enough to justify him in making a location, and he gets the surveyor, as suggested by Judge Heyburn, to make his location upon his discovery. The surveyor, we will say, locates the end line upon the claim at the point of discovery at right angles to the course of the vein at that point. The locator, we will say, opens up the ledge showing the outcrop and one of the walls of the vein with mineral upon it for a distance of 10, 15 or 20 feet. That, according to Judge Heyburn, gives ample data from which the surveyor can tell the general course of that ledge for hundreds, nay, thousands of feet through that mountain. As an old surveyor, I claim that it would not. Assuming that the location was made upon that vein in that way; ultimately as others come upon the hill and discovered the line, which is indicated

by blue lines upon Judge Heyburn's sketch, which is the main vein, they would discover that the first prospector was wrong, and the surveyor was wrong in following his information and locating him in that position, and, consequently everybody else who was forced to take the end lines established by the first location as their guide in all subsequent locations would be wrong, and the main vein in the mountain would be missed by every one of them.

Another fallacy in Judge Heyburn's argument is that he has assumed that the mineral deposits in the Coeur d'Alenes are a criterion for the mineral deposits of all portions of the West. That has already been covered by some speaker, who said that the mineral deposits in other district, Cripple Creek especially, are entirely different from the Coeur d'Alenes. A mineral district, as a rule, contains a great number of veins. For instance, in many regions the veins intersect, coming in from every direction. Now, let me ask you if you are to be guided by a single location upon a single vein in a region containing hundreds of claims. What are you going to do with the rest? It is all part of the public domain. You are entitled to all you can take under the law, whatever it may be at the time; and according to Judge Heyburn's position, if you do not happen to locate upon the correct vein in the first instance, all your subsequent locations would be invalid. The irregularities of the outcrop and the spurs render an absolute implied course for all claims upon any hill impossible. The trouble, as stated by Judge Heyburn, I think was not correctly stated. The litigation arises almost wholly from this peculiar law that gives you the right to follow the vein outside your vertical boundaries.

That law, perhaps, is not understood by our Eastern brethren. It is an exception to the common law of the country. It is a peculiarity that has arisen in the West and has been engrafted upon our statutes. It originated among the Spanish, and was first adopted in California. It is, therefore, a foreign idea that has been incorporated in our United States statutes. It is not home-made. All we endeavor to accomplish in the way of reform is to simplify, not to confuse, present conditions. I was a member of the committee, of which I have already spoken, that took up this matter in the first Congress, and reported to the subsequent Congress at Salt Lake City a few years ago, and I beg to say that the proposition advanced by Judge Heyburn was thoroughly considered by us; and we had numerous other propositions, and most of them have been touched upon this afternoon by one speaker or another. Those propositions were considered by us, a committee of thirteen members, including representatives from Colorado, California, Arizona, New Mexico, Wyoming, Washington, Idaho, Oregon and Nevada. I think that was all. Any way, we thirteen went over the question, having representatives from all the States that would be particularly affected by any change in the public mining laws of the West; and as the result of our deliberations and discussions of those propositions that have been brought before you this afternoon we decided that the only way of reforming the mining laws was to allow a man to take a location in any form he liked, so long as he did not exceed a certain area, which we placed provisionally at 40 acres in any one location; that he might sink his discovery shaft in any portion of that location he chose, close to one corner, close to any boundary, or in the center, and that he should have everything of a mineral nature that he found within that ground. Furthermore, that he should have ample time in which to make his discovery. And, in that connection, I should say that the present laws require a certain amount of time in which a man must make a discovery before he can make his location, and under Judge Heyburn's proposition that time would still have to be observed. The man who first went upon the mountain would practically hold everybody off until he had decided which way he would run his own lines. At the present time the law requires you to make your discovery and your permanent location within sixty days—discovery within sixty days from the time you go upon the location, and your location within thirty days after discovery, making ninety days in all. As a rule the prospector does not make a discovery in the first ninety days, and gets over the difficulty by representing his ninety days until he finds the location he is looking for upon his location after it is made, and so gets within the law.

The argument as to great depth is predicated entirely upon Judge

Heyburn's supposition that there is but one vein in the earth. That matter I have covered.

The recommendation that we made to this Congress two years ago still seems to me to be the only method of reforming the law, and in such a way as to deprive nobody of existing rights, but to take away the most fruitful source of the most expensive litigation in the West.

You can see by referring once more to the cross section the constant contests that come up in the West over mining propositions, conflict at the point of intersection of any two veins, that is, as to the right to the ore at the intersection. The present law gives it to the oldest locator of the two veins on the surface. The oldest locator of the vein has the right to take the ore at the point of intersection; and if two veins happen to join and continue as one vein from the point of junction downward the oldest location has the right to the whole of that vein from the point of junction downward. That frequently leads to injustice. I think every one will agree with me that very frequently the oldest location is a narrow seam, which carries no payable value until it reaches the intersection with the broader and better vein below; and although the small vein is certainly not the original vein as constructed by nature, yet if it happens to have been located first upon the surface it carries with it the right to that enormous body of ore that has been discovered at a later date upon the surface, and the right to hold it downward from that point. The proposition to confine a man within his vertical boundaries, in whatever form, extending down to the center of the earth, is the fairest and most just of all.

If the argument of the old prospector, Mr. Mullen, were to prevail, a reform would never be accomplished. Somebody must be hurt by every reform, but it is made for the benefit of the whole community. That argument, therefore, should not be considered. We are interested in the advancement of the country, and we must look at things as they are; it is better to jump into the band wagon than to be left in the onward march of progress.

MR. EVANS, OF OREGON: Mr. President, we have been going on here for generation after generation in the development of the mining interests of the United States, and the only conflicts we have ever had have been those where the people were ignorant, or misinformed as to their rights. In some parts of Colorado locations were 300 feet wide, and in San Juan County they were 150; so that proposition of 40 acres would mean a little better than two claims side by side. That is very much after the fashion in British Columbia.

One of the greatest mining litigations this Western country has ever seen was the one carried on for several terms of court between the Iron Mask and the Center Star. The question involved was the priority of right. Who had the vein?

Now the last gentleman who had the floor says the prospector comes on the ground and locates a spur instead of the main ledge through lack of knowledge. I deny that. The main ledge may be covered up with vegetation and would never have been exposed to the surface but for the prior discoverer finding the spur. He has given his time, his energy, spent his money, and he has found that which leads to the vein. He is first in the field, and no matter if his is a spur, if it runs into the vein his priority exists in the fact that he was the first locator on the ground, and I believe that it is right. The Supreme Court of the United States has decided this question for us time and time again, so there should be no questions to arise from it, that the apex of the vein marks the right of the owner to the property.

The law says that the end lines must be parallel, so that that question is settled. It does not seem to me that there should be any question at all in regard to locating a claim. I said a while ago, when I was on the floor before, that our mining laws needed revision. I consider that they do, and in this manner more particularly than any other: It should be as simple a matter for a man to go into the Land Office of the United States and patent his title to a mining claim as it is for a man to obtain a patented title to a ranch. I believe that the man who runs a ranch is dependent upon the miner for a market for his product, and yet his interests are made paramount to those of the man who furnishes that market. His interests are paramount to all others. There is no reason why, if I locate only 20 acres of ground

that is practically worthless for other purposes, except for the minerals that may possibly be there, that I should not be able to acquire title to that land for at least the same price per acre as the Government sells its timber and stone lands for. I should be able to go into the Land Office and acquire that title by simply showing a location by discovery and get it.

JUDGE HEYBURN: Mr. President, I feel that I am scarcely justified in occupying more of the time of this Congress, but in a few words I would like to reply to the suggestions made by Mr. Moore. A partial reply has been made by the gentleman who last spoke.

A location made upon a spur of the ledge is just such a location upon that ledge as that which we make upon other portions of it. There is no aristocracy among ledges. If a man discovers three inches of a ledge of mineral-bearing rock in place he has the same rights as though it were 300 feet. A location upon either of those spurs which it has thrown up to the surface upon that section of the map would be just as good, so far as acquiring ownership to the ledge is concerned, as though it were made upon the main ledge. I took it for granted that one ledge would demonstrate the proposition which I suggested as well as a dozen. It is not uncommon at all to find ledges breaking out through the surface. Those great crevices are formed from below, and they go to the surface at the point of least resistance; and they very often spread themselves like your fingers as they come to the surface, and below they unite in one great artery that leads down, we know not where, into the center of the earth; but it does not make any difference which of these branches you discover, you have discovered the ledge. The law says the first discoverer owns whatever leads from that discovery. So much for the spurs that rise to the surface.

Now, as to those spurs which merge, your location would carry that spur; and if an engineer went upon the ground to define that man's rights, he would determine the course of that ledge, and he would locate the end lines at right angles to the course of that ledge. If another man found another ledge, his lines would be located at right angles to that. This would not give rise to litigation, because the prior locator would take it down to the point where the ledges merged in the manner I have described; and the rights of the man who made the second location, whether it be on the spur or on the main ledge, when the ledges merged into one. That is the only practicable solution; and that applies to the lateral spur and the perpendicular spur which goes to the surface. The rule is the same in each case.

As suggested by one of the speakers, it may be that some of the members of the Congress are not familiar with what we locate. We locate a segment of the vein. We locate so many feet of the vein, and under the present system that gives extra-lateral rights to the vein; you may follow that segment down; it never gets any longer or shorter. Your authority is equivalent to that segment of the vein. If your neighbor has another segment you take your chances as to priority of location. The Comstock ledge is an excellent illustration. There were two ledges in the Comstock, and it would not pay expenses, because the ore shoot was on one side of it. The Comstock ledge like the fingers on your hand as you go into Gold Hill, and it splits again in the upper end. The ledge is like your hand with fingers on both ends of it. If you were on Mount Davidson, looking down on it, it would look like the palm of your hand, with veins on each end, spreading out like your fingers. Some of those have come together in depth, and some have not, but the oldest locator takes them.

My friend, the old prospector, who was the locator of the first gold mine in Leadville, on Little Ella Hill, seemed to think that he and I differed about this claim proposition. I think we are on the same side of the question. We agree on many things. The lawyer, the prospector and the engineer are not natural enemies. They work together. The prospector comes to the lawyer when he wants his services, and the lawyer goes to the prospector when he wants money, and so on. Each of them gets what he thinks he ought to have from the other, and so we are not natural enemies at all. But it is not necessary, in considering this question, that we should recognize the difference between the rights of the prospector, the lawyer and the farmer, or anybody else at all.

Now, I did not receive any reply to my inquiry, or request for suggestions as to what you are going to do with your ledge after it has left the lines of your claim. Mr. True says make another location. Mr. True would have to allow you to make a location without discovery if you wanted the vein after it left your side lines. That won't do. As I said, this is a big question, and we can only skim it here; we can not exhaust it at this meeting. It furnishes good food for thought to carry home with you.

MR. PHELPS, OF OREGON: Mr. President, I have not arisen to discuss the points that have so far been made; but there sems to be one point of revision of the mining law that has not been touched upon at all, except in the resolutions presented by the gentleman from Idaho, Mr. True; and that is the part which governs the amount of land that can be located in a certain district. We have to contend at the present time a great deal with this element of speculation. And, while we have not tried to legislate against this feature, still we run up against the fact that under the present law circumstances are such that men who are not prospectors, who are not in that line of business at all, can acquire the most of any piece of country that they desire to take hold of.

Take, for instance, the excitement on the big bend of the Snake River at the present time; a company of eight men go in together and locate 160 acres of land; they club together and put one man on one claim to represent the 160 acres and they do $4,800 worth of work on that claim and hold the land for speculation, and keep out the prospector who would develop the country and make it productive. This is a phase of the question that we need to take into consideration. We do need some revision of the mining laws along this line. For some unaccountable reason they have not done what we expected them to do, or they do not entirely fill the bill.

MR. GRAYSON, OF OREGON: Mr. President, if not out of order, I wish to recommend to the Committee on Permanent Organization that we have to name five members of this organization to draw a constitution and by-laws of the Congress, which we have not, as I understand; and I wish to present them to the Congress, to see if they are acceptable: Mr. Thomas Ewing, of Arizona; Mr. Shafner, of Ohio; Mr. Kleinschmidt, of Montana; Mr. Bradley, of Illinois, and Judge Heyburn, of Idaho.

PRESIDENT PRINCE: It would, perhaps, be proper for the chair to state that any amendments to the existing organization have to be laid over for one day after they are received. Of course, if they are put in tonight they can come up tomorrow morning, that is a legislative day, and require a two-thirds vote for acceptance. Whether they come from the committee, or from an individual, they have to be proposed a day in advance of consideration.

On motion of Mr. Evans, duly seconded and carried, the Congress took a recess until 7:30 this P. M.

The Congress re-assembled at 7:30 P. M.

PRESIDENT PRINCE: The chair begs to read the following gratifying communication from Hon. Alexander DeLamar, who was at one time Chief of the Bureau of Statistics, who, as you probably all know, is the author of works on the precious metals, and who is now engaged on a report on the subject.

New York, July 22, 1901.

Hon. L. Bradford Prince, President International Mining Congress, Boise, Idaho.

My forthcoming history of the precious metals strongly supports your movement for Government department of mines; success attend you.

ALEXANDER DELAMAR, 240 West Twenty-third.

On motion of Mr. Mullen, of Idaho, duly seconded, and carried unanimously, the thanks of the Congress were voted to Mr. DeLamar for his interest in the work of the Congress.

PRESIDENT PRINCE: The regular order on the program is a paper by Prof. C. W. Hall, of Minneapolis, on the subject of "The Geology of Minnesota," which will be illustrated.

Prof. Hall delivered the following address:

THE GEOLOGY OF MINNESOTA.

By Prof. C. W. Hall, University of Minnesota.

Minnesota is one of the few States of the Union in which the oldest rocks known to geologists are magnificently exposed. Nearly all the rock terraces of the State were formed before those profound events occurred which separated the Eo-Paleozoic era from the Neo-Paleozoic. Indeed, from the forming of the Archean crust over the globe until the close of the Eo-Paleozoic, Minnesota exhibits one of the most clearly defined and consecutive series of rocks to be found anywhere in North America. The following table presents in a summary way in the left-hand column those time divisions accepted by the geologists of the United States; in the right-hand column the word "present" indicates that the time division opposite it is represented within the State:

Divisions in United States.	In Minnesota.
CENOZOIC—	
Pleistocene	Present
Noecene	.....
Eocene	.....
MESOZOIC—	
Cretaceous	Present
Jura-Trias	.....
PALEOZOIC—	
Carboniferous	.....
Devonian	Present
Silurian	.....
Ordovician	Present
Cambrian	Present
ALGONKIAN—	
Keweenawan	Present
Animikie	Present
Keewatin	Present
ARCHEAN—	
Mareniscan	Present
Laurentian	Present

In the brief geographical and petrographical description of the rock formations within Minnesota, special emphasis will be given those in which economic products are abundant.

THE PLEISTOCENE.

DISTRIBUTION.—The glacial drift is the representative of Pleistocene geology most clearly presented. The material is the result of several invasions during the Glacial period. Naturally the last of these invasions left the most pronounced imprint upon the surface features. Two or three great streams flowed in from as many different directions.

First—From the northeast, the Lake Superior invasion brought from the region of Keweenawan rocks great quantities of reddish till. This was gathered from decomposed portions of extensive lava flows, conglomerates and sandstones lying within the Lake Superior basin. The extent of this invasion, as traced through the red clay of the drift and the lithologic character of the pebbles and boulders constituting it may be summarily indicated by drawing a line upon the map of Minnesota from Wabasa County northwesterly along the west side of the Mississippi River to the vicinity of Motley; thence in a northeasterly direction to the very northeastern corner of the State, and for more than 100 miles

skirting the north shores of Lake Superior within comparatively few miles of the coast.

Second—The great invasion from Manitoba, evidently taking its rise in the great Keewatin ice sheet which accumulated in the region between Nelson and Mackenzie rivers. This stream broke up and carried along great quantities of Paleozoic rocks gathered in the valley of the Red River of the North, but particularly large quantities of cretaceous limestones, slates and sandstones torn from the eastern edge of these deposits. This ice stream flowed up the Red River valley past Brown's Valley, down the Minnesota, and, breaking across the divide, it reached the vicinity of Des Moines. The debris left by this invasion is highly calcareous, and everywhere wells yield a hard water.

Third—Another ice sheet must have invaded the northern part of the State from the region of James Bay, entering as a sort of wedge between the other two. This may be called the Rainy Lake lobe. The material which it brought consists largely of broken granites and gneisses and crystalline schists, rocks peculiarly characteristic of the region whence this ice came and over which it flowed. This material is distributed southward as far as the region of lakes in which the Mississippi rises and gathers its waters.

The result of these three confluent ice streams, bringing such quantities of till, and modifying much of it through the action of many streams and glacial lakes, was to produce a remarkable succession of moraines, glacial plains, and extensive lake beds. These features give character to nearly every part of the State. This is especially the case in the so-called Lake Park region; in western Central Minnesota; the Coteau region of Southwestern Minnesota, and where the southwestern extension of the famous Great Kettle Moraine of Wisconsin geologists is situate, which stretches across the southeastern part of Minnesota and beyond the Iowa boundary.

ECONOMIC RESOURCES.—The important product of the glacial drift is clay. Everywhere throughout the State beds of clay are found of a quality sufficiently high to make excellent brick. With the disappearance of lumber within the State brick will rapidly become prominent as a building material, not only in cities and villages, but also upon farms, and the development of clay industries is looked forward to as one of the marked features in the advancement of the State in wealth and population. Already the clay industry is important in Minneapolis, Chaska, Carver, Anoka, Dresbach and Belle Plaine.

THE CRETACEOUS.

DISTRIBUTION.—On account of the lithologic character of cretaceous rocks and their subjacent position with respect to the glacial drift, it is well-nigh impossible to define their area in Minnesota. The Cretaceous is undoubtedly present over much of the western part of the State; it has been reported from several localities well toward the eastern border, but some of these reports do not seem to be well authenticated.

LITHOLOGIC CHARACTERS.—So far as they occur exposed to view, the cretaceous rocks are sandstones, shales and limestones of a somewhat incoherent type. Along the Minnesota River near Redwood Falls, and the Cottonwood River near New Ulm, the rock is a rather coarse sandstone or a light gray clay, save where iron oxide has locally imparted a brownish hue. Near New Ulm limestone occurs in small quantities, although sufficient to burn for lime. Near Mankato and in Goodhue County a cretaceous shale occurs in the glacial drift which affords excellent material at the former place for fire-brick, and at the latter for various articles of earthenware. Indeed, the pottery establishment at Red Wing for working this material is one of the most extensive of its kind in the United States.

THE DEVONIAN AND SILURIAN.

That the Carboniferous occurs in Minnesota is assumed from the fact that the Iowa geologists have traced its rocks to the Minnesota line. It may occur in well borings within a small area on the southern border of the State.

The Devonian is present as a thin layer of limestone in Mower County, extending thence a few miles both east and west into adjoining counties. This limestone has recently been discovered to be a valuable material for hydraulic cement, and this is being extensively manufactured. The rock is also a fair building stone, but its use thus far has not extended beyond local demand.

The Silurian which occurs in Iowa and Wisconsin, seems to have disappeared before the Minnesota boundary was reached. In Minnesota the geologic changes separating the Eo-Paleozoic from the Neo-Paleozoic all point towards a period of uplift and land erosion during the Silurian time.

THE ORDOVICIAN.

This series is present in a succession of formations, which may be grouped as follows:

Trenton	Wykoff—limestone. Maquoketa—shale. Galena—shales and limestones. Trenton—shales and limestones.
Canadian	Sait Peter—sandstone. Shakopee—dolomite. New Richmond—sandstone.

DISTRIBUTION.—The Ordovician may occur beneath the clays and shales of the Red River valley, since its presence is established in Manitoba. Its surface exposures are confined to the southeastern portion of the State. Its northernmost exposures are north of Minneapolis, St. Paul and Stillwater. Thence, southwestward they lie along the Minnesota River to Mankato and beyond. The Mississippi River gorge exhibits them in a continuous succession of exposures from the northern limits of the city of Minneapolis to the Iowa line. As indicated in the table just given, the rocks consist of sandstones, coarse and fine; shales, sometimes well indurated; limestones and dolomites, locally thoroughly crystalline.

ECONOMIC PRODUCTS.—The several sandstone formations of the Ordovician yield quarry products, but for the most part they are not sufficiently well indurated to be of value as building material. The well-worn and rounded condition of the grains prevents extended use for mortar, and this same quality has caused disappointment in several attempts at glass-making. But near river gorges percolating carbonates have well-cemented the sand grains, and a building material of durability and strength has been formed. The Shakopee dolomite has been found in many localities well adapted for building purposes, although the underlying Oneota proves more valuable. The Shakopee is apt to be concretionary, and this habit sometimes causes disappointment to quarrymen. The Trenton at Minneapolis and St. Paul is the only local building stone attainable. A layer 12 to 15 feet thick in the lowermost 30 feet of the Trenton formation furnishes valuable material. Above this are one or two layers which yield material adapted to certain uses in construction. Above these layers at St. Paul lies a shale, the characteristic Trenton shale of the formation, which is being extensively manufactured into brick. Some excellent brands are produced from these shales, and an extensive industry is being developed.

In the more southern portion of the State, the higher beds of the Trenton are quarried. At Mantorville, Spring Valley, Rochester and other places they produce beyond the supply of local demand.

THE CAMBRIAN.

The division of the Cambrian represented in the Minnesota series are Middle and Upper. The subdivisions are as follows:

Upper	Oneota—dolomite. Jordan—sandstone. St. Lawrence—dolomites, shales and sandstones.

Middle	Franconia—sandstones and shales. Dresbach—sandstone.
Lower	Wanting.

GEOGRAPHICAL DISTRIBUTION.—Along the Minnesota River, from Judson to Fort Snelling, there is practically a continuous exposure of sandstones and dolomites. The same may be said of the Mississippi River from Hastings to the Iowa line, and the St. Croix from Taylors Falls to Point Douglas. From the St. Croix Valley there extends a narrow belt of Cambrian sandstones along the west side of the great fault line to the Lake Superior basin. At Fond du Lac in the west end of Duluth, Cambrian sandstone of a red color is found in considerable abundance.

ECONOMIC PRODUCTS.—These for the Cambrian are almost identical with those of the Ordovician. At several places extensive quarries have been established, particularly at Mankato, Kasota, Stillwater, Frontenac and Winona. Quarrying for local supply takes place at scores of places. The rock is a dolomite, fairly massive, making excellent dimension stone, which is used extensively for bridge work residences and business blocks.

THE KEWEENAWAN.

DISTRIBUTION.—The rocks of this formation, so conspicuous throughout the Lake Superior basin, occur in Minnesota in two completely separated areas. The larger is that lying northwest of Lake Superior, stretching along the shore continuously from Duluth to Pigeon Point, and extending so far inland that it overlaps the eastern end of the Mesabi iron range. The area consists of some 5,400 square miles.

The other area of 900 square miles, lies chiefly in Pine and Chisago counties. It is separated from the rocks to the west by the fault line, marking the western border of a series of lava flows and associated conglomerates. These rocks now constitute a synclinal trough whose western side stands dipping eastward at an angle varying between 40 and 67 degrees. Along the east side, the western dip is not over 15 or 20 degrees. The western side passes southward, crossing the Kettle River near Hinckley and the Snake River beneath Cross Lake near Pine City.

The rocks of the Keweenawan of Minnesota are partly clastic and partly eruptive; the latter group presenting by far the most conspicuous features of the accumulations of this age. They present many forms of eruptive deposits, as laccolites, sills, lava flows, dikes, tuff beds, and volcanic breccia, and the local phenomena under which they occur are extremely varied.

The clastic rocks, excepting the breccia and tuff beds mentioned, are generally coarse sandstones and conglomerates. Their color is prevailingly red, and their lithologic contents are fragments of granitic and other acid eruptive rocks with, locally, debris of basic types occurring even within the Keweenawan itself.

The eruptive rocks of the northeastern division represent four distinct epochs of ejection: (1) The lowermost are gabbros lying upon and between the Animikie formations; (2) An extensive series of lava flows; (3) A group of acid eruptives, being locally granites, felsites, quartz porphyries, and related rocks; (4) An extensive series of dikes which, it is assumed, extends well across the State, since many dikes are found in the Minnesota River valley that are attributed to this period of volcanic activity, the closing days of the Keweenawan.

In that area lying within Pine and Chisago counties, the rocks are a remarkable series of lava flows interbedded with a succession of conglomerates. The latter all lie in such position as to indicate very little crustal movement while they were accumulating, beyond that indicated in the associated volcanics. The time was one of sedimentation, interrupted by repeated outpourings of lava, sometimes in streams of great depth—as high as 200 feet thickness has been measured—but usually in streams less than 50 feet thick.

The period was closed by the development of a fault line hundreds

of miles, along which the lava flows and associated sediments were thrust up to an inclination of more than 40 degrees and after being eroded again submerged, to become a Cambrian sea-floor.

ECONOMIC PRODUCTS.—Although the Keweenawan is a formation carrying enormous deposits on Keweenaw Point, to the present date but little copper has been found within the boundaries of Minnesota. The metal occurs at many localities, but not enough has been found to warrant mining operations, or to encourage extensive exploration.

THE ANIMIKIE (UPPER HURONIAN).

GEOGRAPHICAL AREAS.—Geographically the Animikie is subdivided into three areas. Beginning with the northeastern corner of the State, the first area extends from Pigeon Point along the International boundary to a point a few miles west of Gunflint Lake. While it is exposed in force upon the Ontarian side of the boundary, within Minnesota its exposures are largely capped by eruptives and intruded by sills of material presumably of Keweenawan age. This subdivision shows a continuous section from the bottommost layers to the very top, estimated by Irving to be 10,000 feet in thickness.

The second area is the Mesabi iron range. This stretches from the Mississippi River eastward to township 61, range 12, a distance of 100 miles in a belt which nowhere exceeds a few miles in breadth.

Third, in the southwestern corner of the State from the city of New Ulm is an interrupted series of exposures across the boundary of South Dakota. In the last-named State it forms some notable exposures, as at Sioux Falls and elsewhere.

LITHOLOGY OF THE ANIMIKIE.—The rocks comprised within the formation are, first of all, quartzites. These, in Southwestern Minnesota, and, to a certain extent along the Mesabi range, are of a reddish color. They are thoroughly indurated wherever they appear at the surface. Upon these rocks along the Mesabi range is an extensive formation of so-called taconite which carries the world-famed Mesabi iron ore. Upon the taconite in this Mesabi range is a layer of carbonaceous shales, but usually called slates, which pass frequently into silicious phases and become decidedly quartzitic. In many places along the range the shales have been eroded, and the taconite and ore bodies lie immediately beneath the glacial drift. This greatly facilitates discovery of ores and subsequent mining operations.

ECONOMIC PRODUCTS.—It is in this formation that the Mesabi ore bodies occur. These deposits lie between quartzite beneath and black slate above, save where erosion has removed the slate. The ore itself has every relation to the enclosing rock that rock alteration in its cleast sense can possibly give. The taconite formation, evidently containing a large percentage of iron oxide, was attacked; the silicious as well as carbonate contents of the rock mass were removed, and the compounds of iron transported by waters secured a place for lodgment. The quartzite beneath the iron-bearing formation, as well as the calcareous slates above, were so impervious that waters loaded with mineral content failed to pass through them save in the smallest quantities. The conditions of a trough were thereby attained, and the accumulation of iron ore slowly proceeded.

THE KEEWATIN.

GEOGRAPHICAL DISTRIBUTION.—The name Keewatin was given by Lawson to areas of rocks discovered in the Lake of the Woods. The name in Chippewa means Northwest Wind.

The Keewatin rocks doubtless have a wide distribution. It is in but few places that they are clearly differentiated from the rocks above and below. Hence, generally, the term Keewatin indicates a large area of the State in which no clear stratigraphy has as yet been wrought out.

Along the boundary from Lake of the Woods eastward to the outlet of Gunflint Lake there is a series of mingled gneisses, schists, and acid and basic eruptives that are largely Keewatin age. They have not thus far been carefully delimited. Hence it may be regarded as a region of unclassified Keewatin and Archean, and as such it is thus far mapped.

To the south of this belt lies a series of schists designated Vermilion, which belong to the Keewatin. These schists are important, since they carry the Vermilion iron ores.

Another somewhat clearly defined area of Keewatin schists and ruptives lies in the central and eastern portions of the State. First noted along the bed of the St. Louis River, where they are a series of graywackes and graywacke slates, these rocks extend westward and southwestward beyond the Mississippi River. They become for the most part highly altered, yet their exposures are sufficiently near to each other to render quite positive the recognition of the entire series through steadily changing lithologic characters. Along the Mississippi River in Benton, Sherburne and Stearns counties, granites seem to have displaced every other rock type.

LITHOLOGY OF THE KEEWATIN.—The rocks along the Ontarian boundary being undivided consist, broadly speaking, of a series of schists and eruptives which need not here be further described. In many places, along Rainy Lake, Lake Namekan, Lake la Croix and Basswood Lake, in dikes and bosses of erupted granite are with but little hesitancy relegated to the closing days of Keewatin time. Along the Vermilion iron range the rocks enclosing the iron ores are so thoroughly altered that it is impossible to determine at times whether the belt was originally clastic or eruptive.

Reaching the third Keewatin area, that extending from Duluth southwestward, a rock series is seen which possesses lithologic characters of no little interest. At Thomson and in the Dalles of the St. Louis, where lie the easternmost exposures, the clastic character is quite clearly set forth. The rocks are graywackes, and represent a very thoroughly indurated mixture of quartz, feldspathic, calcareous and volcanic pebbles. Passing southward and westward, we find that their strongly marked clastic character gives way to metamorphic influences, and the rocks gradually become hornblende, and hornblende-biotite schists. Such schists, dipping southward at a low angle, gradually yield to alteration agencies, become thoroughly crystalline, and, finally, a mass of coarsely hornblendic or biotitic schists. Into these, it would appear, are intruded dikes and enormous bosses of hornblende-biotite granite, so that by the time the Mississippi River is reached the schists have entirely given place to these eruptives. This is true of the southernmost series of exposures stretching into Stearns County. Further north, and entirely isolated from the hornblende-biotite schists already mentioned by masses of glacial drift, is a belt of staurolitic schists which crosses the Mississippi River in the vicinity of Little Falls and Pike Rapids. These staurolitic schists are undoubtedly of the same Keewatin age as are the granitic dikes and hornblende schists lying to the southeast.

ECONOMIC PRODUCTS.—The iron ore of the Vermilion mines is the most conspicuous product of the Keewatin. This ore is remarkable for its purity, and it can be said without contradiction that the ores accumulated in the Minnesota rocks of Keewatin age are the purest ores of iron ever produced in any part of the world. The quantity already mined has been enormous, and at the present time there is no apparent diminution in supply.

The origin of the iron ores has evidently been brought about by a series of chemical processes, of which oxidation is the chief. Iron in various combinations, but possibly largely as a carbonate, was originally distributed through the rocks. Percolating waters have furnished the oxygen; the transporting power of the underground waters has effected the removal of the iron compounds from the rocks into their places of deposition. The large quantities of jaspilite present, with and near the ore bodies, give evidence of the large amount of silica which has been re-distributed in the ore-forming processes. This must have been taken into solution at the time the percolating waters were oxidizing, transporting and re-depositing the iron ores. Thus simultaneously rock material was taken into solution and removed, and iron ores were segregated within the space vacated. It is only when these processes, which are going on everywhere within the rock formation, have taken place upon a large scale, that deposits of workable size, that is, ore bodies, have been developed. A further inference is that iron-ore build-

ing is a continuous process, going on today with the same vigor as in any past geologic time.

Within the area of the Keewatin extensive quarrying has ben done. Along the Mississippi River at St. Cloud, Haven, Sauk Rapids and Watab, great quantities of excellent granite have been quarried. Lithologically it is a hornblende-biotite granite, medium in texture, remarkably fresh in condition, and adapted to a wide range of uses.

THE ARCHEAN.

GEOGRAPHY.—As has already been stated, along the International boundary eastward from Lake of the Woods is a vast belt of undivided Keewatin and Archean. Exactly what proportion of these rocks is Archean is not now known. The character of the rocks for much of this distance, whether schists, gneisses, or granites, is also a matter not yet determined, because exploration has not yet touched every point in a region embracing thousands of square miles. In Southwestern Minnesota, however; along the Minnesota River from New Ulm to Ortonville, and westward; and exposed at a few points on the prairies between th State of Minnesota and South Dakota, is a belt of somewhat folded hornblende-biotite gneisses and gabbro-schists relegated to the Archean.

It must be admitted, however, that these rocks are not clearly and absolutely delimited from the rocks of Central Minnesota, typically exposed in Stearns County as already mentioned, of Keewatin age. The general features of these rocks are quite different from those, and, based partly on lithologic and partly on structural conditions, a division has been made between the two localities—the Mississippi Valley from Stearns County northward to Cass County on the one hand; and the Minnesota Valley with boundaries, as already defined, on the other.

LITHOLOGIC FEATURES.—These have already been indicated in the names given to the rocks along the Minnesota Valley. The gneisses are sometimes granitoid, and at other times quite schistose, carrying as their principal minerals quartz, several different feldspars, hornblende-biotite, and a small proportion of magnetite with other oxides of iron. Quite closely associated with the gneissic rocks are gabbro schists. The schists appear to belong to two different series of gabbros: those which carry hypersthene, and those which are hypersthene—free. These gabbro-schists are somewhat basic rocks, seldom carrying over 65 per cent silica, lying in more or less contorted beds, and possessing a very uniform and medium texture.

ECONOMICS OF ARCHEAN.—Gold hunting has been an important factor in the exploration of the Archean rocks. Whether great quantites of gold will be found in these rocks is a matter of grave uncertainty. The exploration has been close and protracted along the International boundary.

Quarrying, however, in many places, and notably at Ortonville and Morton in the Minnesota River valley, has developed valuable structural material. The supplies of good granite and granite-gneiss building material seem to be inexhaustible.

MR. HUTCHINSON, OF IDAHO, read the following preamble and resolutions which were referred to the Committee on Resolutions:

Whereas, an official committee of our National Congress, known as the Rivers and Harbors Committee, having recently visited the Pacific coast for the purpose of thorough investigation; therefore, be it

Resolved, That the thanks of this International Mining Congress be extended to the Rivers and Harbors Committee for their painstaking visit; and, be it further

Resolved, That we express to the people of the United States for the purpose of helping and sustaining said rivers and harbor committee in its actions, that the most important appropriation, in our opinion, should be for the purpose of making the Snake and Columbia Rivers navigable, so that there will be an open river from Lewiston, Idaho, to the Pacific ocean.

PRESIDENT PRINCE: The next regular order of business is a paper by May Arkwright Hutton, of Wallace, Idaho, on "Some of the Ethical Aspects of Mining."

Mrs. Hutton read the following paper:

SOME ETHICAL ASPECT OF MINING.

Mr. President and members of the International Mining Congress: I thank you for the honor you have conferred on me as a representative of the wives and mothers of that noble army of miners, in assigning me a place on your program.

I take it not so much a personal honor as a courteous method of recognizing, what all truly chivalric and fair-minded men always recognize, that in mining as in other vocations of life, women who toil side by side with men, share their trials and privations, and help them win their victories, are entitled to share the honors of their achievements.

I am to discuss in the few moments allotted to me some of the ethical aspects of mining. You have mapped out a rather big job for the time given me, but I address myself at once to the task, fearing that when I shall have closed, I shall have done what Thomas Carlyle did after he had discoursed through some weeks on Heroes and Hero worship, only broken ground on it.

The term ethics in my topic may seem at first sight a misnomer; but in point of fact there is much of a really ethical character in mining. The basis of almost everything in nature is ethics. The trend of things as destined by that power which Matthew Arnold says makes for righteousness is toward securing right conduct. There is an educational and ethical design in all the vocations of life apart from their bread and butter character.

On the assumption that there is an Architect of the universe, a thinker back of all natural phenomona, shaping directly or indirectly human destiny or interests, it is inconceivable that there should not be an ethical design in such a vast industry as mining.

It seems to me that it affords a wide opportunity for its devotees to become acquainted with the works of the Creator.

The prospector toiling over the mountains in search for hidden treasure cannot but feel the near presence of God when he beholds their immensity, their rugged grandeur, undisturbed by the storms and sunbeams of ages; these most sublime features of the handiwork of his Maker; this wonderful region where all the seasons are at the same time represented. The flowers bloom in the valleys and foot hills, further up the mountains the sturdy evergreens, spruce, hemlock and cedar mingle their dark foliage with the tender green of the tamarisk; higher still in the very heart of the forest is a lake with its limpid waters sparkling like diamonds wherever a lucent sunbeam finds its way. Here cradled in the mighty arms of the mountains its waters are lulled to sleep by the soughing of the winds through the great overhanging pines murmuring a lullaby: higher yet above this picture more beautiful than ancient master ever portrayed upon cathedral walls, are the bare bleak craggs, where the eagle rests her young, while higher still, enfolded in a shroud of perpetual winter, is the peak, silhouetted against the clouds like a monument above the grave of some illustrious dead.

The prospector being thus brought in contact with the mighty heart of his moods are softened by his environments, and his communion with self in the dim solitudes, amid the temples of the Deity, silence the baser passions in his nature.

How these scenes must inspire noble thoughts, evoke such emotions as were in the hearts of the multitude, as they gazed upon Sinai; and cause him to bare his head to the breezes of heaven, and consecrate his hopes, his energies and his life to the bettering of mankind.

It is not easy to see the moral effect of this contact with nature, this brooding over tablets known to have been written by the finger of God. Verily, the mountains, the cradle of courage and liberty, exert their benign influence upon their habitues.

The miner of today must be a student of his calling. The isolation natural to his vocation and life make him reticent, and a reticent man

is almost always a thinker; as a rule he is well versed in current topics, and is often more at home with his books than with his fellows; he may not always be able to express his sentiments, yet, when a fellow workman is in sorrow or need, he performs acts of kindness which are more potent than words; he will care for an injured brother man as tenderly as a mother cares for her helpless babe. Every day the miner is promulgating the true brotherhood of man. The attitude of the miner often puzzles strangers; they do not understand that in the pursuit of his hazardous calling he must face death daily, that he learns to follow where duty leads without comment, and to accept whatever fate may have in store for him without complaint. The world has come to look to the miner, delving in the heart of the mountains, for the blood that throbs through the arteries and veins of the body politic, giving it bouyancy, energy and life.

He goes down into the depths of the earth, and wrests from the gnomes their jealously guarded treasures for the benefit of humanity —where—

> "He is shut out from the sunlight, in the glimmer of the lamps;
> He is cut off from the sweet air, in the sickly fumes and damps;
> He must toil in cramped positions, he must take his life in hand,
> For he works in deadly peril, that few can understand.
>
> "He unlocks the bolted portals of the mountain, to the stores
> Hid in nature's vast exchequer, in her treasure house of ores.
> He applies the key dynamite, and the gates are backward rolled;
> And the ancient rocks are riven to their secret heart of gold.
> Things of comfort and beauty and of usefulness are mined,
> By this brave and quiet worker; he's a friend to human kind."
> Blind is that man or woman who cannot see how this great in-

dustry acts as an ethical force, not only upon those engaged in the work of mining, but upon who gave it serious thought.

In fancy I see a smile of incredulity o'erspread the faces of my audience when they remember the constituency I represent, but, while we do not find in every plow-boy a Burns, neither do we find in every Coeur d'Alene miner a "dynamiter" or "rioter," but many who are nature's noblemen, capable of responding to every refining influence by which they are surrounded.

Again, I say that there is an ethical force in the proper conception the relation of the mining industry sustains to the working out of the great problem of civilization. What is civilization? Guizot, you remember, once wrote a history of civilization, but, from start to finish of his great work, he failed to define his principal term. I may venture that civilization means in a broad sense culture, refinement, some progress in the arts and sciences, coupled with material improvement and prosperity; and I may venture further that the development of the mineral resources of the world, more than any other factor, have furnished our material prosperity.

It means also social and political order, advancement in knowledge, and all the gentle courtesies and amenities of life.

The history of the race is one long record of civilization. When Caesar first made the acquaintance of our ancestors, he found them living in caves, clothed in skins of wild animals. Primitive man used weapons of stone to protect himself from the attacks of wild beasts. The wife of the Patriarch Abraham on the occasion of the angel visitors ground the meal with her own hands, and baked the cakes for their entertainment on a hearth of heated rocks. The wise woman described by Solomon sought wool and flax and worked willingly with her hands; she laid her hands to the spindle, and her hands sought the distaff. What a contrast between the bow and arrow of primitive man and the dynamite gun and repeating rifle of today. Think of the gulf that separates the hand mill on which the food of the ancients was ground from the modern binding, flouring and baking apparatus by which the wheat is cut in the field, ground, made into dough, conveyed to the oven and baked into loaves in less time than it took the frugal Sarah to prepare one humble meal. Machinery has multiplied labor many hundred fold. The invention of the spinning loom alone has made one pair of hands

equal to 266. Prof. Parsons in the July Arena makes the astounding statement that the total mechanical and horse-power of our country is equal to the power of half a billion willing slaves, or on an average of 20 to each human worker. He says further in the same article that four men, with the aid of machinery, can plant, raise, harvest, mill and carry to market wheat enough to supply with bread one thousand people for a year. Who can estimate the value of the steamboat, the steam engine, the railroad, the telegraph, the telephone, the cooking stove and range to civilization. Franklin was a great scientist in his day, but he printed his paper on a little hand press, at the rate of from 60 to 70 impressions an hour, while with the perfecting press we print from 70,000 to 80,000 papers an hour. Napoleon was a great military genius, but he never saw a Krupp gun fired, or sent a message around the world on the wings of lightning. Wellington never rode on a motor car or took a spin on an automobile. See how the advancement of the age depends on machinery, and think further that machinery rests on mining and depends on it, for the metals must first be sought in the depths of the earth, and brought out by much care, pains and toil before they can be utilized in the printing press, the steam engine, or the wondrous whispering wire that now binds the countinents of the world together as one family.

The miner thinks on these things, and should think of them. He realizes that his work in the heart of the mountain, toiling there in the silence, is a part of the world's great work; that he is one in the grand army of heroes who are toiling for the advancement of the race; that on his broad shoulders the age is mounting upwards into light and liberty; that he stands connected in a large decree with the divine plan to "Make the sum of human sorrows less" and add to the comforts of the race, and this in turn acts as an ethical force to inspire in him right conduct, high ideals and noble aims.

I am aware that there are miners who never give thought to these things. As a class they are not unlike other men in other callings. There are men in all callings who see nothing but th bread and butter side of things. They resemble that gad-grind materialist, Peter Bell, described by Wordsworth, to whom ever and ever "a primrose by the river's brim. a yellow primrose was to him, and it was nothing more."

There are those who go through life with their eyes closed in a sort of a dream. They see no miracle in the dawn, no beauty in the sunset or the opening rose, no majesty in the starry heavens that filled Emanuel Kent with awe. Your Ruskin saw an apocalypse in a daisy; your Burns—why, under his magic touch the wayside weed becomes a flower, gorse and grass and heather where his footsteps pass the brighter seem; and your intelligent miner—and we have many of them in this glad free West, educated, refined, sensitive, broad-browed—sees how his calling stands related to the progress of the world, how manufactures with their scope, machinery in all its ramifications, rest at last on mining as their proper foundation, and that these are the chief factors in lifting men and women to grander heights, and that this is the arm and his the skill by which the metals are brought from the depths of the earth to make machinery possible, and this inspiring view brings him at once into the vast plan of the Infinite, and reveals him to himself as a factor in the mighty work of the world's advancement.

What an ethical force in this view, and how it tends to inspire right ways of thinking and acting. In closing I wish to pay a tribute to the prospectors and miners who in the true sense may be called the Argonauts of their age. I have known them in the Coeur d'Alenes for years. I know their manly worth, their devotion to duty, their self-sacrifice for those they love, their noble qualities of heart and mind. Of them I sing. Honor to them. The Argonauts of the Golden State were brave men and true. Two generations ago, when our beloved country struggled in the throes of civil strife, it was the miners of California who furnished the gold—the real sinews of war—which so materially aided in the preservation of the Union; they plundered the hills of their treasure and poured it into the channels of commerce; they were as brave as any who were upon the field of battle, amid the tumult and carnage of war, fought and bled and died for their country. Far from the plaudits of the world, they toiled and struggled; they bore uncomplainingly the stings and arrows of outrageous fortune; with the wand

of their power they subdued the strongholds of barbarism; without the restraining influence of pure women and without constituted authority they enforced order and paved the way for the dainty footsteps of civilization. Gradually the hope of making a "stake" and returning to the home of their childhood, to help the old folk, or perhaps to greet a waiting sweetheart, vanished. Ah, could we but know of the blighted lives, and broken hearts among these heroes of pioneer days, we would at least drop a tear of sympathy; many of whom have found a resting place on the hillsides, within sound of the busy haunts thier early toil had founded. Who shall say that the battles they so nobly fought are not chronicled upon the scroll of time? In our haste for fortune let us ever kindly remember those whose early labors made our present achievements possible. We who are the heirs of this goodly heritage, whose homes are in this great free West, owe a debt of gratitude which we can never pay to the Argonauts of the Pacific coast. Out of our abundance, let us aid the old prospectors and miners whom fortune have passed by, and who are no longer able to pursue the "Fickle Goddess," they who were the "Advance guard" of the mining industry, and who are now its "battered soldiers of fortune." Let us endeavor to make them comfortable and happy in their age.

PRESIDENT PRINCE: The next regular order of business is an address by Mr. Charles J. Moore, of Colorado, on the "Geology of the Leadville District."

Mr. Moore delivered the following address:

THE FORMATION OF THE LEADVILLE MINING DISTRICT, LAKE COUNTY, COLORADO.

By Charles J. Moore, Mining Engineer of Cripple Creek, Colorado.

Mr. President, Ladies and Gentlemen: I wish to say a word or two before starting on this subject as to the importance of bringing these subjects before the Congress—I mean subjects of the character of the one upon which I am now addressing you, and that upon which I addressed you this morning. Geology, of course, is a technical subject, and enters into mining operations. The system which I have adopted of graving subjects before you is, I hope, one of interest, and the practical importance to an association like this, of such a subject, is the fact that by learning in this way of large mining regions which are producing, and have produced in the past to a very great extent and have added to the mineral wealth of the country, will give you such information as will enable you, perhaps, to discover others like them. Not by reading in reports of congresses of such places, but by personal observation, do you obtain the knowledge necessary to enable you to recognize an analogous district when you see it. Therefore, I have endeavored, as much as possible, to bring before you the formations of two very important mining regions.

I brought before you this morning Cripple Creek, which is the most important gold district, and in some respects the most unique mining district in the United States today. Tonight I bring before you Leadville, which is one of the oldest, and still remains one of the most important mining districts of Colorado. In both of these cases eruptive rocks have formed a considerable and most important feature in the formation of the ore deposits, but the actual amount of practical work that the eruptive rocks have done in creating the ore deposits in these two cases is entirely different.

This morning we had a volcano in active operation, resulting in formations in which the last active process in the volcano deposited large amounts of valuable ores. This evening I will show you the structure of a district in which lava flows, or flows of molten rock, reproducing a stream of quartz and porphyry, resulting in a formation entirely different from Cripple Creek, yet carrying large quantities of valuable ores, containing gold, silver, lead, copper, bismuth, manganese—in all, eight different metals; so that the peculiarity of the Leadville district is the fact that it produces no less than eight metals of economic value, which are in constant demand in the markets of the world. The archean

rocks, of which Prof. Hall, of Minnesota, has spoken this evening, are represented in the Leadville district, and also in the sketch on the blackboard, by the lowest layer, marked with the letter "G," "G" standing for granite, or granitic rocks. This irregular line (indicating) represents the ancient surface of the archean rocks. Upon that, in the process of time, were deposited a series of sedimentary rocks, first, quartzite, representing the Cambrian period, shown by the last layer of these rocks, colored brown; next, Silurian limestone, which is colored violet; next above that is blue limestone of the lower carboniferous period. The different strata shown upon the board by green lines, represent a series of shales and sandstone, of which the greatest development known in this country is in your neighboring State of Utah, and are called the Weber grit shale series, named from Weber Canyon, in Utah, where they are most highly developed, showing an entire thickness of 4,000 feet.

The town and district of Leadville are situated around the headwaters of the Arkansas River. That part of the district in which these deposits occur measures 15 miles from east to west between the summit of the two ranges, the range upon the west being the continental divide, composed of granitic rocks, traversed by porphyry dykes and veins, while the range upon the east, known locally as the Mosquito, or Park range, forms the eastern boundary of the Arkansas River, and is composed of a series of sedimentary rocks overlying the granite. The first range, elevated above the general plane of the archean, is the Saguache range, or continental divide. Here (indicating) occurs a series of certain eruptive rocks, the origin of which we know something, but not yet accurately. They are supposed to have come up in the eastern portion of this ground, through certain vents, but not in volcanic form, that is, not from an active volcano, similar to what we saw described this morning. They came up in molten lava flows, through fissures in the archean. As they reached the overlying sedimentary rocks they found, naturally, immense resistance, due to the weight of the entire series above them, amounting at that time to probably ten thousand feet in thickness, as erosion had not yet taken place in many of these strata. The consequence of the force acting to push up this molten rock, resisted by the weight of the sedimentary strata above, resulted in the porphyries under the great pressure above, finding its way laterally along the lines of least resistance, partly in the sedimentary strata and partly between them. Naturally, the line of least resistance was where one formation joined that immediately underlying; the base of one and the summit of the other. The consequence was that these rocks, coming up in this way did not penetrate the general mass of the sedimentary, so much as they found their way along the lines of division, between separate formations. They are largely that way (indicating), and came up still further along another line of division, and further still along another. And at this point, the highest that I have drawn upon the board, the porphyry succeeded in creating the greatest mass, partly on account of the bending character of the shales—you know all rocks will bend to a certain extent before breaking, when force is applied to them in mass—and partly on account of the division between the shales and grits belonging to the middle carboniferous series not being well jointed, as it were, connected with the upper layer of the lower carboniferous blue limestone. The consequence was that this kept increasing until an enormous mass of porphyry was formed, the greatest body upon the top of the blue limestone. That also naturally led to a bending upward, or folding, of the shale series, so that after the eruption ceased, or rather the flows of lavas, the shales would appear naturally in about that position (indicating). These lavas, of course, extended for some considerable distance along these strata, bending the strata more or less as they forced their way through between them. Occasionally a dike would come up independently, and in a zig-zag form run across, probably trending a little upwards into the overlying shales.

After the eruption had taken place, or rather the lava flows, the pressure from beneath caused a general bending upwards of the upper crust of the Archean granite, which ultimately folded in the formation of the Saguache range as we have it today. The point on the left-hand side of the board lettered "W" is west, and that on the right side east. The Saguache range, therefore, was raised in something like this manner (drawing). You know that if you apply a strong force

from below to a rigid mass overlaid by a great weight, that the resultant force acquires a tendency to buckle that solid mass. These mountains followed that law of the creation of mountain ranges, and we find that evidently folded in something like that form (indicating), until this (indicating) was all granite, and naturally through that great force acting from below it raised the overlying sedimentaries, and at the same time cracked and broke them more or less, until, in the process of time, by the acting of nature's erosive forces from the surface downwards, etc., the overlying sedimentaries which were brought up in an enormous fold were gradually all removed from the summits of the range, until we find them lying at different angles today on opposite sides of the Saguache range, some on that western side (indicating), some on this eastern side, the latter (indicating) almost entirely denuded.

That was the first action which ultimately resulted in the formation of the Arkansas River, forming the western boundary of the future valley.

All the strata that I am now rubbing out were gradually removed by erosive forces. Of course, in raising an enormous range like that, the summits of which even now reach elevations of over 14,000 feet above the sea level, and which, as I said before, divided the North American continent, the waters on the western side flowing into the Pacific and those on the east into the Atlantic, in such an enormous uprising, faults or breaks were created, because of the mass not being able to withstand such a tremendous force without breaking in some point or other, the folds coming down in something like this form (indicating), a few minor folds on this side (indicating) not so extensive as on the west. At that point (indicating), immediately to the west, were left highly inclined strata which have been mined for ore in the district known as the Aspen, and from which your eloquent and talented Lieutenant-Governor came to this State.

Overlying the quartzite come the different strata that I have represented on the left-hand or eastern side of the board; the underlying granite first, then quartzites, then a layer of Silurian lime, then a narrow quartzite, then the blue limestone and porphyry. In the district of Aspen occurs the greatest amount of ore that is found in the contact of the two limestones, and in the limestones themselves.

The next process in the formation of the Leadville district was the uprising of the range to the east, known as the Mosquito, or Park range, dividing the main continental range, the Saguache, from a series of big ancient lakes, which are now known as the park system of Colorado; immense mountain valleys, level, as a whole, and surrounded entirely by mountain ranges. The existence of the continental divide, the Saguache, and the general pressure of the Archean, and overlying sedimentaries to the east formed such an immense pressure, to resist the forces acting from below in the uplifting of the second range that a great number of faults or breaks were created in contradistinction to the western range in the main mass of which there are not so many. The consequence of that uplift was something like this (drawing). Instead of just one large range rising, the whole mass being raised upwards would bring us along that line (indicating), and another portion would get a little higher before it broke again, and broke along this line (indicating), and then kept on raising at another step a little higher, until we have a series of steps of a gigantic staircase in the granite, overlaid by thick strips of different carpets, as it were, representing the sedimentary strata and their included porphyries.

Now, if you will kindly bear in mind the sketch of the strata, with the quantities of eruptive porphyries which I have just rubbed out, you will see how the sedimentary rocks were displaced, and formed into what we found and are finding today. Overlying that comes, first, the quartzite, corresponding to the lowest layer that I have shown, the base of each of these steps, or benches, then overlying that again the lowest of the limestones, and then over that limestone the others, the included masses of porphyry, whatever they may be, and such mineral as had already come up with the porphyries, which was not very great. Overlying that came the next limestone, and on top of that the great mass of porphyry, a series, as you will notice, of steps or benches, and, with the porphyry

the ultimate erosion gave a form something like this (drawing) as the ultimate result, in the form we have today.

I spoke briefly of the manner in which the ore was deposited, and I will explain that a little further. The waters on the surface of the earth, due to the snow and ice melting, and to the rains from the heavens, circulating through the porphyries, combined with hot water risen through the numerous fissures from below, leached out the valuable contents and redeposited them in the depressions between the sheets and masses of porphyry and the sedimentary rocks; they also penetrated some distances into the limestones, in some cases entirely through the first limestone, which is 240 feet in thickness, mineralizing the whole mass. The red chalk that I now use to represent the veins will show you that process. The general leaching through these masses of porphyry, the main deposit along the upper face of the limestone, and the penetration into the heart of the lime, so that we have these (indicating), is the manner in which the Leadville deposits were created. Occasionally the limestones, not only the upper limestones, but the one below, were mineralized throughout their extent. Those, for instance, penetrating that mass (indicating) would then flow along this plane (indicating), penetrate through this mass (indicating) in places, even flowing along the plane of the top portion of the lower quartzite, that in that case began sinking and from this point would go down practically through all those formations, and would penetrate no less than three distinct formations, forming ore bodies known locally as the first, second and third contacts, because the main bodies are found at the contact of two different rocks. The method of the formation of those ore bodies is by what is known as a replacement of the rock particles, technically metasomatic replacement, which means the replacement of each particle of the original particle of rock by particles of mineral; not an impregnation, where the mineral is found, permeating through the small interstices and spaces between the particles of the individual rock, but an actual replacement of the individual particles forming the rock itself. So that when the upper limestone is found altered into ore for its entire depth the greater mass of it when it is mined is galena, similar to the ore of the Coeur d'Alene district. The importance of the district, as I said before, consists in the fact that it has added no less than $275,000,000 to the world's wealth in the last twenty-three years. When the panic of 1893 came on and stopped the production of silver, and almost destroyed the production of silver through these western States, for a time at least, the Leadville miners were forced to hunt for gold, and they found it in the eastern portion of the region, gold ores impregnating a large portion of the contacts which heretofore had been unexplored. And, in fact, from a certain point eastward, all the ores carry gold to such an extent that there is good profit in working for the gold alone. But in addition to that the silver, lead, iron, manganese and bismuth all produce good returns. The explanation of that is this: that subsequent to the first ore-bearing currents flowing along those planes, subsequent to that time from a certain point eastward, a later series of solutions came up from below carrying values which, in the main, were gold and copper, and distributed those values along the planes of least resistance already described, depositing them in these places, enriching the pre-existing silver and lead ores. So that those currents coming up through certain of those planes, and also through fissures, breaking through irregularly in something like that form (drawing) as they came into the lower quartzite, and the lower limestone would penetrate along the lines of stratification, and also enrich the silver and lead deposits which were first found in the district, and thereby formed gold, silver and lead throughout.

I think that is all I need to state tonight. The importance of this, as I said before, is to lead you to look for similar occurrences elsewhere. I am not aware that in Idaho, or any portion of the West, a duplicate of the region and deposits in Leadville exists, but it is reasonable to expect such, although at the time Leadville was discovered in 1878, when these silver and lead deposits were discovered, and their magnitude and importance made known to the world, it was said that no such thing had ever been discovered before, and no such would ever be found again. Personally, I do not believe that; and I think that by searching in regions where you have stratified rocks associated with porphyry or some other eruptive there is no reason why such a thing should be discovered, even

yet, in the less-known regions of Idaho, Oregon, Washington, and also in parts of Montana. I thank you for your attention. (Applause.)

As in the morning, the lecturer spoke entirely without notes, illustrating by frequent sketches upon a large blackboard. The following table of statistics relative to the Leadville mining industry is of interest to compare with those of the Cripple Creek district, and was compiled for use in the above address:

LEADVILLE STATISTICAL TABLE.

	1899		1900		TOTAL FOR 23 YEARS
	OZS. TONS	VALUE	OZS. TONS	VALUE	
Gold	106,203	$2,195,222	137,936	$ 2,851,146	$ 31,351,146
Silver	6,930,120	4,132,128	7,547,969	4,650,318	174,650,318
Lead	25,916	2,213.258	32.669	2,704,576	54,704,576
Copper	1,670	538,218	1,425	445,286	6,745,286
Manganese	15,653	54,785	47,000	141,000	3,391,000
Zinc (Spelter)	5,287	528,762	22,635	1,867,425	3,767,425
Bismute (est)	....	10,000	..	240.900	515,900
		$9,672,373		$12,900,651	$275,125,651

Revised and corrected at Cripple Creek, Colorado, August 13, 1901.
CHARLES J. MOORE, Mining Engineer.

On motion of Mr. Voss, of Oregon, duly seconded and carried, the Congress adjourned until July 25, at 9 o'clock A. M.

July 25, 1901, 9 o'clock, A. M.

The Congress met pursuant to adjournment.

The secretary read the following communication and report from Mrs. E. C. Atwood, treasurer of the Congress:

TREASURER'S REPORT.

San Francisco, July 22.—Irwin Mahon, secretary International Mining Congress, Boise, Idaho:

Dear Sir—Herewith I beg to hand you my report as treasurer of the International Mining Congress for the year ending July, 1901.

I regret that for the first time since the International Mining Congress was established my inability to attend.

To your very energetic effort the present Congress owes its success. I understand it is the purpose of the Trans-Mississippi Congress and the National Irrigation Association to co-operate with the International Mining Congress, conolidating their interests with the view of obtaining recognition from Washington on subjects that are of vital importance to the Western States. I trust this may be done, and the fight began four years ago by yourself and others in Denver may meet with great success.

I would suggest that in the matter of subscriptions to the International Mining Congress that they be sent direct to the secretary, who should make a monthly report to the treasurer. I think this would be of benefit that the secretary might immediately be placed in communication with the membership. Had the membership price been inserted in all the printed matter I believe that the results would be more favorable. Since I have noticed in the newspapers your calling attention to the subscription for membership I have received a number of applicants.

The receipts for the past year were $285; the expenditures $193.45. The balance $91.55 will be delivered as directed by the Congress.

Very truly yours,

E. C. ATWOOD, Treasurer.

On motion duly seconded and carried the report of the treasurer was accepted by the Congress.

On motion of Mr. French, of Idaho, duly seconded and carried, the balance of $85 due the stenographer for the report of proceedings of the last session of Congress was orderd paid, the balance remaining in the treasury after such payment to be turned over to the new treasurer of the Congress.

MR. FELTHAM, OF IDAHO: Mr. President, I desire at this time to introduce these resolutions:

Whereas The present tariff of freight rates on ores, mining products and mining machinery on various railway lines is unnecessarily high and burdensome, and prevents the development and operation of mines containing low-grade ores, and

Whereas, The interests of Western mining districts demand a reduction of said freight tariffs and rates sufficiently low to permit the operation of mines producing low grade ores; therefore, be it

Resolved, That a standing committee of fifteen persons be appointed by the Executive Committee with full powers to confer with railway companies and earnestly request them to at once consider favorably a substantial reduction of the present freight rates upon ores, concentrates, fuels, fluxes and all mineral products and mining machinery; and that said committee shall report to the next annual meeting of this Congress the reductions and concessions secured by it from said railway lines.

PRESIDENT PRINCE: It will be referred to the Committee on Resolutions. Are there any reports at this time?

MR. RICHMOND: Mr. President; a report of the Committee on Resolutions:

Whereas, the attention of the United States Congress on sundry occasions has been called to the desirability of supporting and advancing education in mining, metallurgy and kindred subjects, and partial action has been taken in Congress; therefore,

Resolved, That the International Mining Congress heartily endorses this movement for appropriating support to this object, and that a permanent committee be appointed to present before the proper committee of the United States Congress the sentiments of this organization, which we believe represents the wishes of the mining interests of the country.

The Committee on Resolutions beg leave to report to the Committee of the Whole, with the recommendation that it be adopted.

On motion, duly seconded and carried, the report and recommendation of the Committee on Resolutions were adopted.

MR. RICHMOND: A resolution introduced by Hon. Joseph H. Hutchinson:

Whereas, an official committee of our National Congress, known as the Rivers and Harbors Committee, having recently visited the Pacific coast for the purpose of thorough investigation, therefore be it resolved,

First, That the thanks of this International Mining Congress be extended to the Rivers and Harbor Committee for their painstaking visit; and be it further resolved that we express to the people of the United States for the purpose of helping and sustaining said Rivers and Harbor

Committee in their actions that the most important appropriation, in our opinion, should be for the purpose of making the Snake and Columbia rivers navigable so that there will be an open river from Lewiston, Idaho, to the Pacific Ocean.

The Committee on Resolutions beg leave to report this back to the Committee of the Whole, with the recommendation that it be adopted.

MR. HUTCHINSON: Mr. President, I move you that the report be adopted.

Motion seconded.

MR. FELTHAM, OF IDAHO: Mr. President, I am not sure that I caught the reading of the resolution perfectly, but as I understand it, it reads from Lewiston to the Pacific Ocean. That does not include a great amount of the Snake River in the southern portion of Idaho, which is navigable. It is a matter of great importance to this State, and to the mining interests of Idaho, in the interior regions, that the Snake River be opened in the interior. It seems to me that the resolution does not express fully what this Congress desires.

MR. HUTCHINSON, OF IDAHO: Mr. President, I think if the resolution is read again that the gentleman will understand that it would be impossible for us to take up the question of navigation above Lewiston, for the simple and sole reason that it would be a State matter, and cannot properly be asked for by this Congress.

On vote being taken the report of the committee was adopted, and the recommendation concurred in.

MR. RICHMOND: Mr. President, the Committee on Resolutions beg leave to report and recommend for adoption the following preamble and resolutions:

Whereas, The primary and most important purposes of this Congress are to inaugurate a movement that will ultimately result in the establishment by the National Government of a bureau or department of mining, and

Whereas, In order to accomplish that purpose, it will be necessary to bring before the people of the United States, and present to them in form such information upon that question as will convince them of the great importance of the movement, and

Whereas, In order to successfully disseminate this information, subordinate branches of this Congress should be created in all the States of this Union in order that through these subordinate branches this work may be carried on under the directions of the International Congress; therefore, be it

Resolved, That steps should be taken at this meeting of the International Mining Congress to properly and systematically inaugurate this movement. And further, be it

Resolved, That the president of this Congress be and is hereby authorized and directed to appoint, either before or after the adjournment of this meeting as to him may seem best, a committee of three to formulate articles of confederation to embody and carry out the purposes above set forth, and to appoint in each State and Territory of this Union one person to be known as the organizer of subordinate branches of this Congress. The same to be done until said articles of confederation are formed and adopted under the direction of the president and secretary of the International Mining Congress.

PRESIDENT PRINCE: Gentlemen, you have heard the report of the Committee on Resolutions. Perhaps the chairman of the Committee on Resolutions will permit me one suggestion. Would there be any objection to striking out the words "Bureau or?" The contention of the mining community, as the chair understands it, has been for a department. At a former session of the Congress the desire was expressed to retain the word "Bureau" as an alternative in case we did not succeed in getting a department; but we succeeded in carrying the resolution unanimously for a department, and not for a bureau.

MR. RICHMOND: I think, Mr. President, that that expression was inadvertently incorporated in the resolution.

Mr. President, in regard to this resolution that has been introduced by the Committee on Resolutions, the Committee wish to be heard in its behalf before action is taken.

This Congress has been organized and has been in full operation now four years. Those of us who were members of the first Congress can see no material advancement today over four years ago in its material welfare. It seems to have the appearance of a magnificent piece of machinery, with all kinds of latent forces, but lacking in effectiveness. We can meet year after year and pass resolutions, and if we have not some power behind us, or the ability to effectively exert that power, our time and money are absolutely wasted. We, of course, recognize that it is a great pleasure to come here and meet our fellow miners and fellow business men. But up to the present time we have accomplished absolutely nothing.

Your committee feel that the only way to obtain any national action is to commence at the bottom and work up. We also feel that the only way to get any national action is to get it through political work. Now, I do not mean by that that we propose to utilize any one party; but we do propose to utilize every and all parties and make them respect the mining industry, and force our congressmen and senators to so respect us that when we go before the national Congress they will adopt our cause as their cause, and our fight as their fight.

To that end we have suggested this organization somewhat on the lines of all other national organizations, with separate local organizations to take up the work in their respective states. Those local organizations will, of course, look after their membership, and also look after the financial end of the proposition, which is one of the most important propositions that we have to contend with, as without the necessary funds we are absolutely useless.

It has been thought by your committee that if such action as this were taken, and that if this business was gotten down to a strictly commercial basis, with the mining interests of the several states taking this in hand, taking the power of appointing delegates out of the hands of mayors and the governors of the several States. Today we meet here in Boise as delegates from our several States and Territories as the appointees of our respective governors or mayors, as the case may be. We do certain work in this convention, and a year from today we meet in some other place, and as we probably have a new set of governors all over the country, and each of them has a new set of friends, it follows as a consequence that in the meeting held a year hence there may be 25 or 30 members who attend this convention who will attend that one. The whole convention has got to be started over again, and the work of a year before has got to be done over again, and we leave that convention in the

same condition that we left this one. This thing is not an ethical proposition; it is a commercial proposition. We come here and enjoy hearing scientific papers, but the prime object that we are here for is commercial economy, to get our mining industry on a basis where we can control it. We think that the representatives to this Congress should come from commercial bodies, representing purely the mining industry.

With these ideas in the minds of your Committee on Resolutions we have drafted this preamble, not going into the specific details, preferring to leave it to the action of this Congress, only putting before you the skeleton of our thoughts.

MR. ROBERTS, OF OHIO: Mr. President, as I see this matter, I understand that there is a Committee on Permanent Organization working on a plan by which this organization shall be constituted. When that committee is ready to report I think we shall have a comprehensive plan before us, by which we can have a future Congress. Now, is this the work of that Committee on Permanent Organization? If so, this resolution providing for the organization of subordinate lodges or councils of mining and commercial men for the appointment of delegates to a future Congress would be out of place. We should leave that matter in the hands of the Committee on Permanent Organization, I think. If they are not going to provide us with the means for a permanent membership, then this proposition is certainly necessary.

I believe the proposition is good, that our future membership should come from local councils of men who are interested in mining, and commercial interests connected with mining, and that they should appoint the delegates to the future Congress.

Now, is the Committee on Resolutions or the Committee on Permanent Organization to present a plan for the future existence of the Congress?

MR. HUTCHINSON, OF IDAHO: Mr. President, the delegate from the State of Ohio is taking a very peculiar stand. He, as a member of the Committee on Resolutions, voted for this resolution. He now appears not to understand it. A plan will be reported by the Committee on Permanent Organization, but this is the report of the Committee on Resolutions, recommending a certain plan, and, if adopted, the Committee on Permanent Organization will take it up, and report it back to this body. We have not recommended any plan, we have simply offered that suggestion, and if that suggestion is adopted by this committee the Committee on Permanent Organization can adopt the plan, but they cannot move until it is adopted.

PRESIDENT PRINCE: There is nothing in this that interferes with the regular organization of this body as it exists now. It is absolutely a permanent organization now. It is impossible now to amend this year, unless a session is held tomorrow, but this does not interfere with it at all. It simply proposes to have some one assist in carrying out the organization of the States.

The motion to adopt the report and recommendation of the committee was put by the chair, and declared carried.

MR. RICHMOND: Mr. President, a second resolution originating in the Committee on Resolutions:

Resolved, That from and after the enactment of this resolution, that any city bidding for a meeting of the International Mining Congress shall

guarantee to said Congress not less than $3,000 in cash, to be paid into the treasury of said Congress within 30 days from the time that the said International Mining Congress shall accept said invitation.

Your Committee on Resolutions beg leave to refer this to the committee of the whole, with the recommendation that it be adopted.

On motion of Mr. Burke, of Oregon, duly seconded and carried, the report and recommendation of the committee were adopted.

MR. DERN, OF UTAH: Mr. President, on the assembling of this Congress a most cordial welcome was extended to the delegates by the governor, the mayor and the ex-mayor, and, whereas, from personal experience I know what effort has been made here to make this a grand success, knowing the amount of labor that has been performed by the different committees and the citizens of Idaho, I want to offer a resolution to show our gratefulness and our appreciation of the efforts of the citizens of Idaho and the citizens of Boise, in particular. I offer this resolution:

Whereas, The State of Idaho is appropriating the sum of $5,000 to aid in advancing the best interests of the fourth annual session of the International Mining Congress, and

Whereas, the City of Boise, Idaho, extended to this Congress the hospitality of the city, and by all means in the power of its citizens, financially and otherwise, have so magnificently seconded the efforts of the State in promoting the success of this assembly; therefore, be it

Resolved, That we, the delegates of this Congress, herewith tender to this State at large, and to the citizens of Boise especially, our heartfelt thanks for all they have done, and the generous welcome extended to us on this occasion; be it further

Resolved, That to his excellency, F. W. Hunt, governor of the State; the Honorable Mayor M. Alexander, of the city, and the Hon. J. H. Richards, ex-mayor; the president and members of the Chamber of Commerce; and the president, Mrs. W. H. Ridenbaugh, and her associated members of the Columbian club we are especially grateful.

The resolution was duly seconded, and was adopted by a rising vote.

PRESIDENT PRINCE: The next regular order on the program is the reading of a paper by Hon. J. J. Demming, of Salmon City, Idaho, on "Stamp Mill Construction."

Mr. Demming read the following paper:

STAMP MILL CONSTRUCTION,

By Hon. J. J. Demming, Salmon City, Idaho. Read before the International Mining Congress, Boise, Idaho, July 23, 1901.

The first stamp mills of which we have any record were first used in the classic region of Trans-Sylvania, Austria; from there the idea was brought across the sea to this country by the early pioneers of Georgia, who in turn carried the same idea to the early mining camps of California and Colorado. The gradual evolutionary changes caused by experience and local conditions have so changed and modified the original mill, so that to the casual observer it has but little resemblance to the mechanism of the modern stamp mill of today. The common operation or construction of a stamp mill do not necessarily involve a fine knowledge of chemical formula or complicated mechanics. A good millwright or mill man has that common sense which is the basis of all true science, and has won a knowledge of the true bed rock principles of stamp mill construction by close observation and experience, which no book-knowledge can give him; always remembering never to use a new device or make a change without a reason for it, and that where there has been so

many great improvements in the past, that there is still room for more in the future; for no stamp mill has ever yet been built that was perfect in every detail.

One of the great axioms of successful stamp mill construction is to adapt the construction of the mill and reduction process to the character of the ore to be treated. This, in a measure, accounts for so many variations in stamp mill construction.

The most truly scientific method in the reduction of any ore is certainly the most sensible, and it is one of the duties of every mill constructor or mill man to determine what are the exact conditions required and then arrange his mill to them. If a stamp mill is to be the process employed in the treatment or reduction of a particular kind of ore, the first consideration in constructing that mill should be the arrangement and design of the process best suited to saving the values in the ore. It is the adaptability of the stamp mill to the ores of a great diversity of character which enables it to hold its own in the wake of the ever-coming new devices continually offered by the inventive genius of this generation; it is this distinctive feature of combination that enables the stamp mill to compete successfully; for it is a crushing, amalgamation, reducing and extracting device combined, and despite these new inventions with the encroachments of the smelter on one side, and the leaching process on the other, the stamp mill still continues to be the simplest and best way of extracting the hidden gold yet invented by the ingenuity of man. It is probably true that the ores of Gillipin County, Colorado, contain a higher percentage of sulphurets than any other gold-bearing mill ore treated by amalgamation at any of the chief milling centers of the world today. The fact that they make a higher percentage of extraction from these pyritic ores is evidence that their system of mill construction and milling is second to none.

If this be true it is due to the proper recognition of the necessity for changing the modes of treatment and mill construction to conform to the different character of the ore. These changes did not take place in a day, but are the outgrowth of years of hard work and observation. The mill men of Colorado have been trained in the best of schools, that of experience.

The mine owner should not consider the work finished when the ore is hoisted to the collar of the shaft, but on the contrary, the mill demands the greater experience and attention, and no management can be too careful in placing competent men in charge of the plant. It is one of the faults of mill construction today that the building of mills has not been left to the direction of technically trained engineers. The design and mode of construction of stamp mills is usually left almost entirely to the judgment of the foundry man. The millwright, whose duty it is to look after these things, seldom ever concerns himself with the details of the design of the machine which is intended to do the work. The factory very naturally changes their patterns as little as possible. There seems to be an unexpressed sentiment that the ores must suit themselves to the mills, rather than design the mill to comply with the character of the ore.

While it is not possible to go into all the details of stamp mill construction in a few brief paragraphs, yet there are always certain principles that must be considered. In the construction of the mill building there are three important factors to be observed; light, heat and room. Nearly all our large mills are dark in the middle; none should be that way; builders depend too much upon the side wall windows for light; if the mill is not built in elevated sections so that each department can have its own system of lighting, it is better to place skylights in the roof, for one skylight will give more light than four windows in the wall of the building. Whitewashed walls and ceiling will aid in producing better light. The amalgamation and concentration departments should be warm in winter. It is best to build this part of the building double board, with building paper between and battings on the outside. If the mill has steam power, a very good system of heating can be arranged from the exhaust steam from the engine. If the mill is not equipped with steam power, a good stove or two with large hot air drums will prove economical of fuel and keep a thirty-stamp mill sufficiently warm for operations. Avoid cold draughts of air, for icicles, plate amalgamation and concentration will not work together.

In the matter of room or space no millwright should try to economize in this particular. Have plenty of elevation between the different departments of the mill, plenty of room around the batteries and the concentrating machines.

These three factors, light, heat and space, are not luxuries; they are necessities in every well-regulated mill.

Next we come to the battery foundation. Nearly all stamp mill constructors seem to think that the mortar blocks must be set on solid rock, or rather that mill sites must be chosen with reference to the foundation for the mortars. While it is probably true that natural rock foundation is better for any machinery, yet it cannot always be secured, and a better rule would be to locate the mill in the most convenient place with reference to the mine and other surrounding conditions, and if there is no rock foundation, construct one. This may be a violation of all rules of battery foundation, but like many other rules there sometimes must be exceptions. If a natural foundation cannot be secured, make an excavation deep enough so that the bottom is of a homogeneous character. A foundation partly on rock and partly on sand can never last. A space of 72 square feet or about 6x12 feet will be large enough for a ten-stamp battery; on the bottom of the excavation build a cement concrete three feet high, using about three parts of sand, three parts of broken rubble and three parts of Portland cement; a coping of about two inches on this concrete, consisting of equal parts of sharp sand and cement will give a smoother level surface. After this concrete foundation has thoroughly set it is ready for either an iron or wood mortar block. In a like manner concrete piers can be built for the mudsills and battery posts. Anchor bolts should be built in concrete work for holding the mudsills and mortar blocks.

The back knee frame, while it has some objections is considered best for a battery frame, it gives a solid support to the ore bins, and the pull of the belt to the cam shaft is downward. However, there seems to be a considerable difference of opinion among mill men as to just where the driving shaft for the batteries should be placed. Many insist that the shafting be placed on the battery sills, while others maintain that it is better to place this shaft on an approximate level with the cam shaft. This last arrangement has two or three advantages over the first. There is less vibration at this point than on the battery sills, less dust and dirt, and the use of the belt-tightener is not required. The life of the belt in this portion is much longer, as has been demonstrated in the mills of South Dakota, where the two arrangements have been used. The iron battery frame has gradually come into use in Australia; this has added much to the appearance of the stamp mill, but the question is often asked, does not the iron frame increase the vibration produced by the fall of the stamp? It is generally supposed that the wood frame takes up this vibration better than iron and prevents a crystallization of the iron work of the battery. This question is often a matter of controversy between mill men, but the experience of the Australian mill man does not sustain the idea of crystallization, for many of the iron frame batteries in that region have been running for many years without any serious results. The design of the mortar, which is seldom ever left to the millwright or the amalgamator, becomes an interesting question, for the character of the ore may require that the mortar be made an amalgamating machine as well as crushing; in that case the mortar should be built wide and deep, after the fashion of the Colorado or Black Hawk mortar, which gives room for both back and front inside plates. On the other hand, the ore may be of such a class that inside amalgamation cannot be affected. Notable among this class are milling ores of Custer County, Idaho. Every attempt at inside amalgamation of these ores has reduced the percentage of extraction. From this experience the mill men of this district have learned to design their mortar as a crushing machine; narrow, with a shallow discharge. Again, we may bridge between these two extremes and design a mortar with chuck block and front plate only. This modification is to be recommended when both back and front plates cannot be used, for the sooner we catch our gold the less chance there is to lose it. If it can be recovered in the mortar, it is better not to let it pass out in order to catch it on the table outside; finally these different modifications become a business proposition to be carefully weighed by the mill manager, as to whether the

increased extraction inside the mortar will make up for the loss in tonage by inside amalgamation.

The depth of discharge or the distance from the level of the issue from the top of the die is a very important factor, the importance of which is usually underestimated. In the deep discharge mills of Colorado the distance from the top of the dies to issue is from 14 to 16 inches, while in many other milling centers the discharge is less than 2 inches. These varying conditions usually come from arranging the mortar to suit the requirements of the different kinds of ores. In any case the discharge should be kept as constant as possible. It is better to put more metal in the stem and less in the bosshead. With a light steel tappit there is less vibration in the stem and consequently longer life. With a steel tappit and the end of the cam chilled there will be less friction and little wearing of cams.

Shoes and dies should not be of the same hardness; better have the shoes of steel and the dies of cast iron. Use the individual iron guide; it is preferable to any wooden guide.

Tables for the apron plates should be made heavy and solid and of the best material; usually 3x5-inch pipes spiked together and dressed to an even surface on the top side, 1-6-inch lower in the center, with a side rail on either side 1½x10 inches. This will make a solid bed for the plates. If the tables are long, 12 or 16 feet, it is better to divide them into two sections of 6 to 8 feet each, with a drop of 2 inches between the two. The pitch of the tables is another question that mill men do not always agree upon. The tendency in later years is to give the plates more pitch. The pulp in this case requires less water and gives it more of a rolling motion; a 2 or 2¼-inch grade seems to give the best results.

The weight of the stamp varies from 500 pounds to the heavy stamp of 1,250 pounds or more; only the prospecting mills have lighter weight. The most desirable weight for a given ore depends much more than is usually supposed upon the required conditions favorable to amalgamation. The light stamp of Colorado is an outgrowth of one of the conditions; while on the other extreme, the heavy, quick drop of California, is desirable on account of its great crushing capacity. A series of experiments carried out by the Alaska-Treadwell Company, among others demonstrated, was that a stamp heavier than 1,000 pounds was a good pulverizer, but not a good amalgamator. Likewise the same conditions have been found to prevail with the heavy steam stamp on gold ores of the Black Hills. The arrangement in the order of drop of the stamps in a battery must be arranged according to the rock required; for rapid crushing order, 1, 5, 2, 4 and 3, will work well, while for the long slow drop of the Colorado mill the order 1, 5, 3, 2 and 4, will give an even distribution of the ore in the battery. The order 1, 4, 2, 5 and 3, for heavy stamps and inside plate, amalgamation will give good results. The order 5, 1, 3, 4 and 2, commonly used in Australia, is a very good system, but the order of drop is more a fancy of the mill man, rarely any two men using the same drop.

We find in general stamp mill practice three classes of plates in use, the plane copper, the silver-plated copper and the Mutz metal, a composition plate, 60 per cent copper and 40 per cent zinc; while the plane copper is used in many mills it is not to be recommended in any instance; although its first cost is less, it will not compare with the many advantages that the heavy silver-plated plate has over it; while it is true that in time the silver-plating will wear off and expose the copper, and in that case lose some of its efficiency, it still can be plated again, for no large stamp mill is complete without a plating arrangement. Again, an old plate will always buy a new plated one. The Mutz metal plate used in Australia, in some instances is superior to the silver-plated copper; its absorbing power for mercury is limited, and is much more easily cleaned up than either of the other plates, which makes it better for test runs or custom mills. When the ores contain compounds of other elements, which will cut up the mercury, the composition plate is preferable. Again, it is said that the zinc in Mutz plates sets up a kind of galvanic action which has a tendency to purify quicksilver. The "verdigris," so annoying to the mill man, never forms on the composition plate, but all conditions the silver-plated plate is superior to all others. The sluice plates should be made at least as wide as the plates above instead of narrower, which is the common practice; the same amount of pulp and water must

necessarily pass over them as over the upper plates, and the gold expected to be caught by the sluice plate is finer and more difficult to catch than that which has been caught on the plate above; but the reverse of this is generally the case. In most mills the sluice plates are much narrower, sometimes only 20 inches wide and set with a greater angle and the little gold caught is more by accident than by reason of design.

It occurs to me that they are excellently devised for carrying off the mercury, the gold and everything else rather than arresting what has already passed the tables above. The quantity of water used is usually about 750 gallons per ton or ofe crushed; this amount is sometimes varied to suit the specific gravity of the pulps; the intention being to regulate this factor, so as to produce a slow wave-like motion as the pulp passes down over the tables, using sufficient water to prevent the heavy particles of ore from banking on the place. Warming the water for amalgamation and concentration in winter is a point to which too little attention is given. This can be accomplished where steam power is used by passing the exhaust steam through a coil of pipe in the water tank. Never turn the exhaust steam into the water tank. The water should be kept at an even temperature, never exceeding 70 degrees; frequently a lower temperature will do better work. The water tanks should be so arranged as to give a constant pressure at the batteries, hydraulic sizers and concentrators. Every stamp mill, no matter how small, should be equipped with sizing bars, rock breakers and automatic feeders; better to have two rock breakers, one for the coarse and a smaller one for the fine ore. Uneven ore, sizing and irregular feeding add very much to the wear and tear of a stamp mill. Do not try to make a rock breaker out of your mortar, if it pulverizes and amalgamates your ore that is all that is required. It has been thoroughly demonstrated that the rock-breaker is a great saver of mortars, shoes, dies, boss-heads, screens and so forth. The time lost in a year by the frequent stoppage of the mill in order to replace and make these repairs at once becomes a monetary question which must be added to the cost of these excessive repairs.

A stamp mill can reach maximum capacity only through the aid of a perfect system of rock-breaking, sizing and automatic feeding; besides, these factors are an efficient aid in the matter of amalgamation and concentration.

In the matter of machine feeding, it is safe to say that the automatic feeder is superior in every way to the shovel, for man is human, and the temptations known to stamp mill feeders as other men cause them occasionally to neglect their duty. Every mill should have an automatic sampler for tailings. This is an apparatus too frequently left out of the mill entirely. The lack of proper tailing samples is one of the consequent losses of gold due to bad milling, which is the result of ignorance on the part of the mill man as to what he is doing. It is to the mill owner's interest to know just what is being lost in the tailings. It is to the mill man's interest to have the tailings run low, the hand sampler will soon learn to sample an idea of his own, while an automatic sampling machine cannot be coached. The grinding pan or clean-up barrel is another machine frequently left out in the construction of mills; many mill men object to these as an aid in cleaning the residue from the mortars after taking out old shoes and dies; they claim that the grinding process of the machine causes the mercury to flour and a loss is sustained. This loss can generally be prevented by giving the barrel a slower motion and adding a small amount of perchloride of iron to the contents to be ground. Mercury traps should not be discarded where amalgamation is carried on by stamp mills. The arrangements of the stamps depends somewhat upon the location of the mill site; if the site is level and the mill large, it is better to arrange the battery in two rows back to back; when a graded mill site is used on a sloping hillside the batteries are arranged in one single row; this is a better arrangement, as the hillside gives the desired elevation for the different departments of the mill and makes a better condition for lighting the building.

The stamp mill of late has suffered much in reputation from the frequent failure of the designer or the constructor who adopts the arrangement and construction of his mill to the character of the ore to be treated. The mine owner orders his reduction plant about the same as a man orders

his dinner; he goes to the agent of a well-known manufacturer of machinery and tells him about the mine and the probable character of the ore and then leaves the plan and arrangement of the mill to him, the same as a man enters a restaurant and directs the head waiter to serve him with a good lunch. Mine owners do not like to spend a few hundred dollars in advice or experiment previous to the construction of a milling plant; but actually enjoy ordering a $150,000 mill, which too frequently after being completed and put in operation they find that the plant or process is not adapted to the character of the ore, and from this frequent haste and ill judgment we find so many failures in our mining camp which are monuments to folly, and the hillsides are dotted with the silent mill. Only recently an instance of this kind came under my observation; a superintendent of a mine in one of the remote mining districts of Idaho wanted a fifty-ton reduction plant for his mine. The ore was of the hardest kind of silicious quartz. An agent of a mining machinery firm recommended that Bryan mills would be about the thing for this ore; accordingly a pair of mills were ordered with a complete plant of machinery; a large excavation was made in the hillside and without foundation or retaining walls a building was erected, the machinery installed and the mill started up. After running a few days it was discovered that instead of a fifty-ton plant the mill would treat but fifteen tons, after a continued run of a few days longer the excavated embankment gave way, carrying the whole building down the hill, throwing the shafting out of line, leaving the engine and other machinery without foundation; thus adding another silent mill to the already increasing number. Among these many failures the questions often come up, "Will the stamp mill continue to survive amid the many inventions daily made; will it continue to compete successfully with the unending number of pulverizers and amalgamators, together with the array of new processes which the active brain of man brings forth from time to time?" Looking over the field of competition and the continued failure of the army of ill-devised machines which their originators fondly believed would revolutionize the reduction of ores there is every reason to believe that the stamp mills will continue to survive amid all these new inventions and enjoy a career of further usefulness.

In conclusion, to mine owners and millwrights who intend to build stamp mills; first study the character and requirements of the ore to be treated and, if necessary, go to some expense in experimenting to find out the true process for your ore, or, better still, employ a competent expert in that line who is able to judge which is the real system by which to treat your ore; that done, design your mill according to these conclusions; employ the most competent millwright to superintend the construction of your plant, a man who can run the mill after he has built it, and understands every detail of its operations; use your stamp mill intelligently and observe each and every one of its continued operations; take advantage of every occasion to use any new contrivance, or change, which experiment and common sense may sanction; and in due time the inventive genius of this great age of progress may produce something better than the stamp mill to extract from its hidden recesses the yellow metal, the constant want of which is the continued pain of many and its abundance the curse of others.

MR. FELTHAM, OF IDAHO: Mr. President, permit me to ask the gentleman, do we understand that he contends that the stamp mill at the present time is the most perfect system of reducing ores for concentration purposes, or does he apply it only to what are classed as free-milling ores?

MR. DEMMING: It applies to free-milling and concentrates, but not for all concentrating ores.

MR. FELTHAM: Your paper, then, applied only to that class of ores that carry both free values and concentrates?

MR. DEMMING: Yes.

MR. FELTHAM: But not to that class of ores that are in fact concentrates, such as the lead ores of the Coeur d'Alene district, and the

sulphurets of these camps that only carry free gold values in the oxidized surface ores.

MR. DEMMING: Yes; I do not refer to the purely concentrating ores.

MR. FELTHAM: You do not contend, then, that the stamp mill is the proper means of reduction of concentration ores?

MR. DEMMING: Not for all ores, I do not; no, sir.

MR. FELTHAM: I would like to hear from other members of the Congress on this question, for it is a live question to those who are interested in milling in this country. This part of the world is very largely a base ore district. There is very little free gold here outside of the placers; and this question of reduction for concentration purposes is one of vital importance to us.

MR. VOSS, OF OREGON: Mr. President, in reply to the gentleman's question, what little I have to say is this:

There is only one mill built in the world, and that is the stamp mill; but it must be fully equipped for the treatment of all kinds of ores. Where you have ores that are to some extent refractory but carry fre values you can amalgamate them first, and then concentrate them. There are many mills that are used for concentrating purposes, such as the Bryan, Huntington, and various others, but they use them principally after the ores have gone through the stamp mill. All other mills partake of the principle of the stamp mill. With the exception of the concentrators only minor improvements have been made in the stamp mill.

MR. MULLEN, OF IDAHO: Mr. President, I have been listening to the statements about stamp mills, and I want to say that for about 35 or 40 years I have been using my own. I own them, and therefore have had a chance to experiment with different processes for the pulverization of ores. I want to ask the advocates of the stamp mill if there is a single stamp in Nature's pulverization? Wasn't it all by attrition? The beauty of the stamp mill is that you can't injure it. You can teach a man to feed the stamps, and he can't injure it by his own carelessness. But there is a large amount of lost energy every time the stamps are lifted. The only execution it does is at the moment of concussion.

I don't condemn stamp mills, but I do say that there are other mills that are superior to the stamp mill for many of the ores of different districts. The best way to learn the value of a stamp mill, or other mills, Huntingtons, Ball Roller mills, crushers and everything else, is to go and find a mine, and then get different kinds of mills, and go broke about fifteen or twenty times, as I have. Then you will know more about stamp mills than you can ever learn from a paper.

It has been a long study of inventors to improve stamp mills, so that their lost energy can be utilized, but they haven't done it.

All machinery needs good, common sense to be exercised in the handling of it in order to make it successful.

MR. STEPHENS, OF MONTANA: Mr. President, I would like to know if a person can bring up a subject here for discussion without reading a formal paper upon this subject? Is it necessary to read a formal paper in order to bring up any subject for discussion before this Congress?

PRESIDENT PRINCE: Not at all, sir. The ordinary method, if a desire is to bring up a subject, would be to introduce a resolution on that

subject, and upon the incoming of the report of the committee on resolutions it could be discussed.

MR. STEPHENS, OF MONTANA: Mr. President, I move that a committee be appointed to examine the laws relating to the creation of the mineral land commissioners, for the purpose of proposing amendments to those laws, as they may find it necessary. Motion seconded.

PRESIDENT PRINCE: The subject to be referred to the Committee on Resolutions?

MR. STEPHENS: To the Committee on Resolutions.

PRESIDENT PRINCE: I would suggest that the gentleman put it in somewhat this form: That the subject that he indicates be referred to the Committee on Resolutions, with the request that they formulate a resolution on the subject.

MR. STEPHENS: I think that is very elegantly expressed by the chair. I will adopt that.

The particular thing that I am interested in is to get that subject before the Congress, as we are a mining congress, and as I believe it is a good thing in its character.

If the mineral land commissioners are not acting under a proper law there is a great deal of the mining country here that the miners will never be able to get hold of for any particular purpose. You can't put stamps on them or anything else. There was a law, the act of 1895, which takes in Telegragh and Missoula Creeks in Montana, and it takes in the Coeur d'Alene district in Idaho.

MR. FELTHAM, OF IDAHO: Mr. President, I move to amend the motion to the effect that the gentleman from Montana be requested to formulate his ideas in the form of a resolution, and present it to the Committee on Resolutions, and let it take its regular course.

Motion seconded.

MR. STEPHENS: Very well; I will be glad to put it in writing.

PRESIDENT PRINCE: The chair understands that the gentleman from Montana intends to pursue that course, without the necessity of putting the motion. Is the understanding of the chair correct?

MR. STEPHENS: Yes, sir.

The secretary read the following resolution:

Resolved, That we, the members of the fourth International Mining Congress do most heartily endorse the proposed Lewis and Clark Centennial Exposition to be held in Portland, Oregon, in 1905; and that we especially urge upon all mining corporations and individuals interested in mining that they begin at once to collect specimens, to the end that the mining exhibit at this exposition shall be the most complete in every department that the world has ever seen.

Referred to the Committee on Resolutions.

PRESIDENT PRINCE: The Committee on Permanent Organization sends the following communication, and asks that it be read:

The resolution was read by the secretary, as follows:

The Committee on Permanent Organization upon motion, duly made and seconded, has resolved to recommend to the Congress at its forenoon session, July 25th, that the chair announce to the Congress assembled, that all wishing to become members for the ensuing year give their names to the recording secretaries to be appointed for that purpose

and pay the membership fee of $5 to such secretaries, who will issue a receipt for such sum, to be later on substituted by certificates of membership.

The two secretaries so appointed shall take their positions at the door, and, as the Congress passes out, or before, any one wishing to get his receipt may do so. All the members on the permanent organization have paid their dues for the ensuing year.

V. G. HILLS, Secretary.

PRESIDENT PRINCE: The next order of business is a paper by Mr. W. R. Everett, of Chicago; subject, "Honest Methods of Promotion."

Mr. Everett read the following paper:

HONEST METHODS IN MINE PROMOTING.

The importance of the mining industry in advancing the wealth and power of the nation and the welfare of the people can scarcely be overestimated.

In the year 1900 this industry contributed nearly $115,000,000 in dividends to the nation's wealth. Nearly 30 per cent. of the people of this country are dependent directly or indirectly upon it. It affects the entire community more largely than any other and more directly than any other excepting only the production of food stuffs.

But, while the welfare of the public is largely dependent upon mining and its allied and kindred interests, the industry, for its advancement, at least, is dependent upon the public.

A mine begins as a prospect; a potential source of wealth. It needs the power of capital to delve into the mountains and to uncover and extract the precious values. The great mass of the people are, generally speaking, the source of this necessary capital.

While this Congress properly should and, indeed, has considered the industry from many standpoints, and has considered technically the proper treatment of ores, the prospector, it ought to devote some time to a consideration of the proper treatment of the public which is so very directly interested in the industry, and in which the industry is so directly interested. Indeed, the public is as important a factor in the future of a property as is its hidden values. Once found, the proper development and the proper treatment of both are equally important.

There can be no question that mining is a legitimate undertaking, as legitimate as any business venture. In fact, the chances of success in the mining industry are probably better than the chances offered by any other business. Statistics demonstrate that above 90 per cent. of commercial ventures result in failure; a record that the mining industry does not approach. There is less competition; there is always a market for the output and comparatively small capital is required. A mine, like a grocery store, must be run on business principles. A business will not run itself except into failure.

There are many instances where mining properties have proven unprofitable to the owners solely because of incompetency in the management. The same incompetency in the mercantile field would inevitably result in loss. In any business there is a close relationship between expenditure and income. A proper harmonious balance results in success; a disregard of such balance results in failure.

Properly conducted, assuming the possession of a mine to begin with, mining is more universally profitable for the invested capital than any other industry. There are so many unknowable conditions absent in practical mining which are only too apparent in many other lines; fluctuations both of raw material and finished product, overproduction and changeable and fickle markets cause the miner comparatively no uneasiness; while and fickle markets cause the miner comparatively no uneasiness, while driving the merchant and manufacturer to despair. If the figures were available they would demonstrate this; considering on both sides only investments made with judgment and discrimination and confining the test to enterprises conducted on thorough business principles.

Our coal and oil barons and our gold, silver and copper kings are independent, practically, of all outside conditions. Their market is secure. The demand for their product is always pressing. Their wealth is inexhaustible. More safely invested than in bonds; more securely kept than in banks. When they need cash they simply go to the bowels of the earth and bring it forth.

Any mine, of whatever nature, begins with the discovery of certain surface indications. And, of course, there is much question as to the future of any mere prospect, but Nature seldom works hap-hazard. Though her laws seem intricate and many, they are simple and few.

Under natural conditions the geologist can read the story of her workings through past ages. The history of the planet has been found and translated in the sequence of conditions preserved in the regularity of deposits and formations. It is all comparatively plain to the trained student.

True, great cataclysms, upheavals and slides have occurred and in their effects present many and new conditions. But these unnatural conditions can be discovered, known and understood. The rocks are open books to him who will only investigate sufficiently. It is not the *unkn w-able* conditions that render hazardous, but rather the *unnoticed* surroundings.

The diamond drill spreads before the investigators' eyes the pages of the book which lie far beneath the surface, and together with the surface surroundings give incontrovertible evidence of the value of the property. Where formerly we depended on indications and guess work, now we can examine conditions and know.

There is no room for chance in successful mining. It must be eliminated. A careful estimate of the wealth of mining men in the United States demonstrates that for every $4 made in the industry $3 is the result of hard work, thorough investigation of all conditions, study, care and shrewdness in business methods.

Chance may be a factor in the procuring of a property, but there its operation ceases. The success of failure which follows depends on business ability and judgment. The odds are 3 to 1 in favor of work and ability against chance and luck.

Chance always has and always will play an important part in the original discovery. The records of the West are full of romantic discoveries, lucky chances and even ludicrous and ridiculous events leading to the location of rich strikes.

There is the story of the Bunker Hill mine, which received attention at the hands of the District Court at Murray, Idaho. The facts briefly are that back in '85 Cooper & Peck, of Murray, Idaho, grub-staked on Kellogg, and part of the outfit was a burro. Making the story brief, the trip was unproductive and the partnership dissolved. Sometime afterward the prospector and a partner went back into the hills, where he discovered his former companion, the burro. One night the burro broke loose, and in the morning when the two men found the animal he was standing on an outcropping mineral vein, and the while gazing at a spot where was found another outcrop. The property was afterwards sold for $1,500,000. Cooper & Peck started legal proceedings, asking for an interest in the mine on the ground that the burro they had furnished was the real discoverer of the property. Judge Henry Buck, in his decision, stated, "That the Court was of the opinion that the Bunker Hill mine was discovered by the jackasses O'Rourke and Kellog," and inasmuch as the learned judge finally gave a half interest in the property to the claimants, he must have considered that the brain power demonstrated by the jackass equaled that of the two prospectors. While it is true that some jackasses are successful prospectors, or even the converse, it would be unsafe, however, to always depend on the discoveries of jackass prospectors.

After the discovery chance must be absolutely eliminated for knowledge and ability in all future operations. As I have said the mining industry needs the public, because, generally speaking, every mine is discovered by a prospector. If there is any one thing a prospector has not got, it is capital to investigate and develop his find.

In mining as elsewhere, it takes money to make money. Now it is comparatively easy to get money for mining ventures. In fact, statistics demonstrate that $2 has gone into mining for every $1 taken out.

It is human nature to want something for nothing. It is enticing to dream of large returns from insignificant investments. It is positively hypnotic to think of finding precious metal, coal or oil, a cornucopia, flowing streams of plenty, of affluence right from the ground. No work nor worry. It is there in the ground beneath one's foot. The wealth of Midas waiting for the stroke of the Miner Moses to gush forth in overwhelming quantities. The shrewd promoter takes advantage of the cupidity and avarice of the people and money flows in streams from the public into the widely-advertised new camps, and from that portion least able to lose, except, having but little to lose, in losing all they lose only a little. Unfortunately, most of this money sinks like water into the desert sands, and is lost so far as its intended usefulness is concerned. Of all the money put by a trustful public into mining ventures but a small proportion goes into mining. The mine promoter grows richer, but the mining business and the mines suffer. The mining promoter today, in many sections, is considered but little better than a criminal, a confidence man, and, in many instances, rightly so.

In Minneapolis, just last month, another mining bubble exploded. The American Mining & Investment Co., with assets consisting of a capital of $1,000, aside from its chief resource, which was a conscienceless rogue with ability and nerve to write a lying prospectus, sold stock in a number of so-called mines, with pleasing names, and realized upwards of $300,000, perhaps more. This was money which went into mining companies, but not into mines, and was lost.

It is difficult to find words in which to properly characterize acts of this kind of brokerage. It is not too much to say that highway robbery and burglary become commonplace as compared with the enormity of such fraud and deceit as appear to have been practiced by this concern. Yet it is questionable if the laws of Minnesota or any other State can properly reach these men.

If they do escape punishment, then surely there is need for an active and influential committee of this assemblage on revision of the Criminal Code; to make the laws specially potent in punishing swiftly and surely all such practices; "to make the punishment fit the crime."

Overcapitalization in mining properties is a great and widespread mistake. No other legitimate industry is so afflicted. Things in this world usually cost just about what they are worth, or, perhaps, a little more. Stock in a million-dollar mining proposition selling for one cent per share is usually a little high. Why not incorporate for a reasonable figure and sell the stock at only a slight discount?

Of course, overcapitalization has been long practiced and, of course, the laws of the mining States sanction it. But neither the sanction of usage nor of absolute law make the practice either good morals or good policy. It is not an evidence of the knowledge nor even the faith of the incorporators, as to the merit of the property, but simply of their fancy, even when it is honestly or mistakenly done. Usually it is done with no further or more honorable purpose than to mine the public. If mining ventures were taxed on their capitalization it would discourage the practice. And why not?

The incorporators sell a prospect to a company for $1,000,000 in stock. Surely this means that the property, potentially, is worth the price. The stock is offered to the public on that supposition, to-wit: Some day, with development, this stock will be worth par and in that hope, if not belief, the public buys. The public ought to know it is being swindled. I say swindled because the statistics demonstrate that $2 goes into mining ventures for every $1 that comes out, which proves that some one has been misrepresenting the facts as to the large majority of the ventures.

If the State would say to the incorporators, you can fix the values of your property as you please, but you will be taxed on that valuation, this species of frauds would cease; or, supposing the taxation was limited to stock issued, a very modest tax would suffice. For development funds treasury stock could be issued at par or a slight discount. The net returns to the public would be as large as under the present system, but the promoter would get less. One one-hundredth of the capital stock of any honestly administered corporation will receive 1-100 of the profits, so that having a single $10 share of stock in a $1,000 corporation is exactly the same as having 10,000 shares in a $1,000,000 corporation:

but the public doesn't understand these mathematics. The promoter finds it easier to sell the 10,000 shares at 10 per cent. than to sell 100 at par.

Misrepresentation is another evil. I recently read a mining prospectus which was a work of art. It graphically described a magnificent property with a shaft down eight feet and a tunnel in 12 feet. A second shaft had been sunk something over six feet, and the ore was so valuable that she shaft had been refilled. This bonanza vein was to be saved for the benefit of the stockholders, which closely approaches philanthropy on the part of the originators of the enterprise. Most mining men are selfish; when they find a great body of ore averaging up in the thousands they keep it all. They don't let the public in.

Now, if the law will prevent oleomargarine being sold as butter, why not prohibit selling prospects as mines? Or, as a prospect may some day become a mine, if the law prohibits the sale of "bob" veal, which, in due course, might become beef, why not insist that a prospect must stay a prospect and be called a prospect until its youth is passed? No absolute rule can be fashioned, but surely an eight-foot shaft and a twelve-foot tunnel could be put into the prospect class.

Just recently I read of a billion- dollar mining incorporation in New York, and Morgan wasn't in it, either. Two women in New York and some prospect holes in Nevada made up this combination. I presume the stock will be offered below par to the first subscribers as an incentive to purchase early and avoid the rush. I think the company is overcapitalized and possibly will make some misrepresentations in its prospectus of important details concerning its properties, but the pictures and promises will undoubtedly be glorious.

The total capitalization of the various companies operating in Texas oilfields is probably several billions. This stock is now being sold broadcast at prices from 1 to 25 per cent. I judge it costs about 50 per cent. of the receipts to meet the selling expense, to which must be added commissions. The amount of money going into "mining companies" might be estimated, but that going into *mining* can only be guessed at.

It is undoubtedly true that where one mine so capitalized and pronoted with the public has proven successful, probably 20 have failed. Some of them, perhaps, for lack of proper management, but most of them surrounded by such circumstances as amounts to nothing but fraud on the public. This principle that "the public be damned" is wrong. The confidence of the public in the mining industry must be preserved; I had well nigh said restored. But, unfortunately, "a sucker is born every minute," as the saying goes, and, unfortunately, easy money, money without work, is so tempting, and, unfortunately, it is so easy to tempt the public. But, fortunately, and, in spite of it all, the mining industry can still place some reliance in the public.

The remedy for past mistakes and the safeguard for the future is simply that ordinary business practices be applied to the promotion and conduct of the mining industry. In business "Honesty is the best policy;" why not in mining? With modern methods of expert investigation mining enterprises can be demonstrated within the limits of the examination, at least with as much certainty as can any business enterprise. Hence a meritorious proposition can be offered the public as an investment and not as a gamble.

Why offer a gamble when a business proposition is possible? Or if it is a gamble, let us call it that. There are many people who like to gamble, but don't get the innocent into a shell game when he thinks it's some other kind of a game.

There is no difficulty in selling a demonstrated mine, individual purchasers are always ready. But in dealing with an individual the broker must show the goods; in dealing with the public pictures and promises seem to answer.

The mine broker who sells as distinguished from him who "promotes" deserves some attention. He is of a more honorable class than that above referred to, but too often he, too, is a parasite.

In Salt Lake recently I heard of this case: A prospector optioned his claim to broker No. 1 for $40,000. No. 1 turns it over to No. 2, and adds $10,000 to the price. No. 2 passes it to No. 3, 3 to 4, and so on; finally the property was sold in New York for $175,000. The owner probably asked all the property was reasonably worth, but I

suppose the brokers needed the money. However, such deals do not add materially to the standing of mining brokerage as a business.

It has seemed to me that this entire subject should receive careful and considerable attention at the hands of this Congress. I would suggest the establishment of a permanent committee of this association to conduct a bureau of information. The members would gladly, I think, represent the bureau in their several communities and furnish information concerning mines, etc., located in their vicinity. A very small fee per inquiry would maintain the bureau. There are several such institutions, but, being individual enterprises or conducted as an adjunct to newspapers or journals, they are open to the suspicion of ulterior motives. Such a bureau conducted under the auspices of this Congress would be above all suspicion.

There should be uniformity amongst all mining exchanges as to the rules governing the listing of properties, uniformity as to the classes of prospects and mines. All mining stocks should be registered and transferred by responsible agents. Over issue of stock is not an infrequent crime. It can and should be prevented. Real estate exchanges assume the control of real estate agents and brokers. Their commissions and charges for various services are fixed by these exchanges with no warrant of law, but nevertheless are adopted as law by the courts. With perfect propriety this Congress might assume a similar prerogative; it should, at least, in strong language recommend all these protective measures to those interested—mining exchanges, brokers and the public. A permanent committee should continue the matter if no other definite action is now taken. By another year the method of eliminating many of the present evils can be determined. An association such as this International Mining Congress possesses great moral power. Properly directed this association by moral force can accomplish the correction of the most crying evils at least.

To sum up I would suggest that we discard old methods. That the confidence of the public is too important a factor in the success of the mining industry to be destroyed for the benefit of the few; that this Congress take measures to protect the public for the benefit of the mining industry; that by means of a bureau of information these brokers and promoters who will not deal honestly and fairly with the public be made so to do; that by means of a committee on laws this Congress endeavor to procure legislation that will especially punish fraud and deceit in mining practices, and that we bend every effort to secure and enforce honest methods in promotion, and thus try to achieve the greatest good to the greatest number.

PRESIDENT PRINCE: The next order of business is the reading of a paper by Prof. E. Howorth, of Lawrence, Kansas, on the subject of "Geology of Kansas."

PROF. HOWORTH, OF KANSAS: Mr. President, I have a paper here, but nobody wants to hear long papers at this late stage of the proceedings. Therefore, I will not read it, but ask that it be published in the proceedings of the Congress. (Applause.)

Prof. Howorth's paper is as follows:

GEOLOGY AND MINING INTERESTS OF KANSAS.

A few weeks ago His Excellency, the Governor of Kansas, in accordance with a letter sent him by the honorable secretary of this Congress, requested me to prepare a paper on the geology and mining interests of Kansas.

GENERAL GEOLOGY.—The general geology of Kansas is quite well known as accounts of it have been published from time to time during the last 20 years. The State is, approximately, 400 miles long and 200 miles wide. The oldest formations lie to the east and southeast, with newer ones continuously coming in as one passes westward. In the extreme southeast the sub-carboniferous, or Mississippian, limestones and shales cover an area not exceeding 30 square miles. These are the producers of lead and zinc ores and the only rocks thus far known to carry

enough lead and zinc to be of any practical importance to commerce, although traces of such ores have been found, here and there, almost all over the eastern fourth of the State. The sub-carboniferous rocks dip westward and soon pass hundreds of feet beneath the overlying formations.

THE COAL MEASURES.—Immediately above the sub-carboniferous rocks may be found the coal measures. This formation covers about 2,000 square miles, extending entirely across the State from north to south and from the eastern line westward to its junction with the overlying Permian. They have a maximum thickness of not less than 3,500 feet; they produce all the coal marketed from the State, except a small amount from the cretaceous beds farther west. They also are the only oil and gas producers thus far known, although recent prospecting gives great hope of heavy productions from the cretaceous shales.

THE PERMIAN.—Above the coal measure and overlying them, is a heavy mass of limestone and shales, commonly called Permian. This formation occupies a zone from 50 to 75 miles wide, extending across the State from north to south. On the south it joins the so-called red beds, extending west almost to the southwest corner of the State. It seems the lower part of the red beds are Permian, while the upper part appears to be Triassic and possibly is the continuation of the red Triassic formation in Colorado and New Mexico. Farther north the Permian is immediately overlaid by the Dakota Cretaceous.

THE CRETACEOUS.—The cretaceous rocks cover all the State lying west of the Permian and the red beds. They may be divided into five parts, which are, from the base upwards, the Caminayche, Dakota, Benton, Niobrara and Fort Pierre. Above the western part of the cretaceous is a thin cover of alluvial deposits, known as the Tertiary. This is a portion of the sand and silt and gravel deposits covering practically all of the great plains from Mexico to Canada and beyond, known in the north as the Bad Lands and by different names in other parts of the plains area. It reaches a maximum thickness in Kansas of about 250 to 300 feet and covers approximately to the western fourth of the State. The rings and lesser streams almost invariably cut through it, revealing cretaceous rocks along their banks and bluffs. This is particularly true of the Arkansas and the Smoky Hill, each of which has cut out its channel down into the cretaceous, leaving the Tertiary sands covering the high upland on the other side.

Thus far the Tertiary has produced nothing of commercial value, excepting some valuable fossils for which paleontologists occasionally pay exorbitant prices.

MINING.—The mining products of Kansas are not as varied as those in some other States. They are: lead, zinc, coal, oil and gas, salgypsum, clay, building stone and sand. They will be discussed briefly in the order named.

LEAD AND ZINC.—The lead and zinc ores of Kansas, so far as development has yet shown, lie in the sub-carboniferous or Mississippian rocks in the southeast part of the State. Mining operations were begun here in the spring of 1876 by the discovery of lead ore in Short Creek valley. About a year later, however, before much mining was done, unusually rich deposits of ore were found where the town of Galena now stands. In three months time a mining camp of 5,000 people had sprung up carrying with it the usual accompaniments of mining camps in the West. The mines about Joplin, Missouri, had been in operation for some years before and a zinc smelter had been established at Wier City for nearly four years. At that time lead ore was selling at nearly double the price it now brings, while zinc ore was less valuable than at present. On this account the zinc ore was largely neglected and many old dump piles produced in those early days have since been worked over for the zinc they contain.

The ores occurring at this place are almost entirely galena, or the sulphide of lead, and zinc blende, or the sulphide of zinc. A small amount of secondary ores, sulphates and carbonates produced by weathering are sometimes found. The ores occur principally in flint rock or chert, yet they are found sometimes in fractured limestone and occasionally in less amounts in large fissures which have been almost entirely filled

with the one time overlying coal measure shales. The flint is exceedingly abundant and very interesting in its manner of occurrence. It abounds throughout the whole of the southwest mining territory, but perhaps is more concentrated at Galena than any other one place. It is so intimately associated and interbedded with limestone that the two seem to have had a synchronous origin. It is full of fracture seams of great variety and form, producing endless variations in the character of openings. Doubtless much of the limestone has been dissolved out through weathering agencies, which likewise has helped in the production of ground openings. The ores are found in such cavities almost infinitely more irregular in details than the human mind can conceive, yet always fully within this scope of conditions produced by earth tremors and the solvent action of water.

There is such an intimate relation between the occurrence of ore and the presence of flint rock that the miners about Galena almost invariably stop when they pass from flint rock into limestone. Whether or not this is a correct method of procedure may be questioned, but it is given simply as a matter of history.

It may be well doubted if another place can be found in the world where lead and zinc ores are mined, unassociated with the precious metals, that will surpass in richness the Galena area. Here we find that practically from four square miles, and through a period of almost unprecedentedly low prices for ore Kansas has produced in about 20 years' time lead and zinc ores aggregating nearly $33,000,000 in value. Her greatest production was in 1899, when it surpassed two and one-half millions in value. This represents the value of the ore at the mines and not of the metal contents; should the latter be given the figures would be carried well up towards the fifty million mark.

Kansas has in her territories extensive zinc smelters and, from time to time, has likewise operated lead smelters. The first zinc smelter in the State was established at Wier City, in the southwest corner county, in 1873. From this little beginning, the zinc smelting industry has developed into one of the great productions, particularly since natural gas has come into use as a fuel. The first smelters were located in the coal fields near the ore mines. A few years ago, when natural gas was found in large quantity 50 or 60 miles farther west at Iola and Cherryville, the zinc smelters were gradually moved to the gas fields, so that for the last 18 months the gas smelters have been about the only ones in operation. We are now producing 60,000 or 70,000 tons of smelter a year with gas furnaces which are still being enlarged; other industries, such as sulphuric acid factories are turning out in connection with the smelters. Our metallurgical business, therefore, aggregates from five to eight millions annually.

COAL.—Kansas produces a fair amount of good bituminous coal. The 20,000 square miles of coal measures, already mentioned, have traces of coal here and there, all through them. But the most valuable coal is confined principally in two horizons. The first and most important lies at the base of the coal measures in the Cherokee shales. These shales carry the Pittsburg-Wier lower and upper coal, the Fort Scott coal, the Leavenworth coal and a considerable amount of coal mined elsewhere on a small scale. During the last ten years they have aggregated from 80 to 90 per cent of the total production. The next most important coal-bearing horizon is the Osage shale, producing the coal of Osage City, Scranton, Burlingame, etc., averaging about 10 per cent of the State's productions. This horizon lies, geologically, about 2,300 feet above the rich coal beds of the Cherokee shales, which carries its croppings a hundred miles or more farther west, and therefore away from competition with the better coal. As a result, we have a somewhat anomalous condition of an inferior coal, selling at the mines for a higher price than is obtained for a superior one.

The total annual production of coal in the State varies from three and a half to four and a quarter million tons, with an aggregate value of from $4,000,000 to $5,500,000.

OIL AND GAS.—Oil and gas have been known in the State for more than 20 years. It is within the last ten years, however, that their development has reached any considerable proportion. There is now a

refinery for oil at Neodesha, while the gas fields are rapidly becoming a great manufacturing center.

Reference has already been made to the extensive zinc smeltering factories operated by natural gas, to which should be added a large Portland cement factory with a daily capacity of 25,000 barrels; the brick factories aggregating $500,000 of business per annum, and many other lesser manufacturing enterprises, greatly increasing the total consumption of natural gas. With such a rapidly increasing consumption it is difficult to estimate the value of the annual production. It reached about $1,000,000 in 1900, and it is safe to say that for the present year the figures will be much larger.

Both the oil and gas are found principally in the Cherokee shales at the base of the coal measure. In the vicinity of Iola, Independence and Neodesha the depth most commonly reached by drilling is from 750 to 1,100 feet, with a few wells passing even to a greater depth. The pressure varies from 100 pounds, or less in some of the shallow wells, to a maximum of 425 pounds for the deeper ones. The daily flow capacity of the strongest wells is about 10,000,000 cubic feet, measured by the pitot instrument, and calculated by the Robinson tables.

Since the extensive use of gas in the vicinity of Iola the pressure is slightly decreased, falling from 325 pounds to about 275, but the pressure flowage capacity has not yet been altered sufficiently to permit a decrease perceptible at the large zinc smelter and cement factory.

Recently considerable interest has been shown in the probable development of oil fields in the cretaceous shales of Central and Western Kansas. It has been known for years that a considerable amount of oil existed in the shales near the surface, but as no prospecting of importance has yet been done, it is impossible to speak definitely on the subject. Cretaceous and even younger rocks produce large quantities of oil in different parts of America, so that one need not be surprised to learn of heavy oil producers being developed in the near future.

SALT—Kansas has salt enough to supply the world for thousands of years, and then hardly miss the amount taken. The coal measure shales produce a strong brine in many places from which vast quantities of salt could be made. The cretaceous shales, likewise, in some places are so saturated with salt that salt marshes and salt springs are very common, but it is to the Permian we must look for the extensive beds of rock salt which support the mines and manufacturing plants of Hutchinson, Kingman, Sterling, Kanapolis and other places. Here about the middle of the lower Permian is found the purest of rock salt, aggregating a thickness of 400 feet, and underlying an area of 5,000 square miles, with the limits to the west and north not known, making it possible, indeed, probable, that the area is much larger.

Kanas salt is prepared for market in two ways. At Lyons, Kanapolis and Kingman it is quarried, crushed and graded, sieved and sent into the market as rock salt, or in different sized grains to suit the trade. From 40,000 to 45,000 tons of rock salt are thus marketed annually. At Lyons the shaft is 1,000 feet deep, and solid masses of rock salt are quarried like building stone, hoisted to the surface and sent to market.

At Kingman and Kanapolis the mines are not quite so deep, but the greater proportion of Kansas salt is prepared by the evaporation process. A well is drilled into the salt beds, two pipes are inserted, one within the other; fresh water is pumped down one, which in turn forces brine up the other. This strong brine is piped into large evaporators, from which the salt is obtained to the extent of 1,500,000 to 2,250,000 barrels annually.

For quite a period of years salt was very low, the best grades selling at the factory at from 25 to 26 cents per barrel for the salt itself, with the cost of cooperage added. During this period retailers sold the best grade of evaporated salt, delivered to the purchaser's seller, at 90 cents a barrel. Recently, however, prices have been better, ranging from 50 to 75 cents per barrel, plus the cooperage, at the factory.

GYPSUM—During recent times a cement plaster made from gypsum is extensively used for plastering walls instead of the old-fashioned lime mortar. This has created a market for one of our greatest natural resources. Kansas has gypsum in almost unlimited quantities. There is a

zone reaching across the state which has rock gypsum interbedded with limestones and shales coming to the surface here and there along the river banks and bluffs, so that it is mined by tunneling at Blue Rapids, or lying many feet beneath the surface and mined by the shafting, as at Hope and other places. Still further to the southwest, in the vicinity of Medicine Lodge, about the middle of the red beds, rock gypsum from 20 to 30 feet in thickness cap the hills in that rugged country south of Medicine River. Here the operator quarries it like stone and rolls it down the hillside to the factory, where a grade of cement is made, competing favorably with the famous Kings Windsor brand of New York, Keel's cement of England. In addition to this rock gypsum we have many deposits of the so-called gypsum dirt or gypsum earth, the "gypserde" of the germs, which is in gypsum the form of minute crystals almost microscopic in size, thoroughly intermixed with a small per cent. of clay or salt and other impurities, serving the purpose of a retarder in the manufactured plaster, adding greatly to its value.

We are now producing from $250,000 to $300,000 worth per annum in gypsum, and could easily produce ten times as much if the markets demanded it. It requires no prophetic eye to see in the future gypsum occupying the position of one of the most important of our natural resources.

CLAYS—We have a great variety of clays suitable for pottery and brickmaking. Our most extensive clay industry is located in the gas fields where pressed brick, common brick and vitrified brick are manufactured on an extensive scale, one firm alone aggregating a fourth of $1,000,000 a year. In 1900 our clay goods had a market value of no less than $1,000,000, with a fair prospect for the output being greatly increased.

RESUME.

In summing up the foregoing it will be seen that Kansas, although pre-eminently an agricultural and stock-raising State, is also a mining State of mean proportion, yielding annually an output of from $20,000,000 to $25,000,000 in mineral and metallurgical products, which in variety and general usefulness compare favorably with those produced by other States.

PRESIDENT PRINCE: The next matter on the program is the reading of a paper by Dr. George A. Louderbach, of Reno, Nevada; subject, "Geology of Nevada."

Dr. Louderbach read the following paper:

GENERAL GEOLOGICAL FEATURES OF NEVADA, AND THEIR RELATIONSHIPS TO THE PREVAILING ECONOMIC DEPOSITS.

By George D. Louderbach.

In approaching the study of the geography or geology of Nevada, what first attracts our attention is the fact that the whole State is made up of a great number of mountain ridges, more or less parallel to each other, and running in a general northerly and southerly direction—some, indeed, having an axis almost true north and south.

The individual ridges are not continuous from the northern to the southern part of the State, but each extends perhaps 50 or 60 miles on an average, a number of them stretching out considerably more than 100 miles; and when any one ridge terminates, it is rarely far to another ridge that continues the march to the north or the south, thus extending the structure to practically all parts of the State. A line drawn through the north-central part of the State, between the great desert of Utah and the Sierra Nevada mountains of California, would cut through nineteen distinct and important mountains ranges, besides several more limited mountain groups. As the total number of mountain ranges in the State is probably between three and four times that amount, it is evident that it would be impossible to present here even a most limited outline of the nature of each range, supposing that they had all been carefully

studied—which they have not—and therefore you can readily see that it will be possible for me to give you but a meager supply of that definite and particular information which the miner habitually demands of the geologist and which, unfortunately, he, too, seldom obtains. I shall attempt, however, to present systematically and make clear the general geological features and their general distribution, and to show their broader relationships to the prevailing economic deposits.

There are other striking characteristics of the Nevada ranges besides their abundance, parallelism and general north and south trend. They are nearly all quite narrow—say from six to ten miles in width, though occasionally this may be doubled—so that at the passes one may generally cross them by team in the neighborhood of a couple of hours. On their flanks they plunge more or less abruptly beneath the surrounding flat valleys as if particularly submerged by an earthy lake. And they are literally partly submerged, some of the lower ranges being apparently almost entirely covered by the remarkable accumulations of silt and other alluvial material of the intervening valleys.

These valleys generally stretch out as almost perfectly level floors, treeless, and frequently without a sign of water or of vegetation of any kind, and they have been found, wherever bored, to be deeply filled with detritus. As they are determined in position by the mountain ranges, these valleys are mostly long and narrow, not commonly over ten or twelve miles in width, and they have a general north and south trend. They may extend the full length of the enclosing mountain ranges, but are sometimes cut off and closed by low, oblique ridges of sedimentary rocks, or, more commonly, by masses of lava.

With the exception of a narrow northern belt and the southeast corner, all of Nevada lies in the Great Basin region, which means that most of its streams do not get far from the feet of their parent mountains, and those that do end their existence in the so-called sinks or in more or less alkaline lakes, which are occasionally of large size—as, for example, Pyramid Lake, which is some 40 miles long and varies from five to ten miles in width. In fact, most of the interior valleys contain some water in the winter, which may spread out as a shallow playa, a foot or even only a few inches in depth for miles, it may be, in either direction—but these same valleys are as dry as can be during the summer and autumn.

Of that part of Nevada which belongs to the Great Basin, the eastern half has been called the Nevada Plateau, and the western, the Nevada Basin. In the plateau region the valleys from which the mountains rise are notably higher than in the basin portion, reaching an average of about 5,000 or 6,000 feet; while in the west, 4,000 to 4,500 feet prevails as an average, going as low as 3,800 on the Carson desert. The mountains rise from 2,000 to 6,000 feet (rarely 8,000) above these valleys, or from 6,000 to 10,000 feet (rarely 12,000 or over) above the sea level.

The streams of the State are generally confined to the intermountain valleys, into which they flow directly from the mountain ridges. One notable exception to this is Humbolt River, which cuts directly across the axis of eight or ten mountain ridges, and persists in this course for some 300 miles.

Agriculture generally follows the valleys of the main rivers, while small streams occasionally allow of the cultivation of fractions of the other valleys. While we confidently expect our agriculture to increase largely with the aid of judicious irrigation, nevertheless the ultimate limits are not very broad, and we know that the State must depend on the mineral industry as its main source of activity and wealth.

But the question of climate, water supply and vegetation is of the greatest importance to the miner, especially in the arid region, and we know that many a locality of good value has been deserted or allowed to lie untouched because, at the time of its discovery, water, wood and other supplies were too scarce and costly to pay the profits at that time desired. The plateau region is colder in winter, gets more snow on the mountains, has more water in the form of springs and mountain streams, and supports more vegetation than the western region. Nevertheless, we find, even in the barren basin region at the present day, small mills in side canyons successfully working with a carefully sought-for and cared-for, though small, supply of water under conditions which

would have been considered most unmanageable during the bonanza days of the west.

As regards the general geological structure, the Nevada ranges appear to be comparatively simple. Only locally are complicated foldings or faultings met with, each mountain range having generally a distinct and dominating structural feature, which may be a great anticlinal or monoclinal fold, generally faulted on one or both sides by simple faults, with throws of frequently several thousand feet. This faulting has been of such recency that the scarps are still distinctly visible—the ranges rising with steep grades and lowering over the valleys. If the faulting is confined to one side, the mountain range has a characteristic cross-section, with a steep slope on one side and a comparatively gentle slope on the other, the later rocks, if any, dipping in the direction of the gentler slope, and cut off abruptly on the steep slope.

Besides the above features, great and irregular masses of volcanic rocks are found along the majority of the ranges, sometimes spreading over the upper portions and down the sides, sometimes only at the feet of the mountains and flowing out to some extent into the valleys, and sometimes flooding the whole range completely for many miles, so that the older rocks can no longer be seen or only, perhaps, in small patches. A noteworthy geological characteristic of these volcanic rocks is that they are distinctly and intimately connected in their distribution with the mountain uplifts. The great masses uniformly follow the lines of the ridges, and are rarely, if ever, found in prominent groups or outbursts transverse to the general mountain system.

It has been shown that the greater part of Nevada, or that situated in the Great Basin region, could be divided geographically into two distinct parts; but it can also be divided geologically into two great divisions. In one, the bedrock series (that is, excluding the overlying tertiary sediments and lavas) consists entirely of ancient, of Paleozoic sediments; while in the other, it consists entirely of Mesozoic sediments. The line separating these two divisions, running roughly north and south, strikes the Southern Pacific Railway only a few miles west of a line dividing Nevada into two equal parts. From here it runs south some distance, passing towards the west into California. The country east of this line belongs to the Paleozoic division, all west of it, to the Mesozoic.

It seems very remarkable that these two areas should be so distinctly and completely separated, only Paleozoic rocks occurring in one part and only Mesozoic in the other; but a satisfactory explanation readily suggests itself. It is that, during the Paleozoic time, Eastern and Southern Nevada was covered by water—a part of the great Paleozoic Sea—while Western Nevada was dry land, contributing sedimentary material to the seas of that period, but receiving no deposits over its own surface. At the end of this era, when the whole continent was undergoing active changes, the eastern and southern part of the State was raised from seat bottom to dry land, while the former land was submerged. In this way the eastern and southern part received no sediments, while the western part was covered with the great thicknesses which we now find in its mountains. At the end of this era, Western Nevada was raised to dry land—coincidently with the great Sierra Nevada mountains on its west—and never since has any part of the State been invaded by the sea, although immense lakes have covered large parts of its surface down to geologically recent times.

Let us now take up the more general geological groups of formations, notice their distribution and their broader relations to man.

Granite, generally with an accompanying series of metamorphic rocks, occurs at many places in Nevada. While a number of the ranges show no sign of its presence, yet in the majority it can be seen, varying from small exposures more or less difficult to find, as in the mountains of the Washoe and Eureka districts, to extensive areas, as in the East Humboldt or Ruby range, and in most of the western ranges from the Oregon boundary, south through Esmeralda County. In their nature these are generally true granites, though some are of the basic or grano-diorite type.

In a number of ranges in the eastern and central part of the State a peculiar structural relationship has been observed. The granites and schists appear to form anticlinal axes which cut through the ranges

obliquely to their present trend and axes, as if, perhaps, there had been original uplifts and older ranges which were not in the same directions as the later ones. On account of the general narrowness of the present ranges, it results that the granites are here limited in extent, and do not underlie those portions of the ranges north or south of where they cut across. In other words, they do not form granite "cores" or axes, of these modern mountain ranges. The fact that the general direction of these older axes is closely parallel to the direction of the Humboldt River as it sweeps unceremoniously across the trend of the modern mountain uplifts, is very suggestive of the origin of that great boon to the Nevada people.

During the history of Nevada mining, a number of districts have been formed to work deposits in the granites. The veins are generally quite distinct in structure, have a quartz gangue, and carry, frequently, gold as well as silver or even gold only. As examples, may be mentioned the mines of the Reese River district and of several districts in Esmeralda County. In the vicinity of Austin, very rich veins containing complex silver sulphurets, with blende and pyrite, and a gangue of quartz, were at one time extensively mined in the granites.

Areas of other pretertiary eruptive or intrusive rocks occur here and there throughout the State, but as far as known play no very important part in the geology and affect only slightly the mineral wealth of the State. These are generally diorites, sometimes diabases or serpentines. They are associated with precious metals in some of the Esmeralda County mines, as at Candelaria, and contain magnetic iron deposits in Humboldt County. I shall speak of the quartz-porphyries later.

The Paleozoic sediments, which, as already said, are limited to the eastern and southern part of the State, are made up of great thicknesses of limestones with quartzites and shales. They have been studied most carefully in the Eureka district by Hague and Walcott. They were there found to extend from the Cambrian to the Carboniferous, and to include altogether some 7,000 feet of quartzites and conglomerates, 4,000 feet of shales, and 19,000 feet of limestones. It will be noticed that the limestones greatly preponderate, and they have been extremely productive in silver, gold and lead, in importance in the order named. The ores occur in masses or chambers scattered through the limestone, and connected, it may be, by the most narrow and insignificant cracks or fissures, and are generally considered to be replacement deposits. Sometimes, however, they occur in distinct veins. The Eureka district has been a world-renowned producer, and carried large and important values in gold besides its abundance of silver. White Pine County has had several active districts for the mining of ores of similar occurrence, especially in the White Pine mountains near Hamilton. In the Eureka district the ore is deposited directly in the crushed limestone, but near Hamilton it is generally in viens associated with a quartz gangue. Further south, in Lincoln County, similar deposits occur, as at Half Moon and Jack Rabbit camps near Pioche, and in the Pahranagat and the Tempiute mountains. Like deposits have also been worked in Elko and some of the central counties. It is interesting to note that, wherever studied, the above group of deposits has been found to occur in the lower limestones of the series, rarely, if ever, in the carboniferous. At several places in the State these silver-lead ores are characterized by the occurrence of manganese as an important element of the gangue, most notably to the south of Austin, and also in the White Pine mountains, where the mineral is rhodochrosite or manganese spar. In some other localities manganese dioxide appears. The ores in general may be sulphides—galena and the silver sulphur or sulph-antimony compounds—or they may be the oxidized ores—anglesite, cerussite or hornsilver—with, in many places, notable amounts of the lead molybdate, wulfenite.

Throughout the same region, series of more or less perfect veins are found traversing the quartzites, sometimes the shales and limestones, and passing over into the granites in places. While they generally carry ores of silver and the commonly associated metals, copper-bearing veins are not uncommon. Valuable deposits of this type occur in the vicinity of Belmont, in Nye County, where the complex silver ores associated with galena, and with copper and iron pyrites, in a quartz gangue, are found as veins in quartzites and slates. Other important occurrences of this kind are in Lander County north of Austin, and near Battle

Mountain; also at Egan canyon, the Ely district and others in White Pine County; near White Rock and other places in Elko County; and Silver Peak and neighboring districts in Esmeralda County.

With such a thickness of carboniferous rocks as occurs in this province (something over 9,000 feet), some hope has been held that coal of this period might somewhere be found in this State in paying quantities, but it seems to be practically barren. However, anthracite, generally impure and in small quantities, but belonging to the so-called true coal period, has been reported at several points; a 15-foot bed in the Independence mountains, by Emmons; in the Shoshone mountains near Argenta, by Hague; and a 5 or 6-foot bed near White Pine, by Hoffman, who says that it was sold at one time to the Eureka Consolidated Mining Company for from $12 to $15 a ton.

We next come to the Mesozoic formations, which are limited to the northwest third of the State, as already described. These also consist of slates, quartzites and limestones, but unlike the Paleozoic, the slates are the most abundant. Just west of the line separating the Mesozoic from the Paleozoic province the trias is most abundant, and in it the limestones are more or less prominent; but throughout the western part we find principally the jurassic, which includes some 2,000 feet of limestone overlain by some 6,000 feet of slate. These Mesozoic rocks, wherever their base is exposed, lie directly on granites or on certain strongly metamorphosed schists, whose relationships have not been satisfactorily determined In no case are they underlain by rocks of recognizable age belonging to the Paleozoic.

These rocks show some deposits of what may be called the limestone replacement type, as already described, but they have never assumed any great prominence and do not at all compare with the corresponding Paleozoic deposits.

More commonly are found more or less distinct vein systems, traversing the slates and passing more rarely into the adjoining limestones or granites. Here again, silver sulph-antimony compounds are the more prominent ores, and are associated commonly with quartz gangues; but copper veins are not uncommon. Unionville and Star Canyon districts and the vicinity of Golconda may be given as examples, but a number of localities are known especially in Humboldt and Washoe counties.

We may note here, concerning the Paleozoic and Mesozoic systems taken together, that at numerous localities we find rock most desirable for structural purposes: granites, limestones, beautiful white and colored marbles, coarse and fine grained, and, especially in the Mesozoic, good slates. It may be also noted that many of the limestones have been found to be almost pure calcium carbonates, although magnesian limestones form considerable areas. Owing to the small population of the State the demand for such material has been hitherto very slight.

No rocks belonging to the Cretaceous period have so far been recognized in Nevada.

We, therefore, turn to the tertiary rocks, which may be divided into the lake beds and the lavas.

The lake beds are rather widespread, occurring mainly in the valleys and plains, where they are largely covered by later accumulations. Frequently they form a fringe along the mountain ranges, but never rise to any considerable height; that is, above a few hundred feet. In age, they extend from the Eocene through the Pliocene, the lower beds (belonging to the Green River group) occurring only in the eastern part of the State, the middle and upper divisions being most largely developed in the western part, right up to the base of the Sierra Nevadas. These tertiary beds are made up of friable or not greatly indurated sandstones, shales, calcareous shales and limestones, and, particularly in the Truckee or middle group and the Humboldt or upper group, beds of volcanic ash more or less stratified. The Truckee group is further characterized by quite heavy beds of diatomaceous earth, which is very pure in some places. This has been used commercially only to a slight extent. The lower members of the tertiary are generally more or less tilted, even, in limited areas, standing vertical, and they are broken by series of small normal faults. The Humboldt beds are as a rule horizontal and undisturbed.

So far, the only thing of value that these formations have yielded

is coal or, more strictly speaking, lignite. Up to the present time this has not proved profitable to place in the general market, largely owing to want of transportation facilities. However, much of it seems to be of value for steam or ordinary heating coal. Mining for local use has been done near Elko in the Green River beds, where the industry has lately been revived; the Columbus field in Esmeralda County is supposed to be in the Miocene. Several other localities are known but have never been worked. All of the above lignites have been formed from layers of leaves and drift twigs and stems, some beds being separated into a large number of thin seams by narrow layers of ash or fine silt. In fact this admixture of foreign material in the form mainly of fine volcanic ash is what makes much of the coal of low value.

The tertiary volcanic rocks form an important and striking feature of the geology of Nevada. As before pointed out, they bear a close relationship to the modern mountain upheavals, and they occur sometimes on the summits spreading out here and there towards the bases, sometimes flanking for many miles and occasionally shooting out into the desert valleys whose eveness and continuity they then destroy, while at times they so overwhelm the ranges that the older rocks are found only with some difficulty and at great intervals. Perhaps the best example of such a submerged range is the Virginia, in Western Nevada, which from the Washoe district for some 40 miles north exhibits almost nothing but great masses of volcanic rocks, mostly andesite. It should not be thought, however, that all of the ranges show large areas of volcanic rocks, for some are practically free from them, as, for example, the Toano or Gosiute range in the eastern part of the State, which is some 60 miles long, and the White Pine mountains already mentioned.

The volcanic rocks of the State consist of rhyolites, dacites, hornblende or acid andesites, augite or basic andesites and basalts—the last named being the latest and generally considered Pleistocene or recent activity. As to which kinds are most abundant, it would seem from the published accounts that rhyolite covers the greatest area in the eastern part of the State. However, while it is certain that rhyolite is common, many of the determinations were made while petrography was still on an insecure basis, and have been found since, in several cases, to fundamentally disagree with modern conceptions—what was once called rhyolite being now considered dacite, or even andesite. This latter misconception seems to have been remarkably common. In the western part of the State the andesites are undoubtedly by far the most abundant and important of the tertiary lavas.

These volcanic rocks are very important and interesting from the economic standpoint. In many localities geologists and mining engineers have looked upon them as the determining factor in the production of important ore deposits—either as associated with the fissure systems, or as initiating the circulation of underground waters, which made concentration and deposition possible.

Again, they have been looked upon as the direct carriers of the precious metals from the interior of the earth, beyond man's reach, to the upper crust, where the active aqueous agencies could gather them from the mass and concentrate them in valuable treasure houses within man's grasp.

Careful investigations by Becker on the Comstock lode, and by Curtis in the Eureka district—two of the greatest wealth-producing districts that the world has ever seen—have lent great weight to, if they have not given absolute proof of, the above opinions.

But besides these most interesting relationships these rocks are found in many places as the direct carriers of important mineral deposits. Sometimes these deposits are in the form of distinct fissure veins, of which the Comstock lode is the mightiest and most noted example. But very frequently the deposits lie along belts of "solfatarized" or brecciated andesite or rhyolite, and may or may not be accompanied with distinct gangue minerals such as quartz or calcite. The ore sometimes simply impregnates the decomposed or brecciated zone, or fills directly the spaces between the crushed fragments. Such latter occurrences seem to have been neglected during the earlier days of prospecting, probably because there was no quartz or "spar," or even distinct ore minerals in evidence. This latter is brought about by the surface decomposition of the sulphides and sulpho-salts leaving an impregnation of silver chlo-

ride, frequently not distinguishable by the eye. But such localities are being found now, and have already given rise to several prosperous, if not large, camps such as the Olinghouse and Wedekind districts in Washoe County. Tuscarora in Elko County has been worked for many years, the district having attracted attention through its placers, but its veins were afterwards found in the andesite, carrying the various complex silver ores accompanied by pyrite with quartz or calcite as gangue, or deposited directly in the decomposed country rock. Tonopah is one of the most recent of such districts.

Silver ores appear to predominate in these volcanic rocks, but some with half or even practically all their value in gold occur. Copper veins occur under similar circumstances, and are attracting more attention now than formerly. Locally, the basic volcanic rocks contain iron deposits of small extent which have been occasionally used as a flux in smelting operations. Some important deposits have been found associated with, or lying in rock called quartz-porphyry. This rock has often been considered as pretertiary but without strong proof, and in some cases, if not all, appears to be dikes or other intruded forms of the tertiary rhyolites. As examples of ore deposits in such rocks may be mentioned the ores of Adams Hill, near Eureka, certain occurrences in the Hawthorne district, and some of the deposits near Virginia City.

The Quaternary rocks include certain lavas; mainly, if not all, basalts, with horizontal lake beds of not great thickness in many of the valleys, and alluvial and glacial deposits of various kinds. It is to this period that the glaciers of the higher ranges and the great lakes, whose shore lines form a striking feature of many of Nevada's valleys, are referred. The most important of these lakes has been named Lahontan, and occupies a great area of the Nevada basin. It was rather broken in form and contained several ranges as islands. While it did not reach the magnitude of Lake Bonneville in Utah, it was yet a great body of water of some 8,422 square miles, surface area. It never found an outlet. When it gradually died away, as was to be expected, it left more or less extensive saline deposits. These deposits have also added to the wealth of the State. They occupy many of the valleys, but especially those on the western border, from the Black Rock and Smoke Creek deserts on the north, to the California deserts on the south. The most important of the salts obtained are probably borax and soda, but common salt, sulphate of soda, nitrates and other salts occur, and have contributed to the general value. Near Ragtown the soda was obtained from the waters of two small lakes, but the deposits are generally dry, though the surface of some may be dissolved by the winter playas—those temporary lakes already briefly described—and redeposited when the dry season returns.

Gypsum has been found at several points, and is now being quarried near Mound House. It is not certain with which of the later geological groups it should be connected.

Manganese deposits occur in some of the Quaternary material as small beds or concretionary deposits, but, so, far as known, have never been worked economically.

The basalts are not commonly of great extent. Some flows have, indeed, produced "table mountains," but they are very much more restricted in volume and in distribution than the andesites. So far as known they do not carry valuable deposits. Their outpouring, however, has been looked upon in some cases as having given rise to hot springs and solfataric action, which is in many of the localities still continuing. Steamboat Springs is a well-known case in point. While many of its older vents have become extinct, considerable activity still continues along the lower belt of fissures, and sinter is still depositing. Here were situated, once, quicksilver mines, and cinnabar can still be seen where it has been deposited in the decomposed country rock by the heated waters.

Sulphur has been found at several points in Western Nevada, but has proved of commercial importance only at the Rabbit Hole mines on the eastern border of the Black Rock desert. These deposits owe their existence, apparently, to solfataric action connected with the extrusion of lavas.

Many of the hot springs, however, for which Nevada is noted, seem to be undoubtedly connected with the faulting along the great mountain crust-blocks. This faulting has continued down to very recent times, and

has given rise to abrupt and high escarpments, as already described, as characteristic of many of the Nevada ranges. But the majority of these springs are simply hot water springs; and, while a number of them contain sufficient salts to be of medicinal value, they are not actively depositing sinter or any other mineral precipitate, such as characterizes the Steamboat Springs or the old Rabbit Hole solfataras just described.

Along the shores of the ancient Lake Lanontan tufa deposits are common, and in places are quite thick. They form very striking and picturesque groups resembling walls, buttresses and towers. They have been found too impure to utilize for lime.

The placers of the Quaternary have been of very great value to the State. These alluvial deposits in the ravines and canyons on the mountain sides and flanks have yielded large quantities of gold, especially in their earlier days, and have even performed a greater service in leading man to the rich lodes from which they were derived.

The Tertiary and Quaternary have yielded much stone—sandstone, tuff and trap, and also sands and gravels for building purposes. These rocks form notable features in the towns—as Carson, Virginia, Eureka, Elko, Reno, etc.

We have now completed our survey of the general geological features of Nevada. In accordance with my plan of presenting the general geological characteristics first, and then their broader relationships to the prevailing economic deposits, I have not touched upon all of the kinds of valuable deposits that have been, or may be, found in the State. There are many other things which have proved and will surely yet prove of interest and value, such as nickel and tungsten ores; turquoise, garnets and other precious stones; mica, kaolin, etc.

A study of some of the later camps which are continually springing into existence, and the history of their development, shows that the early prospecting was partial and imperfect, and that the ground must be gone over again with a broader knowledge of the conditions and possibilities. Nevada will never again witness the feverish—the mad times of the old bonanza craze, when mining was the wildest, the most fascinating form of gambling, that caught all in its powerful dragnet, baited with glittering visions of millions in silver and gold; which, while it produced a number of rich to maintain the excitement, kept the majority an unstable, shiftless crowd, now raised to the clouds in temporary riches, and now crushed to the earth in poverty—no repetition of such times can be expected—but for straightforward, rational, business mining, the State is going steadily forward, and has, undoubtedly, a long and prosperous future.

On motion of Mr. Dern, of Utah, duly seconded and carried, the Congress took a recess until 2 o'clock P. M.

The Congress re-assembled at 2 o'clock P. M.

The secretary read the following communications:

Lewiston, Idaho, July 25, 1901.

E. L. Shafer and W. L. Kendal, National Mining Congress, Boise, Idaho:

I regret to say that the River and Harbor Committee will be unable to visit Boise. Our examination of harbors continues until Friday night at Portland. We send greetings and hope that the Congress may prove a pleasant and profitable occasion for all who attend it.

T. E. BURTON, Chairman.

Boise, Idaho, July 25, 1901.

To the Officers and Members of the International Mining Congress:

The citizens of Boise city extend to you a cordial invitation to attend the public reception to be given at the Natatorium this evening,

from the hours of 8 to 11 o'clock, to the members of the Mining Congress and all visitors.

Very respectfully,

W. ALEXANDER,
Mayor.
F. W. SHUIT,
Chairman General Entertainment Committee.
B. F. OLDEN,
President Chamber of Commerce.
RALPH P. QUARLES,
Chairman Executive Committee.

On motion of Mr. Ewing, of Arizona, the Congress unanimously voted to accept with thanks the invitation extended to them to attend the reception.

MR. FREEMAN, OF MONTANA: Mr. President, at the request of Secretary Mahon, I will read a resolution which was presented by the gentleman from Montana, Mr. Stephens, with reference to the Mineral Land Commission:

Whereas, W. S. Stephens made a motion at this Congress calling upon the next Congress of the United States to amend the law creating the Mineral Land Commission, and

Whereas, It was ordered by this Congress that said Stephens formulate a resolution in regard thereto, to be read and presented to the Committee on Resolutions, and therefore, in compliance with said order, the following amendments are suggested:

Amend Section —— of the Act of February 26, 1895, by providing that no appointment shall be made without the publication of a notice in the district for 30 days, stating that an application for appointment has been made by certain persons, stating their names, and calling upon all persons interested to show cause within a specified time why such appointment should not be made.

Add to that part of Section —— which provides that classification shall be made by said commissioners in such manner as the commissioners may determine, insert the words "Provided the commissioners shall not have power to report less than a full township at any one time."

Amend that part of Section —— which requires the commission to report, by a proviso to the effect that they shall not report once a month, unless a full township has been examined and classified during such month.

PRESIDENT PRINCE: It will be referred to the Committee on Resolutions.

A special order, under the rules, takes precedence of everything else this afternoon; the rule being the selection of a place for the meeting of the succeeding Congress, shall be the special order at the opening of the afternoon session on the third day.

That subject is now before the house.

MR. GRAYSON, OF OREGON: Mr. President, I name Portland, Oregon, as the proper place to hold the next Congress.

MR. CAMP, OF TENNESSEE: Mr. President, I name Knoxville, Tennessee.

MRS. HASKELL, OF MONTANA: Mr. President, I have been selected by the delegation to which I have the honor to belong to place in nomination as the meeting place of the next International Mining

Congress the most marvelous city in the world; a city which in the annals of history has no counterpart. I refer, as you all know, to the city of Butte, Montana.

I refer, as I have said, to the most marvelous city in the world. In the year 1882 a shaft about 300 feet deep was sunk in the city of Butte. It penetrated an enormous body of rich copper ore, and from that day to this the greatest mining camp in the world has attracted the attention of all nations. Since 1882, over the limited area of a little less than two square miles there has been extracted from beneath the city of Butte the enormous sum of $475,000,000. (Applause.) It is a city of smelters, in which the furnaces never cool. It is a city of great concentrators, where this Mining Congress, composed of engineers, experts, and scientific mining men may see in operation the largest mining plants on the face of the earth. We have the largest smelters in the world, and just now, as we have nobody to surpass but ourselves, we are constructing in Anaconda, a little more than a half-hour's ride from the city of Butte, a single smelter which is to have a daily capacity of 6,000 tons.

Now, ladies and gentlemen of the International Mining Congress, if you will come up to Butte City next year we will not only present to you the keys of the city, as the mayor of Boise has so kindly done, but we will present to you the keys of two cities, one more than 2,000 feet beneath the surface of the earth; one above ground and one below ground; a city in the depths of the earth, where from 15,000 to 18,000 men every day in the year descend to extract the precious metals. We will show you nature's treasure house, the richest spot on the face of the earth. We will show you the most modern appliances of mining machinery for the crushing and reduction of ores that money and genius can furnish.

If the delegates to this Mining Congress would see their fondest theories practically applied, and carried out upon a gigantic scale, let them come to Butte City, Montana.

Furthermore, I have to say to you that Butte City has four transcontinental lines. If you come from the south or southeast, from St. Louis, Kansas City, or Omaha, you may take a through sleeper to Butte via the Burlington, and travel in palace cars all the way. If you come from the northeast, from St. Paul or Minneapolis, you may take your choice of the Great Northern or the Northern Pacific railroads, and travel in a through sleeper to the city of Butte, upon some of the finest trains running on this continent. If you come from the northwest, from Portland in the great State of Oregon, or from Washington, you may travel in a through sleeper, and have your choice of two railroads to Butte City. If you come from San Francisco and the southwest, you can travel via the Central Pacific to Butte, with only one change of cars at Ogden.

We are a people where great enterprises are formulated and carried into immediate action. We are a city of great hotels, one recently having been completed which contains more than 200 rooms, and another enormous hotel recently remodeled from top to bottom. Another great hotel is to be remodeled between now and next summer; and I say to the members of this Congress that there is not a day in the year when thousands of people are not entertained at the hotels of Butte, and nobody ever knows they are there. We have hotel facilities, and restaurants to spare, and you may come in full force to the greatest mining camp on earth, and there will be room for all.

You may visit our school of mines, which is fostered by the State of Montana, where the sons and daughters of these United States may take a thorough course in metallurgy, assaying, mining and engineering, and in every branch pertaining to the great industry of mining.

Right here in the Montana delegation sits the personal representatives of Senator W. A. Clark, and his enormous interests of the Montana Ore Purchasing Company, with its plants and great smelters; the personal representative of the Amalgamated Copper Company, which, as I have told you is now constructing the largest smelter on earth. (applause); members of the Silver Bow Club, which in its personnel represents more than $150,000,000; the owner and proprietor of the Montana Iron Mines Works, and the representatives of the great mining machinery companies of Fraser & Chalmers, of the Gates Iron Works, and

the E. P. Allis Company, of Milwaukee. This delegation represents in this Congress more than $500,000,000, and these gentlemen have been mingling with you in the lobbies of the hotels, and attending the deliberations of this body, and you would never know who they were if I had not volunteered the information. (Applause.) They have been sent here by the great companies they represent to invite you to visit the works and plants of their companies, and they have honored me by permitting me the pvivilege of addressing this Mining Congress in their behalf.

Also in this delegation are members of the faculty of the Butte School of Mines, and representatives of all the mining publications issued in the city of Butte.

I understand that there is a resolution that the city which is to have the next Mining Congress shall deposit $3,000 inside of 30 days. Gentlemen of this Congress, the city of Butte wants you to visit them, and if it is necessary they will deposit $30,000 inside of 30 minutes. Butte never does things by halves.

In behalf of the great State of Montana, than which there is none on the face of the earth richer in natural resources, in behalf of the active, generous, intelligent people of that great State, in behalf of this delegation and the gigantic interests it represents, in behalf of the Silver Bow Club, the Butte Citizens' Association of business men, in behalf of the Overland Club, and the municipal organization of the city of Butte, I cordially extend to this Mining Congress an invitation to hold your fifth session in the most marvelous city of the world, located at the base of one of the grandest mountain ranges in the whole Rocky Mountain system; and I assure you, members of this Congress, and gentlemen of this convention, that if you come to Butte you shall see your fondest theories of mining crystalized into actual, practical every-day facts. We will show you our plants; we will tender to you the welcome of the most generous city of the Northwest; and I assure you on behalf of every citizen of Montana a most royal welcome. (Applause.)

MR. HECKLER, OF PENNSYLVANIA: Mr. President, and ladies and gentlemen; as an humble delegate to this convention, bearing the commission of the great old commonwealth of Pennsylvania, in connection with my worthy colleagues, I arise to second the nomination of that magnificent city, which has just been so eloquently presented by the accomplished representative of Montana. (Applause.)

Being a citizen of the Atlantic coast, and only occasionally visiting the Pacific northwest, I am seriously handicapped by lack of information, and I am unable to say to my fellow delegates, "There is Butte, behold her!" But, recognizing not only the desirability, but the actual necessity of having the deliberations of this International Mining Congress held at a place which is large enough, and which is hospitable enough, and which is energetic enough to entertain the delegates, gathering, as they do, from all parts of this glorious country, Pennsylvania is unanimously for the city of Butte. (Applause.)

Believing that there is more energy in that wonderful camp, which has just been depicted, believing that there is more go-aheadativeness, believing that the men are more of that Western hustling character, which is so graphically shown here in the West, and believing that the women are more fair there, and more sociable than in any other place in the West—of course, Boise City excepted—Pennsylvania gladly, cordially, joins the request of Montana, and asks that you take the next convention to the city of Butte, and Pennsylvania believes that this convention will make no mistake. (Applause.) I second the nomination.

MR. EWING, OF CALIFORNIA: Mr. President, and ladies and gentlemen of this convention: In behalf of those engaged in mining and the mining interests of the Southwest, covering the country of Northern Mexico, Arizona, Nevada and California, I present the name of the city of Los Angeles, California, as the place to hold the fifth session of this Congress.

It is in the interests of this Mining Congress that its next session should go to the southern country, and the Pacific. If you will grant us this we will promise the most successful session of the Congress that has ever been held. Denver, Salt Lake City, Milwaukee and Boise have each had a session, and I am pleased to see the growing interest this shows in mining matters.

Los Angeles is favorably situated, having so many railroads entering the city that a cheap rate can easily be obtained for a terminal point. I can promise you in behalf of the mining associations of that district, and the city of Los Angeles, ample funds for taking care of the convention. I need not state that we can put up that $3,000; we can put it up in a minute and a half, if you want it. We don't say we can put up $40,000 in a minute, but we have got just about as rich men in Los Angeles as anywhere else. Nearly all the rich men have come down there. Senator Clark and all the rich men of Butte dislike Butte so much that they come down there and sleep among the angels. (Laughter and applause.)

I call your attention also to the fact that Senator Clark's great property, his great interests that are paying as high as $2,500,000 a year alone in the southwest, do not lie in the north.

Everybody admires the push and drive of these great mining companies of the north, but we, in the South, have some things, and we say to the delegates that have been in this Congress year after year that we have always been ignored, we are left out. We are just as large a country, we produce one-third of all the precious metals of the country, and we propose to have the convention down there, if you will grant it to us; and we can promise you a royal welcome, not only for the mining interests of the southern district, but the hospitable people of the city and country.

I will also promise you that all who can come shall not only have a grand time, but one of benefit to you all. The city is prepared to take care of many thousands of outsiders. They have had 30,000 at a time there; and the hotels are so much grander, so much better in every way, and every facility for getting over the city is so much in advance of all these other countries—but I make no plea in behalf of the city of Los Angeles. I do not know the date when it was formed; it is a whole lot older than I am, and I am not a spring chicken. (Laughter.) Perhaps no city in all our country can offer you so many inducements to come there. Everything shall be thrown open; the whole country; the peach orchards, and every other orchard. Our friends here some of them say there are no great orchards down there, and no mines to keep them going. Why, they can all throw fruit away, and still have more fruit than they can use and sell. Wine? They will give you cases and cases to haul home with you. (Laughter and applause.) They will entertain you in the most royal manner in the world. We propose to make this Congress great. Then treat us as we should be treated. Let the Pacific coast have a chance, and we will go back to the Rocky mountains with you, and all feel happier and better and richer for having come among us.

I want to introduce my friend and colleague here, who will say something in regard to the city. I do not propose to take up the time of this convention by any further remarks on the subject, only I would ask the secretary to read two or three telegrams and resolutions before Mr. Townsend makes his remarks.

The secretary read the following communications:

Los Angeles, Cal., July 24, 1901.

To the President of the International Mining Congress, Boise, Idaho:

Commercial, industrial and financial interests strongly urge your body to accept the invitation to hold your next Congress in this city. We believe no better selection could be made. Our fame for hospitality and the ability to entertain large assemblages will be fully sustained if you accept.

MERCHANTS & MANUFACTURERS' ASSOCIATION,

F. J. Z. HANDLER, Secretary.

Col. Thomas Ewing and Los Angeles Chamber of Commerce, Delegates to International Mining Congress, Boise, Idaho:

Los Angeles Chamber of Commerce tenders invitation to Interna-

tional Mining Congress to hold its next convention in Los Angeles, and will assist and co-operate in every way possible.

A. D. CASE, President.

Los Angeles, Cal., July 17, 1901.

International Mining Congress, Boise City, Idaho. Gentlemen:

In behalf of the commercial and manufacturing interests of Los Angeles, and of the Merchants & Manufacturers' Association, we extend to you herewith an earnest and hearty invitation to hold your next Congress in this city.

According to recently published reports of the State Mineralogist, Los Angeles County ranks second as a mineral-bearing county in the State of California. Southern California has long since established a well-earned reputation by her hospitality and great advantages for entertaining large gatherings; and we feel justified in assuring you that your reception, if you honor us with your next Congress, will be as spontaneous and hearty as any we have ever given. Respectfully,

C. C. REYNOLDS, President.

F. J. Z. HANDLER, Secretary.

MR. TOWNSEND, OF CALIFORNIA: Mr. Chairman, ladies and gentlemen of the fourth International Mining Congress, fellow-workers and friends. In behalf of the City of Los Angeles, California, through its representative commercial organizations, the Chamber of Commerce, the Merchants and Manufacturers' Association and its citizens, I tender to you our most heartfelt and sincere invitation to convene your next annual session of this Congress in our city.

In extending to you this invitation, we do so with full knowledge as to our ability to take care of each and every one who may come to us as a delegate. Our hotel accommodations are practically unlimited, and are of the best. Our people will appreciate the honor of your presence, and, as they are known the world over for their hospitality, I am hereby authorized to extend to you the promise that each and every one who enters the gates of our city as a delegate shall receive the attention of our citizens, and his stay with us shall be one of pleasure and long to be remembered by him.

The Land of Sunshine awaits your coming, and you have but to accept our invitation and come and eat of our oranges, olives and fruits, and to those who desire we offer wine. Come and sit beneath our vine and fig tree; view our snow-topped mountains; gaze on our verdant orange groves, and pluck the golden fruit. Rest on the beach sands of the Pacific and bathe in its limpid waters. Feast on the firsh of the deep, and ride on its curling waves to its far-famed and beautiful Island of Catalina.

The city of Los Angeles is the railroad terminus of a number of transcontinental lines, and we can promise to you that the Transcontinental Passenger Association will give to you reduced fare, so that the expense of the trip will be comparatively small; our commercial bodies, in whose behalf I invite you, are strong and will make it their duty to assist your Committee on Passenger Rates in securing transportation at the lowest rate possible.

We have halls for public assemblages that have ample and comfortable seating capacity for thousands, and our balmy air, be it summer or winter, assures you of absolute comfort while carrying on your deliberations.

Owing to the vast number of wealthy travelers of pleasure who visit our city and who will be attracted by the brilliant, and I may say magnificent mineral display which we can make, we will draw the attention of many thousands to our cause who have never before evinced any but a passing interest in the great mining industry of our country.

Therefore, Mr. President, I, as a representative of the Golden State; that State which poured into the lap of our country in her time of need and peril the riches of her sands; that State which first disclosed to the eyes of the world the fabulous wealth of our Western States, and, as a

representative of the people of the great city of Los Angeles, ask that you select as the place for holding the fifth annual session of the International Mining Congress of 1902 our city of Los Angeles.

I thank you, Mr. President, ladies and gentlemen of this Congress.

MR. FITZGERALD, OF COLORADO: Mr. President, I have the honor to come from the little State of Colorado, which has one county that produces more gold than the State of California—one little county. However, that is not the question to be discussed before this Congress.

This is an association of mining people, organized for the purpose of discussing matters pertaining to mining, not pertaining to angels, or anything of that kind, because we do not belong to that class, as a rule. (Laughter and applause.) I have spent most of my life in mining camps, associating with mining people and prospectors, and I have never discovered any angels running around that part of the country; therefore I don't believe we would be able to find delegates to send who would fit the occasion.

Now, it seems to me if we are going to have a mining congress we should have it in a mining country. This congress invites people from every state to come in and participate with us in these deliberations; and it is a healthy omen to this Congress that so many places are inviting us to come with such energy and enthusiasm. But we should meet in a mining country, where we can see mining from the beginning until the finished product is sent to the mint.

Therefore, on behalf on the Colorado delegation—

MR. MOORE: No, no.

MR. FITZGERALD: All but one, I second the selection of Butte.

MR. RICHMOND: Mr. President, I occupy rather a peculiar position on this question, somewhat similar to the man on his deathbed, who was being administered to by the clergyman, who asked him if he knew where he was going. He said he didn't give a cuss; he had friends in both places. I am in that same condition on our delegation. I am not going to get myself into the fix that my friend from Colorado did, because I know that our delegation is divided. Some of us want to go to Los Angeles and have the privilege of associating with the angels; and I presume those who wish to go to Butte want to get a taste of what is in store for them in the hereafter. (Applause.)

Four years ago we met in Denver; Salt Lake City, Omaha and Los Angeles were candidates for the session of the coming year. Salt Lake was the choice; and at that time it was tacitly understood, if not formally promised, that the next annual session should go to Los Angeles, and those who were present at that time, I think, will bear me out in that statement. Now I think Los Angeles should have it. I appreciate more than I can tell the most eloquent address that we received from the lady from Montana. Nothing that she said about the people of Montana and of Butte was exaggerated—of their resources, of the manner in which they will take care of us, of the money they will spend on us, of the sights they will show us—everything is exactly as she said it, if not more so. But the question is now whether we have the time to visit Montana, to examine the mining enterprises, the mining plants, the reduction plants, or whether we are going to meet for the purpose of discussing mining subjects, and subjects that appertain to the commercial economy of mining. We can discuss that subject just exactly as well in Los Angeles as we can in Boise, Salt Lake, or Denver, in the heart of the Rocky mountains. We have delegates here from the far East who have invited this convention to meet with them there. There is no reason under the sun why those gentlemen should not be entitled to this convention; but at the present time it looks too inopportune to visit any other mining state. We have been close to Butte; we are within five or six hours of the city, and now it is my opinion that it is the best interest of this Congress not to meet at a place so close to this.

Another point that has been touched upon, Mr. President; California is the mother of our entire Western mining interests. It was from that glorious State that the sinews of war came to us, and in that State we have our representatives from every State in the Union. Those peo-

ple come to us now and ask us to come out there and meet the descendants of our own forefathers.

I believe, Mr. President, that in this case it is our duty to this Congress and to the industry that it represents to go to the mother lode of the country and hold our next session. (Applause.)

MR. CARRERA, OF NEW MEXICO: Mr. President, I am in favor of Los Angeles. Business is a very good thing and pleasure is a good thing, but the two combined are much better. When I am going to attend a business convention if I can mix business and pleasure I am going to do it. I would like to get under the fig trees and pull down a fig once in a while. I don't say that all the people there are angels, but the women are; and, as the angels have a good deal to do with paradise, I would like to go and see a country that is so intimately related to Paradise. I want to say to you that there is not a sweeter spot on earth than Los Angeles.

MR. MOORE, OF COLORADO: Mr. President, on behalf of, I think, a large proportion of the delegation from Colorado, I want to second the nomination of Los Angeles. My sentiments have been expressed by the gentleman from Utah, and my immediate predecessor. I agree with them that angels are awfully nice company; and if I could get used to associating with them in this world I want to do it; it won't come so hard in the next.

But, joking aside, this is an international Congress, and if we keep it inside the Rocky mountains it is going to lose its international character, and become a local affair. It seems to me that we ought to take it away from local influences and maintain its international character.

Mr. McANTIRE, OF MISSOURI: Mr. President, I am told in confidence by these people here—I didn't know that they represented the vast interests and the vast wealth that the lady from Helena said that they do; but they have told me in confidence that, instead of giving only the keys of the city, they will give to the delegates to this convention the keys of a mine, so you can go down and examine our products; you can go down and see that which, perhaps, to the miner from all but these mountain states is a matter of interest, and one that they desire to look into. These men from the east and south invest in the gold, silver and copper mines of the West, though they never saw them; and if they are selected as delegates they want to come to a city where they can see not only the practical operation of the machinery, but the practical operation of the mines.

I believe I voice the sentiment of every delegate from Missouri when I say it gives me pleasure to second the nomination of Butte.

MR. DERN, OF UTAH: Mr. President, I believe the location of the Congress is the most important question which comes before our meeting at this time. We should be very careful in the selection of a point where we believe that we can get the largest representation. Two years ago when the question of the place for the next Congress came up for consideration the same argument was advanced which has been made here, as to taking it out somewheres on the prairies. People don't go to see mines and machinery and the like. They can discuss mining subjects in the east just as well as in mining states. I ask you, gentlemen, who have kept track of it, what success have we had? If you want a live, active mining congress and have a good meeting, take it somewhere where everybody is interested in mining. Take it to a mining town and you will have success. Take it to a city like Butte, where everybody is interested in mines and the welfare of mines, and I assure you we will meet with grand success. I second Butte as the place for holding the next Congress. (Applause.)

MR. KENNEDY, OF OHIO: Mr. President, as I look out upon this vast sea of upturned faces of intelligence and high foreheads, intermingled with so much beauty and female loveliness. I am constrained to ask myself, Where am I at? (Laughter.) I had supposed I was attending an annual session of the International Mining Congress; but, after listening to the eloquence with which we have been favored for the

last ten minutes, I think perhaps I am in the wrong pew; that I am in a mutual admiration society; an institution arranging for a junketing trip to some kind of a health resort, or to the fruit-growing sections of this, our own beautiful Arcadia of America,

Now, in my judgment, this is a business organization; we are here in the interests of the mining industries of this country. And if we would do what would most redound to our own interests, in my judgment, we would take this convention to Butte, Montana. We are mining men, not fruit-growing men. We are looking after our interests; we are seeking for information along the lines of mining and mining operations, and we are going to find just what we seek if we go to Butte.

MR. LOUDERBACK, OF NEVADA: Mr. President, I wish to second Los Angeles on the part on the Nevada delegation. We believe that Montana is so close to Idaho that the Congress should be taken to some mose distant place in order to appear more representative of the different parts of the country, and so secure the interest of the greatest possible number of people. It would be well to make all of the people feel that it is not a private affair; that it is not locked up in one or two states, but that it is an affair for the whole people of the United States to interest themselves in. The representative from Butte laid great stress on the fact that that city is one of the greatest mining camps on earth. If we were always to select mining camps it might be possible that the Congress would meet in the same place year after year. California has great mining interests, although she may not stand as high in the scale of States as she once did. California is noted for the enthusiasm with which it carries forward projects in which it is interested, and for the hospitality it displays. The presidential party lately traveled through California, and the hospitality shown them was so great that one of the party afterward said that the only change of program he would suggest was that they allow a few hours for sleep.

Now, I think, if we wish to interest the people in the western part of the country in this movement that we should take the Congress there for at least one session.

MR. VOSS, OF OREGON: Mr. President, ladies and gentlemen: It is my understanding of the proposition that we are discussing the welfare of this Mining Congress, and not disseminating knowledge along the lines that we have been discussing here. Mining is our business; we are not in the business of growing fruits. We like to eat them, and we like to go down to California once in a while and enjoy ourselves with the people who raise them, for they are, indeed, a hospitable people, if there is one on the face of the earth. But there are people who come into these gatherings with papers to read, and open their addresses with the proposition that they don't know anything that they are writing about. As mining men, I think I voice the sentiments of every other mining man in this audience when I say that there is something for us to learn every day of our lives, and we can't learnit too fast, nor become too proficient in our line.

I am in favor of carrying the next session of this Congress into the greatest mining camp in the world. (Applause.) I don't want you to be mistaken about this proposition that I am naming. I don't want this assemblage to take it for granted that I voice the sentiments of our delegation, for I don't know that I do; but I think the greater number are with me on this question. I ask you to come with us to the greatest city of its kind on the face of the globe, and with us learn something about mining.

On motion of Mr. Heckler, of Pennsylvania, duly seconded and carried, the nominations were closed.

On motion of Mr. Flenner, of Idaho, duly seconded and carried, the previous question was ordered.

A vote was then taken by roll call of States, resulting as follows:

Votes cast	121
Butte	80
Los Angeles	41

MR. EWING, OF CALIFORNIA: Mr. President, I move that the vote be made unanimous for Butte.

MR. TOWNSEND, OF CALIFORNIA: I second the motion, Mr. President.

The motion was carried by a rising vote.

The Committee on Resolutions presented the following resolution, with the recommendation that it be adopted:

Resolved, That the earnest and heartfelt thanks of this assembly be, and the same are hereby extended to the several ladies and gentlemen accepting the invitation extended to them to prepare and read papers before this body.

On motion duly made and seconded the resolution was adopted unanimously.

MR. RICHMOND: Mr. President, the committee beg leave to report back to the committee of the whole, with the statement that the committee sympathize with this theme, but do not believe it advisable to take any action other than that of sympathy:

Whereas, The present tariff of freight rates on ores, mining products and mining machinery on various railway lines is unnecessarily high and burdensome and prevent the development and operation of mines containing low-grade ores, and

Whereas, The interests of Western mining districts demand a reduction of said freight rates and tariff sufficiently low to permit the operation of mines producing low-grade ores; therefore, be it

Resolved, That this International Mining Congress approves of the sentiments therein expressed.

The committee simply reports sympathy with the resolution, but with no recommendation.

It was moved and seconded that the resolution be adopted.

MR. FELTHAM, OF IDAHO: Mr. President; the report of the Committee on Resolutions does not present to this Congress what that resolution was. Before this Congress can intelligently take up and vote upon the matter as it was originally presented, I ask that the resolution as originally presented be read, so that I may speak to this assembly upon the matter.

PRESIDENT PRINCE: The reading of the resolution is called for. Is the original resolution in the hands of the committee?

MR. RICHMOND: Mr. President, the resolution was passed up to the secretary.

PRESIDENT PRINCE: The resolution will be read.

SECRETARY MAHON: (Reading). Whereas, The present tariff of freight rates on ores, mining products and mining machinery on various railway lines is unnecessarily high and burdensome, and prevent the development and operation of mines containing low-grade ores, and

Whereas, The interests of Western mining districts demand a reduction of said freight rates and tariffs sufficiently low to permit the operation of mines containing low-grade ores,

MR. FELTHAM: Now, I ask that the balance of that resolution, as it was presented in this Congress this morning, be read without alteration.

SECRETARY MAHON: (Reading) Therefore, be it Resolved, That a standing committee of 15 persons be appointed by the Executive Committee with full powers to confer with railway com-

panies and earnestly solici· them to at once consider favorably a substantial reduction of the present freight rates upon ores, concentrates, fuels, fluxes and all mineral products and mining machinery; and that said committee shall report to the next annual meeting of this Congress the reductions and concessions secured by it from said railway lines.

MR. FELTHAM: Mr. President, as the mover of that resolution, I would like permission to address this Congress from the platform, if I may have the privilege.

PRESIDENT PRINCE: Let the chair state the question, if you please.

The Committee on Resolutions reports a resolution for the consideration of this body. A motion was made that the resolution be adopted. Does the gentleman from Idaho move to substitute the resolution as originally introduced?

MR. FELTHAM: Yes, sir; the original resolution as introduced this morning, and as recently read by the secretary of this Congress.

PRESIDENT PRINCE: You wish to substitute that for the resolution reported by the committee.

MR. FELTHAM: For the substitute presented by the committee.

PRESIDENT PRINCE: Very good. The question is on the amendment to the report. The gentleman from Idaho has the floor.

MR. HUTCHINSON, OF IDAHO: Mr. President, if Mr. Feltham will allow me just a minute—I do not desire to speak anything upon the proposition at all; but if you will yield the floor for me to make a statement before you commence I will be much obliged.

MR. FELTHAM: I will.

MR. HUTCHINSON: Will the president allow me to take the last part of that paper from the Resolutions Committee?

Mr. President, I hope the chairman of the Committee on Resolutions is present because this convention, I think, does not clearly understand the report of the Committee on Resolutions; and I will state for the benefit of this convention that the Committee on Resolutions did do something besides express its sympathy with that resolution. It said: "Therefore, Be it Resolved, that this International Mining Congress expresses its approval of the spirit of the resolutions, and pray that said reductions be made."

A DELEGATE: Is that the form of the resolution or motion?

MR. HUTCHINSON: It is in the formal report of the Committee on Resolutions.

A DELEGATE: Are you moving its adoption?

MR. HUTCHINSON: No, sir. I am not doing anything of the kind. I am stating for the benefit of the speaker who has the floor that the Committee on Resolutions did recommend something besides its sympathy. There is something stronger than sympathy. (Applause.)

This is what the Committee on Resolutions reported: That this International Mining Congress expresses its approval of the spirit of the resolutions, and prays that the reduction be made.

With that statement, so that the Congress may clearly understatnd that the Resolutions Committee did something besides express its sympathy, I desire to withdraw in favor of the speaker who desires to address the convention.

MR. FELTHAM: Mr. President, and members of this Congress: I once heard a story of a scene in a passenger car, where a poor little child was crying and begging for assistance to enable it to return to its

home. The people filed by, said a kindly word to the child, and expressed sympathy for it; and finally a great square-shouldered fellow, with callous upon his hands, and the look of an honest man in his face, stepped upon the car seat and said to that crowd of people: "Yes, you are all in sympathy with this child, you feel for this child; now how much dou you feel for it? How many dollars worth of sympathy have you got for this child to send it on its way home?"

This Congress, from its very opening to this moment, has been ready with expressions of sympathy and friendship and favor to the prospector, to the miner, to the operating man who digs the mineral from the earth and puts it into the market of the world. A speaker upon this stand, the first day of the Congress, read a paper, in which he declared that a crying evil of the condition of this country was that the profits of the miner's industry were eaten up by the transportation companies. If he did not express it in that language, that was the intent and purport of his paper.

I stand here in behalf of the producer, offering a resolution before this body, to make this matter tangible and certain that is uncertain and very indefinite at this time. A resolution was presented this morning by me, and was sent to the Committee on Resolutions. The committee has returned that resolution so garbled and so distorted out of its natural function, out of its true and real function, that it does not bear the countenance that it started with. It has changed color, complexion and form. It says, We are heartily in sympathy with the resolution: we are heartily with the sentiment therein expressed, but we can't do anything for you.

Why, the vital question before this Congress today is to benefit the miner. If it is not, then I have come here under a mistaken idea, and I believe dozens of people have come here under a mistaken idea. If you are not here for the purpose of doing something that is tangible and beneficial to the producer you have come here for naught. If you have come here to sing high-sounding praises, if you have come here to throw bouquets at the prospector, then I say you have come here in vain.

I ask in this resolution that a committee of 15 be appointed, it said by the Executive Committee. I was misinformed upon that matter. I understood there was an Executive Committee of this Congress.

PRESIDENT PRINCE: There is.

MR FELTHAM: There is one? Well, then I was just informed again that there was not.

PRESIDENT PRINCE: Certainly there is an Executive Committee.

MR. FELTHAM: For that reason I was drifting a little bit. But the resolution asks that a committee be appointed by the Executive Committee, with power and authority to take up this matter, discuss it with the railway companies and the transportation companies, present the matter from the standpoint of the miner to them, and ask for a reduction of freight rates upon ores and mining products. The committee admits that that is a glaring evil, and say they are in sympathy with it.

Let me specify more particularly. We are in the very heart of the mountain system; we have no competing railway lines. About you on every hand you have mining districts in an embryonic state. Thousands of tons of ore have been exposed upon the surface; thousands of tons are prospectively near the surface, and not one ton out of this capable of shipment. What is the matter? Why, the matter is simply this: That the tariff of freight rates is so high it is utterly impossible to get it out of this country; because we have no smelters, because we have no means for the reduction of our low-grade ores our entire country is kept back, and we do not have the development we naturally would have under favorable conditions.

Now, I believe, as a prospector and miner, that the railroad company does not thoroughly understand the situation, or they would change the rates. And the object of this resolution was to have a standing committe of 15 persons, or more, if you see fit, select one from each of the mineral States if you see fit, selecting one from each of the individual

States, so that the correspondence may flow from each State as a unit, so that they may work in perfect unison each with the other throughout the mineral-producing districts, so that they may apply to the individual railway companies for a general reduction, a reduction which will make it possible to send the ores of this State and other States to the markets of the world, to the smelters, to plants where they can be profitably treated for the miner as well as for the smelter owner, and all people that have to do with the product.

Isn't that a tangible question, isn't it the real question, isn't it the live question for you prospectors?

I see men right in this audience now who are owners of claims who are not shipping a dollar's worth of ore; I can call their names by the dozen in this country; they have claims that have thousands of tons of sulphurets carrying galena, iron pyrites, carrying gold and silver, and not shipping a dollar's worth of ore; and I am seeking by this resolution to put into existence an actual, tangible working force that will bring that matter fairly and squarely before the railroads of this country and ask them in all candor to do the right thing by the prospector and the producer. Is it wrong? I would like to know what is the reason that this committee turns down a proposition like this. Why, that declaration fell on my head like a thunderbolt. I have stood in the court room when the jury brought in its verdict, a verdict in which I was personally interested, sitting there as an advocate, or as a party interested in the financial result of a case, and never in my life did I feel the weight of a blow deeper than when I heard the report of the committee that refused to act directly in the interests of the people that are here represented. I do not understand that this is a convention of railroad men: I do not understand that this is a convention of capitalists, who are speculating on the resources of this country. I understand that this is a convention of miners, and people who are interested in mining, interested in taking the raw material from the bowels of the earth and putting it into the markets of the world; and if you are why not pass this resolution? Why not carry this out? I say you have a right, this convention has the authority, to create any committee, standing or temporary, that will do any work that subserves the purposes of this Congress. Why not? That is what we are here for.

I am a member of this Congress, and I am a prospector, and I have a right to be heard upon this floor, and that is why I am addressing myself to this Congress, asking that they pass this resolution in the interests of this and adjoining States. I ask that it be done. I am willing to do my part, to help along that line; and there are dozens in this convention who are willing to extend all the assistance in their power to bring about the desired result. Why not?

I say to you, ladies and gentlemen of this Congress, in all candor, it is right that this resolution should be passed. If it does not conform in every feature to what you consider to be right, change it, reform it, but sustain the principle, sustain the proposition as it is stated; sustain the effort to organize effective effort in this direction. The fault of this Congress here today is that it is a conglomerate mass, made up of somebody from somewhere, with no distinct entity, no distinct plans—

PRESIDENT PRINCE: Your time is up.

MR. FELTHAM: I thank the Congress for the opportunity to be heard.

PRESIDENT PRINCE: The question is on the amendment offered by the gentleman from Idaho to strike out the resolution reported by the Committee on Resolutions, retaining the preamble, and inserting the resolution as he originally introduced it. Are you ready for the question?

MR. MOORE, OF COLORADO: Mr. President, that resolution was very carefully considered by the committee when it came before them. The gentleman who has just spoken is quite mistaken in thinking that we laid that to one side and did not consider the principle. It seems to me that the resolution which has been proposed by the Committee on Resolutions does conform, not in sympathy merely, but contains an

absolute and strong approval of the principle contained in the original resolution. It seemed to us in the committee that the fact of fifteen—or appointing a committee of any kind as a third party to deal between the producer and the transporter was not good policy, not in accordance with sound business principles. It seemed to us, therefore, that if we did affirm our active sympathy, and strong approval of that principle, it would be as far as we could go.

I am, therefore, not in favor of the amendment.

The amendment, upon vote being taken, was lost.

PRESIDENT PRINCE: The question is now on the adoption of the report of the committee.

The chair takes the liberty of suggesting to the chairman of that committee, if he is present, that the resolution, as reported, refers to something that does not exist. It says that this International Congress expresses its approval of the spirit of the resolutions. There are no resolutions; there is nothing but a preamble.

MR. FITZGERALD, OF COLORADO: Mr. Chairman, I move to lay the preamble on the table.

PRESIDENT PRINCE: Of course the chair will put the motion on the report of the committee, but it really ought to be put in a little different shape.

On being put to vote the report of the committee was not concurred in by the house, the motion to adopt being lost.

Secretary Mahon read the following report of the Committee on Permanent Organization:

To the International Mining Congress, in convention assembled: Your Committee on Permanent Organization reports the following recommendations:

1. In future, only such as have fully paid all dues up to annual meeting of 1902 (payable in advance) shall be eligible to vote upon any question relative to officers and organization.

2. Suggests a call of those present by the chair to enroll their names as permanent members.

3. Future meetings shall be held beginning the first Tuesday in October and continue not to exceed five days.

4. The following committee to draft constitution and by-laws to present to next meeting:

Col. Thomas Ewing, California; E. L. Shafner, Ohio; L. M. Bradley, Illinois; W. B. Heyburn, Idaho; Albert Kleinschmidt, Montana.

5. That the secretary receive $1,000 per year from the treasury for salary and expenses.

6. The Executive Committee to be Messrs. Ewing, Shafner, Kleinschmidt, Bradley and Heyburn.

7. A Committee on Transportation of three members, Messrs. Ewing and Shafner to select the third member from Colorado.

8. No State to cast more than 10 votes.

9. We recommend the following officers for the next year: President, L. Bradford Prince, New Mexico; first vice-president, E. L. Shafner, Ohio; second vice-president, J. T. Grayson, Oregon; third vice-president, Clarence E. Allen, Utah; secretary, Irwin Mahon, Pennsylvania; treasurer, E. C. Camp, Tennessee; sergeant-at-arms, Willard White, Massachusetts.

PRESIDENT PRINCE: This report includes so many subjects that I imagine it will have to be taken up in sections. The first clause of

the report, as the chair understood it, is an amendment to the constitution, and is not in order.

MR. DERN, OF UTAH: Mr. President, unless there is some objection it would not be necessary to take it up in sections.

In order to properly bring it before the house, I will move the adoption of the report of the committee.

Motion seconded.

PRESIDENT PRINCE: There are two portions of the report that are entirely unconstitutional. It is impossible to act on the first clause; it is an amendment to the constitution, and has not been proposed for one day. That proposes an Executive Committee of more members than are provided for in the constitution, and more than can be elected.

MR. WHITE, OF MASSACHUSETTS: Mr. President, as a member of that committee, I dare say that no member of the committee had any idea that any constitution had ever been adopted; therefore we made certain recommendations for the government of this body in the future. We have not been able to discover from the president, the secretary, or anybody, that there is any constitution or by-laws of this Congress. That was the unanimous result of our opinion in the meeting of the committee today.

PRESIDENT PRINCE: The chair would be glad to permit the consideration of any of these matters, but they are absolutely precluded by the constitution as it stands, as to the clause I have spoken of. The constitution was the result of the greater part of the labor of the last session. It is under the title "Organization." It is not printed there in full, but it is in the record of the last Congress. The method of amendment is in article 6. It requires a two-thirds vote, after one day's notice.

MR. DRAKE, OF OREGON: Mr. President, I move, sir, that the report of the committee be taken up by sections, or paragraphs, and considered and acted upon in that form.

MR. DERN: Under the ruling of the chair, I will withdraw my motion.

PRESIDENT PRINCE: The motion is that it be considered by paragraphs.

Motion seconded and carried.

The report was then read by Secretary Mahon by sections, as follows:

"1. In future only, such as have fully paid all dues up to the annual meeting of 1902 (payable in advance) shall be eligible to vote upon any question relative to officers and organization."

PRESIDENT PRINCE: That would be an amendment to Article 3 of the constitution, and cannot be considered at this time.

"2. We recommend that by announcement from the chair all persons now present wishing to become members by paying $5 enroll their names in the list now in the hands of the secretary and receive their evidence of having become permanent members.

PRESIDENT PRINCE: The same rule applies. The recommendation might be made that persons become members under the second clause of membership. There is no objection that I know of to a recommendation of that kind. That is one of the methods of becoming a member. I think that is entirely competent. What is your pleasure with regard to this section?

On motion of Mr. Grayson, of Oregon, duly seconded and carried, the section was adopted.

"3. Your Committee on Permanent Organization recommend that

future meetings of the Congress be held on the first Tuesday in October, and that the sessions continue not to exceed five days."

On motion of Mr. Tibbles, of Utah, duly seconded and carried, the section was adopted.

"4. That the following committee of five be appointed to draft and present for adoption at the next session of the Congress a constitution and by-laws:

Col. Thomas Ewing, of Arizona; E. L. Shafner, of Ohio; L. M. Bradley, of Illinois; W. B. Heyburn, of Idaho; Albert Kleinschmidt, of Montana.

On motion, duly seconded and carried, the section was adopted.

"5. That the permanent secretary shall receive from the treasurer of the Congress the sum of $1,000 per annum for his salary and personal expenses."

On motion, duly seconded and carried, the section was adopted.

"6. That a committee consisting of Col. Thomas Ewing, Arizona; E. L. Shafner, Ohio; Albert Kleinschmidt, Montana; L. M. Bradley, Illinois, and W. B. Heyburn, Idaho, be elected to act in connection with the president, the secretary and the treasurer as the Executive Committee of the Congress."

MR. STEPHENS, OF MONTANA: Mr. President, I move that that section be stricken out.

Motion seconded and carried.

"7. That the following be elected a Committee on Transportation: Thomas Ewing and E. L. Shafner, who shall have power to select a third member, who shall be from the State of Colorado."

On motion, duly seconded and carried, the section was adopted.

"8. That no State shall cast more than ten votes."

PRESIDENT PRINCE: That is already in the constitution.

"9. That the following list of officers be elected for the next Congress: President, L. Bradford Prince, New Mexico; first vice-president, E. L. Shafner, Ohio; second vice-president, J. T. Grayson, Oregon; third vice-president, Clarence E. Allen, Utah; secretary, Irwin Mahon, Pennsylvania; treasurer, E. C. Camp, Tennessee; sergeant-at-arms, Willard White, Massachusetts."

Mr. Stephens, of Montana, moved the adoption of the section as read.

Motion seconded.

MR. KENDALL, OF OHIO: Mr. President, I move that this section of the report of the Committee on Permanent Organization relating to the election of officers be amended to read: "That the election of officers for the ensuing year be made by the Mining Congress in convention assembled."

Motion seconded and carried.

On motion of Mr. Fitzgerald, duly seconded and carried, the Congress then proceeded to the election of officers for the ensuing year.

The president called Mr. White, of Massachusetts, to the chair to preside over the meeting.

Nominations for president being in order, the following named gentlemen were placed in nomination for that office:

L. Bradford Prince, New Mexico.

E. L. Shafner, Ohio.

John T. Grayson, Oregon.

W. B. Goodsell, Illinois.

The roll of States was then called by the secretary.

At the conclusion of the roll-call, and before the announcement of the result, the following named gentlemen withdrew their names as candidates for president.

W. B. Goodsell, John T. Grayson and L. Bradford Prince.

On motion of Mr. Prince, seconded by Mr. Grayson, the election of Mr. Shafner was made unanimous.

Mr. Shafner was then called to the platform, and spoke as follows:

Mr. Chairman, Ladies and Gentlemen of the Congress: This election comes to me as a great surprise. I would very much rather have had my friend, Mr. Prince, remain as president of the International Mining Congress, for many reasons. First, he is a man of great executive ability; again, he is familiar with parliamentary usages, and I believe in past years he has guided this Congress to its present success. I, however, feel gratified with the courtesy and honor that have been shown me, as representing the State of Ohio at this Congress, in electing me its president for the ensuing year. I trust that in the deliberations of this Congress I shall have the hearty support and co-operation of every member, to the end that the very best work may be done to further the interests of this Congress as an international organization.

I thank you most heartily, ladies and gentlemen, for your kindness in electing me, and trust that you will be with me at all times in working for the success of this Congress. (Applause.)

Nominations for vice-president then being in order, the following named gentlemen were nominated for that office:

F. R. Reed, Idaho.

John T. Grayson, Oregon.

On motion, duly made, seconded and carried, nominations were closed.

A vote was then taken by calling the roll of States and resulted as follows:

Votes cast	103
Reed	61½
Grayson	41½

On motion of Mr. Grayson, duly seconded, the election of Mr. Reed as vice-president was made unanimous.

Nominations for secretary then being in order, Mr. Irwin Mahon was placed in nomination for the office of secretary for the ensuing year.

On motion of Mr. Flenner, of Idaho, duly seconded and carried, nominations for secretary were closed.

The chairman thereupon declared Mr. Irwin Mahon elected secretary of the Congress for the ensuing year.

In response to calls for "Speech," Mr. Mahon spoke as follows:

Mr. President, Ladies and Gentlemen of the Congress: I am unable to express to you how sincerely I appreciate the honor you have conferred upon me; and if within my power to accomplish it I promise to give you one of the grandest sessions at Butte, Montana, in 1902, that we have ever recorded for this Congress.

To the citizens of Boise I return my sincere thanks for the aid and assistance they have rendered me from start to finish, in making this Congress the great success that it is.

I wish to specially thank the Governor of this State, who has stood

very close to me from the hour I touched the soil of Idaho, up to the present time.

I now have but one favor to ask of the gentlemen who have so nicely and so acceptably to myself elected me for the fifth time as their secretatry, that they will remove from the report of the Committee on Permanent Organization the salary that they have appropriated for me and for my expenses of $1,000. I ask that, and I hope before we adjourn that some gentleman will kindly move that it be stricken out.

I thank you kindly. (Cries of "No.") Some gentleman says No. I cannot and will not accept it.

MR. FLENNER, OF IDAHO: Mr. President, I move that that be stricken out, and that it be made $1,500.

Motion seconded.

THE PRESIDENT: The next order of business is the election of a treasurer.

The following named were nominated for the office of treasurer of the Congress for the ensuing year:

Mrs. E. C. Atwood, Colorado.

E. C. Camp, Tennessee.

A vote was then taken by roll-call of States, resulting as follows:

Votes cast 85

Mrs. Camp 47

Mrs. Atwood 38

E. C. Camp was declared elected treasurer for the ensuing year.

Nominations being in order for members of the Executive Committee, the following named were nominated:

L. Bradford Prince, New Mexico.

Mrs. Ella Knowles Haskell, Montana.

John T. Grayson, Oregon.

On motion, duly seconded and carried, the above named were elected by acclamation the members of the Executive Committee for the ensuing year.

The president then resumed the chair.

PRESIDENT PRINCE: This concludes the election of officers.

Each State and Territory is entitled to name a State vice-president and a State secretary, and they are expected to take care of the interests of the Congress in their respective States and Territories, and promote them as far as possible. They are to be named by the delegation of the States and Territories respectively, and their names handed in to the secretary.

In response to the calling of the roll of States by the secretary, the following were named as the State vice-presidents and State secretaries for the ensuing year:

MR. WHITE, OF MASSACHUSETTS: Mr. President, I move you, sir, that the new president be empowered to appoint a committee of five to be named in the future to take into account the question of legislation respecting mineral interests, and confer with the powers at Washington with reference to the appointment of a cabinet officer for the mineral realm.

Motion seconded and carried.

MR. FLENNER, OF IDAHO: Mr. President, I understand that Mr. Mahon will not accept the secretaryship with the provision for $1,000 as his salary. I don't know whether the objection is to any salary at all, or whether it is not enough. I am sure the members of this Congress

will take pleasure in raising that salary to meet the wishes of Mr. Mahon. Consequently I would like to know about this matter.

MR. SHAFNER: Mr. President, I should judge $2,000 would be small enough compensation to Mr. Mahon for his services during the coming year. If it would meet with the approval of the organization I would like to make a motion to that effect.

MR. FLENNER: Mr. President, we will have to first reconsider the action by which that was adopted, before taking such action. I move that we reconsider that part of the report providing for a salary of $1,000.

MR SHAFNER: If it is the sense of the body, it might be well to leave that to the Executive Committee—the entire matter, if you so desire.

MR. FLENNER: There is no objection. Then, Mr. President, I move that we leave this matter to the Executive Committee.

PRESIDENT PRINCE: As it stands now, at $1,000, the Executive Committee could add to it, if desirable. Do you make the motion?

MR. FLENNER: Yes; that it be left to the Executive Committee.

MR. STEPHENS, OF MONTANA: That what be left to the Executive Committee?

MR. FLENNER: The salary.

MR. STEPHENS: The salary is $1,000. Now what is going to be left to the Executive Committee?

PRESIDENT PRINCE: All these business matters go to the Executive Committee without motion in the interim.

MR. FLENNER: I would like to ask, Mr. President, whether we have passed a resolution allowing the secretary $1,000.

PRESIDENT PRINCE: Yes.

MR. FLENNER: Then I move that we reconsider that.

PRESIDENT PRINCE: Very well. Is that motion seconded?

Motion seconded and carried.

MR. STEPHENS, OF MONTANA: Mr. President, I make the point that it requires a two-thirds vote to carry it.

PRESIDENT PRINCE: A majority vote is sufficient. It is reconsidered, and it is now before you. The question is upon the adoption of the report of the Committee on Permanent Organization, which fixes a salary of $1,000 for the secretary. What is your pleasure.

MR. FLENNER: Mr. President, I move to amend that report by fixing the salary of the secretary at $2,000.

MR. BRADLEY, OF ILLINOIS: Mr. President, I move to amend that by leaving it with the Executive Committee.

Motion seconded.

MR. FLENNER: I will withdraw my motion, Mr. President.

MR. BRADLEY, OF ILLINOIS: Mr. President, I move to amend the report of the Committee on Permanent Organization by leaving the matter of the salary of the secretary to the Executive Committee.

Motion seconded and carried.

At the request of the president Mr. White, of Massachusetts, took the chair.

MR SHAFNER: Mr. Chairman and gentlemen of the Congress: I think it would be nice to extend a vote of thanks to ex-Gov. Prince for the able manner in which he has presided over this meeting, and I make that motion.

Motion seconded and carried.

MR. BELL, OF IDAHO: I move you, Mr. President, that a vote of thanks be extended to the secretary, Mr. Mahon, and all other officers of this International Mining Congress for their faithful services during the past year.

Motion seconded and carried.

President Prince then resumed the chair.

PRESIDENT PRINCE: Ladies and Gentlemen, I have the pleasure of presenting to you the president-elect of this organization, and who is now your president, Mr. Shafner, of Ohio, and I welcome him to the chair. (Applause.)

Mr. Shafner, the president for the coming year, then took the chair.

PRESIDENT SHAFNER: Gentlemen of the convention, is there any further business to come before this convention? If there is no further business, a motion to adjourn will be in order.

On motion of Mr. Carrera, of New Mexico, duly seconded and carried, the Congress then adjourned.

LOUIS C. JAQUISH, Stenographer,
Baker City, Oregon.

RULES GOVERNING THE CONGRESS.

The International Mining Congress, organized for the purpose of promoting the general mining interests of North and South America, has adopted the following rules and regulations for its government.

NAME.

First: The name of this organization shall be "The International Mining Congress.

OBJECTS.

Second: Its objects shall be those for which it was originally created, and has been sustained during its existence, namely, the fostering of fraternal relations among those engaged in mining and kindred pursuits in various countries and the United States; the advancement of the interests of those pursuits; and especially, until those objects are attained, the improvement of the mining laws of the United States to conform with the teachings of experience and changed conditions of the country, and the establishment of a National Department of Mining.

MEMBERSHIP.

Third: Any person interested in mining and kindred pursuits, who shall pay into the treasury of the Congress, the sum of five dollars ($5) annually, and such members shall be accredited to their respective countries, States or Territories.

REPRESENTATION BY DELEGATES.

Fourth: Shall consist of such delegates as are appointed by the Chief Executive of countries, States and Territories, the mayors of cities and towns, boards of trade, boards of county commissioners, scientific associations, mining exchanges, mining bureaus, chambers of commerce, and such other business organizations as may from time to time be fixed by the Congress or its Executive Committee.

EX-OFFICIO DELEGATES.

Fifth: Representatives of foreign countries, governors of States and Territories, members of the United States Congress, and ex-presidents of this Congress, are ex-officio delegates, with all the privileges, except those of voting and election of officers.

VISITING DELEGATES.

Sixth: The Executive Committee is authorized to extend invitations to any person to attend any session of the Congress; to take part in its discussions; such persons shall have all the privileges of delegates, excepting those of voting and election to office. The names and addresses of all such persons thus invited must be reported to the Congress at its opening session.

VOTING POWER.

Seventh: The members from each country, State or Territory, shall each cast one vote up to the number of ten, which shall be the limit of the vote of any such civil division.

MEETING.

Eighth: A meeting of the Congress shall be held once in each year at a place designated by the preceding Congress, and at a time designated by such preceding Congress, and in case of necessity by the Executive Committee.

OFFICERS.

Ninth: The officers of the Congress shall be a president, a vice-president, a secretary and treasurer, who shall be elected by the Congress, and together with the other officers shall hold their position until their successors are elected, and installed at the next succeeding Congress.

EXECUTIVE COMMITTEE.

Tenth: There shall be an Executive Committee of seven (7) members, consisting of the president, vice-president, secretary and treasurer, together with three (3) other members to be elected in like manner as the officers heretofore named.

STATE VICE-PRESIDENTS AND SECRETARIES.

Eleventh: There shall be a vice-president and a secretary elected for each County, State or Territory, by the members therefrom present at each Congress, whose duties shall be to foster the interests of the Congress in their respective localities.

DUTIES OF EXECUTIVE COMMITTEE.

Twelfth: The Executive Committee shall have general charge of the work and interests of the Congress; shall supervise the work of all special committees, fix the time of meeting, when not previously determined by the Congress, or when necessary to change from one location to another, fix the time of meeting and make all arrangements for holding same; arrange the program of subjects to be discussed, and announce them in, or as nearly so as possible, the official call, take such steps as it may deem necessary to carry on the work of the Congress, including the securing of national legislation in accordance therewith; shall have control of the funds of the Congress, and such funds as may be used to defray the expenses thus incurred.

COMMITTEE ON RESOLUTIONS.

Thirteenth: The Committee on Resolutions shall report at such times as the Congress may direct upon all resolutions referred to them and return the same to the secretary of the Congress with their action indorsed thereon.

THE SECRETARY.

The secretary of the Congress shall take entire charge of the work as outlined by the Congress, and the Executive Committee of said Congress. He shall in due time open international headquarters in the place designated for holding said assembly. He shall have charge of all books

pamphlets and documents belonging to said organization, keep a register of the names and addresses of all members and of all delegates of whose appointment he is officially advised, showing by whom such appointment has been made, and such register as shall be accepted by the Congress, as the official list of members and duly accredited delegates. Collect all moneys due the Congress, and keep an account of same; take care of all correspondence, and attend to all duties that naturally belong to the office of secretatry.

He shall be paid a reasonable salary for his services, also traveling and other necessary expenses while in the discharge of his duties as secretary.

COMMITTEE ON PERMANENT ORGANIZATION AND ELECTION OF OFFICERS.

The Committee on Permanent Organization shall nominate a president, vice-president, secretary and treasurer and report such nominations on the morning of the last day of the session, at which time the election shall take place.

RULES.

1. The session of the Congress shall open at 10 A. M., and 2 P. M., and 7:30 P. M., unless otherwise determined by the Executive Committee, or by vote.

2. Cushing's Manual shall govern the deliberations of the Congress.

3. All resolutions shall be submitted in writing, in duplicate, with full name of the mover, and of State to which he belongs, and shall be referred to the Committee on Resolutions without debate, but the mover shall be allowed five minutes for explanation, if desired. The duplicate copy shall be retained by the secretary.

4. Subjects to be discussed shall be confined to mines, mining and kindred interests, and such other matters as may be named in the program.

No subject which has been made a party issue in politics shall be placed on the program, nor shall any resolutions referring to any such subject be considered.

5. Discussions of resolutions, as reported by the committee, shall be limited to 40 minutes each, no person speaking more than ten minutes.

Papers read or addresses made shall be limited to 30 minutes, unless by consent of the Congress.

ORDER OF BUSINESS.

The order of business each daily session shall be as follows:

1. Miscellaneous.
2. Introduction of resolutions.
3. Reports of committees.
4. Discussion and vote on committee reports.
5. Reading of papers, or addresses, on subjects named in program.
6. Selection of place for holding the next Congress, special for 4 o'clock last day of the session.

AMENDMENTS.

These rules and regulations may be added to or amended by a majority vote, on one day's notice.

COMMITTEES.

LEGISLATIVE COMMITTEE.

Willard White, Boise, Idaho; E. L. Shafner, Cleveland, Ohio; Irwin Mahon, Carlisle, Pennsylvania; L. Bradford Prince, Santa Fe, New Mexico; John Dern, Salt Lake, Utah.

AUXILIARY LEGISLATIVE COMMITTEE.

Senator M. A. Hanna, Cleveland, Ohio; Representative S. D. Woods, Stockton, California; Senator T. M. Patterson, Denver, Colorado; Senator Eugene Hale, Ellsworth, Maine; Senator W. A. Clark, Butte, Montana; Senator Boise Penrose, Philadelphia, Pennsylvania.

LEGISLATIVE APPROPRIATION COMMITTEE OF STATE SCHOOL OF MINES.

Prof. Erasmus Haworth, Lawrence, Kansas; Prof. J. A. Holmes, Chappel Hill, North Carolina; Prof. R. B. Fulton, New Oxford, Mississippi; Prof. E. A. Babcock, Grand Forks, North Dakota; Prof. E. A. Smith, University, Alabama.

TRANSPORTATION COMMITTEE.

Thomas Ewing, Los Angeles, California; E. L. Shafner, Cleveland, Ohio; C. J. Moore, Cripple Creek, Colorado.

COMMITTEE ON CONSTITUTION AND BY-LAWS.

Thomas Ewing, Los Angeles, California; E. L. Shafner, Cleveland, Ohio; W. B. Heyburn, Spokane, Washington; Albert Kleinschmidt, Helena, Montana.

EXECUTIVE COMMITTEE.

Irwin Mahon, Carlisle; Pennsylvania, secretary; E. L. Shafner, Cleveland, Ohio; Ex-Gov. L. Bradford Prince, Santa Fe, New Mexico; Major Fred R. Reed Boise, Idaho; Col. John T. Grayson, Baker City, Oregon; E. C. Camp, Knoxville, Tennessee; Mrs. Ella Knowles Haskell, Butte, Montana.

STATE VICE-PRESIDENTS.

Alaska	Hon. A. P. Swineford	Ketchikan
Alabama	Dr. P. H. Bell	Auburn
Arizona	Prof. Wm. C. Blake	Tucson
Arkansas	Randale Silverman	Hamberg
California	Col. Thomas Ewing	Los Angeles
Colorado	G. E. Alexander	Cripple Creek
Georgia	Prof. S. W. McCalla	Atlanta
Idaho	A. G. Kearns	Wallace
Illinois	B. W. Goodsell	33 S. Canal, Chicago
Indiana	N. Galbert	Michigan City

Iowa	Thomas Burke	Des Moines
Kentucky	J. B. Stubbins	Bowling Green
Kansas	H. F. Brickman	Dillon
Maine	Elmer D. Smith	Pittsfield
Michigan	A. L. Flewelling	Crystal Falls
Minnesota	N. C. Westerfield	St. Paul
Missouri	George P. Paxton, M. E.	Joplin
Montana	Prof. N. R. Leonard	Butte
Maryland	Henry Shriver	Mt. Savage
Nebraska	H. M. Rice	Lincoln
New Mexico	J. Turley	Santa Fe
North Carolina	J. Franklin Wilkes	Charlotte
North Dakota	Prof. E. J. Babcock	Grand Forks
New York	John T. Gard, 20 N. Div. St.	Buffalo
New Jersey	Hon. F. A. Canfield	Dover
Nevada	Prof. George D. Louderbeck	Reno
Oregon	Col. John P. Grayson	Baker City
Ohio	W. L. Kendall	Cleveland
Oklahoma	Hon. W. C. Renfrow	Oklahoma City
Pennsylvania	E. N. Carpenter	Wilkesbarre
South Dakota	D. O. Bear	Lead City
South Carolina	Dr. Jos. McIntosh	Newberry
Tennessee	E. C. Camp	Knoxville
Texas	Hon. Roger Q. Mills	Corsicana
Utah	Hon. John Dern	Salt Lake City
Vermont	Gen. W. W. Grout	Johnsbury
Virginia	Hon. J. Hoge Tyler	Richmond
West Virginia	Wm. N. Page	Anstead
Washington	Col. Carl Kleinschmidt	Seattle
Washington, D. C.		Washington City
Wisconsin	M. H. Richards	Platteville
Wyoming	Will Reed	Rawlins
Province of Ontario	Hon. E. J. Davis	Toronto

STATE SECRETARIES.

Alaska		Revilla
Alabama	W. B. Knox	Anniston
Arizona	P. C. Bicknell	Williams
Arkansas		
California	J. Irwing Crowell	Los Angeles
Colorado	Mrs. E. C. Atwood	Denver
Georgia	W. W. Williams	Macon
Idaho	J. D. Flanner	Boise
Illinois	Mrs. Pauline Holland	Galena
Indiana	L. P. Newsby	Knightstown
Iowa	J. A. Green	Stone City
Kentucky	M. H. Crump	Bowling Green
Kansas	James Bastigen	Atchison
Maine	George H. Morse	Pittsfield
Michigan	E. N. Breiting	Marquette
Minnesota	J. C. Stout	St. Paul
Missouri	O. J. Raymond	Webb City
Montana	J. H. Trerise	Butte
Maryland	Charles Matt	Baltimore
Nebraska	J. T. Dorgan	Lincoln

New Mexico	Prof. J. C. Carrera	Las Cruces
North Carolina	A. H. Isbell	Murphy
North Dakota	Prof. E. J. Babcock	Grand Forks
New York	W. J. Johnson, 35 Liberty	New York
New Jersey	George W. Maynard	Mansfield
Nevada		
Oregon	S. F. Biler	Baker City
Ohio	H. F. Fulton	Cleveland
Oklahoma	H. E. Glasier	Guthrie
Pennsylvania	C. F. Heckler, 825 Heed Bld	Philadelphia
South Dakota	Jos. Hinton	Central City
South Carolina	Earl Sloan	Charleston
Tennessee	T. J. Stephenson	Knoxville
Texas		
Utah	W. C. Higgins	Salt Lake City
Vermont	G. M. Mansur	Newport
Virginia	George W. Miles	Radford
West Virginia	T. E. Huston	Elkhorn
Washington	D. C. Johnson	Everett
Washington, D. C.	Dr. A. W. McKnight	Washington City
Wisconsin	M. D. Kelley	Milwaukee
Wyoming	J. M. Thomas, Jr.	Battle Lake
Province of Ontario	Hon. Thomas W. Gibson	Toronto

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THE INTERTATIONAL
MINING CONGRESS EXPOSITION BUILDING
BUTTE, MONTANA
SEPTEMBER 1 TO 5, 1902
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WILLIAM A. CLARK