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MESABI IRON COMPANY MILL AT BABBITT, MINNESOTA.

D. M. & N. RAILWAY DOCKS, DULUTH, MINNESOTA.

GENERAL VIEW OF MINNESOTA STEEL COMPANY’S PLANT, DULUTH, MINN.

CUYUNA RANGE—SAGAMORE MINE DRYING PLANT—JOHN A. SAVAGE & CO.

CUYUNA RANGE—ARMOUR NO. 2 MINE—INLAND STEEL CO.

CUYUNA RANGE—KENNEDY MINE—ROGERS, BROWN ORE CO.

CUYUNA RANGE—PORTSMOUTH MINE—GORDON MINING CO.
FIRST-AID AND MINE-RESCUE TEAMS OF OLIVER IRON MINING COMPANY AND PICKANDS-MATHER COMPANY AT VIRGINIA.

OFFICERS.

For the year ending with the close of the annual meeting, August 30th, 1923:

**PRESIDENT**

FRANCIS J. WEBB

(Duluth, Minn. (Term expires 1923))

**VICE PRESIDENTS**

-WILLIAM D. CALVERLEY


-M. E. RICHARDS

-Iron Mountain, Mich. (Term expires 1923)

JOHN E. HODGE

-Minneapolis, Minn. (Term expires 1924)

EARL E. HUNNER

-Duluth, Minn.

-GEORGE R. JACKSON

-Negaunee, Mich. (Term expires 1924)

**MANAGERS.**

-THOMAS HOATSON

-Laurium, Mich. (Term expires 1923)

-G. E. HARRISON

-Crystal Falls, Mich.

- F. H. ARMSTRONG

-Vuican, Mich. (Term expires 1923)

WILLIAM A. TAPPAN

-Hibbing, Minn. (Term expires 1924)

JOHN E. NELSON

-Negaunee, Mich. (Term expires 1924)

**TREASURER**

E. W. HOPKINS

-Ironwood, Mich. (Term expires 1923)

**SECRETARY**

A. J. YUNGBLUTH

-Ishpeming, Mich. (Term expires 1923)

OFFICERS.

The following is a list of officers elected at the annual meeting, August 30, 1923, also the officers holding over from the previous year which are indicated by an asterisk:

**PRESIDENT.**

JAMES E. JOPLING

-Ishpeming, Mich. (Term expires 1924)

**VICE PRESIDENTS.**

-JOHN E. HODGE

-Minneapolis, Minn. (Term expires 1925)

-EARL E. HUNNER

-Duluth, Minn. (Term expires 1924)

-GEORGE R. JACKSON

-Negaunee, Mich. (Term expires 1924)

-WM. H. SCHACHT

-Painesdale, Mich.

-WM. E. MRANDEL

-Boscaher, Mich. (Term expires 1925)

**MANAGERS.**

-WILLIAM A. TAPPAN

-Hibbing, Minn.

-JOHN E. NELSON

-Negaunee, Mich. (Term expires 1924)

-FRANK CARDE

-Iron Mountain, Mich.

-CARL W. HUGHES

-Ansona, Mich.

-J. WILBUR VAN EVERA

-Crook, Minn. (Term expires 1925)

**TREASURER.**

E. W. HOPKINS

-Ironwood, Mich. (Term expires 1924)

**SECRETARY.**

A. J. YUNGBLUTH

-Ishpeming, Mich. (Term expires 1924)

(The above officers constitute the council.)

LIST OF STANDING COMMITTEES FOR YEAR ENDING 1924.

**PRACTICE FOR THE PREVENTION OF ACCIDENTS.**

WILLIAM CONIBEAR, Chairman

GEORGE MARTINSON

G. H. LOHNES

WILLIAM H. BENGBY

T. C. DESOLLAR

**CARE AND HANDLING OF HOISTING ROPE.**

WILLIAM J. RICHARDS, Chairman

OCHA POTTER

D. H. CAMPBELL

WILLIAM CONSTABLE

E. S. BONNE.

**PAPERS AND PUBLICATIONS.**

WILLIAM KELLY, Chairman

F. W. MCNALL

W. O. HICKS

LUCION EATON

ALEX D. CHISHOLM

**BUREAU OF MINES.**

M. M. DUNCAN, Chairman

F. W. DENTON

A. J. YUNGBLUTH, Secretary

**MINING METHODS.**

W. H. SCHACHT, Chairman

J. WILBUR VAN EVERA

G. B. JACKSON

F. J. SMITH

F. W. SPERR

[Members of the Institute, 1924]

**LIFE MEMBERS.**

KELLY, WILLIAM

-RIVER, Iron Mountain, Minn.

HURTER, G. W.

-Wilmingto, Ind.

SLILLMAN, A. P.

-Hibbing, Minn.

**ACTIVE MEMBERS.**

ABBOTT, C. E.

-1405 Minnesota Ave., Bessemer, Ala.

ADAMS, DAVID T.

-1423 Westminister Blvd., Chicago, Ill.

ADAMS, ROBERT M.

-Fidelity Bldg., Duluth, Minn.

ADGATE, F. W.

-28 E. Jackson Blvd., Cleveland, O.

ALLEN, E. C.

-Oglebay Norten Co., Cleveland, O.

AMBERG, J. W.

-1400 Fulton St., Chicago, Ill.

ANDERSON, J. P.

-Lock Box No. 4, Crook, Minn.

APPLEBY, WILLIAM R.

-School of Mines, Minneapolis, Minn.

ARMSTRONG, P. H.

-926 S. Monroe Ave., Green Bay, Wis.
DECEASED MEMBERS

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6 Iron Mountain, Mich. . . February 6, 1900 . . . . Vol. VI
7 Houghton, Mich. . . . . March 5-6, 1901 . . . . Vol. VII
8 Mesabi and Vermilion Ranges, August 21, 1902 . . . . Vol. VIII
13 Mesabi and Vermilion Ranges, June 24-27, 1906 . . . . Vol. XIII
18 Mesabi Range, August 28-30, 1912 . . . . Vol. XVIII
19 Marquette Range. . . . . Aug. 21 to Sept. 3, 1914 Vol. XIX
20 Gogebic-Cuyuna Ranges . . . . . . . . . . . . . Sept. 6 to 9, 1915 . Vol. XX

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RULES OF THE INSTITUTE.

I. OBJECTS.
The objects of the Lake Superior Mining Institute are to promote the arts and sciences connected with the economical production of the useful minerals and metals in the Lake Superior region, and the welfare of those employed in these industries, by means of meetings of social intercourse, by excursions, and by the reading and discussion of practical and professional papers, and to circulate, by means of publications among its members, the information thus obtained.

II. MEMBERSHIP.
Any person interested in the objects of the Institute is eligible for membership.
Honorary members not exceeding ten in number, may be admitted to all the privileges of regular members except to vote. They must be persons eminent in mining or sciences relating thereto.

III. ELECTION OF MEMBERS.
Each person desirous of becoming a member shall be proposed by at least three members, approved by the Council, and elected by ballot at a regular meeting (or by ballot at any time conducted through the mail, as the Council may prescribe), upon receiving nine-tenths of the votes cast. Application must be accompanied by fee and dues as provided by Section V.

IV. WITHDRAWAL FROM MEMBERSHIP.
Upon the recommendation of the Council, any member may be stricken from the list and denied the privilege of membership, by the vote of three-fourths of the members present at any regular meeting, due notice having been mailed in writing by the Secretary to him.

V. DUES.
The membership fee shall be five dollars and the annual dues five dollars, and applications for membership must be accompanied by a remittance of ten dollars; five dollars for such membership fee and five dollars for dues for the first year. Honorary members shall not be liable to dues. Any member not in arrears may become a life member by the payment of fifty dollars at one time, and shall not be liable thereafter to annual dues. Any member in arrears may, at the discretion of the Council, be deprived of the receipt of publications or be stricken from the list of members when in arrears six months; Provided, That he may be restored to membership by the Council on the payment of the arrears, or by re-election after an interval of three years.

VI. OFFICERS.
There shall be a President, five Vice Presidents, five Managers, a Secretary and a Treasurer, and these Officers shall constitute the Council.

VII. TERM OF OFFICE.
The President, Secretary and Treasurer shall be elected for one year, and the Vice Presidents and Managers for two years, except that at the first election two Vice Presidents and three Managers shall be elected for only one year. No President, Vice President, or Manager shall be eligible for immediate re-election to the same office at the expiration of the term for which he was elected. The term of office shall continue until the adjournment of the meeting at which their successors are elected.

Vacancies in the Council, whether by death, resignation, or the failure for one year to attend the Council meetings, or to perform the duties of the office, shall be filled by the appointment of the Council, and any person so appointed shall hold office for the remainder of the term for which his predecessor was elected or appointed; Provided, That such appointment shall not render him ineligible at the next election.

VIII. DUTIES OF OFFICERS.
All the affairs of the Institute shall be managed by the Council except the selection of the place of holding regular meetings.
The duties of all Officers shall be such as usually pertain to their offices, or may be delegated to them by the Council.
The Council may, in its discretion, require bonds to be given by the Treasurer, and may allow the Secretary such compensation for his services as they deem proper.

At each annual meeting the Council shall make a report of proceedings to the Institute, together with a financial statement.

Five members of the Council shall constitute a quorum; but the Council may appoint an executive committee, business may be transacted at a regularly called meeting of the Council, at which less than a quorum is present, subject to the approval of a majority of the Council, subsequently given in writing to the Secretary and recorded by him with the minutes.

There shall be a meeting of the Council at every regular meeting of the Institute and at such other times as they determine.

IX. ELECTION OF OFFICERS.
Any five members not in arrears, may nominate and present to the Secretary over their signatures, at least thirty days before the annual meeting, the names of such candidates as they may select for offices falling under the rules. The Council, or a committee thereof duly authorized for the purpose, may also make similar nominations. The assent of the nominees shall have been secured in all cases.

No less than two weeks prior to the annual meeting, the Secretary shall mail to all members not in arrears a list of all nominations made and the number of officers to be voted for in the form of a letter ballot. Each member may vote either by striking from or adding to the names upon the list, leaving names not exceeding in number the officers to be elected, or
by preparing a new list, signing the ballot with his name, and either mailing it to the Secretary, or presenting it in person at the annual meeting.

In case nominations are not made thirty days prior to the date of the annual meeting for all the offices becoming vacant under the rules, nominations for such offices may be made at the said meeting by five members not in arrears, and an election held by a written or printed ballot.

The ballots in either case shall be received and examined by three tellers appointed at the annual meeting by the president; and the persons who shall have received the greatest number of votes for the several offices shall be declared elected. The ballot shall be destroyed, and a list of the elected officers, certified by the tellers, shall be preserved by the Secretary.

X.

MEETINGS.

The annual meeting of the Institute shall be held at such time as may be designated by the Council. The Institute may at a regular meeting select the place for holding the next regular meeting. If no place is selected by the Institute it shall be done by the Council.

Special meetings may be called whenever the Council may see fit; and the Secretary shall call a special meeting at the written request of twenty or more members. No other business shall be transacted at a special meeting than that for which it was called.

Notices of all meetings shall be mailed to all members at least thirty days in advance, with a statement of the business to be transacted, papers to be read, topics for discussion and excursions proposed.

No vote shall be taken at any meeting on any question not pertaining to the business of conducting the Institute.

Every question that shall properly come before any meeting of the Institute, shall be decided, unless otherwise provided for in these rules, by the votes of a majority of the members then present.

Any member may introduce a stranger to any regular meeting; but the latter shall not take part in the proceedings without the consent of the meeting.

XI.

PAPERS AND PUBLICATIONS.

Any member may read a paper at any regular meeting of the Institute, provided the same shall have been submitted to and approved by the Council, or a committee duly authorized by it for that purpose prior to such meeting. All papers shall become the property of the Institute on their acceptance, and with the discussion thereon, shall subsequently be published for distribution. The number, form and distribution of all publications shall be under the control of the Council.

The Institute is not, as a body, responsible for the statements of facts or opinion advanced in papers or discussions at its meetings, and it is understood, that papers and discussions should not include personalities, or matters relating to politics, or purely to trade.

XII.

SPECIAL COMMITTEES.

The Council is authorized to appoint from time to time special committees to consider and report upon, to the Institute through the Council, such subjects as changes in mining laws, safety devices, the securing and editing of papers on mining methods, definition of mining terms, affiliations with other societies, and such other subjects as the Council shall deem it desirable to inquire into, such reports not to be binding on the Institute except action is taken by the Institute in accordance with the rules, and the Council is authorized to expend not exceeding six hundred dollars in any one year to carry out the purpose of this section.

XIII.

AMENDMENTS.

These rules may be amended by a two-thirds vote taken by letter ballot in the same manner as is provided for the election of officers by letter ballot; Provided, That written notice of the proposed amendment shall have been given at a previous meeting.

PROCEEDINGS OF THE TWENTY-THIRD ANNUAL MEETING, AUGUST 28th, 29th AND 30th, 1923.

WEDNESDAY, AUGUST 28TH.

Members and guests met at the Spalding Hotel, Duluth, Minn., on Wednesday morning, where registration was held. Papers and programs were issued, and the visitors were taken in charge by the local reception committee. Upward of two hundred were registered during the day, and many of the range members joined the delegation at Hibbing, Virginia, Crosby, and other points visited during the trip.

The Duluth Committee prepared a very interesting program which contained much information on the industries of Duluth with list of mines and tonnages shipped to end of 1922. This is published elsewhere in this volume.

The following Committees were in charge of the arrangements for this meeting and much credit is due them for the splendid entertainment provided:

Duluth Reception and Entertainment—J. S. Lutes, Manager Tod-Stambaugh.

General Arrangements; Mesabi Range—B. W. Batchelder, Manager Wisconsin Steel Company.

Hibbing Reception and Entertainment—W. M. Tappan, General Superintendent Oliver Iron Mining Company.

Virginia Reception and Entertainment—Mark Elliot, General Superintendent Jones & Laughlin.

Babbitt Reception and Entertainment—W. G. Swart, Manager Mesabi Iron Company.

Committee Arrangements; Cuyuna Range—Clement K. Quinn, Clement K. Quinn & Co.

Finance Committee—W. P. Chinn, Manager Pickands, Mather & Co.

Literature—J. H. Hearding Assistant Manager Oliver Iron Mining Company.

Papers—E. E. Hunner, Manager M. A. Hanna & Co.
Transportation—E. J. Maney, General Manager Shenango Furnace Company.

A. J. Perrin, Secretary of the Lake Superior Industrial Bureau, will act as local secretary.

**ITINERARY.**

Headquarters, Spalding Hotel—The party will travel out of Duluth by special train and Pullman reservations can be made at headquarters.

Wednesday, August 29th—Members will report at headquarters immediately upon arrival for registration and transportation assignments. In the afternoon a visit to the Minnesota Steel Plant will be made. A banquet and business session will be held in the evening, leaving later for Babbitt.

Thursday, August 30th—Arriving at Babbitt an early breakfast will be served on the train after which the Mesabi Iron Company's plant will be inspected. The remainder of the day will be spent on the Mesabi Range. A business session will be held in Hibbing, after which party will leave by special train for the Cuyuna Range.

Friday, August 31st—Arrive at Crosby or Brainerd. Breakfast will be served on train. The day will be spent in visiting the various mines. Luncheon will be served at Crosby. Schedule will be arranged, for the return to Superior and Duluth in time for connection with all evening trains. This will close the Institute program.

Parties desiring to attend Minnesota State Fair, which opens September 1st, can make arrangements to go direct from the Cuyuna Range.

At 12:30 p.m. a special train over the Northern Pacific, took the party to visit the Minnesota Steel Company's plant at Steelton. This plant occupies a site on the St. Louis river with a water frontage of about two miles and comprises 1,600 acres. Luncheon was served at the plant, the party being the guests of Samuel B. Sheldon, Vice President and General Manager. This plant is a subsidiary of the United States Steel Corporation, and manufactures a general line of steel and wire products, using the ores from their Minnesota mines.

A complimentary banquet was tendered by the Duluth members in the ball-room of the Spalding Hotel at 8:00 o'clock. The decorations were splendidly arranged, covers were laid for four hundred and a substantial menu was furnished. Following the banquet the meeting was called to order by President Webb with an address to the members and guests.

**PRESIDENTIAL ADDRESS.**

Members of the Institute, Members of the Safety Conference and Our Guests—

We have looked forward with a great deal of interest to your visit and it gives us great pleasure to welcome you to Duluth and the Minnesota Iron Ranges. I assure you that we will do all in our power to make your visit enjoyable as well as profitable.

It is ten years tomorrow since the Institute visited the Mesabi Range and eight years since you were on the Cuyuna Range. Since then there perhaps have been no great changes on the Mesabi Range, except the opening of more mines and the enlargement of many open pits. Still, we have some new things to show you. In Duluth the magnificent plant of the Minnesota Steel Company which you visited this afternoon, the concentrating plant of the Mesabi Iron Company at Babbitt and changes in the Mesabi Range villages and cities will astonish you. It is true that during this time great advancement has been made along certain mechanical lines, and our methods of mining have been improved. Where ten years ago a hundred and ten-ton steam shovel was the largest, you will see there are many three hundred and fifty-ton shovels. The only electrical shovel in Lake Superior region up to recent date was the hydroelectric shovel of the Penn Iron Company at Vulcan. Now the M. A. Hanna Company is using two large electric shovels on the Mesabi Range. Practically all Mesabi Range mines have been electrified partially or wholly. Many new concentrating plants have been built, so that at the present time every open pit mine west of Nashwauk and many mines on the eastern end of the Range have concentrating plants for the beneficiation of ore.

On the Cuyuna Range, where there were two open pits at your last visit, there are now several large pits; the entire range has grown apace and is rapidly taking its proper place with the older iron ranges. It is a baby no longer.

We also have a tonnage tax a most interesting institution, I assure you. We hope our neighboring states may be spared such pernicious legislation.

We are sorry some of our older members are unable to be with us. We miss our William Kelly, who was one of the organizers of the Institute and has been one of its foremost workers. He had arranged to attend the meeting of the American Institute of Mining and Metallurgical Engineers, which dates are in conflict with ours. Rumor says that Mr. Kelly may be the next president of that Institution, an honor he richly deserves.

A meeting was held in Ironwood on February 2, 1893 to discuss plans for the organization of a Mining Institute. W. J. Olcott, now of Duluth, called the meeting to order. Mason W. Burt was the chairman and William Kelly was made secretary. Among others present at that meeting who are well known in the mining industry and who have been very active in the Institute were O. C. Davidson, of Iron Mountain, Michigan; D. E. Sutherland, Ironwood, Michigan; J. H. Hearding, Duluth, Minn.; Pentecost Mitchell, of Duluth; C. H. Munger, for many years a resident of the Lake Superior region and now of Cleveland, and James McNaughton, of Calumet. A letter was sent out by Mr. Kelly, secretary, which was published by the Skillings’ Mining Review of August 25th, 1923, which I beg leave to read to you:

"Dear Sir:—

At a social meeting of a number of mining men of the Menominee and Gogebic ranges, held in Ironwood, February 2, the subject of an association of all persons interested in mining on Lake Superior was discussed, and a resolution adopted, that an effort be made to organize an association with the object of promoting social intercourse, and affording an opportunity for an interchange of views. It was embodied in the resolution that an invitation be extended to the mining men of all districts of the Lake Superior region, to assemble at Iron Mountain on March 22, 1893, at 8 p.m. to effect an organization.

"We would heartily ask your cooperation in this matter, and request that you invite to this meeting all whom you think likely to be interested.

Vulcan, Mich., February 11, 1893."
On March 22nd the Institute was organized at Iron Mountain, Michigan. Nelson P. Hulst was the first president and our C. M. Boss of Duluth, who is present with us tonight, the first treasurer, and F. W. Denton of the Copper Country, the first secretary. Among the men who were present at that meeting and who has since gained great prominence in the mining industry, was T. F. Cole.

From the time of the organization, the Institute has held twenty-three annual meetings. Meetings were not held in 1897 or in 1899. The 1907 meeting, scheduled for the Mesabi Range, was cancelled. In 1916 the meeting was cancelled because of the rush in the mines on account of the war and in 1918, 1919, 1920 and 1921 it was impossible to hold meetings because of the effect on the mining industry caused by the war. Due to the interim of four years without a meeting, many members dropped their membership and it was hard to reckon just what the result would be and we feared that it would take several years to recover. This fear, however, was entirely dissipated by the wonderfully full meeting held in the Copper Country in 1922. To date we have over 175 members out of 300 present and there are many others who will join the trip at various places. This is surely a good showing. Some of our older members have been detained for various reasons and have all sent their regrets, among them O. C. Davidson of Iron Mountain, M. M. Duncan of Ishpeming, F. W. Denton of Houghton, Thomas Hoatson of Houghton, W. H. Johnston of Ishpeming, C. E. Lawrence of Iron River, D. E. Sutherland of Ironwood and several others.

We have lost by death since our 1922 meeting at Houghton:

BJORK, ARVID .................................................. Crystal Falls, Mich.
BACON, DON H. .......................................... St. Augustine, Fla.
HULST, NELSON P. ........................................ Milwaukee, Wis.
JANSEN, F. A ........................................... Norway, Mich.
JEFFERSON, AUGUST R. .............................. Chicago, Ill.
KIRKPATRICK, JOHN CLARK .......................... Escanaba, Mich.
LAMBERT, MICHAEL .............................. Hurley, Wis.
LAWRY, H. M. ........................................... Caspian, Mich.
POWELL, DANIEL W. ...................................... Marquette, Mich.
PUMPelly, RAPHAEL ................................. Dublin, N. H.
TREZONA, R. R. ............................................. Hurley, Wis.
WHITE, WILLIAM ..................................... Virginia, Minn.
WINCHELL, H. V. ........................................ Minneapolis, Minn.

We have many new applications for membership, 54 in all, and while this is an excellent showing, we must have more. If we wish to hold up the past reputation and good record of the Institute and to make our organization one that will be a help to the entire mining industry, we must individually put our shoulders to the wheel. We must try and persuade the younger men to join with us. We want the help of the Lake Superior Mining section of the National Safety Conference of whom we are glad to say we have some forty members present with us tonight. We would like their papers for our publication and our Secretary advises me that separate pamphlets of the deliberation of the Conference can be furnished them. We want the cooperation of the Engineer’s Society of Northern Minnesota and the privilege of publishing its papers. Some one has said “The Lake Superior Mining Institute is the foremost regional organization of its kind in America.” Let us keep it there.

Our annual publication should be in every mining man’s library. Copies are sent on request to practically every mining country in the world and to the libraries of all the technical schools.

There are many fine trips ahead of us, not only in the Lake Superior region, but many other mining districts. I hope on your next visit to Minnesota, we will be able to point out to you freighters from European and American ports, possibly loading ore, steel or wheat to be shipped via the deep waterway to foreign countries.

The president then introduced Mayor Snively, who delivered the address of welcome in behalf of the citizens of Duluth.

ADDRESS OF WELCOME BY MAYOR SNIVELY.

Mr. President and Members and Guests of the Lake Superior Mining Institute:

I feel somewhat embarrassed tonight in trying to express to you the welcome which the people of this city hold in their hearts for you, and the cordiality they extend to you on this occasion of your visit to our city.

When your president, Mr. Webb, spoke to me and kindly asked me to appear here tonight and say a few words, I replied: “What could I say that would express the whole-hearted welcome that those of a happy city extend to those of the Mining Institute?” “Well,” he said, “Talk about your city then and describe the town to them, and say a few words as to the proposed deep waterway to the sea.” And so I will probably have to conclude what I have to say in welcome, by expressing to you again the heartfelt feelings on the part of our people for your presence with us tonight. And again, what could I say that would interest you, in the subject in which you are specially versed? I will not try to attempt that, for I might find myself called upon to follow the advice of an old colored parson, or in a predicament in which his brother parson found himself when called to a new pastorage.

He found that, try ever so hard, or talk ever so earnestly, he could not command the interest of his congregation. After pondering over his problem for sometime, he went to his brother pastor, and explained his difficulty to him. He said: “Ah picks out my text, Ah reharses my sar-mon, Ah talks it out loud during the week and figures out the strong pints, but it doesn’t seem to bring any response.” Then the other pastor said: “Now my dear brother Johnsing, Ah am glad you have spoken to me about this and Ah wish you had mentioned it to me before, Ah can tell you just what is the trouble; first, you should never be talking to people on a subject about which they know more than you do, and second, you made a great mistake in picking out your text, and re-harsin’ your sarmon out loud, for you well knows, that the devil is going to and fro in the earth seeking whom he may devour SOMEBODY, and he hears all you have to say, and then he closes the ears and seals the hearts of your congregation against it. Now, Ah keeps my text and my sarmon to myself, and when Ah does go before my congregation, Ah talks so suddenly, and such a way that no member of my congregation, and not even the devil himself if he were present can tell what Ah am talking about.”

Therefore, I will not undertake to speak to you on matters in which you are better versed than am I, but I will call the bluff of your president and tell you something instructive about my city.

Professor Lane and others were inquiring of me this afternoon, when at the steel plant, if we were still in the city, and I replied: “Yes, indeed we are,” and then he asked, “How big is your city?” and I told him, as I now tell you, that it begins away to the east somewhere in the regions of the rising sun, and extends westerly to where the King of Day drops down behind our golden hills, and it starts at some unknown depth in the waters.
of our lake, and rises on up towards the heavens, no one
knows where. With this minute and helpful description, you
can feel very much assured that you can rise early in the
morning and travel about to the end of the day and still be
within the city limits of Duluth. We are visited each year by
many thousands of people and tourists, and they tell us we
have a very beautiful city here, and some say, it is to be the
most beautiful city in America, and somehow we have caught
that faith and spirit and are trying to conserve and improve
what nature has given us, so that we will have, physically,
speaking, one of the most beautiful cities in all the world.

Then again, it is a city situated in the heart of the North
American Continent, with the great forests, the great mines,
and the great prairies spread round about it, all yielding
immeasurable wealth, and productive in everything that obtains
in the civilization of mankind and naturally, with all these
things, we feel a certain sense of pride and self-reliance,
because we can feed, house and clothe ourselves, and
manufacture what we need. We have our own ocean, our own
mountains, our own productive fields and our own mines, and
yet with all these we are not a selfish people, but a genuinely
American hearted people, and we share our good fortune and
our vast wealth with others of our land. We wish, however, to
be brought so close to the different sections of our country, that
we will really form a part of one great American brotherhood.

And so it is, too, that we want to reach out yet further, and find
our place “in the sun.” We want to be generous enough to take
the produce of these, our mines, our forests, our fields and our
shops to the people of other climes.

At the hand of science, mountains have been penetrated and
made to render up their hidden wealth, oceans have
contracted and rivers that once divided hostile tribes made to
unite nations engaged in pursuits of peace, and the spirit of
American genius is reaching out to foreign lands, there to
reproduce in the world at large, a development similar to that
which it has contributed to our own glorious country.

And we of the “Northwest America” have a right to get out into
other parts of the world—and we propose to get out into other
parts of the world—and we hope that you will come to visit us
again and be here at a time when the two associate nations,
our neighbor country of the British domain, and our own United
States of America shall have built a ship, grand, beautiful and
strong, manned it with the human element of the two countries,
and laden it with the products of this vast interior America,
and when high up on its mast we shall nail the Union Jack, that
symbol of unity and strength, and by its side haul up our
beautiful emblem of justice, humanity and fraternity, the red,
the white and the blue, and with their ample folds floating in
friendly companionship to the breezes of freedom, we shall sail
out of our grand capacious harbor, cheered and serenaded by
the music from the humming industries of two great peoples, at
work upon the arts of peace; sail on down the great inland
seas, through the channel of the historic St. Lawrence, and on
across the blue Atlantic to lay our blessings on the shores of
every land that is washed by the waves of the seven seas.

So we hope when you leave our city, that you will go with the
same good will for us that we extend to you, and that you will
give us a helping hand in this our great undertaking, so that
you may be instrumental in the education of our countrymen to
the end that no one part or section of our land shall stand
against any other section, when a great project is presented for
the general national good, and so that in pursuing any grand
national purpose we may know no north, no south, no east, no
west, but may all rally under the banner of progress and march

triumphantly on towards the higher and more glorious plane of
our national destiny.

RESPONSE TO MAYOR SNIVELY.

JOHN M. BUSH, ISHPEMING, MICH.—Mr. President, on be-
half of the visiting members of the Institute, I wish to
voice the thanks of the members for the hearty welcome
extended to us by the Mayor of Duluth. We have
enjoyed the Zenith City; we have taken great pleasure in
your beautiful boulevard drive; we have enjoyed your
wonderful parks and your golf links; we enjoyed your
places of business and the visit to your Steel Plant, but
most of all we have enjoyed the hospitality of your
citizens and when you ask us to come again we are
going to be here.

THE PRESIDENT—In giving a short history of the Institute,
I mentioned the first meeting of the organization, held in
Ironwood in 1893, and it gives me very great pleasure to
introduce to you a man who really needs no introduction
to any of you, who was present at that meeting, Mr. W.
J. Olcott, President of the Oliver Iron Mining Company.

MR. OLCCOTT—Mr. President, Members of the Institute, and
Friends All:

When I left my home this evening, Mrs. Olcott casually asked
me if I was going to make any remarks and I said “No,”
because I had been playing golf in the afternoon and was told
the program committee had made all arrangements for having
but a few speakers and some entertainment, which I see they
have prepared. Therefore, I came down here unconscious of
any effort that I would have to make and prepared to have a
good time, but after I was seated the President leaned over
and said, “You were present at the first meeting that started
this Institute, and I think it would be very appropriate if you
would, therefore, make a few remarks,” and for this reason I
talk to you entirely unprepared.

Mr. Webb’s address shows that the first social meeting of the
mining men was held in Ironwood in 1893 and was composed
of men interested in mining in the Lake Superior region, and
that was the first meeting which finally led up to the large and
growing organization which we now have. I notice also it says
that there were forty mining men present, all of whom I knew
very well; but Mr. Boss and myself, I believe, have the honor of
being the only two of those forty here tonight. I notice that
there are about 400 here tonight, and many will join the party
when we get on the Range. I think Mr. Boss must feel with me
a great pleasure in having met with the original forty.

I have no set speech, but on an occasion like this it may be
appropriate to recall some of our early experience. When I first
started work at the Chapin mine, January 1st, 1885, it was a
large mine and my first trip underground was with the two
mining captains, both of whom are long since dead. We had at
that time a young man from the South who was a very unique
character—a little fellow and quite a dandy and many here
tonight must remember him, Jonah Orrison. He had a very
small foot, and out of his kindness he said: “If you can wear
these rubber boots of mine you can have them.” They looked
like a pair of boots that were almost new and as I was starting
in at that time at $50 a month it looked like a pretty good
proposition to me so I took him up on it. We were underground
nearly all day and as we had no cages as you have today we
had to climb many hundred feet. We didn’t get up until about
four o’clock in the afternoon and my feet were so swollen I.
could not get the boots off, and had to cut them off. I made up
my mind then that that was the first and last time I would try to
get something for nothing. For the benefit of the young men I
want to relate my first task. Mr. Per Larsson, Chief Engineer at
the Chapin mine at that time, a very capable mining engineer
and who was an early member of this Institute, now long since
dead, and who was a great and kind friend of mine, first told
me to go over to "C" shaft and do something. Unfortunately at
that time engineering as taught in the universities was mostly
theoretical. The only practical experience I had had was
running a few curves on the campus at Ann Arbor and I did not
know what he was asking me to do. I had a helper, a young
Swede, and he had been working with Mr. Larsson some
years, and when we were clear of the office I said, "August,
what does the old man want," and August explained to me the
task. It is a good thing I did not tell Mr. Larsson I didn’t know
what his orders were, and it simply shows the importance of
combining the practical with the theoretical, and I also advise
the young men, not to say they do not know when told to do
something, for if persistent you will surely find the solution.

I am glad to see so many faces of old friends I have known for
a great many years, and I see a great many that I do not know,
and I wish I knew them all. But with all the pleasure we have
of coming here together again and having this wonderfully
successful meeting, there must creep into it a considerable
feeling of sadness when we think of the men identified with the
mining industry for so many years who left their mark in the
mining world, and especially in this Lake Superior district, and
have passed on. We recall with esteem and admiration D. H.
Bacon, Captain Dickinson, Harry Roberts, Joseph Sellwood,
Captain White, Richard Mitchell, Billy West, Richard Trezona,
and many others. The pioneers are getting older and older
and they are dropping off faster as the years advance. It was a
great pleasure to me to be one of the first members of the
Institute, and it is a greater satisfaction to feel and to know that,
young as I am, I have been identified with the early pioneering
of three ranges, especially the Gogebic and Mesabi. I went to
the Gogebic Range in June, 1887, at the Ashland and
Germania mines, when that country was a forest. They had to
cut down trees to make room for my laboratory and
engineering office, and in it I had a room 10x12 feet for a
sleeping room. My first trip to the Mesabi was in June, 1892.
We made the trip from Mesabi Junction on the Duluth & Iron
Range railroad to Hibbing with horses. It was a great deal
more comfortable to walk on account of the rough road and
mosquitoes. There was nothing on the range at that time
except test-pits and I wondered, with the difficulty of making
roads, if that country would ever have wag-roads to travel on,
never dreaming that in this short time we would have a
concrete pavement the entire length of the range. I almost
forgot to recall that I had the pleasure of meeting Captain
Frank Carbis, this evening, and I want to acknowledge to him
tonight my thanks for his kindness and assistance to me during
the time I was at the Chapin mine, and also to all of the
underground men with whom I frequently came in contact, and
who were always strong, helpful friends of mine. Now, while
there are only a few of us, and we are getting fewer each year,
who were identified with the pioneering of the iron ranges in
the Lake Superior region, we had what none of the young men
of today can ever have. We had the romance of pioneering.
We had to get along on very little. Every dollar was weighed;
money was not plentiful at that time. We went through panics,
when the mines had to be shut down and the men laid off,
because there was no market for the ore. Those were the
early days in mining on the three ranges, and especially during
the pioneering of the Mesabi, and it is a privilege and honor, I
think, to be identified with the pioneering of such an industry
and to see it develop to what it is today. And you young men
who are coming after us, will not have this romance. You are
working in a country which has been developed. You have
your cities, towns and good roads, none of which were there
when the pioneers first went to the Mesabi. Still you will have
your own problems, and they will probably be just as difficult
and just as important as the problems we faced. To the young
man I want to give this word of advice: If you are going to
succeed it is not going to be by sitting around waiting for a pull.
I can only advise you to make yourselves so useful to the
people that you are working for that your services will be
indispensable. Work without regard to the hours, and make
friends of all the men you meet underground, and all the men
you meet on surface, and in fact all the men you come in
contact with. While they may not have the education you have,
whether he is a mining captain, a timber trammer or what not,
every one has information in his possession that can help you
and they are all ready to give it to you. He is not your friend.
If I have been successful in any degree, it is not
because of any marked ability, it is due to the men I have
associated with, and because I always tried to make myself
indispensable. No man can succeed by himself, but rather the
organization with which he surrounds himself. Therefore,
makes yourselves indispensable, make friends everywhere,
make yourself so useful that your company cannot well get
along without you, and success will be your reward.

THE PRESIDENT—There are several papers to be
presented at this session. We will not have them read
this evening, but I think in each instance the author is
present and if there are any questions to be asked, I am
sure the author will be very glad to respond. The papers
have all been printed and were distributed to you at
headquarters today.

The papers to be presented at this meeting are as
follows:

“Safety in Electrical Installations in Mines”—F. C.
Stanford, Ishpeming, Mich.

“Guniting in the Athens Shaft”—C. W. Nicolson,
Ishpeming, Mich.

“The Cement Industry in Duluth”—Ray S. Huey, Duluth,
Minn.

“Report on the 1922 Lake Superior Mine Safety
Conference”—George Martinson, Hibbing, Minn.

“Fire Prevention and Fire Fighting in Metal Mines”—

“Mesabi Iron Company’s Reduction Plant”—W. G.
Swart, Babbitt, Minn.

Mr. Swart presented his paper in abstract. As the Babbit
plant was to be visited the following morning, he called
attention to some of the details.

The next order of business was the appointment of
committees.

On motion the president named the following
committees:
Duluth at midnight over the Duluth & Iron Range railroad. Special trains for Babbitt and the Mesabi Range left.

Entertainment arranged by the Duluth members. The meeting was adjourned. The evening was spent in announcement of the program for the next day the Hotel Androy, Hibbing, on Thursday evening. After Committees to report at the business session, at the Hotel Androy, Hibbing, on Thursday evening. After announcement of the program for the next day the meeting was adjourned. The evening was spent in entertainment arranged by the Duluth members. The special trains for Babbitt and the Mesabi Range left Duluth at midnight over the Duluth & Iron Range railroad.

THURSDAY, AUGUST 29TH, 1923.

The party arrived at Mesabi Junction at 3:00 a.m. Breakfast was served in the cars at 6:30, and at 7:30 a train of coaches provided by the Duluth & Iron Range Railroad left for the Mesabi Iron Company’s operations at Babbitt, the first stop being made at the mine, where the ore for the concentrating works is produced. This resembles a quarrying operation as the work is still near the surface, there being very shallow stripping. In time it will resemble the open pits so familiar on the Mesabi and Cuyuna Ranges. Babbitt is situated on the Eastern end of the Mesabi Range and about 16 miles nearly due South of the Ely group of mines of the Vermilion Range.

The next stop was made at the Concentrating plant some two miles East of the mine. The party was met by Mr. Swart, Vice President and General Manager, and the officials in charge of the Plant, and after registering the tour of inspection was begun, guides taking the party through in small groups. As the plant is fully described in Mr. Swart’s paper, no further description will be attempted here. The party returned to Mesabi Junction, where the special train was again board, leaving at 11:00 o’clock for the trip to Virginia, arriving at 1:30 p.m. The party was met at the station by the reception committee of the Mesabi Range under Mark Elliott, General Superintendent, Jones & Laughlin Steel Company. A first-aid and rescue demonstration was held at Virginia. This was given by teams representing the Oliver Iron Mining Company and Pickands, Mather & Co.

Automobiles were provided and the members taken to Hibbing. The highway is largely of concrete, although a portion of the way is still macadam road, but kept in good repair. The trip was much enjoyed and gave the visitors a good opportunity to see some abandoned locations, marked by costly school houses now only partially occupied. The route also goes through some of the prosperous milling locations where operations are actively conducted.

Arriving at Hibbing the party was met by the reception committee, in charge of William M. Tappan, Superintendent, Oliver Iron Mining Company. Two trains of flat cars were provided and a trip was made into the Hull-Rust Pit. This was a very interesting feature. The excavation, which includes the Mahoning is two miles long by over one mile at its widest; the deepest part is about two feet below the original surface. Many of the members who have attended previous meetings of the Institute remarked the development in the depth and extent of the present workings. The general shops of the Oliver Company were also inspected. Some of the members visited the Hibbing high school.

At 8:00 o’clock the party met at the Hotel Androy, where a banquet was served by the Range members. The hotel is in South Jibbing, where the new town is now located, and was completed in 1921. The dining hall was attractively decorated and a splendid menu was prepared. Provision was made for three hundred guests and all were comfortably served.

Following the banquet a business session was held in the dining hall. President Webb called the meeting to order and presented the opening address.

THE PRESIDENT—It gives us great pleasure to be in Hibbing tonight. The last meeting on the Minnesota Ranges was in 1913. The Lake Superior Mining Institute is scheduled to make each of the various ranges once in five years, but owing to the World War, meetings were cancelled for 1918-1919, 1920 and 1921. The next meeting in Hibbing will be in 1928 and if your entertainment is as good as it was in 1908 and 1913 and tonight, I think that they might make Hibbing every three years.

I have just finished reading the Hibbing Daily News and I wish to congratulate the News on its great enterprise and compliment the reporters on the authenticity of the report to the minutest detail.

The Lake Superior Mining Institute was organized in Iron Mountain, Mich., in March 1893, and the preliminary meeting was held in Ironwood in February of that year. We have with us several members who were in attendance at the meeting held in Ironwood, and who were at the Iron Mountain meeting. Nelson P. Hulst was the first president, C. M. Boss the first treasurer, and F. W. Denton the first secretary.

The membership of the Institute previous to the War was about five hundred, then after this setback we were afraid it would he many years before we would get back in regular running order. We have at the present time three hundred members, and two hundred have been in attendance at this meeting. We want more members. We have fifty-four applications which is the largest number we have had in several years. But this is not enough and we believe it is the duty of the younger men, mining engineers and superintendents, and others.
identified with the mining industry, to join this institution. We also have found in going over the roster, men who have been identified with mining for years and are not members. They should not neglect becoming members but file their applications as soon as possible.

We would now like to hear from M. H. Godfrey, of Hibbing, District Manager of the Oliver Iron Mining Company.

MR. GODFREY—In the absence of our Mayor, who was called from the City, I extend to the members of the Institute and their guests a most hearty welcome to Hibbing. We trust that you will enjoy every moment of your stay while in our midst and hope that it will not be many years before you will make us another visit.


We are glad to be with you tonight and it is an extreme pleasure to stand here and say on behalf of the Institute that we have enjoyed every moment of our visit.

I might, if I wished to flatter you, adopt the method used by a prominent Michigan man who toured France with a body of men who were the guests of the French Government. At each City the usual addresses were made and at each place he responded. The response made in each place was about as follows: “We have been received with whole-hearted hospitality everywhere, but nowhere has that reception been so cordial, so heartfelt and generous as in your City.” Our appreciation of your effort and your hospitality is, however, genuine and sincere.

When we come here from the older ranges and see your mammoth pits and hear of the daily tonnages mined and shipped, we realized that in this field we do not speak the same language—your Hull-Rust pit mines and ships in a day half a season’s product. However, we still claim relationship with you—sort of a poor relation.

Let me again tell you we appreciate your welcome and hospitality and for the remainder of our stay may I remark with Tiny Tim, “God bless us every one.”

THE PRESIDENT—We are pleased to have with us tonight a member of our Institute who has been identified with mining and transportation in the Minnesota fields before any ore had been shipped, and who is familiar with the progress and development of the several ranges. I will call on William A. McGonagle, President of the Duluth, Missabe & Northern Railway, to whom, I am sure, you need no introduction.

WILLIAM A. M’GONAGLE, President of the Duluth, Missabe & Northern Railway Company said:

I bagged hard to escape making a speech tonight, but Frank Webb has a way of getting people to do the things that he has outlined and so I had to obey the order of the Commander.

It is forty-one years since I came to Duluth to engage in the work of locating and constructing the Duluth & Iron Range Railroad. I was first employed as transitman on location and as such laid out the main line from Agate Bay to Bassett Lake, where we connected with an old survey made by an engineer named Case. Afterwards we located the line from Two Harbors to Duluth, where we connected our line with the St. Paul and Duluth Railroad, now a part of the Northern Pacific System.

We left Duluth with an experienced engineer corps on December 6th, 1882, and went over the ice in Lake Superior to Agate Bay, as there were no roads fit to travel by land. We arrived at Agate Bay in the evening of the same day and pitched our tents near the location of the present Ore Dock No. 1. Some of us slept in the old claim shanty built by Thomas Saxton, this being the only habitation in that part of the country and the next day we stepped off into the wilderness on our way to Tower, the location of the iron mines. It was a desperate winter, with at least four feet of snow and with temperatures running as low as forty degrees below zero, Fahrenheit, but we were young men and had no fear of climatic conditions and therefore moved on by shifting our camps day by day until we reached our final destination. We then returned to Two Harbors on Agate Bay and began the construction of the line, which was completed and the first iron ore dumped into the ore dock on July 31st, 1884, one day ahead of time and the contractors, Messrs. John S. Wolf & Co., earned a bonus of fifty thousand dollars, which was promptly paid to them.

It has been a great privilege to watch the development of the iron ore industry in Minnesota and elsewhere since that date. Many millions of tons of ore have been shipped and you gentlemen, composing the membership of our Institute, have in a large measure been responsible for the successful outcome. We thought we had a great year when we shipped two hundred thousand tons of iron ore, but this year on the Duluth, Missabe & Northern Railway we will ship about twenty million gross tons, and this month we are shipping three and one-half million gross tons. This has only been possible by the enormous development of mining methods and mining machinery, as well as by the improvement of the transportation service and by the development of modern ore docks and modern ships. In all of these developments our members have had a hand and the results obtained have been caused by close cooperation of miners, railroad men and vessel men, the gospel of cooperation being developed and spread by the Lake Superior Mining Institute.

Our members are vigorous, resourceful and efficient and the exchange of ideas during our conventions has been a very great benefit to the iron ore industry. Our members have never been afraid of hard work and the message we want to leave with our younger members is that “hard work never injured anyone, but rather prepared them for greater and greater attainments.” A good maxim to follow is to work for the property in your charge as if it were your own, then there cannot be any doubt of the final result.

It is saddening at times to look about in our conventions and note the absence of familiar faces. Many of these members have crossed the Great Divide. It was a privilege to know them during the period that they were permitted to be with us and now we can only emulate their noble example of faithful service, and leave to our successors an example worthy for them to follow.

THE PRESIDENT—Mr. McGonagle’s experience in the early days of the Minnesota Iron Ranges is very interesting and will add much of historical interest to our publications.

President Webb next introduced Mr. Thomas F. Cole, of New York, one of the earliest members of the Institute and one of the first presidents of the Oliver Iron Mining
Mr. Cole addressed his remarks chiefly to the younger men of the mining profession and urged them to become members of the Institute and take part in its proceedings. He recounted some of his personal experiences and what he had learned during the years that he spent in mining work in the Lake Superior region and in other mining districts. He brought out several bits of history dealing with the Michigan copper country and the Mesabi range that were highly interesting and greatly enjoyed. Mr. Cole fully realizes the value of such an organization as the Institute to the mining men and before closing his remarks again urged those interested in mining in the Lake Superior region to become affiliated with the Institute if they did not already hold membership.

The President—It has been a great pleasure to hear from these men tonight. We have several papers that have been printed and distributed among the members and it was our intention to have these papers discussed, by owing to the fact that a business meeting must be held and entertainment to follow, we will be compelled to merely present the papers by title and will have very limited time for discussion. The authors will, however, be glad to answer any questions that may be asked. Members are invited to send discussion of the papers to the secretary in time to be printed in the proceedings or to present the same at our next annual meeting.

We also hope to have the proceedings of the Lake Superior Branch of the National Safety Council published with our Annual Proceedings, and we would like to receive from time to time the papers on various subjects pertaining to mining from the Engineers' Society of Northern Minnesota.

The following papers were read by title:

"A Brief History of the Cuyuna Range"—J. Wilbur Van Evera, Crosby, Minn.

"Slushing Practice in the Mines of the Oliver Iron Mining Company"—Ford E. Boyd, Duluth, Minn.

"Recent Developments in the Geology of the Gogebic Range"—W. O. Hotchkiss, Madison, Wis.


"The Wear and Care of Wire Rope"—William Constable, Duluth, Minn.

"Developments of the Use of Cuyuna Range Manganiferous Iron Ores"—L. E. Ives, Cleveland, Ohio.

The Secretary—We have been requested by the trustees of the "Norrie Fund" to present to our members at this meeting and to publish in our Proceedings the following report:

The Norrie Fund.

On January 30th, 1890, A. Lanfear Norrie set over to the Michigan College of Mines, Houghton, Michigan, and to Peter White, D. H. Ball and J. M. Longyear, of Marquette; Michigan, as Trustees, the sum of Five Thousand ($5,000.00) Dollars. This was afterwards increased to a total of Ten Thousand ($10,000.00) Dollars. One of the conditions of this gift is that one-half the income of this fund "shall be paid yearly by the said Trustees into the Board of Control for the support of some student whose father has worked in, or in some way been connected with, mining operations in the Upper Peninsula of Michigan, who shall be designated by the Faculty of said School, and the remainder of said income shall be accumulated and invested as said principal shall be invested (in mortgages as specified) and that this fund, with its accumulations, shall be the basis of a larger fund to be obtained from other contributors, amounting to at least One Hundred Thousand ($100,000.00) Dollars, to be used for the erection of a dormitory building for the use of said students as may be designated by the said Faculty."

In 1906, with the approval of Mr. Norrie, $7,500.00 of the accumulations of this fund was devoted toward the erection of a gymnasium at the Mining School.

Beyond the above diversion, the accumulations have now reached several times the amount of the original gift. The demand for aid from this fund to needy and worthy students has always been far less than the amount of money available for this purpose. For the last two years the advances amount to only $300.00. It seems to the Trustees of the Fund that the knowledge of its availability to such students must be very limited, and that there ought to be many more students who can qualify under the provisions of this gift for aid from this Fund. It is our desire to spread this information as widely as possible in the Upper Peninsula of Michigan, with the idea that it may encourage qualified students to undertake the course at the Mining School. It should be noted that under the terms of the gift it is not necessary that an applicant for aid from this fund be a resident of the Upper Peninsula at the present time, the only qualification being that his father has in some way, at some time, been connected with mining operations in the Upper Peninsula of Michigan. It would hardly seem necessary to say that the Faculty, in recommending applicants for aid from this fund, seek to find, men who have ability and show promise. We ask that the members of the Lake Superior Mining Institute take the responsibility each year of spreading this information throughout the Lake Superior region, making certain that this information is given annually to the High Schools. We further ask that part of this statement be printed annually in the published proceedings of the Mining Institute.

It is also evident that the second purpose of this original gift has been largely forgotten, viz., the provision for the beginning of a fund towards the erection of a dormitory building at the College of Mines. There is available for this purpose today something over $10,000.00. If this were announced from time to time, it might encourage others interested in the mining industry in the Upper Peninsula to add to this fund, either by direct gift or by bequest.

Marquette, Michigan, August 21st, 1923.

H. R. Harris, Alton T. Roberts, Robert S. Rose, Trustees.
THE SECRETARY—The following communication from the American Mining Congress was presented by J. S. Bond of Milwaukee:

“In behalf of the Milwaukee executive committee and the American Mining Congress we wish to convey through you to F. J. Webb, President of the Lake Superior Mining Institute, and the members and delegates meeting in Duluth, a cordial invitation to attend the sessions of the Twenty-Sixth Annual Convention and National Exposition of Mines and Mine Equipment of the American Mining Congress, to be held here at Milwaukee, September twenty-fourth to twenty-ninth. A feature of the entire convention will be a discussion of practical equipment problems of special interest to operating men,

“E. C. PORTER,
“Convention Manager,"


Secretary’s report of receipts and disbursements from September 1st, 1922, to August 31st, 1923:

<table>
<thead>
<tr>
<th>Description</th>
<th>Amount</th>
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</thead>
<tbody>
<tr>
<td>Cash on hand August 31st, 1922</td>
<td>$ 9,005.56</td>
</tr>
<tr>
<td>Entrance fees 1922</td>
<td>$ 120.00</td>
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<tr>
<td>Dues for 1922-23</td>
<td>$ 1,855.00</td>
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<tr>
<td>Dues for 1921-22</td>
<td>$ 255.00</td>
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<tr>
<td>Dues for 1916-17</td>
<td>$ 25.00</td>
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<tr>
<td>Advance dues 1923-24</td>
<td>$ 10.00</td>
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<tr>
<td>Sales of Proceedings</td>
<td>$ 58.54</td>
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<tr>
<td>Total</td>
<td>$1,290.54</td>
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<tr>
<td>Advance entrance fees, 1923-24</td>
<td>$ 110.00</td>
</tr>
<tr>
<td>Advance entrance dues, 1923-24</td>
<td>$ 220.00</td>
</tr>
<tr>
<td>Total secretary’s receipts</td>
<td>$3,015.54</td>
</tr>
<tr>
<td>Interest on bonds and deposits</td>
<td>$ 654.59</td>
</tr>
<tr>
<td>Total receipts</td>
<td>$2,668.13</td>
</tr>
<tr>
<td>Total on hand and receipts</td>
<td>$11,676.99</td>
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Disbursements—

<table>
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<tr>
<th>Description</th>
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</thead>
<tbody>
<tr>
<td>Stationery and printing</td>
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<tr>
<td>Postage</td>
<td>77.37</td>
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<tr>
<td>Freight and express</td>
<td>1.31</td>
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<tr>
<td>Telephone and telegraph</td>
<td>5.15</td>
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<tr>
<td>Stenographic work</td>
<td>88.48</td>
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<tr>
<td>Secretary’s salary and expenses</td>
<td>750.00</td>
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<tr>
<td>Total office expense</td>
<td>$1,103.29</td>
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<tr>
<td>Publishing, Bulletin, 1922</td>
<td>$ 243.00</td>
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<tr>
<td>Photographs, maps, etc., 1922</td>
<td>237.75</td>
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<tr>
<td>Publishing Volume XXII</td>
<td>1,695.00</td>
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<tr>
<td>Programs, lodges, etc., Houghton meeting</td>
<td>215.65</td>
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<tr>
<td>Total publishing</td>
<td>1,784.80</td>
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<tr>
<td>Total disbursements (vols. 1 to 24)</td>
<td>2,888.89</td>
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<tr>
<td>Balance on hand</td>
<td>$ 8,819.60</td>
</tr>
<tr>
<td>Grand total</td>
<td>$11,676.99</td>
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</table>

Treasurer’s Report.

<table>
<thead>
<tr>
<th>Description</th>
<th>Amount</th>
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</thead>
<tbody>
<tr>
<td>Balance on hand August 30th, 1922</td>
<td>$9,050.56</td>
</tr>
<tr>
<td>Remittance from secretary</td>
<td>$2,015.54</td>
</tr>
<tr>
<td>Interest on bonds and deposits</td>
<td>624.59</td>
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<tr>
<td>Total receipts</td>
<td>2,658.13</td>
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<tr>
<td>Total balance and receipts</td>
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<tr>
<td>Disbursements for secretary’s vouchers</td>
<td></td>
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<tr>
<td>Treasurer’s balance</td>
<td>$ 8,819.60</td>
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<tr>
<td>Bank balance August 25th, 1923</td>
<td>$ 238.07</td>
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<tr>
<td>Loss drafts outstanding</td>
<td>77.18</td>
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<tr>
<td>Net balance</td>
<td>$ 170.89</td>
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<tr>
<td>Remittances not deposited</td>
<td>270.04</td>
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<tr>
<td>Treasurer’s cash balance</td>
<td>$ 449.93</td>
</tr>
<tr>
<td>Alpha township bonds</td>
<td>5,099.00</td>
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<tr>
<td>Pennsylvania Railway bonds</td>
<td>2,309.67</td>
</tr>
<tr>
<td>Cash balance on hand August 30th, 1923</td>
<td>$8,819.60</td>
</tr>
</tbody>
</table>

I hereby certify that I have audited the books of the Secretary of The Lake Superior Mining Institute for the year 1922-1928 and found the same correct.

T. J. RICHARDS.

The Council appropriated the sum of one thousand dollars for salaries and expenses of the Secretary’s office for the next fiscal year.

On motion the report of the Council was adopted.

Reports of Committees.

The Auditing Committee presented the following report:

Dated August 25th, 1923.

Hibbing Minn., August 30, 1923.

Your Committee appointed to examine the books of the Secretary and Treasurer, beg leave to report that we carefully examined same and find the receipts and expenditures shown therein to be in accordance with the statements of the Secretary and Treasurer for the fiscal year ending August 31, 1923.

J. E. NELSON,
GEO. J. EISELE,
A. P. SILLIMAN,
Committee.

On motion the report was adopted.

List of Proposals for Membership—The following proposals were acted upon by the Council and recommended for election to membership:

- Adams, Robert M., Robert M. Adams Co., Fidelity Bldg., Duluth, Minn.
- Anderson, J. P., Superintendent, Hillcrest Mining Co., Lock Box N, Crosby, Minn.
- Archibald, Ralph S., Consulting Engineer, Negaunee, Mich.
- Bond, John S., Worthington Pump & Machinery Corporation, Manager Power and Mining Sales, Cudahy, Wis.
- Botsford, Frank P. District Manager, Pickands Mather Co., Ribbing, Minn.
- Boyd, Ford E., Steam Engineer, Oliver Iron Mining Co., Wolvin Bldg., Duluth, Minn.
- Butcher, E. W. R., Chief Mining Engineer, Northern Ore Mines, Republic Iron & Steel Co., 808 Fidelity Bldg., Duluth, Minn.
- Byrne, Frank P., Salesman, Hercules Powder Co., 902 Torrey Bldg., Duluth, Minn.
- Cannon, George M., Assistant to Manager, M. A. Hanna & Co., 909 Fidelity Bldg., Duluth, Minn.
- Cash, F. H., Superintendent, Republic Iron & Steel Co., Kinney, Minn.
Chisholm, Alex D., Mine Manager, Youngstown Sheet & Tube Co., Ironwood, Mich.

Clark, Gilbert R., Manager, Trojan Powder Co., Lyeceum Bldg., Duluth, Minn.

Coates, Albert B., Jr., Mining, York Iron Mining Co., Virginia, Minn.

Cole, Frederick Lincoln, Mining, Seneca Copper Corporation, Mohawk, Mich.

Constable, William, Electrical and Mechanical Engineer, Republic Iron & Steel Co., 807 Fidelity Bldg., Duluth, Minn.

Coventry, E. D., Mining Engineer, John A. Savage & Co., Crosby, Minn.

Crosby, George Howard, Jr., Whitmarsh Mining Co., Crosby, Minn.

David, L. C, District Superintendent, Pickands Mather & Co., Gilbert, Minn.

Deatherage. George E., Secretary, The Hoar Shovel Co., 207-209 Palladio Bldg., Duluth, Minn.

Donovan, Michael J., Chief Clerk, The Cleveland-Cliffs Iron Co., Hibbing, Minn.

Drake, Morris Claire, Mining Engineer, Cleveland-Cliffs Iron Co., Gwinn, Mich.

Drake, Rollin E., 1835 Cambridge Road, Ann Arbor, Mich.

Duncan, Kennett, Superintendent Zenith Mine, Pickands Mather & Co., Ely, Minn.

Fay, George M., Mining Operator, Liberty Mining Co. and Joan Mining Co., Ironon, Minn.

Fearing, E. J., Superintendent, John A. Savage & Co., Crosby, Minn.


Haslam, Charles J., Sales Representative, E. I. DuPont de Nemours & Co., Hibbing, Minn.


Jackson, J. H., Salesman, W. S. Tyler Co., Cleveland, O., 555 McCormick Bldg., Chicago, Ill.

King, Alexander, Mine Superintendent, Oliver Iron Mining Co., Taconite, Minn.

Knight, William, Representing Allis-Chalmers Manufacturing Co., Lake Superior District, 709 Alworth Bldg., Duluth, Minn.

Lippla, John, Superintendent, Chicago & Northwestern Railway, Antigo, Wis.


Lohneis, George H., Assistant Superintendent, R. I. & S. Co., Virginia, Minn.

McLeod, Donald G., President, Murray-McLeod Co., Virginia, Minn.

McTaff, John C., Mining Engineer, Pickands Mather & Co., 700 Sellwood Bldg., Duluth, Minn.

Miller, S. F., Assistant Freight Traffic Manager, Chicago & Northwestern Railway, R. 303, 226 W. Jackson, Chicago, Ill.

Murray, Charles B., Chemist, Crowell & Murray, 407 Perry Payne Bldg., Cleveland, O.

Noyes, Jonathan, District Sales Manager, Sullivan Machinery Co., 910 Alworth Bldg., Duluth, Minn.

O'Connell, Charles J., Chemical Engineer, Crosby, Minn.

Pearsall, W. G., Adbar Development Co., Engineer, Fidelity Bldg., Duluth, Minn.

Perkins, Enoch, General Superintendent of Mines, Replloge Steel Co., P. O. Box 743, Wharton, N. J.


Perrin, Andrew J., Secretary, Lake Superior Industrial Bureau, Duluth, Minn.

Potts, Charles W., Exploration and Mining, Deerwood, Minn.

Read, Thomas T., U. S. Bureau of Mines, 508 Sellwood Bldg., Duluth, Minn.

Refuss, Ernest W., Assistant Purchasing Agent, Pickands Mather & Co., 700 Sellwood Bldg., Duluth, Minn.

Richards, Alvin E., Mining Superintendent, Ford Motor Co., Imperial Mine, Michigan, Mich.

Ries, Lester S., General Foreman, Oliver Iron Mining Co., Taconite, Minn.

Ring, John T., Cashier, First National Bank, Nashwauk, Minn.

Rose, Wm. A., Assistant General Manager of Mines, Pickands Mather & Co., 700 Sellwood Bldg., Duluth, Minn.

Rough, J. H., Jr., Mining Engineer, Cleveland-Cliffs Iron Co., Hibbing, Minn.

Royce, Stephen, Mining Engineer and Geologist, Pickands Mather & Co., Crystal Falls, Mich.

Rutherford, Harold McKnight, Mining Engineer, Oliver Iron Mining Co., Hibbing, Minn.

St. Clair, Rex, Salesman, Hercules Powder Co., Virginia, Minn.

Savage, William D., Mining Superintendent, John A. Savage & Co., Crosby, Minn.

Scallon, E. P., General Mine Manager, Clement K. Quinn Ore Co., Crosby, Minn.

Schwedes, Walter F., Electrical Engineer, Oliver Iron Mining Co., 714 Wolvin Bldg., Duluth, Minn.


Simpson, W. F., Chief Mining Engineer, Pickands Mather & Co., Hibbing, Minn.

Slaughter, W. F., Superintendent, Clement K. Quinn Ore Co., Riverton, Minn.

Smith, Harris G., U. S. Rubber Co., 25 Messaba Bldg., Duluth, Minn.


Strachan, William H., Division Superintendent, Northern Pacific Railway Co., Duluth, Minn.
Summersby, John James, Jr., St. Paul Sales Manager, Worthington Pump & Machinery Corporation, 1017 Commerce Bldg., St. Paul, Minn.

Swart, Walter Goodwin, Vice President and General Manager, Mesabi Iron Co., Babbitt, Minn.


Tinker, Willis L., Secretary, The Lake Superior Iron Ore Association, 1001 Kirby Bldg., Cleveland, O.

Tweed, Paul H., Hardware, Lumber, Nashwauk Hardware Co., Nashwauk, Minn.

Ulrich, William F., Superintendent, Oliver Iron Mining Co., Box 159, Coleraine, Minn.

Van Slyke, William Ralph, Superintendent, Robinson, Flinn, Murphy, Dorr, Fowler Estates, Eveleth, Minn.

Weidenfeller, Raymond P., Chief Engineer, Canisteo District, Oliver Iron Mining Co., Coleraine, Minn.

Westbrook, Donald McDermid, District Manager, Chicago Pneumatic Tool Co., 5th Ave and 5th St. S., Minneapolis, Minn.

The report was on motion adopted and the Secretary instructed to cast one ballot for the election of the applicants to membership.

The Council approved the following schedule of prices for the sale to members of extra copies of the Proceedings:

<table>
<thead>
<tr>
<th>Volumes</th>
<th>Cloth binding</th>
<th>Paper binding</th>
</tr>
</thead>
<tbody>
<tr>
<td>I to IV Inclusive</td>
<td>$1.25 each</td>
<td>1.00 “</td>
</tr>
<tr>
<td>V to XX Inclusive</td>
<td>1.50 “</td>
<td>1.25 “</td>
</tr>
<tr>
<td>XXI and XXII</td>
<td>1.75 “</td>
<td>1.50 “</td>
</tr>
</tbody>
</table>

Prices to non-members to be 50c advance from the above prices.

The price of Institute Pins was reduced from $5.00 to $3.50. (There are only a few left.)

The Committee on Resolutions presented the following report, which was on motion adopted:

Your Committee on Resolutions submit for your approval the following:

Resolved, that the sincere thanks of the Institute be extended to the President and the retiring officers for their efforts in behalf of the organization during the year; that the local committees be tendered our appreciation for the arrangements made at Duluth, Hibbing, Virginia and on the Cuyuna Range; that we record our thanks for the courtesies extended to us by the Minnesota Steel Company, the mining companies and their officials; that we also express our gratitude to the various railroad companies, their officials and employes who have handled the movement of the Institute so expeditiously; that we record our thanks for the courtesies extended to us by the former holders of this office. I wish to thank the members for this honor and in accepting the office I want to introduce the new President and call on Mr. Jopling for a few remarks:

With the greatest surprise I learned just now of my election as President of the Institute. There has not been time enough to find words to express my deep appreciation of the honor that has been bestowed upon me. The past record of the Institute shows the splendid work which has been accomplished and the part taken by the former holders of this office. I wish to thank the members for this honor and in accepting the office I will do all in my power to carry on.

During this trip of the Institute I thought of a number of topics that might come up for discussion and upon which some word from me might be spoken but a speech of acceptance of this office was not among those which entered my mind. At this session we have not had the opportunity to discuss the many technical questions brought to our attention by the papers printed in advance. It is to be hoped that members will make comments on them and add to the information already collected on these subjects. These might take the form of discussion of preceding papers, or of new articles. There will always be room in the Proceedings for all of these, especially on the topics which affect the mining industry of Lake Superior as a whole.

For the last two days we have been shown extensive developments, not only in mining, but also in concentration of
ore and in the manufacture of iron and steel. For many of us it seems like a realization of hopes and expectations voiced many years ago.

My return to Hibbing brings many pleasant memories of the early days accompanied by the excitement over new explorations, at a time when we used to start for the exploring camps on horseback. Hibbing itself shows wonderful growth and it is hard to realize that I am in the same town when I look around at the open pits stretching literally for a mile or more in extent, at the new town that has been built up and at this wonderful hotel.

There are many subjects to be taken up by the Institute, such as further scientific discoveries in geology, more particularly with reference ore deposits in the Lake Superior region, the handling of extensive mining operations, not only at surface but at great depth, a systematic report on mining methods, a discussion, on the beneficiation of ores and a description of mining machinery used both on surface and underground. At present there is a lull in prospecting and new development work as far as iron and copper are concerned but if the Canadian side is to be regarded by us as part of the Lake Superior mining region, there may be many more interesting features for discussion.

Among other subjects for discussion, there is the timber supply for mining, which is already becoming a problem. Besides a rapid depletion of the forests, there is to be noted the altogether too frequent occurrences of forest fires, for the prevention of which no working system has yet been adopted. Too little attention has been given to this subject. Fires are still permitted to destroy the undergrowth so long as valuable timber belonging to individuals is not destroyed. A system such as adopted in Europe for centuries might be introduced, namely, that of scattering the dwellings of responsible men at intervals in the forest who would work to save their own property from destruction rather than the system of leaving the business of fire protection to those who live in the towns. Capital under such a plan might be induced to attempt reforestation.

Again I thank the members for this honor and President Webb for his hearty congratulations and hope to see you all on the Marquette Range next year.

The President—This concludes our business session, and before we adjourn I want to thank the officers and members of the institute for the loyal assistance given me during my term of office. I deeply appreciate the help given me by the several committees having had in charge the arrangements for this meeting which have been carried out so successfully. Our train for the Cuyuna Range will leave at midnight and we want as many as can from the Mesabi to accompany us on this trip. Breakfast will be served enroute. The train is due at Crosby at 7:30 a.m.

We are invited to attend an entertainment prepared by the local committee, at the State Theater. We know you will have a good time because the arrangements have been in the hands of a real live committee.

Adjournment,

The program at the State Theater was presented by local talent, under the title of the "Kalso Mining Company," a farce to men of the industry, and was pleasingly rendered. The program and cast of characters was as follows:

**FRIDAY, AUGUST 31ST, 1923.**

The special train left Hibbing in two sections, at 1 a.m. over the Duluth, Missabe & Northern Railway. At Duluth the transfer was made to the Minneapolis, St. Paul & Sault Ste. Marie Railway for the Cuyuna Range, arriving at Crosby at 9:30 a.m. The party was met at the station by the reception committee, in charge of Clement K. Quinn, Chairman. A train of coaches was provided for the trip to the mines, which were visited in the following order:

- Portsmouth—Gordon Mining Company.
- Mahnomen—Clement K. Quinn & Co.
- Armour—Inland Steel Company.
- Pennington—Pennington Mining Company.
- Hillcrest—Hillcrest Mining Company.
- Sagamore—John A. Savage & Co.

Many changes have taken place since the previous visit of the Institute in 1915. New mines have been developed and the stripping operation has been greatly increased.

"The paper by J. Wilbur Van Evera, on the history of the range, and by L. E. Ives, on the Manganiferous Iron..."
Ores, gives much information as to recent developments."

Returning to Crosby, the party was escorted by the city band to the New Armory building where luncheon had been prepared. This was served by the ladies of Crosby. The hall was beautifully decorated and a substantial lunch was provided.

"Cuts of some of the properties described in these papers are published in this volume.


President Webb delivered a brief address, as a closing of the twenty-third annual meeting, reviewing the trip over the ranges and the splendid attendance had everywhere. The weather was delightful throughout and the program carried out exactly as planned. Many new applications for membership have been received since the close of the Hibbing meeting on the previous evening, bringing the total up to seventy-seven. Mr. Webb said this was very gratifying as it showed the interest taken, especially by the young men, many of whom having engaged in mining occupations since the former visit to the Minnesota ranges. Mr. Webb introduced the president-elect, J. E. Jopling, who spoke in part as follows:

"PRESIDENT WEBB AND MEMBERS OF THE INSTITUTE—It is my pleasure to reply to your invitation to speak this morning. We have been splendidly entertained during the past three days by our friends in Minnesota who have showed us the remarkable developments of the past few years. Our last visit here was in 1915, and at that time there were but five open pits. This morning we were shown a great number. It has been interesting to watch the gradual development of this range, which has added such a large tonnage to that of the Lake Superior region. To the members of the Institute who were not at the Hibbing meeting last night, I wish to call attention to the next meeting, which will be held on the Marquette Range and to invite all the members to be present."

A vote of thanks was extended to the ladies for the splendid lunch furnished also to the Legion for the use of their magnificent armory and to the band for the musical entertainment.

At 2:00 p.m. the party left for the return trip to Duluth.

The following is a partial list of members and guests in attendance (by ranges):

**COPPER COUNTRY.**
Coffey, W. D., Houghton, Mich.

**DULUTH, MINNESOTA.**
Adams, R. M., Duluth, Minn.
Barrett, R. D., Duluth, Minn.
Birch, C. R., Duluth, Minn.
Belford, M. P., Duluth, Minn.
Borden, F. H., Duluth, Minn.
Brower, R. C., Duluth, Minn.
Butler, E. W. R., Duluth, Minn.
Cram, F., Duluth, Minn.
Cromwell, G. M., Duluth, Minn.
Clark, W. H., Duluth, Minn.
Clark, Gilbert R., Duluth, Minn.
Conlin, Wm., Duluth, Minn.
Duntawell, G. B., Duluth, Minn.
Dudley, H. C., Duluth, Minn.
Evans, E. S., Duluth, Minn.
Fawley, J. A., Duluth, Minn.
Fielding, J., Duluth, Minn.
Fischer, J. K., Duluth, Minn.
Fiske, C. F., Duluth, Minn.
Forsberg, J. W., Duluth, Minn.

**GOGEIC RANGE.**
Pettengil, J. F., Bessemer, Mich.
Huthen, A. V., Waukegan, Ill.

**MARQUETTE RANGE.**
Clark, H. A., Marquette, Mich.
Call, Alfred, Ishpeming, Mich.
Collins, Wm., Ishpeming, Mich.
Gong, W., Ishpeming, Mich.
Hoffman, W., Ishpeming, Mich.
PAPERS

FIRE PREVENTION AND FIRE FIGHTING IN METAL MINES.

BY LUCIEN EATON* AND WILLIAM CONIBEAR!,
ISHPEMING, MICH.

A recent publication of the United States Bureau of Mines* reports that, in proportion to the number of men employed in each industry, fires in metal mines have since 1869 caused a greater loss of life than fires in coal mines. If a complete record of all the fires that have occurred underground in metal mines during this 53-year period were available, the frequency of their occurrence would convince mine-operators that this source of danger is present at all times and in all mines, and would direct their attention to the necessity of adopting fire-preventive measures and providing fire-fighting appliances at all underground mines. The loss of life and property by mine-fires in recent years has been so large that the attention of the public, as well as that of the members of the mining profession, has been forcibly called to the seriousness of this menace, and a great deal of publicity has been given to recent disasters. Unfortunately the lessons taught by such tragedies as the Argonaut and Granite Mountain fires are soon forgotten, precautions which might minimize the danger of fire-loss are not taken, and the need of them is overlooked, until another disaster occurs.

With the idea of putting the lessons taught by past fires into concrete form, so that they will be applicable to the mines of the Lake Superior District, we have drawn up a set of rules and specifications for fire-prevention and fighting; which can be used as a basis in determining the precautions to be taken and the policy to be followed at each individual mine. This compilation is based largely on the recommendations of the United States Bureau of Mines, whose engineers were of material assistance in their formulation, on the rules drawn up by a committee of the American Mining Congress at Cleveland last October, on the recommendations of the committee on mine-ventilation in the Standardization Division of the American Mining Congress, and on the recommendations of the National Safety Council.

*Superintendent, Ishpeming District.

The suggestions and recommendations that follow have for their primary object the safety of the men; and, in case of fire underground, first consideration is given to getting the men out of the danger zone with the least possible delay. After that has been accomplished, the extinction of the fire can be undertaken with a minimum amount of risk. The rules or recommendations have been divided under five headings as follows:

I. PREVENTION—Under this head come all fire-proofing and other measures for reducing the likelihood of the occurrence of fire.

II. EXTINCTION—This heading covers fire-extinguishers, water-supply, etc., and all other matters connected with putting out fires.

III. SEGREGATION—Under this heading are treated all fire-doors, brattices, etc., by which fire-areas can be isolated or traveling roads separated from the rest of the mine.

IV. NOTIFICATION—Under this heading are grouped all recommendations dealing with warning the men in case of fire, summoning assistance, and directions for action when warning has been received.

V. EXTRACTION—This heading covers all matters dealing with getting the men out of the mine, such as mine-rescue equipment, rescue crews, second outlet, etc.

The use of gunite is recommended for fire-proofing. It will stick well on rough wooden surfaces, and will prevent a fire from spreading, even after it is well started. Wet shafts are not immune from fires, if they have reasonably dry timber on the levels close in the shaft, and either they should be fire-proofed, or the levels within 100 feet should be fire-proofed.

Sprays should not be used in upcast shafts, as their use in time of fire would be likely to reverse the air current. There is seldom am, immediate danger to life from a burning up-cast shaft, because the products of combustion go directly to surface. A connection should be made to a fire-main with a shut-off close to the shaft.

Sprays should not be used in upcast shafts, as their use in time of fire would be likely to reverse the air current. There is seldom am, immediate danger to life from a burning up-cast shaft, because the products of combustion go directly to surface.

(b) No combustible material should be permitted near shafts on surface or on plats underground.

It is, of course, necessary to handle and often to pile timber, lagging and planks near shafts in the course of operations, but neither the shaft-collar nor the plats underground should be used for storage.

(c) Lagging-piles should not be nearer than 50 ft. from the shaft or timber-tunnel portal.

One of the greatest sources of danger from fire in the summer is the lagging-pile, which is usually exposed to
sparks from locomotives or steam-shovels, and it should therefore be kept far enough away from the collar of the shaft or the portal of the timber-tunnel, if one is used, to prevent smoke or fumes, in case of fire, from entering the mine.

(d) Buildings within 25 ft. of the shaft on surface, should be fire-proof.

If they are frame buildings, they should be covered with sheet iron or gunite, inside and out.

(e) Shaft-houses should contain as little wood as possible. Although it is not so important from a safety standpoint, if the shaft is up-cast, yet the danger of fire in a wooden shaft-house is a constant menace to continuous operation. Reinforced concrete or steel shaft-houses enclosed in sheet iron are recommended. Gunite may be used for fire-proofing wooden structures.

(f) All electrical insulation should be extra good.

Only the best material and construction should be allowed underground. Defective electric wiring has been one of the principal causes of metal-mine fires, and, now that candles are no longer used for lighting, it is probably safe to assert that electricity is now the most prolific source of fire existing in the mines. The probability of accident to men or of danger from fire is always greater during construction or in temporary installations, and it should be a fundamental rule in making electrical installations, whether for signals, lighting or power, never to allow poor workmanship even for temporary construction, but to insist that all work be carefully done.

(g) As little combustible material as possible should be allowed in pump houses.

(h) Oil and waste should not be stored in pump houses, except in small quantities, and then only in metal containers.

Care should be taken not to neglect the ordinary precautions for fire prevention, even though a pump station is cut out in solid rock or constructed of steel and concrete. Separate receptacles should be provided for clean and oily waste, and the use of open lights should be prohibited as far as possible. If a station is not made of steel and concrete, or in rock, the continuity of the timber to the shaft should be broken by fire-proof material.

(i) Fan and pump-stations should be fire-proof. This applies especially to booster-fans.

Electric motors installed close to timbers or in timbered drifts, or under timbered stopes or raises, are a source of danger. There should be no combustible material used in the installation of such motors or in the housing of fans and auxiliary equipment. The necessity of operating a booster fan is frequently regarded as only temporary and there is a tendency to resort to what is commonly termed “hay-wire” work, but as high a standard of excellence in this work should be required as elsewhere.

II. Extinguishment

(a) Carbon tetrachloride fire-extinguishers should be provided for all plats, pump-houses and shaft-houses, where electricity is in use.

(b) Other types of extinguishers, preferably fire-foam, should be provided in timber-tunnels and in buildings adjacent to shaft or tunnel openings. All small extinguishers should be kept under glass.

It is as important to keep fire extinguishers underground at places where combustible material, electric appliances and open lights are used as it is to maintain them in dry houses, shops and other buildings on surface. Various types and sizes are used, and they have been found very efficient for attacking fires in the early stages. The history of several recent fires has shown that the lack of any simple fire-fighting unit, such as an extinguisher or a water barrel and water pails, to quench or check a fire immediately upon its discovery, may result in a fire of vast magnitude. Men have been known to stand helplessly, watching a small fire spread until it was too late to make a direct attack upon it, because the time taken to assemble proper equipment was so great that smoke and gases had penetrated far beyond the fire zone, making approach impossible without oxygen-breathing apparatus. The time that is usually consumed in meeting this contingency too often makes possible a mine disaster, in which there is the liability of severe loss of life and property. Prompt action should be the first consideration.

Fire extinguishers should be tested and recharged at reasonable intervals, and the firemen should know where they are kept, and should be familiar with the methods of operation. They should be cautioned to guard against any dangerous fumes that may be generated in their operation, especially in places where there is little or no air movement, such as dead ends and other confined places.

(c) Standard 2½ in. fire-hose should be provided at all mines in sufficient quantity to reach all buildings near the shaft or timber-tunnels from one hydrant.

Fire-hose should be kept in all pump-stations with connections for instant use. Fire-pails should be provided at all plats and pump-houses, and in the principal buildings on surface, especially drys, engine houses and shops.

The fire-hydrants on surface should be located at sufficient distance from shaft buildings to make them usable in case of a severe fire. Cases have occurred, where the heat of the fire prevented men from reaching the hydrants.

Mines that are located near or within municipal boundaries, usually have surface water mains connected with the municipal water plant, and it is essential that hose and hydrants he equipped with a standard thread in order to obtain the protection of the local fire department. Many fire departments have adopted 2½ in. hose and 7½ threads per inch, which are the standards
recommended by the International Firemen’s Conference, held several years ago at Philadelphia. Mutual cooperation between mining companies and villages, towns and cities in the use of similar fire-fighting appliances is essential.

(d) The location of all fire-hydrants, fire-hose and fire-extinguishers should be shown on a map, which, together with instructions as to what is to be done in case of fire, should be framed, and a copy hung near the bulletin-board and in a conspicuous place at each shaft and in each of the principal buildings.

If the map shows the fire appliances in appropriate colored designs, accompanied with an explanatory legend, it will be more legible, and will be easily interpreted by all workmen. It should give a few specific instructions, such as what immediate action should be taken, whom to notify, etc. The names and addresses of the mine officials and rescue men should appear on it, in order that assistance may be summoned without the confusion and delay that are so frequently characteristic of fire-scenes, when there is a lack of a thoroughly trained organization. An example of such a map is shown in Figure 1.

In all mines which are piped for water for Leyner drills 200 ft. of ¾-in. hose should be provided at each shaft with nozzle and pipe-fittings suitable to make connections readily with the water-line wherever a fire should occur. At all shaft stations and pump-houses the water-line must be provided with a tee, valve and union conveniently placed, so that connection with the hose can be quickly made.

In mines not piped for water for Leyner drills connections should be made between the water-column and air-line at each level, such connections being provided with shut-offs and reducing valves, so that excessive pressure will not build up in the air-lines, and hose connections should be provided at each plat and pump-house as recommended above; or at such mines a water-tank of at least 200 gals, capacity and capable of withstanding a pre-1 sure of 250 lbs., mounted on a truck with wheels of the proper gauge for all main-level tracks, and equipped with 400 ft. of ¾-in. air-hose with nozzle and connections for both air and water, should be provided. This tank should be kept filled with water underground near the shaft. Its piping should be arranged so that compressed air can be turned into the tank on top of the water.

The water system that should be installed underground is usually determined by the mine facilities that can be utilized most readily and economically, and, therefore, we have recommended three methods of installation. Deep mines in which fire hazards are high should be equipped with a very efficient water system. Several mining companies have installed a complete system from surface throughout all underground workings, the piping practically paralleling the air lines and water being drawn from large tanks on surface, or from the local municipal water main. Where the pressure is not too

![FIG. 1.—SURFACE MAP OF MINE SHOWING LOCATION OF FIRE APPLIANCES.](image)

As fire may be discovered in a mine between shifts or when there is very little man power at hand to use the equipment, hose should not be too cumbersome nor the water pressure too strong to prevent speedy work by two or three men under the difficult conditions that are to be found in the average metal mine. If the hose is not kept on a truck for rapid transportation, it should be hung on a swinging rack so that it can be stored safely and pulled out without kinking.

III. SEGREGATION—

(a) At all levels close to all shafts and near all other entrances to the mine fire-doors should be provided, arranged in such manner that they can be all simultaneously closed at any plat or entrance or on surface. These doors should be of fire-proof construction, tight, and should be provided with a latch and a counter weight for closing. They should preferably be closed in the direction of the air-current. The doors should be latched open, and a small cylinder operated by compressed-air should be provided for tripping the latch. For operating the cylinders a 1-in. air-line should be hung in the shaft with a ½-in. pipe leading to the cylinder and a connection with a brass shut-off should be made at each plat or entrance between this 1-in pipe and the air-line. By opening this shut-off at any place, compressed air will be introduced into the 1-in. pipe and all doors will close immediately.

The installation of doors as described above near the shaft on all levels, and at other strategic points in the mine is of the utmost importance to insure the safety of the men. Ventilation currents will carry smoke and gas throughout the workings of a mine in a very few minutes, and it is therefore essential that the air-current be stopped completely as soon after fire is discovered as possible. After the men have reached a place of safety such doors may be opened as those in charge think best. Drawings of a door and latch-trip are shown in
Figures 2 and 3. In mines depending upon natural ventilation the air currents during a fire may be reversed, and without doors the fire fighters are liable to encounter difficulties that will prohibit them from working. Regardless of the volume of air passing through a mine and the directions of the currents, they can be controlled if air splits are provided and fire-doors maintained.

LEGEND

[Diagram showing legend symbols: FIRE EXTINGUISHER, FIRE HYDRANT, FIRE HOSE, FIRE ALARM BOX.]

LOCATION OF FIRE EXTINGUISHERS

One in Office
Four in Engine House
One in Dry
Two in Shaft House
One in Carpenter Shop
400 Feet of Hose in Small Office S.W. of Shaft
Fire Hydrant, 180 Ft. S.W. of Shaft
Fire Helmets in Laboratory at Smith Mine

IN CASE OF FIRE

Notify Mine Office and Engine House Immediately
Call Superintendent ............................................ Telephone No. 321
         “ Captain ......................................................... 430
         “ Safety Inspector .......................................... 454R
         “ Fire Chief ..................................................... 514
         “ Central Office ............................................... 406
For Fire Underground—Notify Engine House and Close all Fire Doors.
For Surface Fire—Notify City Fire Department.

MINE RESCUE MEN

Fire Chief—Fred Staples .................................. W. Bluff St.
Richard Cartran, Capt. ................................. Rock St.
John Toms .................................................. Mill St.
Jules Gagnon ................................................ 335 Cherry St.
John Treloar .............................................. 608 Iron St.
Arthur Olsen .............................................. 726 E. Main St.
Sydney Cocking ........................................... Brown St.
John Nicholas ............................................. Iron St.
John Frederick, Capt. .................................... Case St.
Abel Laitinen ............................................. 733 E. Main St.
Simon Chetto .............................................. Ann St.
Amedes Spedetti ........................................ Ann St.
Noah Hares ............................................... Ridge St.

Fig. 2.—Showing fire door and frame construction.

IV. NOTIFICATION—

(a) As soon as the existence of a fire is known the engine-house must be notified by telephone and all men possible notified by word of mouth underground. If the telephone does not work, the fire-signal should be rung on the electric bells in the shaft. As soon as the engine-house is notified the engineer will introduce a stinking fluid into the compressor or air-main, so that it will be distributed to all working-places in the mine. When this stink appears in the working places the men there will stop work immediately, and start for surface, notifying all others who are not in a position to receive the same warning.

(b) When fire is discovered in a mine it is the duty of any employe, without waiting for orders, to close the fire doors. Notices to this effect should be kept posted near all doors.

All fire doors should be closed immediately when fire is discovered and every employe should know that he is expected to close them without delay. The orders should be obeyed implicitly, regardless of the source and location of the fire. The doors should be fire-proofed, and should be hung so that they will be as near air-tight as possible, and so that any deformation in the door or frame that may appear will not prevent their operation.

(c) At all mines where mechanical ventilation is used the fan should be stopped as soon as knowledge of the existence of fire in the shaft is obtained.

The operation of the fan or fans in each mine will be covered by the special rules prepared for that mine under the provisions of Section 5, (c) of these recommendations.

Fig. 3.—Showing fire door latch construction.

Some quick method of warning the men of fire and ordering them to reach surface or a place of safety should be adopted. Various means have been used, such as sounding electric gongs, interrupting the flow of compressed air, or turning water into the air-link, a
telephone system running to the vicinity of all the important workings, the introduction of a stench into the air-lines, etc. It is obvious that the means that is used most readily and transmitted most rapidly is desirable. The odor or stench system is simple to install and is as effective as any other method heretofore used. It is particularly adopted to metal mines that are equipped with compressed air lines. Even though the miners may not be drilling or otherwise using air when the stench is turned into the air line, there are leaks in the pipes, valves or joints sufficient to permit it to escape. Experiments have been made which demonstrated that a quick and positive warning can be given by a number of chemicals such as ethyl mercaptan, butyle mercaptan, valeric acid, etc. Ethyl mercaptan is recommended, as it has no toxic effect and can be readily obtained. Bulletin 244 of the U. S. Bureau of Mines gives full information about its use. It is desirable that the miners should know the nature of the odor to be used as a warning, and they should be instructed that, when it is detected, there should be no delay in seeking safety, and that they should warn the men who work near them of the danger.

(b) At least once a year each underground man should be given with his due-bill a printed set of rules and directions, telling him just what to do in case of fire underground. Similarly surface-men will be given notices in regard to fires on surface.

In the average metal mine men may be found working together in close proximity and others scattered over a wide territory. When a fire occurs it is essential that all of them know the best plan of procedure to follow and that they act accordingly and promptly. The rules and regulations should explain the significance of the fire signal, that the underground men must keep familiar with all traveling roads to surface, that fellow workmen should be warned of the danger, and that there should be no needless delay while retreating to surface or a safety zone.

(c) Maps will be prepared and kept accessible at the office and all shiftbosses, timber foremen, and others whom the captain and superintendent may select, will be instructed in their use and in the proper mode of action to be followed in case of a fire underground, in any part of the mine. The policeman, surface-boss, firemen, engineers and dry-men will receive similar instruction as to fires on surface.

The maps should show the volume and directions of the air currents, and the location of the fire-doors, fans and all exits to surface. The foremen and bosses should be informed what route the men in their charge should travel in case of fire in any part of a mine. A careful study of the problems that may arise by fires should enable the mine officials to outline definite plans of procedure that should have precedence over those that are likely to be made at the moment by men who are without a full comprehension of the situation.

(d) The road to the second outlet should be clearly marked underground and all men should be trained to follow it. In mines with electric lights, red lights at all ladder-roads and drifts leading to the second outlet are recommended.

(e) Suitable signs of warning and directions should be posted at all advantageous places.

The second outlet should be inspected at least weekly and this inspection made by a competent person, preferably the timberman foreman or one of his assistants, who should be required to repair defective ladders, etc., when found. All outlets should always be ready as avenues of escape, and the men should be made familiar with them by traveling through them from surface to their working places once in three months, or, in deep mines, by traveling from their working places to the ladderway leading directly to surface.

V. EXTRACTION—

(a) Fire-fighting equipment and mine rescue apparatus should be provided in each district and at each isolated mine, and crews of men thoroughly trained each month.

The apparatus should be of a type which meets the tests and requirements of the U. S. Bureau of Mines*. No less than five two-hour apparatus should be kept at a station, and, if more apparatus is not available within two hours after a fire occurs, ten sets should be maintained. When a mine rescue crew is carrying on operations in a mine containing smoke and gases, a second or relief crew should be placed at the nearest fresh air base. The rescue station should be equipped with a sufficient amount of oxygen, regenerating cartridges, portable electric lamps, repair tools, etc., to continue rescue work until additional supplies may be obtained from a distant source.

At least ten or more men at each mine should be qualified to wear the apparatus, and only those whose physical and mental qualifications are of the highest standard should be trained. Each rescue crew must be directed by one member of the crew, who shall be designated captain. The course of training should be equivalent to the work outlined by the Bureau of Mines, and should also include a sufficient amount of underground work to make the wearers familiar with the mine workings.

(b) At each mine one man must be designated as fire-chief, who will take charge of all rescue or fire-fighting work carried on, until relieved by the mine captain or superintendent.

The fire-chief must assume the responsibility of taking complete charge in time of fire and must direct the work of all fire fighters and rescue crews. It is not necessary, however, that he shall be a member of a mine rescue crew, but he should know the limitations of the work that have been outlined for men who use the apparatus. He should be familiar with the workings of the mine and have a thorough comprehension of the plans that have

*Technical Paper 334, Mine Standards.
been prepared for fighting fires. He should retain control of all the work in connection with a fire, until relieved by the mine captain or superintendent.

(c) At each mine definite plans must be made and set down in writing as to the procedure to be followed in case of fire in any part of the mine, and one copy of these plans is to be furnished to the fire-chief, one to the mine captain, one to the superintendent, one to the safety engineer, and one to be kept on file in the mine office.

These plans are to be approved by the General Safety Committee, or in lieu of such an organization, by the operating head of the company. Rescue work must be carried out according to these plans, unless by authority of the superintendent, general superintendent or general manager, who will, in that case, assume all responsibility.

The fire department of a mine may be equipped with all the units herein outlined, and yet remain an ineffective organization, if plans have not been arranged for fighting fires in all parts of the mine. It should not be left to chance or to the decision of the men who may be the first to appear at the time of a fire to decide the method of attack that shall be taken. A fire in a shaft having a down-cast air current presents a different problem from one in which the air is up-cast, and likewise a fire in a remote stope or sub-level may entail more hardship than one in a main-level drift where fire fighting equipment is convenient for speedy action.

The limitations of men working underground as compared with men working on surface must be recognized in any plans that may be formulated, especially with reference to men working in rescue apparatus. Under no circumstances should the Bureau of Mines rules and recommendations in this respect be violated.

(d) Every mine more than 100 feet deep should be provided with a second outlet.

There should be no exception to the rule that requires a second outlet to surface. It is now generally regarded as a mining standard of safety that is not debatable. In recommending mines more than 100 ft. deep, we have been guided by the report of the Committee on Uniform Mining Laws for Prevention of Mine Accidents, published by the American Mining Congress in 1911.

RECENT DEVELOPMENTS IN THE GEOLOGY OF THE GOGEBIC RANGE.

BY W. O. HOTCHKISS, 1923, MADISON, WIS.*

With the vast demands for ore made upon the mines of the Lake Superior Iron District the question of the continuation of the supply becomes one of vital importance to one of the leading industries of the country. It is the function of geologists and mining engineers to study this question most intensively, as on their conclusions must be based the investment of many millions of dollars in exploration, new shafts and equipment and mine development work. Insofar as their conclusions are correct this money will be well invested, and insofar as they are incorrect it will be spent wastefully. Consequently they must give the fullest possible consideration to every fact of observation, to every scientific theory, and to every detail of practical mine operation and finance.

There are three important geologic questions relating to the occurrence of ore on this range, concerning which much information is needed, and to which much study should be given. One is the relation of ore deposits to the various horizons of the iron formation. The second is the depth to which ore forming processes have been active. The third question is the relation of ore to the small cross faults.

With regard to the first—the relation of ore bodies to specific horizons—much information has been obtained. With regard to the depth to which ore will be found, relatively little is known. With regard to the third much remains to be learned.

*Director of Wisconsin Geological Survey.

RELATION OF ORE BODIES TO DEFINITE HORIZONS.

In the mines from Bessemer to Wakefield 22 different recognizable beds in the iron formation have been identified so clearly that in some mines both miners and mine management use them in describing the location of exploration work. In five of these ore bodies have been found. In my series of articles in the Engineering and Mining Journal I described six major divisions of the formation which are readily identifiable in most mines. From the foot northward these are:

1. Plymouth wavy bedded granular cherty formation.
2. Yale slaty iron formation with beds of cherty formation.
3. Norrie wavy bedded granular cherty formation.
4. Pence slaty iron formation.
5. Anvil wavy bedded granular cherty and red jaspery formation.
6. Pabst conglomeratic, cherty and slaty formation.

Of these 1, 3, 5, and 6 carry important ore bodies, and in exceptionally favorable situations ore may make in all six as in the Norrie and Newport ore bodies. What is needed is closer subdivision of these members of the formation in each mine and careful observation of the conditions favorable for the formation of ore in each one.

**RELATION OF ORE BODIES TO CROSS FAULTS.**

The relation of ore bodies to the cross faults needs a great amount of study. We know that these faults favor the formation of ore bodies in some places, and yet we find no concentration in similar situations where all the factors we know are just as favorable. We find one ore body lying on the west side of a fault. At the next fault the ore may lie east of the fault. In a third case the ore may lie on both sides of the fault. Why this is we cannot say, and consequently prudent exploration demands that both sides of the fault be investigated.

One thing that handicaps us in this study is that these cross faults have not been mapped with sufficient care. They are not easily identified in many instances, as the throw is usually very slight. In many cases the footwall may not be offset at all, and the only way the fault can be identified is by offsets in dikes, or by a broken rubbly condition of the beds. This rubbly condition is also produced by slump in the vicinity of ore bodies so it requires close observation, in many cases, to identify the faults. Again many faults that slightly offset the footwall are mapped as minor “rolls” of the foot. In following the quartzite with a footwall drift it often happens that the footwall is lost, so the drift is turned gently to the south until the foot is encountered again, and the presence of a fault may not be detected. It is important that careful study of the bedding of the formation be made in all such cases to determine whether it is really a fault or actually only a gentle roll in the formation, as so many cases are mapped. The identification of these cross faults should be made as workings are being driven, as they may furnish important guides to exploration on other levels of the mine.

**ULTIMATE DEPTH OF ORE.**

The question of most acute interest at the present time is probably that of the depth to which ore bodies may be found in sufficient abundance to warrant the expense of mining. Shafts are being sunk and others are under consideration that are designed to go ultimately to depths of 4,000 ft. The cost of such a shaft and its equipment is in the neighborhood of one and a half million dollars, so it is very important to use every bit of knowledge we possess that has any bearing on the probability of the occurrence of ore at this depth. The theories of origin of the ore, and the conditions under which the iron formation was deposited become of vital importance in such a consideration.

Of definite information we have the following:

1. Near both east and west extremes of the productive part of the range—the Castile and Atlantic mines—narrow ore bodies and favorable conditions as to oxidation and leaching of the formation are known at depths of about 2,000 ft. vertically from surface, in drill holes from the bottoms of the mines.

2. Toward the central part of the range ore is known at somewhat greater depths—about 2,400 to 2,600 ft. below the surface in the Montreal, Pabst, Newport and Geneva mines. Favorable conditions for ore—well oxidized and leached iron formation are known at the Eureka mine nearly 3,000 ft. below the surface.

**ORIGIN OF THE ORE—**Recent studies of the ore bodies have disclosed nothing to change the original idea of Van Hise that the ore bodies were produced by the oxidation and leaching of the iron formation by the circulation of oxygen bearing waters, which were localized in their course through the formation by the impervious dikes and the footwall. However, considerable advance in the detailed application of this theory has been made. It has been recognized that those beds of the iron formation which were originally more porous and richer in iron are more favorable for the localization of ore deposits; the richer beds because it took less leaching of silica to make an ore body, and the more porous beds because they favored an abundant circulation of the water. Conversely it has been recognized that several of the less porous beds oftentimes serve as secondary footwalls and in conjunction with the dikes make the same sort of conditions that produced ore on the quartzite footwall.

As already described, it has been recognized that the fracturing of the formation by faults has greatly increased the possibilities for water circulation, and in many cases has favored the formation of ore. With this, however, must be considered the possibility that the formation may have been made so porous along some of the faults that the circulating water was too widely diffused to produce the desired concentration.

**THE WORK OF CIRCULATING WATER—**If we knew all the details of the circulation of the water through the past history of the iron formation we could predict accurately the position, grade and size of every ore body on the range. Such being the case it is unfortunate that we know so little about this important subject.

In all the early history of the range many mining men and geologists believed that the water circulation was stopped by the uppermost dike, and consequently that little or no ore would be found below the dike by deeper exploration. It was also believed by many that all ore bodies started at ledge and continued down the trough of dike and footwall and when that ore body ended no more ore would be found farther down that trough. These notions were not entirely abandoned until J. R. Thompson went below the bottom of the old Newport ore body through 800 ft. of barren formation and found the continuation of the Pabst ore body. Now we know that many large bodies of ore have no connection with the