

A STUDY OF SAFETY EDUCATION IN THE CALIFORNIA  
SECONDARY SCHOOL SHOPS WITH  
RECOMMENDATIONS

by

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L. P.

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And the end is that the workman shall live to enjoy the fruits of his labor; that his mother shall have the comfort of his arm in her age; that his wife shall not be untimely a widow; that his children shall have a father, and that cripples and helpless wrecks who were once strong men shall not longer be a by-product of industry.

P. B. Juhnke

Quoted from - Deblois, Lewis A.  
Industrial Safety Organization, 1st edition.  
McGraw-Hill Co., New York, p. 1.

CHAPTER I

INTRODUCTION

## CHAPTER I

## INTRODUCTION

During the last quarter of a century many new problems have been added to the list of difficulties to be solved by the human mind. Practically every new invention or development has brought with it new dangers previously unknown. In order for us as individuals to profit from this super-scientific age, we must educate ourselves and others in the proper ways and means of using these new developments with safety.

Approximately 30 years ago certain industrial organizations, realizing the great waste of time and human life that existed, started a campaign to reduce the number of accidents that occurred in their plants. Their efforts yielded results, and the number of deaths and serious accidents were materially reduced. However, the fact that two-thirds or more of all accidental deaths in the United States occur outside of industry, emphasizes the necessity of a campaign to educate people in the field of accident prevention and safety.

The tremendously increasing number of accidents caused by the complex organization of our social life

has caused no little amount of thought to many business men and social thinkers. Due to the importance of the problem, in 1912 the National Safety Council was organized for the purpose of promoting better safety practices in the American industrial and social structure.

One of the recent developments that has caused a great increase in accidental loss of life is the motor vehicle. One need but glance at the statistics concerning accidental deaths and injuries to realize the necessity of encouraging the safe operation of motor vehicles. Furthermore, these statistics will show that drivers of high school and college age are large contributors to automobile fatalities. It is also true that there are many other types of accidents that may be avoided, and many safety measures which the individual may be taught to observe with profit to himself and to the community.

#### The Need and Value of Safety

When one reads that in a recent single year in the United States alone the number of deaths due to accidents,<sup>1</sup> or other undefined external causes was 95,527, corresponding to a rate of 80.6 per 100,000 population, the seriousness of the problem becomes apparent. The last two decades have added the new problem of motor vehicle casual-

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<sup>1</sup>Mortality Statistics 1930 - U. S. Dept. of Commerce  
Bureau of census. p. 51.

ties, which in one year in our country took a toll of 27,500 human lives, injured 95,000 persons, and caused an economic loss of \$900,000,000.<sup>2</sup>

Seven per cent of the 42,000,000 persons gainfully employed are injured each year, and the entire working population pays annually for industrial injuries a tax on its earnings which has been estimated to be from 2 to 4%.<sup>3</sup>

Accidents are a needless waste. These unfortunate happenings are in the main attributable to carelessness or ignorance. If this is the case, the remedy is education. Education in safety must be continuous because the next century will probably bring more new hazards than the last.

W. C. Dickerman, Vice President of the American Car and Foundry Co. says:

"Safety pays large dividends, to which may be added the reduced costs resulting from increased production and improved quality, decreased overhead, and decreased labor turnover. These savings cannot be reduced so readily to dollars and cents; nevertheless they exist in themselves and present a vigorous and emphatic argument for the spread of the safety movement."

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<sup>2</sup>Manual of Safety for Secondary Schools - Public Safety Department of the Automobile Club of Southern California, 1931, p. 9.

<sup>3</sup>De Blois, Lewis A., Industrial Safety Organization, McGraw-Hill Book Co., New York, 1926, p. 4.

One must not think that long no-accident records and conspicuous reductions in injury frequency or severity are merely the result of good fortune. Usually they are the result and reward for years of conscientious and patient effort to cut down the causes of accidents.

"Production without safety is inefficient. Accident prevention is absolutely an essential part of the industrial program. While we take great pleasure in giving employment to maimed men, we believe that we are doing a far greater work in preventing this maiming of men. We feel that accidents are absolutely unnecessary."<sup>4</sup>

#### Training for a Safer Life is a Problem in Education

Safety must not be thought of as something one can purchase with little effort and thereafter be under its guiding hand and protected at all times without any effort of his own.

The presence of safety signs and posters will not assure the worker of complete protection. Neither will the fact that he has worked at a job for many years without accident make it impossible for him to be injured, even though fully experienced in that job. Constant repetition on some types of work tends to throw one off guard, reducing safety consciousness and increasing hazard. Neither will the passing of a perfect examination on some phase of safety, or a set of safety rules

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<sup>4</sup>Quotation by Henry Ford, taken from *Speaking for Safety*, A handbook for the safety speaker. National Safety Council, 20 N. Wacker Drive, Chicago, Ill., p. 69.

make it impossible for the worker to become injured.

The child who has early in life developed the proper attitudes toward the prevention of accidents will make a much better member of society than one who lacks such attitudes, whether he be engaged in industrial, commercial, domestic or other pursuits. Other things being equal the graduate of any school who has, along with other educational accomplishments, developed the proper safety attitude is assured of greater consideration and more rapid advancement than if he were lacking in this respect, regardless of the vocation he may choose as a life work.

The elementary schools have for a number of years emphasized safety in many of its phases, giving particular emphasis to safety in traffic. The fire drill and street and playground situations have also been given attention.

Safety work has been continued into the junior high school where emphasis has again been placed on habits. Some responsibility has been placed upon pupils through the organization of safety patrols, safety committees, and the like.

In the senior high school safety instruction has been neglected.<sup>5</sup> Curtis Billings<sup>6</sup> while secretary of the

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<sup>5</sup>Manual of Safety for Sec. Schools - Public Safety Dept. of the Automobile Club of Southern California, 1931.

<sup>6</sup>Personal correspondence with Curtis Billing, Secretary School Shop Committee, National Safety Council, Chicago, Ill., Feb. 13, 1935. Quotation by permission.

school shop committee of the National Safety Council;  
Chicago, Ill. writes as follows:

"It is a rather unpleasant commentary that American schools are for the most part far behind American industrial concerns in the matter of safety education. Conditions exist in schools which would never be tolerated for a minute in a progressive industrial concern. This seems strange on the face of it because one expects to find ideal conditions in the school which the industrial concern would seek to emulate."

It is to be regretted that safety education is not stressed more in the senior high school because at this level the insights, appreciations, and attitudes can be built upon the basis formed by the many experiences of the earlier years, in such a way as to really be effective in adult life. The boys and girls of the senior high school are fast approaching life in the adult world, and they should have training in one of the serious problems which the world has as yet not conquered. Dr. Herbert J. Stack, in his book - "Safety Education in the Secondary Schools"<sup>7</sup> states as follows:

"Education has a very important place in accident prevention. Machines may be perfected until there is rarely an accident due to lack of safeguards or defects in structure; elaborate codes and regulations may be established to prevent accidents, and restrictions may be passed - but with all these, education has a very definite contribution to make. It is through education that

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<sup>7</sup>Stack, Herbert J., Safety Education in the Secondary Schools  
Nat. Bureau of Casualty and Surety Underwriters,  
New York, P. 6.

society may learn the dangers of its environment and the methods by which accidents may be prevented."

If education is to function; if lives are to be saved and accidents reduced, safety education must result in safe conduct on the part of the pupils. Safety instruction should be directed toward the acquiring of safety habits, skills, and attitudes.

Albert Whitney and A. B. Meridith<sup>8</sup> presented the basic theory on which safety education exists in the schools, contending

"Safety is immediately related to life, physical and social. Because it is related to life, it has a place in the modern school curriculum. Safety is the condition which accompanies the realization of a purpose and teaching safety is teaching how to control the factors in an environment that a purpose may be realized."

In the end the real test of safety education is whether or not it brings results in the reducing of accidents and their accompanying losses. Industries believe in safety because they have been able to secure very definite results. The railroad accident prevention program has resulted in a decrease in accidents of from 20 to 50 per cent.<sup>9</sup> The real test of a safety program

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<sup>8</sup>Ibid., p. 9.

<sup>9</sup>Stack, Herbert J., Safety Education in the Secondary Schools, National Bureau of Casualty and Surety Underwriters, 1929, p. 10.

in education, at the secondary school level, must therefore be measured by the general tendency toward accident reduction over a period of time.

CHAPTER II

THE PROBLEM

## CHAPTER II

### THE PROBLEM

The purpose of this study is to determine the present status of safety education in the secondary school shops of California, and to organize objectives and material for teaching safety education in connection with the regular industrial arts work. In order to accomplish this the investigator has attempted to answer the following questions:

1. How many of the secondary schools have a definite program for the industrial arts work?
2. What are the causes of most accidents that occur in the industrial arts work?
3. What are the sources of material which may be used for instruction in safety?
4. How is instruction in safety education commonly given in the industrial arts work?
5. Is there evidence to indicate a shortage of educational instruction in safety?
6. Is training in first aid important in connection with safety education?
7. Is training in safety given an important place in the industrial arts program?

#### Importance of the Problem

Implications were made on previous pages that this

industrial age has introduced many new dangers. The speeding up of life activities, the introduction of dangerous machinery, the rapid development of the automobile, have each brought new hazards to be overcome. The records of the many preventable accidents and waste is an outstanding indication of educational shortage in safety.

Many accidents are the result of failures to realize fully, and react promptly and properly to certain dangers which confront us. Industry has become highly automatic, and mechanical safeguards are common; yet we are amazed at the number of accidents occurring in industry yearly.

A few avoidable accidents may be cited as follows: Electrocution as the result of installing radio aerials over high voltage lines; burns caused by fire as a result of bringing a flame too near gasoline; trying to beat the train to the railroad crossing; taking off, or putting on some article of clothing while driving a car. This list may be extended indefinitely, but these and numerous unlisted causes are direct evidence of errors or educational shortages.

#### The School's Relation to the Problem

The purpose of the school is to direct the learning activities of youth, to train and guide in the early years, so that boys and girls may grow up to be self-sustaining

and worthy citizens. It becomes a basic responsibility of the school to meet educational shortages shown by accident records, and to use every reasonable means to establish habits of safe action. Safety instruction may be a matter of information alone, in some cases, but habits of safety can be developed best through action growing out of applied information in life situations. Some school subjects lend themselves naturally to safety instruction while others could be related by more remote application.

Industrial arts work by its very nature places the student in an ideal situation to receive instruction in safety. He is surrounded with actual life situations and many are the opportunities for him to injure himself or a fellow student if he does not think and act wisely. The student is called upon to handle materials, ideas, and himself. In connection with his work he must learn to cooperate with his fellow students so that all concerned may profit from the endeavor.

The industrial plants in this country demand safe workers. The high school student who learns to practice safety is a more valuable employee in the industrial world than the unsafe worker.

Shop safety today consists in much more than saying, "always whittle from yourself and you'll never cut

yourself." Mr. Charles D. Dawson<sup>10</sup>, Assistant superintendent of schools, Grand Rapids, Michigan, remarks as follows:

"The problem of school safety is now recognized as a difficult one and must be dealt with as an important phase of school work. Pupils must be so impressed with safety that they will be found doing things for safety that they have not been told or taught to do. This is an index of safety mindedness, which is of far greater value than guards or mechanical devices."

#### Procedure in Making the Study

The need for a more efficient type of safety education has been indicated on previous pages. An attempt has been made to show that society realizes the value and need of a more efficient safety program to take its place along with the industrial development. Inasmuch as safety is connected directly with life and the purpose of education is to train for a better life, the developing of safety habits and attitudes has an important place in the various phases of our educational system. A survey of the present status of safety work as carried on in the industrial arts departments of the senior high schools of California has been made to determine the extent and methods used to teach safety in the California

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<sup>10</sup>Dawson, Charles D., Assistant Sup't of schools, Grand Rapids Michigan, 1934 Transactions of the National Safety Council, p. 81.

secondary school shops.

The first step in the preparation of this paper was to survey all available literature, magazines, books, etc. which dealt with safety work. Visits were made to industrial plants. Information was received from several manufacturing plants describing methods used in handling the safety problem. Correspondence was exchanged with a number of the larger city school systems regarding their methods of handling the safety problem. Insurance companies were requested to send what data they had which would contribute to the problem. The National Safety Council contributed much to the problem. Fine cooperation in answering and sending information was received from all who were asked.

#### The use of the questionnaire

To determine the present status of safety education in the California secondary school shops a questionnaire was prepared and sent out to the high school districts of California whose enrollment was one hundred and fifty pupils or more. Two hundred questionnaires were sent out. One hundred and twenty-four replies were received.

Various phases of safety work were covered, as carried out in grades 9, 10, 11, 12 of the senior high school shops of California. The principal phases covered were:

1. Does your school recognize safety work as an important phase of education, and is an organized method of instruction used to present the safety work?
2. Is the school interested in organizations which are in existence for the purpose of promoting the cause of safety?
3. Is first aid recognized as a phase of safety work not to be neglected?
4. How is safety rated in importance with the other work offered?
5. What methods are commonly used in the shop to present safety instruction?
6. What safety qualifications must students have to work in the shop and use power machines?
7. Are safety signs and posters considered important?
8. Is the safety foreman system used to a very great extent?
9. What are the most common causes of accidents which occur in the school shops?
10. Are records of accidents kept?

A letter of transmittal was inclosed with each questionnaire. A copy of the letter of transmittal and of the questionnaire follows.

Department of  
Industrial Arts

Out of the growing complexity of civilization and the increasing number of dangers presenting themselves at every turn, there comes an increasing need for training in the habits of safety. From many sources, including the White House conference report, it has been shown that the study of safety education is confined mainly to the elementary and junior high school levels. For some unknown reason the study of and training in safety has not been stressed at the senior high school level.

With this in mind, and with a desire to improve upon the present procedures wherever possible, a study of the present status of safety education in the high schools of California has been undertaken. It will be appreciated if you will cooperate in this study by asking the head of your shop department (industrial arts, trade education, and/or farm shop) to fill out and return the enclosed form.

An extra copy of the questionnaire is attached for your files. A stamped return envelope is enclosed. We believe the study will merit the small amount of time involved in the cooperation requested. A report will be made available to all participants, either in the form of a mimeographed summary or a more complete publication of results in one of the Education journals.

Very truly yours,

  
Laurence Pitcher,  
Coordinator.

Approved:

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Professor of Industrial Education

A SURVEY OF INSTRUCTION ON SAFETY EDUCATION  
IN THE SECONDARY SCHOOL SHOPS OF CALIFORNIA

Please check or fill in the required information.

- |  | Yes | No  |
|--|-----|-----|
| 1. Is organized instruction in safety given in your school?--  | ( ) | ( ) |
| 2. Is your school a member of the National Safety Council or similar organization?---                                    | ( ) | ( ) |
| 3. Are any general assembly periods given over to safety programs? -----   | ( ) | ( ) |
| 4. Have any of the teachers in the shops department had training in first aid? -----                                     | ( ) | ( ) |
| 5. Is a first aid kit available in each shop for student use? -----  | ( ) | ( ) |
| 6. Do you follow a set course of instruction for safety in the shops? -----  | ( ) | ( ) |
| 7. Is instruction in safety placed on a par with instruction in the various fundamentals of shop work? -----             | ( ) | ( ) |
| 8. Is safety instruction given:  |     |     |
| a. In the use of hand tools?-----  | ( ) | ( ) |
| b. In the use of machine tools?-----   | ( ) | ( ) |
| c. As a unit of instruction for the operation of each machine?-----  | ( ) | ( ) |
| d. For the shop as a whole?-----   | ( ) | ( ) |
| e. Each time a new operation or process is shown?-----   | ( ) | ( ) |
| f. Only at the beginning of the year?---   | ( ) | ( ) |
| g. Throughout theyear?-----  | ( ) | ( ) |
| 9. Do you use any printed material, instruction sheets, pamphlets or accident posters as an aid in teaching safety?----- | ( ) | ( ) |
| 10. Is safety instruction covered by examinations?-----  | ( ) | ( ) |
| 11. To qualify for the use of power machines:  |     |     |
| a. Must a student pass a perfect examination on safety?-----   | ( ) | ( ) |
| b. Must a student possess a "machine operation permit" signed by his parents?-----                                       | ( ) | ( ) |
| 12. Are careless students, or students who show themselves indifferent to safety instruc-                                |     |     |

- Yes No
- tion permitted to operate the power machines? ( ) ( )
13. Does the instructor personally supervise students who may be doing work of such nature that the guards must be removed from a machine?----- ( ) ( )
14. Are students permitted to work in the shop when the instructor is absent?----- ( ) ( )
15. Do all machines have:
- a. Safety signs placed on them?----- ( ) ( )
- b. Safety lines painted on the floor around them, beyond which no student is permitted to pass when another student is operating the machine?----- ( ) ( )
16. Do you have student safety foremen?----- ( ) ( )
17. Number in order of importance the items listed below which you consider the direct cause of most accidents in your shops.

Physical Causes	Mental Causes
Indicate order of importance by numbering from 1-10	Indicate order of importance by numbering from 1-10
( ) Hand tools :	( ) Lack of instruction
( ) Machine tools :	( ) Lack of sufficient training
( ) Handling material :	( ) Chance taking
( ) "Horseplay." :	( ) Faulty habits (hurry)
( ) Burns :	( ) Carelessness
( ) Handling chips :	( ) Low I. Q.
( ) Struck objects :	( ) Inattention to work
( ) Falls :	( ) Sense defects
( ) Cranking motor :	( ) Nervous
( ) Faulty arrangement of shop :	_____
( ) Miscellaneous :	_____
( ) _____ :	_____
( ) _____ :	_____

18. Is a record of all accidents which occur in your shops kept?----- ( ) ( )
19. Describe any special methods or devices you have used to teach safety.

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Please complete the answers at your earliest convenience and mail to . . .Mr. Laurence Pitcher - Capistrano Union High School, Capistrano, California.

CHAPTER III

SUMMARY OF THE STUDY

## CHAPTER III

## SUMMARY OF THE STUDY

Related literature

Although safety in schools is a comparatively new problem, it is receiving considerable attention. It is realized that safety is one of the large problems confronting the people of the civilized nations today; that it must be studied carefully in order that proper methods of safety education may be developed. In order that this study might be more valid, and have a better opportunity to add to the present fund of knowledge, the author undertook a rather extensive survey of available literature and publications in the field of safety education, both in industry and in schools. The more important parts of this study of literature is summarized herewith.

Are "don'ts" justified in teaching safety? A study by James Vaughn<sup>11</sup>, with an introduction by Charles H. Judd, University of Chicago, offers an experimental, psychologi-

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<sup>11</sup>Vaughn, James - Positive Versus Negative Instruction. National Bureau of Casualty and Surety Underwriters, New York, 1928.

cal study of the effects of various types of behavior. It discusses the problem of whether fear can legitimately be used, and whether negative instruction should form any part of teaching safety. Mr. Vaughn points out that "Verbal instructions unsupported by any other forms of stimulation are relatively ineffective with children." He also states that negative instruction, i.e., "Do not cross the street except at crossings", is superior in its effect over positive instruction in getting better results. The "don'ts" in safety instruction seem to be justified, especially if they are followed up with a chance to practice the instruction that has been given.

Safety education in the secondary schools -- H. J. Stack -- was, to best of the writer's knowledge, the first book dealing distinctly with safety education in the Secondary Schools. This book, a result of graduate study at Teachers College, Columbia University, in (1929) should be very helpful to high school teachers seeking information regarding safety and its importance in modern industry and society. Problems and methods in organizing curriculum material, various safety activities in secondary schools, and the construction and use of the safety education test are important parts of the book.

Safety education in the vocational school -- Max S. Henig-- is a valuable piece of work from the point of view both of

education and of accident prevention. Dr. Henig not only presents the first curriculum developed for safety instruction in an academic department of a vocational school, but also lays down principles around which similar curricula should be developed. The results obtained are from actual knowledge and experience rather than theory and mass statistics. He shows not only what can be done but also what has been done. This work should be consulted by those interested in safety in any of its various phases in the secondary school.

How to teach safety in the high school -- Frances H. Miner-- is a very fine piece of work covering the methods of teaching safety in the high school. It should be very helpful to the teacher who is planning and presenting the various phases of safety in his or her special subject.

Manual of safety for secondary schools -- Public Safety Department, Automobile Club of Southern California. A very splendid manual for the teacher or supervisor who is seeking information for his or her particular field in the secondary school. This manual also contains a very complete bibliography of material dealing with safety.

#### Courses of study

The writer has examined a number of courses of study pertaining to safety education in the industrial arts work. Those from Oakland, San Diego, Los Angeles, New York

City, Grand Rapids, Buffalo, and Philadelphia, contain much valuable information and seem to present the best methods and practices.

The National Safety News - A monthly publication of the National Safety Council, 20 N. Wacker Drive, Chicago, Illinois, contains much valuable information on safety methods. Each issue includes a number of miniature posters that may be procured in large size for bulletin board display.

Transactions of the National Safety Council - A little manual containing much information of interest to those interested in safety. In addition to these two publications the National Safety Council<sup>12</sup> prints many other helps and informational items of value to the teacher handling safety education problems.

The industrial safety problems and methods of handling them

From a study made of various industrial safety methods and procedures, the following general procedures appear to be standard practice at present. The information has been collected by the reading of trade journals, safety pamphlets, personal correspondence, and visits to industrial plants.

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<sup>12</sup>National Safety Council - Civic Opera Building, 20 N. Wacker Drive, Chicago, Illinois.

Organized safety has had but a brief existence in the United States. It has been within the last quarter century that the importance of safety has been realized in industry.

In many small plants those employing twenty-five men or less, safety practice and methods seem to be confined particularly to the placing of guards on machinery, perhaps "safety first" poster, and that is the limit of any efforts spent on safety. Good housekeeping will be found lacking in many small plants.

Most of the larger plants however realize to a greater extent the importance of an organized safety program. Many plants have a safety committee appointed to have charge of all safety measures in the plant. This committee is generally made up of competent foremen, generally one man from each department. Regular meetings are held in which various problems dealing with accidents and safety are discussed.

In some plants safety contests are held between the different departments to see which department can maintain the longest no-accident record.

Any number of plants use the huddle or safety captain system. A brief description of the system is as follows: Before the men start to work, the foremen call them together and give them a minute or two talk on safety;

or they may only pass the remark, "Remember fellows, work safely today, etc." Each month a new group of safety captains is appointed.<sup>13</sup> Many reports are used, as daily reports of accidents, duties of safety captains, foremen's reports of accidents, and reports on safety questions.

Colored lights are sometimes used, to indicate the occurrence of an accident. A change in color of the lights is used to remind the men in the department that an accident has occurred in their department and their record has been broken.<sup>14</sup> Many schemes and devices have been used to reduce accidents. In general the object is to keep the problem of accident prevention before the men at all times, in an effort to make them alert to accidents, their causes and the importance of their prevention.

#### Safety work in the schools

If big business in this country recognizes the need and importance of safety education in industry, and can reduce its accident rate through an organized safety department, the public schools may well profit from the example. Safety taught through the proper channels should pay dividends in several ways on the time and effort spent.

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<sup>13</sup>Personal correspondence with Mr. C. G. Fortune, Safety Engineer, Columbia Steel Co., 2087 E. Slauson Avenue, Los Angeles, California.

<sup>14</sup>Axelson Manufacturing Co., Los Angeles, California, Personal visit, January 19, 1935.

First, on saving of lost time and suffering resulting from injuries; second, the acquiring of the safety attitude by the student, which should be carried through life; third, avoiding of small and minor injuries which invite infection that may lead to serious results; fourth, the acquiring of the first aid habit and knowledge; and fifth, adequate returns to the individual and society in later life.

Safety education has received considerable attention in the elementary and junior high schools, but the senior high schools in general, have been very lax in the teaching of safety. A letter received from the state board of education in one of the western states indicates the lack of attention placed on safety. The letter, in part, is as follows:

"In reply to your letter, will state that we have not worked out any systematic course of study in safety education."

The lack of attention to a systematic program of safety probably is due to the lack of some stimulating motive, such as a large number of accidents in school, public demand, or a national movement. On the other hand, many senior high schools have recently devoted some attention to the teaching of safety, particularly in the field of the industrial arts. The work in safety is, however, still in the experimental stage. There are yet but few

school systems that have made a definite effort to introduce an organized safety program into the general program of the schools.

In order to sample the procedures used in teaching safety in the United States, the writer wrote to 27 of the larger cities inquiring about their safety programs for the industrial arts departments. A study of the twenty replies received indicates that there is a trend toward the teaching of safety in a more carefully organized manner, especially in the school shops. Sixteen of the replies included material describing briefly the program of safety education. In all of the programs examined the trend appeared to be toward developing safety habits and attitudes in the student.

"A great deal more can be done and is done in some places, and complete information is available; but if the average school at the present time were only to recognize the need for safety education, keep a record of all accidents which occur, and appoint a safety engineer in each class (this position to rotate so that every boy would have an opportunity to serve)\* the number of accidents in American vocational schools would be materially reduced and the graduates of the schools would be better trained to take their places in industry."<sup>15</sup>

#### General Summary and Tables of Accident Records

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\*The part in parenthesis inserted by the writer.

<sup>15</sup>Billings, Curtis - Safety in the Vocational School Shop, National Safety Council, April, 1935.

From the combined questionnaire study and the survey of available literature, the following results are given.

Judging from the lack of response in some cases, and the nature of the response in others, interest in the safety problem seems to be lacking in many of the secondary schools. Out of 200 questionnaires 124 replies were received, giving 62 per cent return. Seventy of the replies indicated the presence of organized safety instruction. Eighteen indicated their membership in a safety organization and 52 reported that general assemblies are at times devoted to safety.

The problem of first aid seemed to be given more consideration. One hundred answers indicated the presence of a first aid kit in each shop for student use, and 92 answers indicated that one or more of the teachers in the shop have had training in first aid. This would indicate that a fair majority recognize the importance of first aid as a means of caring for the victim after an accident has occurred. Although first aid is a proper and necessary item its use in many cases could be avoided by logical and thoughtful considerations of some of the accident problems which confront us. The following poem amply expresses the accident situation as it too often exists.

THE FENCE OR THE AMBULANCE

'Twas a dangerous cliff, as they freely confessed,  
 Though to walk near its crest was so pleasant,  
 But over its terrible edge, there had slipped  
 A duke and full many a peasant.  
 So the people said something would have to be done,  
 But their projects did not at all tally,  
 Some said, "Put a fence round the edge of the cliff";  
 Some, "An ambulance down in the valley."

But the cry for the ambulance carried the day,  
 For it spread through the neighboring city;  
 A fence may be useful or not, it is true,  
 But each heart was brim full of pity  
 For those who slipped over that dangerous cliff;  
 And the dwellers in highway and valley  
 Gave pound and gave pence, not to put up a fence,  
 But an ambulance down in the valley.

"For the cliff is all right, if you're careful,"  
 they said,  
 "And if folks even slip or are dropping,  
 It isn't the slipping that hurts them so much  
 As the shock down below when they're stopping."  
 Then an old sage remarked, "It's a marvel to me  
 That people give far more attention  
 To repairing results than to stopping the cause,  
 When they'd much better aim at prevention."

"Let us stop at its source all this mischief,"  
 cried he,  
 "Come, neighbors and friends, let us rally;  
 If the cliff we will fence we might almost dispense  
 With the ambulance down in the valley."  
 "Oh, he's a fanatic," the others rejoined.  
 "Dispense with ambulance? Never --  
 He'd dispense with all charities, too, if he could;  
 But no! We'll protect them forever;  
 Aren't we picking folks up just as fast as they fall?  
 And shall this man dictate to us? Shall he?  
 Why should people of sense stop to put up a fence  
 While their ambulance works in the valley?"

But a sensible few, who were practical, too,  
 Will not bear with such nonsense much longer,  
 They believe that prevention is better than cure  
 And their party will soon be the stronger.  
 Encourage them, then, with your purse, voice, and  
 pen.

And (while other philanthropists dally)  
They will scorn all pretense and put up a stout  
fence  
On the cliff that hangs over the valley.

--Anonymous

Instruction in safety was placed on a par with the various fundamentals of shop work by 89 of the 124. In several cases notes on the questionnaires indicated instruction in safety in the shop was placed above all other shop instruction in importance.

The methods of presenting safety instruction appear to be the same in nearly all cases. The use of printed matter, instruction sheets, posters, examinations, personal demonstration, with follow-ups in the form of tests, are apparently the typical methods now in use.

Indifference to safety instruction in nearly all the cases answered is not tolerated. In several cases notes on the returned questionnaires stated that students who were indifferent to safety instruction regarding the use of the power machines were either not permitted in class, or deprived of the use of the machines for a pre-determined length of time.

The practice of having student safety foremen was indicated as used very little although it is recommended by some of the leaders in the field of safety education.<sup>16</sup>

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<sup>16</sup>A School Safety Program - Bulletin No. 228 - State Board of Control for Vocational Education, Lansing, Michigan, July, 1934, p. 11.

The causes of most accidents in the shops are indicated as follows: The order of importance is indicated by the numbers, the most frequent cause being listed first.

Physical Causes

1. Hand tools
2. Machine tools
3. Horseplay
4. Handling material
5. Burns
6. Struck objects
7. Falls
8. Handling chips
9. Miscellaneous
10. Cranking motor
11. Faulty arrangement of shop

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Others mentioned are:

Crowded classes  
Lack of order  
Splinters

Mental Causes

1. Carelessness
2. Faulty habits (hurry)
3. Inattention to work
4. Chance taking
5. Low I. Q.
6. Nervous
7. Sense defects
8. Lack of instruction
9. Lack of sufficient training

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Others mentioned are:

Overconfidence  
Not following instructions  
"Don't care" attitude  
Lack of experience  
Lack of judgment

A copy of the questionnaire with complete compilation of returns will be found on the following pages.

COMPILED RESULTS OF QUESTIONNAIRE STUDY  
USED IN THIS THESIS

	Yes	No
1. Is organized instruction in safety given in your school? ----	(70)	(48)
2. Is your school a member of the National Safety Council or similar organization? -	(18)	(92)
3. Are any general assembly periods given over to safety programs? -----	(52)	(64)
4. Have any of the teachers in the shops depart- ment had training in first aid? -----	(92)	(21)
5. Is a first aid kit available in each shop for student use? -----	(100)	(19)
6. Do you follow a set course of instruction for safety in the shops? -----	(79)	(41)
7. Is instruction in safety placed on a par with instruction in the various fundamen- tals of shop work? -----	(89)	(25)
8. Is safety instruction given:		
a. In the use of hand tools? -----	(112)	( 5 )
b. In the use of machine tools? -----	(112)	( 2 )
c. As a unit of instruction for the operation of each machine? -----	(100)	(11)
d. For the shop as a whole? -----	(100)	(10)
e. Each time a new operation or process is shown? -----	(91)	(18)
f. Only at the beginning of the year? ---	( 9 )	(63)
g. Throughout the year? -----	(107)	( 2 )
9. Do you use any printed material, instruction sheets, pamphlets or accident posters as an aid in teaching safety? -----	(104)	(16)
10. Is safety instruction covered by examinations	(72)	(45)
11. To qualify for the use of power machines:		
a. Must a student pass a perfect examin- ation on safety? -----	(50)	(61)
b. Must a student possess a "machine oper- ation permit" signed by his parents? -	(19)	(93)
12. Are careless students, or students who show themselves indifferent to safety instruction permitted to operate the power machines? -	( 5 )	(105)

Yes No

13. Does the instructor personally supervise students who may be doing work of such nature that the guards must be removed from a machine?----- (102) ( 5 )
14. Are students permitted to work in the shop when the instructor is absent?----- (31) (85)
15. Do all machines have:
- a. Safety signs placed on them?----- (49) (66)
  - b. Safety lines painted on the floor around them, beyond which no student is permitted to pass when another student is operating the machine?----- (40) (74)
  - c. Guards and dangerous parts painted some contrasting color to attract attention? (24) (90)
16. Do you have student safety foremen?----- ( 8 ) (108)
17. Number in order of importance the items listed below which you consider the direct cause of most accidents in your shops.

Physical Causes

Mental Causes

Indicate order of importance by numbering from 1-11.	Indicate order of importance by numbering from 1-10.
(1) Hand tools :	(8) Lack of instruction
(2) Machine tools :	(9) Lack of sufficient training
(4) Handling material :	(4) Chance taking
(3) "Horseplay" :	(2) Faulty habits (hurry)
(5) Burns :	(1) Carelessness
(8) Handling chips :	(5) Low I. Q.
(6) Struck objects :	(3) Inattention to work
(7) Falls :	(7) Sense defects
(10) Cranking motor :	(6) Nervous
(11) Faulty arrangement of shop :	( ) _____
(9) Miscellaneous :	( ) _____
( ) _____ :	( ) _____
( ) _____ :	( ) _____

18. Is a record kept of all accidents which occur in your shops?----- (65) (49)

### Results of studies made by others

The causes of most accidents that occur in shops as found by two others who investigated the field recently are listed below. In both cases the causes are listed in decreasing order of importance or frequency of occurrence.

#### Henig's Study<sup>17</sup>

1. Hand tools
2. Machines
3. Handling Material
4. Miscellaneous
5. Scuffling
6. Struck object
7. Burns
8. Chips
9. Struck by object
10. Cranking car
11. Falls

#### Judy's Study<sup>18</sup>

1. Hand tools
2. Power machines
3. Pupil carelessness
4. Disobedience of rules
5. Hasty work
6. Improper guarded machines
7. Crowded conditions
8. Anger
9. Worry
10. Clothing
11. Working after school hours
12. Improper shop arrangement

### Causes of Most Accidents About Schools

Very little data is available at present relative to

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<sup>17</sup>Henig, Max S.- Safety Education in the Vocational School. The Construction of a Curriculum for accident prevention, National Bureau of Casualty and Surety Underwriters, 1928, p. 30.

<sup>18</sup>Judy, Wayne M.- Accidents & Safety Education in the Industrial Arts Shops of Iowa, Iowa State College, Ames M. S., 1932.

the extent of fatal and non-fatal school accidents. However, from the studies that have been made of school accidents, although they do not provide wide sampling, at least indicate the predominating causes of accidents. In St. Louis, Missouri, in 1926 the school authorities kept a record of school accidents for a period of one year. The following table, No. 1, gives a list of the causes of these accidents.

TABLE NO. 1

Causes of Accidents in St. Louis High Schools, 1925-1926<sup>1</sup>

Cause	No. of pupils
Falls-----	44
Turned ankle, knee or back while going up- stairs or playing ball-----	15
Tool, lathe or apparatus-----	9
Collision ( not fall )-----	45
Struck by falling, flying or exploding object	19
Diving-----	3
Burns (in laboratory or shops)-----	6
Improper landing, high jumping-----	5
Gas-----	1
Fainting-----	1
Miscellaneous-----	3
Total accidents-----	151
Total High School enrollment-----	11, 305
Percentage of accidents based on enrollment-----	1.3

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<sup>1</sup>Stack, H. J. - Safety Education in the Secondary Schools, National Bureau of Casualty and Surety Underwriters, New York, 1929, p. 28.

It is interesting to note here that approximately one-third of the high school accidents took place in the gymnasium, one-sixth in the shops and laboratories, one-sixth on the campus and athletic fields. It was also found that the percentage of accidents to enrollment in the high schools was 1.3 as compared with .6 in the elementary schools.

The results of a record kept in Los Angeles during the year 1927-28 indicate the common causes of accidents are similar to those shown in the St. Louis records.

TABLE NO. 2

Los Angeles City School District  
Compilation of Data on Major School Accidents 1927-1928<sup>2</sup>

Type of accident	Elementary School	Jun. H. School	Sen.H. Schl.	Total
1 School Grounds -----	502	109	152	763
Apparatus -----	172	4	6	182
Games-----	200	74	125	399
Baseball -----	162	41	29	232
Basketball -----	2	8	4	14
Football -----	6	9	66	81
Jumping -----	19	9	21	49
Soccer -----	6	3	4	13
Volley Ball -----	3	1	0	4
All other games ----	2	4	0	6
Miscellaneous -----	130	31	21	182
2 Building and Agricultural	106	62	113	281

<sup>2</sup>Stack, H. J. - Safety Education in the Secondary Schools, National Bureau of Casualty and Surety Underwriters, New York, 1929, p. 29.

TABLE NO. 2 (cont.)

Type of accident	Elementary School	Jun. H. School	Sen.H. Schl.	Total
3 Outside School Grounds	121	18	25	164
Traffic-----	98	14	22	134
Miscellaneous-----	23	4	3	30
Total Accidents	739	189	290	1,212
Total fatalities-----	4	0	1	5
Broken members-----	354	89	135	578
Total School registration	130,355	32,237	40,031	202,623
Ratio of accidents to pupil enrollment---	1-178	1-170	1-139	1-167

A study of this table shows:

1. The great majority of school accidents (approximately 65%) take place on the school grounds and athletic fields.
2. In comparison with enrollment there are more accidents in the high schools than in the elementary schools.
3. Major non-fatal accidents (those which cost a loss of school time of at least one day) exist in a ratio of 242 non-fatal to 1 fatal school accident. This is a much higher ratio than apparently exists in the insurance company records of policyholders.
4. Of the athletic sports, although baseball has the largest number of accidents, football and jumping have been found to be more dangerous

from a standpoint of percentage of accidents of those competing.

Dr. Henig<sup>19</sup> found that there is a close relation between intelligence and liability to accident. The following table from Dr. Henig's study shows the comparison of intelligence and liability to accidents:

TABLE NO. 3

COMPARISON BETWEEN NUMBER OF BOYS IN EACH INTELLIGENCE CLASS SUSTAINING TWO OR MORE INJURIES WITH ENTIRE NUMBER IN ITS RESPECTIVE CLASS

Intelligence Class	Total Number in Class	Number Injured Two or More Times	Ratio of Number Injured to Number in Class
A	6	2	33.3%
B	28	3	10.7%
C/	59	10	16.9%
C-	55	16	29.9%
C-	14	5	35.6%
D	2	2	100.0%

These 38 boys sustained 98 accidents out of the 146 accidents recorded for the period covered, that is 66.2% of the total.

#### The Accident Situation in Industrial Arts Shops

Even though the above data does not indicate a large number of accidents in the industrial arts work the field is still rich in opportunities to teach safety.

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<sup>19</sup>Henig, Max S. - Safety Education in the Vocational School, National Bureau of Casualty and Surety Underwriters, New York, 1928, p. 101.

Each and every industrial arts department has an accident problem of its own. An effort should be made to solve this problem for two reasons. First; the students should have the safety habit and attitude instilled in them to protect them while in school, and second; a worker who has had training in safety is more likely to have established safety habits which will protect him in later years, in any occupation that he may choose.

A study by Wayne M. Judy<sup>20</sup> covering most of the schools of Iowa towns indicates the causes of most accidents to be hand tools that are not considered dangerous. In Mr. Judy's report 557 injuries were caused by hand tools, and 156 by power machines. Three hundred and twenty-three accidents were listed as caused by "pupil carelessness", and one only was caused by lack of instruction. In his conclusions Mr. Judy points out that there is a great need for more safety education. He states, "The methods and devices now employed are not adequate for safety".

Mr. C. E. Karlstrom, assistant supervisor of Vocational Education in the Detroit public schools, seconds Mr. Judy's conclusion. Mr. Karlstrom continues "I am inclined to believe that these figures would be a better representation of the facts if they were revers-

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<sup>20</sup>Judy, Wayne M. - Accidents & Safety Education in the Industrial Arts Shops of Iowa, Iowa State College, Ames M.S., 1932.

ed, to read 323 accidents were caused by lack of proper instruction and that one was caused by pupil carelessness."<sup>21</sup>

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<sup>21</sup>Billings, Curtis - Safety in the School Shop, Curtis Billings, Secretary school shop committee, National Safety Council, Chicago, Illinois, April, 1933.

## CONCLUSIONS &amp; RECOMMENDATIONS

The study of the present status and trends of safety education was undertaken for the purpose of determining how much emphasis is placed on safety work in the senior high school shops of California, and also what methods are used in the California school shops and elsewhere to "put over" safety education.

The material presented is intended for the use of teachers of shop subjects who are endeavoring to improve their methods of teaching safety. All safety procedures given are not to be considered as hard and fast rules. These may be modified by each teacher to fit his particular need.

The results of the study may be summed up as follows:

## Conclusions:

1. Safety education is a new but very important phase of our life. Dangers meet us at birth and stay with us in varying degrees until death.
2. Because safety is conditioned by our habits and attitudes the proper time for developing these habits and attitudes is in early life.
3. Safety work is recognized in industry as a very important phase of any program, and must be given the utmost consideration and attention if full efficiency is to be expected.
4. Safety instruction in the elementary and junior high schools has received some attention

but is somewhat lacking in the senior high school. There is a need for more attention in the field of safety education.

5. Safety in the shops of the senior high school has been given considerable attention recently but in many cases there is a need for considerable improvement.
6. The common causes of accidents, listed under physical and mental causes, in order of importance are:

Physical - Hand tools, machine tools, horse-play, handling material, burns, struck objects, falls, handling chips, miscellaneous, cranking motor, faulty arrangement of shop.

Mental - Carelessness, faulty habits, inattention to work, chance taking, low I. Q., nervousness, sense defects, lack of instruction, lack of sufficient training.

#### Recommendations:

1. More emphasis should be placed on the teaching of safety in the secondary school.
2. The value of membership in the National Safety Council or a similar organization should be recognized more by schools. This membership places the school in a position to receive the latest and most complete information regarding safety education.
3. More attention should be given to the proper and careful use of hand tools in the shop.
4. Safety signs and posters should be used to a greater extent, and these should be changed frequently.
5. The student safety foreman system should be adopted in more school shops.
6. A record should be kept of every accident that occurs in the shop.
7. All accidents should be given first aid.

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APPENDIX A

SAFETY PROCEDURES AND RECOMMENDATIONS

## SAFETY INSTRUCTIONS FOR THE SHOP DEPARTMENT

From results of the questionnaire, visits to industrial plants, study of trade journals, books on safety, and courses of study now used in teaching safety, the writer has arranged a sequence of units for a program of training in safety, the principles of which can be made an integral part of any shop program.

The writer does not intend to convey the impression that the following safety procedures are the final, or last and perfect method of presenting safety instruction to the students of our public schools. An attempt has been made to determine the latest methods used by the public school and safety leaders in presenting safety instruction. The information gathered has been used in formulating the following safety material in a hope that it may be of some assistance to those who wish to improve their methods of teaching safety in school shops.

When boys enter the shop for the first time there are certain hazards with which they must become acquainted. The first lessons on any job or equipment should teach the proper use of the equipment, the dangerous elements of the various machines to be employed on that job or operation, and the care to be exercised in their use. A thorough understanding of the care, operation, and limitations of each machine is the best way to avoid accidents. The

skilled operator many times becomes careless because of overconfidence, and neglects to use the guards and safety devices or to take proper precautions when operating the various machines. This condition is likely to become prevalent in advanced classes and should be guarded against. A thorough knowledge and understanding of all safety rules should be had by all who may operate any of the machine tools.

The following safety rules and precautions have been adapted from various sources, including especially the departments of vocational education in the cities of Los Angeles, Oakland and San Diego, and from the Orange County (California) shop teachers' association; also from the boards of education in the cities of Detroit, New York, Pittsburgh, and Philadelphia. To the ideas and suggestions derived from these sources the writer has added safety procedures and ideas developed from his own experiences in shop teaching, and as a result of the study.

## GENERAL INSTRUCTION TO TEACHERS

1. Leaving Room The teacher in charge shall not leave any shop while the class is in session, except when absolutely necessary. In case of necessary absence power to all machines is to be cut off.  

Shops in which machine equipment is located, are to be locked when not in use.
2. Student Assignments Before assigning a job to a student the teacher must be sure that he is physically and mentally fit to perform the job safely.
3. Sharp Tools The importance of sharp tools should be stressed; also the danger from edge tools improperly handled.
4. Open Flames Open flames are prohibited except where absolutely necessary, such as tool dressing forges, melting furnaces, soldering furnaces, and acetylene welding torches.
5. First Aid The teacher in charge should have a knowledge of first aid.
  - a. First aid should be administered as soon as possible after an accident occurs, regardless of how trivial the accident may seem.
  - b. Serious injuries should be referred to the school nurse or doctor.
  - c. All first aid kits should be kept in first-class

condition and fully equipped at all times.

d. A record of all accidents that occur should be made on the accident record blank and filed for possible future references.

6. Machine Operation Before operating machine tools or other hazardous equipment, all pupils shall receive instruction in the care and safe use of such equipment, pass a safety examination on its use with a perfect score, and possess a machine operation permit signed by the pupil, the teacher and the parent or guardian.

7. Housekeeping Proper housekeeping is perhaps the greatest single factor in the prevention of fire and accidents, and in promoting the general efficiency of class work. Proper order and cleanliness are requisites to the prevention of accidents. Without this setting, adequate training and discipline will be ineffective.

a. Floors are to be kept free from oil or water.

b. Avoid piling material on the floor when possible.

c. Overhead material, shaftings, etc., must be securely fastened and inspected regularly.

d. Machines that are out of order must be locked.

e. Oily rags, waste, and inflammable liquids must be kept in proper containers.

8. Supervision Proper supervision is probably the best

accident preventive at the command of the shop teacher. With the proper shop organization, the instructor should be able to spend nearly all of his time moving about the shop, constantly observing the progress of all operations, both from the standpoint of proficiency and safety.

9. Guarded Machinery All power machinery shall be carefully guarded with the best, approved type of guards. Neither instructors, nor students shall at any time use power machinery that is not properly guarded. The instructor should set a safety example for the students.
10. Turning on Power Instructors should be sure power switches on all machines are released before power is turned on. All students must stand clear of machines when power is turned on.
11. Safety Zones A heavy line shall be painted on the floor around each hazardous machine, inside of which no student shall stand when another is operating the machine. In addition the area inside the line, upon which the machine operator stands shall be treated in some manner to render it nonskid.
12. Acids and Poisons All acids shall be kept in a safe place and properly labeled. All poisons shall be used only under the direct supervision of the instructor.

13. Enforcing Rules All rules of the shop must be enforced to the extent of forbidding the use of machines to those who are indifferent or not willing to conform to safety rules.
14. Safety Posters Safety placards, posters, signs, etc. should be freely used and posted about the shop to keep "safety consciousness" before the students at all times.
15. Class Discussions Frequent class discussions on the problems of safety shall be held.
16. Fire Signal In case of a fire signal, all gas and power should be turned off.
17. Safety Engineer A student safety engineer should be appointed to supervise safety practice in the shops. He should serve for a period, as a week at a time. At the end of this period another student should be appointed to serve for the next interval of time. The student's duties are listed on page 57.

## GENERAL SAFETY INSTRUCTIONS TO THE STUDENTS

The safety instruction is given with the purpose of developing within the student a safety-conscious attitude and habits to keep with him during his life, so that he may always keep his body in good condition.

The following rules should be thoroughly understood and observed by the student. Frequent violation will be sufficient cause for dismissal from class. Neatness and cleanliness should prevail in the shop. Tools and materials must be kept in their proper places and not allowed to lie around in a haphazard manner, cluttering up the floor and benches.

1. Student Dress. All students must be properly dressed for work.
  - a. Sleeves rolled up to the elbow, hands bare.
  - b. Loose-hanging ties removed or fastened.
  - c. Jewellery on hands removed.
  - d. Long locks of hair removed or fastened in placed.
2. Sharp Tools. Tools shall be kept sharp and in good condition at all times.
3. First Aid. All accidents, small cuts, and abrasions must be reported and given first aid.
4. Care of Machinery.
  - a. Where necessary, oil themachine before starting.
  - b. Examine the machine carefully to make sure every

part is in working order.

- c. Before throwing on the power, start the machine by hand to make sure all moving parts are free to move.
- d. The machine must be at a dead stop before any oiling, cleaning, or adjusting is done.
- e. When in doubt about the machine consult the instructor in charge.
- f. Always report any breaks or defects.

- 5. Attention to Work. When operating a machine, the student must give his undivided attention to his work. Running, fooling, or horseplay is not tolerated in the shop.
- 6. Safety Devices. Guards and safety devices are for the protection of the operator of the machine and should be kept in place. If the nature of the work necessitates their removal, permission of the instructor in charge must be obtained.
- 7. Hands Off. Students must keep their hands off and must stay a safe distance away from all machinery they are not operating.
- 8. Placing of Tools and Material. Tools laid aside temporarily should be placed in a position that will not endanger other persons in the shop. Tools or materials should not be placed on the floor, on unguarded overhead trestles, or on platforms from

which they might fall. The floor and machines must be kept clear of scraps at all times.

9. Setting Cutting Tools. It is extremely dangerous to set cutting tools in a moving machine. The machine should always be stopped.
10. Rotating Objects. Form the habit of not standing in line with swiftly-revolving parts such as grinding wheels, circular saws, pulley, etc.
11. Eye Protection. The eyes should be protected by goggles when the student is doing any type of work which directly endangers them, as work which throws or causes dirt and particles of material to get into the eyes.
12. Firm Footing. Be absolutely sure of your footing when working around any machine and always keep the body and all its parts at a safe distance from all moving machinery.
13. Oily Waste and Rags. Deposit all oily waste material and rags in cans provided for that purpose.
14. Burred or "Mushroomed Tools". All tools with burred parts such as heads of punches, chisels, drifts, etc. must be repaired or replaced by new ones.
15. Pouring Metal. Before pouring metal, be sure that the mold is dry to avoid splattering or an explosion.
16. Projecting Parts. Avoid all projecting parts such as

set screw head, bosses, sharp corner, etc. on rotating objects.

17. Files without Handles. Use no files without handles.
18. Shop Courtesy. All students should treat their shop-mates with courtesy and should work in harmony with them, acquiring habits of caution for their own protection and for that of their fellow students. They should cultivate careful, thoughtful, and deliberate habits of work, and try to develop a "safety consciousness" attitude of mind.

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## THE SAFETY ENGINEER--HIS DUTIES

Each class should have its safety engineer or foreman appointed from the class group by the teacher. Each member of the class by rotation should have a chance to serve in the capacity of safety engineer. He shall have authority to enforce all safety rules and give orders or directions to anyone in the shop in so far as the directions pertain to safety.

The duties of the safety engineer are as follows:

1. Check the first aid cabinet; see that the supplies are complete and clean.
2. See that all students are properly dressed for work.
3. Check all tools and see that they are in good condition. Take care of all mushroomed tools, such as heads of punches, drifts, chisels, etc. See that handles on all tools are tight and in good condition.
4. See that guards are properly set and adjusted on all machines.
5. See that tool rests on the grinder are properly set.
6. Enforce the use of goggles where necessary.
7. Keep supply racks, piles of material, or rooms in an orderly condition.
8. Give first aid in case of accident and make out

and file accident reports, all under direct supervision of the instructor.

9. Care for and adjust flames in all furnaces.
10. Fill out safety report and make note of all violations.
11. Make any safety suggestions which seem necessary.
12. See that new safety placards and posters are placed in conspicuous places frequently.

## ACCIDENT REPORT

In case of accident, an accident report must be filled out and filed for future reference.

REPORT OF ACCIDENT  
Blank Union High School  
Department of Industrial Arts

\_\_\_\_\_ shop

Upon occurrence of an accident, complete this report and file in the department office.

1. Name of injured person \_\_\_\_\_ Address \_\_\_\_\_
2. Age of pupil \_\_\_\_\_ Date of accident \_\_\_\_\_ Time of day \_\_\_\_\_
3. What was the character of the injury? Serious ( ) Not Serious ( ) Description of injury \_\_\_\_\_
4. Description of how the accident occurred \_\_\_\_\_  
\_\_\_\_\_
5. What was the student doing when the accident occurred?  
\_\_\_\_\_
6. If the accident occurred on a machine were guards in place? \_\_\_\_\_ If not, why were they removed? \_\_\_\_\_  
Who removed them? \_\_\_\_\_
7. Check on list the direct cause of the accident.

- |                       |                           |
|-----------------------|---------------------------|
| ( ) Hand tools        | ( ) Lack of instruction   |
| ( ) Machine tools     | ( ) Lack of sufficient    |
| ( ) Handling material | training                  |
| ( ) Horseplay         | ( ) Chance taking         |
| ( ) Burns             | ( ) Faulty habits (hurry) |
| ( ) Handling chips    | ( ) Carelessness          |
| ( ) Struck by objects | ( ) Inattention to work   |
| ( ) Falls             | ( ) Sense defects         |
| ( ) _____             | ( ) Anger                 |
|                       | ( ) _____                 |

8. Recommendations to prevent accidents of similar nature \_\_\_\_\_
9. Who rendered first aid? \_\_\_\_\_
10. Witnesses of accident \_\_\_\_\_
11. Pupil sent; a. Back to class \_\_\_\_\_ b. Home \_\_\_\_\_  
Receiving hospital \_\_\_\_\_
12. Did the accident necessitate absence from school? \_\_\_\_\_  
How long? \_\_\_\_\_
13. Signature \_\_\_\_\_ Signature \_\_\_\_\_  
Instructor Safety engineer
- Signature \_\_\_\_\_  
Injured student
- 

Let us consider for a moment  
that an accident may happen in  
spite of all precautions.

WHAT THEN?

F I R S T A I D

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#### PRACTICAL FIRST AID

The teacher should have a thorough knowledge of,  
and be able efficiently to administer first aid.

The first-aid cabinet shall be kept clean and com-  
pletely and properly stocked at all times.

nomatter how healthy you are, you cannot afford to

take chances with infection. It is not a sign of bravery to display indifference to small injuries. A fellow fools only himself.

A few simple precautions:

1. If injured, stop what you are doing long enough to get the right kind of first-aid treatment.
2. Do not touch open wounds with your hands or use water to wash them out.
3. Do not break blisters.
4. Never permit anyone but an authorized doctor or specialist to remove particles from your eyes.
5. Never wrap a wound with ordinary cloth except in an extreme emergency. Leave it exposed to the air until proper treatment can be administered.
6. Never put adhesive tape directly on a wound.
7. Do not use absorbent cotton directly over a wound or burn, as it sticks and is very hard to remove.
8. Never use adhesive tape, electricians tape, court-plaster, colodian, or similar preparations directly on a wound.

#### First-aid treatment of wounds.

1. Do not touch the wound with the hand, mouth, clothing or any unclean material. Use only sterile gauze.

2. Do not wash with soap and water.
3. Encourage some bleeding. This helps to wash out the wound.
4. Apply half-strength ( $3\frac{1}{2}\%$ ) tinctures of iodine, once well down into the wound and on the skin around the wound. Do not wrap up while wet as blistering is likely to occur.

Other antiseptics may be used in the place of iodine particularly those that do not cause pain when they are applied. If the antiseptic Hexylresorcinol, solution ST 37, is used, a gauze bandage may be saturated with the solution and then applied to the wound.

#### Nervous shock.

Nervous shock usually accompanies an accident. The signs of nervous shock are as follows:

1. Very pale face covered with beads of sweat.
2. Wide, staring eyes--pupils large.
3. Cold, clammy skin.
4. Feeble breathing or breathing in long, drawn out sighs.
5. Very weak pulse.
6. "Gone" look.

What to do:

1. If the injury is severe, send for a doctor. If

there is any severe bleeding, endeavor to stop it immediately by applying a compress (pad) of sterile gauze and tying it in position. Do not remove until the doctor comes.

2. Don't ask the persons questions.
3. Lay him on his back with his head low if possible.
4. Do not move him if it can be avoided.
5. Loosen tight clothing.
6. Keep the patient warm.
7. Turn head to one side for fear of vomiting.
8. Hold a cloth moistened with aromatic spirits of ~~ammonia~~ ammonia near his nose.
9. Rub limbs, under the covers, toward the body.
10. Don't give him anything to drink until he is conscious.

#### Accidents to the eye.

Any serious accidents to the eye must be taken care of by a skilled physician. Do not attempt to remove any foreign matter which is lodged in the under surface of the eye ball.

#### Chemicals in the eye.

This includes lime, cement, and battery fluid.

Wash well with water, and then put two or three drops of clean olive, mineral, or castor oil into the eye. Cover with a moist compress and secure medical aid at once.

## CONTENTS OF THE FIRST-AID KIT

Sterile gauze - rolls 1 and 2 in. wide.

Sterile gauze-squares about 3 x 3 in. in individual packages.

Burn ointment (Pyrol) or powdered tannic acid to be made up as needed by adding about 8 teaspoons to one glass of water and then saturating gauze in the solution and applying to the burned area.

$3\frac{1}{2}$  per cent iodine in a suitable container or in ampules.

Solution Hexylresorcinol ST 37.

Aromatic spirits of ammonia.

Inelastic tourniquet.

Scissors.

3 in. splinter forceps.

The above materials and first-aid kit must be kept sterile.

Note. Most of the first-aid information given has been taken from the American Red Cross, FIRST-AID TEXT-BOOK.

## PUPIL STATEMENT OF PROFICIENCY IN SAFETY INSTRUCTION

This is to certify that I have been given instruction in safety precautions in the \_\_\_\_\_ shop.

My instructor has demonstrated and taught me how to operate safely the power machines and tools used in the \_\_\_\_\_ shop. I promise to observe all safety precautions and use the utmost care to prevent any accident to myself or to any of my fellow students. If I am ever in doubt regarding the doing of any operation, I promise before proceeding to get the necessary instructions from my teacher. I have been told and know that I will be deprived of the use of the power machines if I am careless when using them.

Signed \_\_\_\_\_ Date \_\_\_\_\_

This is to certify that \_\_\_\_\_ the above named pupil has been given safety instruction and demonstrations on the machines and tools to be used in the \_\_\_\_\_ shop. He passes a written test with a perfect score, his original paper being attached hereto as evidence. \_\_\_\_\_ also knows that he will be deprived of the use of the power machines if he is careless when using them.

Signed \_\_\_\_\_ Date \_\_\_\_\_  
Instructor

To parents or guardian:

Every effort is being made to teach safety in the

\_\_\_\_\_ shop in which \_\_\_\_\_ is enrolled. With your permission \_\_\_\_\_ will be allowed to use the power machines at his own risk as long as he follows all safety procedures and conducts himself properly while using them.

The above is satisfactory to me.

Signed \_\_\_\_\_  
Parent or guardian  
Date \_\_\_\_\_

#### SAFETY IN THE WOOD SHOP

The general instruction to students about safety are to be applied in the woodshop. Special safety precautions for the woodshop are listed below. Students who operate the power machines must possess a machines operating permit signed by their parents or guardian.

1. All safety guards must be kept in their proper positions while the machines are being operated unless special set-ups require their removal, in which case the instructor must personally supervise all such work.
2. All adjustments must be securely fastened, and all special set-ups checked by the instructor before power.

is turned on.

3. No one should start or stop a machine for another operator. All students not operating machines must stay outside safety lines painted on the floor and must not talk or do anything to attract the attention of the operator of the machine.
4. The machines and floor must be kept clear of scrap material and tools. Scrap material should be placed in the scrap box.
5. If, while operating a machine, it gets out of order he will immediately report to the instructor instead of attempting to use or fix the machine.
6. Care must be taken to see that all lumber is free from nails, sand, paint, or loose knots before being machines.
7. Stock must never be forced into a machine faster than it can be cut.

#### Safety Instructions for the Circular Saw.

1. The top guard must be kept down over the saw while the machine is being operated unless special set-ups require its removal, in which case the instructor must personally supervise the work being done.
2. The saw must not be raised above the table more than absolutely necessary to make the cut.
3. A push stick must be used when ripping narrow pieces of lumber.

4. The splitter guard must be in place behind the saw at all times.
5. The clearance block must be secured to the fence when cutting off short pieces of stock.
6. The fingers must be kept clear of the track of the saw.
7. A stick about 2 ft. long should be used to clear all scraps away from the saw.
8. When helping to "tail-off" the saw, students must never pull on a board being ripped, but should hold the board up and allow the operator to push the stock through the saw.
9. Ripping stock without using the ripping fence or cross-cutting without using the sliding, crosscutting fence is absolutely forbidden. This also applies to dado head work.
10. The work must rest firmly on the table before being pushed into the saw.

#### Safety Instructions for the Jointer.

1. The guard must be kept over the knives at all times while the jointer is being operated.
2. The jointer must not be used for stock less than 10 in. long.
3. The push stick must always be used when a flat piece of stock is being planed on the jointer.
4. The end grain of a piece of stock must never be run over the jointer.

5. Deep cuts on the jointer should be avoided.
6. Stock less than  $\frac{3}{8}$  of an in. thick must not be run over the jointer.

#### Safety Instructions for the Planer.

1. The planer must be adjusted to take not more than  $\frac{1}{8}$ " cut.
2. The planer should not be adjusted to plane stock less than  $\frac{1}{4}$ " thick. Thinner stock than this should be run through the planer on a thick board. The instructor's permission must be obtained for this operation.
3. Stock less than 14 in. long should not be run through the planer.
4. When operating the planer the students must not allow their hands to come near the feed rollers.

#### Safety Instructions for the Band saw.

1. The guide must be adjusted to within  $\frac{1}{4}$ " of the thickness of the stock to be cut before power is turned on.
2. Students must not allow their fingers to come closer than 2 in. to the saw when cutting stock.
3. Students must not allow their hands to cross the saw line when operating the band saw.
4. Students must not stand at the right side of the band saw.

5. Never back up a band saw except when absolutely necessary. If necessary to back saw out of a long cut the power should first be turned off and the machine allowed to come to a dead stop.
6. A curve of small radius should not be cut except with a very narrow blade.
7. Cylindrical stock must never be cut on a band saw unless properly clamped.
8. Stock must not be cut on the band saw unless such material is firmly supported against the downward thrust of the saw.
9. If the band saw blade should break while the machine is in operation, the student should immediately shut off the power, keep clear of the saw, and notify the instructor.

#### Safety Instructions for the Swing Saw.

1. The swing saw is intended for quantity cutting only and must not be used for sawing short pieces of stock.
2. The operator must keep his hands away from the track of the swing saw at all times.
3. When operating the swing saw, great care must be taken not to force the saw through the stock faster than it will cut.
4. Students must never attempt to clear away scraps of stock from the track of the swing saw with their fin-

gers. If it is necessary to remove them, push them away with a stick about 2 ft. long.

5. Care must be taken when sawing wide boards to avoid warped lumber pinching the saw. Warped stock should be cut slowly and the saw kept cleared by swinging the saw backward until the cut is complete.

#### Safety Instructions for the Mortiser.

1. Before power is turned on the downward travel of the hollow chisel and height of the table must be adjusted so that the bit at the bottom of its stroke will not strike the table.
2. Stock must be firmly clamped in the machine before being mortised.
3. The sliding table must not be moved until the bit is clear of the mortise.
4. The sliding table carrying the stock must be moved sideways the width of the chisel between each cut.
5. When mortising hardwood, the hollow chisel must not be forced into the stock faster than it will cut. The bit should be oiled if it makes a noise while running.

#### Safety Instructions for the Wood-Turning Lathe.

1. Loose sleeves or ties must be fastened or removed while operating the wood-turning lathe.
2. All wood intended for turning must be carefully examined for checks, knots, or other defects before being put

in the lathe.

3. All glued work must be properly set (dry) before being turned in the lathe.
4. Rough stock must be turned a few times by hand after being centered in the lathe to make sure it will clear the tool rest.
5. All turning tools except the parting tool must be held firmly with both hands while cutting stock in the lathe.
6. All lathe jobs must be started at the lowest speed and stock must be roughed down to cylindrical form before a higher speed is used.
7. Great care must be taken to prevent turning tools from catching while using the lathe.
8. The lathe must be stopped before a caliper is used to determine the diameter of stock, unless work is already turned to a smooth cylinder.
9. The tool rest must be kept as close as possible to the stock being turned, but must not be adjusted until the lathe is stopped. It should be removed while sanding and polishing.
10. Large diameter stock must never be turned at high speed.
11. Face-plate work must be securely screwed to the face plate before being turned, and great care must be taken when turning to avoid cutting too deeply and striking screws.

12. The gouge should not be used in cutting the inside of a cup-shaped face-plate job.
13. The tail stock must be securely locked before the lathe is started.
14. Wood-turning tools only may be used for lathe work.

#### Safety Instructions for the Belt Sander.

1. The belt sander is intended for quantity production work and should not be used in sanding small pieces of stock.
2. The height of the table must be adjusted so that the sand-paper belt will just clear the stock to be sanded before power is turned on.

#### SAFETY INSTRUCTIONS FOR THE MACHINE SHOP

The machine shop offers a valuable opportunity for safety instruction and for the formation of habits in safety and in general, industrial accident prevention. There are several divisions in machine shop work that all offer hazards of various kinds.

#### Safety Procedures for the Engine Lathe.

1. Before turning the power on, be sure the lathe is free to run. Test first by turning over by hand. All feeds must be released before power is turned on.
2. When turning between centers, be sure that the tail stock is firmly clamped before turning on power.
3. The lathe must be at a dead stop before any material is

- removed from between center, chucks, or faceplates.
44. Gears must not be changed when the machine is running.
  5. When polishing or filing, keep clear of all projecting parts that revolve.
  6. The chuck wrench must never be left in the chuck.
  7. The chuck or face plate must never be put on or removed by using power.
  8. All work must be securely fastened in the lathe before power is turned on.
  9. When a job is finished, throw out all feeds, clean the lathe, and leave in first-class order.
  10. Never attempt to clean the taper in the lathe spindle while the machine is running.
  11. Always remove tool bits from the tool holder when cleaning the lathe. It may save a nasty cut.

#### Safety Procedures for Belting.

1. Never attempt to stop a machine by grabbing a belt.
2. If an overhead belt is caught and it begins to wind around the shaft, shut off the power and get away.
3. When replacing belts, adjust them first on the driven pulley.
4. When handling a belt between two overhead pulleys, never place a ladder between the pulleys nor rest it against a revolving shaft. Replace the belt with a stick provided for the purpose, or stop the line shaft

when the belt must be replaced by hand.

5. Metal fasteners or laces must never be used on hand-shifted belts.

#### Safety Procedures for the Drill Press.

Many injuries may occur if care is not exercised in operating this machine.

1. Before starting the machine be sure the drill is held firmly and the table and work clamped securely.
2. All work should be held by a vise or clamp, and safety stops should be placed on the table to prevent the work from tearing loose.
3. The drill must be fed slowly and carefully when it is just breaking through the work.
4. If the drill slips in the chuck, do not attempt to tighten it until the machine stops.
5. Always remove a drill or chuck with a drift, and do not allow either to fall.
6. Never leave the chuck wrench in the drill chuck.
7. Never get any closer to the drill press than necessary.
8. Keep the body clear of all revolving parts on the drill press.
9. Never attempt to clean the taper in the drill press spindle when the machine is running.
10. Do not use excessive pressure in an effort to drill faster, as this may cause trouble.

### Safety Procedures for the Grinding Wheels.

No student must work on an unguarded wheel, and each student should be instructed to use all precautions when using the grinding wheel.

1. Before mounting a new grinding wheel check its rating speeds. Never force a grinding wheel on an arbor. When starting the wheel always stand to one side.
2. Goggles must be worn when heavy grinding is done.
3. Keep tool rests close to the grinding wheel and in no case should the gap exceed  $1/8$  of an inch.
4. Do not exert excessive pressure against the surface of the wheel.
5. It is bad practice to grind on the side of the wheel when not absolutely necessary.

### Safety Procedures for the Milling Machine.

1. All work must be securely fastened before the machine is started.
2. Do not remove or tighten the arbor nut by power.
3. Be sure the cutter is properly clamped on the arbor before starting a cut.
4. Do not get hands or arms near the cutter when the machine is running.
5. Use a brush on the off side to wipe chips from a revolving cutter. Never use fingers or a steel scale.
6. Be sure stops are set and see that everything will run

clear during the entire cut before throwing in automatic feeds.

7. Never leave the machine before stopping it and releasing all automatic feeds.

#### Safety Procedures for the Shaper.

1. Be sure the tool and head clears the housing and work, before starting the machine by power.
2. Before taking a cut be sure all work, holding devices, and tools are clamped firmly.
3. After changing the length of stroke be sure to tighten the ram.
4. Never attempt to adjust or remove a tool while the machine is in motion.
5. Keep the arms and hands away from all moving parts.

#### Safety Procedures for the Planer.

1. Before starting the machine be sure all work will clear the crossrail and housings.
2. Never ride on the platen.
3. Under no circumstances place yourself where you could be caught between the tool, crossrail, housing, and the work or platen.
4. Check all work tools and adjustments to see that they are tight before starting the machine.
5. Before leaving the machine, throw out all feeds and shut off the power.

## SAFETY PRECAUTIONS FOR THE FORGE SHOP

1. Hardened tool steel should never be struck with hardened tool steel, such as a hammer against the face of an anvil or hammer against a file.
2. The head or blunt end of a chisel should never be hardened.
3. Use goggles for all heavy grinding.
4. All hammers, handles, and other tools must be in first-class condition before being used. Be sure the hammer head is tight on the handle.
5. Avoid standing in line with the swing of any person's hammer or sledge.
6. Be sure tongs are fitted to the work before forging.
7. When chipping or cutting off rivets, be sure no one is in line with the direction in which pieces may fly.
8. Hot metal pieces on the floor should always be placed out of the way so they will not be stepped on.

## SAFETY PROCEDURE FOR THE ELECTRIC SHOP

1. A student must not, under any condition, give another student an electric shock without his knowledge and consent. Low voltages or shocks may be dangerous to certain people.
2. Never cut two wires at the same time with a pair of pliers.
3. Do not deliberately short any electric circuit or gen-

erating device.

4. Never short a storage battery, as there is danger of causing an explosion. There are proper instruments provided for testing batteries.
5. Be sure of the line voltage before plugging in any device on it.
6. Treat all unknown wires as "hot wires".
7. Never substitute anything else for a fuse of the proper size. Remember a fuse is a safety valve.
8. Do not handle portable, electric tools while you are in a damp or grounded location unless the tool frames are connected to ground.
9. Never allow moisture or water in or on molten metal, as an explosion may result.
10. Never use a straight ladder without proper precautions against slipping.
11. Knives and other sharp tools are to be properly used and are not to be thrown or played with.
12. Use care when working with a hot soldering iron.
13. Do not use metal rules around electrical equipment.
14. Always mix acid into water - never water into acids.
15. Use only Pyrene fire extinguishers on electrical fires.
16. Never handle anything on the switchboard without permission of the instructor.
17. Never change a circuit on the distributing panel unless all load is off that circuit.

18. Do not touch a brass socket with wet hands.

### SAFETY PROCEDURES FOR THE PRINT SHOP<sup>1</sup>

1. Never run the press at a speed which causes you to become nervous or faint. More can be accomplished by running the press at a slower speed and feeding regularly.
2. In selecting a speed to run the press, choose one that makes you feel at ease in feeding, and not a speed that causes you to make jerky movements. Jerky movements indicate that the press is running too fast.
3. If you should feed a sheet crooked, under no circumstances attempt to adjust or remove the sheet until the press opens. Never allow the hand to follow the platen to a point of danger when the press starts to close.
4. When feeding stock to the press and removing stock from the press, try to do so in an easy, even motion, removing your hand from the press immediately after feeding stock to the guides.
5. While the press is in motion do not place your hands on any moving part. Keep them on the receiving board

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<sup>1</sup>Bulletin on Safety, San Diego City Schools, San Diego, California.

until the press is in proper position to have the stock removed and a new sheet inserted.

6. Do not talk to another person while feeding the press, ~~and do not~~ feed the press while someone is standing near you or the press. Should you find it necessary to speak to someone, stop feeding.
7. Should you feel ill or dizzy the day you are to feed the press, or while you are feeding it, or while you are using the paper cutter, inform the instructor.
8. Do not lift the proof press off the track nor place the hand on the track while the drum or cylinder is in motion.
9. Do not tamper with the motors. If they need adjusting, call the instructor.

#### Paper Cutter

1. Do not play with the paper cutter, as the blade is extremely sharp, and an accident might result.
2. When you find it necessary to use the paper cutter, make sure that no one is talking to you or standing close to you or to the paper cutter.
3. When changing stick in the paper cutter, be careful to avoid the knife edge.

#### Type-Casting Machine.

1. On the type-casting machine, slide metal pigs into the metal pot, but do not drop or throw them in. Sliding them in will avoid splashing the molten metal.

2. Carefully observe rules of proper spacing of lines to avoid squirts.
3. Sit erect while operating the keyboard, and obviate stooped shoulders and curvature of the spine.
4. Use a lighted paper to ignite the gas under the melting pot. A match is too short and its use might result in a flareback and a painful burn.
5. Do not put damp or wet slugs into the metal pot or pour molten metal into wet molds.
6. Exercise extreme caution in the use of the saw trimmer. Be sure no one is near enough to you to jostle you, and avoid talking when running the saw.

#### SAFETY PROCEDURES FOR GAS WELDING AND CUTTING<sup>2</sup>

1. Under no condition should acetylene be used where the pressure is greater than 15 lb. per sq. in.
2. Do not allow oxygen or acetylene tanks to remain near stoves or any other source of heat. An increase in temperature of the gas within the tank will cause a increase in pressure which may exceed the safety limit.
3. An open flame should never be used for discovering leaks in acetylene tanks, but apply soapy water to the part to be tested and watch for soap bubbles.

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<sup>2</sup>Viall, Ethan, Gas Torch and Thermit Welding, McGraw-Hill Co., New York City, p. 306.

4. Care should be taken to protect the discharge valves of tanks from being bumped, as a jar may damage the valve and cause it to leak.
5. Grease in contact with oxygen under pressure may cause spontaneous ignition. Great care should be taken not to handle threads or valves with oily hands or gloves, and gages should not be greased with oil or any other hazardous carbon. If a lubricant must be used, the purest glycerine is permissible.
6. All repairs to apparatus should be done by an authorized dealer or the manufacturer.
7. The discharge valves on the tank should be opened slowly, and care should be taken to avoid straining or damaging them by the use of the wrong kind of wrench.
8. Proper precautions should be taken to protect the hose from flying sparks.
9. Those who do welding should wear suitable clothing and welding goggles for eye protection.
10. Open the acetylene tank not more than  $\frac{1}{4}$  turn and leave the wrench in place so that the valve may be closed quickly if necessary.
11. The operator should not stand in front of the gages when opening the discharge valves on the tank. If the pressure is turned on suddenly, it may possibly destroy the gage and the glass and parts will be blown out at the front.

12. All hose and couplings should be inspected regularly for defects.
13. Do not hold the torch near the face at any time.
14. Never hang the blowpipe from regulators which are attached to the cylinders.

#### SAFETY PROCEDURES FOR THE AUTO SHOP

1. If a car or motor is supported off the floor on blocking or stands be sure that the blocking is cribbed or that the stands or horses are firmly placed. An inspection by the instructor must be made before removing wheels from a car, or working under any object so supported.
2. Before removing the engine from a car or before starting an overhaul job, the ground wire from the battery must be disconnected. This may save a fire.
3. When using the grinder, use goggles on all heavy grinding and at all times if the grinder is not guarded by a glass shield. Do not stand directly in front of the grinder until it is running at full speed.
4. Gasoline is very inflammable. Never approach an automobile with any naked flame without the instructor's permission.
5. Never attempt to solder any gasoline tank, empty or otherwise, without the instructor's permission.
6. Before using a hammer, make certain that the head is

fast to the handle.

7. All chisels and punch heads or tops must be in proper shape and not mushroomed.
8. Before removing a car, crane, motor, or moving any piece of work on which a shopmate is working, make sure that he is clear and that he knows what you are doing.
9. No motor or heavy object should be lifted off the frame without notifying the instructor and getting his permission.
10. If you are chipping or cutting rivets, see that the flying metal will not damage adjacent property or endanger your shopmates.
11. Extreme care must be taken at all times when running cars over the school drives. Someone may dart out from behind a building directly in front of you.
12. Keep car doors closed if possible to prevent damage to a passing pupil who may strike the door hard enough to jar a supported car from its blocking.
13. Never turn an engine over by means of the crank unless it fits securely into the socket and is in perfect condition.
14. Never leave a creeper lying around on the floor where someone may step on it and receive a bad fall.
15. Do not use hardened pieces of steel for punches, as a

chip may fly off and cause an injury.

16. In case of a gasoline fire in your clothing, above all things, do not run. Lie down and roll in the dirt. Wrap something around you. Beat the fire out with rags or your hands. Do not run.
17. In placing a ladder, be sure that the ladder is set as nearly perpendicular as is practicable and that the base will not slip.

#### SAFETY PROCEDURES FOR THE FOUNDRY

1. Molten metal should never be poured before the mold has been inspected by the instructor.
2. Crucibles should be inspected by the instructor each time before they are used and if any flaw is found, the crucible must be broken.
3. Do not attempt to remove the crucible of molten metal before the fire is turned off.
4. See that the crucible tongs have a firm grip on the crucible before it is lifted from the furnace.
5. Before lighting the furnace, make sure gas has not been turned on, or is not leaking. The proper procedure for lighting the furnace must be obtained from the instructor in charge.
6. Approved clothing, goggles, and leggings must be worn while pouring metal.
7. Care must be taken to prevent splashing or spilling of

the metal.

8. If you are carrying a crucible or ladle of molten metal and are burned, do not drop the ladle or crucible, but quickly set it down.
9. When tapping the cupola, care should be taken to prevent splashing metal.
10. All molds must be securely clamped or weighted before being poured.

#### SAFETY PROCEDURES FOR THE SHEET METAL SHOP

1. Tools with sharp edges should not be carried in the pocket.
2. Cuts are often caused by ragged edges being left on pieces of sheet metal. Be careful of all sharp edges and corners.
3. Do not pull a piece of metal out of a person's hand as it may cut him seriously.
4. All scraps of sheet metal should be put into the scrap box.
5. Take care when lighting the gas furnace to see that you are not directly in front of the furnace. Light the gas immediately after turning it on. Do not let gas collect before lighting.
6. Keep the hands away from the knife when using the squaring shears.

7. When using the brake, keep clear of the folding blade.
8. Be careful when using acid flux to see that it does not splatter on your skin. Acid which may be accidentally splashed on the skin should be washed off immediately with water.
9. A hot, soldering iron and molten solder can cause very painful burns; be careful in using them.