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University of Illinois
PROCEEDINGS

of the

First Short Course on Fire Prevention, Control and Extinguishment

University of Illinois
June 16, 17, 18, 19, 1925

[Printed by authority of the State of Illinois.]
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INTRODUCTION

The Short Course in Fire Prevention, Control and Extinguishment, given at the University of Illinois June 16-19, 1925, was the first of its kind given in the United States.

The idea of utilizing the resources of the state university for a short course of practical instruction for fire chiefs, firemen and local officials had its origin in an address by State Fire Marshal John G. Gambr before the Illinois Firemen's association at their convention in Rockford in 1922. The idea was nursed along until 1925, when, at the Murphysboro convention of the association, a resolution was adopted, calling upon officers of the association to take the matter up definitely with the university.

The proposition was taken up with President David Kinley and met with spontaneous approval. By his direction, M. S. Ketchum, dean of the college of engineering, appointed a committee to report on the feasibility of giving the course and submit an outline. This committee consisted of Professors L. H. Provine, chairman; M. L. Enger, A. R. Knight and J. A. Polson. This committee developed the course, with Professor C. E. Palmer as director of the course.

The course was given under joint sponsorship of the university, the state fire marshal and the Illinois Firemen's association. Officers and members of the executive committee of the last named organization are: President, Pearl Smith, Madison; vice-president, Thomas J. Ruddy, Joliet; secretary, Roy W. Alsip, Champaign; treasurer, Fred E. Danner, Mt. Pulaski; historian, Elmer W. Weidler, Mt. Olive; executive board, August W. Thode, Galena; Simon Kellerman, Jr., Edwardsville; Albert Herring, Murphysboro; Albert Hasse, Peru; Otto Reiche, Naperville; W. Campbell, Kewanee; Fred P. Haderlein, Carlyle; Samuel C. Hunt, Jacksonville; Leo Connole, Venice.

The total registration for the course was 219, which was much larger than was expected for the first course. Ninety-five were present at the last meeting of the last session.

The total number of counties represented was 37. Seventy cities and towns were represented, of which 63 were Illinois communities. The other seven were Cincinnati, Ohio; Indianapolis, Indiana; Kansas City, Missouri; Michigan City, Indiana; Newton Falls, Massachusetts, Pittsburgh, Pennsylvania; and St. Louis, Missouri.

The occupational distribution of those attending was:

1. Fire chiefs and assistant chiefs ............... 59
2. Fire captains and lieutenants ............... 8
3. State fire officers and organization officials ........................................ 4
4. Firemen ........................................ 84
5. City Officials ................................. 13
6. Public service and industrial representa-
tives ............................................. 14
7. Underwriters’ Laboratories, actuarial bu-
reaus, etc. ...................................... 10
8. Inspectors ................................... 6
9. Fire extinguishment and safety equip-
ment ............................................. 12
10. Miscellaneous—committee, instructors,
etc. ........................................... 11

Total ............................................ 219

As will be noted from the foregoing, the course was thrown open not only to firemen and city officials, but also to any industrial concerns or others who might be interested in the fire problem.

The success of the course was assured the first day. A resolution was adopted unanimously during the course, asking that the course be made an annual event and plans are now underway for a larger and better course in 1926.
STATEMENT FROM GOVERNOR LEN SMALL

Read at Opening of Short Course, Tuesday, June 16

I wish it were possible for me to be present in person at the opening of this short course. The closing hours of the General Assembly necessarily keep me at my desk in Springfield, but I do not wish to let the opportunity pass of expressing my personal interest in this undertaking and my hope and belief that it will bring far-reaching benefits to our State in the matter of fire control.

Our tremendous fire waste, both in human life and property, is a blight on the prosperity and happiness of our people. If we are to check this waste, and reduce it, we must adopt a practical, effective means to that end. The fire loss of the State is simply the sum total of the losses in the hundreds of communities of the State. Any practical fire prevention program of the State should, therefore, give an important place to providing some effective method of helping local communities to cut down their losses. This, I understand, is the thought back of this short course.

I can conceive of no greater service which the State can render its communities in this important field of fire control than the service which this course aims to render. The modern problem of fire prevention, control and extinguishment is greatly more complicated than it was a few years back and will become more so. Fire chiefs and firemen should have specialized information on its essential phases. Very few of our communities are in a position to provide this and the State aims to meet this need in this course.

I commend the University of Illinois for conducting this course. It is the first State University in the United States to apply its facilities toward a practical solution of the fire problem. I am proud that Illinois has again blazed the way.

I commend State Fire Marshal John G. Gamber and the Illinois Firemen’s Association for their respective parts in sponsoring the course and cooperating with the University in conducting it.

The course is founded on sound ideas. It ought to endure as an annual event. I trust that it will do so and that its benefits to the people of the State will increase each year.

(Signed) Len Small
RESOLUTION

Adopted Unanimously at Session, June 18

Whereas, We are convinced of the great good and practicability of the Short Course of Fire Prevention, Control and Extinguishment; and

Whereas, The Chiefs, the Communities they represent, and the Industrial Interests have been greatly benefited: therefore, be it

Resolved, That it is the unanimous opinion of the Charter Class, that this aforesaid school be continued from year to year that further benefits may result; and be it further

Resolved, That a sincere vote of thanks be tendered to Professor L. H. Provine, Professor C. E. Palmer, Fire Marshal John Gamber, Chief John Ely, Assistant Chief Roy Alsip, members of the Champaign Fire Department, Officers and members of the Executive Committee of the Illinois Firemen's Association and others whose untiring efforts have so largely contributed to the success of the course.

Respectfully submitted,

(Signed) M. S. Philip
Herman J. Lohmann
Samuel Hunt
Otto H. Reiche
Committee.
PROGRAM OF SHORT COURSE
TUESDAY, JUNE 16.

Morning.

8:30—Registration. 221 Engineering Hall.
Chairman of Session—C. E. Palmer, Director of Short Course and Assistant Professor of Architectural Engineering, University of Illinois.

9:30—The Short Course in Fire Prevention, Control and Extinguishment ........................................... 2
A. N. Talbot, Professor of Municipal and Sanitary Engineering, University of Illinois.

10:15—The Work of the State Fire Marshal ....................... 6
John G. Gamber, State Fire Marshal.

11:00—The Underwriters' Laboratories ................................ 15
Dana Pierce, President.

Afternoon.

Chairman of Session—John G. Gamber, State Fire Marshal.

1:30—Fire Prevention and Building Construction ............. 23
Raymond T. Nelson, Engineer, The Western Actuarial Bureau, Chicago.

2:30—Exit Facilities ............................................. 70
John Plant, Chief Engineer, Fire Prevention Bureau, Chicago, Courtesy of Joseph F. Connery, Fire Commissioner, Chicago.

3:30—Demonstration—Combating the Smoke and Gas Hazard .... 76

4:00—Inspection of the University.

WEDNESDAY, JUNE 17.

Morning.

Chairman of Session—A. R. Knight, Assistant Professor of Electrical Engineering, University of Illinois.

8:30—Mechanical Installations ................................. 83
Raymond T. Nelson, Engineer, Western Actuarial Bureau, Chicago.

9:30—Electrical Installations ................................. 126
Victor H. Tousley, Chief Electrical Inspector, Department of Gas and Electricity, Chicago.
10:30—Life Safety ........................................ 134
Harry K. Rogers, Engineer, Western Actuarial
Bureau, Chicago.

Afternoon.

Chairman of Session—Pearl Smith, President of Illi-
ois Firemen's Association.
A few words of welcome from Dr. W. F. Burres, Mayor of
Urbana .................................................. 140
1:30—Motion Pictures, "The Menace."
   By the National Automatic Sprinkler Association.
   Training the Fireman .................................. 141
   L. L. Wolf, Cincinnati, Ohio.
2:30—Hazards and Exposures .................................. 152
   Benjamin Richards, Manager, Underwriters' Service
   Association, Chicago.
3:30—Demonstration of Resuscitation .......................... 161
   L. L. Wolf, Cincinnati, Ohio.
8:00—Motion Pictures, "Training the Fireman."
   Illinois Union Building.

THURSDAY, JUNE 18.

Morning.

Chairman of Session—John Ely, Chief of the Cham-
paign Fire Department.
8:30—Safeguarding the Business District ..................... 166
   J. J. Conway, Superintendent, The Underwriters' 
   Salvage Corps, Cincinnati, Ohio.
9:30—Fire Alarm Systems .................................... 179
   F. A. Raymond, Consulting Engineer, Gamewell 
   Alarm Company, Newton Upper Falls, Massa-
   chusetts.
10:30—Demonstration—First Aid ............................. 191
   L. L. Wolf, Cincinnati, Ohio.

Afternoon.

Chairman of Session—Samuel C. Hunt, Chief of the 
Jacksonville Fire Department.
1:30—First Aid Extinguishers ............................... 199
   R. O. Matson, Assistant Engineer, Gases and Oils
   Underwriters' Laboratories.
Demonstration.
The Foamite-Childs Corporation, Chicago.
The Pyrene Manufacturing Company, Chicago.
4:00—Inspection of the Champaign and Urbana Waterworks.
FRIDAY, JUNE 19.

Morning.

Chairman of Session—Roy Alsip, Secretary, Illinois Firemen's Association.

8:30—Modern Methods of Fire Extinguishment. .......... 207
Harry K. Rogers, Engineer, Western Actuarial Bureau, Chicago.

10:00—Care and Maintenance of Equipment. .............. 222
Harold F. Hunter, Engineer, Chicago Board of Underwriters.

11:00—Demonstration—Rescue Work.
       L. L. Wolf, Cincinnati, Ohio.

Afternoon.

Chairman of Session—M. L. Enger, Professor of Mechanics and Hydraulics, University of Illinois.

1:30—Waterworks and Piping. .............................. 235
Clarence Goldsmith, Assistant Chief Engineer, National Board of Fire Underwriters, Chicago.

4:00—Demonstration—Raising Ladders, Hose Work.
       L. L. Wolf, Cincinnati, Ohio.
PROCEEDINGS OF SHORT COURSE

TUESDAY, JUNE 16, MORNING SESSION

C. E. Palmer, Assistant Professor of Architectural Engineering, University of Illinois and Director of Short Course, Chairman

Chairman Palmer: There is no doubt but that the American public is more or less familiar in a general way with the tremendous annual waste due to fire; that fire is the greatest boon to civilization and at the same time one of the most dreaded harsh enemies of civilization. We are all familiar with the fact that artificial heat produced by means of a regulated and controlled fire has been one of the greatest factors in the development of modern civilization, but, like all of man's blessings, and perhaps in a greater degree than any, fire in any form is almost pregnant with destructive threat.

The annual fire waste has a far-reaching influence extending over various fields of activities, including those fields of building construction, inspection, insurance and maintenance of both public and private protection. The foremost authorities agree that the fire loss in the United States is out of proportion to both invested capital and population as compared with fire losses in European countries. Perhaps this is largely due to that American characteristic which we know as taking a chance. If so, education and improvement are possible.

Statistics show that upwards of one-half of the fire losses in this country can be classed as preventable. The magnitude of this problem and the problems that are connected with the fire loss are probably not grasped fully by the average person, due to the fact that the loss is spread over a large area, but nevertheless it is no less important than if it occurred in a relatively small area.

We are familiar with the fact, perhaps, that can be gained by a review of statistics compiled by the National Board of Fire Underwriters, which shows us that the capital or monetary loss per year is sufficient to build three hard roads, of Illinois state specifications, reaching from the Atlantic to the Pacific ocean, and that the loss in human life each year is about one-fourth of the total American loss in the world war. This certainly presents a problem which deserves consideration by all of us who are interested in the progress of civilization and the progress of our own communities.

The movement to broadcast the importance of this problem is not a new one. For many years various organizations have been interested in preparing facts and statistics for the people. It was, therefore, with considerable pleasure that the University of Illinois accepted the opportunity to cooperate with the state fire marshal's office in promoting this course for fire prevention, control and extinguishment.

The University of Illinois is a state institution, the primary function of which is service to mankind and especially to the commonwealth of Illinois in any field where study and research are operative. We want your visit here to be one of pleasure as well as profit and we will
welcome any suggestion that you have or any advice that you care to
give relative to this, the first meeting of the short course, or for the
purpose of helping us with future meetings.

There are a few announcements I want to make at this time. The
director of athletics, Mr. Huff, has agreed to open the gymnasium to
you people, that is, the pool and shower baths, and towels will be fur-
nished at the regular towel window at the right hand of the front en-
trance as you go in.

The Illinois Union building, which is one block to your right as
you go out of this building, has offered its rooms for your use while
here, either for small committee meetings or the general purposes of
loafing and smoking and whatever else you care to do.

I would suggest we would all be very much more comfortable
and very much happier, perhaps, if we would remove our coats. It will
be perfectly all right if you care to do so.

Doctor Ketchum, of the college of engineering, has been called
cast on business, but he has made arrangements with Doctor Talbot,
professor of municipal and sanitary engineering, to fill his place on
this program. I take great pleasure in introducing Professor Talbot.
(Applause.)

THE SHORT COURSE IN FIRE PREVENTION, CONTROL
AND EXTINGUISHMENT

By A. N. Talbot, Professor of Municipal and Sanitary Engineering,
University of Illinois

Gentlemen, I am sure that Doctor Ketchum regretted very much
that he could not be here this morning, for from the time that this pro-
ject was first talked of he had a great interest in it, but he had need to
be at Schenectady, New York, today to attend a special meeting of re-
search, which is being participated in by members of faculties of col-
leges all over the country.

One of the functions of a university is to cooperate in the dis-
semination of knowledge to help promote movements that tend to ad-
advance the welfare of the public. It is, therefore, the duty, as we think,
of the University of Illinois to help on a project such as this and I
assure you that the university is much interested in this series of
meetings.

You will all appreciate, of course, the great development and
many changes that have taken place in this country in the last, say a
half a century, from what might be called the pioneer days to these
later days. I always think the changes in the railroads of the country
do show something. The timber bridges and structures were cheap
buildings, lacking the permanence that was quite necessary. If the
policy had been to build permanent structures, very few of these
railroads would have been constructed, but with the railroads as built
came the opportunity for development of the resources of the country.
There was a growth of the cities, increase in population, growth in the
industries and later the railroads were able to put in second tracks,
put in ballast and permanent structures, and they have increased their motive power until today our railroads are not excelled in quality anywhere on the face of the earth. Cities, too, are grown up. The changes there have also been important. Cheap construction is being replaced by better construction. Sometimes the fires have been of advantage.

I remember as a boy being taken into Chicago just after the great Chicago fire and seeing the destruction that had been wrought, as well as the small shacks that were going up everywhere in order for business to be carried on temporarily. But, after that came better construction, good construction for that time, although many changes have been made in what we call proper building construction in the last fifty years.

Now this means that there have been great changes, changes in point of view. Then each man felt that he should be allowed to do as he pleased, put up any kind of a structure in any way he wanted. We have come to recognize with fifty per cent or more of our population in what we call cities, there must be something for the common good, there must be regulations and requirements, something that will protect the general public, and a man himself may not do just as he pleases.

The fire departments have made great changes and it is not necessary to call your attention to the great improvements in equipment, in housing and in matters that have come about in the last few years.

I would say with all of these changes there is an opportunity for a course of this kind: an opportunity for men to get together for discussion, for conference, for receiving information, for giving out views and for movements of various kinds for the improvement of our cities, and I believe that we shall have excellent results, not only to the individual members who are in attendance here, but to the cities of the state that are sending their firemen and others to this conference.

Great changes have been made in building construction. There is need for study of what requirements should be made, the planning of a building, the regulations, the requirements, the different materials, and I presume I must include in this also a general method of city planning: how cities should be laid out in the beginning. That's easy to say, but what changes should be made in our cities to reduce the fire hazard as well as to give better access in the different parts of the city?

One of the features of your work is that of fire extinguishment. I remember very well when that important paper on hydraulics was presented by John R. Freeman at a meeting of the American Society of Civil Engineers some thirty-five years ago. It was an epoch making paper in that respect. The friction through fire hose was the effect of different kinds of nozzles and different kinds of clay pipes, the relation of water discharged by a ringed nozzle and a smooth nozzle, the flow, distance and height that this would be thrown; it was a very excellent paper. When I think of that paper I am reminded of an incident that occurred in a nearby town some twenty-five years ago, when the fire department to throw water on a little church laid something like 1,500 feet of hose to the nearest hydrant and naturally with
the fire pressure in the mains given by the city water works there was not a very strong stream, and there was some discussion. Some thought that the water works company was derelict in its duty in not being able to furnish water under pressure to throw sufficient water to save this building. When a suggestion was made to one of these firemen—this was, of course, a volunteer fire department—that the line of hose was so long that they could not expect to get pressure at the nozzle, the reply was made that that was not true, that the chairman of the fire and water committee had told him if they only had the pressure in that hydrant it had to come out at the nozzle, there was no other place it could go. I am citing this as one of the things that ought to come in the future in giving more attention to the members of the fire department so that they will, have some comprehension of the hydraulics of the fire streams as well as many of these other things that will be taken up.

I think then it is plain that this course should be of advantage to the members who come and to the state, and I hope that it will prove so and that it will be only the beginning of a series of short courses and conferences that will materially aid the work of the fireman of the state.

Now, if I may say just a few words concerning the university. Many of these things are known to you. The university has, including departments at Chicago, registered this year something over 12,000 students. Of those over 10,000 have been on the campus here, the remainder, those in medicine, pharmacy and dentistry, being in Chicago. There were given out in degrees yesterday something over 1,400 in all departments, and with those in Chicago something over 1,800 degrees conferred at this commencement. The college of engineering has something over 1,400 students and there are ten or more courses of study, meaning by that groups of courses in which a man pursues a specialty ending in a degree of a certain kind; a course made up of a great variety of special courses. I may name some of them; architecture, architectural engineering, ceramic engineering, civil engineering, electrical engineering, mechanical engineering, municipal and sanitary engineering, general engineering, railway mechanical engineering, railway civil engineering, railway electrical engineering, and, of course, in municipal sanitary engineering there will be included a variety of engineering subjects such as sewerage treatment, water works and water purification. In addition to the structural work, which of course is the main feature of the work of the university, a considerable amount of research is carried on and we have what is called the engineering experimental station. In my own work I have to do with concrete, reinforced concrete, the properties of this and the method of design or method of making the concrete to give it strength.

We have the hydraulic laboratory where the flow of water through pipes, through hose and through nozzles is determined; where there are methods of measuring water and water power. Just in this next building we have a strip of cast iron water pipe which has been laid to the north for something like 250 feet and then back again. The lower pipe is cement lined pipe and the upper one is pipe which is...
coated with the ordinary coating, the purpose of this test being to
determine how much difference there is in the loss, how much differ-
ence there is in friction, in the two kinds of coating. That is a test
which is being carried on and is being made for a manufacturer of
cast iron pipe in Birmingham, Alabama.

We have tests on various kinds of building material, on steel,
iron, etc., and there is another building where they test the fatigue
of metal, where a pipe is bent, a piece of steel is bent in the oppo-
site directions within the stresses. We would like to determine them and
that is repeated, going on for days and weeks and months, sometimes
way up into the millions of applications. We find what stress will be
necessary before material of certain kinds will break. Then we have
our physics laboratory, laboratories in electrical engineering and serv-
ice and mining engineering, a variety of laboratories where tests of
research work of various kinds is going on, and I am sure you will
be interested while here to see the work of architecture and design.

Outside of the college of engineering there is, of course, a great
variety of work. In fact one of the things which impresses us at the
university, and it must impress outside people also, is the great variety
of work carried on in the University of Illinois. Each department is
working in its own line and getting it into a co-ordination with the
college. There is the college of liberal arts, the great chemistry labora-
tory, with all its facilities and its laboratory in zoology, the college of
commerce and business administration, the college of education, and
the college of agriculture and its great experimental crops to the south
and farm lands and buildings. Tests are going on in regard to soil
cultivation, in regard to stock and a variety of things I think you would
be interested in looking at if you have the time to get a glimpse of
all of them. Then we have our gymnasium, our stadium and a variety
of other things.

I hope you will be at home and take what opportunity you can
gain in seeing something of the university. It happens we have just
finished the regular work of the college here and many of our people
are away and things are not going on regularly. You will see that they
are dead plants at the present time, or most of them, but in your
visit around you will be able to get some idea of the method of work
and of the great importance of the work which is being carried on
by the University of Illinois. I think there are seventy-nine buildings
in the university and seven are being built.

Another thing that may interest you is the National Warm Air
Heat association, which deals with equipment for heating buildings
and houses. That is the house over here (indicating). It is closed at
the present time, but is open through the winter and tests are being
carried on through the year to determine the effectiveness and ad-
vantages in this way or that way in heating apparatus.

We have a great variety of cooperative investigations here. Funds
are furnished largely by outside associations. The investigations of
which I spoke are being financed by the manufacturers of certain
classes of materials. Tests are being made on brake shoes for cars. Another investigation was made about three years ago to determine
the losses of pressure in forcing air through a long concrete conduit, a long pipe you may call it, which was made for the board of construction of the vehicular tunnel that is being constructed under the Hudson river, between New York and New Jersey. That was done here because the university had the men who were conversant with that sort of thing and who would know how to conduct the test.

That is an example of the sort of things down here. Again I want to say, we are glad you are here and I would ask you to enjoy all of the conferences. (Applause.)

Chairman Palmer: The University of Illinois is an ideal vehicle for a meeting such as this, but the driving power, the man who has started the vehicle, the man who has made possible this meeting, is going to speak to you next and I take great pleasure in introducing John G. Gamber, state fire marshal of Illinois. (Applause.)

THE WORK OF THE STATE FIRE MARSHAL

By John G. Gamber, State Fire Marshal

Mr. Chairman and Gentlemen: First of all I want to extend greetings in behalf of the governor of the state in a written statement that he prepared and wanted me to read to you:

"I wish it were possible for me to be present in person at the opening of this short course. The closing hours of the general assembly necessarily keep me at my desk at Springfield, but I do not wish to let the opportunity pass of expressing my personal interest in this undertaking and my hope and belief that it will bring far-reaching benefits to our state in the matter of fire control.

"Our tremendous fire waste, both in human life and property, is a blight on the prosperity and happiness of our people. If we are to check this waste, and reduce it, we must adopt a practical, effective means to that end. The fire loss of the state is simply the sum total of the losses in the hundreds of communities of the state. Any practical fire prevention program of the state should, therefore, give an important place to providing some effective method of helping local communities to cut down their losses. This, I understand, is the thought back of this short course.

"I can conceive of no greater service which the state can render its communities in this important field of fire control than the service which this course aims to render. The modern problem of fire prevention, control and extinguishment is greatly more complicated than it was a few years back and will become more so. Fire chiefs and firemen should have specialized information on its essential phases. Very few of our communities are in a position to provide this and the state aims to meet this need in this course.

"I commend the University of Illinois for conducting this course. It is the first state university in the United States to apply its facilities toward a practical solution of the fire problem. I am proud that Illinois has again blazed the way."
"I commend State Fire Marshal John G. Gambr and the Illinois Firemen's association for their respective parts in sponsoring the course and cooperating with the university in conducting it.

"The course is founded on sound ideas. It ought to endure as an annual event. I trust that it will do so and that its benefits to the people of the state will increase each year."

That is a message from the governor to you.

Before starting in on the subject assigned me I feel that I want to say just a few words. I feel highly elated this morning at the wonderful showing made here in the number of registrations at the opening session. I have been told by the professors who have had charge of the short courses that this is one of the largest registrations which has been made or had at the opening session of any short course that has been conducted here. That, in itself, is evidence that the firemen of the state of Illinois are looking for an opportunity to study the problem and get first hand information. I feel grateful to the firemen, to the chiefs, and to the city officials throughout the state for the support they have given this movement and I only hope that it will be, as the governor has said, an annual event. I have dreamt this, I have slept it and I have eaten it for the last five or six years. It has been my hobby. I have introduced resolutions, or had them introduced, in the International, in the National Firemen's association conventions and the Illinois Firemen's association, and the Illinois Firemen's association is the only one that has come forth and put their shoulder to the wheel and given it a good push.

I want to thank the officials and members of the Illinois Firemen's association for the help given me in this matter.

The subject assigned to me is "The Work of the State Fire Marshal." In order that work be assigned to someone there must be a reason for doing that work. The fire losses in Illinois back in 1909, when the state fire marshal's office was first organized, were somewhere around eight or ten million dollars per annum. There was no idea at that time, when the office was organized or first established, about taking up actual fire prevention work in any other way than by trying to stop incendiary fires. That was the theory and on that basis the office was organized. Although authority and power were given to make inspections, the real thought was only to make inspections in connection with fires.

The law was passed in 1909, but unfortunately, and as perhaps some of the university trustees and officials have found out, the legislature doesn't always do the wise thing. They established the fire marshal's office and forgot to make any appropriation. Therefore, the office did not function very well until along in 1911, when it was finally organized. Prior to that time they provided for the salary of the fire marshal, who was my good friend C. J. Doyle, but did not provide even for the salary of a stenographer or any deputies. Finally, along toward the beginning of the session, the 1911 session, he, himself, through the efforts of the then governor, Charles S. Deneen, employed a few deputies with the understanding that they would have
to wait for their pay until after July 1, 1911. The men accepted the proposition and started to work and, as I say, the first work was the investigation of fires, in which they made a splendid record.

In 1911 the appropriations were made and the department was then fully organized with about eight deputies and two or three stenographers. That was increased during that two year period to about twelve deputies and three stenographers. It did not take very long for them to realize if they were going to make a dent into the fire losses in the state of Illinois, that they had to do something else besides the investigation of suspicious fires, so they established an inspection department in connection with the investigating department.

At that time the records show that they thought that they were doing wonderful work, and no doubt they were, when they were making 8,000 inspections per annum throughout the state of Illinois. The record last year in the office shows that we have made a little bit better than 65,000 inspections outside of the city of Chicago. We do not attempt to make inspections in the city of Chicago because they have a fire prevention bureau there which functions and it would only make an overlapping of effort, so we do not attempt to make inspections in Chicago, but we make investigations.

Well, we went along. The fire losses, instead of decreasing, increased. Of course, a lot of it is due to the fact that the population was fast increasing and the value of property going up. About that time the fire losses in the nation were something like $225,000,000 a year. Last year, 1924, with incomplete records, shows a loss in the United States of $548,000,000, a little bit over a half a billion dollars. That's a matter of loss in dollars and cents. Some will say, "Oh, well, look at the insurance; we got enough money out of it to rebuild." That is not the idea. Property that is burned up is gone forever into the winds and we have just reduced our resources in the United States to that extent. As I have said, that's the side of the dollars and cents and property.

The records show that in each year there are about 15,000 lives lost, directly due to fire. In addition, there are anywhere from 17,000 to 18,000 crippled, the majority of whom are women and children, and many become charges of the state, county or municipality wherein the fire occurred.

In this state of ours, we have reached the sum of $24,000,000 per annum in fire losses, as shown by the reports made by the chiefs throughout the state, with hundreds of deaths and injuries.

Now, we are getting down to the fire losses. As I have stated, there are two kinds of fire losses we must consider. One is the accidental, of which three-fourths, fully three-fourths, is preventable, and it is through a course of this kind that we expect to reach and cut down that loss. The other kind of loss is the incendiary that generally is set for gain by some person who cares not what he does to the community or anybody else. It is just a matter of getting the almighty dollar. He is the hard one to catch, this kind of crook, for the simple reason that even when we do pin the facts on a fellow, sometimes the judge, sometimes the jury, can not see it in the same light as we do.
We had a recent experience in an up-state county.—I am not going to mention the county or the judge’s name, but some of you perhaps will recognize it,—where a man had a record of starting three fires within a period of three months. In one instance, a neighbor was putting up a very beautiful home for himself. This man was rather jealous of the neighbor because the home was somewhat better than the one he had himself, and he served this sort of notice upon his neighbor: “If you don’t quit building your house so much better than mine, I am going to burn it down.” The man continued on building; he did not think the fellow meant it. One night about midnight, the alarm went forth and sure enough, on the side of the house next to this fellow the fire had a fairly good start. The fire department saved a portion of the building. We investigated that fire, but did not get much support. A short time later he again served notice on somebody that he did not like them and he was going to give them a visit. He again made good his word. We investigated that fire. The third time he bought a piece of property in that city for which he was to pay $10,000. He had $200 to pay down and was to pay the balance within five days. The contract was drawn up, everything was in good shape, the man who sold him the property was getting anxious for his money, the five day period arrived and in the meantime he forged a check and forged a note, trying to raise the money. He did not make good, the time for payment lapsed, the formal notice was served on him, which meant another five day’s service, and the property was sold to another man. That night at midnight that building was set on fire. While the fire department was working on the fire, this fellow was across the street from the building with a jimmy in his hand, trying to prevent the firemen from working on the building. He was arrested, taken to jail and the jimmy taken from him. By good fortune a portion of the front part of the building was saved and in that portion was a door which that fellow had jimmed. They noticed in the morning that the door was jimmed, went to the jail and got this jimmy and fitted it in the groove in the door jamb. That’s the evidence we had to start with.

This fellow was indicted and the matter was postponed from time to time for trial. Finally it was called up and the attorney for the defendant asked that the man’s sanity be inquired into. That meant another postponement. It went over for a week and it was again called up. They had not completed the sanity investigation and it went over for another week. Finally it came up for trial and the jury found him sane. The arson matter then came up for trial. The judge in the meantime had asked the prosecuting attorney, as well as the attorney for the defendant, what they wanted to try this fellow on. The fellow was not in court at that time and the sheriff was instructed to bring him in. Finally the judge himself suggested that they try him upon the forgery charge and that he would suggest that the man plead guilty and he would give him one year, the arson charge to be withdrawn with the right to reinstate. The state’s attorney did not take to that very kindly, but after consulting with the witnesses and some business men in this village, he consented. When the man was brought
into court he refused to plead guilty, so the judge took him in charge, talked to him and finally he said, “All right, if you say so I will plead guilty.” When the fellow plead guilty the judge, instead of fixing the sentence at one year, fixed it at six months and was going to take off of that the time he had already been in jail because he could not furnish bond, which would reduce the sentence another thirty days. The state’s attorney objected and said he would not withdraw the arson charge. The judge looked at him and said, “If you don’t you are going to try him immediately on the arson charge.” The state’s attorney said, “I am ready, your honor.” The judge said, “Now, let me tell you, young man, before you start, I am going to find the fellow not guilty.” The jury was impaneled and the state’s attorney offered his evidence. The defense did not offer any and when the state’s attorney got up to argue, the judge called him down and said, “You have no argument to make; I have told you what I am going to do.” He proceeded to produce the form of verdict, handed it to the jury and said, “Go back and get at it as fast as you can and find this man not guilty.” The jury was out twenty minutes. He sent the sheriff after them. The sheriff brought them in. He said, “What’s the matter with you fellows, can’t you follow the instructions of the court?” One fellow spoke up and said, “We have not organized yet.” “Well,” said the judge, “you are too late, you are discharged.” Then he proceeded to find the defendant not guilty and entered an order therefor. Then he proceeded to sentence him on the forgery charge and gave him forty days. On second thought he reduced that to thirty days and gave him the time he had already served, which made it only a day or two he had to serve.

That is what we are confronted with. Do you wonder why we get discouraged? That is some of the work of the fire marshal and his deputies. That is only one of the many instances that we have to contend with, so we get pretty thoroughly discouraged.

Whenever we can get a state’s attorney or court willing to cooperate with us, we go in and try to get convictions, but even in cases where we have had confessions and they were read to the jury, the fellow has been found not guilty simply because he was a member of some good secret society the court belonged to or some member of the jury belonged to.

We had one a short time ago where a man was away up in a certain order, and we were confronted with the fact that the judge belonged to the same order, the state’s attorney belonged to the same order, and the sheriff belonged to the same order, so what chance do you think we had? We finally got a plea of guilty from the defendant with an understanding he would surrender his insurance policy, make no claim, pay a fine of $1,000 and stay out of the state of Illinois for a period of ten years. That is one way we have of getting rid of them.

On our inspection work what we want to do is to cooperate with the chiefs and fire departments throughout the state, but in doing so we want the chiefs and city officials to bear in mind the old saying that “God helps them who help themselves.” If you are not going to take the lead, blaze the way in your own city and pass the necessary ordi-
nances, we are almost powerless to do very much in your city. With a force of forty or forty-five men in the department you can readily see we can only scrape the surface and, when called upon by the chiefs in the different cities, we attempt to take care of the most pressing needs in those cities.

As I said, last year we made 65,000 inspections, but that doesn't mean the rechecks. Every order that is issued is rechecked. We attempt to select, in a community where we are unable to get very much compliance, several of the most drastic cases or the most neglected places and if the fellow will not respond to our request, we convince him by issuing a summons and letting him appear before the judge and tell the judge his troubles. By making a few prosecutions in the different communities, it makes the other fellow sit up and take notice and he starts to clean up and comply. In some communities we have had to arrest ten and fifteen men and have them fined from $10 and costs to as high as $50 and costs, which in some instances will amount to about $63 or $64. Those fellows will immediately start to clean up, because we have made it a rule after a man has been fined, to serve a five day notice, and if he does not make an effort in the five days to comply, we take him for another ride to the justice of the peace, and in some instances the justice is kind enough to make the fine double the amount of the first.

We gave an experience to a gentleman in southern Illinois who was in the habit of dumping gasoline in the sewer. The fire chief had called upon this fellow and he told the fire chief to go to the hot place; that he was running his place of business. The fire chief tried to get the mayor to do something and the mayor would not back him up. The fire chief called me on the telephone, said he did not dare to write as he did not want anything of record. We sent our man there six hours after the chief called me. We served notice on this fellow. He did the same thing that night. The next morning we took him to the justice of the peace and he gave him a fine of $100 and costs. Three days later he did the same thing and was defiant; said they could not fine him this time. We pulled him in again and the judge gave him $200 and costs. That fellow is a real dyed-in-the-wool fire preventionist in that city now. We have no more trouble with him.

These are the things we have to contend with. We want your support in it. We are willing to go the limit for you. If you can not get your own city officials to back you up, we will back you up, but I want you to make the effort first, show us that you are with us and we will go the limit with you. With that kind of cooperation there is not any question but what we can make a record and a showing in the state. Of course, you say you have not the experience necessary for work of that kind and you are somewhat timid in making inspections. That is the purpose of this course. We are here to listen to men who have had the experience, who know about this kind of work, and we are going to have views exchanged here, and I want everyone of you to make up your mind that if there is anything you do not thoroughly understand, as discussed here, don't be bashful. We are all the same kind of fellows here, all starting from the same class. Ask a question
you are in doubt about and somebody here will attempt to answer it for you and help you out so you can go back home with a feeling of confidence that you will do the right thing.

That same thing applies to the incendiary question, where you have questionable fires. We will help you wherever we can. Get word to us as quickly as you can and we will try to help you clean up and get rid of the firebugs, but in the meantime, watch the fellow sitting on high and giving instructions to the jury. If he is not right, there is a day of reckoning coming for him. You as firemen are the men entering the places that have been set by these crooks, not knowing whether you are going to return to your engine house or family that you left in the morning. If the fellow who sits on high gives instructions as he did in this case I cited to you, let's figure with him at the next election. He has no business on the bench. Where he belongs is over in Russia and they will make short work of him there if he ever gets there. (Applause.)

Before closing, I want to mention some ordinances that are necessary. Where a city is large enough to warrant it, you should have a fire prevention bureau. If not a real bureau, you should have men who are assigned to do nothing else during certain periods of their hours on duty but make inspections.

It is the little hazards, the rubbish and trash, that cause a great many of the fires that we are having. Get rid of the rubbish in your city or in your village and you are going to get rid of pretty near one-half of the fire causes you have. Every community should enforce strict regulations on this subject.

Next in importance is an anti-wooden shingle ordinance. I am sorry to say that there are a few cities in the state of Illinois that are going backwards along that line. Two or three cities in the northern part of the state have repealed the anti-wooden shingle ordinance because the mayor, in some instances, is the lumber man of the city. He is not doing anything for his city, he is only causing trouble. During the last year in Illinois we had about 1,600 roof fires, all due to wooden shingles. The fires that you have due to wooden shingles are the ones that strike nearest to our hearts. They are in the homes, where your loved ones are and you never can tell when a wooden shingle roof starts to burn what it is going to do to the neighbors or the houses in the block, or for blocks away. Practically all of the big conflagrations we have had, such as Baltimore, Paris, Texas, and Berkeley, California, have been due to wooden shingles.

I remember a few years ago, when the International Fire Engineers met in California, I was walking through the city of Berkeley with the chief from Buffalo and the secretary from Detroit. We were walking through the city to make a survey and I made the remark to the chief from Detroit, "What would ever happen in this town if a good wind storm and a roof fire got started?" He said, "Don't talk about it." It was only about a year afterwards when the message was flashed over the wires that Berkeley had practically been burned down, all due to the wooden shingles. It started on one house that was near a ravine going into the mountains. A good puff of wind coming down that
opening started this blaze going and the sparks flew from roof to roof. You, as firemen, recall the reports you saw the day the message flashed over the wires. I got telegrams from three chiefs who were with me on that survey, just saying, "It has happened." I knew what it meant.

Both North and South Carolina have had some disastrous wooden shingle fires, and there have been several in Texas.

Are we ever going to learn that the time to act is today? We must protect ourselves and the only way we can do so is to get the proper ordinances passed. I am not going to intrude upon my friend, Mr. Pierce, because he will tell you about the laboratories, but there are tests made by the laboratories and various brands and kinds of fireproof shingles are approved.

We should have in every city in the state of Illinois an anti-wooden shingle ordinance. The time is coming when we are going to make it statewide. I am going to dream it, eat it and sleep it, the same as I did this short course. (Applause.)

I am going to cut this short right here because some of you perhaps want to ask some questions. I want again to express my gratitude to the chiefs and city officials for the splendid attendance here today. I will go back to Springfield, make my report to the governor and will start out anew, not to make it a short course the next time, but to make it a two weeks' course. We will get you down here, drill you two weeks and you will go back home so enthused there will not be any fires for some time to come. I thank you. (Applause.)

If there are any questions anybody wants to ask I will be glad to answer them if I can.

DISCUSSION

Professor Provine: In your inspections you are looking after fire inspections as well as fires from the incendiary point of view?

Mr. Gamber: Yes, sir.

Professor Provine: The larger towns have certain ordinances and when you go into a community to investigate, what ordinance prevails?

Mr. Gamber: On the question of investigations, very few cities have any ordinances that cover that feature. That is part of the criminal code, written into the criminal statutes of the state and we make the investigations under the criminal code with the authority given the state fire marshal's office. As to inspections for fire hazards, the law provides we shall have concurrent jurisdiction in cities where they have ordinances, and we go out with the fire chief or some of his men he may assign and we make the order to comply with the city ordinance and prosecute under the city code. Does that answer your question?

Professor Provine: May I ask one more question?

Mr. Gamber: Yes, sir.

Professor Provine: Take an example, purely imaginative but in a community which does not exist except in my mind, I feel its public auditorium is not properly safeguarded from an exit point of view as well as a fire hazard. What will be the rule of procedure for me to re-
port this to you? I am powerless in my community to do very much.

Mr. Gamber: Report that a certain building has not proper exit facilities or is so situated it is dangerous as to fire, also dangerous as to life, and we will assign a man to make an inspection.

Professor Provine: Is it desirable or necessary that it go through the local fire department? They are cooperating with me but have been powerless.

Mr. Gamber: Unless we had information that the chief himself was lukewarm on the matter, the deputy would have instructions to go to the fire chief first, take the matter up with him and then proceed to the building and if possible take the chief or some man assigned by him with him.

Mr. Wills, South Elgin: Would it not be the part of wisdom relative to the wooden shingles to have a committee of some kind appointed to wait on the legislative body of the state of Illinois to see if a law could not be enacted to condemn the use of those shingles?

Mr. Gamber: I say yes and no. We are going back to the trend of local or home rule and I just want to reiterate what I said before that it is a question of, "God helps them who help themselves." I realize that sometimes it is almost impossible in a community to put over a thing, therefore, we try to supplant that by a state law. If I may just suggest: A few years ago I saw it coming and I guess a good many of you saw it coming, the gasoline proposition in filling stations. I knew it was only going to be a matter of time until we would have filling stations on almost every corner, as numerous as the thirst parlors were some years ago, so we made an effort to get some cities to pass ordinances. We did not get very far, so I went before the legislature and secured passage of a bill giving the department of trade and commerce, under which we operate, the right to make the necessary rules regulating the sale, storage, transportation, etc., of gasoline and all oils, including fuel oil. We immediately proceeded to get up a set of rules. We printed some 20,000 and distributed them throughout the state. Where the city or village does not pass an ordinance, it comes within the provisions of those rules and it is up to the state fire marshal to regulate handling of oils in such cities and villages.

Mr. Lewis, Canton: We have an ordinance in the city of Canton and I would say they don't get by with anything else. The city officials back us up to a man.

Mr. L. L. Wolf, Cincinnati, Ohio: I come from a city that was one of the first cities in the United States to put in effect a shingle ordinance and I think we have a model ordinance that has been copied by many cities in the United States. We haven't a shingle roof in the fire limits of Cincinnati today. We passed an ordinance and made it possible that any time there was a shingle roof fire that destroyed twenty-five per cent of the roof, that shingle roof could not be repaired. That was good, but meant many fires on shingle roofs. We had a good fire department and never allowed a fire to destroy twenty-five per cent, but wherever the fire failed to do it we did it. In that way we got rid of all shingle roofs within the fire limits of Cincinnati.
The speaker forgot to mention one of the biggest shingle roof conflagrations, that was in Atlanta, Georgia. I was there and went to the fire with Chief Cody. I saw fire jump three blocks and catch a shingle roof. Nineteen alarms from different parts of Atlanta came in. The fire got so great the fire department was not sufficient and they had every assistance possible. It became necessary to blast or dynamite blocks of houses to save what we could. This occurred in Atlanta, Georgia.

Your speaker was present at that same city and I was sitting in the audience with George Booth when a certain chief of the fire department made the assertion that he thought it was a good thing to lay fire-proof shingles on top of the wooden shingles. If anybody has that idea in his mind and figures on putting fire-proof shingles over the old shingles, it might be a temporary relief, but in my estimation I think it is worse than a shingle roof. If a fire ever originates around a flue and commences to burn underneath, you haven't a chance to fight it and what you are going to get is a lateral spread of fire. If you are going to have fire-proof shingles, make them take off the old shingles and put on a good fire-proof roof.

Mr. Hammerer: Does a retail merchant have a right to retail gas by the gallon in his place of business?

Mr. Gamber: We provide that he cannot have over five gallons above ground and that must be in a safety can. If he has it only in a five gallon lot, he can not very well retail it.

Mr. Wolf: He could still retail it in gallon lots if he could have five gallons.

Mr. Gamber: He would not have very much of it.

Mr. R. H. Bradbeen, Spring Valley: In a case where you thought a building had been set on fire and you wanted to take legal procedure, would it be best to take it up locally or take it up with the state fire marshal?

Mr. Gamber: If you have a sheriff who will cooperate with you and give you support it is all right to take it up with the sheriff. The chances are he will notify us anyhow, but I would as leave you would notify us direct.

Mr. Bradbeen: But from a legal point of view you can take it up either way?

Mr. Gamber: Yes. We would have to operate through your state's attorney anyhow.

Chairman Palmer: On a little side street running to the east on upper Michigan boulevard in Chicago there is one of the most interesting laboratories that I have ever been in, that's Underwriters' Laboratories. We have with us this morning Mr. Dana Pierce, president of Underwriters' Laboratories, who will have something worth while for you I am sure.

UNDERWRITERS' LABORATORIES

By Dana Pierce, President of Laboratories

I have a short time to speak to you, but have a very different story to tell from that you just heard. It is a story of a rather quiet
instituition, as the chairman said, on a side street in Chicago. There nothing very exciting goes on, apparently. I want to try to tell you where I think the work of Underwriters' Laboratories fits in with the general program of study of fire prevention and fire protection.

Within the lifetime of many people still living the world has seen vast changes. Let us examine for the moment some of these changes from the point of view of fire prevention and fire protection.

Seventy-five years ago our cities were comparatively small and neither their business districts nor their suburbs had attained any such size or congestion as we see today. Values as represented by both buildings and their contents were also much smaller than now and were very differently distributed. Correspondingly the fire departments were smaller, less elaborately equipped and less expensive. In those days there were no skyscrapers and no enormously congested areas either of office buildings or in wide-spread factory districts. The whole physical character of our cities and towns has materially changed and is becoming increasingly vast and complicated.

Within a lifetime we have seen the entire development of electricity as universally used for power and light. In the earlier days we had no gasoline, no acetylene, no wide distribution of oils, gasoline and other hazardous liquids, and no automobiles.

The development of industrial chemistry with all of its consequent complications in living and working conditions both in the factory and in the home has come about largely within the span of a single life. Seventy-five years ago practically all power was derived from steam and flowing water.

It must be apparent to everyone that our time has seen not only a marvelous development in the application of science, but a corresponding increase in the hazard of living of all sorts for each and everyone of us. Along with these hazards has developed the art and science of extinguishing fires, but nevertheless the fire loss in our country continues to grow year by year.

One writer has described the situation in the following words. "We have exchanged the few natural hazards of our early ancestors for a bewildering number of artificial dangers that have grown up with the progress of civilization. Everything today is on a vastly greater scale. Man-made towns are swept by conflagrations springing from man-caused fires. Man-made buildings collapse and bury scores. Man-made ships sink at sea and man-made trains crash in collision. Man's faithful servants: fire, steam, electricity and the processes of chemistry, which he has called forth from the realm of nature, frequently escape their bounds and work havoc. As the result of thousands of years of meddling with nature, man has thus exchanged the old natural world for a new and artificial world of tremendous potentialities and unnumbered perils. Thus new and complex hazards are by-products of science. If man is now surrounded by such a diversity of dangers it is needless to state that these have not been sought, but have arisen unsought and sometimes unrecognized in the course of efforts to improve conditions of human life."
Such considerations as the foregoing lead to the development of a great campaign for fire prevention which characterizes the present day, originally promoted chiefly by the fire insurance interests; it has since grown to be nation-wide with many organizations cooperating in it.

Some thirty years ago it began to be realized that one of the fundamental needs in any independent warfare on fire was exact knowledge concerning the materials which contributed to fires and conflagrations, the appliances and resources available for preventing or extinguishing fires and in fact scientific knowledge of all of the elements involved in the problem of fire protection as they arise in our buildings.

The need of this information and of tests by which it could be secured was first realized by the insurance companies, whose attention to this was particularly secured by the early work of W. H. Merrill of Chicago, at that time an insurance inspector. It was from his recognition of the need of a central adequate testing organization that Underwriters' Laboratories was created. It was realized that the underwriter engaged in the business of insurance was not of himself qualified to judge the great number of engineering problems involved in building construction, maintenance, and operation. It was equally true that few builders or owners of buildings had or could, of themselves, secure such information, nor had manufacturers of building materials and equipment themselves determined with reliability the value of the safety of the products offered to the public. The same was true of city authorities charged with the duty of making statutes, codes, and inspections in the public interest. If none of these, as is evidenced, could be experienced in the field of fire prevention twenty-five or thirty years ago, still more is it true today.

Starting from very modest and simple beginnings, Underwriters' Laboratories has extended its work into a wide range of engineering fields until it has now become an institution of national importance not only to the insurance world which gave it its original reason for existence, but quite as much to the general public, municipalities and all who are interested in the safety of towns, cities and people.

Naturally, Underwriters' Laboratories finds it necessary to cooperate in its engineering work not only with the insurance fraternity, but with the endless variety of sciences, technical and trade organizations whose technical and business relations are affected by it and are contributory to its knowledge and experience, but this is not the time to attempt an explanation of all of these forms of relation and cooperation.

Underwriters' Laboratories, established and maintained by the National Board of Fire Underwriters, is for “service—not profit.” The object of Underwriters' Laboratories is to bring to the user the best obtainable opinion on the merits of appliances, devices, machines, and materials with respect to life, fire, and collision hazards and theft and accident prevention. This work is undertaken as one means of reducing the enormous and unnecessary loss of life and property by fire and accident. It can not be emphasized too strongly that the Laboratories are a testing organization whose opinions are not based upon individual judgment of its engineers, but primarily upon the results of actual
tests and investigations especially designed to bring out the information or significance from the view point of hazards and protection.

Its principal plant on Ohio street in Chicago represents a very large investment in buildings and in a vast variety of special apparatus for the conduct of tests of all sorts. Manufacturers desiring to have their products tested submit them to the Laboratories, together with the payment of a preliminary fee as an earnest of good faith. The tests are conducted in accordance with elaborately prepared standards, which are the outgrowth not only of the experience of Laboratories' engineers and their advisors, but also of the industries affected. It is very difficult in a brief article to give an adequate idea either of the range of work undertaken or of the elaborate and highly specialized equipment utilized for it, and only a brief statement of some of the more important features of the work can be undertaken here.

Automatic sprinkler equipment is undoubtedly the greatest single device for reducing the fire loss and the testing of sprinklers and all the related appliances that go with them naturally forms an important part of Laboratories' work. The familiar sprinkler head is subjected to very searching tests of hydrostatic pressure, sensitiveness, water hammer, leakage, rough usage, and the like. The amount and distribution of the water from the sprinkler head is investigated and every possible form of weakness or inefficiency is guarded against both by the original tests and equally by a constant re-inspection of sprinklers as they are made in the different factories. Some thousands of sprinkler heads taken from buildings are retested each year to determine the degree to which they may have deteriorated by the effects of time, corrosion, or otherwise. The Laboratories has a large and very finely equipped hydraulic laboratory in which all the necessary tests are made of alarm valves, dry pipe valves, meters and the other complicated and vastly important parts of fire protection equipment of the modern factory or office building.

The importance of such work in determining in advance, rather than during or after a fire, the adequacy of this most important form of fire protection is quite obvious.

Closely related to this is the work of Laboratories in testing and inspecting fire hose, including both hose for building equipment and hose used by municipal fire departments. A city which desires to secure reliable fire hose made under standards proved by years of experience to be adequate and proper may buy labeled fire hose from the manufacturer with the assurance that each and every length so purchased and labeled has been tested by Laboratories' engineers at the factory where it is made and that, therefore, the product delivered to the city may be accepted with assurance that it is what it should be.

This is only one of the cases in which the work of Laboratories affects not only the insurance companies, but contributes directly to the advantage of municipalities and their officials and citizens.

Probably the most important and certainly the most dramatic of the tests conducted by Underwriters' Laboratories are those of fire tests on doors, windows, partitions, and the other elements of building construction. No dependence is placed upon mere examination of sam-
amples of materials; doors, windows and partition materials, and floors are tested in furnaces under conditions as nearly as possible identical with those to be found in buildings. The actual door or window in full size is tested. Partitions and floors are tested in large panels. The equipment is such that the degree of heat applied can be accurately determined and repeated over and over.

A fire door, for instance, is mounted in a brick wall which forms the front of a gas-heated furnace. For an hour, two hours, four hours, as the case may be, the door is subjected to gradually increased heat from the roaring gas flames until it is as severely punished as it would likely be in any conflagration. It may become white hot during this test and any latent weakness in its construction or materials is fairly sure to be developed.

At the conclusion of the fire test a stream of water, such as a fireman might use from a hose line, is played upon the sample to still further develop any weaknesses of construction or design.

Witnessing one of these tests makes one realize that Laboratories are not dealing with theory only, but depend chiefly upon tests and severe tests at that.

Other great furnaces in Laboratories provide for fire tests of floors, partitions, building columns, safes, and the like.

The comparative values of roofing materials are determined by tests where roof decks are covered with the material under test, exposed to fires from gas flames, from burning brands and from radiant heat, while a strong wind is blown over the test sample as might occur on the roof of an actual building.

The department of gases and oils is constantly engaged in investigations of a great variety of devices which are nowadays used for storing, distribution, and dispensing gasoline, oil and other hazardous liquids. Here again the tests are all on actual full sized, commercial samples under the most severe conditions of use which can be anticipated.

Three ranges of furnaces are constantly employed in the testing of oil burners both for house and for industrial purposes. This is a comparatively new development which has gone forward very rapidly and the necessity of positive information as to the hazards and safeguards for such heating and power plants is apparent to everyone who has given the matter even the slightest consideration.

In the electrical field the endless variety of both standard and special materials entering into electric lighting, heat and power are constantly under examination and test in accordance with standards which have been evolved through many years in cooperation with the electrical industries.

The chemical department is engaged in researches of a great variety, some of them dealing with the chemical aspects of articles under investigation by other Laboratories' departments and many others with special problems, such as spontaneous combustion, explosion, propagation of flame through pipes and other vessels, and in researches on special hazards which are constantly developing in industrial processes in a great variety of arts and industries.
In all of its work, Laboratories is interested not only in safety from fire hazards, but equally with questions of safety to persons. The accident hazard thus becomes an important part of every investigation as well as the primary object of work on safety devices themselves. More recently Laboratories has extended its operations into the automobile field, both the machines as a whole and accessories of every sort, and has also a large and active department dealing with questions of burglar alarm systems and related devices. These have an insurance interest of their own, but as they do not so directly affect the ordinary fire hazard I will not describe them at length here.

While it is important that we should have definite and reliable information about materials and devices as determined by tests originally made on the products as they are submitted by the manufacturer, it is quite as important for the insurance companies, the purchasers and inspecting authorities of both underwriters and municipalities to know that the articles which are made and offered for sale day by day continue to be safe and reliable. It is one thing to test a sample and quite another thing to know that day by day, month by month, and year by year the quality and safety of the article continues essentially unchanged.

For this reason Underwriters' Laboratories from the beginning has supplemented its original searching tests by a system of supervision and inspection, follow-up we call it. In hundreds and hundreds of factories scattered from one end of the country to the other, the inspectors of Underwriters' Laboratories are daily subjecting the products of these factories to re-tests carefully designed to determine that the daily product continues up to standard.

The evidence of compliance with such standards is the well known label of Underwriters' Laboratories which is an evidence, first, that the manufacturer has shown that he can make the standard article of its class, second, that he has done so, and third and quite as important as either of the others, that his goods have been supervised by Laboratories' inspector and found to be of continuing standard quality. The label is evidence, therefore, not only of quality, but of inspection, persistent, efficient and reasonable. It's value to the manufacturer, to the buyer, and to the city authority is very great. Its expense is so small as practically to affect the selling price of the goods not at all. Millions of such labels are used annually by American manufacturers and their recognition by purchasers and by underwriting and municipal authorities is the best and most widely available form of security.

A few concrete illustrations of how this works out will perhaps make the value of this factory inspection and label service clearer.

Rubber-covered wire is universally used in our buildings and is produced by some forty-five manufacturers, large and small, scattered throughout the United States and Canada. Rubber is an organic material which must be combined with minerals and some other materials in proper proportions to produce a substance which will be at once strong, waterproof, and of highly electrical insulation. If too little rubber is used or the manufacturing process goes wrong, you may find
in the walls of your building wires which will become in a short time positively dangerous.

At the wire factory the Laboratories’ inspector makes constant physical and electrical tests of the product day by day and at Chicago chemists are repeatedly analyzing samples collected from the various factories to determine the quality of the rubber insulation and the strength and integrity of the cotton braids or other materials which make up the finished wire. Any failures observed are immediately reported to the manufacturer and to the local inspector and made the subject of investigation at the factory and corrected as promptly as may be possible. Meanwhile product showing such defects is rejected for labeling.

A very similar process applies to fire hose, only in this case, as has been indicated above, each and every length of hose is tested at the factory for bursting, strength, elongation, twisting, kinking, and other physical properties, and chemical and physical analyses constantly keep track of the materials employed and the methods of fabricating and assembling them.

At the factory where sprinkler heads are made are elaborate, delicate sets of gauges which the manufacturer constantly uses under Laboratories’ supervision and which Laboratories’ inspector periodically employs himself to determine that each and every part of the sprinkler head is properly made, finished and assembled. Here again variation beyond certain narrow limits entails immediate investigation and correction.

While fire doors are being put together in hundreds of factories, Laboratories’ inspector reviews the process, gauges the metal employed, reviews the choice of lumber selected for the tin-clad doors, and in many other details insures by first hand inspection and knowledge that the door or window is standard and may, therefore, be depended upon in the fire emergency for which it alone is designed to perform its useful purpose of confining the fire within the room or building where it starts or of preventing the entrance of fire into a building from another nearby.

Week in and week out this detailed inspection in hundreds of factories is going on quietly, unobtrusively and effectively. The evidence of it is in the label on the goods or in the listing of the device in one of the numerous pamphlets published by Laboratories and given wide, free distribution to all who are interested in fire protection.

To the buying public and city authorities all the results of these very far-spread activities of Laboratories in testing, inspecting, and the maintenance of standards are available without cost and it is largely on this score that the Laboratories bases its claim to be an institution for public service.

In recent years we have seen a change of emphasis in the duties of fire departments. We used to think of a fire department chiefly, if not solely, as an organization which upon receipt of an alarm rushed to the fire and by heroic and dramatic efforts put it out as promptly as possible. This is still a most important part of a fire department’s duties, but we are gradually learning the wisdom of employing in fire
departments devoted and trained men for the prevention of fires as well as for their extinguishment. The fire department today which is not thoroughly acquainted with the building conditions in its town and which does not conduct regular, persistent inspections for the improvement of conditions and removal of hazards cannot claim to be a modern or an efficient department.

In such fire prevention inspections many problems come up regarding the quality, safety, and reliability of building materials and equipment of every sort and of fire fighting appliances such as alarm systems, extinguishers and the like. The technical problems involved reach out into every science and individual art and are not generally capable of being answered either by mere inspection of the things themselves or from the necessarily limited knowledge and experience of the fire chief, his inspectors, or the city officials. It is in this field especially that the work of Underwriters' Laboratories may be made of service to the fire department and to the city. Its lists, its labels and its technical information are constantly available and freely given.

Many fire chiefs and city departments constantly apply to Laboratories for information of this character and utilize it to the very greatest advantage, confident that the opinions expressed are those of a disinterested, non-commercial institution, whose only concern is to improve conditions of fire safety and advance the cause of fire protection.

I conceive it to be the purpose of this short course in fire prevention, control and extinguishment, generously and wisely provided by the University of Illinois, to assist in the education of all who are concerned in problems of safety in our state and cities. Other speakers will deal with a wide variety of problems of concern to you each in his special field. The arts of preventing fires and fighting them include enough to tax the intelligence of the best of us and any man may find in this field full scope for all of his abilities and for the performance of work of the highest grade of public value.

In closing this brief account of the place of Underwriters' Laboratories in fire protection, I ask you, as you listen to the other speakers and as you continue in your professional life and at home, to remember constantly that before any fire starts there must be something to burn and that after it starts you must use one or another form of manufactured articles in the process of putting it out. In other words, at the basis of fire protection must lie a sound and real knowledge of the materials and construction of buildings and their contents; a correct understanding of the hazards which are introduced into those buildings in their equipment and the processes which are carried on, and, finally, a reliable and unquestionable knowledge of the apparatus which we must use to confine or extinguish the fire.

It is on these basic problems that Underwriters' Laboratories works. Its tests, inspections, and standards are designed as a fundamental and necessary basis for the fight against fire, all of which information and service are at the disposal of anyone who can use them and that the knowledge and utilization of this service should be as general and universal as possible.
I shall ask to show a very few pictures which will illustrate some of the equipment we have on Ohio street in Chicago and give you a little more idea, perhaps, of the character of the plant. I repeat my invitation to everyone, individually and collectively, to come and see us; we can give you an interesting half hour, probably an interesting half day and I think an interesting day. I thank you very much. (Applause.)

**Chairman Palmer:** We will now adjourn until 1:30 o'clock this afternoon.

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**TUESDAY, JUNE 16, AFTERNOON SESSION**

*John G. Gamber, State Fire Marshal, Chairman*

The time has arrived to start the afternoon session. I want to suggest first that if anyone here has not registered, please register so we can get your name upon the records. We are going to publish the proceedings and anyone that is not registered is likely to be missed in mailing the proceedings, so kindly register and give your full name and address.

The first topic for this afternoon is Fire Prevention and Building Construction. The speaker who is going to take this topic up is a young man I have known for a great many years. In fact I got very well acquainted with him through the young lady he married, who told me all about him before she married him and asked my advice about him. I recommended him highly, after giving him the once-over, and he has made good in the work he has taken up. I have the extreme pleasure of presenting Raymond T. Nelson, engineer of the Western Actuarial Bureau, Chicago. (Applause.)

**FIRE PREVENTION AND BUILDING CONSTRUCTION**

*By Raymond T. Nelson, Engineer, Western Actuarial Bureau, Chicago*

I hope you gentlemen will not be disappointed in my remarks after what Mr. Gamber has said concerning myself. Personally I am not used to being complimented so highly and I surely want to thank him. This is the first time I have ever been officially accused of being an engineer. It is true I went to an engineering school, but it so happens everybody who goes through an engineering school is not an engineer, and I happen to be one of the few who cannot qualify.

You men are more or less acquainted with the operation of a relay team. Whether in a track meet, swimming meet, or any other athletic activity, you know there are four jobs that call for “pinch hitters”, and these men have very difficult jobs to perform. The first man has to take the mark and set the pace, while each succeeding man has to attempt to do something better in order to win. This morn-
ing Mr. Gamber talked to you, as did Mr. Pierce and the doctor from the university. My position on this relay team, number four, is a rather difficult place, inasmuch as I cannot lose ground, but must keep up the standard already set in order to go through to the finish. So I feel I am in a more or less embarrassing position, having followed these men, and I trust that I will not lose any ground, for I will try to follow the pace that they have set.

Have you gentlemen ever thought of the general subject of Fire Prevention and Building Construction, and if so have you ever considered how much thought the average individual gives to the building he occupies as long as it satisfactorily serves the purpose for which it is being used?

A week ago last Saturday I stopped in to see Captain Healy, of the Rogers Park fire station in Chicago. I sought him out purposely to ask this question, as to how much thought the average individual gives to the building he occupies as long as it satisfactorily serves its purpose and Captain Healy answered me in practically the same terms that several other people have, and by the way Captain Healy is well qualified, inasmuch as he is the oldest active member of the Chicago city fire department. He said, "very little". Following this answer I asked why so little attention was given to the buildings and a reply came from him similar to one I have received from several others, and you undoubtedly have asked the same question from time to time, "Why?"

We are living in a most peculiar age, an age where production and time rule beyond all other things. Every year production must be perfected to an almost ideal state in order to meet competition. In perfecting production and increasing turnover the building is entirely disregarded as long as its housing facilities suffice and then should reconstruction be required, the cheapest possible building is put up. No expense is spared on machinery, but as much as possible is saved upon the housing. The building itself does not actually contribute towards the efficiency of the machinery contained within that structure. I am speaking more of our mercantile and industrial property than dwelling house property in this behalf, but the same thing applies to the dwelling as any other structure.

Very few people consider fire seriously. They only realize the power of its sting when it befalls them and then its memory is not long lasting, for they return to their former ways and trust to Divine Providence to protect them. This is more true relating to the building than to the occupancy itself. Have you ever read reports of large fires and followed up those reports as to how the properties were replaced? Undoubtedly if you have you have found that the buildings were put in practically the same identical manner as they were before the conflagration.

You have heard of the Berkeley conflagration and the Berkeley conflagration probably illustrates this point more effectively than any other we have had to deal with, for in the heat of the conflagration Berkeley passed an anti-wooden shingle ordinance and practically before the embers were cooled repealed it, permitting people to replace
their roofs with the same material which caused their properties to be destroyed.

Our large fires have demonstrated certain facts which must not be lost sight of. In Baltimore, San Francisco and Japan, the only buildings that stood in the path of the fire were those of fire-proof construction and you may be interested to know the only buildings which stood the earthquake in Japan were of an American built fire-resistant type. It is true they were seriously damaged, but notwithstanding this they absorbed the shock and in so doing stood as a barrier, thereby reducing the probable spread to limits far beyond where the fire died out.

Only three years ago in Chicago we came in contact with an illustration of this character and, had the Burlington building not stood where it did, no one can tell where that fire would have gone to and I may say, had the Burlington building not absorbed the entire fire from the Austin building, this fire would have been one of the greatest conflagrations we have ever had.

In the present day buildings are generally classified in three groups, the fire-resistant group, more commonly known as fire-proof; the brick group; and the frame group. In discussing the standards applicable to these various types of structures I believe it is better to discuss them more from the standpoint of fire insurance standards than purely structural standards, inasmuch as the standards the insurance companies have adopted are solely for the purpose of minimizing the spread of fire. We have individual standards which deal with stress and strain, a building designed to carry certain loads, and the standard adopted by the fire insurance company may not meet the requirements for which the building is to be used. We may need a very much thicker floor in order to carry the load to which the floor is to be subjected, but from the standpoint of fire insurance that floor need not be over four inches thick if of reinforced concrete or six inches if of hollow tile. We will discuss this from that point of view, inasmuch as that represents the minimum that should be applied in order to stop the spread of the fire. But please do not take this as a fact that the floors should not be more than the specified thickness, as the thickness should be varied in order to carry the loads to which the floor is to be subjected, the thickness specified in the illustrative example being merely the minimum requirement.

May we have the slides please? Three classes of buildings exist, the fire-proof, brick and frame. In order that we may understand the various types of structures, the first thing we will do is to consider the basic definitions of each type.

*Fire-proof Buildings*—Buildings of this class of construction are defined as those having masonry exterior walls or incombustible exterior walls between masonry or protected metal supports, with all floors and roof of fire-proof construction.
Brick Buildings—Buildings of this class of construction are defined as those having masonry exterior walls or incombustible exterior exterior walls, or incombustible exterior walls.

a. All floors and roof combustible or incombustible.
b. All floors fire-proof, but with a combustible or incombustible roof not separated from top story by a fire-proof ceiling conforming to the requirements for fire-proof floors, or from basement or lowest floor by three fire-proof floors.

Frame Buildings—Buildings of this class of construction are defined as those having combustible exterior walls with combustible or incombustible floors and roof.
Walls

Masonry Walls

Definition: Masonry walls are defined as walls of brick (including hollow, sand-lime and concrete brick), stone, concrete, adobe, hollow concrete block or tile, and hollow walls of block construction.
MASONRY WALLS

Requirements: The thickness of a masonry wall is dependent upon the Class of Occupancy, the Class of Wall, and the Material of Wall.

Class of Occupancy: Occupancies are classified as Light or Ordinary. Light Occupancies consist of such occupancies as banks, churches, dwellings, libraries, offices, etc. For a complete list, see the "Analytic System." All occupancies not classified as Light are considered Ordinary Occupancies.

Class of Wall: Walls are classified as Independent, and Party or Division Walls, these in turn being subdivided into Bearing and Non-Bearing Walls.

An Independent Wall is any wall other than a Party or Division Wall.

A Party or Division Wall is a wall common to two or more buildings on one or more floors.

A Bearing Wall is a wall which supports any load in addition to its own weight.

A Non-bearing Wall is a wall which supports no load in addition to its own weight.

REQUIREMENTS FOR BRICK WALLS

In the following table, two sets of figures are found, Light Face and Bold Face, designating the thicknesses required for brick walls of varying heights. Preceding this table appears a key which outlines the requirements applying for each combination of Class of Occupancy and Class of Wall.

Key

Independent Wall

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<td>Non-bearing</td>
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<table>
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<tr>
<th>Party or Division Wall</th>
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<tbody>
<tr>
<td>Light Occupancy</td>
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<tr>
<td>Ordinary Occupancy</td>
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MINIMUM THICKNESS

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Party or Division Walls: In addition to the requirements given above. Party or Division walls should not be less than 16 inches thick on top story common to both buildings nor less than 20 inches thick on any story below common to both buildings. (Fig. 3.)

Material of Walls: The following modifications in the requirements for brick walls should be made for each material:

Reinforced Concrete Walls: Thickness should not be less than two-thirds of that specified for brick walls; minimum 8 inches.

Stone or Concrete (not reinforced) Walls: Thickness should be 4 inches greater than that specified for brick walls.

Hollow Concrete Block or Tile Walls or Hollow Walls of Block Construction: Thickness should be 1 inch greater than that specified for brick walls. If faced on both sides with 4 inches or on one side with 8 inches of brick, such walls should be considered the equivalent of brick walls.

Hollow Brick and Sand-Lime Brick Walls (approximate size of brick 2½x4x8 inches): Thickness should be the same as that specified for brick walls.

Concrete Brick Walls (approximate size of brick 2½x4x8 inches): Thickness should be the same as that specified for stone or concrete (not rein forced) walls.

Adobe Walls: Thickness should be 4 inches greater than specified for brick walls.
REQUIREMENTS FOR MASONRY WALLS.
Definitions:

A **Parapet Wall** is that portion of a masonry wall which extends above the roof line of a building.

A **Fender Wall** is that portion of a masonry wall which extends beyond roof structures or extensions.

Requirements:

A **Parapet Wall** should extend not less than 18 inches above the roof lines of the building except when within 20 feet of a building grading Large (see table) when height should be increased to 36 inches.

**Note 1:** When two buildings of unequal height adjoin, the facing wall of the higher should be considered the equivalent of the parapet of the lower. The height of the parapet should be determined according to the height of openings in the facing wall of the higher above the roof of the lower or, if no openings, by the height of the facing wall.

**Note 2:** When roof of either exposed or exposing building is of fireproof or incombustible construction or when roof of exposing building is two or more stories lower, unless combustible cornices, eaves, or roof houses project, no parapet is required.

**TABLE OF LARGE BUILDINGS**

<table>
<thead>
<tr>
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<th>Height in Stories</th>
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<td>5,000</td>
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<tr>
<td></td>
<td>4 or higher</td>
<td>All Buildings</td>
</tr>
</tbody>
</table>

**Note 3:** When a story exceeds 15 feet in height, each 15 feet or greater part thereof in excess of the first 15 feet should be treated as an additional story. When such a story extends to the roof, height should be measured to the eaves.

**Note 4:** When a building contains exclusively incombustible contents, areas in above tables should be increased one-half.

**Note 5:** Solid Rows under 9th and 10th classes of protection should grade Large under the following conditions:

- If total ground floor area of all buildings in row is 7,500 square feet or more **when no building in row exceeds** one story in height.
- If total ground floor area of all buildings in row is 4,500 square feet or more **when any building in row is** two stories in height.

If any building in row grades large.

A **Fender Wall** should extend not less than 18 inches above, except as provided for under parapets, and not less than 36 inches beyond combustible roof structures or extensions.
FIRE STOP WALL

Definition:
A Fire Stop Wall is a fire wall subdividing a row of frame buildings or sections of frame buildings so as to restrict the spread of fire.

Requirement:
Fire Stop Walls should be of masonry, not less than 12 inches thick, without openings or with all openings protected by doors approved for the protection of openings in fire walls and extend at least 36 inches above the roof combs and 36 inches beyond the ends of the building, or have a T extending 6 feet on each side of the walls or an L extending 12 feet on one side of the wall.
FIRE STOP WALL
INCOMBUSTIBLE WALLS

Definition:
Incombustible walls are walls of metal, metal lath and plaster and (or) glass or any other incombustible material on incombustible supports.

COMBUSTIBLE WALLS

Definition:
Combustible walls are walls of wood, wood iron clad, skeleton iron clad, brick veneered, brick nogged, or any combustible or incombustible material on combustible supports.
"D" WALLS
(COMBUSTIBLE)
ROOF OPENINGS

SKYLIGHTS

Skylights should be constructed of wire-glass set in metal frames or of heavy glass set in metal frames and protected by screens of No. 12 gauge wire with not more than one inch mesh supported on iron frames and set not less than 6 inches above the glass.

Note: Skylights over masonry elevator or stair shafts may be of thin glass set in metal frames and protected as described above.
VENTILATORS

Slatted or other ventilators in wall, roof houses, etc., should be protected by heavy screens of not more than one-fourth inch mesh or provided with windows or other effective means of preventing the access of sparks.
ROOF HOUSE WITH PROTECTED LOUVRES.

METAL SCREEN 1/2" MAXIMUM MESH 4"
SCUTTLE HOLES

In buildings of ordinary construction, scuttle should be constructed of metal lath and plaster on angle iron frame, or double battened wood, tin clad on the outside, tin turning over lower edge.

Stair or permanent ladder should be provided. If ladder, it must be fastened to the scuttle and if hinged may be drawn up to ceiling. Rope ends should not be over six feet above floor.
COURTS

INTERIOR COURTS

Definition: An interior court is any uncovered area within a building enclosed on all sides by walls of the enclosing building.

Requirements:

Walls should be of cement plaster on both sides of metal lath, not less than 2 inches thick, supported on iron frame; gypsum blocks, tile or reinforced concrete, not less than 3 inches thick; or brick.

Openings into courts should be protected by wire-glass in stationary, automatic or self-closing metal frames, or by automatic doors or shutters approved for the protection of openings in vertical shafts.

Note: If court pierces only one floor (and roof) and is 20 feet or more in both dimensions, or if court pierces more than one floor (and roof) and is 40 feet or more in both dimensions, requirement as to the protection of openings may be waived.
EXTERIOR COURTS

Definition: An exterior court is any uncovered area within a building enclosed on all but one side by walls of the enclosing building. (Fig. 1.)

Note: The junction of two walls forming a re-entrant angle should not be considered as forming a court (Fig. 2) except in the case of small V-shaped courts (Fig. 3) which are included in the above definition.

Requirements: The same requirements that apply to exterior walls should apply to court walls. (See Masonry Walls.)

Openings: If court is enclosed on all sides by walls, either of the building of which the court forms a part or by walls adjoining buildings, openings into court should be protected by wire glass in stationary, automatic or self-closing metal frames, or by automatic doors or shutters approved for the protection of openings in vertical shafts.

Note: If court, enclosed on all sides, pierces only one floor (and roof) and is 20 feet or more in both dimensions, or if court pierces more than one floor (and roof) and is 40 feet or more in both dimensions, requirements as to the protection of openings may be waived.
Floor and Roof and Supports

Fireproof Floors and Roofs

Definitions: Fireproof floors or roofs are floors or roofs constructed of brick or tile arches, reinforced concrete slabs, reinforced concrete slabs with reinforced concrete joists, or reinforced concrete joists and tile on incombustible supports.

Note 1: Combustible floor surfacing does not affect the grading of a floor, except that when earth or other fireproof floors laid directly on earth have combustible floor surfacing with air space beneath, they should class as combustible floors.

Requirements:

Floors, if brick or concrete, should be not less than 4 inches thick, or if tile, not less than 6 inches thick. Wood floor surfacing, if any, should be laid on nailing strips embedded in incombustible materials with no air space beneath.

Floor Supports should be of materials other than stone, concrete (not reinforced) hollow concrete block or tile, and unprotected steel.

If supporting columns, girders, trusses and beams are steel or reinforced concrete, or if floor and roof slabs are reinforced concrete, all steel work and reinforcing bars should be protected according to the following minimum requirements:

Material: Only brick, concrete, burned tile or other materials, which, upon test, show equal value, should be considered as fireproofing; thickness of plaster should not be considered in determining the thickness of fireproofing.

Thickness of Fireproofing:

Metal Supporting Members:

Columns: Columns built in or supporting exterior walls, 4 inches.

Note 2: When fireproofing consists of reinforced concrete, thickness may be reduced to 3 inches.

Interior Columns, 3 inches.

Note 3: Interior columns, constructed of steel or wrought iron pipe filled solidly with concrete may be protected by a minimum of 1 1/2 inches of fireproofing.

Horizontal Supporting Members: Girders and all members of trusses, built in or supporting exterior walls; on sides, 4 inches; over top and bottom plates and flanges, 2 inches.

Note 4: When fireproofing consists of reinforced concrete, required thickness or fireproofing on sides may be reduced to 3 inches.

Interior girders, trusses, beams and other supporting members not built in or supporting exterior walls; on sides and over top and bottom plates and flanges, 2 inches.

Reinforced Concrete Supporting Members and Floor or Roof Slabs: All metal reinforcing in reinforced concrete columns, girders, beams or other supporting members should be protected by not less than 1 inch of concrete or its equivalent.

All metal reinforcing in floor or roof slabs should be protected by not less than 3/4 inch of concrete or its equivalent.
INCOMBUSTIBLE FLOORS AND ROOFS

Definition: Incombustible floors and roofs are floors and roofs constructed of asbestos board, glass, metal, metal lath and plaster, concrete on expanded metal; or clay, concrete or gypsum tile on metal ties or pur-lins; on incombustible supports.

Floors or roofs constructed of concrete on expanded metal with all supporting columns, beams, or girders protected by fireproofing materials equivalent to not less than one-half of that specified under the protection of supports for fireproof floors and with all metal joists on floor slabs protected by a ceiling of cement plaster on metal lath, may be classed as Fireproof Floors or Roofs.

COMBUSTIBLE FLOORS AND ROOFS

Definition: Combustible floors and roofs are floors or roofs of wood or incombustible materials on combustible supports.

Requirements: Combustible floors are graded according to their type of construction, their grades being designated, for convenience, by the letters A, B, and C.

A. Floors

All floors not conforming with the requirements for B or C as described below. (Fig. 1.)

B. Floors

(Semi-Mill Construction)

Combustible floors not less than 3 inches thick (2 3/4 inches dressed) with vertical supports of wood not less than 6x6 inches and with horizontal supports of wood not less than 4x6 inches, or with vertical or horizontal supports of metal not protected as required for C floors; or fireproof or incombustible floors on metal supports not protected as required for C floors. (Figs. 2 and 3.)

C. Floors

(Mill Construction)

Combustible floors not less than 4 inches thick (3 1/2 inches dressed) with vertical supports of wood not less than 8x8 inches and with horizontal supports of wood not less than 6x6 inches, or with vertical and horizontal supports of metal protected by not less than 1 inch of plaster on metal lath; or fireproof floors on metal supports protected by not less than 1 inch of plaster on metal lath. (Figs. 2, 3 and 4.)

Note: Ceiling, if any, of top story should be graded according to the construction specified for floors, except that a ceiling of wood, wood lath and plaster, etc., may be considered equivalent to a floor grading A.
Water-Tight Floors

**Floor:** Floor should have a pitch of at least 1 inch to each 20 feet.

**Waterproofing:** Floor should be covered with a layer of 1 inch rock asphalt, or have two layers of felt with a coating of waterproof compound between plies and on top. Wooden overlay should be laid when waterproof compound is hot.

**Flashing:** Felt should turn up at all posts and at side walls at least 6 inches and be protected by a counter flashing of galvanized iron, or by a wooden base board.

**Scuppers:** Scuppers should be of an approved type anchored in walls and be spaced not more than 20 feet apart.
Protection of Floor Openings

Enclosed Openings

This type of enclosure is suitable only for floor openings in buildings of ordinary construction.

Enclosure should be of wood lath and plaster or matched flooring not less than 1 inch thick (7/8-inch dressed) with all openings into enclosure protected by automatic or self-closing doors of matched flooring not less than 1 inch thick (7/8-inch dressed) or by wire glass in stationary automatic, or self-closing metal frames.

Note: The above type of enclosure should not be used for elevators (except small dumb waiters) passing thru more than one floor.
ENCLOSED OPENINGS

Enclosure should be continuous from floor to floor and be constructed so as to meet the following minimum requirements:

**Partitions:** Partitions should be of cement plaster on both sides of metal lath, not less than 2 inches thick, supported on iron frame; boiler iron properly riveted and framed; gypsum blocks, tile, or reinforced concrete, not less than 3 inches thick; or brick.

**Openings:** Openings into enclosure should be protected by wire glass in stationary, automatic or self-closing metal frames, or by automatic or self-closing door approved for the protection of openings in vertical shafts.
ENCLOSED OPENINGS

(Counter Balanced Elevator Doors)

Enclosure should be continuous from floor to floor and be constructed so as to meet the following minimum requirements:

**Partitions:** Partitions should be of cement plaster on both sides of metal lath, not less than 2 inches thick, supported on iron frame; boiler iron properly riveted and framed; gypsum blocks, tile, or reinforced concrete, not less than 3 inches thick; or brick.

**Counter Balanced Door Equipment:** Only doors and hardware approved for the protection of openings in vertical shafts should be used.

**Size:** Openings should not exceed 8 feet in width and 10 feet in height. Door should lap sides and bottom of opening at least 2 inches, and top, 3 inches.

**Sills and Lintels:** Should be standard.

**Guides:** Guides should be mounted on inner face of shaft wall at sides of opening and fastened by 1/2-inch thru bolts with nuts at each end and spaced not more than 18 inches on centers. Bolt holes should be slotted and guide arranged so as to engage door in each side at least 1 inch with 1/2-inch clearance in each guide for lateral expansion.

Two inches should be allowed between units for clearance and expansion.
OPENINGS NOT ENCLOSED
(Stair Trap)

Size: Door should be of sufficient size to overlap opening on all sides by not less than 1 inch.

Trap: Trap should be of matched flooring, not less than 2 inches thick (1\(\frac{3}{4}\) inches dressed), entirely covered with tin as required for approved fire doors.

In buildings of ordinary joist construction, door may be of matched flooring not less than 1 inch thick (\(\frac{3}{4}\)-inch dressed) covered with tin on under side. Tin should be securely fastened to woodwork, nail heads being covered by single lock joints. Covering should lap top side of trap.

Hinges: Hinges should be heavy wrought metal and bolted to the trap.

Stop: Stop, to prevent door being raised to a vertical line, should be wrought metal and bolted either to door or wall.

Door: Door should be arranged to close automatically.
FLOOR OPENING, NOT ENCLOSED
OPENINGS NOT ENCLOSED
(Elevator Trap)

**Size:** Door should be of sufficient size to overlap opening on all sides by not less than one inch.

**Trap:** Door should be of matched flooring not less than 2 inches thick (1\(\frac{3}{4}\) inches dressed) entirely covered with tin as required for approved fire doors.

In buildings of ordinary joist construction, door may be of matched floor not less than one inch thick (\(\frac{1}{2}\) inch dressed) covered with tin on under side. Tin should be securely fastened to woodwork, nail heads being covered by single lock joints. Covering should lap top side.

Openings in door for cables, counter weights, etc., should be provided with automatic flaps of same construction as door.

**Hinges:** Hinges should be of heavy wrought metal and bolted to door.

**Closing:** All doors should close automatically by fusible link or electrical attachment, so arranged that all doors on one shaft will operate by the fusing of any one link or by thermostat.

All wires, chains, and pulleys and weights should be protected, if necessary, against mechanical injury, by guard strips, or from being rendered inoperative by piling stocks or other materials against same.
OPENINGS NOT ENCLOSED

(Heating, Ventilating and Conveyor Pipes)

**Sleeve:** Sleeve thru floor should be of cast iron or constructed of No. 14 gauge iron or steel and anchored by collar.

**Door:** Door should be constructed of same material as sleeve pivoted on bronze pin and held open with stranded wire or chain and fusible links.

Weights should be attached to door to insure positive closing.

**Painting:** Apply two coats of paint.
A. G. 9.

- AUTOMATIC DAMPER -
HEATING AND VENTILATING PIPE
THRU FLOOR
OPENINGS IN HALLS OR CORRIDORS

Enclosure should be continuous from floor to floor and constructed so as to meet the following minimum requirements:

**Partitions** should be of cement plaster on both sides of metal lath not less than 2 inches thick, supported on iron frame; gypsum blocks, tile or reinforced concrete, not less than 3 inches thick; or brick.

**Openings** into enclosures should be protected by wire-glass in stationary, automatic, or self-closing metal frames, or by automatic or self-closing doors approved for the protection of openings in corridors or partitions.
Exterior Attachments

All exterior attachments to fireproof and brick buildings should be of incombustible construction.

Cornices: Cornices, if hollow, should not be continuous with adjoining buildings.

Bay Windows: Bay windows should conform to the requirements for exterior walls.

Walls: Walls of roof houses with floors and constituting more than 25% of the roof area or more than 800 square feet in area or, with or without floors and more than one story in height should conform to the requirements for exterior walls.
FIRE STOP IN CORNICE
CHAIRMAN GAMBER: If anybody desires to ask any questions I am sure Mr. Nelson would be glad to answer them. If there are no questions we are ready for the next speaker.

The next subject is Exit Facilities. When we looked around for a speaker for this particular subject we thought we would go to the largest city in the state, the second largest city in the United States, where they have more experience along that line than any other city in the state and we asked Fire Commissioner Connery to supply us with a speaker. Mr. Connery very kindly selected his fire prevention engineer of the fire prevention bureau of Chicago, John Plant, who will talk to us on Exit Facilities. Mr. Plant suggests that this might be the seventh inning and you might stretch a little bit and move around if you want to.

(Short recess taken).

EXIT FACILITIES

JOHN PLANT, Fire Prevention Bureau, Chicago

Mr. Gamber and Gentlemen: The subject assigned to me, Exit Facilities, might be talked over in different ways. We will start with the Indian wigwam. When the Indian had his wigwam or the settler had his hut, exit facilities were everywhere. All he had to do was to roll out under the canvas and he was out, if anything happened inside the room. As civilization progressed and ground became more valuable men started building buildings higher rather than wider and longer. Thus arose the necessity of getting people into the building. That is the predominant idea of the theatre man or the merchant, or perhaps everyone, except those interested in safety,—to get the people in first and then they don't care particularly whether they can get out or not, because there is never going to be a fire. They say—the place has been up thirty-five years and never burned down, so don't ask them to widen the exits or put an additional fire escape on. I have in mind such a fire escape as that (indicating a ladder fire escape). Why ask any human being other than an able bodied fireman or circus acrobat to perform on that in zero weather with smoke and gas issuing from the building? The architect works very hard and spends many sleepless nights designing a building so it will be serviceable and useful, and so that the proportions will be right. He finds the height is out of proportion with the width and the ornamental scrolls over the doors will be out of place; but after it is all done he comes along and tacks on a tangled mass of iron in the shape of a ladder or stairway and calls it a fire escape. This is a notice to the whole world that there is danger in the building and that someone may have to use that exit to get out of the building in order to save his life or limbs.

A fire escape is good sometimes as a means of attack for the firemen. They can scramble up on the fire escape and put streams of water on the burning material, but in many cases it is no means of escape for the occupants.
When people build a building, regardless of the type of construction, and then fill the inside of the building with great quantities of combustible contents, with large undivided areas, fires will start in the most unlooked for places and from the most mysterious causes, and spread with the rapidity that only men like yourselves, who have been trained to race away from fire, know how great. With the above fact in mind, you will agree something other than a ladder fire escape or stairway fire escape should be counted on as a means of egress from a burning building.

But it is a most difficult thing to sell this idea to architects. They cannot get over the idea of building a building and tacking a fire escape on it. I will cite an example. In Chicago, on the northwest corner of Randolph and Madison streets, is a twenty-two story library building. They were not pressed for money because in 1891 Doctor Cerrar died and left a fortune of about three million dollars to found a library. Today the resources available have increased very much. They built a most beautiful so-called fireproof building. When they got the twenty or twenty-two story building constructed, after the architect wasted many hours of sleep and perhaps got grey hairs designing correct proportions, they tacked on two masses of iron bars called a fire escape. In lieu of this iron stairway fire escape, which will rust and require scrapings and paintings and thus stain the beautiful stonework on the front of the building, a new idea in exit facilities could have been used on the building. The additional expense would not have been great and the cost was not troubling the builders.

This new idea is known as the Philadelphia smoke-proof stair tower. That’s the outside wall of the building (indicating): we will count that partition as the other outside wall; we would bring a brick wall to this column and a brick wall straight through, leave out the window and about half that space would be the Philadelphia smoke-proof tower. Thus your stairway is entirely surrounded with a twelve inch brick or concrete wall. In order to get in that stairway you must leave the building. The wall comes out of this portion here, out on the back porch, if you please, and then into your stair tower.

I have been able to sell that idea to several building contractors and architects up north. The enclosed stair tower is not required by law. I would have a difficult time selling it to the law makers. Should I try to sell the members of the city council on the idea of eliminating fire escapes and requiring a Philadelphia stair-tower, I would have a difficult job. Imagine a building without a fire escape? But we have better than a fire escape in the Philadelphia smoke-proof stair tower. Regardless of what happens within the building, that stairway is one hundred percent efficient as means of an attack for the fire department and one hundred percent efficient as a means of escape for the occupants above. Once off of one floor you will descend down through the stairway without leaving the stair tower until discharged into the alley or street. That sort of a stairway can be completely worked out and incorporated within the original walls of the building.

To get away from the fire escape is a step in advance, but I am telling you men this as perhaps you might come in contact with a
building contractor or construction men who may be in a position to incorporate the idea of the Philadelphia smoke-proof tower in some building.

We have had many fires in which there was a loss of life. I know the experience of this year alone, in three fires, one in which there were nine lives lost in a four story building having two flats on the first floor, two flats on the second floor, two flats on the third floor and two flats on the fourth floor, with one open stairway and no combustible contents in the building other than the furniture with which the people carried on their domestic avocation. Nothing was in the corridors perhaps but a baby carriage. The stairway was of wood, the banister was wood, there was a rug on the stairs and corridors. If a fire starts on the first floor it immediately transforms the stairway into a roaring mass of flames and before the fire department is there the stairway has burned away and fallen into the basement. There was no fire in the basement, but the stairway collapsed and the people on the upper floors never had a chance to leave their rooms to get in the corridor. You recall how fast fire travels.

We had a case in the hospital for the blind in Chicago. One man lost his life who had had an operation performed on his eyes the previous day. The reason only one man lost his life was because there was only one man sleeping in the building. The whole side of the building was covered with an iron platform with access to a very fine stairway fire escape. What was the cause of that loss of life? The same old open stairway idea. The stairway started at the basement, with no enclosure whatsoever, and within 50 feet of that hospital were two companies of firemen with the finest kind of equipment, a pumper costing $16,000, an 85 foot aerial ladder, and twenty as fine men as you can wish to see at any fire. No one knew the fire started, but in the twinkle of an eye it started in the basement, and went to the open stairway and traveled upward, and the loss of life occurred. The inside stairway was 48 inches wide. Every window on one side of the building had access to a platform fire escape and yet that fire came up and snuffed out the life of the poor blind man. The fire department made a good response and put out the fire, but could not save the life.

In buildings of that kind we have taken it upon ourselves to try to sell the idea of enclosing the stairway so it will be not only an exit facility when the emergency arises, but that the fire will be confined to the floor where it starts for a little while at least.

Fire-proof construction, as you perhaps know, does not mean you are safe from fire, that you cannot have a fire if the building contains combustible contents, and the building does not have to be heavily loaded with combustible contents either.

Our building code is based on records of fires and loss of life, running up into the hundreds, especially among factory workers, girls and women; yet we have not been able to sell the law makers in our city the necessity of enclosing stairways.

As a sample of what an enclosed stairway accomplished, let me cite the following: The Burlington building is a fine type of fire-
proof or fire-resistive construction. By the use of that term I do not mean you cannot have a fire, but it is as fine a type of building as can be found anywhere. It is superior to the requirements of the city code and I believe to the National Board code on building construction. Why is it superior? Because all stairs and elevator shafts are enclosed in walls and masonry and all doors are metal doors. It was used as an office building. It had exterior windows fronting on the east and north streets. The windows were of ordinary wood sash and glass. The exposure from the neighboring fire was not severe, because the street on the east was 88 feet wide and for a distance of 110 feet the building was exposed by a two story building and only by a six story building for a distance of about 60 feet. Thus its total length was 170 feet, for 110 feet it was exposed by a two story building and for 60 feet it was exposed by a six story building, across an 88 foot street. The wind was blowing from that direction. Had the Burlington building been subjected to a severe exposure and its stairs and elevator shaft not been enclosed in masonry, I fear there would have been floors falling in the Burlington building.

The fire department entered and used the stairs from the ground up. The standpipe equipment was not in the stairway as it is now. We learned something at that fire, namely to have all standpipes in the stair towers.

The fire department is never called when things go as they should. When the finest type of building was being consumed by fire, then the fire department was called. Did they put the fire out? No. They were fortunate to stop the fire in the building. There were defects not observed before the fire. When the firemen did get to the open floor, they found the standpipe was inside a cabinet and the hose connection was so close to the ceiling it could not be reached. When they did get the hose on the standpipe the opening on the standpipe went to the side of the hose cabinet, which caused the hose to kink and little water would flow through the hose. The boys then filled the cuspidors with water and threw the water on the burning window sash, trying to prevent the fire from entering.

Those are the facilities given the fire department to fight the fire that never was supposed to happen in the Burlington building. There are many other exposures in other cities far greater than the exposures around the Burlington building.

There is another thing I happened to think of when the man spoke about elevators being considered as a means of exit. Not from our experience. They had a fire pump in the Burlington building, which our men state did not operate. It is alleged that when the fire started the engineer had gone for a sandwich. Perhaps the elevator operators will go to eat when the fire starts, so you cannot count on the elevators.

They had a fire at the Dunning institution and a little nurse girl told a world of facts concerning it. This little nurse girl said three things. This was a one story frame building. It covered a large area and was an L shaped building and over it all an attic. They did not have even a pine partition for a fire stop. Exit facilities in a one story building? They could have stepped from the window out on the
ground. The doors opened inward. All exit doors should open outward. The little girl said this: "No one thought it would come so fast." Next she said, "The lights went out." The lights always go out. That means your elevators are out, being electrically driven. The next thing she said, "The place filled with smoke and gas." There were the three things, no one thought it would come so fast; next, the lights went out and the place filled with smoke and heat. Twenty-four people lost their lives and they were not helpless people either, but in full possession of all their mental faculties. They were epileptics, that's true, but in possession of all faculties except during a period of mental stress.

In the Iroquois fire they tell you the people died because exit doors were locked, but if other things were done that should have been done, the exit doors could have been locked and the people could have watched the material on the stage burn. The Iroquois theatre did not burn, the contents on the stage of the theatre burned and the heat, the smoke and the gas going out into the auditorium did the damage. Many people never left their seats at all. What difference did exit facilities make to those people. Loss of life in a theatre has always occurred where up to fifteen feet of open space around the building was provided. When the fire starts the probability is it is not going to give the occupants of the building a chance to get to the exit space.

In the inspection of places of public assembly it is not unusual to find exits locked or obstructed. When we happen to see a few people standing in the aisles it is not considered a great hazard, but when we see doors put in as means of egress barred and bolted or loose obstacles in the aisles or passageways for people to trip on, we see that it is rectified immediately.

In our city it is provided by city ordinance exits must be kept free and no one shall be permitted to stand there, but before the exit facilities come, take the other steps to eliminate the possible chance of a fire by having the known causes of fire safeguarded. Eliminate from the theatre stage the chance for the fire to start by having the scenery fireproofed before it is used. Provide a stage vent to permit the immediate escape of smoke and gas. Provide a steel curtain to separate the auditorium from the stage. Provide automatic sprinklers and give the people a chance to use the exit facilities provided by the architect.

We do not always do things right in a big city. Size sometimes is our only claim to fame. Many small towns have good ideas in their fire departments that could be profitably adopted by the larger cities.

I don't know that there is anything else I can say about stairways and exit facilities. I would be glad to answer any question at all.

**DISCUSSION**

**Mr. Gibson, Champaign:** I would like to ask your opinion of the horizontal fire escapes?

**Mr. Plant:** The man asks my opinion of a horizontal fire escape. I would like to have you qualify it. Where does it lead to?

**Mr. Gibson:** To another building.
Mr. Plant: Through another building?
Mr. Gibson: Simply through a brick wall.
Mr. Plant: Fine. A horizontal exit is always to be preferred to a vertical exit. Especially is that true of a school or hospital where the occupants can be carried or marched horizontally out of danger.
Mr. Gibson: A party wall balcony for an escape.
Mr. Plant: Balcony fire escapes?
Mr. Gibson: Yes, one window on one side of the wall, including a window on the other side of the wall.
Mr. Plant: In such as a home for the aged, incurables or children, a horizontal exit is ideal. In the hospitals, of which we have so many three, four and five story buildings with open stairways, which themselves have enough combustible material to create sufficient gas so that everybody will be burned to death and each patient takes at least two firemen to get him out and most fire departments are undermanned. horizontal escapes help greatly. If the occupants have to be lowered vertically, it is a big problem. It is sometimes found that the doors leading to the fire escape are so narrow they will not admit the passage of a bed. This creates additional dangers.
Mr. Rogers: I would like to ask your opinion of this new tubular fire escape, not the spiral, but the straight tube, about a 45 degree angle?
Mr. Plant: Yes, providing you can get one to every window in the institution.
Mr. Rogers: I mean for schools particularly?
Mr. Plant: No. I don't think we should put up a building so hazardous and compel children to go to school in a fire trap building. That would mean they would have to exit very fast from the building. You don't need them on fire-proof two story buildings. Provide them with the Philadelphia smoke tower.
Mr. Rogers: That's all right on buildings to be erected, but what about 90 per cent of the public schools not of that type of construction; you are compelled to use them.
Mr. Plant: If the large department stores in Chicago and elsewhere and factories can see their way clear to protect sausage, socks, underwear, etc., by installing an automatic sprinkler system, aren't the lives of school children worth as much?
Mr. Rogers: I am asking your opinion of the building, not that type of construction.
Mr. Plant: They should not have a school building of that kind.
Mr. Rogers: But you have got them all over the country. Chicago is full of them.
Mr. Plant: They should not permit school children to be housed in a school building of that kind. Here is a fire escape on a building, notice to the world there is danger in the building. You compel them to go to school in a fire trap building. Is it not possible to get a sprinkler system in a school building? The merchant protects his shirts and underwear, etc., with a sprinkler system. It is highly inconsistent. Put a fire escape on the school that is a fair fire hazard, but where human life is at stake in a fire-trap building they should go
beyond the mark and put in not alone exit facilities, but sprinklers also. The time to fight a fire is when you are building and you will not need so many fire escapes.

Mr. Wolf: I see the erroneous idea prevails where they have frame boarding houses and they put up these ladder escapes and they lead past windows where they have no chance of using them.

Mr. Plant: I have seen many one story and a half cottages with only one stairway to the second floor. If a fire starts in the basement somebody is going to be out of luck. Why not put an enclosure on that stairway? The cost is not much. I have seen firemen living in such a home. Firemen are away from home 24 or 48 hours at a time. Some firemen are quite difficult to sell fire prevention to. It strikes home at times. Many fires in one and one-half story cottages spread up the stairway. There is enough combustible material there to furnish food for a fire and a human being's life is very easily extinguished by heat and smoke.

Everyone should have two means of escape. The chances of fire being in two places at once are rather remote. In order to get to a fire escape, if you have to go through a room the door to the room should have a full glass panel. I thank you. (Applause.)

Chairman Gamber: The next on the program is the demonstration, Combating the Smoke and Gas Hazard. After a talk by the speaker, demonstrations will be had on the outside and my suggestion would be to follow the leader when he starts out to the place where the demonstration is to be held. I have the pleasure of introducing J. B. Fleming of the Mine Safety Appliances company of Pittsburgh. (Applause.)

COMBATING THE SMOKE AND GAS HAZARD


The subject, "Combating the Smoke and Gas Hazard," is one that demands considerable attention on the part of firemen. For the past ten years we have been doing a lot of work in perfecting methods and devices for protection and have had practical experience in using the same, to which has been added the wide use and experience of various fire departments throughout the country. As pointed out in preceding talks, prevention of fire is the main thing, but when fires occur you must be prepared for them and you must have proper equipment. From the standpoint of preparedness, I always think of the fire department as fully organized for a kind of warfare, prepared ready to get on the jump in a moment. Time is an important item in the saving of life and property when fire starts. There might be smoke or gas that is comparatively harmless and there might be deadly gases, so the conditions are such that men cannot rush heedlessly into without protection. With proper protection a fireman may do many things more effectively and to much better advantage. In the old days, a handkerchief was often used, put over the nose to take out the solid particles of smoke. This will not do. To combat deadly gases firemen must have real protection.
There has been quite a lot of study given to the different gases and their effects upon the human body. The mining departments have done a great deal in that respect and this work has been supplemented by medical societies, and many different organizations and industries that have to deal with the problem. The recent war gave a good idea of what gas will do. One dangerous gas that a fireman is likely to come in contact with is carbon monoxide, formed by incomplete combustion. A good example of the occurrence of this gas is in automobile exhaust and in artificial gas and it is deadly even when breathed in very small quantities. There are many fires that produce carbon monoxide. In the burning of moving picture films, celluloid, large quantities of carbon monoxide are given off. Also in department store fires, furniture, varnish, and paints, deadly gases are present. Take a drug store fire in the burning of various chemicals you can get any combination of harmful gases. Carbon monoxide gas causes the loss of many lives. It cannot be ordinarily detected as it has no odor, it acts rather quickly, and even in partial gassing the after-effects are severe.

Man is so constructed that he should breathe pure air, which is composed of about twenty percent oxygen and eighty percent nitrogen, and he breathes when at rest about twenty times per minute, and when active at strenuous work thirty times or faster per minute. The oxygen content of the air is important and man is therefore somewhat

Gibbs, Two Hour Type.  
McCaa, 3/4 Hour Type.  
OXYGEN BREATHING APPARATUS USED IN FIRE FIGHTING
Left—Machine used in Mouse Demonstration to show that chemical Hopcalite removes carbon monoxide effectively from air. Right—All-Service Mask used in demonstration at University Fire Station for thirty minutes in deadly atmosphere.
restricted in his movements on this old earth. He can go up in the air a certain distance, but if he wants to go very high he must carry some means of providing oxygen. Devices have been made so he can penetrate places where there is no breatheable air, or so he can go under water. For the fireman, however, the greater part of his work, fully 90 to 95 per cent, is not the special problem where no air exists, but in an atmosphere having ample oxygen polluted with smoke and dangerous gases.

There are three types of apparatus for protection and the Mine Safety Appliances company, with which I am connected, manufactures all these types, so from that standpoint I can easily afford not to favor any one particular type, but from our experience in the past ten years we have come to some rather definite conclusions regarding the field of use of each type. I want to mention briefly the three types:

1. Oxygen breathing apparatus.
2. Hose mask.
3. Canister mask, all-service type.

1. This one (indicating) is the oxygen breathing apparatus and is constructed in the best possible form, all the weight being carried on the back. It is a two-hour type. The heavy bottle contains about ten cubic feet of oxygen pumped in at 2,000 pounds pressure, so that as it feeds out slowly through a reducing valve it will give a required two-hours service. Wearing this apparatus, a man is breathing oxygen and he is cut off entirely from outside air. The cartridge contains chemicals for purifying his exhaled air so that he breathes it over and over. It is provided with an automatic admission valve so that the wearer can get all the oxygen he needs if breathing slowly or at a high rate. It is a mouth-breathing type and a clip is provided to close the nostrils. It takes a trained man to wear it and the mechanism should be inspected often so that it is always in proper working condition. It weighs thirty-four pounds and naturally a man cannot do his normal amount of work when wearing this equipment, but trained men are able to do very satisfactory work with it.

One very interesting experience, we had tests on Pike's Peak, 10,000 feet above sea level, and the man wearing thirty-four pounds of this equipment could do more work than the ones that did not use them. That shows some of the different results under different conditions. Then there is this lighter type, the McGaa apparatus, weighing about half as much as the other, with the weight more in front, but the principle of operation is practically the same. It is the three-fourths hour type. With these types a man can go where there is no air at all. He is not dependent at all on the outside air. That would be a good device if called upon to go down a deep well to rescue someone, or other places where oxygen content is low. A fire department is called on to do most everything. There is seldom any breatheable air in a deep well and if a fellow has to stay longer than he can hold his breath it is not a good place to be, so some type that supplies oxygen is necessary in such cases and in certain other cases.

2. The hose type is not adapted for fighting fires. In this, fresh air is forced by a blower in through a hose to the wearer. I mention
H-H Inhalator (left) and method used in reviving persons overcome by gas, also in electric shock and drowning cases.
it to show the method of handling certain problems, such as cleaning out gas tanks and tank cars, and in sewers and manholes, and such places where the wearer is within 50 or 100 feet of fresh air which can readily be supplied to him through the hose. The fireman, however, is called on to assist in rescue work under such conditions and he should be familiar with this type of equipment.

3. The third type and one which we especially recommend is this one (exhibiting the Burrell all-service mask). For firemen's use, naturally you should have the lightest possible outfit and one that you can put on quickly, one that is comfortable and that gives absolute protection against all gases or combinations of gases where the oxygen content is not too low. This outfit weighs only five pounds. The face piece, known as the Kops, is made of pure rubber, is very comfortable even when worn for some time, easily adjusted in a couple of seconds and fits the face snugly. The tubes bring the incoming air against the lenses and thus prevent any fogging of the lenses. It provides for breathing naturally through the nose or mouth and the breathing resistance is slight. The air is breathed through the canister and all poisonous gases are taken up and only good air passes through. The timer rotates in a circle as the hand of a clock and makes one complete revolution in about two hours, at a breathing rate of twenty to thirty times per minute. After that much use the canister should be replaced with a new one and this can be done simply by unscrewing the canister and putting on another. Now an important thing about this mask is the contents of the canister. There are five layers of chemicals in the canister and these will positively purify the air coming through and make it free from all harmful smoke and gas. It is the only canister that will protect against carbon monoxide. This gas is taken up by a chemical called Hopcalite, which is a combination of certain mineral oxides, silver, manganese, and mercury. The government had twenty chemists work on this during the war and the problem was not solved until about the end of the war, and since that time it has been greatly improved for use in the firemen's mask as you see it.

In connection with this mask I want to do two things, later give you a real demonstration outside in Shorty Fay's fire truck garage and now make a demonstration on the effects of carbon monoxide on a mouse, and I think this will interest you, gentlemen. I have an outfit here all ready for this demonstration. In this bottle there is a one per cent mixture of carbon monoxide, such as you might encounter at fires. I have a nice little white fellow (mouse) here and will put him down in the gas chamber. First, we will test the mixture to find out about carbon monoxide. In mine rescue operations we used to carry a canary in a small cage and if it fell off its perch, it was a warning to put on protective devices. Now the chemists have come to our assistance and I have a chemical here that changes color if any carbon monoxide is present in the air I pass through it. You see the test shows it has changed in color to a decided green and when I compare it with the color chart, it shows a one per cent mixture. This is a deadly mixture and would get a man down in a short time. Even a much smaller amount would affect a man in ten to fifteen minutes. It
isn’t a good thing to take a chance on this gas by having a man find it by getting knocked out or having several men overcome with it. When I test this gas on the mouse, he will act about the same as a human being would.

Now I want to show you the value of this chemical in the mask. You see the Hopcalite is chocolate color. I will pour some in this tube and pass the mixture through this chemical onto the mouse. In effect the mouse will be wearing a gas mask. I will now feed the mixture through the tube into the mouse in the gas chamber. You see him sniffing at the air, but it has been purified and he is all right so long as the mixture passes through the chemical. This chemical has one feature that is very interesting. When it takes up or changes the carbon monoxide, it begins to heat up and if a fireman wearing a mask got into a mixture that was high, say between two or three per cent, the canister would become very warm and he would have warning about such a high content. In the test the chemical is getting somewhat warm and shows that it is working right; also the mouse is safe. We could run this test for some time, but after a few minutes we will short-circuit the mixture direct; in other words he won’t have any gas mask on and then we will watch what happens. (Test continues.) Now as our time is getting short we will give him the one per cent mixture; then we better have our rescue outfit ready and revive him if we can. I have a bottle of carbogen (oxygen mixture) for reviving him. In about a minute he will be overcome. You will note that as he gets some of the gas his cars, legs, and tail are turning decidedly pink. He is affected now and is getting groggy. Naturally he wants to get out and escape if he can. Now he is down after about forty seconds. (Mouse is then revived after a couple of minutes, showing the value of resuscitation with carbogen.)

We have now seen something on how to deal with the poison gas problem. Later in your program you are to have several sessions on resuscitation and first aid so I will not go into that. There is a standard method now almost universally adopted, that is the prone or Shafer manual method, with the administering of carbogen with an H-H inhalator (H-H inhalator developed by Drs. Henderson and Haggard).

We will now adjourn to meet at the university fire station, where Mr. Fay will fix up a real mixture for demonstration in a deadly atmosphere. He will exhaust that big fire truck in the garage for twenty minutes or so and we will have formaldehyde fumes, ammonia, and burn sulphur, rubber, roofing paper and anything that he wants to use to give us a good test. (Demonstration of the gas mask outside then given by Mr. Fleming.)
WEDNESDAY, JUNE 17, MORNING SESSION

A. R. Knight, Assistant Professor of Electrical Engineering, University of Illinois, Chairman

Chairman Knight: This morning, as I see by your program, the session is to be devoted to various installations, mechanical and electrical, which have a direct bearing on the fire hazard to buildings. The first talk is by Mr. Nelson, who will speak on the Mechanical Installations of Buildings. You heard Mr. Nelson yesterday afternoon so he needs no introduction this morning.

MECHANICAL INSTALLATIONS

By Raymond T. Nelson, Engineer, Western Actuarial Bureau, Chicago

When we come to consider mechanical installations, we leave the structure to itself and revert to a different type of hazard than we had in the case of a building. If you will recall, fire hazard is divisible into two groups, causative hazards and contributive hazards. Causative hazards are those which originate combustion, while contributive hazards tend toward the spread of the fire when once started. A device will start a fire but will not tend to spread it, this latter effect being caused solely by the materials surrounding the device.

I will not discuss these various causes found within a building, but will only make direct mention as to what the hazard includes, not attempting to say why the individual devices are hazardous. In other words, I will merely take them up from the standpoint of their installation, that they may be installed as safely as possible.
Enclosures for Electric Motors and Dynamos

Small Enclosures

Size: Cubical contents of enclosure should not be less than three times the product of the dimensions of the motor or dynamo (length, length of shaft, and height). For enclosures of minimum size, the height should not be greater than one and one-half times the height of the motor or dynamo.

Enclosures for motors not in dusty surroundings, having sides and top constructed of No. 16 mesh wire screen on metal framing, need only be large enough to permit easy access for inspection and cleaning.

Sides and top should be constructed of any substantial incombustible material, or of matched lumber, not less than 1/8 inch thick, lined throughout with 1/4-inch asbestos or equivalent material.

Floor, if combustible, should be covered with 1/4-inch asbestos or equivalent material.

Door should be equal in size to one full side or top and be self closing.

Window should be of wire-glass and located so apparatus may be plainly seen. No dimensions should be less than one-half the height of the motor or dynamo but need not exceed 2 square feet.

Ventilation: All enclosures should be ventilated.

Ventilation of enclosures of minimum size, when motor is not subject to inflammable dust or flyings, may be effected by means of at least two No. 16 wire mesh screens placed on opposite sides of enclosure, one near top, the other near floor. The area of each screen should equal the square of the height of the motor or dynamo. If either dimension exceeds 2 feet, screen should be reinforced.

If device is subject to dust or flyings, screens should not be used. Ventilation should be effected by two metal pipes to the outside of building, the diameter of which should equal one-fourth the greatest dimension of device, unless a blower is used to circulate the air. If blower is used, pipe need only be supplied for intake, outlet being screened as above described. Intake pipe should enter box near floor and exhaust pipe on opposite side at top.

Ventilation of enclosures larger than minimum size should be effected by the use of two metal pipes not less than 6 inches in diameter ventilated to the outside of the building. Intake and exhaust pipes should enter and leave box as above described.

Power Transmission should be effected by shaft passing thru side of box with pulley on the outside. Hole in side should be as small as possible, and closed by two pieces of galvanized iron, sliding horizontally in grooves, with semi-circular openings in each, closing tightly over shaft and held in place by hooks, thumb screws, or other similar fastenings.
ELECTRIC MOTORS & DYNAMOS

Small Enclosures
ROOM ENCLOSURES

In general, room should be built as nearly dust proof as possible. It should be used for no other purpose and be of such a size that a man may enter and have free access to all apparatus.

Walls and Ceiling should be constructed of any substantial incombustible material, or of matched lumber, not less than 7/8 inch thick, completely lined with 1/4-inch asbestos or equivalent material.

Floor, if combustible, should be covered with one inch of concrete or equivalent material.

Door should be all metal or of matched lumber, not less than 7/8 inch thick, lined with 1/4-inch asbestos or equivalent material, and be self closing.

Window should be of wire glass in fixed sash, not less than two feet square and be so located that apparatus may be plainly seen.

Ventilation: All rooms should be ventilated. Ventilations should be effected by the use of two metal pipes not less than 6 inches in diameter, vented to the outside of building. Intake pipe should enter room near floor at one side and exhaust leave at or near top at other side.

Power Transmission: If pulley is outside of room, shaft passing thru wall should have least possible clearance. Hole in wall should be closed by two pieces of galvanized iron, sliding horizontally in grooves, with semi-circular openings in each, closing tightly on shaft or bearing and held in place by hooks, thumb screws, or other similar fastenings.

If by belt passing thru wall, belt should be housed in an enclosure of metal, or of matched lumber, not less than 7/8 inch thick, lined through with 1/4-inch asbestos or equivalent material. Housing should be provided with a hinged panel to permit cleaning.

Control apparatus should be located inside of the room.
ROOM ENCLOSURES

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Power Transmission: If pulley is outside of room, shaft passing thru wall should have least possible clearance. Hole in wall should be closed by two pieces of galvanized iron, sliding horizontally in grooves, with semi-circular openings in each, closing tightly on shaft or bearing and held in place by hooks, thumb screws, or other similar fastenings.

If by belt passing thru wall, belt should be housed in an enclosure of metal, or of matched lumber, not less than 7/8-inch thick, finished throughout with 1/4-inch asbestos or equivalent material. Housing should be provided with a hinged panel to permit cleaning.

Control apparatus should be located inside of the room.
ELECTRIC MOTORS & DYNAMOS
ROOM ENCLOSURES
Installation of Internal Combustion Engines

Location: Engines located so as to be subject to inflammable vapors, dust or flyings should be enclosed in rooms well ventilated to the outside at floor and ceiling.

Feed:

Gas Engines: Feed pipe should run as direct as possible and be provided with a shut-off valve in service side of pressure regulator.

Gas bag or pressure regulator should be enclosed in a gas tight metal drum vented to the outside thru a pipe used for no other purpose.

Gasoline Engines: Supply tank: (See plate B.4.a.)

Feed pump should be of an approved type and have check valve as close to pump as is convenient.

Carburetor should have an overflow connection draining back to supply tank.

Kerosene and Fuel Oil Engines: Supply tanks: (See plate B.6.q.)

Auxiliary tanks for providing a supply of oil within building should not exceed 60 gallons. Tank should be filled by pump, and have overflow pipe draining back to main supply tank. Oil should be drawn from auxiliary tank by approved pump operated by engine. Gravity or compressed air feed may be used from tanks not in excess of one gallon.

Ignition:

Gas and Gasoline Engines: Electric ignition only should be used.

Kerosene and Fuel Oil Engines: Torches for preheating combustion chambers should be of an approved type and used only while starting engine.

Muffler: Muffler should be on firm foundation and have at least 12 inches clearance to combustible materials.

Exhaust: Exhaust pipe should be carried above the roof or extend at least 10 feet from any wall opening.

Clearance between exhaust pipe and combustible materials should not be less than 9 inches.

When exhaust pipe passes thru combustible partitions, floors, walls or roof, it should be guarded, by a metal thimble at least 12 inches larger in diameter than the pipe.

Floor: Wooden floor under engine should be covered with metal extending 24 inches on all sides of engine.

Drip Pan: Drip pan should be provided under engine.
INSTALLATION OF INTERNAL COMBUSTION ENGINE.
GASOLINE STORAGE TANKS
(UNDERGROUND)

Tanks:

Construction: Tanks should be of approved construction.

Setting: Tanks should be buried at least 3 feet below ground and below the level of any piping to which tanks may be connected.

Tanks should be set on firm foundation and surrounded with soft earth or sand well tamped in place, or encased in at least 6 inches of concrete.

Fill Pipe should be screened, and terminate in a metal box or casting provided with a means for locking.

Pipe should extend into tanks within 2 inches of bottom.

Pipe should not be located less than 5 feet from any window or other building opening.

Vent Pipe: A permanently open vent should be provided. Vent opening should be screened (30x30 brass mesh or equivalent) and of such a size as to allow proper flow of liquid during filling operation.

Outlet should be provided with a weatherproof hood and terminate at a point at least 12 feet above top of fill pipe and at least 3 feet, horizontally or vertically, from any window or other building opening.

Where a battery of tanks is installed, vent pipe may run into a main header. Individual vent pipes should, however, be screened between tank and header, and connection to header should not be less than one foot above the level of the highest reservoir from which tanks may be filled.

Vent pipe should not extend into tank.

Suction Pipe: Liquid should be withdrawn from tank without unnecessary exposure by a substantially constructed discharge device of approved design.

Openings for withdrawal of liquid should be provided with a means for locking.

Pipe should extend into tank within 2 inches of bottom.

Overflow Pipe: An overflow pipe should be provided and extend into tank within 2 inches of bottom.

Piping should be of full weight galvanized wrought iron or steel, or brass.

Piping should run as directly as possible, be protected against injury and laid so pipes pitch back to supply tank.

All pipes should have well fitting joints. Unions, if used in place of right and left couplings, should be of an approved type. Pipes leading to surface of ground should be cased or jacketed.

All outside piping should be laid below frost line in solid earth. Pipes should not be laid near or in same trench as other piping.

Opening for pipes thru outside walls should be cemented and made oil tight.

Fitting: All fitting should be of an approved type.

Location: Distance of tanks from buildings should be as indicated in sketch.

Care and Attendance: Tank should be filled in daylight hours only. No fire or artificial light should be allowed near tanks. All openings should be locked except when in use.
INSTALLATION OF GASOLINE STORAGE TANK.
Fuel Oil Storage Tanks
(underground)

Tanks:

Construction: Tanks should be of an approved type.

Setting: Tanks should be buried as follows:

At least 3 feet below ground or below level of any piping to which they may be connected, or

Under 18 inches of earth and a 6-inch reinforced concrete cover extending at least one foot beyond outline of tank in all directions.

Under 12 inches of earth when completely enclosed in reinforced concrete not less than 12 inches thick with at least a 6-inch space on sides between tank and concrete. Space should be filled with sand and tamped.

Tank should be anchored or weighted in place to prevent floating.

Fill Pipes should be in cast iron or incombustible box which is provided with a lock. Pipe should extend into tank within 2 inches of bottom.

Vent Pipe: A permanently open vent, not less than 1½ inches in diameter should be provided. Vent opening should be screened (10 x 10 brass mesh or equivalent) and of such a size to permit the proper flow of liquid during filling. Outlet should be provided with a weatherproof hood and terminate at a point at least 12 feet above top of fill pipe and at least 3 feet horizontally and vertically from any window or other building opening.

Vent pipe should not extend into tank.

Manhole covers should be securely fastened in place. No manhole should be used for filling purposes.

Suction Line: Liquid should be drawn from tank by an approved pumping system having strainers in suction line.

Pump and strainers should be set in a concrete pit and enclosed in an incombustible structure.

Suction pipe should extend into tank within 2 inches of bottom.

Overflow Pipe should extend into tank within 2 inches of bottom.

Piping:

Cross Connections permitting gravity flow from one tank to another should not exist except in case of outside tanks where it may be permitted thru an open connection.

Material should be full weight wrought iron or steel.

Piping for working pressures of 100 pounds or less should be able to withstand 150 pounds, while piping for working pressures of more than 100 pounds should have a 50% factor of safety.

Protection of Piping: Pipes leading to surface of ground or above floor should be protected against injury.

Outside piping should be laid below frost line in solid earth. Pipe should not be located near nor in same trench with other piping except steam lines for heating.

Opening in outside walls below ground level should be securely packed with flexible material and be oil-tight.

Fittings should all be of an approved type.

Heating: Where it is necessary to heat oil in storage tanks in order to handle, the oil should not be heated to a temperature higher than 40° F. below the flash point, closed cup.

Heating should be done by means of properly installed coils in tank, using only hot water or steam. Thermostatic control should be provided.

Location: Distance of tank from buildings should be as noted in sketch.
Furnaces

Furnaces are classified as follows:

Hand or Movable, embracing glue and soldering furnaces, oxyacetylene torches, blow torches, crucibles, cupels, and other small devices, such as stoves for heating irons in tailor shops, water heaters in barber shops, etc. Fixed gas pipe connections should not affect the classification of the furnace.

Stationary, embracing all furnaces not classed as Hand or Movable. Stationary furnaces are graded according to temperature as follows:

Low, embracing all furnaces with temperatures up to the melting point of lead, 600° Fahr.

Medium, embracing all furnaces with temperatures necessary to produce high pressure steam, anneal metals, glass, etc.; 600° to 1500° Fahr.

High, embracing all furnaces with temperatures necessary for ore roasting, bloom and billet heating, iron smelting or fusing; 1500° Fahr. and upwards.

Note 1: Furnaces grading High should grade as Medium and furnaces grading Medium as Low when not more than 100 cu. ft. in size, outside measurement.

Note 2: All furnaces used for heating only should grade as Low except boilers carrying more than 50 pounds pressure, which should grade as Medium.

Small boilers, not used in connection with power devices, such as those found in rubber tire repair shops, milk depots, etc., should grade as Low regardless of pressure.

The following List of Furnaces and Tables of Temperatures will be found useful for reference in establishing the grade of a furnace:

List of Furnaces

<table>
<thead>
<tr>
<th>Grade</th>
<th>Low</th>
<th>Medium</th>
<th>High</th>
</tr>
</thead>
<tbody>
<tr>
<td>3. Boiling Vats, for wood fibre, straw, lignin, etc.</td>
<td>3. Charcoal Furnaces.</td>
<td>3. Blast Furnaces.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>15. Ore Roasting Furnaces.</td>
<td></td>
</tr>
</tbody>
</table>
Table of Temperatures
Fusion Point of Metals

<table>
<thead>
<tr>
<th>Material</th>
<th>Temperature</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blast Furnace Slag</td>
<td>2500° Fahr</td>
</tr>
<tr>
<td>Bessemer Retort Slag</td>
<td>3100° Fahr</td>
</tr>
<tr>
<td>Brass</td>
<td>1600° Fahr</td>
</tr>
<tr>
<td>Bronze</td>
<td>1450° Fahr</td>
</tr>
<tr>
<td>Cast Iron (pig)</td>
<td>2000°-2400° Fahr</td>
</tr>
<tr>
<td>Copper</td>
<td>2000° Fahr</td>
</tr>
<tr>
<td>Ferro-nickel Steel</td>
<td>2250° Fahr</td>
</tr>
<tr>
<td>Gold</td>
<td>1950° Fahr</td>
</tr>
<tr>
<td>Iron (pure)</td>
<td>3275° Fahr</td>
</tr>
<tr>
<td>Iron (wrought)</td>
<td>3300°-4000° Fahr</td>
</tr>
<tr>
<td>Lead</td>
<td>630° Fahr</td>
</tr>
<tr>
<td>Manganese Steel</td>
<td>2300° Fahr</td>
</tr>
<tr>
<td>Nickel</td>
<td>2700° Fahr</td>
</tr>
<tr>
<td>Silver</td>
<td>1750° Fahr</td>
</tr>
<tr>
<td>Soft Solder</td>
<td>340° Fahr</td>
</tr>
<tr>
<td>Steel</td>
<td>2400°-3300° Fahr</td>
</tr>
<tr>
<td>Tin</td>
<td>450° Fahr</td>
</tr>
<tr>
<td>Zinc</td>
<td>775° Fahr</td>
</tr>
</tbody>
</table>
Installation of Hand or Movable Furnaces

GAS PLATES

Base: If plate is not equipped with legs at least 4 inches high, plate should rest upon an incombustible base or upon a combustible base protected by a course of 4-inch hollow tile on ¼-inch asbestos crossed with boiler iron.

If plate is equipped with legs at least 4 inches high, plate may rest upon a combustible base covered with metal and half a baffle plate suspended at least 2 inches above combustible base.

Lateral and Vertical Clearances: Clearance between plate and unprotected combustible material above, and at sides, front and rear should conform to the following minimum requirements:

- Above ......................... 48 inches
- Sides, front and rear ........... 18 inches

- If combustible material at sides and rear is protected with ¼-inch asbestos covered with sheet metal to a point 18 inches above burners, clearance at sides and rear may be reduced to 6 inches.

- If combustible materials at sides and rear are protected with ¼-inch asbestos covered with 4 inches of hollow tile to a point 18 inches above burners, clearance at sides and rear may be reduced to 2 inches.

Gas Connections: Gas connection should consist of an iron pipe.
DRIP PAN MAY BE OMITTED WHEN TABLE IS OF ALL METAL CONSTRUCTION.

HAND OR MOBILE FURNACES GAS PLATE.
GAS SOLDERING FURNACE

Base: If plate is not equipped with legs at least 4 inches high, plate should rest upon an incombustible base or upon a combustible base protected by a course of 4-inch hollow tile on 1/8-inch asbestos crossed with boiler iron.

If plate is equipped with legs at least 4 inches high, plate may rest upon a combustible base covered with metal.

Lateral and Vertical Clearances: Clearance between plate and unprotected combustible material above, and at sides, front and rear should conform to the following minimum requirements:

Above ......................... 48 inches
Sides, front and rear ............. 18 inches

If combustible material at sides and rear is protected with 1/4-inch asbestos covered with sheet metal to a point 18 inches above burners, clearance at sides and rear may be reduced to 6 inches.

If combustible materials at sides and rear are protected with 1/8-inch asbestos covered with 4 inches of hollow tile to a point 18 inches above burners, clearance at sides and rear may be reduced to 2 inches.

Gas Connections: Gas connection should consist of an iron pipe.
HAND OR MOVABLE FURNACES.
GAS SOLDERING FURNACE
Installation of Stationary Furnaces

Without Masonry Setting and Unlined

Ventilation: Rooms containing Medium Furnaces should be provided with adequate means of ventilation either in ceiling or wall above furnace.

Lateral and Vertical Clearances: Clearance, between furnace and unprotected combustible materials above and at sides, front and rear, should conform to the following minimum requirements:

<table>
<thead>
<tr>
<th>Grade of Furnace</th>
<th>Low</th>
<th>Medium</th>
</tr>
</thead>
<tbody>
<tr>
<td>Above</td>
<td>18 inches</td>
<td>48 inches</td>
</tr>
<tr>
<td>At sides and rear</td>
<td>18 inches</td>
<td>36 inches</td>
</tr>
<tr>
<td>In front</td>
<td>48 inches</td>
<td>96 inches</td>
</tr>
</tbody>
</table>

Metal Breeching or Smokepipe: Clearance between metal breeching or smokepipe and unprotected combustible materials, except where passing thru floors or roof (see B.2.h. and i.), should conform to the following minimum requirements:

<table>
<thead>
<tr>
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</tr>
</thead>
<tbody>
<tr>
<td>Above</td>
<td>18 inches</td>
<td>36 inches</td>
</tr>
<tr>
<td>At Sides</td>
<td>18 inches</td>
<td>36 inches</td>
</tr>
</tbody>
</table>

Metal Stacks: (See plates B.2.h. and i.)
Installation of Stationary Furnaces without masonry setting and unlined

Ventilation: Rooms containing Medium Furnaces should be provided with adequate means of ventilation either in ceiling or wall above furnace.

Floor: Floor under Low Furnaces, if combustible, should be protected by two courses of 4-inch hollow tile crossed with boiler iron on top, or three courses of brick, with middle course laid crosswise and on edge, with ventilating spaces, left open at ends, between. Protection should extend even with furnace at sides, front and rear, and in addition, if other than gas, electricity or liquid fuel is used, floor, for a distance of 18 inches in front, should be protected by a layer of ¼-inch asbestos covered with sheet metal or its equivalent.

Floor under Medium Furnaces should be fireproof or incombustible on incombustible supports extending 8 feet in front and 3 feet at sides and rear.

Lateral and Vertical Clearances: Clearance between furnace and unprotected combustible materials above and at sides, front and rear, should conform to the following minimum requirements:

<table>
<thead>
<tr>
<th>Grade of Furnace</th>
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<th>Medium</th>
</tr>
</thead>
<tbody>
<tr>
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<td>48 inches</td>
</tr>
<tr>
<td>At sides and rear</td>
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<tr>
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<td>18 inches</td>
<td>36 inches</td>
</tr>
<tr>
<td>At Sides</td>
<td>18 inches</td>
<td>36 inches</td>
</tr>
</tbody>
</table>

Metal Stacks: (See plates B.2.h. and i.)
MEDIUM FURNACES

Ventilation: Rooms containing medium furnaces should be provided with adequate ventilation either in ceiling or in wall above furnace.

Floors: Floors should be fireproof or incombustible on incombustible supports extending 8 feet in front and 3 feet of sides and rear of furnace.

LOW FURNACES

Floors. If combustible, should be protected by two courses of 4-inch hollow tile crossed with boiler iron on top, or three courses of brick, with middle course laid crosswise and an edge with ventilating spaces between. Protection should extend even with the furnace at sides, front, and rear; and in addition, if other than gas, electricity, or liquid fuel is used, floor for a distance of 10 inches in front should be protected by a layer of 2-inch asbestos covered with sheet metal or its equivalent.

Arrangement and Clearance of STATIONARY FURNACES (without masonry setting and tiles)
Installation of Stationary Furnaces

with masonry setting or lined with fire brick or its equivalent

Ventilation: Rooms containing Medium Furnaces should be provided with adequate means of ventilation either in ceiling or wall above furnace.

Lateral and Vertical Clearances: Clearance between furnace and unprotected combustible material at sides, front and rear, should conform to the following minimum requirements:

<table>
<thead>
<tr>
<th>Grade of Furnace</th>
<th>Low</th>
<th>Medium</th>
</tr>
</thead>
<tbody>
<tr>
<td>Above</td>
<td>12 inches</td>
<td>36 inches</td>
</tr>
<tr>
<td>At sides and rear</td>
<td>12 inches</td>
<td>18 inches</td>
</tr>
<tr>
<td>In Front</td>
<td>48 inches</td>
<td>96 inches</td>
</tr>
</tbody>
</table>

Metal Breeching or Smokepipe: Clearance between metal breeching or Smokepipe and unprotected combustible material, except where passing thru floors or roof (see Stacks), should conform to the following minimum requirements:

<table>
<thead>
<tr>
<th>Grade of Furnace</th>
<th>Low</th>
<th>Medium</th>
</tr>
</thead>
<tbody>
<tr>
<td>Above</td>
<td>18 inches</td>
<td>36 inches</td>
</tr>
<tr>
<td>At sides</td>
<td>18 inches</td>
<td>36 inches</td>
</tr>
</tbody>
</table>

Metal Stack: (See plates B.2.h. and i.)
Arrangement and Clearance of STATIONARY FURNACES (WITH MASONRY SETTING OR LINED WITH FIREBRICK)
Installation of Stationary Furnaces

Foundry Cupolas

Clearance between unprotected combustible materials above and in front of charging door, tap hole, slag spout; at sides of furnace; and the height of top of stack above combustible roof, should conform to the following requirements:

In front of charging door ........................................ 10 feet
Above charging door ............................................. 10 feet
In front of tap holes or slag spout .............................. 30 feet

Note: When molten waste materials are dumped beneath furnace, lateral clearance from base of furnace should be not less than 30 feet in all directions.

Above tap holes or slag spout ................................. 10 feet

Where passing thru floor or roof, or where walls, partitions, etc., are exposed by portions of the furnace without charging doors, tap holes, or other openings ...... 2 feet

Clearance from top of stack to combustible roof:
With approved covering ........................................ 10 feet
With unapproved covering ....................................... 30 feet
CUPOLA CLEARANCES AND PROTECTIONS
Stacks Through Combustible Floors or Roof

Without Collar

Clearances between stacks, chimneys and stovepipes and unprotected combustible materials where passing thru floors or roof should conform to the following minimum requirements:

<table>
<thead>
<tr>
<th>Grade of Furnaces</th>
<th>Low</th>
<th>Medium</th>
<th>High</th>
</tr>
</thead>
<tbody>
<tr>
<td>Metal stacks unlined or not entirely enclosed where passing through floors or roof</td>
<td>6 inches</td>
<td>18 inches</td>
<td></td>
</tr>
</tbody>
</table>

Note: If metal stack, unlined or not entirely enclosed, passes through rooms with combustible contents, clearance from contents should be provided by surrounding the stack with an approved wire or metal screen with clear space between stack and screen equal to the distances specified above.

Brick stacks or metal stacks lined with fire brick (not including foundry cupolas or similar upright furnaces which constitute their own stacks).............. 18 inches
STACK THRU COMBUSTIBLE ROOF
(WITHOUT COLLAR)
Stacks Through Combustible Roof

with collar

Clearance from stacks, chimneys and stovepipes and combustible material where passing thru floors and roof should conform to the following minimum requirements:

<table>
<thead>
<tr>
<th>Grade of Furnaces</th>
<th>Low</th>
<th>Medium</th>
<th>High</th>
</tr>
</thead>
<tbody>
<tr>
<td>Metal stacks unlined or not entirely enclosed, but provided with metal ventilating jacket at floors or roof equidistant from woodwork and stack, extending not less than 6 inches below lower edge of floor or roof joists, and with metal hood around stack over opening through roof with at least a 2-inch air space above roof for air circulation........</td>
<td>3 inches</td>
<td>12 inches</td>
<td></td>
</tr>
</tbody>
</table>
STACK THRU COMBUSTIBLE ROOF
(WITH COLLAR)
Installation of Hot Air Furnaces

Floors: Floors, if combustible, should be protected by two courses of 4-inch hollow tile crossed with boiler iron on top, or three courses of brick, with middle course laid crosswise and on edge, with ventilating spaces, left open at ends, between. Protection should extend even with furnace at sides, front and rear, and in addition, if other than gas, electricity, or liquid fuel is used, floor, for a distance of 18 inches in front, should be protected by a layer of \( \frac{1}{4} \)-inch asbestos covered with sheet metal or its equivalent.

Lateral and Vertical Clearances: Clearances between furnace and unprotected materials above, and at sides, front and rear should meet the following minimum requirements:

Above ............................................. 18 inches
At sides and rear ................................ 18 inches
In front ........................................... 48 inches

Note: If clearances are less than those specified above, combustible materials should be protected as follows:

Above: Top of furnace should be insulated with 4 inches of sand or its equivalent leaving ceiling open for inspection.

At sides, rear or in front: Woodwork should be protected by a layer of not less than \( \frac{3}{4} \)-inch asbestos with a covering of sheet metal supported so as to leave an air space of one inch, or by a layer of \( \frac{3}{4} \)-inch asbestos board supported to leave at least a 1-inch air space. In no event should the clearances be less than one-half of those specified above.

Breeching or Smokepipes: Clearances between metal breeching or smokepipe and unprotected combustible materials should not be less than 18 inches.

Note: If clearance is less than 18 inches, pipe should be covered with at least 2 inches of magnesia lagging or its equivalent, or woodwork protected as above. In no event should the clearance be less than 9 inches.

Hot Air Pipes: Pipes should be of metal. Horizontal pipes leading from furnace should not be less than 6 inches from combustible material. If less than 6 inches, woodwork should be protected with loose fitting tin, or pipe covered with at least \( \frac{1}{2} \) inch of corrugated asbestos. If so protected, clearance may be reduced to 3 inches.

Pipes should not be placed in a combustible partition nor enter a combustible enclosure at a distance less than 8 feet horizontally from the furnace.

Pipes passing thru combustible partitions or floors or located in closets should be double walled with an air space of at least 1 inch between.

Pipes contained in combustible partitions should be double walled with an air space of at least \( \frac{1}{2} \) inch between or have a covering of not less than \( \frac{1}{2} \) inch of corrugated asbestos. Clearance between outer pipe or surface of covering to wooden studding should be not less than 1\( \frac{1}{2} \) inches. Plaster covering portion of partition containing pipes should be on metal lath.

Cold Air Pipes: Pipe should be of metal or other incombustible material.

Registers: Registers placed in woodwork or combustible floors should be surrounded with a border of incombustible material not less than 2 inches wide.

Register boxes should be metal double walled with at least 1 inch air space between or single walled covered with asbestos, not less than \( \frac{1}{4} \) inch thick. Clearance between outer wall or surface of covering should be not less than 2 inches. If less than 2 inches woodwork should be covered with tin within a distance of 2 inches.

One register should be fastened open or be without valve or louvers to prevent overheating.
B.2. ALL EXPOSED WOODWORK METAL COVERED DOUBLE METAL PIPE METAL LATH & PLASTER.

4. CLEARANCE TO COMBUSTIBLE MATERIAL.

FLOOR IF COMBUSTIBLE SHOULD BE PROTECTED AS SHOWN OR BY THREE COURSES OF BRICK, WITH MIDDLE COURSE Laid Crosswise on Edge and WITH SPACES BETWEEN ROWS TO FORM VENTILATING DUCTS.

HOT AIR FURNACE
Installation of Hot Air Furnaces
(pipeless)

Floors: Floors, if combustible, should be protected by two courses of 4-inch hollow tile crossed with boiler iron on top, or three courses of brick, with middle course laid crosswise and on edge, with ventilating spaces, left open at ends, between. Protection should extend even with furnace at sides, front and rear, and in addition, if other than gas, electricity, or liquid fuel is used, floor, for a distance of 18 inches in front, should be protected by a layer of 1/4-inch asbestos covered with sheet metal or its equivalent.

Lateral and Vertical Clearances: Clearances between furnace and unprotected materials at sides, front and rear should be as follows:
- At sides and rear ......................... 18 inches
- In front ..................................... 48 inches

Note: If clearances are less than those specified above, combustible materials should be protected as follows:
- At sides, rear or in front: Woodworking should be protected by a layer of not less than 1/8-inch asbestos with a covering of sheet metal supported so as to leave an air space of 1 inch, or by a layer of 1/2-inch asbestos board supported to leave at least a 1-inch air space. In no event should the clearances be less than one-half of those specified above.

Breechings: Clearance between metal breechings and unprotected combustible materials should not be less than 18 inches.

Note: If clearance is less than 18 inches, pipe should be covered with at least 2 inches of magnesia lagging or its equivalent, or woodworking protected as above. In no event should the clearance be less than 9 inches.
Installation of Ordinary Stoves

Floor: Floor under ordinary stoves, with legs **less than 4 inches** high should be protected by two courses of 4-inch hollow tile crossed with boiler iron on top, or three courses of brick with the middle course laid crosswise and on edge, with ventilating spaces, left open at the ends, between. Protection should extend even with stove at the sides, front and rear and, in addition, if other than gas, electricity or liquid fuel is used, floor, for a distance of 18 inches in front, should be protected by a layer of ¼-inch asbestos covered with sheet metal or its equivalent.

Floor under ordinary stoves with legs **4 inches or more high**, if combustible, may be protected by a layer of sheet metal in place of the materials above specified.

Lateral and Vertical Clearances: Clearance between stove and unprotected combustible materials above, and at sides, front and rear should conform to the following requirements:

- Above ..............................................18 inches
- At sides and rear.................................18 inches
- In front ..........................................48 inches

**Note 1:** If clearances are less than those specified, combustible woodwork should be protected by a layer of ¼-inch asbestos or its equivalent covered with metal so supported as to leave an air space of one inch; or by a covering of ¼-inch asbestos or its equivalent supported so as to leave an air space of one inch. In no event should the clearances be less than one-half of those specified above.

**Note 2:** Stove should be provided with a metal shield set away 18 inches at sides and rear where inflammable materials can come in contact with same.

Stovepipe: Clearance between stovepipe and unprotected combustible materials should be not less than 18 inches. Stovepipes, passing thru combustible partitions, windows, sides of buildings, ceilings, or roof should be provided with at least 6 inches of clearance to combustible materials.
Installation of Small Ranges

Floor: Floor, under small ranges with legs less than 4 inches high, should be protected by two courses of 4-inch hollow tile crossed with boiler iron on top, or three courses of brick with the middle course laid cross-wise and on edge, with ventilating spaces, left open at the ends, between. Protection should extend even with stove at the sides, front and rear and, in addition, if other than gas, electricity or liquid fuel is used, floor, for a distance of 18 inches in front, should be protected by 1/4-inch asbestos covered with sheet metal or its equivalent.

Floor, under small ranges with legs not less than 4 inches high, if combustible, may be protected by a layer of sheet metal in place of the materials above specified.

Lateral Clearances: Clearance between range and combustible materials at sides, front and rear should conform to the following minimum requirements:

At sides and rear..............................18 inches
In front ....................................48 inches

Note 1: If clearances are less than those specified, combustible wood-work should be protected by a layer of 1/8-inch asbestos or its equivalent covered with metal so supported as to leave an air space of one inch; or by a covering of 1/4-inch asbestos or its equivalent supported so as to leave an air space of one inch. In no event should the clearance be less than one-half of those specified above.

Stovepipe: Clearance between stovepipe and unprotected combustible material should be not less than 18 inches.

Stovepipes passing thru combustible partitions, windows, sides of buildings, ceilings or roof should be provided with at least 6 inches of clearance to combustible materials.
ARRANGEMENT & CLEARANCE
OF
SMALL RANGE.

IF CLEARANCE TO FLOOR IS LESS THAN 4" MOUNT STOVE ON BOILER PLATE SUPPORTED BY
(A) 3 COURSES OF BRICK, MIDDLE COURSE LAID ON EDGE TO FORM VENTILATING DUCTS, OR
(B) 2 COURSES OF TILE LAID CROSSWISE AND FORMING VENTILATING DUCTS.
INSTALLATION OF LARGE RANGES

Floor: Floor, if combustible, should be protected by two courses of 4-inch hollow tile crossed with boiler iron on top, or three courses of brick with middle course laid crosswise and on edge, with ventilating spaces, left open at the ends, between. Protection should extend even with range at the sides, front and rear and, in addition, if other than gas, electricity or liquid fuel is used, floor, for a distance of 18 inches in front should be protected by a layer of 1/4-inch asbestos covered with sheet metal or its equivalent.

Lateral Clearances: Clearance between range and unprotected combustible materials at sides, front and rear should conform to the following minimum requirements:

- At sides and rear: 18 inches
- In front: 48 inches

Note 1: If clearances are less than those specified, combustible woodwork should be protected by a layer of 1/8-inch asbestos or its equivalent covered with metal so supported as to leave an air space of one inch; or by a covering of 1/4-inch asbestos or its equivalent supported so as to leave an air space of one inch. In no event should the clearances be less than one-half of those specified above.

Breeching or Smokepipe: Clearance between metal breechings and unprotected combustible materials should not be less than 18 inches.

Note: If clearance is less than 18 inches, pipe should be covered with at least 2 inches of magnesia lagging or woodwork protected as above. In no case should the clearance be less than 9 inches.

Ventilation: Hood should be constructed of No. 16 gauge iron securely riveted to angle iron frame. Clearance between top of hood and unprotected combustible material should be at least 18 inches. If clearance is less than 18 inches, hood should be covered with at least 2 inches of asbestos cement. In no case should clearance be less than 6 inches.

Pipe from hood should enter 8-inch brick flue used for no other purpose, or metal flue outside of building with vertical clearance of 18 inches and lateral clearance of 6 inches from combustible materials and extending 6 feet above roof.
INSTALLATION
OF
LARGE RANGE.
**Installation of Motion Picture Machines**

All motion picture machines using inflammable films should be enclosed in a booth meeting the following minimum requirements:

**Size:** Booth should be not less than 6x8 feet in size and 7 feet high.

**Walls:** Walls should be constructed of one of the following or equivalent materials:

- Masonry not less than 8 inches thick, 4 inches if reinforced concrete; gypsum blocks plastered on both sides; metal lath and cement plaster, not less than 2 inches thick, supported by incombustible members; or

- A metal framing of 1 ½ x 1 ½ x ⅛ inch angle and tee irons, securely braced and riveted, with panels of asbestos board at least ¼ inch thick fastened to frame with bolts spaced not more than 6 inches on centers, or of No. 20 gauge sheet metal fastened to frame with bolts or rivets spaced not more than 3 inches on centers. Inner face of angles and tees should present a smooth surface at joints. Asbestos or metal panels should be continuous between angles and tees and have no open seams.

**Ceiling:** Ceiling or top should be similar in construction to walls.

**Floors:** Floors, if not fireproof or incombustible, should be of matched lumber not less than ¾ inch thick with an overlay of asbestos board or equivalent material not less than ¾ inch thick. If booth is constructed of a metal framing, floor should rest on bottom flange of base angles.

**Door:** Door should be of at least 2x5 feet constructed of materials similar or equivalent to those of the walls.

**Openings:** Openings for operator’s view or thru which picture is shown should not be larger than 6x12 inches. Each opening should be provided with a gravity door constructed of No. 12 gauge metal overlapping opening 1 inch on all sides, when closed, and arranged to slide in grooves. Door should be held open by fusible links placed in series with fine cords so arranged so that one link will be over each machine.

**Ventilation:** Inlets, not less than 3x16 inches, should be placed on all but front sides of booth and not more than 3 inches above the floor. Openings should be covered on the outside by wire screen of not more than ⅛ mesh and on the inside by gravity doors similar to those described for Openings.

Outlet should not be less than 12 inches in diameter leading from the center of ceiling and vented to the outside. Clearance between the vent pipe and unprotected combustible material should be not less than 6 inches.

**Shelves:** Shelves, furniture and fixtures should be of incombustible construction.

**Wiring:** Electrical wiring should be in accord with the rules embodied in the National Electrical Code.
I could go on indefinitely and speak further on mechanical installations, inasmuch as we have barely scratched the surface. There are probably 50 or 60 more examples we could give, but I see I am already beyond my time. If there is any further information that you gentlemen should desire you can obtain the requirements and specifications for installations of these various devices from the National Board of Fire Underwriters, New York, for they will be more than pleased to favor you, or else you can provide yourself with a copy of this booklet "The Analytic System Handbook on Fire Protection," and if you care to you can write direct to the Western Actuarial Bureau, Box 1089, Chicago. I thank you. (Applause.)

**Chairman Knight:** Let's have a five minute recess.

(Recess taken).

**Chairman Knight:** The next subject on this morning's program is Electrical Installations in Buildings, by Victor H. Tousley, of the department of gas and electricity of the city of Chicago. I take pleasure in calling on Mr. Tousley. (Applause.)

**ELECTRICAL INSTALLATIONS**

By Victor H. Tousley, Chief Electrical Inspector, Department of Gas and Electricity, Chicago

It is going to be a little difficult for me to get into the minds of you men and see just what part of the electrical inspection work might interest you most. I have charge of the electrical inspection work of the city of Chicago and, of course, our work is of a nature somewhat different than that which you men get. The principles are quite the same, but their working out is, possibly, quite a little bit different. However, if what I say to you gives you one or two ideas and will benefit you in your work, I feel the hour will have been well spent.

The matter of electrical inspections or protection from the electrical standpoint is divided into two general classes: The protection from the standpoint of safety to life, and the protection from the standpoint of fire hazard.

Peculiarly enough the fire hazard, which is really the least important of the two, has always had the preference. Safety from the life standpoint, everyone will admit, is of much greater importance than safety from the fire standpoint and yet the city of Chicago has been making inspections I think since 1880, forty-five years ago, and originally those inspections were under the direction of what was known as the superintendent of telegraph, who was the electrical man of the fire department and directly under the fire marshal, but had charge of the electrical equipment of the fire department. This was later changed to a department of its own and is now maintained as a separate department.

However, in the old days there were practically no rules which had to do with safety to life; the rules had exclusively to do with fire. I do not think there was a rule in the original code which had to do with safety to life. The matter of electric hazard from the life standpoint is of more or less recent development.
The first rules designed to cover electrical construction or installation were those gotten up by the Fire Underwriters in about 1892 or 1893. During the Chicago World's Fair there was a convention of various fire insurance people throughout the country and at that time they started what later became the National Electrical Code. This is another reason why the rules had to do more directly with fire than life, because they were originated by the fire insurance interests.

In the last seven or eight years the matter of the protection from the life standpoint has been taken up by the national bureau of standards and there is now published by the bureau what is known as the Safety to Life Code, which deals almost exclusively with the safety from the life standpoint and covers not only the subject from the users' or consumers' standpoint, but also goes into detail for the protection of workmen around a factory, station or plant.

As time goes on you will find the matter of safety from the life standpoint is to become much more important than it has been in the years past and rightfully so, because the most important duty we have is the saving of human life. The matter of saving property is more or less secondary.

I don't know how much you men do in the line of electrical inspections, but if you are in the fire departments or if you are city officials it devolves upon you, if there is no one else looking after that work, to take up the matter of making electrical inspections. The electrical inspection is an absolute necessity. The number of fires that occur from electric wires is really enormous. Now, I don't mean by that that electricity is a hazardous material, or whatever it is you call "electricity."

I am reminded of a story of a college professor who had a student in his class who used to fall asleep and if the professor would call on him he would always rise up with, "Professor, I knew, but have forgotten." So one day this particular student,—it was a hot, warm day like today,—this student was taking his usual nap and the professor thought he would play a little trick on him so he called him by name and says, "John, what is electricity?" John woke up at the sound of his name, but he did not want to let on that he did not know the question and said, "I knew, but I forgot." The professor says, "Here's the only man in the world who knew what electricity is and he has forgotten." When I stalled on what electricity was it recalled that little incident.

Electricity is undoubtedly the cause of many fires that we know of and many we don't know of, but I don't want to convey the impression it is unusually or particularly dangerous. If you compare a Christmas tree lighted with candles with one lighted by electricity, you know there is no comparison so far as safety is concerned. And, you know electric lights in a house or building of this kind are safer than gas and oil lamps. But that does not mean electricity hasn't certain hazards. Electricity does start many fires; many fires we know of and many we don't know of.

I know a number of years ago when making inspections in Chicago we had a peculiar epidemic, you might call it, of fires occurring
in a class of buildings wired about 1892 or 1893. In those days the buildings were wired with the wires pulled through the joists with no bushings of any kind. It got us rather excited. We had a number of houses wired in that manner and a careful investigation was made. These fires occurred in the night time, nearly every one of them. We found in one of the houses, where a fire had occurred about two or three in the morning, wires run down the side of a joist to a switch in the dining room. A wooden cleat fastened the wires onto the joist and at one point between the two wires, which were separated about two and one-half inches, the wood was all charred and showed that about the same thing was going on that goes on in the case of a hot steam pipe against wood. Undoubtedly, the slow leaking of current charred the wood, ultimately setting fire to that house. We were instructed at that time to condemn any buildings we might find wired in that manner.

Undoubtedly, many houses that have taken fire have taken fire from some such thing as that. It is rather hard to determine, but yet exists.

There is another matter incidental to electrical inspections and that is the matter of economy. If you men make inspections in your own towns or cities or contemplate doing so you are not causing a needless expense, but are accomplishing an economical result. A building wired in accordance with the National Code is an economical installation. During the last month an electrical engineer of one of the large companies operating in Chicago made the direct statement to me, and agreed to put it in writing, that compliance with the rules of our department in the original installation of the work, and compliance with the rules in the maintenance of the work, resulted in an economical installation. The first cost might be a little greater, but the maintenance cost was much less and the losses from the shutting down of parts of the plant were reduced to a minimum.

An engineer came to our office with an elaborate set of plans covering a new plant in the city of Chicago. They had their own generating plant and a large switchboard and were installing a temporary plating and buffing equipment. I asked the idea of that. He stated that on the main switchboard in this plant, which was a Ford plant, everything was polished just as if it were going into the main ballroom of a hotel. Then he showed the plans with numerous circuit breakers, switches, and fuses, costing in some cases several thousand dollars apiece. I made a remark to the effect that Ford did not apparently use the same system in installing electric equipment as he did in constructing his cars and asked, "How do you explain that?" He said, "Maybe he does. A shut down of thirty minutes in a Ford plant has to be made up. Their cars are sold way ahead of production and promises of delivery made for certain days. A shut down in any one department for a half an hour would delay the completion of machines that should be finished in that half hour and the delay must be made up or the whole schedule would be disarranged." While the Ford is probably the cheapest car you can buy, it is one of the most economical and
reliable and so it is with this electric plant Ford puts in. While much
more elaborate and costing much more money in comparison with
ordinary plants, it is put there for the same purpose, to make the plant
reliable and dependable.

A compliance with the rules of the National Electrical Code will
get for whoever complies with them that same result. They will ob-
tain an installation safe from a fire standpoint and economical to main-
tain.

The matter of safety to life, as I say, is receiving more attention
of late and it will receive greater attention as years go on. I will
show you later a slide which will indicate to you a little bit about
the development in the rules of electrical installations.

I want to talk to you about the National Electrical Code. I
understand you had on your program yesterday Mr. Dana Pierce,
who talked to you from the standpoint of Underwriters' Laboratories
and undoubtedly he covered in his talk to you the matter of the Na-
tional Electrical Code, but not knowing what he said I want to speak
on it again even though it is repeating. All electrical rules of this
country, so far as fire rules are concerned, are based on the National
Electrical Code. The National Electrical Code is a code which is
formulated by what is known as the electrical committee of the Na-
tional Fire Protection association, and has between thirty and forty
members, representing every branch of the electrical industry and
the electrical code is a standard of what is known as the American
Engineering Standards committee, organized a few years ago to draw
up standards for all types of equipment. They have a standard for
fire hose and they are considering a standard for the traffic signs used
in these streets, and such things as that. The National Electrical
Code, as now published, is approved and adopted by the American
Engineering Standards committee.

Any code to be approved by the American Engineering Stan-
dards committee must have a representation that is broad enough to
cover every phase of the subject and the electrical committee, which
consists of about forty members, is so organized as to take in every
interested branch of the electrical field. This committee meets every
two years and revises the electrical code; they meet every year, but
the code is revised only every two years.

Now, when you make an electrical inspection, if you make it on
the basis of the National Electrical Code, you have back of you a code
which I do not think has a parallel in any other industry or in any
other part of the electrical field. You have your building code, your
fire code and your plumbing code, but in the electrical code you have
this development of years and the careful consideration of the repre-
sentatives on this committee. You have back of you a code which is
more generally used and more strictly enforced than any code of a
similar nature in this country and when you inspect a building and
condemn a piece of apparatus or piece of wiring because it violates
the code, you have back of you something that no person can dispute;
the years back of the code and the thought back of the code mean that
that rule is not a whim or chance; it means something, even though
the meaning may not be exactly understood at a glance. You have back of you all that is meant by this National Electrical Code.

In this connection there is a point that might be well to call to your attention; that is the matter of variation from the National Electrical Code. A great difficulty exists at the present time in this country, so far as electrical work is concerned, by the variations in the interpretations of the electrical code. The city of Chicago and many cities have rules varying from the National Electrical Code. But on the principles of the code and on the main rules of the code, it is a pretty bad thing to vary from it.

You men who are connected with the public service company know the experience gone through in the last few years on meter fittings. The number of fittings a manufacturer of switches has to make today is enormous. He has to make one for one town and another for another town and they have such a variety that it must increase tremendously the cost of that device. Unfortunately there is no good way at the present time to get together on the standardizing of electrical fittings.

I would like to call to your attention another matter and I think this would be a good place to talk about it. I am a member of what is known as the Western Association of Electrical Inspectors. That is an association covering the whole western country, from Ohio west. We have two or three hundred members, our next annual meeting will be in Chicago this coming January. I happen to be chairman of the executive committee of this association and we are preparing for chapters. Our executive committee is taking up the matter of arranging for chapters. We have applications from the Pacific Coast and one from Michigan and one from Wisconsin and it occurred to me we ought to have an Illinois chapter of this Western Association of Electrical Inspectors. There is now in Illinois an organization known as the Municipal League, which covers, as I understand it, every phase of municipal work. It might be possible to get some kind of a combination between that league of municipalities and the Western association whereby those interested in electrical inspection of this state should get together.

I came last night from Springfield and you men know what is going on at Springfield. We, in the city of Chicago, have been making inspections for forty-five years. We have an anniversary every year in December and last December was the forty-second anniversary. Many of the cities of the state have been making these inspections for many years, but last October the supreme court declared our city had no right to charge fees for inspection work. The supreme court decision did not say that they hadn't the right to make electrical inspections, but it is my own personal belief the only reason they did not say so was that they were not asked. The case in the supreme court came from Chicago and raised the point that the collection of inspection fees and licenses of electricians was Illegal. That's the only question the supreme court had to answer and it is only a short jump from that point to where the supreme court would say the cities in the state did not have the right to in any way regulate electrical equipment.
There is now before the legislature, and we have hopes of it going through, a bill to give the cities the right to make these inspections. That bill passed the senate and is now on third reading in the house and ought to come up this morning. When that bill goes through, if it does and I hope it will, it seems to me it is the duty of every municipality in this state, no matter how large or small, to control the electrical wiring. It seems to me it is a simple matter to show that any man in the municipal government who is charged with the duty of protecting citizens from electrical hazards is guilty of malfeasance in office if he fails to do so, because the hazards of electricity are too well known to be in any way questioned, and I hope you men representing the municipalities, whether as electrical inspectors or in the fire departments, will get after this electrical inspection in your own municipalities and see that it is done.

If any of you men happen to be officials of cities, towns or villages, there is only one way to do this. Draw up some kind of an ordinance in your city to provide for the taking out of permits and provide for the inspection. You can get money to maintain the department. The department in Chicago has been more than self-sustaining, but the people paying money to the city of Chicago have obtained a service they could not otherwise have gotten for ten or fifteen times the amount they pay for it.

You can inspect a job of wiring in a small bungalow for maybe 83. If the owner was to go to some engineering concern and ask for an inspection of the wiring of the property it might cost 820 or more and he would not get the equivalent inspection of an inspector doing this regularly, so you are doing the people a real service. I think it is for the good of all of us that every city, town and village control these electrical installations, whether through electrical inspections or through the fire department, but I think it should be done in a systematic, logical method, by means of permits or city ordinances or whatever rules are necessary to do it.

One of the most common causes of electrical fires is flexible cords. I have here a memorandum of the number of fires that start from electric cords. In 1923, out of 726 fires in Chicago from electrical causes, twenty-seven were caused from flexible cords. In 1922, out of 267 fires, twenty-seven were caused from flexible cords. In 1921, out of 147 fires about ten per cent of the fires were caused from flexible cords. I am going to show you by slides the use of the flexible cords and want to show you how a small thing may cause considerable trouble.

We had a fire start from a cord supplying a light in a hallway in an apartment building. This cord shorted and started a fire. The tenants could not get out the back of the building and a woman burned to death. That simple piece of cord in this case caused the death of this woman. I will show you later some slides of another fire that had to do with cords.

Another common cause of fire is the burning out of motors. Out of 286 fires in 1923, forty-two fires, that's about one-seventh, were
caused by burning out of motors. The losses in that year were $22,700. Those fires are all in Chicago. In 1922, there were 350 fires and twenty-five were caused by burning out of motors.

Another very common cause of fire is overfusing. You know what overfusing means to an electric circuit. Electric heaters left in circuit cause seventeen per cent of the fires in Chicago, according to the last annual report.

Another very common cause of fire is overheating of contacts and poor joints.

I spoke to you a short time ago about a fire that occurred in a building where the wires ran down the side of a wooden joist. An old fire insurance inspector gave me his theory as to the cause of steam pipe fires. Whether his theory is right or wrong I do not know, but it sounds logical and probably has merit. He said in his investigations he found most steam pipe fires occurred in the winter after the building was closed and the heat shut off. What brought this question up was the investigation of a fire reported to have been caused from crossed wires. We finally decided the fire was caused by a steam pipe in a box enclosure where the pipe was surrounded with sawdust. His theory was this: that the constant heating of the sawdust around the steam pipe sooner or later charred the wood and in the winter time when the pipes were hot the air around this pipe was expanded, but when the pipe cooled the fresh air full of oxygen was drawn in and the sawdust was ignited. How good this theory is I do not know, but it sounds logical.

As I understand it, most of those fires are caused after the plants are shut down. If the theory stated is true it undoubtedly explains the cause of many electrical fires. With the wire against woodwork, the heat and leakage of current gradually char the woodwork between the wires, then at some later period, generally cold weather, air heavily laden with oxygen gets in and ignites the woodwork. May we have the slides please? These slides are intended to represent development in electric wiring. (Shows slides.)

I have shown these slides just to illustrate what can sometimes happen by using things that are not considered dangerous. You know that in your own home you have flexible cords that have been in use several years and never caused a fire. There is no doubt in my mind that in the case illustrated four or five feet of flexible cord was the cause of the death of eight people. I could not prove this before a court, but I listened through the entire inquest which consumed almost a week's time, and there is no question in my mind but that the person who ran that cord out through that door, although probably innocent of any intentional wrongdoing, was responsible for this loss of life. It shows what a small thing can cause a disastrous fire.

As I said before, the American people will take a chance; take a chance on drinking moonshine, some get away with it and some do not. They take a chance driving automobiles and 300 have been killed in Cook county so far this year. They take a chance on cord wiring. That's a wrong thing to do. You have a responsibility in connection
with this and it is up to you to educate your people in the safe maintenance of electrical wiring.

I want to thank you for this opportunity of talking to you and if you have gotten anything out of my talk I feel well repaid. (Applause.)

DISCUSSION

CHAIRMAN KNIGHT: Are there any questions you would like to ask Mr. Tousley at this time?

MR. WOLF: I would like to ask Mr. Tousley a question. In the early part of his speech he made the statement the National Board has drawn up a schedule of rules for inspection from the fire standpoint and in later years they drew up a code for the protection of life. May I ask when that code for the protection of life was drawn up?

MR. TOUSLEY: What is known as the National Electrical Code is the fire code. The National Safety Code is the life code. That is still going on. It was drawn up by the bureau of standards and the work probably started seven or eight years ago.

MR. WOLF: If I might explain my question: In 1919 there was no such code in regard to safety and I got in bad. Mr. Gamber, I think, will remember, at our Fire Prevention Congress in Minneapolis. I was asked to prepare a paper and I did. I said in the years the National Board had been operating they got up fire tests showing how to fight fire, telling the firemen what to do, but in all those thousands of dollars spent in publishing books they had not spent a penny in trying to save a life; everything seemed to them to be dollars and cents. I got in bad, so much so that when I dropped into the National Board's offices in New York and went to see Mr. Booth and Mr. Fleming I got a cold shoulder. I asked the reason. They said, what did you take a fling at the National Board for at St. Paul? I said, I did not take a fling at them, I stated facts. From that day on they commenced publishing different things that lead to the protection of life. I want to explain that's the reason I asked the question.

MR. GAMBER: The code Mr. Tousley had reference to is the code prepared by the bureau of standards, one approved by the National Board, but it was really one prepared by the bureau of standards at Washington.

CHAIRMAN KNIGHT: Are there any other points or any other questions? Mr. Tousley told a class room story. There are quite a number of such stories floating around, the faculty on one side and the students on the other side. A good many of the stories wind up with the faculty getting the best of it, but I think when the real stories are told, the stories based on fact are told, the contest is too unequal for the faculty to come out ahead; they have the faculty outnumbered. In support of that statement I will tell a story that occurred here on this campus in the college of law. One young man was given to sleeping in class during lectures. The professor had the habit of stopping in the middle of his lecture occasionally to ask someone a question to catch him. It was a class that cooperated very well, in fact a study later developed the fact no two consecutive men slept, so there was
always a chance for the man awake to nudge the man next to him and get the answer. There was a chap to the back of the room called Jones. The professor said, "Jones, what is your answer to such and such a question?" Jones woke up. Jones was apparently quite popular with the class because four or five attempted to give him the answer. They were a little enthusiastic and made the remarks audible to the front of the room. Jones caught the answer and gave it. The professor heard the prompting he got. He said, "Jones, are you really sure that is the correct answer to my question?" Jones said,—he saw right away the professor was next and he came back,—"Well, that seems to be the consensus of opinion in this part of the room."

The next speaker on the program this morning is Harry K. Rogers, engineer of the Western Actuarial Bureau of Chicago. I take pleasure in introducing Mr. Rogers. (Applause.)

LIFE SAFETY

By Harry K. Rogers, Engineer, Western Actuarial Bureau

In appearing before a group of men representing the fire service as you men do and talking on the subject which has been assigned to me, namely, Safety to Life, I find myself very much in the position of an old colored man, who was working for the Rock Island railroad in El Reno, Oklahoma. It seems that the efficiency engineers of the railroad, in making investigations of conditions down there, came across one name on the payroll of a man who had been with the company for a number of years without having an increase in salary. This, being unusual, they asked that this man be brought before them and when he appeared it was this old colored man. The following conversation ensued:

"Mose, you have been with the railroad for a long time, haven't you?" "Yas, sir, been here about thirty years." "And in all that time you have never had an increase in salary?" "No, sir, I haint never had my pay raised." "Well, that's very unusual, just what do you do?" "Well, sir, when these passenger trains come in I picks up my hammer and I goes up one side of the train and I hammers on all the wheels and journals there and I comes back on the other side of the train and I hammers on all the wheels and journals on that side." "Well, that's very interesting, just why do you do this?" "Damn if I know." This illustration only points that it is with fear and trembling I approach the subject of life safety, having an audience of such men as you are. Seriously speaking, however, I do not think that too much emphasis can be placed on the need of fire prevention from a humanitarian standpoint.

A few years ago it was the custom on one of the islands in the Pacific ocean, on a certain day each year, for the tribesmen to select their most beautiful girl and with a great deal of pomp and ceremony conduct her to the top of an active volcano, and there, with additional religious ceremony, cast her into the molten lava in the crater below, burning her to death as a sacrifice to the gods. These savages were
sincere in this. It was a part of their religion, but when we good peo-
ple here in the United States, with our high degree of civilization,
obtained possession of this island, we at once decreed that this terrible,
barbarous custom must stop. One girl a year was far too great a
price to pay to their heathen gods. Yet here at home, in spite of this
professed civilization, we still continue to burn 15,000 people to death
annually—15,000 a year. That means, if the law of averages holds, and
we haven’t any reason to think that it will not, forty people, who
are alive and well this minute, without any more idea of dying than
you and I have, thirty-two of them women and children, at this time
tomorrow will have met a terrible death by fire and it is a terrible
thing to be burned to death. Undoubtedly many of you have wit-
nessed one of these horrible scenes. In order to emphasize my point,
if you will pardon personalities, I am going to tell you of one or two
of my experiences, while actively connected with the fire department.

It was on the morning of the fifth of February, 1923, in a south-
er city that we received an alarm of fire for what was known as the
Ghetto building, a four story brick rooming house, located just three
blocks and one-half from central fire station. But, due to the fact
that there was a delay in transmitting the alarm, when we turned the
corner, three blocks from the building, the fire had gained such head-
way that the stairway had already been consumed and the flames were
-going through the roof. As is customary, the hose companies re-
sponding to the alarm stopped at the nearest hydrants to make their
connections and laid their lines of hose down in the street, preparatory
to extinguishing the blaze, but when they got down a little closer where
they could see, all thought of fire extinguishment was banished from
their minds. For, in almost every window of this building were peo-
ple frantically calling for help. The hose-men forgot about putting
out the fire and went over to the truck companies and assisted their
ladder men in placing ladders to windows and were successful in
rescuing sixty-seven people, but I saw a girl come to the window
around the Second street side of the building on the fourth floor and
call for help and there wasn’t a chance to get her. Every ladder that
we had was in service at other windows. Firemen were carrying
women and babies down in their arms. They were sliding their life
lines with their human cargoes. People were jumping from upper
floors into the life nets held below in the streets. There wasn’t a
chance to get this girl, but a group of firemen, forgetful of self, as you
always are, got just beneath the window on the sidewalk, locked arms,
thereby forming a human blanket, trusting to break the force of her
fall with their own bodies and begged her to jump, but for some reason
she did not do it. While they stood begging and pleading with her I
saw her gown burst into flames and her hair go up in a sheet of fire
and with a scream that we heard even above the roar of the flames,
she fell backwards and disappeared from view. Two days later, when
the embers had cooled sufficiently for us to make a thorough search
among the ruins, I found her body, but I want to tell you men if I had
not known what I was looking for, I could have easily passed it by.
Just a charred torso. The left limb had been burned off above the
knee, the right limb just below the knee and the left arm above the elbow, the right arm had been burned off between the wrist and the elbow and the entire back of the head burned away beyond any possibility of identification. The only way we knew that it was this girl was due to the fact that no other bodies were found in that particular part of the ruins and in the ruins of this building were the bodies of eight other victims. Nine people lost their lives in this fire—a fire that undoubtedly could have been prevented.

And then another scene which is to me far more terrible than the Ghetto fire. A fire that occurred in the middle of a bright summer afternoon. It was about three o'clock when this alarm came in for a little house on South Estelle street, located about one mile and one-half from central station. I rode out on the service truck, which is a very fast piece of apparatus, and consequently, was one of the first to arrive at the scene of this fire. A little two room frame house was burning—just a two room building right on the ground. You would think that anyone could get out of a house like this, but before we were within a block of this house we could hear the frantic screams of a woman and when we got down a little closer we saw her frantically trying to break the grasp of other women who were holding her and she was saying, “Oh, my baby, my God, my baby.” We found that she had gone over to the neighbors to visit, leaving a three year old child asleep on the bed and the faulty oil stove burned out in the other room. She knew the stove was faulty. It had given her trouble before, but she did just what you and I are apt to do. She took a chance and went away and left it. The next she knew the house was a mass of flames. We knew that the child was dead. It couldn’t have possibly survived this raging inferno, but as soon as we had knocked the fire down a trifle, another fireman and myself, throwing our bunker coats over our heads to protect us as best we could, went in in an attempt to get the little body. Groping our way blindly through the choking smoke and flames, we located the bed and reaching across we found the little form, but when we attempted to pick it up, all we got was two hands full of charred flesh. I haven’t told these things because I like to talk about them. I only wish that I could forget them, but they are stamped indelibly in my mind, but they do emphasize the point that I wish to make—that it is a terrible thing to be burned to death. There is so much that we can do that will prevent a recurrence of just such scenes as these. Emphatically yes. We each of us do have very definite personal interests in the question of fire prevention from a humanitarian standpoint alone.

Now, as fire chiefs of your various communities you are natural leaders in fire prevention activities and you should make it your business to know that your homes, your schools and your public buildings are as safe as it is possible to make them. Ninety per cent of our public schools are fire traps and we still compel our children to be veritable prisoners of the state six hours a day, nine months a year, in a building that may be burned at anytime. Again, let me urge that you make it your business to know that these schools are safe. You do not want a repetition in your community of that terrible thing
that happened near Cleveland, Ohio, when the Collinwood school
burned, where 173 children and two teachers were trapped like rats
and burned to death in a building that was undoubtedly in as good a
physical condition as a good many of your schools. This fire orig-
inated from oil soaked wooden floors coming in contact with hot
steam pipes. The day before, a perfect fire drill had been given and
the children had cleared the building in one minute and ten seconds,
but, on this day the janitor had forgotten to unlock one exit door.
When the children came through the smoke filled hall and found the
door locked, they became panic-stricken and rushed back to the other
exit. It was already filled beyond the limit of its capacity. The
door swung in instead of out and with the additional congestion it was
forced shut and, when the fire department arrived, it was impossible
to open it until they cut away the door. The chief told me that there
were these little bodies, wedged in there to the top of the door and
he said, "Down in the center of the pile was a sight that made me
forget for a moment that I was a fire chief and I became just an
ordinary father as any man would do, for there I saw my boy with
his little hands outstretched, calling 'Daddy, Daddy.' I took his
hands and tried to pull him out, but all I could do was to dislocate
both arms at the shoulders." Let me repeat that you would not want
a repetition of this thing in your community.

Neither do you want a repetition of that terrible fire that occurred
last Christmas eve at Babb's Switch, Oklahoma, where a little country
school-house, 24 x 36 feet, was the scene of a community gathering.
The room was beautiful, but unwisely decorated with garlands of tissue
paper and a freshly painted ceiling had necessitated the moving of the
ordinary gas light fixtures, so the neighbors had brought in three coal-
oil lights. Two were fastened by brackets to the wall on either side
of the room and the third was placed on a stand table near the Christ-
mas tree, which had been set up insecurely in one corner of the room.
I say insecurely, because on the day before, when they were trimming
the tree, it had fallen over and had been reset in identically the same
manner. The good folks everywhere gathered—about 150 in all of
them—packed in the little school-house. The little children gathered
about the tree, rosy cheeked children, happy in anticipation of the
pleasure that was to come. Santa Claus was going to be there and
distribute the gifts to each of the children. Santa did come and did
give out the gifts that were piled around the tree, but in reaching for
one that had been fastened to the limb of the tree; he pulled the limb
down, bringing the decorations in direct contact with the flame of one
of the candles with which the tree was illuminated. There was a flash
of fire, but too late they realized that not one single precaution had
been taken. There was not even a bucket of water available. One of
the children jumped up in fright and for some unknown reason Santa
Claus took the little red chair that the child had been occupying and
threw it at the blazing tree. The chair passed through the tree and
struck the coal-oil lamp on the stand, causing it to explode and almost
instantly the room was a mass of flames. Those nearest the door man-
aged to get out, then remembering the babies at the other end of the
room, they attempted to come back and get them and a jam ensued at the door. Originally, there had been two doors in the school,—one at each end,—but, the wise school board had seen fit to build a coal bin outside one door, leaving only an eighteen inch opening in the roof. Then they tried to escape by means of the windows, but again the wise school board, guarding against marauders, had fastened heavy screen over the windows. But, instead of placing them in frames which might be removed in an emergency, they had fastened them by means of four inch steel bolts, passing entirely through the window frames, so it was impossible to get out that way. However, they did get one corner of one screen loose and a four year old boy was rescued, the only one that got out through the window. In this fire which lasted but thirty minutes, thirty-seven people were cremated—entire families wiped out. Do you think that the heartache has eased any in that community? Don't you think it would be a long time before it would ease in your community, should a thing like this happen in one of your schools? For the love of God, men, make your schools safe for these babies. Not only your schools, but your homes. Not one of you men would permit your child to play with dangerous explosives, but a great many of you do permit them to sleep over a cellar full of rubbish every night, and do not think that you haven't any rubbish, for I will make this assertion, that if your home has six rooms and you have lived there six months, I can get a wagon load of rubbish out of it,—yes, out of most every home in the state of Illinois,—and I do not mean that you are bad housekeepers either.

Let me repeatedly urge that you not only do these things, but that you talk fire prevention at every opportunity, asking civic clubs to form fire prevention committees to cooperate with you, and the knowledge that you may have perhaps saved the life of some little child, through your determined efforts, will be your reward.

Now, digressing for just a moment, I want to read to you a bit of fire prevention propaganda that is the direct antithesis of what has come before. This was printed by a western coast newspaper, is headed "When the Fire Alarm Sounds" and is as follows:

"When you hear the fire alarm jump into your car, start on high and hike to find the fire. Open your muffler, blow your horn and if you cannot make enough noise, get a few boys aboard to help you out. The city ordinance is that upon the approach of any fire apparatus, the driver should stop as near as possible to the curb and remain there until such fire apparatus has passed. This is for the other fellow. It does not mean you. The second ordinance prohibits driving over fire hose. This is also for the other fellow. When you hear the fire truck coming, get an even start and race with it. Do not forget to open your muffler, blow your horn and yell. The other law prohibits the stopping of vehicles within fifteen feet of the fire hydrant, but do not let this prevent you from parking directly in front of the one nearest the fire. There are plenty of hydrants and the firemen can hunt until they find one. If you have not a car, get to the fire as best you can and then get in the firemen's way to the limit of your capacity. Also, have all the women folks along to add the feminine touch.
If you are not in too much of a hurry, call up central and ask her where the fire is and if she does not tell you in a hurry, cuss her out, for any telephone girl that can not answer you and six hundred other people who want to know the same thing at the same time, should be fired." (Applause.)

CHAIRMAN KNIGHT: I don’t know as I can say for myself that I have enjoyed Mr. Rogers’ talk, but I am glad that I heard it. I think there is a lesson there that we should take home. His talk was too gruesome for enjoyment. Are there any questions you would like to ask Mr. Rogers? If not, the meeting will stand adjourned until the afternoon session at 1:30.

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WEDNESDAY, JUNE 17, AFTERNOON SESSION

PEARL SMITH, President, Illinois Firemen’s Association, Chairman

MR. GAMBER: The time has come for the afternoon session. You will notice on your program that Professor L. H. Provine is chairman for this afternoon, but he has backed up on me. You know the successful thing in a fire department, or one of the more successful things, is a real good chief who can make the other fellows in the fire department follow orders. I now have the extreme pleasure of presenting as chairman for the afternoon session Pearl Smith, president of the Illinois Firemen’s association. (Applause.)

MR. SMITH: Mr. Chairman and brother firemen, I do not know what I ever did to John Gamber to cause him to wish a job like that on me this hot weather. All I do now is to try to find a cool spot and it keeps me busy at that.

I could not be here yesterday on account of illness in my family, but I am proud to be here today and tomorrow and am more than pleased to see the members of the fire departments take such an interest in this school. I was wonderfully surprised that there were 164, I believe, registered. I registered as soon as I came here and the girl said my register number was 163 1/2. I don’t know where the half comes in.

When I heard Mr. Gamber was going to put this school on I knew it was going to be a success.—I am going to call him John,—because John never starts out to do anything without making a success of it, and the attendance we have now is an almost positive assurance that this course will be a regular annual event. I do not think the state could spend money that would benefit the people of the state more than to send the firemen here and give them a school of instruction. The firemen’s work is one of the most hazardous occupations of today and they are serving the public all the time.

We have with us this afternoon Doctor W. F. Burres, mayor of Urbana. (Applause.)
ADDRESS OF WELCOME

By Dr. W. F. Burres, Mayor of Urbana

Mr. Chairman and Gentlemen: It is quite a pleasure to welcome firemen except in an official capacity. I do not suppose anyone is more welcome than firemen at any time, but I want to assure you you are quite welcome in the twin cities. I happen to be mayor of the east half of them and I am proud of the opportunity to have this school meet here and am proud to have you visit the cities. We can offer you almost anything except something to keep you cool, and as much of that as possible.

We will be glad if you will take the opportunity to visit and inspect our cities in the leisure hours and we in an official way would be glad to have those acting as officials and those who have had experience, express themselves as to anything inadequate. We will take it as constructive criticism and will be glad to hear it. Not only that, but as mayor I will be glad to try to enforce anything that will be of advantage to the community.

There is nothing I can say that would add to your instruction. I might say we have a fire department, one in each city and at the university, of which I think we are justly proud. We believe we have the best fire chief between Wright street and the Atlantic ocean.

Our cities have been anxious.—I know I am speaking in the presence of the master because I understand the state fire marshal is present,—but in a former administration I happened to be on the council and know there has been a great effort made to comply with the requirements. I personally paid out $11 for a fire ladder. I did not like it very well, but put it in because I was told it had to be put in. After it was there I was glad to see it and I know it will not get out easily. I think when the mayor has to be called on to put in a fire ladder, that makes him impress things on the rest of the citizens.

I wish you a successful meeting and hope your stay in the twin cities will be filled with pleasure. (Applause.)

Chairman Smith: Next on the program will be motion pictures by the National Automatic Sprinkler association. The film is entitled, "The Menace."

(Pictures shown.)

Chairman Smith: Gentlemen, I am sure that you appreciated that picture because of the attention you gave it. I sat there looking at that picture and did not know there was anyone in the house but myself. I am pleased by the interest you took in that and the good order you gave.

The next on the program is Fire Departments and the Training of Firemen, by L. L. Wolf of Cincinnati. (Applause.) I do not think Mr. Wolf needs any introduction, so we will just present him to you.
TRAINING THE FIREMAN

By L. L. Wolf, Cincinnati, Ohio

Gentlemen, I am this afternoon like Pat Murphy. It was a hot summer's night. Mrs. O'Brien on the street, who took in washing, had to get up early in the morning. Her alarm clock stopped and she had no way of getting the time. She knew Pat Murphy came home every night at eleven o'clock so she waited for him. When Pat came along she said, "Pat, have you got the time?" He looked up and said, "Yes and the inclination, too."

That's the way it was today. One of the men to be on the program from Chicago failed to appear and the professor asked if I would fill in. I said, yes. I hope I will not bother you with my presence or talking on the subject, but will try to fill his part as well as I can under the circumstances. As a rule I usually prepare a subject I am going to talk on, but I have not had any time.

My subject here of the Training of Firemen, that being my life hobby, I want to say to you it is absolutely more essential for a fireman to be trained than it is for the soldier who goes in the trenches. The exposures you are subjected to are much greater than his. Many a crew of men here have responded to an alarm, gone in with their lines, have not had sufficient water and have been compelled to retreat. There is no more relentless an enemy than fire. I will bet many a man sitting in this audience has gone into a building with a hose stream, an inefficient hose stream, and has had to back away, but he will stay and take the punishment until he has to back away.

No man in the world can tell you how to fight a fire. That cannot be done, because there are no two fires alike. You have to meet the conditions as you find them on the ground. There is only one thing we can accomplish in the training of firemen and that is coordination of effort and through the coordination of effort we produce efficiency.

I want to ask you,—most of you men have been firemen for years and have been chiefs for years,—and I want to ask you, down in your heart do you feel you can go to a modern fire apparatus today and name every tool by its right name which you will use in fire fighting? Ask yourself that. See if you can call every tool by its right name.

In order to get efficiency you must have discipline. Discipline gets efficiency and discipline is only produced by training. Training produces discipline, discipline gets efficiency and without efficiency you have nothing. It is absolutely necessary that every man should thoroughly understand every tool that he is called to use, that every man knows that tool by the same name,—not one man call it a rod hook, another a ceiling hook and so on. Everything must have its own name.

A question came up the other day in a department where I was. A fellow says, "How many intakes does a siamese have?" Have you ever thought of that question. You all know what a siames is. You call your two-way a siames, you call your three-way a siames, you call your four-way a siames. Absolutely not. Siamese is taken from
what you all used to go to the circus and pay to see years ago, the Siamese twins, two heads and partial bodies leading into one trunk. When we call for a Siamese we would naturally think of the two-way. You never saw three bodies leading into one trunk. The word is taken from the word, Siamese twins. If you want a three-way it is a three-way, if you want a four-way it is a four-way. Do you think it would be proper to say, give me a four-way Siamese? Your Siamese is your two-way. I will venture to say there is not a man in the audience ever had that question brought up to him before. This was brought up in a very large department in the east the other day. When you want a three-way intake or a three-way outlet you call for a three-way. If you want a four-way you call for a four-way.

How many men here today can actually tie all the standard knots of the fire department? There are only five, but you have never had the opportunity. You have never had the training, and not knowing, you have not appreciated the value of the standard knots in fire department work.

How many men here today know the proper way of anchoring hose lines where you are compelled to go to heights to fight fires in order to do away with as much friction loss and back pressure as you can? I was in a small town a short time ago, not far from here, and saw them take a line on the roof of a four-story building. That stream could have been anchored to the roof of that building in such a way, without any trouble or without any loss of time, that the hose would have made a perfect gooseneck without a break. There is only one real fire stream to fight fire and that is a fire stream with the proper volume and proper force. A fire stream that does not blacken the fire when it hits it is not extinguishing the fire; in most instances it is causing that fire to burn.

I am deviating a little bit from training, but am showing you it is absolutely necessary that a man should know how to anchor that line to get results and get the full efficiency of his engine and stream. You might have the best pump in the world and the best hose and the bravest men on the roof and if you
are not getting the proper flow of water through the line it is the fault of the man who directed that line to the roof in not having it properly anchored to deliver an efficient stream.

The extinguishing quality of water is only equal to the generative quality of the fire. A small stream on a large fire is a menace. The small stream instead of extinguishing the fire causes it to burn; therefore when you get up to the heights and need water you need it bad, therefore in taking a hose line to a roof that line should be anchored in such a way as to get full efficiency.

I have gone to different states in the United States where I installed fire schools. When I got there the first thing the men would do would be to curse me out, say I was there to give them work and make it hard for them. After the first few days they realized it does not mean work for them, but teaches them how to make their work easier and shows the short way to accomplish results with the least amount of spent energy. When I start the men with setting up exercises naturally I don’t blame them for feeling sore the first day or two. A lot of fellows are put through setting up exercises and they are sore all over, but after they keep it up they will work it out and they are better men for it. It improves them morally, physically and every other way.

Every man must begin at the most essential point, that is, preparing the man to perform the duties he is called upon to perform. A lot of you are good firemen. I know there is not a bad fireman in the whole bunch, but I will venture to say I will bring that '5 foot aerial over here and I don’t care what other physical exercises you have been doing, if I send you up that '5 foot aerial and send you into a
smoke filled room your wind is broken before you are in the room. When you go in a smoke filled room you want all the wind you can possibly have. If a man is not physically fit to climb that ladder he ought not to go up there; therefore the training and setting up exercises are absolutely essential to prepare you to do the duties you are called upon to perform.

After we take up the physical training of the man then we start the rescue work, which is one of the most important things in fire training, teaching men how to perform feats of rescue; how to do it with the least amount of spent energy; how to bring a body from the building by the use of a ladder with nobody to assist you; how to carry a body when you can use the fire escape or stairway; how to bring invalids down who have been operated upon. This is very important. For this use what is known as the invalid lift.

After we have taught a man rescue work we teach him first aid. I think it is essential every man in the fire department should understand first aid. Many a time in the small hours of the morning you are called upon to fight fires. Most of the departments do not have regular physicians answer alarms. Somebody gets hurt and it is a wonderful thing to know what to do at the proper time.

It may mean keeping someone from being a cripple for the balance of his life or saving his life.

After we go through our first aid work we start into the fire fighting work. We teach every man first the standard knots that are to be used in his work as a fireman. Now, in a great many cities there used to be a habit of separating the truckmen and pipemen; the truck-
men never did any ladder work. That is done away with in most departments. Every man is a fireman. A truckman must be able to handle a pipe and a pipeman must be able to handle a ladder.

I had one thing called to my attention while here which I want to compliment the people of Champaign on and that is the fact that every man belonging to the department in Champaign can operate a pumper, drive that pumper, act as tillerman or drive the aerial or raise the aerial. I think that's a wonderful thing. How many departments are there that can say every man in department can work the pumper, act as a tillerman or drive a pumper? Very few of them.

I remember several years ago in Cincinnati we had a fire where eight men were killed by the walls coming down on them. This was a general alarm fire and they needed more men. While that fire was going on there were two other fires in Cincinnati. They needed men to handle the line. I said to Chief Barney Houston, "I am not heavy enough to handle the lines, but I can run the engine and you take the engineer and let him help." I was able to relieve that man to do duty I could not perform. In your department something may happen to your engineer. I have known of full companies going to a fire and very few coming back, so it is a good idea for every man to know how to operate every piece of apparatus.

After we have brought him up to that point we start with ladder exercises. That's a very essential thing, not only raising and climbing ladders, but he is taught ventilation, one of the most important things
in fire fighting. If there is any man here that is a chief he will agree with me that every time he rolls out to an alarm and sees the fire coming out of the roof he goes there with an easier feeling than if he sees it coming out of the windows and not the roof. Every time the fire is coming through the roof you have some chance. Any time you have it ventilated you have a chance. When you haven't got it coming out the roof the chances are you are going to have a hard fight and a hard fire to extinguish.

In our fire school every man is taught how to ventilate, where to ventilate and where to open up under certain conditions. All of those are very important things. He is taught all the various hose exercises, how to anchor hose on the ground, roof or ladder. That is very important. Every man is taught to climb the ladder; whether a truckman or a pipeman, he is taught the same thing. Every man has to go through the same thing in the fire school, no matter what his particular assignment is in the department.

After we get them through with the ladder exercises, we start on what is known as the company drill. We bring in two companies, an engine company and a truck company, and every man knows his duty when he arrives on the ground. The truck man knows it is his duty
to put the ladders up and ventilate, the pipeman knows it is his duty to get the lines up.

I want to make a remark here. The city goes to the expense of buying a fine pumper. You have a fine pumper, you also have a chemical, an alarm comes in, you pull up in front of the building with the chemical wagon, go in and only have a small line. You see when you get up to the fire with the small line that the small line is not capable of handling the fire; you have to come back and get the big line. Fires are fought in seconds and fires caught quickly are more easily handled. When you pull into a fire ground with a pumper, connect up that pumper, take no chance. The pumper is there for that purpose, whether you ever use it or not. The hydrant and pumper are there and when you send that small line in, back up the small line with the bigger line so there will be no time lost and I think you will find it pays in the long run.

One of the best friends I ever had, a chief I consider one of the best fire fighters I have ever known,—he was the chief of one of the largest cities in Indiana,—lost his position as chief of the fire department through an accident. He had a lot of pumpers, but in pulling up he would put on hydrant streams and if he wanted more pressure he would call up the city water works and they would give him more pressure. The next day the hydrants in the homes would be leaking. He was warned several times about that. In 1919 when I was conducting a fire school in his city I was asked to speak to him and warn him. I did. He said, "We can handle our fires with plug streams." In a few weeks there was a fire at a lumber yard. He pulled in with his pumpers, but failed to connect them. A high wind came up. The fire jumped across the street and burned out several blocks. There was not a single pumper connected up at that fire. Through that very thing the chief lost his job.

If you have got pumpers connect them up when you get to a fire, even of you don't want to use them. Let the water run through the pumpers and you have it when you want it. I wish you would remember that pumpers are taken to fires to be used and if you don't have to use them so much the better; if you do be ready. When a general goes into battle he sends out his skirmish line, but there are always men back of them to back them up and that applies in fire fighting.

After we have the men trained in those various things we go into the various tools used in fire fighting. One of those tools is known as a life gun. A chief who has never had one of these guns in his department can appreciate what it means. Have you ever taken a crew of men to a roof with a line of hose, gone to work there, and found you could use another stream with the bunch of men you have there, but you have no rope to hoist the other line up? With a life gun a man can shoot the life line up to you and all that is necessary is to haul up your line. I can put a line of hose on any building in this city and I will show them water in a minute and no man will carry a pound of hose up. All I ask the men to do is to go to the roof and when they get there the rope is there. All they have to do is pull it up. You can shoot a life line over almost any building.
Over in Nashville, Tennessee, there is a hotel sixteen stories high. A gentleman who will be here tomorrow, Captain J. J. Conway, said, "That gun will never carry the dart over that building." I don't know whether you gentlemen know the size of the dart. It is a steel shaft on which the rope is fastened. He said, "The gun will never carry the dart over that building." But it did, and we showered water on top of that building in less than one minute. They are very useful, and are not expensive. I am not telling you this to sell you anything. I have no guns for sale. I have nothing for sale and you haven't a thing I want outside of your best wishes. I am not connected with any manufacturing concern. Everything that you see here belongs to me individually and is paid for with my money. I am under no obligations to the manufacturers. The only things that do not belong to me that are shown here are the Gibbs and Burris masks, and I own one of each of those. I show everybody's stuff, because if anybody has anything good, I buy it. I have them all here to show you. I am not saying anything for any particular one over the other. Everything has its merits. I am only showing you what thirty-one years of actual experience in this line has led me to believe has the most merit for your class of work.

I want to say to you if I was a fire chief I would not buy another piece of apparatus until I owned in my department a life gun. They are not expensive. You would pay more for a blown out tire than you would one of these and these will last a lifetime. There is no upkeep. The only expense you have is your cartridges. You don't use them often so that does not run into anything.

I am not going to take too long on any one subject because I haven't the time. We will now take up the subject of life belts. It is absolutely essential that every man in the fire department should know how to slide a rope. I don't know whether you gentlemen ever had the experience of being cut off in a building with the only way to get out by sliding the rope. A man should know how to use this belt and how to handle it, especially in life saving work. I have here a very good belt for the reason it has a brake on it and you don't have to take the chance of burning your hands. You can hold a body with one hand and control yourself with the other. Practically everybody that makes life belts makes that particular kind.

After we get through with life belts we thoroughly instruct every man in the use of the gas masks. I want to say to you that the gas mask is strictly an emergency piece of apparatus and must be treated as such. No department should ever buy one gas mask. When buy-
ing gas masks at least three masks should be purchased. Mr. Fleming talked here yesterday, but he did not give this apparatus of his enough attention. The best and surest and safest thing he has he gave the least attention. That's the Gibbs self-contained gas mask and the Drager Number 1 oxygen mask. I am absolutely opposed to a canister mask of any kind. They tell you you can use those canister masks and they will show you what he showed you yesterday, a little tube treated with certain kinds of acids and when it comes in contact with carbon monoxide how to detect it. If all our firemen were chemists we would not have firemen and when ordered in a cellar they have not got time to make comparisons to see if there is carbon monoxide.

Here is what we use when we send a man in the cellar (showing safety lamp). When we send a man into the cellar, no matter whether he has a gas mask or not, he carries the lamp with him. It will not ignite and the minute you come in contact with explosive gas or carbon monoxide you see your flame commence to rise and then it is time to get out. It is one of the best safety appliances we have. You don't have to depend on chemical analysis. While we are here in the university to learn and we have all the respect in the world for the university, we are all firemen, and if we were all doctors and lawyers we would not have any firemen. We speak in firemen's terms and when we go in burning buildings and cellars we haven't time to make chemical tests. All we want to know is whether we are safe or not and when it is time to get out; therefore the best thing in the world to tell you when to get out, when the carbon monoxide in the air becomes dangerous or when the oxygen in the air becomes less than fourteen per cent, is a safety lamp, unless you have a good self-contained gas mask.

You saw a demonstration here yesterday in that house with formaldehyde and sulphur and an automobile was running a while; with a canister mask fellows went in and walked around. It was all right, a very good demonstration for what you went against, but I will venture to say there are very few firemen in this place but at some time in their lives have not gone against something as strong as that without any mask. That kind of a condition created for tests is nothing; a man knows what he has to go against. But when ordered into a cellar where the fire has been burning you want something on that you know is absolutely safe. You want something that absolutely cuts you off from the outside air and there is only one kind of mask that will do that and that is a self-contained oxygen mask. Everyone of the manufacturers that manufacture these canister masks manufacture these oxygen masks. The reason most of them try to sell the canister mask is that the cost is smaller and it is easier to sell. When a department can buy a mask for $25 or $30 and are led to believe that it is going to fill the bill, you are not going to put $175 or $250 into a mask; therefore it is an easier selling proposition and the buyer takes the line of least resistance.

If you will write to the bureau of research or the bureau of mines at Washington, D. C., they will tell you—they have nothing to gain and nothing to sell—they will tell you there is only one kind of gas
mask to buy and that's the self contained mask, but it is an emergency equipment and must be treated as such and if it is not treated as such and kept up and the men trained, it is absolutely dangerous. Do you think I would go in some fire departments and put on one of those masks and go in a cellar, not knowing what care has been taken of it? It would be like committing suicide. They must be taken care of, examined every two days and men thoroughly trained in them to be safe.

In the bureau of mines do you think those men wait until an accident to practice? Three times a week they have to practice with the gas masks, take them apart, test them and they have to know they are right when the emergency comes.

A couple of years ago I was out to Kansas City. A man was out there, a friend of mine, and he said, "Come out, we want to show you a gas mask." He showed me a No. 1 Drager, one of the highest priced and best masks, but the whole thing was covered with mildew. If a man were to put that mask on and go into a cellar he would be dead in a few minutes, due to the fact that the mask was not properly maintained. What's the use putting money into a thing unless you decide you are going into it right and maintain it and keep it up?

There are different kinds of apparatus. This (indicating) is the canister type and is good in ordinary smoke and most gases. It will handle most of the gases, but it will not handle them all. The next type here is one of the finest types of gas masks made. This is known as the Gibbs self-contained, fits on the back and the oxygen tank is good for two and one-half hours. This has the mouth piece. This is good in mine work and with this you have to use a nose piece and the fellows that wear them get hot, knock the piece off and then they are in bad. That is what is known as the Gibbs type, used by the bureau of mines. This is what is known as No. 1 Drager oxygen helmet. A man puts this on, pumps up his pads and is absolutely cut off from the outside. You can breathe with all the freedom in the world. The oxygen tank supplies him for two and one-half hours. He has a gauge to tell him when to get out, when the oxygen is getting low. This is known as the No. 1 Drager. This is the self-rescue type of Drager. This is a half hour mask and a very good mask for officers, where men only work a half an hour. This machine weighs nineteen pounds, is a smaller machine and is a very good machine in a smaller class of machine. Those smaller machines can also be used with a helmet for the protection of the face. We have the head protection that can be used with any helmet or breathing apparatus. Then we have here what is known as the McCall mask, another half hour mask made by the same firm that makes the Gibbs. We train out men in every class of machine.

Gentlemen, we are going to have a picture taken and then I will go on with another part of the program. When we get through with the picture we will go into artificial resuscitation.

I know I have talked you about half to death, but if I have told you anything that will help you I am glad of it. If I have not, I don’t care, you are the sufferers. Now we will go out and have our picture taken. (Applause.)
Mr. Gamber: We will return here after the picture and Mr. Richards will speak then.

(Picture taken outside of the building).

Chairman Smith: If you will come to order we will continue the afternoon program. Next on the program is Hazards and Exposures by Benjamin Richards, manager of the Underwriters' Service association of Chicago. (Applause.)

HAZARDS AND EXPOSURES

By Benjamin Richards, Manager, Underwriters' Service Association, Chicago

I do not know just what kind of an audience I am speaking to. I imagine it is largely made up of firemen and fire chiefs, so if my stuff is a little technical you will kindly excuse me, because I have been confined, in the fire fighting work, largely to the large manufacturing properties,—properties running from a half a million dollars up to fifteen or twenty million dollars,—and most of these factories, as you know, are especially protected with sprinklers and such things. Don't hesitate to interrupt and ask questions, because this course of hazards could be made to last, as in our Insurance Institute work, a week. One cannot possibly cover it in the forty-five minutes allotted to me, so if there is anything you have on your mind, don't hesitate to interrupt and ask questions.

EXPOSURE

The first subject is exposure. All exposures are hazards. The burning risk becomes a hazard to the neighboring risk, so we classify exposures as hazards. Exposure is probably neglected by property owners more than any one thing. How often we see very fine buildings put up right against a fire trap or no provision provided to prevent a fire trap going up. We are up against that in factory work a lot. The poor selection of a location for any property often nullifies any other good feature one may have. You might spend a lot of money on a fire-proof building, but it can be readily burned out by a bad neighbor. The Burlington building in Chicago was the most excellent fire-proof building, but it was in poor company and when the poor company got to acting badly the fire went through the building, although it represented the best modern engineering. We paid a 60 per cent loss on that building alone.

At Evansville, Indiana, the other day a strictly fire-proof building burned. This was not an exposure fire, but it shows how a fire-proof building can be damaged. Reinforced columns were destroyed that were twelve or fifteen inches thick.

It doesn't matter how good a building is, if in a bad neighborhood; it is no better than its neighbor. A property owner might spend a great deal of money for fire protection such as sprinklers, fire walls, fire pumps, standpipes, hose and all that, yet, if he had a very bad neighbor, these benefits would all be nullified. A good example of that
is the two or three million dollar Naumkeag Cotton Mill fire at Salem, Massachusetts. That mill had several acres of land available when young, but the mill grew and the town grew and the factory help had to live somewhere, so three flat houses were built up to the fences of the mill. The mill people had not bought acreage enough to keep those tenements away, so, when the city of Salem burned, the mill went with it, although there was not a better protected mill in the United States. Everything known was provided to protect the mill, but the fire was too hot and when the tenements burned fire went through the mill and drank up readily all the water applied to stop it. So excellent protection and excellent construction may be absolutely of no use if there is a bad neighbor.

Architects and others advising people about building a house, store or anything else should bear that thing in mind. Nowadays most of our fire prevention work is confined to keeping up production; keeping the store or factory running. It costs much money when a fire stops production, so fire prevention must be considered from a continuity of business viewpoint. Insurance does not pay for the stopping of business, so exposures may involve serious expenses, adding a cost to the investment which should not be there. Blank walls cost money, will cut out light, and handicap the fire chief if you have a fire of your own, yet they are often required to protect against a bad exposure. With an isolated property this expense would not be a factor.

Then we protect window openings with approved fire windows and we protect windows and wooden walls with open sprinklers, which protection saves many buildings. But all these things for protection against exposure are more or less ineffective. Some are only of use in getting the insurance rate. When the property burns it goes just the same and the protection costs the owner money for which he gets little return. He had better go outside the town and get plenty of land to have room enough. Of course a direct charge for the exposure comes in in the insurance cost. There must be a rate for that exposure, otherwise we would be unfair to the property which had no exposure. The state laws will not let us charge one man the same as another when the hazard is different.

Owners and architects could well pay more attention in the cities also to the matter of restriction. Unfortunately in this free country we can build a fire-proof $50,000 house and a man may build a lumber yard or a saw mill ten feet away. We do not have any way of stopping that evil unless there are restrictions in the city code and that is becoming more and more a factor of importance.

Probably the city of Detroit has been one of the notoriously bad examples, with beautiful boulevards and no restrictions, so the boulevards contain $50,000 dwellings and factories and stores, all mixed up. Building was not regulated originally, although I think it is now.

In selecting sites and putting up property it is advisable to get in a restricted location, if one can. The building codes of the towns and cities directly affect this matter of exposure and can safeguard property owners a good deal if properly enforced, but even a vigilance committee or chamber of commerce or the Kiwanis or other organizations in the
town, by moral persuasion, can do a good deal with the building conditions where the town is smaller.

Then, of course, the locations which have notoriously bad reputations are another factor in the exposure. Some parts of your town, as you fire chiefs know, call you out much oftener than other parts of the town. Property owners very often buy a piece of land because it is cheap and put up a valuable piece of property in such a location without taking account of the fact that their building may be destroyed by its neighbors.

I have seen good prosperous industries absolutely destroyed by fire. Although we paid the fire insurance, before they could get going again some competitor had their business, so continuity of production is very important for any industry.

Another thing we find often is that valuable property will be put where there are no water mains. The owner might think and it might be perfectly true that there is a very good fire department in town. Perhaps the water company or the town has not spent money on the water mains, and some fire plugs are rented for $50 a year to the town, but are located only on a three or four inch main. The fire chief is helpless for lack of water and gets criticized for not putting the fire out.

I am glad to hear Chief Wolf say the whole matter of fire fighting is simple, that you don’t need to consider technicalities or fancy business. There is nothing like good cold water to put out a fire, but you cannot do it with two, three and four inch mains, as found in many towns.

Then of course the danger of exposure is also modified a good deal by the quality of the police and fire departments and such things should receive attention of owners building property.

Then the last item is that there are certain districts in certain towns which carry a higher insurance charge than other parts of the town. The property owner should consider that in putting up property because such a rate will be a perpetual charge upon him. Take the lumber district in Memphis, Tennessee, for example,—a couple of miles of lumber yards and saw mills. Insurance men simply have to consider that district mostly as one fire from one to two miles long. Had these plants been separated a bit they would enjoy quite a little less insurance cost. All such things add to the items of expense and are factors when considering exposure.

I recall a good sprinkled candy factory built in a certain town. The owner did not buy a large lot and five feet distant was a four story manufacturing building which helped to keep the fire department exercised. I think they were called down there for a fire on an average once a month. So the owner of the candy factory got practically no benefit from his nice building because of the bad neighbor. He was unfortunate in selecting the location.

Assuming one cannot control neighboring property by the building code but has bad conditions to meet, there are a few items which can be considered, as follows:

I suppose the best protection against exposure is private fire fighting means, such as hose, hydrants and pumps, because you can go out
a few hundred feet and tackle the fire before it gets into your windows and can have the hose laid out ready for the fire department when they get there.

Paterson, New Jersey, experienced a severe fire once. There was a line of silk mills in the path of the fire and having hose they got out and stopped the fire in a perfectly straight line. If they had waited until the fire got to the windows of the mills and for the sprinklers to work, the mills would have been lost.

The next best thing to stop exposure fires, probably, is the blank brick wall, made of good old fashioned bricks. Then assuming there must be windows, as I said, we rely on wire glass, shutters and open sprinklers. Shutters, of course, will save more loss than the other methods because the fire chief can attack the fire freely, if the shutters are shut on the adjoining buildings, and he will not have to wet down that building, as the shutters can effectively keep out the hose streams used on the adjoining fire.

Some of the large congested shoe shops in the east are fixed up in that way. In Massachusetts many of the shoe factories are five or six stories high and the windows, being shuttered, the fire department can operate on a fire to their hearts' content without wetting down the shuttered building. Wire glass in a wooden frame or in an unapproved steel frame is not much use. I had a fire in Detroit where wire glass panels were pushed out on the sidewalk. The unapproved steel frame expanded from the heat and forced the glass out of it, although the glass remained intact until it struck the sidewalk.

When we come to wooden walls of course we are pretty well up against it to fight exposures. We put open sprinklers on these exposed wooden walls. I remember where there burned a seven story wooden sheep skin tannery near a storehouse containing about a million dollars worth of finished calf skins. There was a wooden wall with three rows of outside open sprinklers and by keeping the fire pump running continuously to supply the sprinklers we saved the warehouse. That fire was in a wooden plant, six stories high and only forty feet away, so it was an unusually favorable result from the use of open sprinklers.

Opensprinklers are usually connected to the city water and as the water is under the control of the fire chief at the time of fire, it is not likely to be used for private open sprinklers very much.

The only other protection against exposure is good plaster on metal lath or sometimes metal cladding, which, however, will get hot and ignite woodwork beneath it.

When we come to certain classes of exposures, such as oil tanks, we are up against an entirely different problem. The problem of oil tanks has been before us a couple of years with all sorts of opinions expressed, but the main point is to keep them away as much as you can. If you cannot do that build some dikes or ditches or walls so if the oil gets loose it will not drain to your property and destroy your building. Good old cold water is good protection against oil fires if you can get enough of it.

You have read how the burning oil in the harbor of New York was kept away by the streams of fire-boats by sweeping the surface
of the water with the streams and keeping the fire away from the wharves. That can be done on the ground as well.

When we come to conflagrations, when a city is on fire, of course there is not much we can do with private protection of any kind. Superior construction will help some. In the Salem, Massachusetts, fire, although the cotton mill was all destroyed, there was one building, a three or four story, small reinforced concrete warehouse, with wire glass windows and shutters on the windows (inside shutters and wire glass outside), and although the building was full of smoke and we paid some loss, it was the only building standing in many acres of ruins. So this shows that good construction is some good even in the case of conflagration exposures.

In that same fire there was a four story shoe counter factory and the building was sprinklered. Of course the demands for water in that fire were very heavy. The other towns turned in the water from the so-called Metropolitan water system and there was not really a shortage of water, but the pressure fell so the sprinklers in the top story of the factory did not get water. The top story was therefore burned off, but the other floors, where the sprinklers did get water, held and the factory was operating again in a few weeks. So automatic sprinklers can do good if they have water, even under very trying conditions.

In the Toronto conflagration, the sprinklered Kilgore factory stopped the fire in that direction. The factory was badly damaged, but the sprinklers helped stop the fire and saved much of the factory.

Roofs, of course, become very important when studying conflagrations and you gentlemen know the troubles we have had with wooden shingles for the last eighteen or twenty years.

A conflagration fire does not go from block to block. We were comfortably walking along the streets in the Chelsea, Massachusetts, conflagration, but over our heads burning pieces of roofs were sailing along and they would drop down a half a mile or so in front of us and set the buildings afire. So hundreds of fires were started all at once. That's where the shingle roof proves a bad feature. Mr. Wolf said that he liked to see the fire running out through the roof so he could locate it, but with ten acres of shingle roofs around him he doubtless would divide his department to fight the many fires which would start from sparks and flying brands. On the other hand if there were slate or tile roofs I am sure he could concentrate his efforts on the one fire and not worry much.

Some cities prohibit inflammable roof coverings and require slate. Of course the prepared roofings are good, especially those that have been tested and approved. I saw a little dwelling house fire where some shutters or blinds which were burning fell on a lower roof. The roof was covered with some unapproved roofing paper. It was not entirely new, but those blinds burned up on that roof without setting it on fire, showing that roofing if properly selected is a great help.
GENERAL HAZARDS

Now I come to the other hazards. When we analyze all our fires, whether in a manufacturing industry or elsewhere, we come to the three things, lighting, heating, and general disorder or carelessness. Those cover the cause of 90 or 95 per cent of all our fires. There is nothing very technical or scientific about guarding these things; just a matter of common sense in making those hazards safe.

Lighting—We are not troubled much with oil lamps, but they are not considered safe and if used lamps should be kept well filled so they will not be full of gas. There are good and bad burners. Good ones have ventilation through them so they will not heat up. Of course one must keep lamps clean. That applies to the watchmen's and other lanterns as well as the household lamps.

Gas jets, fortunately, are going rapidly. There was a day when convenience demanded swinging gas jets everywhere and they were always swinging against something inflammable and starting a fire. I have been through cotton mills lighted by gas and you would think they would burn every day, but somehow or other they did not. I don't know why. But the swinging gas jet, of course, is a poor proposition wherever found. We should also avoid rubber gas hose and flexible tubes in all cases.

I am no electrician, so I cannot discuss electric hazards in detail. There is a so-called National Electrical Code, about a half an inch thick. I have had it on my desk eighteen or twenty years. It is too deep for me, but we have men that do know it and use it and we all know it produces very good results. Any casual inspection of any property may show broken fixtures and overfused circuits and general carelessness in maintaining the electric light and power apparatus, and I am sure that the chiefs present will agree with me if those glaring faults are corrected the other matters are more or less minor. We find nails, wires, coins and everything else in fuse boxes and nowadays because of the great demand for household apparatus driven by electricity, we will find double outlets in a socket only built for one lamp. Outlets especially provided for that purpose should be installed. Of course, there are approved devices which are safe and unapproved devices assumed to be not safe.

In foreign countries and in some places in our own country gasoline lamps are sold. Acetylene lamps are also used, but they are uncommon. Some European people are very familiar with the use of such lamps, much more than we are, and they may be assumed to be safe in that sort of family, I suppose. I have no direct records available on gasoline and acetylene lamps.

Heating—Of course the old story of keeping combustible material away from stoves and keeping stovepipes away from combustibles is just as pertinent today as it was one hundred years ago.

Architects and also people that install heating apparatus are careless. A house built with a furnace may have a horizontal flue a little too long. That basement can be plastered or the flue itself insulated and it will help a little. We don't like hollow spaces so we try to get
flues insulated, which is much better than plastering up your ceiling, leaving a hollow space in which fire may spread, and such spaces are very troublesome. Then of course you can always appeal to the economy of a man running a boiler plant. By insulating the flue he is saving his heat and coal.

Gas stoves should not be portable. If they are portable they are likely to set against combustibles. The whole idea is to keep things that will burn away from stoves. If they must be near the wall and the wall is combustible, the best thing to do is to rip off the sheathing and put on metal lath or anything that will prove more or less fire-proof.

There was quite a lot of talk when the single pipe house heater came into the market and to the casual observer that sort of a furnace looked dangerous. There was a lot of prejudice to overcome, especially among us insurance men. The manufacturers have been using quite a little care to see that the one tube furnace is properly installed so the fire record so far has not been bad on those furnaces. If people sweep paper and things down directly on the dome of the fire box there will of course be trouble.

I don't suppose there is any use speaking to an audience of this kind about the importance of keeping flues, chimneys, etc., tight. Chimneys not on a good foundation settle and crack and, especially if the crack is near the roof, then there is bound to be a fire in the attic. A very casual inspection of those chimneys is important in our own homes and other property which we are looking after.

Matches—I suppose when we talk of common hazards the match is the most important thing. The favorite greeting of the American citizen is, "Have you a match?" We are supposed to have them in our pocket whether we smoke or not. That brings us down to the fundamental cause of all fires, which is carelessness. We have not yet found a way to protect against carelessness. The human element is the problem we are up against more than any one thing. We have fire protection and almost everything we can think of. We have efficient and hard working fire departments, but we have still the careless person with us and how to treat him is a problem.

"Moral Hazard"—That thought naturally leads us into the question of moral hazard, which I don't know much about, but it is a very important factor. Mr. Babson the other day came out with a statement, saying a great many more retail stores were in the country than the country could possibly need. In small towns the automobile carries the people to the larger towns and the small town store is up against it. There is not other thing worrying the insurance companies so much as that just now. The moral hazard does not mean always that a man is going to set his place afire, but more often that he doesn't care much whether it does burn or not. It is a hard thing to guard against. If you find carelessness you can make certain assumptions. That's where the fire departments in their leisure time can help a lot. Walk up and down the street, for the presence of your brass buttons has a good effect on some of those people.

I know one chief in a certain city who does not fail to do this
every week. I think there is no town in the United States which has so few incendiary fires. He thinks if he has his men go into these stores and show their uniform and brass buttons he will not have to get out at night to a fire, and the figures show that he is right. He said, “You know I am kind of lazy and if I can stop these fellows I would rather do that than get out of bed and fight a fire.” He even goes so far sometimes, when a stranger moves into town and opens up a store, as to investigate to see where he came from. He gets into communication with the fire chief of that man’s former town and if he finds that the gentleman has had a few fires while over there and that he has moved into a new location probably to keep up the custom, he notifies the insurance agents confidentially and the fire is prevented before it happens.

Care of Ashes—There is nothing wonderful about that to talk about. We still have with us the man who shovels his hot ashes into a wooden barrel. Metal barrels do not cost much, but they are scarce among homes and hardware dealers should stock up on them and advertise them and thus get rid of all the wooden barrels.

I don’t know whether we will have any ash barrels very long by the way oil burners are coming into use. I am on the Laboratory council and have reviewed forty or fifty oil burners for use in dwelling houses. Of course, they have not been used enough yet to draw real conclusions as to their safety. We try to avoid all we can the gravity feed for oil, because if there is a fire in the basement and the pipe is broken the oil keeps on flowing and continues to feed the fire. That is why approved devices require a pump feed, so if anything happens the pump can be stopped. Of course the oil should be kept outside, if possible.

I only have a few minutes so will have to skip many hazards.

Paints, Oils and Spontaneous Ignition—Of course the problem of spontaneous ignition arises in many factories. I reviewed a garage fire where a pair of garage man’s overalls started a fire, which of course is rather surprising to some of us. They were only saturated with mineral oil, but I suppose there was other dirt maybe that helped. When we try to duplicate such a mineral oil fire in our chemical laboratories we cannot do it, but evidently oily rags and overalls should be taken care of if fires are to be avoided.

Gasoline, Benzine and Alcohol—We are all familiar with these hazards. Most of them, except alcohol, have a heavy vapor settling on the floor like so much water. Take the rubber mills, they are full of such vapors, but we have very few fires because we keep all those processes out of basements and pits. There was a building on which a tire and rubber company wanted insurance, but the floor of the room was eighteen inches below the grade and naphtha is bound to settle in such a low place. The insurer did not like our suggestion to correct the defect very well and said he would be glad to insure the building himself. We agreed and excluded that building when insuring the main plant. Before the year was out the building burned twice and a man was killed and others crippled for life. Then the owner wanted to know what to do. I told him to fill it up so the floor would not be
below grade. That was nine years ago. He did it and we insured it and have not had a loss since. Naphtha fumes collect in basements and low places. Some people go to a lot of expense to buy fans and ventilating systems, which generally add to the hazard. The whistle blows, the mill shuts down, the factory stops and all vapors in the vent tubes settle back. They start up at one o'clock and you get a fire. This fellow I told about paid $7,000 for a ventilating system. I suggested filling the floor up at a cost of $180. If we can remember those fumes are like so much water we can drain them to a safe place. There is no use working against the laws of nature. People try to lift them out the roof. They will not go out the roof, they will readily go out on the floor level like water.

**Chemicals**—When it comes to chemicals we are getting into a technical subject. Chlorates are found in dye works. If there are any chemical works in your territory the fire chief and his lieutenants ought to get acquainted with the places where those drugs and chemicals are kept so they will not put water on them. The same is true of carbide in the acetylene generator plants.

**Fuel Oil**—This causes us a lot of trouble. We unfortunately have a lot of ideas which need readjusting to new facts. We think wood workers are bad and metal workers are good, which is true, but we have not adjusted our experiences properly to show the relative profits on those classes. Last year the record for the National Board of Fire Underwriters showed 18 per cent loss on metal workers, that is machine shops, foundries and such shops. The trouble in this class of risk is almost entirely due to fuel oil. Fuel oil is any old thing the oil companies sell, after they have taken everything else needed out of the oil. It is never twice alike. It may have some gasoline in it and when on fire in a tank it is the worst thing you can get up against. When heated it boils over and flows all over the place. In our metal workers there is much of fuel oil used now. We like to have that oil outside and a valve outside so it can be shut off in case of fire. Fire chiefs can get acquainted with oil systems and where the shut off valve is located, because there is no use fighting a fire and feeding it with oil at the same time.

**Dust**—Dust hazards are bad, especially in grain elevators. You know the farmer has explosions in threshing machines. Almost any dust will burn and explode. A lot of these explosions, like that in the big grain elevator in Chicago, occur from a little fire starting a little puff of dust. This ignites and causes a series of other puffs and they progress until by and by the million dollar elevator is ruined. They build up from a little explosion to a lot of explosions, each explosion driving more dust in the air as it goes along.

There is a book published by the department of agriculture which is very enlightening on the dust explosion feature. Dust should be swept up and be kept cleaned up. In a factory it does not make much difference what the dust is, although some dusts are more explosive than others. Steel filings will burn just as will anything else if finely divided. Dust of any nature in any factory is dangerous. There are not many explosions in a cement mill although there are some.
I don't know how I can close this talk (as I should have closed five minutes ago), better than to say there is only one cause of fire and that is, _disorder_, something out of place. Lightning is all right if running down the chimney on an approved lightning rod. I had a chimney 300 feet high insured for eighteen years and lost the top of it the other day. Why? A contractor working around it got careless and broke the lightning rod. When the loss came in I asked our engineer how it happened: if there was not a lightning rod on the chimney? He went to the mill and found that the rod had been disconnected. So the lightning was out of place, being on a rod that was out of place. No matter what fire you have there is always something out of place. A fire is all right in a stove, it is all right in a fireplace, but when it gets out into the house it is out of place. I thank you. (Applause.)

**CHAIRMAN SMITH:** Any of you school boys wish to ask Mr. Richards any questions? If not, on behalf of the school, I want to thank you, Mr. Richards, for the splendid lecture you gave us. There are a few announcements, one is that tonight at eight o'clock there will be moving pictures at the Illinois Union building; plenty of smoke, but no fire.

You know if you turn a wolf outside he can cut up more and take care of himself better than he can when you put him in the cage. We are going to adjourn now and Mr. Wolf will continue his demonstrations out in the balmy breeze and the shade nature gave us.

(Whereupon a demonstration of Resuscitation was given by L. L. Wolf of Cincinnati, on the outside.)

**ARTIFICIAL RESUSCITATION**

By L. L. Wolf, Cincinnati

This is something that every man, woman and child should know because you may never know when you will be called upon to apply one of the various methods of artificial resuscitation to some of your very own. Artificial resuscitation is divided into two classes, manual and mechanical.

While early medical history exhibits a remarkable paucity of literature on the resuscitation of the apparently dead from their state of suspended animation, there is no question but that all seafaring people from the earliest days practiced some form of artificial respiration. The ancient Greek and Egyptian physicians are said to have attempted to prevent death by blowing the breath of life into the victim's nostrils at intervals regulated by their own breathing. Even the primitive South Sea Islanders practice a form of manual artificial respiration crudely similar to our own most advanced manual methods.

It is not to be assumed, however, that this field of medical research was entirely neglected. Many investigators spent time and thought on it, but their work was spasmodic, isolated and unfruitful.

But in the latter part of the nineteenth century, with the coming of an intense industrial and commercial era and rapid advancement in the chemical, mining and medical fields, the demand arose for something better than the crude methods then in use.
Fireman Using Pulmotor.

View of Pulmotor.
The Sylvester and Schaefer methods of manual artificial respira-
tion were among the first to appear and were followed by many others. For a
time these methods seemed to meet all requirements. In the
following years medical science also made remarkable strides. Principles
of physiology were established which indicated serious defects in
all resuscitation methods then in use.

Various commissions appointed to investigate them reported that
by the application of mechanical devices a larger exchange volume
could be obtained and greater regularity developed, and that such
methods were therefore preferable to manual operation. Mr. Bernard
Draeger became interested in this field of life conservation through
his other medical and rescue apparatus, and his extensive and invaluable
experience in supplying oxygen by means of mechanical devices.

After years of experiment and collaboration with Professor Roth
and other physiologists of international repute they perfected the pul-
motor. Several of these were manufactured and submitted to leading
physiologists and demonstrated before medical conventions.

From the beginning the pulmotor received the hearty acclaim its
merit warranted, but because of the failure of all previous attempts
in this direction and the natural conservatism of a true scientist, Mr.
Draeger preferred to allow the machine to prove its value in actual
service, and sell itself without promotion or sales effort.

The pulmotor was on the market, therefore, for nearly three
years before it was generally known. Then came remarkable accounts
of its service in saving life. Hardly a day would pass but somewhere
a newspaper would record its success. Mining companies, hospitals,
public service corporations, metallurgical and chemical plants, found-
ries, fire departments, and an endless list of others installed it.

Today over five thousand are in use and there is scarcely a com-
munity of any size that hasn't the protection of the pulmotor. Count-
less lives have been saved. Its field of usefulness is being broadened
every day. It is now approved both here and abroad as the most
dependable means of preserving life in all cases of respiratory collapse
due to contusions, drowning, electric shock, asphyxiation by pressure,
noxious fumes and gases, drug and alcoholic poisoning—and in obstet-
rical emergencies to induce respiration in apparently stillborn infants.

Indeed, so complete has been its success, that "pulmotor", although
a trademark name, has become almost a generic title for all forms of
resuscitation apparatus. Newspapers, unfamiliar with the facts,
have published articles calling attention to the explosion of pulmotors,
when the device causing the accident was in reality a competitive ap-
paratus. In over a decade of successful, useful service to humanity
no pulmotor has ever injured operator or patient. For your own pro-
tection remember that there is only one pulmotor and that the genuine
always bears the name Draeger.

The vital defects of all manual methods of artificial respiration
are: That they do not supply a sufficient pulmonary ventilation and
must be continued over long periods. As all of them require great skill
and strength, operators are quickly fatigued and must be relieved by
someone equally competent. Again they cannot be used where the
victims received injury in the accident, such as broken bones, abrasions, etc.

The pulmotor overcomes all these defects. It is absolutely automatic. The operator is not called on for physical exertion to attend the patient. It creates respiration identical in volume and cadence with the natural normal breathing of the patient, regardless of his age or physical development. It furnishes him with air enriched by oxygen, speeding his recovery. It can be used on the patient with perfect safety and comfort, no matter how badly he is injured, and its operation is an unfailing guide to his condition.

The pulmotor operates on established physiological principles. In its decade of service to humanity, not one case has ever been found where its use was not beneficial. It has not always succeeded in preserving life, but in those cases where it failed, the victim was far beyond any human aid, and its use positively indicated that life had departed.

The above paragraphs treat with the mechanical methods. We will now go into what is known as the Schaefer or prone pressure method. Follow these instructions even if the patient appears dead, whether from drowning, asphyxiation, or strangulation.

As soon as the patient is clear of the gas or water quickly feel with your finger in his mouth and throat and remove any foreign body (tobacco, false teeth, etc.). If the mouth is tight shut, pay no more attention to it until later. Do not stop to loosen the patient’s clothing, but immediately begin actual resuscitation. Every moment of delay is serious. Proceed as follows:

1. Lay the patient on his belly, one arm extended directly overhead, the other bent at elbow, and with face to one side, resting on the hand or forearm, so that the nose and mouth are free for breathing.

2. Kneel, straddling the patient’s hips with knees just below the patient’s hip bones or opening of the pants pockets. Place the palms of your hands on the small of the back with the fingers over the ribs, the little finger just touching the lowest rib, the thumb alongside of the fingers; the tips of the fingers just out of sight.

3. While counting one, two, and with arms held straight, swing forward slowly so that the weight of your body is gradually, but not violently, brought to bear upon the patient. This act should take from two to three seconds.

4. While counting three, swing backward so as to remove the pressure, thus return to the position.

5. While counting four, five—rest.

6. Repeat these operations deliberately, swinging forward and backward twelve to fifteen times a minute—a complete respiration in four or five seconds. Keep time with your own breathing.

7. As soon as this artificial respiration has been started, and while it is being continued, an assistant should loosen any tight clothing about the patient’s neck, chest, or waist. Keep the patient warm.

8. Continue artificial respiration without interruption until natural breathing is restored, if necessary four hours or longer, or until
a physician declares rigor mortis (stiffening of the body) has set in. If natural breathing stops after being restored, use resuscitation again.

The Care of the Patient—(1) Keep the patient warm. Every precaution must be taken to prevent a gas patient from becoming chilled. To be chilled means a strain on his already weakened vitality. It may kill him or help to cause pneumonia. Wrap him in blankets and use hot water bottles or hot bricks. You can fill a hot water bottle from the radiator of an automobile. Be careful to protect the patient from burns by hot water bottles or bricks against the bare skin. An unconscious man has no way of telling you when he is being burned. A burn may be worse than the after effects of the gas.

(2) Breathing. Remember always: The most important thing is to see that the patient continues to breathe. If he stops breathing, don’t wait for blanket or hot water bottles. Start artificial respiration.

(3) Treatment. Never give an unconscious man anything to drink. It may choke him. Never give whiskey. Whiskey acts on a man in much the same way as gas. It makes a gassed man worse. Hot black coffee is excellent if the man is conscious enough to drink it. When the patient has become conscious keep him wrapped up warmly. He must be kept quiet. He may want to get up or struggle. Keep him down. After he is conscious, turn him on his back if that is more comfortable, but keep him lying down for at least six hours. Even a little exertion is bad and a gassed man may collapse if he tries to walk.

(4) After effects. After the patient is conscious, it is the work of the doctor to see that he does not develop pneumonia or other after effects of gas poisoning. If you have done your best and followed these instructions carefully, you have done much to prevent these after effects.

The Use of Inhalation to Drive Carbon Monoxide out of the Blood. In gas poisoning oxygen used properly helps to drive the carbon monoxide from the blood. To do anything considerable good the oxygen must be given during the first two hours after the man is out of the gas, the sooner the better. Sometimes the patients do not breathe well after they are brought out of the gas. In fact some stop breathing entirely. Even those who breathe normally often cannot get the gas out of their blood fast enough to prevent their being very sick or even dying afterwards. Pure oxygen does not stimulate the breathing. For this reason it is recommended that about five per cent carbon dioxide—which is the gas that is in soda water—be mixed with the oxygen. This makes the patient breathe much more deeply and thus allows the oxygen to drive the carbon monoxide out of the blood very rapidly. The carbon dioxide also keeps the breathing from stopping. It starts breathing more quickly in those on whom it may be necessary to do artificial respiration. It is useless to try to give an inhalation with a tank and funnel or any such makeshift. A properly designed inhaler and close fitting mask must be used.

The commission on resuscitation has examined apparatus on the market for administering the oxygen plus carbon dioxide treatment and finds that at the present time two devices alone are adequate for this purpose.
General Directions for Giving the Inhalation Treatment.—Start using the inhaler as soon as you can after the patient is out of gas. If the patient has stopped breathing, start artificial respiration immediately and have an assistant apply the inhalation apparatus.

In using the apparatus, open the valve at the top of the steel bottle while the pointer on the dial is at 0.

Put the mask over the patient's face. The lower part should go well down on the chin. Press down firmly over the nose. Try to prevent leaks.

As soon as the mask is properly applied, admit the oxygen plus carbon dioxide into the bag and to the mask at the rate not exceeding ten liters per minute. If the man breathes less than the amount fed, the bag will stay full. If he breathes more than the amount, the bag will collapse. As inhalation proceeds, adjust the valve so that the bag does not quite collapse at each breath, but do not give any more than just all the patient takes from the bag, for the gas in the tank will be rapidly exhausted if wasted. Continue the inhalation for twenty to thirty minutes or even forty minutes, depending upon the severity of the case and until the patient is conscious and can answer questions.

If metal bottles of oxygen plus carbon dioxide are not available or become exhausted, pure oxygen should be used. Oxygen alone is, however, a substitute and does not fulfill the requirements for which the inhalation treatment has been designed.

Get the Man out of Gas.—When a man is overcome by gas, the first thing to do is to get him into fresh air quickly. Fresh air does not mean out of doors in cold weather. Many men have walked from a warm room containing gas to collapse in the cold outside air. Take the patient to a room free from gas and comfortably warm. Be quick, but don't be unnecessarily rough. Remember you are dealing with a human being.

If the patient is unconscious, place him on his belly. If the patient is not breathing or his breathing stops, start artificial respiration at once by the prone pressure method. Don't wait for apparatus or anything or anyone else. Get to work with your own hands. A delay of even a minute may be fatal.

THURSDAY, JUNE 18, MORNING SESSION

John Ely, Chief of Champaign Fire Department, Chairman

Chairman Ely: Gentlemen, we have with us this morning Captain J. J. Conway, Superintendent of the Underwriters' Salvage Corps, Cincinnati, Ohio. (Applause.)

SAFEGUARDING THE BUSINESS DISTRICT

By J. J. Conway, Superintendent, The Underwriters' Salvage Corps, Cincinnati, Ohio

Mr. Chairman and Gentlemen: I have been assigned a subject to discuss with you that would take a volume if I were to touch
the entire subject, so whatever I do will be to touch along the high places and leave you to fill in.

I am more than delighted to be here before a body of men engaged in the service that you are engaged in. You can take what you might call the heroes of the country and compare their services. The soldier must be well trained, must be well drilled, must be disciplined and must face death without a quiver. So must the fireman be disciplined and obedient and fearless of any danger that might come to him. But with the soldier his work is aided and intensified by the rattle of the musketry, the shout of his comrades, the fight which aids him in his undertaking, and the result of his faithful performance of duty is the smouldering homes, the remains of cities and the cry of the widows and orphans. The work you are engaged in is the protection of life and property, of the homes of our people. So, when you compare the service or the duty accomplished by the two, the wreath of fame should be placed upon the firemen. Therefore I am proud to be here and add a word in behalf of men so nobly engaged.

It is not a safe thing to get up before a lot of firemen and try to explain to them duties that they should perform and probably know how to perform better than I.

I am not unmindful of dropping into a college one day where there was a fire school. The chief of the fire department was at the blackboard; he gave the dimensions of a steam engine and asked a man to work out the delivery of that engine per minute. One young man worked it out very quickly. The chief turned around from the platform. In the meantime I came in and took a back seat without him seeing me. My safety director was with me. He put this question. He said, “Now, gentlemen, suppose there was a building on fire, a ladder up to the third story window where there was a woman weighing 300 pounds, how would you go about bringing her down the stairway, with the elevator blocked? An Irishman in front of me said, “Make two trips.” So I am prepared to have anything of that kind fired at me. The professor is always going to get something of that kind.

The subject assigned to me is the protection of the high value district, that is, the congested value of any city. That is a large subject and one that has many angles. In the first place, before starting to extinguish a fire the most important thing is to prevent the fire, and the only way to prevent the fire is to eliminate the hazards that may cause a fire and then eliminate those buildings which we may call conflagration breeders and spreaders. These are buildings which cover a large area and are filled with highly inflammable material, with little access for the fire department and the building exposed on all sides. We are slow in doing those things. I see, if I walk through the streets of almost every city, a big frame area going from one square to the other. It is only a matter of time until the fire department in any of those cities is going to be taxed to its utmost to hold the fire in one of those buildings when it starts.

The only way you can hold a fire is to attack it in time and attack it with force. Don’t be afraid to put your streams on and put them on in the proper manner, even if sometimes you are criticized for using
too much water. You will be more severely criticized if you allow the fire to go beyond the bounds of that building. I am going into my forty-ninth year of fire fighting and it is the only salvation and the only way to fight fire in the congested district, hit her and hit her hard and hit her quick.

When you come to the fundamental principles of fire fighting and the protection of the high value districts, the first and important thing is receiving the alarm and receiving it on time. No matter what equipment you have in your station, no matter how well a man is trained, no matter how good your water supply is, if you fail to get the alarm until the fire has gone beyond the bounds which your forces can handle, your equipment and yourself are helpless, so lay stress in getting your alarms in and on time and through a reliable source, so you know you are going to get them in time to attack the fire.

The next thing is to surround your fire. The fundamental principle of fire fighting is to confine a fire. If it is in this room don’t let it get out and if you have to have more force in order to put it out, all right, but with the force you have stop it from spreading. Attack it on the side of the exposure and drive it back in the burned part of the building and hold it there, but don’t start on one side and drive it out on the other. That’s too frequently done in many places where the idea is to strike the flame wherever it is. That you can not do. If you are to save your congested value districts there has to be help from some other source besides the extinguishing source. That’s the last resort.

The shingle roof is responsible for more conflagrations than any other cause. We will take Nashville for instance. A small fire started in a little shack built on posts two and one-half or three feet above ground. There was a planing mill at the end of the lot and the wind was blowing toward it. The story is that there was a slip of a boy living in there with his mother, a colored child, with no money to buy a ball, so he took his mother’s stocking, unraveled it and winding it up, made a ball. They had an open fire place, and as he bounced the ball around the ball landed in the fire. When he got it out it was burning too much for him to pick it up, so he kicked it out of doors. That ignited some shavings and twenty-two homes were lost inside of two and one-half hours. No fire department in the world could meet that condition. The sparks would go a quarter of a mile. They go in this direction and in that direction and you can not keep up with the shingle roof fire. There is no fire department in the world that ever put out a conflagration after it once started. It either burned itself out or the wind shifted and carried it back. So you are helpless if your fire once gets away from you.

Your streams are very important. Many of your towns are depending on what we might call the Holly system, where you pump direct into the mains and depend on the mains for your pressure up to 100 or 125 pounds. It is highly important that you know in every square how many streams you can put on those pipes and still maintain that pressure, because if you go beyond a certain draft on your pipes, if they are not sufficiently large, you are going to reduce each
stream until no stream is effective. So in your towns where you will be called on for many streams for fire extinguishing you should by test determine to your own satisfaction that the flow in that district is sufficient to give you a good fire stream, and really in a heavy fire a good fire stream calls for 100 pounds at the nozzle. Many of you have not got more than 100 pounds on the pipe. Your friction in the pipe itself, what we call loss of head in the pipe, and your friction in the line reduce you materially.

I had an instance of that kind to occur one time. Mr. Archibald was chief of the Cincinnati fire department. He came to my station in a hurry one morning and said, “I have a telegram from town so and so, asking for help.” I could not ride in my buggy,—we had horses at that time,—so I said to the C. H. & D. railroad, “Get some flat cars next to the platform so we can load.” We started for the depot. The thought struck me as I drove past Fourth and Walnut streets. I jumped off the buggy, ran into the telegraph office and wired, “Cut down the streams until they become effective.” I jumped into the buggy, went to the depot and loaded our engines. We were holding a passenger train to let us out ahead. I said, “Let’s jump on that passenger and go up and see what he has got.” When I got there he threw his arm around my neck and said, “That’s what was the matter, everybody was laying lines from every plug and nobody had a fire stream.”

You should know the flow in any particular section and then figure that you want 460 gallons for each one of those nozzles, for it takes 460 gallons to fill an inch and a quarter nozzle with 100 pounds of pressure, and then give orders not to lay more lines than that, unless you put your engines on. That has been the cause of many a man losing his fire, when he put an overdraft on the line. No pipe should be laid in any section that will not deliver the number of streams necessary for practical fire fighting for the worst emergency case, in addition to the consumption. That is, if the daily consumption on those pipes is a certain amount, you figure you want ten or fifteen streams in order to hold that square, then you want to figure that and see that your pipes will deliver that much or at least put in a protest against the pipes not being sufficiently large, so that when the time of the emergency comes and you are lost for the lack of water, you can put the responsibility on somebody other than yourself.

Now, those things will come up slowly. You will meet with opposition. We had a waterworks that was deteriorated years ago and for six years I kept continuously pounding at the city officials and citizens at large, through our newspapers, that it was absolutely impossible with our going consumption for that waterworks to maintain a sufficient water supply to save our city. It took six years of argument and persuasion before we got them started, with the result we ran out of water one year before the new waterworks was built. Then everybody was wondering why somebody did not start sooner. That’s the condition you will find, but that’s only one part.

The part that should have gone ahead of that is that architects and engineers must come to the assistance of the fire fighters. The
fire fighters can not keep up the equipment and extinguish fires in buildings that have been built so fires can spread from one end to the other without stopping, when it is an economical proposition and very easy to remedy. A copper chimney built in a house will not cost in excess of the present method of building chimneys. A safe chimney will not cost $25 to $30 at the outside. Why not compel them to put them in right instead of letting them burn, one after the other? That's one of our most common causes of fire, defective flues.

The next thing after the fire starts,—and this is an instance where the architect and engineer in constructing the building can do more than anybody else,—is to close off the vertical openings and cut down areas, which can be easily done. I see great frame areas going from one end of a square to the other. The building could be used for the purpose it is now used for and there could be a stop in the middle of the building that would save at least half and keep it from getting to that magnitude which might be called a conflagration. An architect or engineer will draft a building, enclose his elevators or stairways in perfect stops and go across the room and cut a six inch hole to take a four inch soil pipe through and leave it that way. They forget there is no crack or crevice that can be left between floors that will not carry the gases and the smoke to the upper floors; when they become filled with smoke that again descends through the same crack, coming in contact with the flame. Then you have an explosion and your building is gone, because that smoke is nothing more than unconsumed gas. When you see the flame of fire you see the consumed gas burning and the smoke is the unconsumed gas and if that comes in contact with the flame again you are going to have an explosion and fire in every crevice that smoke is in. Therefore, one of the most important things, not only to the saving of the property and extinguishing the fire, but to the saving of life, is the proper enclosing of fire escapes so people can get out of the building.

Last night you saw that picture show and you were told, and it was demonstrated by the picture, that these inflammable films will burn under water. That's true. Water will not extinguish them. They make one of the hottest fires you ever witnessed if they are in any quantity, so wherever films are stored they should be stored in fire-proof buildings and only a certain amount, the smallest amount possible to do the business, should be open and on the outside at one time. All they will do is to burn quickly, but the gas generated from them as they burn, if it is not carried off, becomes one of the strongest explosives you have. There is no building yet built that would take any quantity. I mean any fair sized quantity, of films, and stand the explosion that would occur after ignition if the building were not ventilated and ventilated very quickly. Therefore, if I were making rules for storing films, every one of the top windows would have to have weights taken off and be held shut with wires so the minute there is a fire the windows would drop. If they become ignited as they go out a window they will burn anything within forty or fifty feet. A film fire is the hottest flame I have ever witnessed in my life.
In protecting your high value districts you must bring to your assistance several ordinances that will compel the proper construction and then you must bring to your assistance the citizens whose lives and property you are protecting. You must make them listen to you and they must remove those hazards which are dangerous to the entire community.

The littering of a dump was the cause of a fire. With a high wind it caught the fences in the rear, the little coal houses and other things, finally got the buildings themselves and wiped out a fair sized city. At Paris, Texas, the sparks from a locomotive fell on a shed and Paris went. See how small the fire was in the start and how important your early notification and quick application is? That's the whole secret of fire fighting.

The burning of Augusta, Georgia, was attributed to an electric iron left with the current on in a millinery shop. All had their origin in a small way, but spread quickly.

We are throwing the strictest kind of restrictions on the better structures as they are being built and we are paying no attention or have not been paying attention to the old structures.

You take your medical profession. They have found out what is contagious disease, what causes contagious disease and how it spreads, and they are backed up by the strongest kind of laws to eliminate all those things. If it breaks out in your neighborhood, they compel you to go through a vaccination or things of that kind to prevent the spread of it. But, when we leave what we call conflagration breeders in our midst, they not only take ourselves, but our property with it.

The time has come in America when we can not any longer hold down the fire risk. We have the best trained men in the world fighting fire and yet our fire waste is growing by leaps and bounds. We can not depend entirely on extinguishment. We must go out into the field and preach the gospel the same as the medical people and others. We must prevent the improper construction of buildings. We must prevent the openings that will allow the spread of fire. We must require fire escapes and things of that kind for the protection of people who work in those buildings and we have to get laws by which we can remove those things that will cause what you might term a conflagration, or a fire beyond what would be an individual fire or one that would tax your department to its utmost. Supposing you were fighting a fire of that kind today and a fire would break out in the opposite part of the town, where you are? Those are important things.

We are standing on the threshold of destruction all the time. The fire fighters of this country have done wonderful work in protecting property and the lives of the people, but the drain from the fire waste of this country has gotten to a place where it cannot be borne any longer.

There is a false impression and always has been,—and why anybody should have that impression I don't know,—but there is a fool impression that the insurance companies pay losses. How could they and remain solvent? It is immaterial what an insurance company thinks other than to get advice from their engineers who have been
trained along those lines and may be of service to you. They hold within their hands the means to protect themselves. Insurance companies are only collectors and distributors, plus a fair amount for the capital invested, and who is paying it? The inhabitants of that village. That's the reason rates are different in different sections. In order to maintain it they collect in each district as nearly as possible the fire waste, plus the expenses and plus a fair profit, so it is the public that is paying. When the shoe maker pays a premium on insurance he adds it into the shoes. It is added by the leather man. It is added in the tannery. It is added in the factory and in retail sales departments. The man that wears the shoes out pays the whole toll. The consumer is paying the toll all the time.

If the consumer would only realize these costs of fire prevention, fire protection and fire extinguishing and fire waste, which has now got to be over $500,000,000 a year and almost that much more paid in services for extinguishing.—that is twice as much, gentlemen, for your fire waste as it cost to build the Panama Canal! When you built your Panama Canal, or before you started to build it, there was something to do. Men could not live down there. They became victims of disease and what did they do? They went in there and made it as healthy a place to live today as it is here. And so it is with fire fighting. If we will remove the cause of spread and cause of fire, which are very simple and easy to control, we can cut down this heavy cost coming back to the consumer in everything he drinks, eats and wears, although he does not know it is coming back to him.

As long as these conditions exist we have to combat them as best we can, but you leave them with every opportunity to flank us on every side and give us as small a force with as little money to operate our department as possible. In Cincinnati we are operating with twenty-two companies, 182 men and 40,000 feet of hose, less than we had in 1916. That's due to taxes not permitting sufficient funds to maintain the department, but those are conditions over which we have no control and which we have to work with; therefore, throw your great force on fire prevention and throw the responsibility for those things that will cause a fire to get beyond your control on to the shoulders of those that are permitting them to remain. Do not allow yourself to be blamed if the fire occurs.

I told you in the start to hit them and hit them hard. That is your only salvation. If you go to the individual fire, seventy per cent of the loss is damage by water and smoke. In other words, not over twenty-five per cent of the goods, buildings and other things come in actual contact with the flame. But do not be discouraged in any way by how much wet goods you have. You can do something with wet goods and you cannot do anything with ashes. If you hesitate too long with your application of water, you will feel the truth which was recognized when the Bible was written, "He who hesitates is lost." Hit her and hit her quick and hit her with sufficient volume. Be prepared.

Go through your town and see what you may need to hold a fire within certain bounds and see whether you have nozzles sufficiently
large to deliver the volume of water necessary for the heat in the square to be affected. When you have the necessary equipment and can use it intelligently, as it should be used, you have done all you can do.

In fire fighting years ago all one heard was, "Don't let any air in, don't let any draft in." That's the most insane idea in fire fighting there ever was. Get your ventilation. You can not get to the fire until you do ventilate it. If there is an elevator going through the building with a pent house on it, knock that off, knock the windows out in the upper part of the building and let it ventilate. We will say that was the elevator over there. If I could open the top of that elevator and this was a fire I would not have more fire than fifteen feet on the side of that elevator; with the pressure I could come behind with my hose and put it out. As long as I mushroom my fire, keeping that gas in there, I am endangering my men from an explosion any time and I am throwing water into smoke instead of fire, so ventilation is an important thing in fire extinguishing. It took some of us old fellows a long time to get that in our heads. We kept saying to you, better to keep the draft away from it, but after a while we discovered we had something to learn and that was one of the things. Ventilation is one of the most important things there is in fire fighting. Therefore, if it is possible under the forces that you have, drill into your ladder truckmen that it is nothing but ventilation, and immediately after the pipemen come to that fire they will put it out with less cost, less damage, faster and surer in every way.

I had a fellow say to me yesterday around here, as we were talking about something, "You can not teach an old dog new tricks." He is far off the track. All you have to do is to take the old dog and let him run with the puppies and he will learn new tricks. (Applause.)

We are going along and those are important things, gentlemen. Compared with foreign countries we must hang our heads in shame, as their per capita fire losses are so much less than ours. When you ask why it is, some will say, "better construction, better fire extinguishers," but there is nothing farther from the truth than that. They have no better construction than we have and not half as good a fire extinguishing force as we have, but they do this: They hold a man in those countries responsible for anything that occurs on his premises and damages his neighbor and we don't. We go out and condole with the man who had a fire that could have been avoided. Instead of condoling with him we should hold him up before the bar of public opinion as a man injuring the public, unless he can prove in no way was he responsible for the fire. Until we do that we will have this same careless, this same indifference going on.

I tried to show you a minute ago that the costs of this waste come back to the consumer. So it is with everything, it comes back to the working man. We had a fire in the city, village you might call it, not far from our place. There was one large plant owned by the Pullman Palace Car company. One night it burned. Directly afterwards the company decided that they were going to take that shop to Pullman, Illinois. There were 500 men skilled in a certain kind of work, cabinet
makers, and there was no demand for that kind of work in that part of the country. Nobody took notice of it for a week or two. Then they commenced coming across the bridge. It cost fifteen cents to get out to the factories in other places and they had to work at some profession they were not skilled in for one-third the wages they had been getting for the high skilled labor. In another week the butcher shop, the baker shop and the savings associations left and then the town went up in a howl, asking adjoining cities to join with them and go to Pullman, Illinois, and ask the Pullman company to reestablish there. A payroll of $25,000 a week was lost to that city. That is what maintained them. The business men never realized that the destruction of that plant meant the destruction of their business and income. It is one of the most concrete examples there ever was that the loss comes back to everyone.

I keep a chart. I may be off my subject, but I keep a chart of one, five, ten and fifteen years of the hours of day that fires occur and my peak load is on after quitting time at night. My next peak load is on after quitting time at noon. Why the heavy damage in dollars and cents is between ten and eleven at night is because they are the same fires, but are not discovered until late. I go before the working man and show him in his haste to leave the building he lights a cigar and throws the match away or that he leaves electric current on or something else undone, or does not do something he ought to and tomorrow he is out of employment. You have to find the cause. For years I pounded at all the commercial organizations, but I did not get any place because I was talking to the foreman, the superintendent, the owner or stockholder of the place. When I went back to the men they thought I was bringing to them something to restrict their liberties or increase their output. They said, "The hell with you." When I showed them, I reduced the loss from one of the highest ratios in the United States. Notwithstanding the reduction in fire extinguishing equipment, I have held it below the average, but it is not putting out fires, it is the work of getting people to help me prevent fires and getting men to realize that their employment depends on their doing that very thing; maybe not only their employment, but their own lives depend on it and the lives of their families. When I get the cooperation of the working men and people who do things in the factory, then I begin to get my fire losses down.

As you go along you have to bring to your assistance also, by education, those who are employing people and see that they put them in buildings where they are properly safeguarded. You have to bring home to them the responsibility that rests on them for the destruction of any merchandise that may be caused by fire if they can prevent it, because the laws of supply and demand mean that the more I destroy by fire or otherwise the higher you have to pay for the remaining amount.

The fire loss of the country today has more to do with the high cost of living than any one thing I can point out, so I say to Mr. Factory Owner or the corporation or whatever it is, you owe it to us and also to the people, that you put devices in your buildings which will
assure the protection of buildings and the people that occupy them. I call to his attention that the first thing a first-class purchasing agent does when he puts in an order is to find out the ability of the factory to deliver at a certain period the goods he orders. If it is subject to fire and destruction by fire, the other fellow is out. He will not place his order. The installation of the automatic devices to give an alarm so the fire department can get a quick application, that, I want to repeat, is the whole secret of fire fighting. By the installation of automatic switches, by the closing of vertical openings, a building can be made as safe as though a one story building. If that can be done, why not do it?

Those are the lines we have been working along,—education, to get the organizations to see that they have a further duty than the mere making of money, which would cease the minute the factory was destroyed; that nobody cares to place an order with a place apt to go up in flames at any time and that it was an injustice to the public to maintain such a place. Those are the things that brought success to us and might bring success to you if followed in the same line.

Fire fighting is a science; it is an art. It can not be learned from books. You can learn it and talk it, but when you get on the firing line you are lost. It takes a man of experience, a man grown up with it.

I have gone over my time and have not touched the subjects dearest to me. Not having known I had gone so far over the time, I got a little frightened, due to the fact we are running on daylight savings and my watch is an hour ahead. But those things, gentlemen, are highly important in fire fighting.

You will hear somebody criticize you for having a great water damage. We will say in a six story building you had a fire on the top floor, how else were you going to put it out? Those standing on the outside may think it excess, but you don't. You knew what you were doing under the circumstances. You can give a little more service and a better service and prevent a great deal of that criticism by going along the lines I explained to you.

Years ago when we went to a fire we thought our only duty was to extinguish the flame and return to our house ready for another. Later on we realized by carrying brooms, shovels and things of that kind we might clean up and prevent the water from doing a further damage by getting it out of the building as soon as possible after the fire. If seventy per cent of your fire waste is coming from water and smoke, that can be cut in two.

A year ago I came back from Los Angeles, where I went to help Chief Scott in the training of his men. He put two complete crews in. That's all right for a residence district where you are only going to use a few coverings, but in the heart of your city you have two on number one, three on number two, four on number four and some fellow wants a cover, but he is beaten to it; he runs to another wagon and is beaten again. If you get one piece of apparatus with one man to bring it to the fire and use whatever spare men you can to use those covers at the fire, you will do a great deal towards cutting down
the waste and criticism of excess waste of water. You can not put out fire without water, but you will find you will go into this work and probably be retarded from taking it up by the idea you are saving something for the insurance companies. That's not true.

I followed that thing the country over. They started a few salvage corps, twenty-one in the United States, because they saw it could be demonstrated that they were of great value to the public and to the citizens that maintained them. Out of that grew the present fire department. Many of you here are older than I am and you remember the time when you would go along the street and see a fire up on the house. The Aetna Insurance company, or some other insurance company that had volunteer companies, would put it out if it was insured in their company, but if it was not they would go home and leave it for the other fellow. Soon the people realized there should be protection for all property, whether insured or not. Then came the volunteer fire department, out of which grew the paid fire department. We have grown up now to the most scientific apparatus known. We can go farther and cut down the waste caused by water by carrying a few covers without very many additional men in smaller places and only using those men spared from some other work.

I have taken up a great deal of your time and want to assure you it has been a great pleasure for me to have been here and I would like to have had more time to have laid stress on some things I know. Before sitting down I want to say one word. Too many people, including ourselves, are a little bit peeved or distressed if somebody says that something we did yesterday was absolutely wrong. The first thing we want to do is to get that out our heads. When we come home from a fire call we should sit down, the chief, his assistants, captains and lieutenants, and say, “Boys, we had a fire at such and such a place, what did we learn, what happened over there, if it should happen tomorrow would we do the same thing?” Get them to realize you are not criticizing that fire, but want to find how much education came to you and them from fighting that fire and what you might avoid the next time, if a mistake was made. With that cooperation and discussion among your own men, as to whether there was any way that they could have done better, you will bring education into the department that will be highly valuable. I thank you ever so much. (Applause.)

DISCUSSION

Mr. Gamber: Mr. Chairman, I was a little timid in the introduction of Captain Conway, knowing him as I have for a number of years. I knew he was timid and I did not want to say some of the things before he started. He is like a schoolboy; you can sweep him off his feet. What I want to say is that I have known Captain Conway for eight years. Captain Conway performed one of the greatest services for firemen, and especially his home city, Cincinnati, that has ever been performed by any fireman in the world. Years ago Captain Conway started in Cincinnati when the rates of insurance there were something like nine or ten dollars per capita per year. Captain Conway
took the matter in hand and today Cincinnati enjoys the lowest fire insurance rate of any city of its size in the world. That's the record he has made. He studies it, he eats it, he sleeps it and he is always working on it. He is always on the job. It is the experience he has had. He has gone through a severe school of experience.

Some fifteen years ago—I am going to say this, he is here and seems to have grown a little stouter since then—in the Presto-Lite fire in Cincinnati, Captain Conway was blown. I don't know how many feet, through the brick wall and lay at the point of death for about nine months. After he got on his feet he studied it over and began to wonder how it happened and why it happened. He has taken up this work throughout the United States. He knows how. He gets it over and if some of the rest of us would attempt to go out and say some of the things Captain Conway does, the fellows on the National Board would jump all over us and walk on us, but Captain Conway gets by with it and says the things that ought to be said and brings them home to the National Board fellows and makes them like it. I have asked Captain Conway time and again to tell me how he does it. He says, "Go to it, tell them the truth and they will like it."

I feel it is in justice to Captain Conway that I say these things and before we go to the next subject I know some of you have some things on your mind you would like to ask him. The captain made a study of all this work and for the next ten or fifteen minutes let this be a school room and let's ask the captain questions. I know he will be more than delighted to answer them for you, if it is within his power.

CHAIRMAN ÉLY: Any question anyone wants to ask?

MR. CONWAY: While you are thinking of the questions, I would like to tell you a story brought to my mind by that after-introduction. There was an Irishman living in Middletown, Ohio, who did not have any education. I don't know what we would have done with him if he had an education. He broke up every meeting we ever had. He belonged to some building organization or an organization of a bank there. They broke up. He had some of his money in it and as time rolled on the president of the bank called the creditors together and explained how the disaster came about, told them he felt so badly about the thing that if it were possible to cut up his body and divide it among those that lost money, he would be perfectly willing to do so. The Irishman said, "If you do give me your gill."

MR. WOLF: Gentlemen, if I may say a word. I don't think anybody knows Captain Conway any better than I do. I want to say the only thing I have against Captain Conway is that he consumes more cigars for a man that does not smoke than any man you ever knew. As soon as we get on the ground the captain comes around feeling for cigars. He don't smoke them, he chews them.

I am from Cincinnati and we all love Captain Conway for what he is and what he has done in the past. There was a testimonial dinner tendered to Captain Conway by the best people of Cincinnati, the business interests, the banking interests, the working interests,—everybody tendered him a wonderful testimonial dinner and we are all proud of Captain Conway in Cincinnati, not only for what he has done, but for
what he is still doing. Everything we have in Cincinnati in the way of insurance rates, fire protection, fire insurance, etc., I think we owe to Captain Conway. If you will stop to think, your theatrical inspections, the inspection of theatres and the fire-proofing of theatrical scenery, originated in Cincinnati; your first big clean-up campaign originated in Cincinnati and Captain Conway is responsible for it all. We love him not only for what he has done, but for what he is, and we are proud to know he is from Cincinnati and I am proud to be his friend.

MR. CONWAY: It might be interesting to know why in fire prevention work the clean-up and paint-up was put in. If I had stayed on fire prevention I could not have brought up the interest. I took in sodding and beautifying the lawns and explained to the people the reason of the painting was conservation, the protection of wood and wire and other things from deteriorating by rust, and by taking in the whole thing by and by I got a fellow in a square to plant some flowers. His neighbor got jealous and did a little better, so that's the reason we added that slogan, clean-up and paint-up. The whole truth of the matter goes away back to the introduction of the tooth brush and the white collar, which brought the American people up more than anything else. That was a clean-up movement when we did that.

MR. WOLF: Captain Conway turned every dump and waste spot in Cincinnati into a beauty spot. He took places here and there, dumps, and turned them into flower gardens.

MR. HAWK, Moline: I would like to ask the captain a question, in regard to the difference in fire losses in Europe and this country. You say they hold a man responsible for a fire in his property in the old country. We don't do it here. Now, captain, would you suggest that we start in with our city officials or state legislature and state senators to get a remedy for this. We must have a remedy.

MR. CONWAY: We have already got a law if we would attempt to enforce it, but we have allowed that law to become a dead letter by remaining silent. We ought to put the burden of proof on the man who has the fire as to the origin of the fire and prove he was not responsible.

We have a law in Cincinnati that will permit us to tax the man who has a fire, if the fire is caused from any reason or from any cause that we have asked him or served notice on him to eliminate and we have now pending a case where we charged a man on Main street $600 for extinguishing a fire. Those things are helpful and if they know they have to pay for the extinguishment, where the fire is brought about by their own carelessness, in addition to the taxes they are already paying, that is a good help.

You let some fellow with no insurance get his building burned by the carelessness of his neighbor and see how quickly he will sue his neighbor and take damages. That's on the statute books today, but we have not enforced it and we have gone on condoling with such a man the same as we are condoling with the fellow running over people with his automobile in the streets today.

I was talking with a Pennsylvania safety man who told me of a case where a railroad parallels the road for three-quarters of a mile.
There was an automobile running along here and the train there; about three-quarters of a mile away the train crossed the road. There were 63 cars in that train and that damned fool ran into the 48th car. He said, "I thought the train would get by before I got there." And we still allow that man to drive an automobile.

The question you put, my friend, is very proper. What you want to do is to create a sentiment for the thing. Show the people it is their pockets that are being picked, it is their expense that is being run up, and in that way you will arouse public sentiment; and with public sentiment once thoroughly aroused on any subject, the end is accomplished. A law that is not popular with the people cannot be enforced. It is the same with everything else. We have a mission. Our mission is to educate the public and change their attitude of mind. Take those they have been condoling with and hold them up before the bar of public opinion so they must show they are in no way responsible for the fire and the whole thing will change; just like the clean-up, when two men cleaned up they all cleaned up. (Applause.)

CHAIRMAN ELY: The next address on the program will be on the subject Fire Alarm Systems, by F. A. Raymond, Consulting Engineer of the Gamewell Alarm Company, Newton Upper Falls, Massachusetts.

FIRE ALARM SYSTEMS

By F. A. Raymond, Consulting Engineer, Gamewell Alarm Co.,
Newton Upper Falls, Mass.

MR. CHAIRMAN AND GENTLEMEN: The subject that has been assigned to me is Modern Fire Alarm Systems. The time allotted will suffice to give you merely a bare outline of modern fire alarm and watch systems, their construction, maintenance and operation.

The electric telegraph, in various forms, has superseded largely all other means of transmitting alarms of fire, especially for municipal purposes. To be sure, in some small communities, notice of fire is yet given by shooting a gun, hammering on an old iron tire, by ringing a bell, or blowing a whistle.

A few communities rely upon messengers or telephones, notably St. Joseph, Mo., and Kansas City, Kan., among the larger of such places; but, pretty generally throughout North America, and in the larger cities of most civilized countries, transmission of fire alarms is by telegraph circuits from boxes or stations on the streets or in buildings, either directly to the fire stations or to a fire alarm headquarters, whence the alarms are re-transmitted, either manually or automatically, to the several fire department stations, to bell towers, whistle blowers, etc. At this fire alarm office are received also alarms from private alarm systems having connections into the office, or from the telephone exchanges.

A system of this kind, or a modification thereof, is the only type of system recognized as reliable and satisfactory by authorities generally; it is the only type considered by the fire underwriters as worthy of recognition in entitling the municipality to the benefit of the lowest rates.
The fire alarm telegraph was one of the earliest successful adaptations of electricity to practical uses, coming shortly after Morse’s invention of the electric telegraph, and long before the incandescent lamp or the telephone. As the result of Morse’s first long distance telegraph in 1844, Messrs. Channing and Farmer invented the fire alarm telegraph in 1847 and the first complete system was put in service in Boston in 1852.

The Channing and Farmer patents were acquired by John N. Gamewell; the company established by him and its successors have constructed ninety-five per cent of the municipal fire alarm systems in North America, besides many in other continents.

The basic idea of the Channing-Farmer, or Gamewell system, is that used today. Instead of requiring the services of a trained operator to transmit signals, as is necessary with the Morse telegraph, Channing and Farmer conceived a system whereby any person, no matter how stupid or inexperienced or excited, could instantly and by a simple action send definite information of the outbreak and location of a fire.

The turning of a break-wheel, or code wheel in the box, actuated by a crank, weight or spring, causes, through suitable break contacts, the alternate opening and closing of an electric telegraph circuit, thus transmitting over the circuit a number predetermined by the teeth cut in the break-wheel. The opening or closing of the circuit causes the operation of suitable manifesting and recording instruments located in headquarters, in engine houses or bell towers.

Ownership of systems for general public protection, with boxes on the streets and circuits running directly to the public fire department, is practically always vested in the municipality.

The growth of the modern factory system, the increase in number and extent of schools, hospitals, correctional institutions, department stores, warehouses and terminals, all made it necessary to provide additional devices to warn the occupants or inmates in case of fire, and at the same time to call the private fire brigade or the municipal fire department. There is need also for drilling employes or attendants to be prepared for emergencies and to prevent panic in case of actual fire.

In recent years several states have enacted laws requiring the installation of interior fire alarm and drill systems in factories and public institutions. These vary in size and scope from a simple local alarm circuit, with plain pull boxes and gongs to warn the occupants, to the elaborate systems arranged to permit the drilling of occupants in any section of a building or group of buildings, without disturbing other sections and without any interference with fire calls that may be sent in while a drill is going on.

Many of these private alarm systems make use of the same high grade alarm apparatus used in the municipal systems, and some of them are equal in extent and cost to that of a considerable city. Such are those of the New York Central railroad at Grand Central terminal, the Pullman company at Pullman, Illinois, the General Electric company at Schenectady, the United States Steel Corporation at several plants, the Pennsylvania railroad at various shops and terminals, and many
others. As a good example, the Ford Motor company owns, maintains and operates, a fire alarm and guard (watch) system equal to that of the average city of 60,000, using the same high grade apparatus throughout.

Observe that I did not mention colleges in the list of institutions maintaining fire alarm and drill systems. Unfortunately, many of our institutions of higher learning are as yet in the dark ages as regards fire protection. With thousands of lives at risk in dormitories and class rooms, with millions of dollars invested in buildings and contents, and some of those contents irreplaceable, few of these institutions have any fire alarm system worthy of the name; probably none have systems as suitable and efficient as those usually to be found in our large factories.

Occasionally we read of loss of life from fire in college dormitories; a delayed alarm is usually the proximate or remote cause of the loss, coupled with absence or faulty construction of fire exits.

Cornell university is one of the largest and best managed among the eastern colleges. In December, 1906, they had a fire in a dormitory about 4 a.m. No alarm system; loss $300,000 in money; six killed and five injured. That would be enough for ordinary people, but educational authorities are conservative, so they waited a little. In January, 1908, only thirteen months later, they had another serious fire, but only one student was killed this time. Whereupon the college authorities decided it was time to provide means to call the fire department at least, and fire alarm boxes were installed in the larger buildings.

The list of public school horrors is a long and growing one; no section is immune and all are culpable. Flimsy construction, locked doors or blocked exits, and no means of calling the life savers, that is to say, the fire department. The records of the National Board of Fire Underwriters show an average of five school fires per day for several years previous to 1924, with an average annual loss of six and one-half millions. The records do not tell us how many were killed and injured, but we know it is a sad list.

Fire drills are very well, if facilities are provided to call the firemen and start the drill in time to prevent panic and save the children. Remember, they had a most successful fire drill at the Peabody school on October 27, 1915; the next day twenty-one girls were burned to death while attempting to march out during a real fire; a passerby called the firemen. But, I have disgressed far from my stated subject.

With the increased size of factories, schools and other institutions needing special protection, there developed a practical need for reliable means of operating the street box from inside, without going out; something in the nature of a long arm that could in effect reach from the place of the fire out to the street corner, so that attendants or teachers or nurses could send an alarm without leaving panic-stricken or helpless inmates to be overcome by smoke or flame.

This need was first met by an auxiliary fire alarm system in 1885. Later improvements have made practical what is called the "shunt type" auxiliary service, which employs a circuit running through the building and deriving its energy from the main line, without making
the operability of the main line dependent upon it. The inside circuit
is controlled by closed switch boxes of a simple type, operable in a man-
er corresponding to that employed for sending alarms from street
boxes. The operation of any one of these switch boxes will cause
the operation of a master box to send an alarm over the main circuit
and in turn, to disconnect the inside circuit from the main line. Other
features may be combined with these auxiliary systems so that local
gongs may be sounded to warn the occupants in case of fire, and selec-
tive devices may be used so that an accidental break in the inside cir-
cuit will not cause the operation of the master box. The latter arrange-
ment has met with specific approval by the National Board of Fire
Underwriters.

Another class of systems includes those owned and maintained
by service companies under lease. Most of these companies first in-
stalled messenger call service in subscribers’ premises, and have gradu-
ally added to their activities the furnishing of burglar alarm, sprink-
ler alarm, watchmen’s supervisory and fire alarm services. In some
cases, the fire alarm boxes used are of the auxiliary type, which oper-
ate master boxes connected directly to the municipal fire alarm cir-
cuits, or to the circuits of the service company. In other cases the fire
alarm boxes are of a cheap design developed from the messenger call
box, and connected to the circuits of the service company, from whose
office the fire alarms must be re-transmitted to the municipal fire alarm
office; this re-transmission incurs an extra delay in getting the alarm to
the fire department. Evidently such services duplicate the municipal
system to an extent.

Sprinkler leakage and supervisory systems are operated in con-
junction with some of these service stations. Other forms of service
include automatic or thermostatic circuits, so arranged that the expan-
sion of metals due to heat from a fire, or the expansion of air or
volatile liquid in a tube or closed container, will either close or open
an electrical circuit, and thus sound an alarm at the service station.

The watch service just referred to ordinarily consists of boxes or
transmitters connected on circuits leading to a service station where
signals are received on tape registers, at which routine signals should
be checked and recorded and from which fire calls should be forward-
ed to the fire department. Such boxes are supposed to be so located
as to compel the watchman to patrol the premises at predetermined
intervals (usually hourly) and by a selected route. Because of the
expense incident to the installation and operation of such systems, their
use has been limited to the larger cities; in Illinois, for example, I
understand that only six cities have such service.

Obviously, thousands of factories, stores and institutions are out-
side of the territory served by such companies.

Where the municipal fire alarm is inadequate, as is all too often
the case, the telephone is resorted to as the only ready connection to
fire headquarters. How inadequate this may be in case of a fire dis-
covered by a passerby, and especially when the factory or other prop-
erty is not in operations, it is needless to explain. In the case of the
ordinary industry, operating forty-eight hours per week, less holidays,
for seventy-two per cent of the time the telephone is unlikely to be available to an outsider who discovers a fire. If a house burns down, one or two families only are ordinarily affected; but if a factory burns, on which a large part of the town’s people depend for a living, the whole town may be ruined.

Obviously the fire department must act on all alarms, from whatever source received; but as a means of transmitting fire alarms, the telephone has proven highly unsatisfactory. Every fire chief can tell of many instances where dependence on the telephone has caused delay in receipt of alarms, of confusion in answering them.

Few persons can correctly or intelligibly transmit a fire alarm over the telephone, under the influence of the excitement caused by the fire, especially when the fire is in the property of the person calling. Where the alarm is coming from a person of alien birth, as often happens, he will in his excitement revert to his ancestral tongue, and then the troubles of the harassed fire alarm operator become truly lamentable.

The fire alarm telegraph speaks a universal language; it offers readily understandable means, whereby any person, no matter how ignorant or stupid or excited, may by one simple action send in definite and instantaneous information of the location of a fire.

As the fire alarm telegraph was one of the earliest practical adaptations of electricity, so it has been one of the best engineered. Every part and device in use today has been designed, improved and re-designed. Let us discuss briefly the device with which the public is most familiar, that is the street fire alarm box, and consider its evolution. The first fire alarm box was merely a wooden box of the still familiar “cottage” shape. This contained an ordinary Morse telegraph key, with a notched wheel, whose teeth, when the wheel was rotated, would open and close the circuit by depressing the key and permitting it to snap back; the wheel was operated by a rotating shaft with a crank handle. The instructions on the inside of door were: “Turn the handle six times slowly.”

It was soon found that some users would turn the handle so fast that no intelligible signal would result, while others would turn it so slowly or irregularly that a similar result would ensue. A reducing gear was then added, and instructions were changed to “Turn the handle twenty-five times slowly,” but with little better result. Then a clockwork mechanism was designed for rotating the notched wheel at a uniform speed, whether the handle was pulled slowly or jerked, or if it was held after pulling. Then trouble arose from persons attempting to send in alarms concurrently. This caused a confusion of signals termed “interference.” The confused signals failed to guide the firemen to the fire, or sent them to the wrong locality, so that they were not available when a correct alarm was received later. It required eleven years of study and experiment by inventors and mechanics to overcome the difficulty of interference.

Shortly after the advent of the non-interference box, cases were noted where different boxes were pulled concurrently, (that is together or nearly so) for different fires. The non-interference boxes prevented interference of one signal with the other, but caused the loss of
one alarm. Then followed another long period of experiment, invention and test. Many difficulties were overcome, and we now have the “positive non-interfering succession box.”

The original fire alarm invention contemplated that ordinarily there would be a manually operated office, to which alarms would go, and where trained men would send them out to the engine houses, pumping stations, etc. It quickly developed that the cost of such attendance would be prohibitive in a small community, and the general practice in these places became that of placing the engine house apparatus directly on the box circuits.

With the extension of these systems arose the difficulty of interference between signals from different circuits. The invention of the automatic repeater, to whose perfection many inventors lent their aid, has taken care of this difficulty. In connection with the non-interfering and succession box, this invention made it possible to operate a relatively large fire alarm system without having operators on duty.

There is little time to discuss the various kinds of engine house alarm apparatus. It is sufficient to state that the recognized standard required that in large communities there shall be two circuits from fire alarm central extending into each station. Each of these circuits must have signal manifesting devices, including a gong or tapper on each one, with a tape register transferable to either; additional devices are often connected.

Some of the fire station alarm devices accomplish rather ingenious results. At one station I have visited, this was carried so far that at the first stroke of an alarm signal, the bedclothes were snatched off the firemen; the lights were turned on; the pole-hole covers were drawn up; a trap door was opened over the driver’s seat; the horses, already bridled, were released from their stalls and driven by a blow from a whip to run in front of the hose wagon, where their traces were automatically hooked to the whiffle-trees; and the doors were opened. By the time the driver could drop through the trap-door to his seat below, the horses were ready to run. This company claimed the world’s record time for getting out of the station.

Street boxes at first were of the locked and detached key type, and keys were distributed to nearby houses and were carried by policemen, firemen and other responsible citizens. There was trouble because a family living near the box and holding the key would be absent when a fire occurred, or would mislay the key, or would move away and take it with them; or some irresponsible person would remove it. Many methods were tried in the attempt to overcome this difficulty, give the public prompt access to the boxes, and keep down false alarms.—keys trapped in the lock; door opening keys or handles covered by a glass guard; keyless doors with lever handles and a local gong to warn passers-by that the box is being operated; a glass panel over the pull hook. Finally there was evolved the quick-action door. (Demonstrate.) The pull-hook is visible behind a hinged weather shield, which can be instantly dropped to gain access to the hook. The public does not need to get inside the box, thus removing one cause of dirt and water getting to the mechanism.
Fire alarm boxes and circuits are necessarily seriously exposed to damage, from both man and nature. The weather-proof metal outer box with locked door, and the inner case with glass cover takes care of most of the box troubles due to exposure, but there remain liability to damage from storms and lightning, and from crossing of fire alarm wires with wires of other electrical systems.

The modern types of lightning arresters take care of the lightning hazard very effectively; these include the multiple discharge gap, the carbon block, and the vacuum or gas-filled tube spark gap types.

In the early boxes little attention was given to questions of insulation, but with the advent of lighting and power circuits it became evident that boxes must maintain a high degree of insulation of the current carrying parts from the mechanism and case. (Demonstrate.)

The early fire alarm circuits were built of bare iron wire fastened to poles or to any convenient tree or building. Rust and corrosion eventually brought into use hard drawn copper or copper clad steel wires, insulated with two or three braids impregnated with a weather-proof compound. The increasing number of wires on the streets gradually brought about the joint use of pole lines for all classes of wires. It is customary to place the fire alarm wires below the electric light circuits, since these are stronger and less liable to fall; the telephone lines are placed lowest, since these are lighter and more subject to breaks.

Increasing congestion of wires in the thickly settled portions of our cities finally compelled the telephone lines to use serial cables, or to go underground in cable subways. They are being followed slowly by the telegraph, lighting and municipal wires. Cities, in franchises, have generally insisted on segregation of signal wires in separate duct systems from power wires, and have reserved one or two ducts for municipal purposes; it appears that a single duct is often insufficient for municipal purposes, except in outlying streets.

After long experiment, the fire alarm profession has come generally to the conclusion that, for reliability and durability, cable conductors must be of copper wire, insulated with a high grade rubber compound, and enclosed in lead sheath. This type of cable is called for by the Underwriters, and the International Association of Municipal Electricians has adopted specifications for both underground and aerial cables which are accepted as standard.

The specifications merely provide good cable; stress must be placed on proper installation, for much good cable has been damaged by careless handling. Where the municipal construction force does not include capable cablemen, it is customary to have the cable manufacturer or the telephone company install the municipal cables.

For many years the operating current for fire alarm systems was obtained from primary batteries. At first these were of bluestone gravity type; later the caustic soda or Edison primary batteries were used; the latter were expensive to renew, and the bluestone cells were sloppy and difficult to insulate. About 1895 the lead plate storage battery was adapted to fire alarm use; the first crude charging boards were greatly improved, especially by engineers of the Gamewell com-
pany, and today nearly all municipal fire alarm systems are operated by storage batteries in duplicate.

The Gamewell company has been mentioned frequently, since it was the original and still is by far the largest company in the fire alarm field. No description of the art could omit reference to the Gamewell company or its engineers and inventors. Numerous rivals have arisen at various times to dispute its lead; all but the most recent of these have eventually fallen by the wayside. Of all the 1,600 odd municipal systems in the United States and Canada, ninety-five per cent are Gamewell and the remainder use generally some Gamewell apparatus. One thinks of Gamewell in connection with fire alarms as naturally as of Bell in connection with telephones, Morse with telegraphs or Edison with electric lamps.

Use of Telephone—Concerning the use of the telephone the National Board of Fire Underwriters has summed up the situation in the following statement, probably better than anything the speaker could compose:

"The prime requisites of a fire alarm system are accessibility, speed of transmission and reliability, all of which are lacking in the telephone system... The handling of fire alarms are duties which pertain strictly to the municipal fire department, and the delegation of these duties to private or disinterested parties is fundamentally wrong. The waste of time incident to the repetition and rehandling of alarms, the lack of recording apparatus and of notification to call men or volunteer members of definite locations, the lack of ready means of calling additional men or apparatus, and the danger of incorrect locations being given or received, are all features causing serious delays in response and in extinguishment of fires in the incipient stage, and may at any time be the immediate cause of a conflagration."

Numberless cases could be cited where serious losses, as indicated in the National Board statement, have been incurred, because of dependence on the telephone. I will refer only to one recent example, the Kansas City Automobile Show fire of February 13, 1925. The Underwriters' report on that fire says: "The watchman claims to have turned in an alarm by telephone at 11:15 p.m. by his watch; he claims the fire department did not arrive until 12:12 a.m. A passerby gave the alarm verbally to Hose Company 16, three and one-half blocks distant, at 11:58. The efforts of the fire department were of little avail, due to the great delay in receiving the alarm."

The National Fire Protection association, in conjunction with the engineers of the American Telephone and Telegraph company has worked out an arrangement which aims to reduce so far as possible the delays and errors incident to the handling of telephoned alarms. This arrangement is fully explained in the National Fire Protection association Regulations for Municipal Fire Alarm Systems, which may be obtained by anyone, free on request. The regulations are the standard for the National Board of Fire Underwriters and close adherence to them will assure the fire department of the best grading for this feature of the fire alarm service.
Until recent years there were no written standards for fire alarm systems. When the National Board of Fire Underwriters took up the inspection and testing of municipal fire alarm systems in 1904, the need became evident of a standard to which inspectors, city officials, manufacturers or others could refer when new or improved systems were under consideration.

In 1908 the National Fire Protection association produced these rules, now known in the trade as the Red Book. They are revised from time to time; the latest revision was this year.

Corresponding rules for other protective signaling systems affecting the fire hazard have also been issued and are printed in the Green Book, also revised this year. These systems include: Central station service, auxiliary and private alarm systems, sprinkler supervisory service, automatic alarms and watchmen's time-recording apparatus.

All authorities emphasize the necessity for suitable maintenance and frequent tests of fire alarm apparatus, to insure the prompt and reliable transmission of alarms. The National Board of Fire Underwriters says: "No system is sufficiently automatic or durable to do away with the necessity for periodical inspections and working tests of all its parts." Approved methods are set forth in the Red Book.

The keeping of complete records is a safeguard to responsible officials. I could give you some interesting anecdotes along that line, but time presses.

The subject of tests and records has been well cared for by the inspection bureaus, but they have done little to furnish operating officials with information necessary for the fundamentals of care and maintenance. Practically all that has been done along this line has been done by the Gamewell company, which has issued several pamphlets on the proper care and maintenance of apparatus, for fire alarm and police signaling systems. Fire alarm officials may secure copies of these, free upon request.

Observe that the improvements in devices, materials and methods, of which I have given a brief account, were mainly directed along the lines of increasing the reliability and speed of alarms.

To secure these features much thought, invention, experience and care were necessary. Notice how the successive improvements in boxes aimed toward this end; note the gradually improved methods of giving access to the box starting device, until we have now the quick-action door, whose very appearance instructs the passerby how to operate it and start an alarm. Notice the efforts to provide reliability and continuity of service,—better insulating materials and construction in boxes, in office apparatus, in wires and cables.

This has paralleled the speeding up and improvement of our fire departments. When the fire alarm telegraph was invented, fire departments were composed of volunteers and apparatus was hand-drawn; then came horse-drawn apparatus and paid drivers; then the steam fire engine and full-paid fire companies; finally came the automobile and motorized fire departments. Successive improvements and standardization of fire apparatus all tended to improve reliability and quicken the operations of the firemen. Certainly our American
inventors and manufacturers have done well their part toward the improvement of methods and means for fighting fire.

Soon after the introduction of the fire alarm telegraph, came the adaptation of the telegraph to police and other municipal signaling. At first, these used simple closed telegraph circuits and apparatus similar to the fire alarm. Various features were added, as time demonstrated the need of them. The telephone was found especially useful, and soon after the expiration of the original patents, combination instruments were available.

The police signal system has gradually grown away from the fire alarm, influenced by its own peculiar needs and restrictions. The great increase in street congestion and accidents, riots and other troubles, the hold-up, the automobile thief and the bootlegger, all accentuate the need of special means for quick communication between the patrolman on beat, the officer on his rounds, and headquarters. Dependence on private telephones is hopeless; many sections, often those where disturbances are most frequent, are poorly provided with telephones; as with the fire alarm, at night and in many locations it is impossible to get access to a telephone. Besides, there is no way for headquarters to call the patrolmen, to concentrate men quickly in emergency, or to put patrolmen on the watch for criminals escaping from the scene of the crime.

Thus the modern police signal system, with its associated bells and flashlights to call the policemen, and with auxiliary call boxes in banks and other places where valuables are kept and where hold-ups may be anticipated, has become a highly necessary feature of modern police departments. As an auxiliary to the fire alarm system, the National Board of Fire Underwriters deems an effective police signal system worthy of special allowance in its gradings of cities with regard to their fire defenses.

After the Augusta conflagration, it was not difficult to persuade the citizens of Augusta that wooden shingle roofs were too dangerous to be permitted. After the Baltimore fire, it was easy to convince Baltimore that a modern drilled fire department is a necessity. After the San Francisco fire, it was not hard to get the people of San Francisco to demand reliable and adequate waterworks.

Now, all of these things could have been provided before those catastrophies, and the people of those cities had fair warning what to expect. The underwriters especially, having large interests at stake, had urged in all those cities measures which would have averted such disasters. Yet, many of our cities are blind or indifferent to what is going on about them. With ever increasing congestion of buildings and contents; with ever increasing hazards of materials and manufacturing operations; with ever increasing fires and losses; they refuse to profit by the experiences of their sister cities, or to lock the door before the horse is stolen.

No matter how much we strive for fire prevention, it is inevitable, with our modern town and city life, that there will be the many hazards incident to that life and the consequent fires. We must, therefore, provide suitable and adequate means for combatting the fires that will
occur. These means are chiefly three—waterworks, fire departments and fire alarm systems.

The waterworks alone, no matter how adequate and reliable, would be of little value without the fire department and its apparatus to make effective use of the water; both waterworks and fire department together would be quite inadequate to extinguissh fires in their early stages and thus prevent a conflagration or to rescue endangered persons before it is too late, without speedy and reliable means for notification of the outbreak and location of the fire. And that is just what the fire alarm system provides; it is the nerve system of the fire department; it is the starting gun, which sets in motion all the means that science and skill have devised to protect our modern civilization against its great enemy, FIRE.

DISCUSSION

Now, do any of you care to examine the box I have here, which is one of the very latest type of boxes. It is too far away for most of you to see clearly. You might come up and play with it to your heart's content. For those who are not entirely familiar with the succession box, I might say the principle of succession is, in case the box is pulled and another box on the line is operating already, the succession box will wait and bring in the signal later. I will pull this box. (Pulls box.) If another box is operating immediately the armature of the non-interference magnet drops out and the box runs idle for a time until the box already pulled somewhere finished the signal; when that is finished this box will start and send in its signal. This is a fifteen round box. If the circuit is open when the box is pulled it will run fifteen rounds waiting for the chance to come in and when it does come in it will give four rounds of the alarm and it will come in any of those fifteen rounds, so we have fifteen chances to get your alarm in. Some of the boxes use a bell instead of a sounder. The circuit breakers, you can see, are moving with a cog wheel. The older types of poles have been found troublesome in many ways. In Boston recently we had a fire in a hospital. One of the nurses went out and pulled the street box, as she supposed. They have the so-called keyless doors with the handle. There is a gong in the door, the nurse heard the gong and thought that was the alarm. She stood there and by and by a passerby came along. By that time the fire was shooting out of every window in the hospital. The nurse said, "Why don't the fire department come?" The man says, "Did you pull the hook?" She said, "I opened the door." The result was that one person suffocated by smoke and several were injured.

Mr. Wolf: Has that the connection for the telephone too?

Mr. Raymond: This hasn't the telephone jack, we put them in on request. That is getting to be quite common.

Mr. Jaeckel, Pekin: We have the old Gardner box put in in 1892. That box is built so when you pull your hook it has a plug coming out here and here and two plugs on the outer door. You have to pull the door open and pull the inside. If the second box is
pulled this box would not come in. The greatest thing is to educate
the people that they must close this outer door before it can be pulled.

**Mr. Raymond:** Another trouble where they put the key in the
door, the boys go along and break the glass and let the key drop down
and it will not shut the door.

I used to live in Newark, where doors had the keys in the lock.
Many a time I went along and slammed the door shut. Newark had
the Gardner boxes. If the circuit opened anywhere when the door
was open that meant that box was out of business and anybody pulling
it for a fire would get no signal unless they knew the door had to be
shut first and opened again. In the olden days the keys were dis-
tributed around the houses. That was very well but there was too
much delay.

Twenty years ago I was at Atlanta looking over the fire system
there and Chief Joiner, later fire marshal, said, “Come to court; I have
a funny case.” We went over. A negro was arrested for smash-
ing fire alarm boxes. He said, “Judge, my house was afire. I could
not arouse anybody and get a key so I broke the door in.” The judge
said, “How about it, Mr. Chief?” The chief said, “I don’t blame him,
I would have done the same thing.”

We think anything that gives the public quick access to the box
and at the same time does not leave the box exposed to dirt, water,
ice and snow getting into it is the thing to use. We finally got to keep-
ing the door locked. The firemen have keys, they can get into the
Morse key and the telephone jack; they know what they are and that’s
all right.

**Mr. Wolf:** We have been for years carrying on a campaign of
education in the operation of the boxes and we had mounted on trucks
boxes we could take to schools and public meetings where we could
educate the people.

**Mr. Raymond:** That has been a fine thing in a number of places.
I remember in Camden the chief of the electric bureau had an outfit
set up so the school children could see when they pulled the box what
happened and he found in doing that that his police department needed
a little training. He discovered not less than six of his patrolmen did
not know how to pull fire engine boxes.

**Mr. Wolf:** That’s nothing unusual; you can find that in any city
today. In a certain large city I was called to address the Rotary club.
A man told about the work he had done in fire prevention and I asked
him if he knew the nearest fire alarm box to his home. He studied a
minute and said, no.

**Mr. Raymond:** I have also had that same thing come up and
presume if I had not spent some twenty years in the business myself
I would not know the nearest fire alarm box to my house or what its
number was.

**Mr. Wolf:** I will bet you go to the average city today among
the Boys Scouts and they will tell you where the nearest fire alarm
boxes are to their homes and how to operate the boxes.
CHAIRMAN ELY: Any other questions anyone wants to ask? If not, we thank you. (Applause.) We will pass on to the next subject, Demonstration of First Aid, by L. L. Wolf, of the Cincinnati Fire College. He does not need much of an introduction. (Applause.)

DEMONSTRATION OF FIRST AID
By L. L. Wolf, Cincinnati, Ohio

I would like to have some man volunteer his services who is willing to have his left leg cut off, his throat cut and his right arm removed. Gentlemen, first aid today in industrial plants, fire departments, public service corporations and public utilities has come to be a very important thing, but it is still only first aid and you must remember that we are not doctors; we are only there to administer first aid to make the patient as easy as we possibly can until he can receive expert medical attention and our duty is to do only what we think best to make the patient comfortable and send him to the hospital in the best possible condition in order to avoid, if possible, any future complications that might arise from neglect.

One of the most important things under this subject is stopping the flow of blood. Under that heading we use a tourniquet, we use digital pressure and we use flexing, all of which I will show you. Each one has its place in this work. Every man interested in this work really ought to make a study of it: just a little knowledge of first aid is really apt to cause more harm than if you did not know anything, because if you don't know anything you would not do anything. If you have a small knowledge you are liable to do the wrong thing, which would cause trouble.

The first thing I am going into is what we call digital pressure. In case of a severing of the arteries or veins we have arterial bleeding and venous bleeding. The two can be discriminated and separated by the fact that all arterial bleeding is with the beat of the heart. Arterial blood is red and is a fast pumping flow. Many of you have been called where a man had severed his jugular vein and we have been called where a man has attempted to commit suicide, slashed his throat with a razor. If I had a case of the severing of the jugular vein, the place I would endeavor to stop that—I want you to see this and pay particular attention to this—is right here, where the collar bone forms to protect the arteries and muscles of your neck. There is a hollow space in which you can place your fingers, by taking these two fingers in this manner and pressing down in there, that will
shut off the flow of blood from the jugular vein. That is known as
digital pressure and is used by the doctors and surgeons the world over.

Suppose we have a wound on the side of the head. As you know,
head bleeding is the hardest thing to get at, due to the fact in most
cases the arteries and veins come out between muscles and bones where
they are thoroughly protected. In scalp wounds that is not the case.
If this man had a wound there is only one way to stop it, take this
finger that way and that finger this way and press it until you cause
that blood to coagulate, then take a pack or a bandage and that will
stop the flow of the blood until he can get to a hospital or a doctor.
Never try to wash the wound with water. If you have iodine touch
it up, but never take water, because you do more damage than good;
and don't put too much iodine on. For head and neck wounds and
arterial and venous bleeding never try to wash the wounds, because
nine out of ten times you put more dirt in the wound than you take
out. So far for digital pressure.

We will now go to what is known as tourniquet. Where there
has been a severing of the vein or artery below the shoulder you have
excess bleeding and the man is liable to bleed to death. If you have
a wound below the shoulder taking in an artery or vein and have ex-
cessive bleeding, take your handkerchief and make a knot—all arteries
and veins come out between the muscle and bone where they are best
protected. The arteries and veins come out in this soft place here and
branch out and come up along here and here is the place where you
are bleeding; take an ordinary handkerchief around the arm like that
(indicating), tie a square not, don't tie it tight, but place a stick in it.
If you will feel this man's hand now it is warm. I will show you how
long it takes to shut off the circulation in the arm. The veins are
swelling up. Feel his fingers, they are cooling off. Now then, you
want to remember this will shut off the circulation and stop the blood,
but at no time does that want to be applied and held on longer than
fifteen minutes. After you have had it on fifteen minutes release it
again, let the blood start to flow, but as soon as the blood starts to
flow tie it up again. By doing that you will avoid a case of gangrene.
You will remember when you shut off that arm this blood congeals and
if you don't start circulation again there will be a case of gangrene
which nine times out of ten means the amputation of the member below
the wound. Loosen it up and let that blood flow and then tighten it
up again. Safety first.

I know of cases where a tourniquet was put on and left until they
got to the hospital and ninety cases out of one hundred it required the
amputation of the member below the wound. It is no trouble to put
on and no trouble to take off.

We also use the tourniquet for wounds below the trunk. Sup-
pose I have a wound right here, in the leg above the knee, and want
to put on a tourniquet. I would put the tourniquet here in the same
place under the leg that I did under the arm, where the veins and
arteries are protected by the muscle and bone. Put that in there and
put your stick in there. You noticed in the picture last night the
policeman took his billy and used it instead of a stick.
If the wound is below the knee, a still better way of shutting off that circulation is what is known as flexing. I will show you how that is done. This man has his whole arm crushed and I want to stop that circulation underneath there. I would take any kind of a little ball or a knife and stick it there underneath the arm, in the arm pit, something large that will press in there and bandage this arm on it. This is known as flexing and is a very important evolution. If all this part of the arm were mashed off here by a train or crushed in the collapse of a building, a tourniquet is not going to do much good, so take anything that will fit underneath a man’s arm and bind the arm down. That is known as flexing.

I will show you how that works to an advantage. Will you lie on the table? This is a very important thing that should be in every first aid kit; this is known as the triangular bandage. It is an easy thing to use as a bandage for men that could not be bandaged with an ordinary roller bandage, therefore it is a great advantage. It is very, very easy to handle and everybody can bandage and bandage successfully so it will stay there, but when you see the various uses this can be put to you will realize what a wonderful piece of goods it is. You can buy the muslin at the dry goods store and cut them up yourself. If you write to the Life Saving Division of the Red Cross, at Washington, D. C., you can buy them for eight cents and each one contains printed instructions as to their use for each wound. If you have a local chapter of the Red Cross in your city you can go to them and get it.

In case a man should have his leg or foot crushed and you want to stop the bleeding and send him to the hospital, in case the leg is crushed, the best way to handle that is to bring the leg up like that and put something underneath it. That is what is known as flexing for a crushed bone. That will absolutely shut off all circulation of the blood below the knee. I will guarantee I can leave him that way for ten or fifteen minutes and it will take fully twenty-five minutes before he can use that foot again. That is a very important evolution in first aid because you come in contact with so many accidents by railroads, steam roads, electric roads, automobiles, etc., where the foot is crushed or the leg is mangled below the knee. That’s the way we shut off the circulation.

A voice: Do you have to let that out in fifteen minutes, too?

MR. WOLF: Yes, sir. You always want to get circulation of the blood through the wound every once in awhile. You don’t want to allow the blood to congeal in a severed part or it will cause gangrene. After you have got it shut off you want to start it again. That applies to all wounds below the knee.

Suppose we had a wound between the knee and the hip. We can do that same thing by taking a policeman’s club, a broom or a piece of stick and placing the stick right in here and take two bandages to go around the body. You can put two bandages together by making an ordinary square knot. That’s for flexing where the wound runs between the hip and the knee. That will absolutely shut off the blood in there.
Now we have gone into the flexing, digital pressure and the tourniquet and I would like to have you ask some questions. Remember you are all sent here to learn something.

DISCUSSION

A voice: I would like to ask, in case a man had his arm pulled out of socket, where would you stop the flow?

Mr. Wolf: With the arm torn away?

A voice: Yes, sir.

Mr. Wolf: If this man had his shirt off I could show you to better advantage. (Subject takes off shirt.) We will say the arm was torn out at the socket. It would not be any trouble for you to take your handkerchief and tie it in four knots. Remember your handkerchief is never clean. I don't care whether it just came from the laundry, it is never clean. Therefore, take your first aid pack, take a piece of gauze and wrap around your handkerchief, place that right in the wound, bring this up this way, take your triangular bandage and bring it up around the neck like this (indicating) and then pull, even if you hurt his neck. Pull up in there and tie your bandage, then get the same hold I showed you for the cutting of the jugular vein.

A voice: The reason I asked that question, I had a dear friend working in the boiler works at one time who took a misstep and wrenched his arm out of the socket.

Mr. Wolf: I was in a case in South Carolina in a cotton mill where a fellow got caught in a large belt that runs a machine and tore his arm right out. We are none of us doctors and the best we can do is to give our fellow man the most relief and get him comfortable until he can get the benefit of medical training.

A voice: Where would you place that ball?

Mr. Wolf: Right up where the arm was.

A voice: Suppose it should happen where we had no first aid?

Mr. Wolf: Do the best you can under the circumstances; tear up your shirt, take your handkerchief; if your handkerchief is not so clean you can not help it. But if it happens at an industrial plant there is no reason why every industrial plant should not have a first aid kit handy and if they don't they are negligent of the people they employ.

That also should be opened up if there is any length of time in getting to the hospital. Any time you have had a wound and absolutely shut off the flow of blood to that wound too long; in nine cases out of ten gangrene sets in and you know the danger of gangrene.

Are there any other questions, gentlemen, before we go on to other subjects? I know you don't like to listen to me much, you get tired, but those of you that want the knowledge can ask the questions.

A voice: In case of a stomach rupture or internal bleeding?

Mr. Wolf: I want to say to you that's a case for a doctor; that is not a case for first aid.

A voice: Suppose it happens we are not in a position to get the doctor and are going to send him to the hospital?
Mr. Wolf: Sit your patient up in as comfortable a position as you can, don’t let him lie down. For instance, if you can draw that blood away by putting hot applications to his feet, keeping the blood in the lower part of the body, you can make him easier, but that is really a case for the doctors and I don’t like to trespass on the domain of the doctors and I am not going to tell you to do something that might result in injuries. I know several things I could administer if I had the case, but don’t want to tell you that because I am not going to be arrested for malpractice.

A voice: How would you treat a bad cut below or above the eye?  
Mr. Wolf: By holding the wound together until I got a coagulation of the blood; then I would bandage it and get him to the doctor as soon as I could.

Iodine is one of the best things in the world. I love iodine like I do beer. It is the most wonderful cleanser and can do no damage. Suppose you are around an industrial plant and a man should get his arm or hand badly crushed. You want to clean the wound and if you have nothing else around don’t be afraid to use a little gasoline to clean it off, because that’s cleaner than any water you can use. I am not advising you to use gasoline all the time, but in an emergency it will be all right.

A voice: How about turpentine?  
Mr. Wolf: Turpentine is not bad, it is not good. It is not a cleanser where gasoline is.

A voice: How about oil of salts?  
Mr. Wolf: That is a cleanser for burns.

A voice: How would oil of mustard be?  
Mr. Wolf: That would be bad.

A voice: Suppose there is grease on the hand and gasoline is used, wouldn’t that have a tendency to run the grease in?  
Mr. Wolf: You can wash it off. If you have a man working around machinery and want to clean that grease off, take as clean a piece of rag as you can possibly get and clean it off.

Is there anything else on that subject before we get off of digital pressure, flexing and tourniquet. Any other questions you want to ask? Don’t be bashful, as I am glad to give you whatever I have on it.

A voice: Relative to a severe burn, is any kind of oil that is handy all right to use?  
Mr. Wolf: Absolutely. Anything that would exclude the air is a wonderful thing, even your crude oil. I want to say for the benefit of the firemen and others here, one of the most wonderful things we know of is what is known as carron oil; that is nothing but linseed oil and lime water. That is the most wonderful thing for burns.

A voice: In what proportion?  
Mr. Wolf: For a gallon of linseed oil about a quart and a pint of lime water. Years ago I was in the service of the bureau of mines in Pennsylvania mines and we used to keep that stuff standing around in barrels. You know in those days we had lots of explosions and did not have the modern methods we have today.
We had lots of explosions and always kept this oil around in barrels. I would advise anyone around a plant where there is electricity to carry a bottle of carron oil and to the firemen I would advise that they carry on every piece of apparatus at least a quart of that solution. On our apparatus in Cincinnati we carry a gallon of carron oil. The carron oil,—the linseed oil and lime water,—has a soothing effect on a wound. If you have regular crude oil or lubricating oil, anything that will go over the wound is a wonderful protection.

A voice: Is that raw linseed oil you use?
Mr. Wolf: Yes, sir.
A voice: Suppose these burns blister?
Mr. Wolf: They all blister afterwards.
A voice: Not always.
Mr. Wolf: If it is burned into the under tissues it is going to blister.
A voice: Break the blister or leave it?
Mr. Wolf: The blisters will break themselves. If they are opened it should be done with a sterilized needle. If you could get every man to take a needle and burn the end of it with a match he can sterilize it himself and let the water out of it. I would cover that wound up and absolutely exclude it from the air and take him where he can get medical attention. First aid is only first aid. All it does is to make the patient easier and get him where he can get real medical attention.

A voice: I don’t believe we heard you say in what proportion you divide the linseed oil and the lime water?
Mr. Wolf: To a gallon of linseed oil you can use one quart and one pint of lime water.
A voice: Suppose you only wanted a gallon?
Mr. Wolf: I would take two quarts of linseed oil and a quart and a pint of lime water. Are there any other questions, gentlemen? We are going to another subject in a moment.
A voice: Does that apply to electric burns as well as other burns?
Mr. Wolf: Yes, sir, any burns should be protected from the atmosphere. Now, I want to say to you in burns caused by acids, such as sulphuric, or any of the corrosive acids, they will destroy tissues and if you can get alcohol or an extreme amount of water you can flush it off. One of the best things to use in an acid burn is alcohol.
A voice: How about soda?
Mr. Wolf: Bicarbonate of soda is good in certain cases because it is an antidote for an acid.
A voice: Bicarbonate is all right for sulphuric, isn’t it?
Mr. Wolf: It is not the best for an extreme case, flush it out with water or alcohol. The same thing for carabolic acid.
A voice: Grain alcohol?

Mr. Wolf: Yes, always grain alcohol for medical purposes.

A voice: Is that alcohol wood alcohol or grain alcohol?

Mr. Wolf: Always grain alcohol. Any other questions, gentlemen? If there are no other questions we will go into something else. Suppose this man broke his collar bone. He was fighting fire, holding the hose and a brick fell on him and broke his collar bone. You can fix that man as good as any doctor in the world; it is the simplest thing in the world. Take this hand, lay that arm right up there, the tip of the fingers even with the back of his arm, take the bandage and that is the position to send the man to the hospital. When he gets there all the doctor will do is to see that it is bandaged permanently. I can bandage him permanently, but that's the position to hold him in to go to the hospital. For a broken shoulder blade it is very simple, it is easy, there is nothing to it. If you had a shoulder blade broken you know the pain a man goes through.

Now one of the next things I want to show you is how to put a man's arm in a sling. I will show you where the triangular bandage comes in very nicely. There are so many uses for the triangular bandage it would be almost impossible for me to explain them all to you during a very short space of time. In a head wound they are very handy for the reason that they are the easiest thing in the world to bandage a head with. You can put it any place on the head you want to and hold it and it makes a perfect head bandage. I will guarantee you can not take a rolled bandage and set it on the head like that, no matter where the wound is on the head. For instance, you have a jaw broken and you take a rolled bandage and try to do that and see what it means. It is a lot of work. If you gentlemen are desirous of knowing how that was done I will be glad to show you. With a broken ankle it is necessary to bandage the ankle and bring it right up this way.

You can get these bandages at the American Red Cross and on each bandage is printed every use that bandage can be put to and a picture explaining how to use it. which I think is a very wonderful thing and it is the most convenient bandage there is. I have all kinds, but this is the most desirable bandage for bandaging anything. You can use it any place you can use a rolled bandage and it is so much easier to handle and you don't have to have the skill of a doctor to put on the bandage. Any other questions?

We are now going into the splinting. There are different kinds of splints. Many times in cases of broken thighs you haven't splints and have to make your own, a broom, board, blanket, pillow, table leaf, or shutter; you can use almost anything for a splint. You fellows in the first aid work in fire departments and industrial plants, I want to show something. This is known as the Wolf splint. I made this myself and got it up and fire departments all over the country are carrying them. I have got one street railway in Boston to include it in their first aid kit. You can make these out of an ordinary piece of canvass cut double and lapped and an ordinary stick that will fit
in those slots. It makes the most wonderful splint in the world. I have these patented, but haven't them for sale and any of you fellows who want to make them are at liberty to make as many as you want to. I will show you what a wonderful leg splint it makes. It is shaped around the ankle. It is more quickly applied and easily handled than any splint you can possibly use. There is a perfect splint. Doctors are using it today for permanent splints. It is easily made and does not occupy any room in your equipment. It is inexpensive. There is no reason why everybody should not have one in their first aid equipment. You are at liberty to make them and use all you want to, but the only thing I ask you to do is to not make them for sale; if you do I will sue you for damages.

A voice: Are the sticks the same length?

MR. WOLF: No, I will show you how it is made. Where it goes down to the angle the first ones shorten up.

Now, I will show you something else you ought to have. It is easier for me to tell you what you ought to have than it is for you to get it on your fire department. You ought to have a body wrapper. There is no more gruesome a sight than lowering a burned body or a dead body out of a building. I don't know of anything more gruesome. We have orders whenever a body is lowered from a building in our department it must be put in a body wrapper. Always keep the arms inside so there is no chance for them to get caught. Now, all you have to do is to fasten the rope on this and lower the man out. He is not exposed to the air or the public gaze. Suppose when you get him down you want a stretcher, well, three fellows get hold of these handles on each side and you have a stretcher. The man on this end can hold the head up. You have a bag to lower him from the building, protect him from the public gaze and also a stretcher.

Any of you are at liberty to make those bags. Here's a drawing of the bag and any of you gentlemen that would like to have that drawing can get it by writing to Ahrens and Fox, Cincinnati. They made up a lot of them so any of you who would like to have a blue print can get it by writing to that firm. As long as you make them for your own use I have no objection, but please don't sell them.

Anything else on this first aid? I could keep you here all day. I don't have to eat, so if there is anything you want to ask, go ahead.

A voice: Last night I noted in the show a man stepped on a nail.

MR. WOLF: Yes, that was iodine we put in there first and then gave him an injection of anti-toxin to prevent lockjaw. Any more questions before we adjourn? I have to come before you twice more tomorrow and you will be so tired of listening to me you will wish I was not here. If there are no other questions we will go and see what Mrs. Inman has for dinner. Much obliged. (Applause.)

(Adjourned until the afternoon session.)
THURSDAY, JUNE 18, AFTERNOON SESSION

SAMUEL C. HUNT, Chief of Jacksonville Fire Department, Chairman

CHAIRMAN HUNT: Gentlemen, come to order. I have been appointed to preside over this meeting this afternoon. The first gentleman on the program will be Mr. R. O. Matson of Underwriters' Laboratories, with a paper on First-Aid Extinguishers. (Applause.) After Mr. Matson completes his paper there will be a demonstration in the rear of the Transportation building over where we were yesterday afternoon.

FIRST-AID EXTINGUISHERS

By R. O. Matson, Underwriters' Laboratories, Chicago

Before opening up the subject on First-Aid Extinguishers, I want to make a few preliminary remarks. First, in regard to this pamphlet put in your hands, which is issued by the Western Actuarial Bureau for the use of inspectors. It is not issued by Underwriters' Laboratories, but is put in your hands so that you may have before you a classification of extinguishers.

In regard to questions, if any questions come up in your minds while I am talking on a certain subject, don't hesitate to interrupt me at that time. However, if there are any points not being discussed that you want to bring up, I prefer that you hold those until the address is ended and then I will try to answer any questions I am able to.

It might appear at first thought, on account of the great number of first-aid extinguishers in the field and because of the general acceptance of these appliances as a valuable form of fire protection, that this subject does not involve any special problems and can therefore be dismissed with a few general remarks. It is this attitude which results in the failure of first-aid fire extinguishers to afford the maximum fire protection possible. Too often do purchasers and owners of first-aid extinguishers assume that their responsibility ends when they have installed these appliances in their buildings and too often do persons who might be called upon to use an extinguisher in the event of fire have little or no knowledge of its use and operation. It is for this reason that I wish to direct your particular attention to two most important phases of this subject this afternoon: the care and maintenance and the use and operation of first-aid extinguishers.

It might be well, therefore, to point out at this time that the amount of fire protection which any first-aid extinguisher is capable of rendering is directly dependent upon the care and maintenance given it and upon the ability of the user to operate it efficiently in the event of fire. An extinguisher not maintained in a serviceable condition might, under some circumstances, be worse than no extinguisher at all. Such a device is objectionable because of the false sense of security given, and because of the possible delay in effectively com-
batting a fire. Assume, if you please, a foam extinguisher being car-
ried to the scene of a fire and when inverted, it fails to discharge
the extinguishing liquid. The user probably spends several precious
minutes in attempting to bring the machine into action, but without
results. What is the trouble? Strainer, hose, and nozzle clogged as
a result of the failure to thoroughly wash the extinguisher before
recharging the last time. It is absolutely necessary to comply with the
manufacturer’s directions regarding recharging and to make periodic
inspections to insure that these appliances are maintained in an operable
condition.

That which has been said in regard to maintenance is equally
true of the proper use of first-aid extinguishers. To obtain the maxi-
mum fire protection from an appliance it is important that the operator
be one who is acquainted with its use and operation. A perfectly
good extinguisher in the hands of one not familiar with its use might
result in the spread of fire rather than in its control. Assuming an-
other hypothetical case, imagine a fire in a dip tank, that is, a vat
containing a flammable liquid such as paint or varnish. A two and
one-half gallon soda-acid extinguisher is carried to the fire, inverted
and the stream directed into the center of the burning liquid. What
are the results? The flammable liquid is splashed around, resulting
in the spread of fire to the outside of the tank, and the extinguishing
liquid sinks to the bottom of the tank without any retarding effect
upon the fire. All this merely because a perfectly good extinguisher
for certain types of fires was discharged into the center of a tank of
burning flammable liquid. It is not enough to know that an ex-
tinguisher is operated by inverting or by working a hand pump; it
is equally important to know the suitability of an extinguisher for use
on various types of fires and the most effective manner of attacking
such fires.

Because of the suitability of first-aid extinguishers for use on only
certain kinds of fires, it is necessary to give some consideration to
the ways in which fires differ from one another and to the most effec-
tive means of controlling each. For the purpose of classifying ex-
tinguishers as to their suitability for use on various kinds of fires,
incipient fires are divided into three groups known as Class A, B, and
C fires.

Class A fires are defined as those in which the cooling or quench-
ing effect of water is of prime importance in extinguishing them. The
ordinary wood, clothing and paper fires are examples of this class.
Such fires are extinguished by directing the stream of extinguishing
liquid at the base of the flames. The soda-acid, foam, calcium chlor-
ide, hand pump, etc., in fact any appliance employing water as the
extinguishing agent, are types of extinguishers suitable for use on
Class A fires and are therefore termed Class A extinguishers.

Class B. fires are those in which the blanketing or smothering
effect of the extinguishing agent is of greatest importance in controll-
ing them. Combustion is a chemical reaction in which oxygen com-
bines with the burning material. Generally, the oxygen entering into
this reaction is supplied by the air. Obviously such fires can be smoth-
ered by excluding the air from the burning material. Group B fires are those in which this means of fire control is employed, and examples of this group are fires in small quantities of flammable liquids. Such fires should be attacked by directing the stream of the extinguishing agent, not into the burning material, but rather against the side of the container near the oil surface, from which point it can be spread over the surface of the burning liquid, forming a blanket and excluding the air. Foam and carbon tetrachloride extinguishers are those employing this principle of fire extinguishment and are known as Class B extinguishers.

Class C fires are incipient fires in electrical equipment, where the non-conducting property of the extinguishing material is of prime importance. Carbon tetrachloride, because of its non-conducting property and also because it is not injurious to electrical equipment, is especially suitable as a fire extinguishing agent for this type of a fire. Appliances which employ a material suitable for use on fires of this group are known as Class C extinguishers.

In order to provide some means of indicating the relative effectiveness of each type of extinguisher in fire control, a system has been devised having as its basis a unit of first-aid fire protection, and the value of any one type of extinguisher as compared with another type suitable for the same class fire, is indicated by the number of appliances of each type which constitute one unit. Referring to the list of extinguishers on the leaflet which you have, you will note that the class of fire for which each extinguisher is suitable and the number of appliances of each type which comprise one unit of first-aid fire protection, are given in the second column. This classification system is employed on the labels which are now attached to extinguishers inspected by Underwriters' Laboratories.

The two and one-half gallon soda-acid extinguisher consists essentially of a cylindrical tank of approximately three gallons capacity, with hose and nozzle attached, and an acid bottle supported in a metal cage within the tank. The tank contains two and one-half gallons of water in which is dissolved one and one-half pounds of sodium bicarbonate (NaHCO₃), and the acid bottle approximately four (liquid) ounces of commercial sulphuric acid (H₂SO₄). Soda-acid extinguishers are of two types: The loose stopple type contains an open necked bottle and is operated by inverting; the break bottle type contains a sealed acid bottle and is operated by shattering the acid bottle by means of a plunger extending through the extinguisher cover. Upon operation the acid flows from the acid bottle and enters into a chemical reaction with the soda, and as a result carbon dioxide gas (CO₂) is formed under pressure. It is this gas which causes the water to be discharged through the hose and nozzle.

The idea is not uncommon that this type of extinguisher, sometimes known as a chemical extinguisher, contains some mysterious chemical which when thrown on a fire immediately snaps out the blaze. The extinguishing agent upon which soda-acid extinguishers are dependent for their fire control in the vast majority of cases is nothing more than two and one-half gallons of water. While it is true that
the carbon dioxide formed is a non-flammable gas, it ordinarily plays no material part as an extinguishing agent in this extinguisher for the reason that it is practically all dissipated in the air before the stream reaches the burning material. There are cases, however, such as chimney fires, where the carbon dioxide has been effective in fire control.

The two and one-half-gallon soda-acid extinguisher is suitable for use only on Class A fires and should not be employed on flammable liquid fires and fires in electrical equipment. This type extinguisher bears a classification of A-1, one device constituting one unit of first-aid protection on Class A fires. Soda-acid extinguishers are not charged when received from the manufacturer, and therefore must be charged in accordance with the manufacturer’s directions before installing. It might seem unnecessary to mention that extinguishers of this type should be charged when received, but cases are known where this very thing has been neglected.

They should be discharged and recharged yearly to determine whether they are in an operable condition and to insure that they are charged properly. A desirable arrangement is to have such persons as might be called upon to use these appliances in case of fire, discharge them in order that they may become familiar with their operating characteristics.

When replacements, such as hose and acid bottle, are necessary, they should be obtained from the manufacturer of the extinguisher, as parts not especially intended for use in a particular device might result in altering the operating characteristics of that device.

Repairs should never be made on the extinguisher except by the manufacturer, as inferior workmanship might result in an explosion during operation of the machine because of the pressure developed.

Soda-acid extinguishers should be protected from freezing by placing in a warm room or heated cabinet where the temperature is not allowed to go below 40° F. The practice of placing calcium chloride (CaC12) or sodium chloride (NaCl) in the soda solution should not be permitted. Calcium chloride is objectionable because of the reaction which takes place, resulting in the loss of carbon dioxide gas, and sodium chloride because of its corrosive influences. Besides, lowering the freezing point of the soda solution does not protect the acid within the acid bottle. While it is true that commercial sulphuric acid, 66° Baume, has a very low freezing point, it is also a fact that such acid has the property of absorbing water or moisture from the air and when sufficient moisture has been absorbed to reduce the gravity to 65° Baume, the freezing point of the acid is practically the same as that of water. It cannot be too strongly emphasized that any other means to protect soda-acid extinguishers from freezing than that of maintaining the temperature of the solution above 40° F. have not met with success.

What has been said of the principle of operation, use and maintenance of two and one-half gallon soda-acid extinguishers applies equally as well to one and one-half gallon extinguishers of this type. These extinguishers are especially suitable for use in homes, schools,
and the like, where they may be operated by women and children. This appliance bears a classification of A-2, it being suitable for use only on Class A fires, and two machines constituting one unit of fire protection.

The general appearance of the two and one-half gallon foam extinguisher is similar to that of the two and one-half gallon soda-acid extinguisher. Instead of an acid bottle, however, a long cylindrical inner container is supported within the outer shell. The outer shell contains a solution of sodium bicarbonate (NaHCO₃) and a foam ingredient; and the inner container a solution of aluminum sulphate (Al₂(SO₄)₃). Upon inverting the extinguisher the two solutions mix and a chemical reaction takes place between the sodium bicarbonate and the aluminum sulphate, resulting in the formation of carbon dioxide gas under pressure. The foam ingredient does not enter into the chemical reaction, but gives stability and substance to the minute carbon dioxide filled bubbles which are produced. In this extinguisher the carbon dioxide serves two purposes: It results in discharging the extinguishing liquid from the machine, and it serves as a part of the extinguishing agent. The foam consisting of minute bubbles filled with this incombustible gas forms a blanket over the burning material, excluding the oxygen of the air, thereby extinguishing the fire.

Foam extinguishers are suitable for use on Class A and B fires, but not on Class C fires. Upon Class A fires, both the cooling effect of the water employed in the extinguishing agent and the smothering effect of the foam are of importance in fire control. Upon Class B fires, the blanketing effect or smothering effect only is of importance. While, when attacking A fires with this extinguisher, the stream should be directed at the base of the flames, when attacking B fires the stream should be directed against the side of the container in order that the foam produced may flow over the surface of the burning liquid to form the most effective blanket. One two and one-half gallon foam extinguisher constitutes a unit of first-aid protection on both Class A and B fires.

Foam extinguishers are not charged when received and therefore should be charged in accordance with the manufacturer's instructions before being installed. They should be discharged and recharged yearly. Only charges furnished by the manufacturer of the extinguisher should be used.

Special precautions should be taken to wash all parts of the extinguisher after discharging to insure that the outlet strainer, hose, and nozzle are not clogged. When recharging, the solutions should be made up in separate containers and should not be poured into the extinguisher until the charges are thoroughly dissolved.

Foam extinguishers must be protected from freezing in the same manner as soda-acid extinguishers; that is, by placing in a warm room or heated cabinet, and not by depressing the freezing point of the solutions. While these extinguishers are intended to operate in an acceptable manner at temperatures between 40° and 120° F., the most effective stream and best quality of foam is produced when operating at temperatures around 70° F., which is ordinary temperature. At the lower temperatures the chemical reaction is somewhat slower, tending
to result in sluggish operation, and at the higher temperatures the chemical reaction tends to produce a stream which sprays somewhat. In order to obtain the maximum fire protection from this type of an extinguisher it is important that the solutions be kept as near to ordinary room temperature as possible. For this reason it is recommended that where lower temperature conditions might be encountered, foam extinguishers be installed in warmed rooms or heated cabinets where the temperature is not allowed to go below 50° F., and that they never be placed near boilers, heaters, etc., or in the direct rays of the sun, where they might be subject to excessively high temperature conditions.

The above remarks in regard to two and one-half gallon foam extinguishers apply also to the one and one-half gallon machine of this type. This smaller size is especially suitable for use by women and children. Two appliances constitute a unit of first-aid fire protection on either Class A or B fires.

The two and one-half gallon anti-freeze extinguishers are those which are protected against freezing and therefore suitable for use where low temperatures are encountered, without further protection. These extinguishers contain approximately two gallons of water in which is dissolved sufficient calcium chloride to depress the freezing point of the solution to —40° F., and are provided with means for developing sufficient gas pressure to discharge this solution when the machine is operated.

One extinguisher of this type employs a cartridge containing a slow burning fuse to develop the necessary gas pressure. The cartridge is supported at the upper end of a long inner tube, at the bottom of which is a heavy weight. When the extinguisher is inverted the weight falls to the other end of the inner tube and strikes a percussion cap on the end of the cartridge. This results in the ignition of a small charge of gunpowder, which in turn ignites the slow burning fuse. Another anti-freeze extinguisher obtains its gas pressure as a result of the chemical reaction between two solutions contained within an inner generating chamber. Upon inverting the extinguisher only the gas developed is allowed to escape from the generating chamber into the outer tank containing the calcium chloride solution.

Anti-freeze extinguishers must be discharged, thoroughly cleaned and recharged yearly. Only recharges furnished by the manufacturer of the device should be employed. These extinguishers are suitable for use on Class A fires only, and have a classification of A-1, one appliance constituting a unit of first-aid protection on Class A fires.

Hand pump extinguishers consist essentially of a cylindrical container provided with hose and nozzle without shut-off and a hand pump permanently attached to the top of the tank. Those extinguishers employ water as an extinguishing agent and require continuous pumping during operation. Extinguishers of this type having a capacity of five gallons are given a classification of A-1, while those having a capacity of two and one-half gallons a classification of A-2. Although the two and one-half gallon hand pump extinguisher employs the same quantity of extinguishing liquid as the two and one-half gallon soda-acid extinguisher, it is not considered entitled to a classification rating
of A-1 for the reason that it requires pumping during operation, which does not permit the operator to give his entire attention to steam direction, as is the case with the soda-acid extinguisher. Obviously, the most effective fire control will be obtained from a machine which will permit the operator to concentrate his attention on stream direction and not necessitate dividing his attention on other phases of the operation.

These extinguishers may be protected from freezing by dissolving a sufficient quantity of special calcium chloride to depress the freezing point of the solution below the lowest temperature to which it might be exposed. A solution of five pounds of calcium chloride in one gallon of water has a freezing point of \(-10^\circ\) F., so where temperatures approaching this are reached this proportion of calcium chloride to water should be used. Hard deposits are at times formed on the pump cylinder and piston rod at the liquid surface when a solution of calcium chloride is used, these deposits rendering the pump unserviceable in some cases. To reduce the possibility of such formations to a minimum the calcium chloride used should be free from magnesium chloride and other such impurities, which appear to be responsible for this condition, and the pump parts should be lubricated with a mixture of heavy grease and graphite. The pump should be operated frequently to insure it being in a good condition and the container refilled when necessary. The appliance should be completely discharged and recharged yearly.

Bucket tanks, casks, and pails used as first-aid appliances and employing water as the extinguishing agent may be protected against freezing by dissolving sufficient calcium chloride to depress the freezing point of the solution below the lowest temperature to which it might be subjected. These appliances should not be used for other than fire purposes. They should be frequently inspected to insure that the pails are in a serviceable condition and that the water has not disappeared either through evaporation or otherwise. These appliances should be discharged, thoroughly cleaned, and recharged yearly.

Carbon tetrachloride is especially suitable as an extinguishing agent for use on flammable liquid fires due to the fact that it is very volatile and in the gaseous state is about two and five-tenths times as heavy as air. When applied on this kind of a fire the stream of carbon tetrachloride should be directed against the side of the container just above the flammable liquid, in order that it may vaporize the more readily and the gas be permitted to spread over the burning surface, excluding the air. Should the stream of carbon tetrachloride be directed into the flammable liquid, a good part of it would sink because of its high specific gravity and have no effect as an extinguishing agent.

Because of its non-conducting property and due to the fact that it has no injurious effect upon such equipment, carbon tetrachloride used in extinguishers labeled by Underwriters' Laboratories is especially suitable as a fire extinguishing agent for use on electrical equipment fires. While it is of course desirable to shut off the current when attacking an electrical fire, this may not always be possible, and in such a case carbon tetrachloride may be used on the electrical equip-
ment without any detrimental effect on either moving parts or stationary parts.

Carbon tetrachloride used in first-aid extinguishers labeled by Underwriters' Laboratories is especially treated to remove impurities and contains an important component for depressing the freezing point to \(-50^\circ\) F. Extinguishers employing this special liquid as the extinguishing agent do not require protection against freezing.

The one and one and one-half quart carbon tetrachloride extinguishers labeled by Underwriters' Laboratories are provided with a hand operated pump and require pumping during operation. The one quart device is especially suitable for use in garages, in boiler rooms where oil burners are employed, and on automobiles and motor boats. The one and one-half quart machines are especially suitable for use in industrial plants where they will be operated by men. These appliances are given a classification of B-2, C-2, two machines constituting a unit of first-aid fire protection on either Class B or C fires. They should be partially discharged and refilled yearly, whether used or not, to insure easy working action of the pump. Only the special recharges obtained from the manufacturer of the device should be used and under no circumstances should water be poured into the device. Water or carbon tetrachloride not specially prepared might result in corrosion of the pump parts, rending the extinguisher unserviceable.

The one gallon carbon tetrachloride extinguishers labeled by Underwriters' Laboratories consist essentially of a liquid chamber, a compressed air chamber and a hand jump. The air chamber is normally under a pressure of 100 pounds per square inch, which may be re-established by means of the attached pump. The extinguisher is operated by opening a valve which allows the compressed air to enter the liquid chamber, resulting in the discharge of the liquid through a hose and nozzle.

The one gallon carbon tetrachloride extinguishers are intended for special use in electrical power stations and industrial establishments where consideration is given to the great amount of liquid employed and where they will be operated by experienced men. Where these extinguishers are used it is necessary to take precautions to protect the user from the toxic effects of the vapors. Persons who might be called upon to use these appliances should be familiar with their use and operation, and should be instructed in regard to the hazard involved. An ordinary gas mask, such as were used during the recent war, provides a very convenient and effective means of protecting the operator from the gases formed when the carbon tetrachloride is played on a fire. These extinguishers are given a classification of B-2 by Underwriters' Laboratories for the reason that they are not capable of controlling as large fires in flammable liquids as the two and one-half gallon foam extinguisher; and a classification of C-1 because of the large quantity of non-conducting liquid employed as the extinguishing agent.

These extinguishers should be inspected periodically to determine whether the air pressure is maintained and the pressure should be
re-established to 100 pounds per square inch when necessary. Only special carbon tetrachloride obtained from the manufacturer of the extinguisher should be used for recharging. (Applause.)

CHAIRMAN HUNT: Another announcement I would like to make. After the demonstration on the outside, automobiles will be there to take this body of men to the Champaign and Urbana waterworks. There will be cigars and soda pop besides. If there are any questions you would like to ask this gentleman in regard to these fire extinguishers before we adjourn, they will be in order now. If not we will adjourn outside for the demonstration.

(Demonstration of fire extinguishers given on the outside.)

FRIDAY, JUNE 19, MORNING SESSION

Roy Alsip, Secretary, Illinois Firemen’s Association, Chairman

CHAIRMAN ALSIP: Gentlemen, we will come to order. The first thing on the program this morning will be a demonstration and talk by Harry K. Rogers of the Western Actuarial Bureau. It gives me pleasure, gentlemen, to introduce Mr. Rogers. (Applause.)

MODERN METHODS OF FIRE EXTINGUISHMENT

By Harry K. Rogers, Engineer, Western Actuarial Bureau, Chicago

MR. CHAIRMAN AND GENTLEMEN: In the first place I desire to pay a tribute to the firemen, not only of the state of Illinois, but of the entire United States. You men represent that reserve which stands between the general public and the open jaws of hell you are so often called upon to enter. It is not often that the average layman, the man in business, the citizen of your community, pays much attention to the fire department. It is very seldom that they think of you and if a thought does come it is a fleeting one, except in the time of necessity, when a man’s house or his place of business is on fire, and then he gives a great deal of thought and attention to the fire department; but until that time comes you are not in his mind perhaps as much as you should be.

He does not realize that your business has become very scientific, in a degree, I might say, almost as scientific as that of the physician or any of the other sciences. The old haphazard method of fire extinguishment in passe, they are not doing much of that any more. You are employing different methods than those used a few years ago. The best example of that, I might say, is the great improvements that have been made from a purely scientific standpoint in the matter of equipment. Fire apparatus today compared with that a few years ago is much finer, much more effective in its work. However, if mechanically perfect machines and faultless fire alarm systems were all that is necessary to constitute efficiency in a fire department, many cities would be perfect in this respect, but while these great improve-
ments, involving the expenditure of thousands of dollars, are very necessary, there is a third or human element which is the most important factor. The mechanical equipment can go only so far in the extinguishment of fires. The personnel of the department is a far more important factor. For that reason every man in the department must be well trained, active and capable of filling his position in such a manner that it will not be detrimental to the functioning of the department. For this reason the modern drill school or the fire college has been instituted in a great many of our fire departments.

I do not think it would be amiss to mention the four major parts. The first might be termed practical hydraulics, which has to do with fire, smoke, back pressure, etc. If a man is trained to know what the limits are and what is most effective in this important branch of fire service, his work as a matter of course is more effective than if he were going at it blindly.

The second division I will term the chemistry of fire, which has to do with causes and effects. Those things are very necessary in fire prevention work,—inspections by uninformed members of the fire department,—for the reason if you will inspect a place of business where the stock in trade might be of a dangerous combustible nature, capable of starting fires by spontaneous combustion, it is well for you to have some knowledge of the chemistry of fire in order that these various commodities might be segregated or properly safeguarded. I do not mean you should have a degree in chemistry or a degree in hydraulic engineering. I do not mean that at all, but there are certain fundamental principles involved that every fireman to be efficient should become more or less familiar with in order that he can do the things so necessary in these inspections.

This chemistry of fire treats exhaustively on the subject of oxidation, slow burning. It is nothing more or less than a slow process of burning. If we had two blocks of wood as nearly identical as possible and we would place one in a furnace and burn it, we all know a certain amount of heat would be generated by the consumption of that block of wood, and if the other block so nearly the same size as the first one was placed on the ground and exposed to the elements, it would in time disappear until nothing but a small residue or ash is left. Exactly the same amount of heat has been generated by the piece of wood laid on the ground as the one placed in the furnace, the only difference being in the point of time consumed in this operation. The chemistry of fire, as I have said, treats exhaustively of this process of oxidation. Causes and effects. It is well to know things of that sort.

The chemistry of fire also applies to the subject of gas masks, proper masks to use under certain conditions. This subject has been treated very capably here during this course and I shall not touch on that this morning.

This second branch or division treats of proper extinguishing advantages, proper types of chemical extinguishers to use under certain conditions, which is really a science in itself.
Now, coming down to the third division or the third department of the modern fire college, we will call it the drill school of evolution, which has to do with the proper handling of all equipment. The statement was made by Mr. Wolf during this conference that not many of you men could properly name every piece of equipment carried on the ordinary aerial truck and I believe that statement to be absolutely true. I doubt very much if there are more than a very small number of men in this hall at this time who could go to the service truck or aerial truck downtown and pick up every piece of equipment carried on that truck, give its proper name and tell how it could be used most effectively. I doubt if that could be done by anyone in this body. This training school, or school of evolution, has to do with that phase of the work, the proper handling of all apparatus and equipment, its use and why. A very, very effective thing. It standardizes the work of the men so that when two or more men are used in any single evolution every man knows exactly what is expected of him. He furthermore knows exactly what is expected of the other fellow. He knows exactly what the other fellow is going to do and by a coordination of effort you accomplish results with a minimum amount of energy expended.

Mr. Wolf said the other day in instituting drill schools he had met with opposition a time or two on the part of the firemen, due to the fact that this course is intensive, it is hard work perhaps while being instituted, and I have had exactly the same experience in my work. The men rather resent being forced to go out of the engine house and do certain evolutions that are tiresome and hard work, but after they have been at it a few days, as told you by Mr. Wolf, they come to a realization that, while the work is hard at the start, it makes the actual business of fire fighting so much easier. The balance of the scale is thrown the other way, providing your drill master is not a driver, a man that will use ordinary common sense and judgment.

I know of a case of a fire department employing about one hundred men, where the Chicago drill school methods were instituted several years ago. This town has a central engine house with seven or eight pieces of apparatus in it and I think possibly twenty-seven or twenty-eight men stationed at this central house. The drill field is located back of it. The men at headquarters drill approximately five hours a day, every day in the week except Saturday and Sunday; the outlying men get in once or twice a year for a day’s schooling. In my estimation that’s a poor way to conduct a fire college. These men are so sick and tired of these activities of the fire school that when they have a chance to put these things in operation at a fire they don’t do it. The thing has been greatly overdone in this one city, sacrificing the work with the outlying houses and compelling this one group of men to do it over and over again until it has become a burden. I don’t believe that’s proper. I think ordinary common sense should guide your methods in the institution of drill schools in your departments so that the men do not get thoroughly sick and tired of it.
Learn the best ways of doing things. It teaches the proper methods of raising and lowering ladders of different types; it teaches the proper method of advancing on fires with hose streams; the proper methods of carrying hose, regardless of the location of the fire.

While I am greatly interested in the Chicago method and in my estimation the school of evolution perhaps is the best in the country, I have actively engaged in the work in the other schools and have found things in Detroit, Philadelphia and New York drill schools I like better than the methods used in Chicago, but these drill schools in your community must cover the thing in your town. I think certain things done in the New York fire college are very good for New York, but would be practically valueless in Oklahoma City. Things are done in Oklahoma City that would be of no use in New York. I don't think you can go to any drill school in the country and go home and put all those things in effect in your town. I think these various drills and evolutions should be adapted to your own community.

The fourth and last division of the modern drill school is that of life saving and first aid. Every fireman owes it not only to himself, but the community he safeguards, to become as proficient in this important branch as possible, because in this hazardous business of yours you never know when an emergency is going to arise.

I trust everyone of you have assimilated the knowledge, the work which has been so graphically presented here by Mr. Wolf in this particular line. He is an expert in the business and if you paid careful attention to what he told you in reference to life saving and first-aid I am sure that one thing alone will have paid you for the time and effort it cost you to attend this meeting.

This, gentlemen, in a very small measure shows the advances that have been made in the science of fire fighting from a training school standpoint, but does not in any way show the improvements which have been made in this most interesting of all departments of civic welfare.

There has been a subject mentioned two or three times by speakers that could not possibly be treated effectively in one day's time, the subject of ventilation; a comparatively new science in fire fighting and a most deserving one. In ventilating certain facts should always be kept in mind, the first of which is that it is never proper to open up ventilation until you have lines available for immediate entry into the building. That is, if we have a fire we should not open that building until hose lines were laid so we could follow in immediately as soon as the gas and smoke cleared out to start the extinguishing business. That, of course, should be true only where there is not a life at stake. If lives are to be saved we should not pay attention to the extinguishing of the fire until we get the people out of the building. That's the first business of a fireman always, but in the ordinary mercantile fire don't open your house or building until you have available lines for immediate entry.

The second thing in this consideration of ventilation is selecting the proper place to ventilate. If there is a cock loft or an elevator shaft on the top of the building, that constitutes a wonderful flue which will clear the building as rapidly as possible of the gases. That's
the proper place to ventilate unless this vent house or cock loft is exposed to some other building of combustible material. That should be taken into consideration. Use care and discretion in opening, but get it open as soon as possible.

Just recently I saw a fire in a little town in Minnesota. It was a double occupancy, a fifty foot front with two storerooms on the first floor, one occupied by a millinery store and the other by a ten cent store. This was shortly before noon. When they got there there was a considerable volume of smoke coming from this five and ten cent store. The fire department lined up hose, both in front and the rear of the building, and opened up without making an investigation of the fire. They did not open a transom, they did not open any of the upstairs windows and by that time it was so filled with smoke it was coming out everywhere. These lines in front washed all the stock of the five and ten cent store to the back end of the building and the fellows in the alley washed it back to the front and they washed it back and forth. In order to get water in the building they had to break some windows and that in a measure ventilated it. When the fire was extinguished we found there was a pile of burlap bags in the basement, a fire that could have been handled with a two and one-half gallon extinguisher, but they made no attempt to find where the fire was. As a result the fire damage in this building amounted to about $1,50 and the fire department’s damage amounted to several thousand dollars. Open up. Get in to the fire. I know an old chief that issued an order that the first person that opens up a pipe until he can see red will be fired from the department. Locate the fire and then hit it and hit it hard, as Captain Conway told you yesterday.

This question of ventilation is best illustrated by this little sketch I have drawn on the blackboard, showing what will happen in the event of a building not being open. We have supposedly a fire occurring in the basement of a five story building. This is an open elevator shaft and I have attempted to show you what would occur if this top loft was kept closed. The smoke and heat fill this, of course, first, being lighter than air, and run rapidly over the entire top floor. The third floor is not so badly involved, neither is the second as bad as the third, and the first floor has very little smoke in it, but if this building is not ventilated by heat radiation this is going to continue up until it is full here and here (indicating), and in all probability you can get a flash from this fire in the basement, involving this entire floor. Everything has become so heated it will burn with a flash. The same thing is true of this floor and this floor and this floor (indicating). We get that smoke explosion and the entire building is involved almost instantly, a fire from one corner to the other, whereas had this vent been open it would have taken it up there (indicating), and it would have been possible by advancing in here with your lines to follow it up here and knock it out. That illustrates in a small measure the practicability of ventilation.

Constant criticism has been directed against fire departments, and sometimes very justly, because of excess water damage, such as I
gave you an illustration of a minute ago of this fire in Minnesota.

While I agree that big streams are very often necessary, no question about that, there are any number of fires that may be reached quickly and are of little consequence, where a small stream is more effective than a large stream.

A number of eastern coast fire departments have adopted this means; you can take it for what it is worth: On top of the regular hose body they have fastened an auxiliary hose body, divided in the middle, and in this are two lines of hose, two lines of one and one-half inch cotton jacket, rubber lined hose with nozzles attached. If this apparatus goes out in the residence district to a small roof fire, instead of coupling up this big line with a pipe they lay out the ordinary two and one-half fire hose and instead of putting on the pipe they put on this siamese coupling. Two men advance on the fire, one taking one nozzle of this one and one-half inch stream and the other fellow going on the roof. It is easily possible for a man to take one hundred feet of this hose by himself from the street. It is very effective. I have seen that demonstrated by eastern coast cities and it has been very effective. You can take it for what it is worth. Out here I don’t think I would recommend that, perhaps, but I would recommend that you carry a small line of hose, perhaps one hundred feet of one and one-half inch hose, with a coupling that could be attached for use in mopping up a fire or for small roof fires.

Then there is another piece of modern equipment that has been developed in the last few years, known as the five gallon pump can, an ordinary water can with ten or fifteen feet of hose attached, which has a capacity of five gallons and is used for small fires; used in place of the chemical extinguisher. In a great many instances of a little fire in the attic one fellow can operate this pump and another fellow handle the hose. In grass fires it is a very effective weapon. Two men can walk along with this and pump; each helps carry the pump, one directing the stream, and almost as fast as you can walk you can put out the ordinary grass fire that causes so much trouble in the spring and fall time. Its most important use, in my estimation, is that of an extinguishing agent to use after your big fire is knocked down, where you have a little fire in this window or this pile of rubbish. It is a mean job to drag a line of hose around and this pump can works most effectively in that case. It has the added advantage over the chemical extinguisher in this: when you use an ordinary two and one-half gallon extinguisher, when it is exhausted you are through, while with a pump you can fill it continuously. How many of you men have had a fire you attempted to handle with a two and one-half gallon extinguisher and had it almost out, but did not have quite enough liquid? With this pump you can fill it while using it. It is a splendid piece of apparatus. I don’t mean to replace your chemical extinguishers by using this, because chemical fire extinguishers are very, very necessary, in my estimation.

There are three general types of chemical extinguishers, the soda-acid, the carbon tetrachloride and foam type extinguishers, which are very effective when used on certain classes of fire. The soda-
acid is good on any fire that is more or less confined, due to the fact it requires at least fourteen per cent of oxygen in the atmosphere to support combustion and this gas generated by this soda-acid type hits the heated surface, creating a gas blanket, excluding the oxygen, and it must go out, but it is only good where your fire is more or less confined, because if you have any great volume of fire your heat radiation will carry this gas away faster than you can generate it. In a roof fire the wind will carry the gas away faster than you can make it.

I heard quite a little discussion last night at the fire station in reference to proper charges for soda-acid extinguishers and you do find a wide variation of specific gravity of sulphuric acid when purchased here and there, and in an ordinary forty gallon capacity extinguisher the proper charge would be. I think, sixteen pounds of soda and eight pounds of acid. An acid of a certain specific gravity would not be neutralized by sixteen pounds of soda as effectively as another specific gravity, and that enters into it. I think you should find the proper amount of acid for you to use and then stick to it. Don't buy here and there. On the smaller extinguishers buy the charge from the man that made the extinguisher, because they know what it is for. It was designed to carry certain things.

The carbon tetrachloride extinguisher is very effective in electric fires. It is a very poor conductor of electricity and there is not much danger of getting a short through your stream.

Oil fires, of course, are handled best by the foam type of extinguisher, which is an improvement on the soda-acid type. It creates a mass of bubbles, soap bubbles, which act as containers for this gas. When a surface has once been coated by this mass of bubbles containing this gas it can not support combustion. Fire can not live and it will not do it. I have seen that so often in my own connections in Wichita, Kansas, where we are in the heart of the oil fields. I have seen foam type extinguishers used very effectively down there. They will handle oil fires if you can get it to them in sufficient quantities.

Time is a very important factor in fire extinguishment and for that reason we advocate that all hydrants be painted a bright orange yellow. That's a radical departure from the old fire department idea that everything should be bright red. A bright orange yellow has the highest visibility of any color and no matter whether the ground is covered with grass or snow, or it is dark, you can see these hydrants a considerable distance, and a great deal of time is saved in the outlying districts if you don't have to look for a hydrant. I know there is a hydrant at the corner of so and so, but when I get there I have to grope around and feel for it. I don't know where it is, but if painted this color you can see it almost in the middle of the street, no matter how dark it is. Indianapolis, I think, was the first city to institute that—no, Cleveland was the first city, but it has been followed by many cities all over the country and is a very effective thing.

Again reverting to the question of time brings up the question of the regulation of the speed of fire apparatus. It is my opinion that there should be no set law or ordinance saying the fire apparatus
shall not run over such and such a rate of speed. I don't think we should have anything of that sort at all, because a piece of fire apparatus responding to an alarm at three in the morning can travel with a great deal more speed, and with the same degree of safety, that it could at three in the afternoon. It don't make any difference if you open it up to sixty miles an hour, there is nobody in the road. I think the thing to do in regulating speed is to get that speed as fast as possible and still be conservative with safety. I think that's the proper thing to do.

In Topeka, Kansas, there was a bad wreck in the afternoon in which the assistant chief was injured in going to a fire. When they got back the order went out limiting the speed of the fire apparatus to fifteen miles an hour. This was sent out about five in the afternoon to all stations. About seven o'clock that night an alarm came in for the Thorn hotel. I went down on the service truck from headquarters. We were running about fifteen miles an hour. On the way down the chief went by us running about forty miles an hour. When we got there it did not amount to much, there was some rubbish burning in the basement, but it looked bad. Chief Hammond, as soon as he saw it, pulled his car up to the curb and stood in the street and was giving them this (indicating). It looked bad. He forgot about his order of fifteen miles an hour. I think you should ride consistent with safety and get there as soon as possible. It might be well to consider that the difference between thirty-five miles an hour and fifty miles an hour on the average fire run probably will not make ten or fifteen, perhaps twenty seconds, difference and it is much better to travel thirty miles an hour and get there than it is to attempt to travel fifty miles an hour and never get there.

I would advise each of you to look up your rights while going to a fire. Take it up with your city attorney when you go back in reference to your legal rights. You will find the law does not always give you the right of way. There are certain instances where you might get in bad, so it might be well for you to take that up with your city attorney.

Yesterday Captain Conway spoke of a number of large conflagrations during the last few years and I call your attention to the fact that with the exception of the San Francisco disaster, which you know occurred because of the earthquake, every great big conflagration we have had in this country started from a trivial, preventable beginning, a fire that could possibly have been extinguished with a bucket of water had it been available at the right time. Everyone of those fires had small starts, so time is a very important factor.

Just recently I was in South Dakota at the little town of Redfield. They have a progressive chief, a fellow in the business heart and soul. They have a very small department, four paid men and a number of volunteers. They have several pieces of apparatus and one of them I want to describe to you, which is a Ford truck they built themselves. They bought a Ford chassis and built a body on it and in it they are carrying fifteen blankets, buckets and brooms and all ordinary equipment carried on a salvage truck. The fire department is doing this
and we advocate it where it is possible for the fire department to detail one or two men to go in and spread blankets and do the actual mopping up. I think you will find it will be greatly appreciated by the citizens of your community.

It is not possible in the short time available to in any measure cover this subject of scientific fire fighting, but I trust perhaps I have spurred you on to greater endeavor, whereby each of you can make your respective communities much better places to live. I think perhaps rather than listen to me talk any longer, you would like to open up a sort of round table discussion. I will attempt to act as a sort of a temporary chairman and for the rest of the hour perhaps we can get something out of it. Each of you have your own peculiar problems you have had trouble in solving and at this time I would welcome any questions you care to ask. I will either attempt to answer them myself or ask someone who has had similar experience to answer them for you.

DISCUSSION

Mr. Philip, Chicago Heights: You spoke of the modern tendency of painting hydrants a bright orange yellow for visibility. Do you find the tendency to extend to fire alarm boxes as well or do they still retain the fire department red?

Mr. Rogers: Most of them are still red, but we would like to have the alarm boxes painted the same way.

Mr. Wolf: A great many cities have adopted the orange yellow for the hydrants and also painted fire boxes the same. You know they made a great deal of fun of the mayor of Cleveland when he started that. The newspapers came out and called it the Koehler colors, but it does increase the visibility; there is no question about it. It is a wonderful thing, especially in the smaller towns where your hydrants are few and far between. Of course, some of you today have got your hydrants placed the same as the larger cities, others have scattered their hydrants. There is no question but that a yellow hydrant is visible for a distance about twenty times greater than the red hydrant and it makes a big difference in the fire box and increases the visibility of the fire box. Of course, for the firemen most of them are supposed to know where the hydrants are in their district and if they are quizzed on them, as they should be, they do know. It is a big assistance in spotting your pumper, because it you spot it a little out of line it is hard to make your connection.

Mr. Philip: The reason I asked that question is this: The question has come to my mind, acknowledging the visibility of painting the hydrants a bright orange yellow for the sake of visibility of the firemen, but I still question the advisability of painting fire alarm boxes the same color, for this reason: Red has been associated with the fire department for many years. The public, who do not use the hydrants but do use the fire alarm boxes, spot the boxes from their color, not only being painted in red, but a strip on the telephone pole or post under which it is fastened. You remember only a short time ago the government took up the matter of painting their
mail boxes red and a howl went up throughout the whole country because of the possibility of the general public not taking into account the difference between mail and fire alarm boxes. To the ordinary citizen who only has to do with the fire alarm box, it seems it is a big question whether to leave that fire alarm box red.

Mr. Wolf: I agree it is a good idea to leave the fire alarm box red. It has been that way years and years. I think the idea is very good.

Mr. Jacobs: Why not paint a red band the same height as that box and a yellow band about six inches below it?

Mr. Rogers: I saw that recently in a town, but instead of using a red band they had a red box against a bright yellow band.

Mr. Wolf: In Philadelphia they have done this: They have the regular high pressure hydrants painted white and the regular fire service hydrants painted yellow. Fire alarm boxes are painted red, but on the posts they are painted red, yellow and black, and it is a wonderful thing.

You will notice practically all the street car companies today and the interurban cars have adopted orange yellow as standard for the street cars and interurban cars, due to the fact that they increase their visibility and in trees and shrubbery the green does not blend with the color of the cars and cause accidents.

The question is this: The element of time in getting water on a fire and being able to spot the hydrant rapidly. I suppose you have driven apparatus to a fire, you are making all the time you can and are wondering, am I going to hit that hydrant right. It is like shooting a gun. If you have your hydrant standing out prominently you can spot it right, but I think your idea of a red box is well taken.

Chairman Alsip: Mr. Rogers, I think you have covered a wide scope and taken in much territory. We have now somewhere in the neighborhood of twenty-two minutes before the next speaker and I think a general discussion on the things Mr. Rogers so ably covered,—things which come up in our line every day,—will bring out some facts that will strike home. In regard to the painting of fire hydrants, if I am not mistaken, I read in one of our firemen's periodicals, I believe the American Waterworks association, that some city made a test of three different colors of paint for the fire hydrants, mainly because the general public had been striking them. In a certain part of the town they painted them red, one part orange yellow, another part green and white. In the congested district, or the place where they were having the most accidents by hydrants being struck, they were painted red and in the outlying districts orange yellow. The first check up in the district where the minor accidents were was on the plugs painted orange yellow, then they gradually moved these plugs until they got the orange yellow plugs in the districts where plugs were being struck and mashed, and at the conclusion of those tests the orange yellow stood up with less accidents than all the plugs. Professor Ingram, do you recollect what city that was that made those tests?

Professor Ingram: No, I don't.
CHAIRMAN ALSIP: I would like to hear from some of the other chiefs. Chief Lohmann, I think you told me something in regard to the foamite tank you were having installed on your apparatus, which I think would be interesting.

MR. LOHMANN: Does that come in line with the coloring of fire alarm hydrants?

CHAIRMAN ALSIP: No. I say he covered so many things in his talk; that thought occurred to me to get you on the floor.

MR. LOHMANN: About a year ago I picked up one of the fire magazines. I don’t remember whether it was the Fire Protection or the Fire Service, but it had a little cut in there where there was a Ford chassis rigged up with a couple of fire foam tanks constructed with a pressure tank, which was used in the aviation fields down east so that in case anything happened to their motors they had foamite apparatus. I looked into the thing and thought that was a pretty good idea for us. We had an extra rig down there, a big White speeder, and I thought I would look into that and see if we could not install that on our White. I called up Mr. Bethlehem and he came down and we outlined the idea of how we could install a double forty unit foamite tank with a 300 pound pressure gas tank on the foot board. We got the thing all lined up. I brought it up with the council, who thought the idea was pretty good. We have a lot of oil stations down there and a lot of factories where they use gasoline and benzine and we had nothing but a few little three and two and one-half gallon tanks on each rig. I had been aching to get this thing installed. Finally the council thought I ought to have a larger capacity than forty gallons and told me to go up and see what I could do about two 100 gallon tanks. I took it up with Mr. Bethlehem and Mr. Bethlehem says, “No, I would not bother with two 100’s to start with, two forties will do and if you need a larger one you have room on that body to install another unit.” We will have two forties installed about the 26th of this month, the same as you showed out here yesterday in this demonstration.

The principle of this foamite will be that whenever we go to a fire and use it on a fire, it will not necessarily mean we throw away what is left in the tank. What is left we can use at another fire. You don’t have to dispose of the charge that is not used; all you have to do is to shut off your pressure on your pressure tank and what is left you can use at another fire. Whenever your tank is empty, completely empty, give it a good flushing before you recharge it.

I can not give you any more about it. I have invited several chiefs to come down to Aurora when we get that apparatus installed and I will give them a demonstration of the idea I have worked out with our old White. I thank you.

MR. WOLF: Are you offering any special inducements to have them come down?

MR. LOHMANN: Yes. Mr. Custer is on one corner and Axel Nelson is next door. (Applause.)

CHAIRMAN ALSIP: Is Chief Whalen from East St. Louis in the room? Chief Whalen was having some trouble about proper
quarters of chemical equipment and, as we have a few moments, surely some of you can think of something that will be interesting.

Mr. Coffey, Dixon: Speaking about rural fires, I would like to hear some discussion on the city fire department making trips to the country and protecting the farmers. We are in a little community, possibly 3,500 or 3,600, and have a volunteer department with a pumper. The pumper was purchased a little better than a year ago through a bond issue of the city. We have had a number of calls from the farmers within a radius of three or four miles asking our protection on a hay stack, straw stack or something close to a building where the property is in danger, also one or two fires in barn buildings. We have been criticized by the people of the city. They claim that they are paying for this equipment under this bond issue and the fire department has no right to go to the country. I would like to hear some discussion as to how to get around that so everybody will be satisfied.

Mr. Hawk, Moline: This is not a question, it is a suggestion. I represent a small city. I have my troubles in getting salvage stuff on my alarm truck. I carry some covers on the outlying apparatus, but I haven't enough covers. I have been trying to get them a number of years. You say to the average alderman or city council, "I would like to have some covers." "How much do they cost?" "They run $35 apiece." "The hell with that, let the insurance companies take care of that, take care of your fire." There is a local bureau there. All of our local agents have an association and meet quarterly and I suggested to them that they give me some financial assistance along that line. They say that the companies don't say we can do anything of that kind. Consequently it runs along. I believe the insurance companies in the different localities should tender some financial assistance in a case of that kind.

Mr. Rogers: I agree with you and want to tell you not long ago I had an application come in my office from Oklahoma City from an insurance man who was interested in the salvage end of the department and had taken it up with the chief of the department. This insurance man had taken it on himself to see what steps could be taken in furnishing salvage blankets to the fire department. I took it up with them and so far have not been able to do anything. I don't know what the outcome will be, but it seems to me that anything that will prevent loss should be furnished by somebody and the fellows it prevents the loss for should furnish it. In talking to your alderman it might be well to mention this fact, that eventually the citizens of the town pay the fire loss, as demonstrated by Captain Conway yesterday, and for that reason if you can reduce your fire losses, and that's what salvage does undoubtedly, if you can reduce your fire losses, it comes back to you directly. I don't know whether it is the place of the underwriters to furnish these salvage blankets or whether it is the place of the community. I believe it is the business of the community, but I don't know.

A voice: Possibly I might be able to offer a suggestion to the chief in regard to getting those salvage covers. If he puts it on the
standpoint of saving goods possibly the aldermen will not feel like paying for it, but if the chief has as many shingle roof houses and as many shingle roof fires as we have he might put it in a different way. Quite a number of our cities have these shingle roofs and frequently a large hole is burned in these shingle roofs and we must have a cover to put over that house to protect our citizens against the inclemency of the weather that may ensue until the roof is fixed.

MR. ROGERS: I think that's a valuable suggestion. I want to tell you what has been done in one or two communities. I have known of cases where the county board pays for the fire apparatus and puts it in service in the town where it was best available for the surrounding country. This apparatus is bought by the county for rural service, but is maintained and manned by men of the city fire department. It is used in both instances. I think that's a splendid arrangement. It is manned by firemen on rural calls, but does not deplete the fire fighting force to any extent in the town. If I was chief of a fire department and a call for help came I think I would go, but there are two or three things to consider and one is the legal right of the firemen.

If you are answering a fire alarm in some community or another town and driving across country and have a collision and perhaps kill someone, your city is liable for damages and there is no way you can get out of it, because they are operating out of their province. You have to consider that. Then the question of time, keeping a piece of apparatus working in another town for a considerable length of time. Some cities make a charge for the apparatus when they go over.

Recently in Marion, Indiana, while we were putting on a drill school, a call came from a town six or eight miles away for help and some thirty men went over with the apparatus. The people in the town are the fellows that are paying for that protection, they are paying your salaries and are entitled to that equipment.

MR. WOLF: There are certain rules covering that; sometimes there is a charge for rural service, which many cities adopted. I don't think there was a city in the world more imposed on that Cincinnati. Across the river from Cincinnati we have four large cities. As an illustration of how they imposed on us, Mr. Griffiths of the Covington fire department would go to a convention and they would say, "How many companies have you got?" He would say, "Nine active companies and fifty-two in reserve." They said, "What do you mean by reserve?" He would say, "I have Cincinnati in reserve."

He was overdoing it. We issued an order that any time we send apparatus out of the corporation limits of Cincinnati there is a $25 an hour charge for the apparatus and $25 an hour charge for official supervision, as we never send out the apparatus without a district chief and crew. I think if your citizens were complaining about sending the trucks out into the country that would be overcome if you were to receive remuneration for the work of that apparatus.

If your brother is in danger and in want and needs your assistance, I think it would take a pretty hard-hearted man to refuse to
go to his assistance, but let there be a minimum charge for that work and I think $25 an hour for the apparatus and $25 an hour for supervisory work is reasonable, and that has been adopted by Cincinnati, Philadelphia and Baltimore.

A voice: I come from a small town fire department. We signed up all out outside people and we get $15 for going out there.

Mr. Lohmann: I think the gentleman from Cincinnati is a little wrong on that. I feel if my neighbor is in need of help I am going to help him. I am not going to look for dollars and cents. So if there is an outside fire in the country or anyone of my neighboring towns is in danger and they will call Aurora, we will send them over a company regardless, of whether they have got the money to pay for it or not. That's my idea about this outside help, but the order has to come from the mayor or chief direct. Recently we had a call come to us at midnight on Saturday night from a certain town in the neighborhood. It looked kind of dubious to me. I thought there was some joke about it on account of it being Saturday night around eleven o'clock. I thought somebody wanted to have a little fun. I did not send anybody down. It happened to be it was not the mayor nor the chief that made the call, but the party doing the calling represented himself as the mayor. I found later on he was nothing but a dishwasher in a restaurant. But they had a fire there just the same. The fire was carried from a restaurant to the hotel. They came back and criticized me the next morning in the paper because I did not send a company down there. In this same town only a few months before that, they had a call to a neighboring village to send their company over there to give them help. It happened to be a poor laboring man whose house was burning. He was building himself a home. He had nothing only what he earned. His house caught on fire through a spark from a chimney on a shingle roof. They called for this town to send over help. They sent over a hose cart with some chemical. They used two charges. I want to show you the brotherly spirit of two neighboring towns. They used two charges of chemical on this fire. The first was charged at their home town where the company belonged and the other was charged at the fire. They charged $37 for the two charges of chemical and $15 for making the trip. The poor man did not have the money to pay for it so the neighbors went down in their pockets and made up that price. They got enough for those two charges to pay for all the chemical needed in five years in that village. I don't believe in that. If a neighboring town is in need of help, give them help.

Mr. Wolf: He did not ask about towns. This man was asking about fighting country fires. They will take advantage of you if you don't charge them. That fellow might have got $35 for his two charges, but what about the wear and tear on his apparatus; you have not figured that at all.

Mr. Lohmann: If I break one of my rigs going to a neighbor's fire I will say that was a good act.

Chairman Alsip: Mr. Rogers, anything further?

Mr. Rogers: Our time is up, gentlemen, but there is a matter that I believe Chief Philip would like to present at this time.
RESOLUTION INDORSING SHORT COURSE

Mr. Philip: I will make the matter short. Mr. Chairman and fellow students, if I might call you that, but we are students here; any man acquiring knowledge is a student: While this is not an organization with officers, etc., it occurred to some men last night it might be a good thing for this class to give some sort of an expression as to the benefits accruing to us in our communities in attending this class, so some men got together as a self-appointed committee and by a great deal of labor with a typewriter we have something to present to you this morning, and after reading it I am going to move that it be adopted and I think you will be with me to a man. The resolution is as follows:

WHEREAS, We are convinced of the great good and practicability of the Short Course of Fire Prevention, Extinguishment and Control; and

WHEREAS, The chiefs, the communities they represent and the industrial interests have been greatly benefited; therefore be it

RESOLVED, That it is the unanimous opinion of the charter class that this aforesaid school be continued from year to year that further benefits may result; and be it further

RESOLVED, That a sincere vote of thanks be tendered to Professor L. H. Provine, Professor C. E. Palmer, Fire Marshal John Gamber, Chief John Ely, Assistant Chief Roy Alsip, members of the Champaign fire department, officers and members of the executive committee of the Illinois Firemen's association and others whose untiring efforts have so largely contributed to the success of the course.

Respectfully submitted,

(Signed) M. S. Philip, Hermann J. Lohmann, Samuel Hunt, Otto H. Reiche.

Mr. Chairman: I move the adoption of the resolution.

Mr. Rogers: Is there a second to that motion.

Voices: Seconded.

Mr. Rogers: It has been moved and seconded that this resolution be adopted. All in favor—is there any discussion? All in favor will make it known by rising. (Unanimous.) I shall not call for the negative vote. It is carried unanimously.

I desire to express my appreciation for the courtesies shown me here. I am at your service and if at any time I can come to your town and help you in any way with fire department problems I want you to call on me. The Western Actuarial Bureau maintains this service for you men and it does not cost you anything. I thank you. (Applause.)

Chairman Alsip: You can see what a general discussion of the subject Mr. Rogers had would start. If we had the time we would still be discussing it.

The next speaker is listed on this program as J. A. Neale, but as he was unable to be here he sent his able assistant, Mr. Hunter, who will talk to you on the Care and Maintenance of Equipment.
CARE AND MAINTENANCE OF EQUIPMENT

By Harold F. Hunter, Engineer, Chicago Board of Underwriters

Mr. Chairman and Brother Firemen: I have been with Mr. Neale for the last year working on the fire protection of Cook county and see some of my old friends are here, so I am quite sure any stories I may tell don’t have any particular reference to the particular department chiefs here.

My talk is going to be particularly on the hazards connected with freezing. The first subject to be taken up is inside standpipes and hose.

INSIDE STANDPIPES AND HOSE

Much valuable protection can be received from standpipes and hose, particularly if the building is not equipped with the much more expensive and efficient automatic sprinkler equipment. Standpipes have value also against exposure as well as for interior fires. Four things are necessary:

1. A supply of water.
2. Installation of pipes, hose and valves.
3. Persons with knowledge and inclination to use it promptly.
4. Constant maintenance.

The various types of standpipe equipment will be discussed and especial attention given to the item of maintenance.

There are two distinct divisions of standpipe service, namely, small hose (one and one-half inch, the usual size, one and one-fourth and two inches also manufactured), and the larger two and one-half inch size commonly used for outside hydrant service. The former is altogether more desirable for general use inside of buildings and the latter should seldom be employed; the chief exception being where the public fire department would respond and use their own hose to outlets provided for the purpose, or use the two and one-half inch hose provided permanently within the building. The way this is taken care of in many standpipe installations is to provide also in addition to the usual one and one-half inch standpipe hose outlet, a two and one-half inch connection for use of the public fire department. This arrangement is frequently required by the inspection department having jurisdiction.

Constant water pressure should be maintained on these hose systems, from adequate public water supply, pressure tank or gravity tank. Fire pump, whether or not automatic, is not considered a fully satisfactory primary supply. If hose is to be used at the very first stages of the fire, it is important that the person going to the hose and taking it down shall obtain at once a serviceable stream.

Pressure tanks are recommended for the use of “small hose” service where an adequate public water supply is not available. The automatic sprinkler water supply rules should be followed for any such special tank installation.

In buildings where there is no provision for heating water piping during cold weather, the standpipe system can advantageously be put on a dry valve of the same type as is used for automatic sprinkler service.
Where standpipe is to be used by the public fire department, it will be necessary to install one or more fire department connections to which fire department pumpers or high-pressure lines can be attached. For one and one-half inch hose the diameter of standpipe is generally two to three inches for a building of ordinary height. If a combination standpipe is provided, to which the fire department can attach its hose, the diameter should seldom be less than six inches, and eight inches may be proper for very high and important buildings.

Standpipes are ordinarily located in hall or in fire-resistive stair towers if available, and so located that it will be possible to reach all points with a fifty foot length of hose. One hundred foot lengths are the maximum allowable.

The hose should be labeled (U. L.) unlined linen, preferably the one and one-half inch size. If for public fire department use, the two and on-half inch standard size is customary with threads to fit the public fire department. Hose should be in fifty foot lengths even if lines are 100 feet long, and should be kept on flat fold or pin racks. Semi-automatic racks, designed to be operated quickly by one person, are approved. Reels are not recommended, owing to the difficulty of inspecting hose and of poor ventilation.

Straitway gate valves with drips to prevent leakage from entering hose or globe valves of the soft removable disk type are advisable for standpipe service. It is the general opinion that globe valves give little trouble from leakage so that drips are unnecessary. Unlined linen hose, if kept dry, will last indefinitely. It should never be used except in case of fire. The practice of testing it periodically is decidedly bad. The advantages of unlined linen hose over cotton rubber-lined hose are that it is lighter in weight, is not affected by the heat, occupies small space, does not require testing and costs materially less money.

Brass or iron nozzles are used with orifices to fit the diameter of hose and available pressure. For one and one-half inch hose, one and one-half inch to five-eighths inch nozzles are ordinarily used and for two and one-half inch hose, one inch to one and one-eighth inch nozzles are usually provided. Smooth tapered nozzles rather than ring nozzles are recommended. Painting brass nozzles gives some protection against theft.

FIRE DOORS AND SHUTTERS

It can readily be seen that a solid brick wall is more efficient as a fire retardant than even the best class of door used to protect the openings in walls. The value of any wall structure as a fire stop is, therefore, dependent on the number of openings and the protection afforded by the fire doors, or shutters closing these openings. It is also evident that the door or shutter designed to protect an opening is of no value unless it closes the opening in time of fire and that its efficiency, when in position, depends largely upon its operative condition and the manner in which it is attached to the wall. Labels of Underwriters’ Laboratories on doors, shutters and hardware, therefore, may be taken as evidence of proper construction. The proper installation and oper-
ative condition should be the special concern in inspecting such a closure.

Each door or shutter should be subjected to operating tests to determine the ease with which it closes, the accuracy with which it fits the wall opening and the positiveness of the latching mechanism. When weights hold the door open, the positiveness of the closing mechanism may be determined by lifting the weights. Doors which are normally closed should be provided with a properly operative door check. Doors should not be wedged or otherwise fastened open.

Operate each steel rolling door or shutter, observing whether the mechanism acts easily and positively. Note whether the metal is free from rust and the bearings properly lubricated. These devices require careful observation and great care should be given to their maintenance.

Fusible links of automatic operating devices should be properly placed and in order.

Observe whether doors and shutters are free to operate. Good clearance should be maintained between the door and goods stored in the room protected by the door.

Observe carefully whether any additional unprotected openings have been cut in the walls. If so, approved doors should be provided without delay.

See that all metal work of doors and shutters is kept in the best repair.

See that fire doors or shutters exposed to the weather or subjected to rust or corrosion from any cause, are thoroughly painted.

See that all hardware is securely attached and that the door, when closed, is firmly secured in place, fully protecting the opening.

See that the sills, jambs, lintels and stops are not in a damaged condition. Also, observe whether sills are of fire-resistive materials and whether they extend beyond the door. Determine whether wood in tin-covered doors or shutters is sound. The presence of dry rot in the wood may often be detected by tapping the outside of the door with a hammer. Rotted doors will give out a dead sound. An awl test will reveal the condition of the wood. Special evidence is often contributed by screws pulling out and the caving in of metal covering, especially at the edges.

Readily combustible materials should never be stored in proximity of wall openings.

Positive instructions should be given by the management to close all non-automatic shutters and doors at night and over Sundays and holidays. Night watchmen should be especially cautioned to check up and see that this is done.

The degree of protection furnished by wired glass windows with metal sash and frame is naturally limited by the fusing point of glass. Fire records show, however, that, under any ordinary condition where the exposure is not especially severe, such windows are effective fire stops and their general installation and use should be encouraged.

The National Fire Protection association has recently gotten out a tentative regulation regarding the requirements as to where single
and double fire-retardants are required. The various items considered are the type of construction, height and area, width of exposing side and distance of exposing building from building considered. The requirements are illustrated by diagrams illustrating cases where double retardant and single retardant protection is required.

The more important items of maintenance for wired glass windows are to see that the frames and sash are kept well painted to prevent corrosion and that no lights of wired glass are broken or badly cracked.

It is natural to compare wired glass windows with standard tin-clad shutters as protection against exposure fires and the fire records would tend to show that the many advantages of the former offset the disadvantages. While it is true that glass will melt at temperatures known to occur in ordinary fire (glass softens at 1500° F. when subjected to heat from one side), and while it is also true that combustible material may be ignited on the side away from the fire, nevertheless both these features have been shown to be of relatively little importance in actual practice. To a not inconsiderable extent, this is due to the fact that the wired glass windows are an integral part of the building and are well maintained and normally closed, whereas fire shutters are commonly installed to bring about insurance rate reductions, and very commonly are improperly maintained, let alone not being regularly closed at the end of the working day.

An obvious advantage of wired glass windows over shutters is the fact that they are not unsightly and can be used on all exterior openings except show windows. Also, wired glass is transparent or translucent and fire within may readily be seen from the outside.

**STAIRWAYS AND ELEVATORS AND VERTICAL SHAFT ENCLOSURES**

Floor openings, unless properly protected, will serve as flues through which a fire may rapidly spread and involve all parts of a building. They should, therefore, be thoroughly safeguarded.

Property owners should be particularly careful not to cut new openings (for stairways, elevators or other purposes) in new buildings, without having first notified the inspection department having jurisdiction, and following its suggestions as to proper safeguards.

-_Stairways—_In new factory buildings, stairways in separate towers are advised. Of such towers there are two general types:

_The smoke-proof tower_—This consists of a fire-resistive tower entirely cut off from the building by a blank parapeted fire wall. Entrance is by open outside fire-resistive platforms with approved fire-resistive sliding or swinging fire doors at each opening from platform to building and to tower. This provides a safe means of exit, entirely apart from, while attached to, the building. This type of stair tower is recommended as the safer and the better of the two.

_Ordinary stair tower_—This is an enclosure of fire-resistive construction, the stairway itself need not necessarily be fire-resistive, but preferably should be. Entrance to it is direct from each floor, each doorway being fitted with an approved automatic sliding or swinging fire door.
Ordinary stairways may be protected to a certain extent in either of the following ways: The preferred method is to enclose the stairway entirely from bottom to top in a tight partition. This partition should be at least two and one-half inches thick and preferably of cement on metal lath with metal studs plastered on both sides and when so constructed should have approved automatic sliding or swinging fire doors at doorways opening into each floor. Municipal ordinances, if any, governing these matters, should always be referred to.

In attaching fire doors to metal and plaster partition, care should be taken that special iron framework be provided to carry load and weight of door.

When stairway enclosures are not practicable, a draft check can be provided by means of heavy trap doors, counter-balanced and made automatic by use of fusible links. This method is not recommended, however, where it is possible to obtain an enclosure, not only because trap doors are liable to be left open, but also because having operated in the event of fire, they cut off from the occupants what is often the only means of escape. There is also the possibility of injury to persons, should trap door fall or operate at an inopportune moment.

Elevators—Elevators are safest where located in a fire-resistive enclosure with door openings at the various floors provided with approved automatic sliding fire doors. These doors should always be arranged to open from the elevator side only and should preferably be arranged so that the elevators can not be run unless they are all closed. The approved type of counter-balanced elevator doors is desirable.

Elevators should be protected in either of the following ways:

A shaft enclosure at least two and one-half inches thick of cement on metal lath extending from bottom to top of elevator way, with approved automatic sliding fire doors at door openings each floor.

When shaft enclosure is not deemed practicable, the elevator should always be equipped with automatic hatches. These are so arranged as to operate automatically by the travel of the elevator itself. These hatches, however, are not practicable for fast running elevators and in any event are not recommended except where shaft enclosures are impracticable.

Other Vertical Shaft Openings—These are generally for chutes through which goods are passed to floors below, or for hand hoists, dumb waiters, etc. They are most safely arranged when located in an outside structure thoroughly cut off from the building with standard automatic fire doors or shutters at all openings. Tops of chutes should be provided with weighted covers, so arranged that they are closed except when goods are being passed through. It is also desirable to install dampers at proper intervals in chutes to check draft in event of fire. Belt holes through floors also require the same fire-resistive enclosures as other vertical openings. The holes should be made as small as possible and covered by a housing of heavy galvanized iron or two inch matched plank or its equivalent. There should be at least a three inch curbing around opening at floor to prevent water, dirt and refuse working through.
Night Watchmen—Careful consideration should be given to the selection of the man who is to have the care of the property for more than fifty per cent of the time throughout the year.

The man chosen to fill this responsible position should be of good character, sober, intelligent, honest and faithful, and in all respects an able-bodied man, strong and active, with all his faculties unimpaired. He should have a reasonable amount of mechanical knowledge, good judgment and be self-reliant in emergencies.

Too often the position is given as a sort of pension to an employe, who, from age, sickness or accident has become partially incapacitated. This is a serious mistake, for if the watchman fails to measure up to the standard of an all-round efficient man, to the same extent probably are his services likely to be unsatisfactory in time of emergency.

The watchman should familiarize himself thoroughly with the plant, stairways, elevators, fire doors, different lines of piping, steam water supply pipes both to mill and automatic sprinkler system.

He should know the location of valves controlling the sprinkler system and drip valves to drain the system. He should have the necessary knowledge to start and run the fire pump, rotary steam or electrical, also the location of fire buckets and small hose so that he lose no time when it may be necessary to use them to extinguish an incipient fire when every minute counts. He should know how to use the telephone and such numbers as would enable him to call assistance should be posted near the telephone. He should also know the location of the nearest public fire alarm box. He should have sufficient instruction regarding the electrical equipment to enable him to manipulate the switches to control the lighting of the plant where and when necessary or to shut off the current in case of accident.

It should be explained to the watchman that his duties are in the main threefold:

First—To prevent trespass on the property. (He should allow no visiting, even by acquaintances of his own.)

Second—to discover any smouldering fire which may not have broken into blaze, but may be detected by the smell of smoke.

Third—to watch for leakage from water pipes, sprinkler heads or from broken fitting.

The watchman should go on duty just before the plant shuts down. The practice of making the last round at 4 a. m., the watchman then attending to other duties, is wrong. Now that mill hours are very generally shortened, there is liable to be an interval, both morning and evening, to cover which with proper watch service special provision must be made, also Saturday afternoons, Sundays and holidays. An extra man should be employed to cover these periods. This extra man should have all the qualifications of the regular watchman with the same authority on duty.

To insure the covering of the entire property by the watchman, watch clock systems should be provided, either portable or electric, stations being so located that in passing from one to another in regular order the watchman must enter and pass through every room in the plant.
Watchmen’s clock records should be checked daily by a competent person and any irregularities in punching or order of making the stations be satisfactorily explained. These records should be dated and filed to be available for examination by insurance inspectors. Whenever additions to or changes in buildings are made additional watchmen’s boxes should be installed to properly cover the addition.

The watchman should give particular attention to doors, windows, skylights. closing all outside window shutters, seeing that electric or gas irons have been left in safe condition, caring for neglected waste and sweepings and seeing that all gasoline, naphtha, etc., have been properly removed as required.

Hourly rounds should be made nights, Saturday afternoons, Sundays and holidays, not only on account of danger of fire, but also in a sprinklered risk on account of the possible danger of sprinkler leakage.

In freezing weather special attention should be paid to heating of the several rooms to prevent bursting of sprinkler heads and piping.

The watchman should be properly supported by the management so that all breaking of rules or carelessness will be reported without fear or favor.

At first it may seem that the standard set in the preceding discussion as regards the watchman’s qualifications and intelligence, is unnecessarily severe, but when his great responsibility for over fifty per cent of the time is realized, it is believed that all will agree that every precaution should be taken.

AUTOMATIC SPRINKLERS

The automatic sprinkler system is probably one of the best known, most widely used and effective means of safeguarding mercantile and manufacturing risks and storage warehouses from destruction by fire, and is so familiar to you all as to need little explanation as to its function and operation.

However, the efficiency of any sprinkler system as a fire controlling agent, assuming that the equipment is originally composed of standard materials and installed in an approved manner, is dependent upon the maintenance of the system and it is to these various items of maintenance that especial attention will be given.

A general outline of the procedure followed in making a complete inspection of a sprinkler equipment to determine the condition of the equipment follows: Get in touch with the person in charge of the building (this may be the building owner, superintendent or engineer) and explain the purpose of your visit, and in most cases it will be found that they will be very glad to have the inspection made and will request that any defects noted be pointed out to them so that they may be remedied at once. It is always advisable to have the engineer or employee in charge of the sprinkler system go with the inspector so that defects noted can be pointed out as the inspection progresses.

The source of supply should be checked. For a standard equipment at least two sources of supply are required, one of which must be automatic. Where a gravity tank is provided, note if the tank is
full of water and valve on tank riser open, and the only sure way of determining whether the tank is full of water is to climb the tank, or have filling pump started and note time required to overflow tank, as altitude gauges are apt to be inaccurate and misleading. Note condition of wood of wooden tank and also see if the hoops are badly corroded. Flat tank bands are very quickly destroyed by rusting away.

In climates where weather conditions render it necessary, tank riser should be properly boxed and insulated to protect against freezing, and a proper tank heater provided. In this locality steam tank heaters are generally provided, operating on the same principle as the hot water tank in a residence, the heating element being a steam coil and the piping arranged so there will be a constant circulation of water from the gravity tank through the heating chamber back to the tank.

Where a pressure tank is in service, check up the quantity of water in tank by opening valve at top of column and glass gauge and then open valve at bottom, allowing water to rise in the glass and show true level of water in the tank. Note the air pressure carried, and if below the required pressure, have the air pump started and proper pressure restored. After examining the glass gauge close all air and water valves and open drip cock under glass gauge to drain out the water. Examine the heating arrangements in the tank house. As in the case of the gravity tank, see that all riser control valves are open.

After making sure that tanks are properly filled and control valves open, start on the top floor and make a general survey of the sprinkler piping floor by floor. The more common defects which will probably be found are high piling of stock obstructing sprinkler distribution; oversized decks and fixtures; broken or disconnected hangers; disconnected sprinklers and piping; high degree heads in locations where they are no longer required; small sections which require sprinklers, but where sprinklers have been omitted, such as lofts, towers, under stairs, skylights, inside elevator wells, drying and heating boxes, chutes, cupboards and closets, unless open at top; painted or whitewashed sprinkler heads, etc. Careful note should be made of the location and character of all defects noted so that they can be brought to the attention of the owner or agent of the building for remedial action.

Where a portion of the system is in an exposed location, such as loading platforms, interior driveways, entryways, or in large unheated warehouses subject to freezing, special precautions are necessary; this is usually taken care of by putting this portion of the equipment on a dry system. In such cases the dry valve should be examined to see if it is properly set; note whether gauges register air pressure above and water pressure below valve. The dry valves should either be located in heated portion of building or in frost-proof heated enclosure. Inspectors should become thoroughly familiar with the design and methods of operation of the various dry pipe valves before attempting to operate and test them. The engineer in charge of the equipment should be asked to test the alarm device, but care should be taken to be sure that the alarm is not connected to central station or public fire department. If so connected, proper notification should be given of
such tests to be made. This would also apply where there is danger of exciting employes.

When small areas involving only a few heads are subject to freezing, it is frequently taken care of by filling the piping in that section with a solution of calcium chloride to lower the freezing point of the solution to a safe degree.

Where direct city connections are available at sufficient volume and pressure to be an acceptable source of supply, all valves on the city connection should be inspected to make sure that they are open. Indicator posts attached to all underground valves controlling sprinkler systems are now standard practice. They are quickly accessible in event of fire occurring while water is shut off for repairs and in event of sprinkler failure can be shut off quickly to prevent waste of water.

A well-located fire pump is, under most conditions, the most satisfactory source of secondary supply, as with ample water supply it is capable of maintaining a high pressure over a long period of time. Capacity of pump should be not less than 500 gallons per minute, if supplying sprinklers only, nor less than 750 gallons per minute if supplying hydrants as well. The source of power for operating pump should be investigated. If electric, see that wiring is properly installed and in service, and if steam, note if normal steam pressure is maintained at all times.

HYDRANTS

Experience in the field has developed difficulties in the opening and closing of hydrants, the working loose of interior parts, leakage (especially dangerous in freezing weather), excessive friction, losses, failure to drain, loose nipples and other defects.

The national standard fire hydrant covered by the National Fire Protection association specifications, is designed to obviate these difficulties. Its characteristic features are:

- Liberal area of valve opening and barrel; easy curves to reduce friction.
- Heavy construction throughout.
- Flanged bolt circle above ground level, to permit turning outlets in desired direction.
- Bosses for bolting on standard hose valves.
- Large drips.

There are two main types of hydrant valves. In the one termed the compression type, the water pressure holds the valve against its seat: this is commonly termed a dry break, as even if the top of the hydrant is accidentally broken off, the water pressure will usually hold the valve against the seat and prevent the flow of water. In the other design the valve closes against the water pressure and is sometimes termed a wet break, as a broken hydrant of this type will generally open the hydrant wide and bleed the water system.

The National Board of Fire Underwriters has been doing a great deal of missionary work in standardizing fire hose threads and has developed standardization tools for accomplishing this work to the best advantage. It has determined the range of sizes within which hose
threads are capable of being standardized. The national (American) standard hose thread is three and one-sixteenths inch outside diameter male thread and seven and one-half threads per inch. This size was arrived at as a compromise size among the numerous different standards then in use in the vicinity of Boston, Massachusetts.

All hydrants should open in the same direction to avoid possibility of confusion and possible breaking of the stem by attempting to open in the wrong direction. In any event the direction of opening should be indicated on the hydrant. A raised arrow (sometimes brass screwed to top of hydrant) can be used to show direction of opening and such arrow should be prominent enough to be felt at night.

A liberal number of hydrants makes for economy and efficiency of operation at fires. A good hydrant costs only two or three times as much as a length of standard two and one-half inch fire hose. The depreciation on hydrants is much less than on hose. The loss in pressure, due to friction in long lines of two and one-half inch hose, is a very serious matter; the friction loss in a hydrant is almost nothing by contrast.

The hydrant branch connecting the hydrant with the street main should be six inch pipe and should be provided with an auxiliary valve so that in the event of accident or repairs to the hydrant, the auxiliary valve may be closed and permit these repairs to be made without necessitating shutting off of a section of the distribution system. This feature is especially necessary on hydrants connected to large main feeder arteries, as a broken hydrant on a large feeder main would seriously cripple the available fire supply if not capable of being closed off without closing off the main artery itself. Nearly all the new water systems being installed, and extensions to existing systems, are providing auxiliary gate valves on all hydrant branches.

In locating hydrants with reference to private plants to be protected, care should be taken not to locate them too near to buildings or lumber piles which at time of fire might render it impossible to reach, or where they may have to be abandoned with possible crippling of the system.

Hydrants can advantageously be set on a block of stone or concrete. Those on dead ends should be securely strapped to the underground piping to avoid possibility of blowing off of the hydrant due to water hammer. A large block of stone or concrete placed back of the hydrant will minimize this danger. A bushel of loose stone should be placed around the bottom of the hydrant to facilitate drainage. In clay soils special drain pipes from drips, connected to nearby sewers, are often advisable. A large majority of cases of frozen hydrants are caused by poor drainage of the hydrant.

During periods of severe cold weather hydrants in the high value districts should be inspected daily and in many cities subject to periods of severe cold weather this practice is carried out.

Suggestions for detecting freezing without actually operating the hydrant (which it is inadvisable to do in severe cold weather) are:
Sounding by striking over open outlet with the palm of the hand. Water or ice shortens the length of the "organ pipe" and raises the note.

Partial turning of the hydrant stem. If frozen the stem will not budge.

Lowering weight on stout string into hydrant. It may strike ice or come up with string wet, indicating that the hydrant has not drained properly and will freeze.

Frozen hydrants may be thawed by:

Use of steam hose.

Quick-lime thrown into barrel and hot water added.

Cutting frost with alcohol.

Handful of calcium chloride, which reacts with water and generates heat enough to melt the ice.

With the last two methods the presence of fire may cause explosion in the hydrant barrel.

When drainage is poor or ground water stands at dangerously high level, it is sometimes necessary to close the drains permanently and pump out the hydrant immediately after use, in freezing weather.

In addition to protection against freezing, there are other important items of maintenance, such as keeping hydrants clear of obstructions; "no parking" signs properly enforced for public hydrants and constant attention for private hydrants; keeping them well painted, greased and oiled; in very cold climates a valve stem packing of hemp and tallow has been found satisfactory; and keeping the hydrant thoroughly flushed out. All caps should be kept screwed on tight enough to prevent children removing them and filling the hydrant with stones, sticks and rubbish. In making flow tests I have frequently found hydrants almost filled with stones, broken broom sticks, broken bricks, glass, many of which were of size which would pass through the hose, but would stick in and obstruct the nozzle. This reminds me of a newspaper story about one of my little villages in Cook county. The volunteer department responded full tilt to a residence fire, laid out their hose, connected to the hydrant, but were unable to get water on the fire. While the fire burned merrily the fire boys investigated and discovered a large healthy rat tightly wedged in the taper of the nozzle. This was a very effective shut-off nozzle, but it resulted in the loss of the building. I never was able to verify this story, however, on a subsequent visit to this particular town.

If there are any questions I will be glad to answer them, if I can; if not, I thank you. (Applause.)

Chairman Alsip: Mr. Hunter, I want to thank you on behalf of the assembly here and know they appreciated your very interesting talk and hope again at some time to have you with us. Before we take up the next topic, which will be by Mr. Wolf, Mr. Gamber has a few words to say to you.
PLANS FOR NEXT SHORT COURSE

By John G. Gamber, State Fire Marshal

Mr. Chairman and Gentlemen: At the beginning of this meeting I told you some of the plans we had in mind; some of you were here at that time and others were not. We are planning on publishing or putting out in book form the proceedings of this meeting. They will be prepared and put out in pamphlet form and mailed to every man who was in attendance here. They will be the first ones to receive a copy of the proceedings. Then, I am also planning as a little souvenir a button that will be given to every man who registered here at this time as the beginners of the short course at the University of Illinois, in order that when you go home or when you attend the next convention of firemen, someone will ask you, “What does that mean?” You tell them you were one of the real beginners and they had better come themselves and find out what it is at the next meeting.

As I said before, it is very gratifying to me to see the attendance at this meeting and I have just returned from looking over a new place, a much larger hall, for next year’s meeting place, where we can gather and have equipment on exhibition, and I want to say that next year when you come here you are going to find here one of the best equipments for a drill school that there is anywhere in the United States, excepting none. We will have a drill tower and everything up to date so you can get the actual practice.

This program was prepared on short notice. We were green at the business and the next program will be more evenly balanced in order that you may get every day some practice along the line of ladder raising and actual work that you will get in going to a fire. That in a measure will relieve you some. I realize that for men active the way firemen are it becomes pretty monotonous to sit here from early in the morning until late at night and listen to some of us fellows spout. We might tell you some things instructive, but you want to see the actual work performed. We will be in position to do that.

All I ask of you in return is that you go back home, get in touch with your local newspapers and tell them what you have seen down here, what you have learned and what we expect to put out in order that we may find it easier throughout the next year. In preparing for the next short course the publicity given by the press will be a great help and a stimulant.

There are some cities in Illinois that are not represented here. I want to see them. I want to see every city and village represented here next year.

For your benefit I want to add, and I think I am correct when I make this statement, that this is possibly the largest attendance that has ever been had here on a short course, especially for the first year. We now have 214 registrations. I think Professor Provine is somewhat surprised himself, as he did not expect so many active firemen in the state would take an interest. I think deep down in his heart if we had seventy-five men here he would be well satisfied and feel well repaid for the efforts he made. To be honest with you,
I did not think we would have over 100 myself. It was uphill work for a little while. Quite a number of the chiefs wrote me and asked me to take it up with their mayors or safety commissioners. We did that. We were glad to do it and in almost every instance where a letter of that kind went to the safety commissioner or the mayor, the city is represented. I feel highly elated to think that they had enough confidence in what I said that they permitted the chief or some representative of the city to be present.

In the proceedings will also be a cut of the picture that was taken in order that you may be able to show it. The proceedings will also be distributed to some of the larger cities throughout the United States in order that we may show them that Illinois has again blazed the way for something instructive. Illinois never takes a back seat. We are continually presenting to the public that fire prevention is nothing but a matter of education, then why should we not utilize the best institution that we have in the state of Illinois and one of the best in the United States to start and promulgate his matter of education, not only among the public generally, but among the firemen themselves.

As was said by Mr. Plant of Chicago, I can also say that the hardest fellows I have to sell fire prevention to, I will say about the hardest, are some of the firemen themselves. They are a little skeptical about the things we advocate and doubt the practicability of them, but after we do sell it to them we have no trouble going back and getting a new order. That's what we want to do here. We want to sell this plan to the people throughout the state in order that we may get a new order next year and have not only one or two men from a department, but have three, four and five men and, according to the size of the department, have ten, fifteen and twenty-five men come here and take part.

As I said, next year we are going to balance our program a little better so it will be of more interest to you. I want to take this opportunity, as state fire marshal, of thanking the university and the professors for the wonderful help, the wonderful foresight that they have shown in taking up this question. Already I have letters in my files in Springfield, after this went out, where Iowa, Indiana and Ohio are going to try the same thing next year, but, as I have said, as in a good many things, we blazed the way. We are going to show them how to do it and the plan is going out in the other states as the Illinois plan, so we will get some advertisement in that.

I want to say one more thing and I think I would be amiss in my duty if I did not say it. The administration at Springfield, the state administration, is to be congratulated and thanked for the wonderful support they have given me. When I took this matter up the first time with the governor he was somewhat reluctant about the plan, but I went to him the second time and the third time and he became enthusiastic, and if it had been any other time but the closing of the legislature, the governor himself would have been here to greet you. I was instructed by the finance department to prepare to have this matter taken down in shorthand, at the expense of the state, and also
to have it published, so that part of it should be credited to the state administration for the wonderful support that they have given in this matter.

If I don't get a chance to see you individually once more before leaving, I want to thank you from the bottom of my heart—I know many of you have come here on my account, thinking you were doing me a favor in helping to boost this thing. I trust that you have been repaid and I want to, from the bottom of my heart, thank you for the interest taken and if I don't see you personally before you go I want to bid one and all of you good-bye and I want at the same time to extend an invitation to you to be with us next year. I thank you. (Applause.)

Chairman Alsip: Before taking up the next topic I wish to announce that the photographer who took the picture here the other day will be, at the close of the demonstration by Mr. Wolf, out in the lobby and will take the orders for pictures. He is asking seventy-five cents apiece and will mail them to you, so in order to get away from the confusion, if you will put your name and address on a little piece of paper and with seventy-five cents hand it to him, it will relieve congestion.

Of course, you all know Mr. Wolf, who is to give us a demonstration on rescue work.

(Demonstration given by Mr. Wolf.)

Chairman Alsip: Gentlemen, we will adjourn now until 1:30 o'clock this afternoon.

FRIDAY, JUNE 19, AFTERNOON SESSION

M. L. Enger, Professor of Mechanics and Hydraulics, University of Illinois, Chairman

Chairman Enger: We will call on Mr. Goldsmith for a paper. Mr. Goldsmith is assistant chief engineer of the National Board of Fire Underwriters, Chicago.  (Applause.)

WATERWORKS AND PIPING

By Clarence Goldsmith, Assistant Chief Engineer, National Board of Fire Underwriters, Chicago

This is not going to be a paper. I am going to give a little talk. It has been too hot to prepare a paper the last few days.

It was my pleasure to address the Illinois section of the American Water Works association in this hall, or some other hall, in this building, several years ago on the subject of cooperation between water departments and fire departments. I never had heard of that subject being discussed before, but guess it must be a pretty good one, because I have noted that the subject has been the main issue at several conventions and meetings since. It is very important that the water superintendent cooperate with the fire department, and it is equally as im-
portant for the fire department to cooperate with the water department. If you don't, you are not going to get very far.

We have several types of water supply. We have the gravity supply and there are a few of those in the state of Illinois where the water is collected in storage at high elevation and delivered directly into the distribution systems from those storage reservoirs without pumping. The whole northern part of the state and the major portion of the whole state is so flat that we have to pump the water. In many cases we have direct pumperage and in some we have combinations of the two. We have water stored on the surface, have small elevated tanks floating on the system and get a little water by gravity, but in most cases we are dependent for our fire supply on the capacity of the pumps.

You have been listening during the last three and one-half days to subjects of fire prevention, and operation and methods of extinguishment. As I understand it, you have covered the small appliances for fire extinguishment.

Our fires can roughly be divided into three stages, the fire which can be put out with the small chemicals, or perhaps, with the large chemicals; the next stage is the fire you cannot quite handle with that, which needs a dash of water from the shut off line; then we have the fire in the third stage, which requires several large lines and that is going to be our real problem this afternoon, although we will endeavor to show you some action with the small nozzles where the dash of water backing up the chemical line can be used.

With the various systems of water supply we get our pressure to deliver the water through the distribution system so it will be available at the hydrants. In the smaller towns our pipe is small in size and the quantities of water we can get are relatively small.

Most any fire that has got control of a building needs two streams and as the size of the buildings and the value of the contents increase, we need more water until we get up to the large city block where we require a concentration of 12,000 gallons a minute. I am not going to deal much with that large city problem because those problems are, to my mind, relatively easier than the problems that the firemen in the small cities and towns have to deal with. They have got to utilize what they have and get the most out of it, both men and equipment, and I hope we shall be able to give you several valuable demonstrations of the utilization of comparatively weak water pressures, and be able to show you some fairly good streams.

Most of our water systems are satisfied to maintain a domestic pressure of thirty-five to fifty pounds. In case of fire the pressure is frequently raised and you get your fire streams by directly connecting to the hydrant. In other cities where the pressure is not raised you are dependent on developing the fire stream from gasoline automobile pumphers. Perhaps, in the smaller city, it may still be economical to raise the fire pressure, but as the size of the city increases, I don't believe that can be borne out today as the most economical method, and surely not the most reliable method. If we are going to raise the pressure on the system, we encounter many difficulties, most of which
we overcome, but once in a while we don’t; for instance, if thirty-five pounds is carried and we want to increase the pressure to seventy-five pounds, it means the attendant must be prepared and present at the pumping station, and we must have some reliable way of receiving our alarm and transmitting it to the pumping station. If dependent on raising the pressure, and it is not raised, we cannot develop our fire stream. Raising pressure at the pumping station always involves having reserve equipment or power in some form or other.

In some pumping stations we have centrifugal-motor-operated pumps designed to operate at thirty-five or forty pounds domestic pressure. If we want seventy or eighty pounds pressure we put another pump in series. If we have only two such pumps in our pumping station, and one of these is out of service, we can’t raise the pressure. When we do raise the pressure, we stand a good chance of blowing out a pipe in the system and it may result in the complete failure of our supply. It means also that we will have a marked increase in the domestic consumption at the time we raise the pressure. If we raise the pressure from fifty to 100 pounds, we will be using half as much more water for domestic use, after we raise the pressure, as we were before, and if the supply is limited, or the size of the mains is limited, or the pumping capacity is limited, it means there will be not much water left for fighting a fire. When we realize that the motor pumper of today is a very reliable piece of apparatus, has an excellent service record over a period of years, and that we can develop any pressure we want to at any point we want to, why not get the motor pumper and be satisfied with the ordinary normal domestic pressure from our water system?

In a water system the fireman’s first thought, naturally, is of the fire hydrant, because that’s where he draws the water. The water department in most cases, and I believe properly so, should have charge of the care and maintenance of the fire hydrants themselves, and if its work is properly done, the fireman is going to be able to go to a hydrant and draw water whenever he wants to.

When the fireman finds a hydrant where he cannot get water or when he gets through using one which he cannot close, he should let the superintendent of the water works know the fact, and he might go further and see that the remedy is made. It may be you have had a fire a year or so ago at a certain point in your town, and you were able to get a couple of good hose streams off the hydrant; you remember that very well, but then, you had a little fire there last week, you went down and put on your hose line and got a very feeble stream, but fortunately you got the fire out with that stream or with the chemical. You should immediately call the waterworks superintendent’s attention to that fact, and find out the trouble.

I was talking yesterday to Mr. Hunter, who talked to you this morning, and he said he made a test in a town and found a very small quantity of water available and that the pressure dropped off almost to nothing when they opened the hydrant. They went over the line leading to that particular locality and found the point where there was apparently some stoppage in the pipe; a concrete road was built
over the line, and the valve box was covered up, and the valve was found nearly closed. He opened the valve and got a very satisfactory quantity of water. That's not an unusual case. In our inspection work we find numerous closed valves.

I was in the city of Boston for four years after 1910, and we found 150 valves of twelve inches and larger in that city closed. The city had gone to the expense of putting in the large pipes, but the closed valves cut the capacity practically in two. I could cite a hundred cases where we have found closed valves materially affecting the supply. They ought not to be closed, but they will get closed in spite of all human precaution. Where you find cases where the supply was good and has dropped off, get after it.

I had a case about ten years ago in the city of Omaha. We went to draw some water on a dead end, an eight-inch main, a main of ample size apparently, but could not get more than two or three hundred gallons of water a minute. It happened in that case there was small consumption on the end of the line, and as unfiltered Missouri river water was the source of supply, the main was about four-fifths filled with very fine mud. They blew out the mud, and the supply was practically normal.

I have another case in mind of a dead end line of six-inch pipe. At one time they got two good hose streams from it, but in about a year they could hardly get a drop of water out of it. When they poured one of the lead joints in that main the lead ran down that pipe in streamers. They poured the lead in until they got the joint full; seventy or eighty pounds of lead went into the pipe. The velocity of the water rolled those lead streamers up so that they formed a ball of lead there and finally practically stopped up the pipe. Of course, such cases as that are very, very few, but they are liable to be very serious when they do occur.

Now, we always have a question of hose threads. In many of our larger cities and towns, in going over the hose threads and hydrants with the fire departments and on the connections where there is private equipment, almost invariably we find some threads off size, some so badly off size that they will not fit at all. There is a standardization movement on now. The standard thread has been adopted by all the leading engineering societies, and in connection with the thread standardization, the fire marshals throughout the several states are supporting the movement. It is really becoming more important now since the state of Illinois got hard roads. Until recently it did not make much difference whether or not your threads fitted the hydrants of the neighboring towns, because you could not get there in time to do any good, but today with the hard roads and the pumper, you can cover distances which ten years ago you would not have thought of covering. If you get into a town and your threads don't fit, you are not going to be of much assistance.

As I said before, it is the fellow in the small city and town that has to use his wits. If you are in a town and your threads don't fit you can get one length of hose from that town and get the burst-hose jacket and make a coupling. If you have a pumper and wanting to utilize
what water there may be, you can get a barrel with a hole in the side, put the pump suction in the barrel and have a man attend the hydrant. There is always some way out of the trouble, and we can get the water if we try.

I went with the city of Boston’s fire department to the conflagration that destroyed the city of Salem, Massachusetts. We got there before the fire reached its height. Our suction couplings would not fit the Salem hydrant threads, but we had a master mechanic of the department who went with us, and he got water as long as there was water in those mains by using his wits. That’s all you have to do when up against it—utilize what you have.

The care and inspection of the hydrant of course is up to the water department, but perhaps the water department does not take as great interest in that branch of the work as it ought to. The water superintendent, rightfully so, is mainly interested in furnishing good, pure water for domestic consumption. He is generally pretty busy in a smaller place and probably is called upon to undertake more trades in twenty-four hours than almost any other man and is liable to forget all about the fire hydrants. It is well enough for the firemen to talk it over with the superintendent and if he hasn’t time to do the work and wants you to take hold and inspect the hydrants, go ahead and do it. The hydrants ought to be inspected. That should consist of going to the hydrant and taking the caps off to see that they work freely; if they don’t they should be greased. See if the hydrant has any water in the barrel. (It probably will not in the fall of the year as the ground is liable to be dry.) If it has not, then open the hydrant and blow it out. When you close the hydrant, notice whether it closes easily, is tight and drains properly. A hydrant frozen up is really worse than no hydrant at all, for if you lay your line out and have a frozen hydrant, you have lost valuable time. With a motor pumper it is a mighty good thing to get a hydrant thawing device, for you are bound to find some frozen hydrants. Sometimes in the winter we find five per cent of the hydrants frozen, so we cannot get water. When we had the old steam fire engine we could do a little thawing with it, but now it is not economical for a small city or town to maintain a boiler for thawing purposes when several practical devices are available which can be attached to the pumper. You can readily see it is well for you to know about the maintenance and use of hydrants.

We always believe it is desirable where we have two-outlet hydrants for the firemen to carry independent gates and put one gate on each outlet. One gate should be carried on the hose line, and the other gate tied with a strap to the first gate so that those two gates can be readily available to put on the hydrant. In case you want to lay in a second line, you can lay it in without shutting the hydrant down. Where you have a relatively low pressure, thirty or forty pounds, you may start out and think you can catch that fire without a large line, but if the fire gets away, you can drop your chemical line, come back, and put your pumper on the gated outlet and then the only delay you have in delivering water is to shut down the gate valve.
on the hose line and shift the line over to the pump, which will not take over a half a minute.

The question of putting gates on the hydrants is discussed; sometimes they tell me that it takes too much time. Stop and analyze it. Why should we economize in a place that does not do any particular good? In most fires the hydrant man can get off, take the two caps off, and put the gate on the hose line and get his hydrant open before they are ready for water at the other end of the line. If it is some old woodshed at the back of a house, and you have no entrance to make, you might have to wait two or three seconds for your hydrant man. This question of the time required is unimportant as you will find if you analyze the maneuver.

Along the same line, we do not believe that the soft suction is a desirable thing to use on pumpers. If it is carried on the pumper at all, you are going to use it, as it is a little easier from the manual standpoint to put the soft suction on. Even in the larger cities we are liable to get a fire where we have to concentrate large quantities of water and pull the pressure down on the mains to zero or below, and then the soft suction will collapse. In outlying districts you are liable to get on dead ends where you will pull the pressure down to zero. There are very few times when the operator, if the work of the company is properly allocated, cannot get the stiff suction on the hydrant, without loss of time, and then he can suck the water out of the mains as long as there is any to suck out. So stick to the hard suction because that is not, as I say, a governing feature for determining the time.

In our inspections we run every engine company out of its house, let it take the nearest hydrant, take off the hydrant caps, put on the hard suction, lay 200 feet of hose, attach a nozzle, and raise the pressure to 100 pounds on the pump, and any company that is well trained can do this in just about sixty seconds. So you are not losing very much time and you would not save any time if you did not have to make your connection to the hydrant with a hard suction.

Analyze all fire department maneuvers in this way and find what is the particular portion of the maneuver taking the longest time, then see if you can divide up your men differently so as to cut down the time. We know this can be done from the records of city departments. The city of Milwaukee has a board of six engineers review their standard maneuvers and change them from year to year, so the time may be cut down. Some man in the company or some captain or some officer finds a little easier way to do some particular thing. It is like watching Mr. Wolf this morning lift a man off of the floor. He did it with no physical exertion at all. We can perform all these fire department maneuvers with a minimum amount of exertion if we pay attention and study them.

There is one thing that is very important for the fireman to remember, because the fireman is in supreme command at the time of a fire, he is boss of everything, and that is the capacity of the water system from which water is being drawn. I don’t know that this particular subject was ever more forcibly brought to one’s atten-
tion than it was about ten years ago at Coney Island, when a sweeping fire occurred. They had a separate fire main system of a capacity of some 4,000 or 5,000 gallons. The capacity, however, is immaterial, for they put on hose lines to take about twice the capacity of the system. The result was there was no stream from that system that was of any effect at all, they were all so weak. It is better to have one good stream than two poor streams, or two good streams than four poor streams. The onlooker may see the water coming out of the nozzle, but it is not putting the fire out, so don't try to overload your system. You can determine, or correctly find out, what the capacity of your system is in the mercantile district, where the greatest values are. Today, the Illinois Inspection Bureau classifies the protection in all protected towns in the state, and in the course of that classification, they measure the water they can get out of the hydrants. The engineer who is doing that work secures his information from the members of the fire department and the water department. In your town if they find they can get 750 gallons at sixty pounds pressure, if that's the pressure you need, don't try to use more than three one and one-eighth inch streams. If you do, you will draw the pressure in the mains down and not get the powerful streams you may need. You may have a four inch dead end and you can get one good one-inch stream, but don't try to get two streams.

I used to run with a volunteer department about thirty years ago, and we used to borrow horses from a close-by machine shop. We had a fire one night and had to run up a long hill. One of the fellows named Steve said, "Boys, put on two collars on those horses, that's a steep hill." You are going to do as much good trying to get two streams where there is not pressure enough to supply them as Steve did by putting two collars on the horses. It will not work.

Where you have a pumper you can perform lots more efficient work. You may have sixty pounds pressure in your mercantile district and say you have a 350-gallon pumper. I would not buy a hose wagon without a pump of at least 350 gallons capacity, although I might have sixty or seventy pounds pressure, for there is always some place where the pressure does not hold up and you will need that pump to give one good stream. When you get on the end of a four-inch main, suppose you can get only 180 gallons of water, put your pumper on, and select your nozzle with a three-quarter inch or seven-eighths inch tip so you will get a good stiff stream. We are going to show you later how you can utilize such small quantities of water and develop one good stream.

In a city south of the Ohio river, last year the mayor got into a considerable discussion about a loss they had on the edge of town. They had two pumperers each of 350-gallons capacity. I got them to lay out the hose as it was laid out at the time of the fire, and they were not able to throw water over the sill of the window on the first floor of the brick building destroyed. We found out how much water we could get from the hydrant, we put on the proper nozzles, and got two very nice streams. The mayor was very much surprised. The chief was a new appointee, and at previous fires he had been able to get
fair streams direct from hydrants, but it just happened at this place it could not be done.

You men ought to study the water distribution system. Where you have a volunteer department, if you practice, go to some of the weak places and find whether you can get one good stream or two good streams, or if you cannot get any at all. Find out what you can do with your pumper and what size nozzle to use.

We talk about the hydraulics of fire streams, and it is very true we can make some close calculations on the pressure and quantity of water discharged through hose lines, but fire-fighting, as yet, is not an exact science. In actual practice we don’t know within ten per cent of how much water we need to extinguish fire in any given building, and we cannot tell the friction loss in the hose lines within a few pounds, but you can make rough estimates of the pressure you ought to carry at the pumper to get moderately efficient fire streams. It does not make much difference whether you get sixty or seventy pounds on an outside line, and you don’t want as much on an inside line, but it is well to know how to get a fairly satisfactory stream. The best way to do is to make experimental layouts and actually see the result yourself.

For those of you who will be interested in studying the subject further, the National Board of Fire Underwriters has a little book called the Red Book. It is entitled “Fire Engine Tests and Fire Stream Tables.” If any fireman is interested enough to write to us and say, “Send me a Red Book,” shall be glad to do it. We did not bring them down here and give them out because it is a question of psychology. Nobody cares for anything that is free, but if you care to write about it, we shall send it to you. We want everybody to have them, but we only give them on request, and if any of you are interested in receiving a copy of the Red Book, we shall be glad to give it to you. This Red Book contains tables showing the loss through two and one-half, three, and three and one-half-inch hose when delivering various quantities of water. It gives the quantity of water in gallons discharged with different pressures at the nozzle. For instance, we will take a one-inch, smooth nozzle, if we have 300 feet of hose out and we want to maintain forty pounds on the nozzle, we have got to have sixty-eight pounds at the pumper to do it. It also gives you directions how to work out any of these problems. If you work out a lot of these problems and discuss them around the table at night, you are going to develop your judgment. You will be able to tell the man at the pumper to give you 160 pounds, and you know that’s going to give a reasonable fire stream, considering the size of the nozzle and considering the length of the line. You can do that by studying beforehand.

The city of Detroit has a little brass plate on each pumper which shows the proper starting pressure for different lengths of hose lines, and different sized nozzles required to deliver a good fire stream. If he wants a different stream, the officer can say, “Give us fifteen or twenty pounds more,” and if the men are having trouble holding the line, he can ask for fifteen or twenty pounds less.
In the smaller department it is just as important for the fireman to know how to develop an effective stream as it is in a larger city department. The method is simple, for as a matter of fact, the formula in the book is not based on any scientific facts that I know anything about. I have not been able to find any mathematician that could tell me what they were based on. I believe they were first developed by a first-grade fireman of New York's fire department. They are simple propositions and things you can remember after you study them. There are several city departments where probably sixty per cent of the first-grade firemen in the departments could figure all around me in calculating hose lines, nozzles and hydrant pressure. There is nothing difficult about it.

The city of Boston, several years ago, asked a division engineer to give a talk before the fire department. The division engineer said something about "2Q square plus 2Q," and the chief went up and tapped him on the shoulder and said, "It is all right, Mac, but we don't want that square stuff." Mac's method of stating it was wrong. He should not have said it that way, for he made a mystery of it. As I say, I shall be glad to send these Red Books to any or all of you, and you will be surprised after making a few calculations when you take out your pumper and lay hose lines to find out how close your calculation will come.

There is always the chance of a failure of the water system. Particularly for our smaller water systems a fireman ought to consider what he would do in case of a failure, before it happens. If you cannot work the thing out when it is quiet, and there is no emergency, you surely cannot do as good a job if it comes on you like a thief in the night. Each of you should imagine that the water system in your home town failed for an hour or even for a half a day. What steps are you going to take? How are you going to utilize what water may be around and what are you going to plan to do, so if the emergency arises you are going to be able to devote your entire energy in directing your department and using the equipment you have and not having to think out some scheme to handle the situation?

I was up at Sandusky, Ohio, immediately after the cyclone which swept through there last year. The chief of the fire department had thought more or less of the subject and he immediately stationed his apparatus so he could get water from the lake into about half of the city and he got about 5,000 feet of hose from Toledo and then he could get some water in practically all parts of the city. Here was the emergency, but he had it all figured out beforehand, and the companies went where they were supposed to go, and I think the fire loss was practically nil, except in that portion swept by the tornado.

Some of our larger cities are giving thought to what might result in case an earthquake should rupture the pipes in their water systems. The water department and the fire department in the city of Detroit are considering this question. It will not do you any harm to figure such things out beforehand, particularly because smaller plants are more unreliable than larger ones, although their service
record is very good on the whole. Be prepared for the emergency so you can do the best you can with the equipment you have.

I believe we had better adjourn now and go out and have a few demonstrations. We have, I understand, two pieces of apparatus, one of the Champaign fire department and one of the Urbana fire department. We shall show you what can be done with low water pressure and high water pressure. There is one little thing we are going to try to do. I don't know whether we shall succeed, but I have been wanting to do it for ten years, but never have had the opportunity. It is in connection with the pull-back of a hose stream. Let's imagine we have got a nice stiff stream and we are playing right out in the open; if we move that stream to within three or four feet of a brick wall and play against the wall, are we going to get more or less pull-back, or is it going to be the same? I will bet we shall get no more pull-back, but we shall see whether we do or not. This question has caused more amusement and argument in many departments than any other single question I know of. I think we are all ready now. (Applause.)

Chairman Enger: Mr. Goldsmith will be willing to answer any questions before you go out. We have two different pieces of fire apparatus which you will have an opportunity to see in operation. We will now adjourn for the tests.

Demonstration Tests of Pumping Engines, and Friction Loss in Two and One-Half Inch Fire Hose

Summarized by M. L. Enger, Professor of Mechanics and Hydraulics, University of Illinois

The equipment used consisted of one American LaFrance pumper, 1,000 gallon capacity, belonging to the Champaign fire department, and one Seagrave pumper, 750 gallon capacity, belonging to the Urbana fire department. Water was taken from a cooling pond at the locomotive laboratory of the University of Illinois. Two lines of hose were laid, each 200 feet long, and pressure gauges were placed fifty and 150 feet from the pump, making the distance between the gauges 100 feet. The tests were under the supervision of Mr. Goldsmith of the National Board of Fire Underwriters, Chicago.

Tests to Show Friction in Hose—Several experiments were made at different rates of flow. The results are tabulated below.

<table>
<thead>
<tr>
<th>Length of Hose</th>
<th>Rate of Discharge</th>
<th>Loss of Head</th>
</tr>
</thead>
<tbody>
<tr>
<td>100 feet</td>
<td>160 gallons per minute</td>
<td>5 pounds per square inch</td>
</tr>
<tr>
<td>100 feet</td>
<td>260 gallons per minute</td>
<td>10 pounds per square inch</td>
</tr>
<tr>
<td>100 feet</td>
<td>360 gallons per minute</td>
<td>25 pounds per square inch</td>
</tr>
</tbody>
</table>

The tests show that the friction loss increases very rapidly with increasing rate of discharge.

Tests to Show Pull-back—There has been a controversy among firemen for many years as to whether the pull-back increases when
a fire stream is turned against a wall. To investigate this question the nozzle was held from kicking back by means of a spring balance and a rope lashed to a telegraph pole. The hose was held in a horizontal position for a distance of about fifty feet. When a one and one-quarter inch nozzle discharged 240 gallons per minute the pull-back was seventy-two pounds whether the stream hit the pole or not. When the discharge was 295 gallons per minute the pull-back was ninety-four pounds whether stream hit pole or not. This test proved that the pull-back is not increased by having the stream strike a wall.

Tests to Show the Advantage of Using Small Nozzles in Certain Cases—When the amount of water is limited, either by friction in a long line of hose or by small pump capacity, small nozzles will throw the best streams. This was shown by using one and one-eighth inch and three-quarters inch nozzles simultaneously at the end of 200 foot lines of hose. Pressure at pumper was thirty-five pounds per square inch and was eighteen and twenty-seven pounds per square inch, respectively, at the one and one-eighth inch and three-quarter inch nozzles. The discharges were 160 and ninety-one gallons per minute, respectively. The three-quarter inch stream had much the greater height and distance.

Tests to Show Advantage of Siamesing—The two 200 foot lines of two and one-half inch hose used in previous tests were siamesed into one, one and one-quarter inch nozzle. The discharge was 410 gallons per minute with a nozzle pressure of eighty pounds per square inch. If there had been only one line of hose 200 feet long the discharge would have been 325 gallons per minute and the pressure at the nozzle fifty pounds per square inch. By means of siamese connections the volume and distance of a fire stream can be increased and this is particularly true in the case of hose lines of 400 feet and longer.
REPRESENTATIVES IN ATTENDANCE

(City of residence in Illinois unless otherwise indicated)

Adams, Grover, Danville, fireman
Adams, Ward, Tolono, fireman
Albert, L. O., Danville, fireman
Alsip, R. W., Champaign, assistant fire chief
Anderson, Frank, Champaign, fire department captain
Arens, Otto P., Chicago, fire prevention inspector
Askey, L. J., Freeport, city building inspector
Ayers, C. S., Champaign, fireman
Baley, William, Decatur, fireman
Barber, O. F., Illinois Power and Light, Decatur, electrical engineer
Barden, James, Peoria, fireman
Beecher, D. J., Marseilles, electrician, assistant in fire department
Bethel, R. V., Chicago, Foamite-Childs Corporation
Biggs, Wm. P., Pullman Car and Manufacturing Co., Chicago, safety engineer
Boehm, W. D., Sterling, retired fireman
Boissonin, Joseph, Ottawa, fire chief
Bradbeer, Robert H., Spring Valley, fire chief
Brannon, R., Urbana, member University of Illinois fire department
Bromley, Ted, Danville, fireman
Brooks, Tom, Clinton, fire chief
Buck, W. H., Danville, fireman
Buffin, A. R., Freeport, alderman and chairman of fire committee
Burres, W. T., Urbana, mayor
Burton, Frank, Danville, fireman
Burton, W. S., Tolono, fire chief
Butzow, Chas. A., Sycamore, fire chief
Cantwell, F. P., De Pue, fire chief
Chinske, Stanley L., Michigan City, Indiana, safety and fire prevention work
Coffey, T. B., Dixon, fire chief
Cole, Archie, Elgin, fireman
Comrie, Leslie T., Danville, fireman
Conners, C. J., Peoria, fire chief
Coons, C. E., St. Louis, Missouri, supervisor of trains
Corcoran, J. L., Lockport, physical director, Lockport Hospital
Crump, F. E., Urbana, member University of Illinois fire department
Cullen, M. D., Springfield, fire department captain
Dabels, Frank, Danville, fireman
Davis, Frank M., Danville, fireman
Deutsch, W. H., 3830 Michigan avenue, Chicago, American-La France Fire Engine Co. (fire apparatus)
De Long, Julius, Madison, fireman
Dettmering, Henry D., Matteson, fire chief
Dial, John E., West Frankfort, fireman
Dicke, Elmer, Downers Grove, secretary of fire department
Dickerson, Tom, Danville, assistant fire chief
Dolan, Grant, Danville, fireman
Doherty, M. J., 1804 Conway building, Chicago, representative, The Seagrave Corporation (Motor Fire Apparatus), Columbus, Ohio
Donley, Edward, Champaigne, fireman
Donnelly, H. S., Chicago, Pyrene Manufacturing Co. (fire extinguishers)
Drennan, Robert W., Pawnee, driver for fire chief
Duff, Daniel A., Dundee, fireman
Duffey, John, Decatur, fireman
Eggers, H. F., Chester, steam and electrical engineer
Evly, John, Champaign, fire chief
Enger, M. L., Urbana, professor of M. and S. E., University of Illinois
Farmer, George, Peoria, operating engineer, Illinois Power and Light Corporation
Farnam, Leroy, Pawnee, member of town board and chairman of committee for purchase of new fire equipment
Faverty, L. A., Chester, garage man
Fay, Thomas, Urbana, fire chief, University of Illinois department
Feller, Harry H., Madison, fireman
Felt, Fred, Sr., Chicago Heights, commissioner of public health and safety
Fife, W. T., West Frankfort, assistant fire chief
Fleming, J. B., Pittsburgh, Pennsylvania, western representative, Mine Safety Appliances Co. (gas masks)
Flynn, J. A., Chicago, Potter Manufacturing Co. (straight slide tubular fire escapes)
Frederick, E., Rankin, fireman
Gamber, John G., Springfield, state fire marshal
Gibson, J. R., Champaign, fireman
Godsebois, Paul, East Moline, fire chief
Goldsmith, Clarence, Chicago, assistant chief engineer, National Board of Fire Underwriters, 209 West Jackson boulevard
Gorrey, M. E., Danville, fireman
Green, C. E., Springfield, assistant fire chief
Greenawalt, Herman, Danville, fireman
Gregory, H. P., Moweaqua, fire chief
Gwinn, Howard, 1713 Moulton, Mattoon, fireman
Gwinnup, W. M., Delavan, fire chief
Haderlein, Fred P., Carlyle, secretary, local fire department; vice-president, state association
Hall, Harry E., Clinton, fireman
Hammerle, Ed., Walnut, fire chief
Harmeling, G. H., Cincinnati, Ohio, "Fire Protection"—a magazine published by National Underwriters Corporation
Harrier, Clyde, Danville, fireman
Haskell, Clarence, Mattoon, fireman
Hatfield, Howard, Danville, fireman
Haughton, R. C., Chicago, salesman, Pyrene Manufacturing Co. (fire extinguishers)
Hawk, John Q., Moline, fire chief
Hawkins, J. P., Champaign, fireman
Hays, H. B., Jacksonville, superintendent of operation, Illinois Power and Light Corporation
Hays, J. B., Urbana, assistant fire chief
Helmer, J. P., De Pue, fireman
Henryson, E. F., Elgin, fireman
Hibbard, F. W., Chicago, fire inspector, Illinois Central Railroad, Seventh Floor, Dowie building
Holman, Ralph, Danville, fireman
Hoover, W. D., Gibson City, city councilman
Houren, G. M., Winnetka, fire chief
Howard, J. K., Chicago, engineer, American-LaFrance Fire Engine Co. (fire apparatus)
Huckstadt, John, Danville, fireman
Huffman, E. T., Crystal Lake, fire chief
Hunt, Samuel C., Jacksonville, fire chief
Hunter, Harold F., Chicago, engineer, Chicago Board of Underwriters, 175 West Jackson boulevard
Huntington, J. W., Decatur, fire insurance
Hurd, Geo. R., 8120 Ellis avenue, Chicago, superintendent fire protection, Illinois Central Railroad
Jacobs, Dave, Danville, fireman
Jaeckel, Julius F., Pekin, fire chief
James, T. E., Litchfield, block manufacturing
Jarden, G., Urbana, fireman
Jarden, G., Urbana, fireman
Johnson, Andes W., 422 North Mill street, Pontiac, fireman
Jones, Charles O., Rantoul, assistant fire chief
Jones, Kendall, Gilman, fireman
Jones, R. D., Gilman, fireman
Joseph, T., Mattoon, fireman
Jones, R. D., Chicago, fireman
Krabbe, Charles, Champaign, fireman
Kraff, Peter, Princeton, city commissioner
Krause, Geo. W., Crystal Lake, assistant fire chief
Kruste, Hobart, Champaign, fireman
Kuehuen, Harry R., 116 West Henry street, Staunton, second assistant fire chief
Lamb, Loren, Princeton, fire chief
Landult, Fred, Alhambra, mayor
Lange, W. F., Champaign, fireman
Lawless, R. M., Chicago, Bi-Lateral Fire Hose Co. (salesman)
Leitschuh, O., Litchfield, fire chief
Lenert, A. E., Mt. Carmel, fire chief
Link, John, Blue Island, fire chief
Lohmann, Herman J., Aurora, fire chief
Longer, William, Danville, fireman
Lowry, S. T., Decatur, assistant fire chief
Lueck, Wm. M., Dundee, fireman
Lundstrom, R. A., Pekin, fire marshal of Corn Products Refining Co.
McNeill, Pete, Murphysboro, chauffeur
Maddex, T. E., Springfield, electrical engineer, Central Illinois Public Service Co.
Mann, F. L., Danville, fireman
Martin, C. C., Urbana, fire chief
Martin, Sug, Urbana, mascot of fire department
Matson, R. C., Chicago, Underwriters’ Laboratories, 207 East Ohio street
Mattson, Charles J., Moline, deputy state fire marshal
Maurer, E. D., Galesburg, operating engineer, Illinois Power and Light Corporation
Metzelaars, P. H., Mattoon, fireman
Miller, M. C., Danville, fire department captain
Morrow, W. J., Clinton, assistant fire chief
Muirhead, David, Danville, fireman
Muirhead, Robert, Danville, fireman
Murphy, G. W., Champaign, fireman
Naris, B., Urbana, fireman
Neal, William, Rantoul, fire chief
Nelson, Raymond T., Chicago, engineer, Western Actuarial Bureau
Newton, T. G., Litchfield, electrician
Nicol, Connel L., Sterling, fire chief
Nolan, E. T., Freeport, fire chief
Oneal, Harly, Rankin, fire chief
O’Neill William J., Jr., Lake Forest, fire chief
Ott, Albert, Danville, fireman
Palmer, C. E., Urbana, assistant professor of architectural engineering, University of Illinois
Pauknnin, F. J., Berkeley, fire chief
Paris, E., Urbana, fireman
Paris, T., Urbana, fireman
Perkins, C. N., Danville, fireman
Pesavento, Andrew, Joliet, fire department lieutenant
Phillip, M. S., Chicago Heights, fire chief
 Phillimore, George W., Marseilles, fire chief
Phillips, H. A., 3830 South Michigan, Chicago, engineer for American-LaFrance Fire Engine Co. (fire apparatus)
Pierce, Dana, Chicago, president of Underwriters' Laboratories
Pitman, C., Urbana, fireman
Plant, John, 4833 N. Lawndale avenue, Chicago, chief engineer, fire preven-
tion bureau of Chicago
Platt, Edward, Decatur, fire chief
Platt, Ben E., Decatur, fireman
Poff, A. O., Gibson City, deputy state fire marshal
Provine, L. H., Urbana, professor of architectural engineering, University
of Illinois
Pullman, Henry, LaGrange, police lieutenant
Putman, George, Decatur, fireman
Raymond, Fred A., Newton Upper Falls, Massachusetts, research and con-
sulting engineer for Gamewell Co. (fire alarm devices)
Reddick, Ed. R., Champaign, fireman
Regensburger, R. W., 8210 South Justine street, Chicago, mechanical engineer
Reiche, Otto H., Naperville, fire chief
Richards, Benjamin, Chicago, manager, Underwriters' Service association
Ridgway, Frank, Freeport, fire extinguisher salesman
Rieker, W. F., Danville, assistant fire chief
Rogers, Harry K., Chicago, fire prevention engineer, Western Actuarial
Bureau
Ruch, G. W., Springfield, traveling inspector of motive power, Illinois Traction
System
Ruddy, Thomas, Joliet, assistant fire chief
Ruey, George, Canton, fire chief
Ruhrdanz, A. J., Danville, fireman
Safko, Anthony, Staunton, fire chief
Sawyer, Wayne, Gibson City, fire chief
Schalk, August, 116 West White, Champaign, fireman
Scherer, Fred, Ottawa, city commissioner
Schertz, P., Gibson City, mayor
Schmaedeke, Ed., Matteson, volunteer fireman
Seyman, L. J., Danville, former fire equipment salesman
Shafer, M. J., Room 1804 Conway building, Chicago, Seagrave Co. (fire ap-
paratus)
Sheets, Claud, Danville, fireman
Shue, B. E., Champaign, representative of Illinois Power and Light Co.
Simmons, Theodore E., Danville, fireman
Sloan, Roscoe S., Rankin, fireman
Smith, Pearl, Madison, president, Illinois Firemen's association
Spiering, Albert, Danville, fireman
Starry, D. L., Danville, fireman, captain No. 4
Storm, Merle, Mattoon, fireman
Stubs, William, Champaign, fireman
Tarro, Joseph, Spring Valley, fireman
Tesnow, Henry C., Evanston, fire department lieutenant
Tousley, Y. H., Room 606, City Hall, Chicago, chief electrical inspector, de-
partment of gas and electricity, Chicago
Underwood, T. J., Pawnee, fire chief
Upham, Charles S., Pontiac, fire chief
Van Alstyne, P. J., St. Louis, Missouri, 500 Compton building, electrical
engineer
Waterman, A. T., 501 Gloyd building, Kansas City, Missouri, fire drill in-
structor
Weaver, J. C., Mattoon, fire chief
Welton, H. H., Chester, garage man
Whalen, J. J., East St. Louis, fire chief
White, Fred A., Danville, fire department captain
White, Leo, Danville, fire department captain
Wilcockson, G. W., Pawnee, mayor
Wills, F. M., South Elgin, mayor
Wolf, L. L., Cincinnati, Ohio, paint manufacturer, instructor and drillmaster
Wyatt, Ray, Danville, fireman
Zibble, Walter H., Wilmette, fire chief