# A CURRICULUM STUDY IN THE GENERAL SHOP FOR A LARGE CITY HIGH SCHOOL

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By

JAMES W. HICKS

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THESIS APPROVED:

Dewitt Hicks
Thesis Adviser and Head,
School of Industrial Arts Education
and Engineering Shopwork

C. L. Hill
Associate Professor,
School of Industrial Arts Education
and Engineering Shopwork

Edward P. Taylor
Dean, Oklahoma Institute of Technology

D. G. McIntosh
Dean of the Graduate School

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J. W. H.

## GENERAL SHOP

The general shop is a mighty good plan
To make of the boy a suitable man,
A place where he does more things than one,
The jobs that in life will have to be done.

A shop where he can just sort of explore
To see what trade he is best suited for,
To grasp somewhat of a bird's eye view,
The tricks that old folks wish they knew.

The essential things in more than one line,--
Not a tradesman--no, there's not enough time,
But sufficient to guide the future man
In the making of his own plan.

William L. Hunter

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# CHAPTER I

## ORIENTATION TO THE STUDY

An examination of the artifacts of past civilizations would reveal how man has risen to supremacy over other animals. The cue for this success is certainly not due to man's erect posture nor is it by chance. Why man has accomplished so much can best be attributed to his high intelligence, his curiosity, and his untiring efforts to solve the problems of his environment. At present medical doctors are seeking cures to seemingly uncurable diseases, manufacturers are trying to produce better articles, merchants are seeking to improve their service, and scientists are, as always, busy in their quest for knowledge. But what, one might ask, are the educators doing? There are numerous research undertakings and studies in various phases of completion throughout the nation. This report represents such a study by a teacher of industrial arts.

The Study. In recent years there have been few studies or publications pertaining to the general shop. Therefore this study was undertaken, for one reason, to determine the present situation of the general shop. There is a limited amount of published information available on the general shop for the subject is a relatively new type of industrial arts instruction. However, the greater part of this study is based on written matter which is available through the library of the Oklahoma A. and M. College. Also in this study, proposed solutions to some of the problems of the general shop are included in addition to a discussion of the factors which must be considered in planning a general shop program.

Delimiting Assumptions of this Report.

1. At a very early date this material will be used as a basis for establishing a course of study for the general metal shop industrial arts program of Classen High School, Oklahoma City.

2. The subjects included in the general metal shop in the Classen High School are automobile mechanics, general metal work, and electricity.

3. The general shop must meet the need of the pupils in Classen High School for shopwork instruction. Approximately eighty per cent of the graduates of Classen High School attend college, therefore, the industrial arts program must be basically exploratory in providing the opportunity for discovery of interests and aptitudes. It is anticipated that some of the students who will not enter college may find a vocation of interest to themselves through their general shop experience. It is further planned that those students will be guided toward one of the vocational programs in that school or in other similar schools in Oklahoma City for the remainder of their senior high school enrollment.

4. The long range plan indicates that within three years all junior high school graduates in Oklahoma City who enter Classen will have completed at least one semester in each of the following industrial arts general shop courses:

(1) Woodwork, plastics, and leather.

(2) Printing, photography, and mechanical drawing.

(3) Metalwork, electricity, and automobile mechanics.

The general shop of Classen High School will include more advanced instruction than that provided in the junior high schools and will also have adequate provisions for those students who have not attended an Oklahoma City junior high school.

Definitions of Terms. There are no terms introduced in this report which the writer has invented; however, since some of the terms used do have various meanings, it seems advisable to define these terms as they are commonly interpreted. The following terms will be defined: (1) industrial arts, (2) general shop, and (3) general education. Two or more definitions are quoted for each term.

Industrial Arts

> Industrial arts is a phase of general education that concerns itself with the materials, processes, and products of manufacturers, and with the contributions of those engaged in industry. The learnings come through the pupils experiences with tools and materials and through his study of the resultant conditions of life. Profitt, Industrial Arts, Its Interpretation in American Schools, (16, page 1).

> Industrial arts as a school subject may be defined as a study of the machines, tools, and processes by means of which the forces of nature are utilized and the raw materials are changed by man to make them more valuable and pleasing. It leads to an understanding of the native qualities of raw materials and of the natural forces together with a knowledge of the methods and practices of utilizing and changing these materials and forces. It is also concerned with the social and economic problems incident to these changes. A Course of Study in Hand Woodworking, (1, page 1).

> Industrial arts is defined as those phases of general education which deal with industry--its organization, materials, occupations, processes, and products--and with the problems resulting from the industrial and technological nature of society. Wilber, Industrial Arts in General Education, (22, page 2).

General Shop

> Shops that are planned and equipped to teach two or more distinct types of shopwork at the same time under one teacher are general shops. Newkirk, Organizing and Teaching the General Shop, (14, page 15).

> A general shop is distinguished from a unit shop by the fact that activities in two or more industrial areas are carried on simultaneously. . . . There are certain characteristics, however, which seem to be common to most true general shops. These include:
> 1. Activities in two or more industrial areas are evident.
> 2. A large number of industrial materials are used.

3. The teacher is versatile in many areas.
4. Equipment is diversified, rather than specialized.
5. Breadth of experiences is considered more important than depth in any particular field.

Wilber, Industrial Arts in General Education, (22, page 108).

General Education

> The purpose of general education is to meet the needs of individuals in the basic aspects of living in such a way as to promote the fullest possible realization of personal potentialities and the most effective participation in a democratic society. Progressive Education Association, Science in General Education, (19, page 23).

> Wilber summed up general education as implying three basic purposes: ". . . (1) to transmit a way of life, (2) to improve and reconstruct that way of life, and (3) to meet the needs of individuals." Industrial Arts in General Education, (22, page 3).

Review of Previous Related Studies. There are ten available studies which are concerned with the general shop. Three of these studies which the writer found to be of significant help in preparing this study are reviewed in the following three paragraphs.

Bourne, M. Nile, A Curriculum Study of the General Shop, a masters thesis completed at Colorado State College of Education, Greeley, Colorado, in 1937. The purpose of this study was (1) to determine the problems of the general shops being taught in selected schools which were members of the North Central Association, and (2) to discover the types of shops and the nature of the work offered therein. At the time of this study the number of general shops were increasing rapidly on the junior high school level. The 6-3-3 school plan was being followed by a majority of the schools and in many schools the exploratory objective was regarded as the most important phase of general shop work. Industrial appreciation and guidance were next in order of emphasis. The average number of activities in the general shop were 8.2 and the ten most commonly taught subjects were, in order of their frequency; bench woodwork, elementary mechanical drawing, sheet metal work,

bench metal work, cabinet making, home mechanics, advanced mechanical drawing, forging, machine shop, and elementary electricity. There were three times as many metal shops as wood and the most popular activity from the students' view-point was elementary electricity. This study revealed that much confusion existed around matters of organization, administration, and the definition of general shops.

Luehring, Arthur H., and Yager, Sylvan A., A General Shop, Its Equipment and a Suggested Curriculum for the Smaller Schools. This bulletin was prepared for the Indiana State Teachers' College Journal at Terre Haute, Indiana, and its purpose was to aid beginning general shop teachers in becoming familiar with the types and problems of general shops and to aid those teachers in developing a program to suit their individual circumstances. In presenting the history of general shops the following types of organizations were explained: (1) Ettinger, (2) Bonser, (3) Gary, (4) Pittsburg, and (5) the Laboratory plan. In addition to presenting a comprehensive course of study for a general shop program with drawing, concrete, bench metal work, and foundry as activities, the following factors of the general shop were discussed: (1) advantages, (2) disadvantages, (3) wrong conceptions, (4) selecting activities, (5) objectives of industrial arts, (6) objectives of industrial arts in junior high school, (7) shop plans, (8) equipment, (9) teacher preparation, and (10) teaching aids. A considerable amount of material included in the Luehring--Yager bulletin will be quoted later as a part of this thesis.

University of the State of New York Bulletin, Industrial Arts Syllabus in Comprehensive General Shop for Grades 7, 8, and 9. The purpose of this bulletin is to offer teachers of industrial arts a suggested course of study outline. It represents also an attempt to standardize general shop

instruction in the state of New York. The content of this report is sufficient to aid in (1) the selection, arrangement, and time alloted to teaching materials, (2) establishing a balance between manipulative work, demonstrations, and related information lectures, and (3) maintaining the necessary records of the general shop. Suggested projects, operations, processes, demonstrations, lectures, and record forms are adequately presented for the following six activities; general ceramics, general electricity, general metalwork, general printing, general textiles, and general woodwork. A bibliography of reference material of value in the comprehensive general shop is listed. The bibliography is arranged in ten lists, one for each of the six separate shop activities plus four alternative subjects.

Expected Outcomes. There are many phases of general shop instruction that need further research; a few are suggested in the concluding chapter. It is hoped that this study might be of value to future studies as well as aid general shop teachers in planning their curricula.

Organization of Remaining Chapters. Chapter two is concerned with the history of general education in addition to the philosophy of industrial arts. Chapter three has been devoted to the planning of a total industrial education program with a description of industrial arts on all its levels as well as vocational education, and an industrial arts program for the Oklahoma City schools is proposed. In chapter four the general shop is discussed as to historical aspects, objectives, advantages, and disadvantages. Much emphasis has been placed on methods of solving the problems which are peculiar to the general shop. In chapter five, the planning of the physical area of the shop, tool requirements, text book and reference material selection, and conditions affecting the planning of a general shop program are discussed. In chapter six the organizational and the administrative

problems of the general shop along with suggested solutions are presented. Also this chapter contains a tentative course of study which includes a required and an elective list of projects. Chapter seven is the concluding chapter and consists of a summary of the findings of this study as well as recommendations for further related studies.

Planning a general shop curriculum is becoming a common experience among industrial arts teachers. The recent increases in the number of general shops has necessitated many unit shop teachers to go into general shop programs, and these programs must be planned efficiently if they are to be successful. One purpose of this study is to determine in a methodical manner what the general shop situation is and what the conditions are which must be observed in establishing such a program. The following chapter will be concerned with many phases of the public school general shop programs.

# CHAPTER II

# THE BASIS FOR INCLUDING INDUSTRIAL ARTS IN THE HIGH SCHOOL

The activities of an individual of a small group of persons or of an organized section of society will reflect a recognizable philosophy which controls these actions. An element of humanity which purports to transmit a way of life must make manifest its philosophy. A statement of objectives for the controlling philosophy, as well as the philosophy itself, should be presented for the scrutiny of all concerned. In this chapter a history of general education and a philosophy of industrial arts will be presented together with a list of objectives for the latter.

## PART A

## An Interpretative History of General Education for the First Half of the Twentieth Century

What is general education? What are its aims and content? To answer these questions best, a knowledge of the history of education is almost mandatory. The physical limitations of this report require the writer to list only the most significant events with a brief discussion of each.

The Factor of Individualism as Affecting Educational Theory and Practice. The broad field of education is graced with prominent men possessing prodigious reasoning faculties. Thanks to America's democratic freedoms these leaders share varying viewpoints on many phases of education. Perhaps this is well for as Tennyson wrote in Morte d' Arthur, "Lest one good system should corrupt the world." Or as the French have so aptly phrased it, "autant d' hommes,

autant d' avis," or "so many men, so many minds." Since this divergence of opinions is apparent in matters of objectives and interpretations, this writer wishes to emphasize the fact that all definitions and aims included in this report are selected and in no means representative of all educators.

The Fusion of Physiology and Sociology into Educational Methodology. In order to comprehend more fully, the implications of the status quo of general education an abbreviated history of the movement is presented here. In the first decade of this century psychologists such as Ebbinghaus, Galton, and Cattell questioned the effectiveness of school procedures and the secretiveness long placed on matters of individual differences was soon removed. Very soon thereafter the importance of the intelligence quotient was established and with it came the necessity for changing school curriculums which had previously been founded on the supposition that children are either feeble minded, normal or gifted. In the second decade of this century the sociologists joined forces with the psychologists and the emphasis shifted from school organization to school subjects.

The Experimental Laboratory Schools. Much worthy educational research was accomplished between 1890 and 1930 in the newly organized laboratory schools. John Dewey organized the first of these in Chicago in 1896. Others that followed and affected appreciably the revision of junior and senior high school curriculums were: The University of Chicago High School, the Horace Mann School for Girls, the Speyer School, and the Lincoln School. The latter three were organized under the auspices of Columbia University. Much of the success of these institutions can be attributed to their experimental purposes which provided immunity from traditional impositions.

A Brief Resume of the Significant Educational Movements as Affecting General Education. Sometime around 1890, an economy of time movement was

instigated by several educators. Its most emphatic leader, President Eliot, of Harvard, felt that eight years of grammar school, four years of high school, and four years of college unduly delayed man in his attempt to establish his life's work. By 1920, this movement had ceased in its original form, and its leaders were advocating a more economical use of time while in school. One of the most significant results of this movement was the removal of many irrelevant courses from school curriculums. A social efficiency movement was also started around 1890 and exists somewhat today. Herbert Spencer's analysis for complete living was modified by the leaders of this movement who became the authors of the still famous "Cardinal Principles of Secondary Education" in 1918. Following the pattern set by the proponents of the "Seven Cardinal Principles" the preparation for life movement began. Thomas H. Briggs in his book Secondary Education, epitomized this new theory as, "The first duty of the school is to teach pupils to do better the desirable things that they are likely to do anyway." (6, page 258.) The followers of John Dewey organized the Progressive Education Association in 1919. This theory of progressive education attracted many advocates through their insistence that learning through formal study was inefficient when compared with learning through self-planned and self-executed projects.

The Experimental Movement and its Recent Application in Curriculum Research. To say that American high schools are only as strong, or as weak, as their curriculums, is almost a truism. Current educators are in general agreement that curriculum may be defined as all experiences in which the student is involved under the direction of the school. This broad definition and its implications accompanied one of the latest movements in education; experimentalism. Since 1930 much exploring in curriculums has been undertaken. The Progressive Education Association, in its Eight Year Study, required

administrators of each participating school to outline an individual plan for preparing students for various types of future life. This is merely an example of a multitude of experimental research projects conducted in secondary education. The characteristics of general education, as influenced by curricula, is shown as a comparison between the period of 1890 and 1940 in the following chart, the material of which was obtained from a book sponsored by the North Central Association, General Education in the American High School. (15, page 81)

Characteristics of General Education

| In 1890 | In 1940 |
|---|---|
| 1. Suited to few who had money | 1. Suited to the many who needed education who might or might not have brains and money |
| 2. Education for leadership | 2. Education for efficient living |
| 3. Uniform and disciplinary | 3. Differentiated and socializing |
| 4. Indirect | 4. Direct |
| 5. Designed to prepare the chosen for anything | 5. Designed to prepare all for everything, but nothing in general |
| 6. Permitted a stable coherent curriculum | 6. Enforced a changing, divided curriculum |
| 7. Had a method, in fact, was a method | 7. Had no specific method, in fact, was all methods |
| 8. Product was predictable | 8. Product was of the nature of things hoped for |

Note: The characteristics of 1940 are effective currently.

In summarizing this discussion of an educational history, it would seem only desirable to emphasize the fact that there are frequently several educational movements in progress at concurrent times. Education is a living mass, constantly growing and changing in form. There are many problems facing educators but the one that is most pressing at present is the matter of curriculum. This report represents a curriculum study in industrial arts as a phase of general education.

PART B

## A Philosophical Approach to Industrial Arts

What is industrial arts? What are the educational outcomes of industrial arts instruction? These questions could well be answered by a stated philosophy. The writer recognizes several individualistic philosophies expressed by past leaders of industrial arts education. To be specific a few are Froebel, Rosseau, Della Vos, Salamon, Woodward, and Bonser. With so many differing philosophies, the writer often envies the vocational teacher whose program undeniably must follow one established philosophy. However, the present interpretation of general education harmonizes well with industrial arts. The objectives of the latter are the same for the former for industrial arts is an integral part of general education.

Characteristics of Industrial Arts. The environmental factor will often influence the character of different programs. For instance, in an industrial community, if it has an industrial arts department, such will be offered on a guidance plus general education basis, while in a dominantly non-industrial community a non-vocational, exploratory, and highly generalized plan of instruction would be desirable. John F. Friese, in his book, Course Making in Industrial Education, lists the following fifteen characteristics of industrial arts. (8, pages 58-67).

1. Learning and developmental experiences in industrial arts, through types of experiences not otherwise available, are essential in the complete social education of every boy in a dominantly industrial democracy.

2. The industrial arts constitute a group of school experiences which embrace the most fundamental procedures in education; namely, learning through a combination of seeing, hearing, thinking, and doing.

3. Industrial arts is a convenient and natural agency for educational correlation.

4. The interest factor plays a prominent part in the kind and amount of learning accomplished in industrial arts.

5. The vehicle of learning, the problem, job, or educational project, is the physical expression of a pupil's educative experiences and growth.

6. Industrial arts provides a ready avenue of self-expression for large numbers of persons who find many other avenues for such experiences closed.

7. Industrial arts is fundamentally and naturally child-centered in its concepts and its practice of methods, subject matter, and control.

8. Some phases of industrial arts are applicable to girls as well as boys.

9. In industrial arts, as in other school activities, what little carry-over value or transfer of training occurs takes place more as a result of the methods of teaching employed than through the particular significance of subject matter.

10. Industrial arts and vocational industrial education are complementary parts of a complete industrial education, and education based upon important factors of current industrial life and development.

11. The objectives of a particular industrial arts course or activity must be in harmony with those of the industrial arts department of which it is a part; the aims of the junior high school, senior high school, or secondary education as a whole; and finally, the aims of secondary schools must culminate in recognized contributions to all organized or formal education.

12. The teacher's plan of organization and his control of personnel, equipment, supplies, products, and safety, contribute many of the desirable educational outcomes of the industrial arts.

13. Industrial arts abounds in natural situations conducive to creative thinking or problem solving.

14. Industrial arts provides a ready and natural agency for a degree of foundational training in industrial versatility.

15. In the teaching of industrial arts, the teacher is more important than space, equipment, and supplies.

To be sure there are other descriptive criteria which could be added to these fifteen, however, the items not included can in most instances be classified in one of the given divisions.

Justification of Industrial Arts Instruction. Can industrial arts be justified? The selected definition of industrial arts, presented in Chapter I, indicated a concern for the importance of the materials, tools and processes of industry. This is only logical since America is an industrial nation. Many estimates are available to document this statement; one of the most recent being a research by Leo Guild, What are the Odds, (11, page 169), in which it was reported that seventy per cent of the job holders in the United States are employed in positions requiring varying degrees of mechanical knowledge. Industrial arts can offer much information which is required of these workers. Of course vocational education can offer the same information and develop a higher degree of skill in workers, but how many high school graduates of a vocational program will follow that pursuit? The American Vocational Association research bulletin, Occupational Adjustment of Vocational School Graduates, (2, page 120), contained the statement that of the initial jobs undertaken by 235 graduates of the Williamsport, Pennsylvania, high school, thirty-four per cent had obtained work that was directly related to their training. One of the chief purposes of industrial arts is to provide a basic industrial knowledge applicable to many different occupations. Then too, industrial arts education with the emphasis placed on particular phases can adequately prepare youth for the handy-man abilities required in the average home.

## PART C

### The Aims or Objectives of Industrial Arts in American High Schools

Industrial arts instruction, like general education, has had varying aims or objectives expressed by leaders in the field at different eras in history. For example, manual training, which is the forerunner of industrial

arts, advocated training in the coordination between the hand, eye, and mind. Industrial arts teachers no longer labor under the delusion that their work consists primarily of mental and physical discipline.

The Present Commonly Accepted Objectives of Industrial Arts Education. The objectives stated here are reprinted from the Problems in Sheet Metal Work, (9, page 6), which was prepared by a group of graduate students at Oklahoma Agricultural and Mechanical College in 1941. The consistency of the use of these objectives is very high in many recent publications as is shown in Table I.

1. Basic industrial knowledge.
2. Training in problem solving of the job analysis type.
3. Home mechanics.
4. Exploration.
5. Skills.
6. Consumer knowledge and appreciation.
7. Avocational training.
8. Guidance values.
9. Vocational training.
10. Socializing values.
11. Provides outlet for boy interest.
12. Health.
13. Mechanical drawing.
14. Safety.

1. Basic Industrial Knowledge. The possibility that the high school graduate will receive employment requiring some degree of mechanical knowledge has been estimated by Leo Guild in his, What Are the Odds, (11, page 169), to be seven to three. If seventy per cent of the students have a possible future need for basic industrial knowledge then it should be offered in industrial arts. This type of information will also be of value to all persons, even those not engaged in industrial pursuits.

2. Training in Problem Solving of the Job Analysis Type. There is much acclaim for a dog which perceives that a child is in danger and saves its life. Think how many times man does this daily as a matter of common duty.

TABLE 1

COMPARATIVE ANALYSIS OF THREE STATEMENTS OF OBJECTIVES OF INDUSTRIAL ARTS

| GRADUATE STUDENTS | A.V.A. COMMITTEE | NEWKIRK |
|---|---|---|
| 1. Basic industrial knowledge | 1. Interest in industry | 3. Understanding of industry |
| 2. Training in problem solving of the job analysis type | | 2. Job planning |
| | | 9. Applies abstract thinking |
| 3. Home mechanics | | 1. Home mechanics |
| 4. Exploration | | 4. Testing of interests |
| 5. Skill | 9. Shop skills and knowledge | 8. A degree of skill |
| 6. Consumer knowledge and appreciation | 2. Appreciation and use | 7. Consumer knowledge |
| | 3. Self discipline and training | 11. Avocational interests |
| 7. Avocational training | | |
| 8. Guidance values | 7. Orderly performance | |
| 9. Vocational training | | |
| 10. Socializing values | 4. Cooperative attitudes | 12. Social values |
| 11. Provides outlet for boy interests | 6. Interest in achievement | 10. Opportunity for creative expression |
| 12. Health | 5. Health and safety | |
| | | 5. Read and make working drawing |
| 13. Mechanical drawing | 8. Drawing and design | 6. Appreciation of design |
| 14. Safety | 5. Health and safety | 13. Safety |

Graduate Students I.A.E. 522, Oklahoma A. and M. College, Stillwater, Oklahoma, Problems in Sheet Metal Work, John Swift Company, St. Louis, Missouri, 1941, 56 pages.

American Vocational Association, Improving Instruction in Industrial Arts, American Vocational Association, Washington, D. C., June, 1946, 96 pages.

Newkirk, Louis V., "Teaching Aims in Industrial Arts," American Vocational Journal, pages 12-13, December, 1946.

The people of this age are accustomed to confronting new problems, analyzing the situation and arriving at satisfying solutions. If this is expected of adults then should not youth be prepared for it while in school? In a high school shop each student should analyze his particular project, classifying the job into operations, prepare a sequence of operations, and follow these, correcting them as the occasion demands, to the successful completion of the project.

3. Home Mechanics. Considerable importance is attached to industrial arts for its possibility of pre-training for the industries. If justification for this is made by the large percentage of the working population engaged in mechanistic labor, then home mechanics could equally well be acknowledged, for how many high school students will marry? The average family cannot afford to have all repairs performed by tradesmen. Thus for economic reasons, convenience, and desirability, the development of handy-man abilities is a must.

4. Exploration. This phase of industrial arts has several functions. The student can explore the various industries with the intention of choosing a vocation; he may explore the various trades to find a hobby or craft that interests him; or he may merely want a basic knowledge of the manufacturing world to broaden his education. This objective is quite frequently used as a guidepost for guidance programs.

5. Skills. The desirability of a broad general knowledge stems from the aims of general education; hence, this objective of developing in the individual a certain amount of skill in a number of basic industrial processes. It is an elective of the student to develop that skill further into either a vocational or avocational interest.

6. Consumers' Knowledges and Appreciations. A vast and important phase

of learning is consumer knowledge. In this complex world of countless thousands of manufactured items there appears much merchandise having similarity of use and appearance, but having widely divergent characteristics. The students should learn what is good design, what is functional, of what does quality consist, and by what standards to measure it.

7. Avocational Training. Division of labor and the invention of machines that eliminate much hand labor have compelled industry to operate on a forty hour or less week. This gives the average individual much leisure time. Industrial arts training provides the worker who has some free time with a wholesome, interesting, and even profitable avocation.

8. Guidance Values. The student and his future should always be foremost in the teacher's mind. What the student develops into is the most important thing in the world to his parents, and, sometimes unconsciously, to the pupil also. It is perhaps the main criterion of general education to make more useful citizens of its students. Guidance is the task of every teacher.

9. Vocational Training. The harmony between industrial arts and vocational education was indicated before in this chapter. While it is true that industrial arts courses qualify students to enter or select a vocational program intelligently, the majority of students that enter the vocations will secure their training after graduation from high school. It is therefore important that industrial arts should offer some degree of vocational training to all students regardless of the present occupational intention of the student.

10. Socializing Values. In these days of racial, political, and economic unrest it is apparent that people must learn to live, work, and plan together in a democratic way. The industrial arts shop lends itself to the application of democratic methods more than most other school subjects; for here the students elect their leaders, accept responsibility, and learn to give, take,

and carry out assignments.

11. Provides Outlet for Boy Interest. The growing high school boy has much nervous energy, he is inquisitive usually about machinery, and he loves to make things. To industrial arts instructors these factors are as important as the appetite of the human being is to the bakery shop owner, for around these are centered the reasons for the popularity of industrial arts courses.

12. Health. Health education may be properly emphasized throughout the elementary grades and in some high school courses; however, industrial arts offers a different type of health knowledge. The writer chooses to identify this variation as industrial health for want of a better term and in this program the health conditions of the different manufacturing jobs are studied.

13. Mechanical Drawing. Mechanical drawing is the language of industry. A man may stammer or speak indistinctly but a properly executed drawing needs no interpretation among those endowed with a knowledge of the basic drafting principles. Almost every family type magazine exhibits blueprints or drawings occasionally, further proof that a knowledge of drawing is desirable.

14. Safety. The importance of safety is well known by industrial leaders who are forever seeking to eliminate occupational hazards. All high school shop instructors could render a great service to humanity by employing the five point safety philosophy advocated by DeWitt Hunt of Oklahoma Agricultural and Mechanical College. (26, page 1).

1. Practically all accidents are preventable.
2. A person cannot consciously and purposefully avoid an accident unless he knows the accident hazard exists.
3. Accident situations and hazards must be studied and the causes of accidents must be determined so that the accident can be avoided.

4. A continuous program of education for accident prevention must be made to eliminate accident hazards in the home, on the farm, in the factory, on the highway, etc.
5. All possible improvements of the physical environment must be made to eliminate accident hazards in the home, on the farm, in the factory, on the highway, etc.

Industrial arts is not a separate field of instruction. It is part of general education and as such its objectives are in complete harmony often coinciding with those of general education. One of the major contributions to society is that the shop program permits the democratic principles advocated in general education to be applied by the students in everyday situations.

# CHAPTER III

## PLANNING THE TOTAL INDUSTRIAL ARTS PROGRAM

The organization of a graded program on the eight year basis was effected first in 1810. This system probably was copied from the Prussians. Secondary schools were in operation as early as 1935. Sometime between 1880 and 1900 much dissatisfaction was expressed by educational leaders over the undesirable relationship between grade and secondary schools and the practices prevalent in each. These protests led to the reorganization of American schools and eventually to the inclusion of new subjects into the curriculum.

### PART A

### Industrial Arts at Four Levels

During the years 1810 to 1870 the eight year - four year program of elementary and secondary schools was being developed throughout the nation. This program had no more than been universally accepted as standard before educators began to demand modification or a complete revision. Several committees were appointed to study these situations; the Committee of Seven, Committee of Eight, Committee of Ten, Committee of Fifteen, and the Committee on College Entrance Requirements. Following the recommendations of these committees, the six-three-three program was developed. The Oklahoma Annual High School Bulletin for the year 1948-1949 listed 163 approved junior high schools. Of these, 126 were organized on the 6-3-3 basis. Gruhn and Douglas in The Modern Junior High School, (10, page 37-38), stated that the first application of the 6-3-3 plan was made in 1909 in Columbus, Ohio, and that this plan is accepted as the best present organizational scheme in operation today.

Industrial Arts on the Elementary Level. Many recent articles on elementary industrial arts might well serve as an indication of its rising popularity; however, regardless of its present prominence, this phase of education is not a recent innovation. Bennett, in his book, History of Manual and Industrial Education to 1870, (4 , page 72-73), indicated one of the first applications of shopwork in grade instruction was by Wiegel who in 1650 used handwork, ". . . for the purpose of sweetening education." At a later period in history, Froebel placed handwork at the center of his educational system, using it as an interest retaining device. Elementary industrial arts introduces children to the industrial world in which they live, offering the opportunity to use many basic tools and explore the many interesting possibilities of craftwork.

The Task of Industrial Arts in the Junior High School. Industrial arts in all its phases, is among other things, a great social leveler. In the shop laboratory each student must work and plan in harmony with others. As with other courses industrial arts for junior high school pupils has slightly different objectives and methods than the same type of course might have on the senior high level. Table was compiled by Louis V. Newkirk and is quoted from page 33 of his book, Organizing and Teaching the General Shop.

Previous to World War II, the junior high shop program emphasized the development of vocational skills for up to that time the pupil withdrawal at the end of the eighth or ninth grade was twenty per cent or more. Now the withdrawal percentage is almost negligible and the emphasis is largely upon its general educational values and to some extent on its pre-vocational training to aid pupils in the future selection of vocational courses or pursuits. Also the junior high shop program is strongly exploratory, offering the students an opportunity to investigate many areas of shop work. A

TABLE II

FREQUENCY OF APPEARANCE OF PECULIAR FUNCTIONS PROPOSED IN EDUCATIONAL LITERATURE FOR THE JUNIOR HIGH SCHOOL

| Peculiar Functions of the Junior High School | In statements in school documents | | In statements by educational leaders | |
|---|---|---|---|---|
| | Number | Per cent | Number | Per cent |
| 1. Realizing a democratic system through | | | | |
| A. Retention of pupils | 22 | 73.3 | 18 | 90.0 |
| B. Economy of time | 19 | 63.3 | 17 | 85.0 |
| C. Recognition of individual differences | 16 | 53.3 | 19 | 95.0 |
| D. Exploration and guidance | 12 | 40.0 | 15 | 75.0 |
| E. Beginning of vocational education | 12 | 40.0 | 14 | 70.0 |
| 2. Recognizing the nature of the child at adolescence | 11 | 36.7 | 11 | 55.0 |
| 3. Providing the conditions for better teaching | 14 | 46.7 | 17 | 85.0 |
| 4. Securing better scholarship | 6 | 20.0 | 7 | 35.0 |
| 5. Improving the disciplinary situation and socializing opportunities | 14 | 46.7 | 14 | 10.0 |
| 6. Effecting financial economy | 6 | 20.0 | 2 | 10.0 |
| 7. Relieving the building situation | 6 | 20.0 | 1 | 5.0 |
| 8. Continuing the influence of the home | 2 | 6.7 | | |
| 9. Hastening reforms in grades above or below | 1 | 3.3 | 2 | 10.0 |
| 10. Normalizing the size of classes | 1 | 3.3 | 2 | 10.0 |
| 11. Relieving teachers | | | 2 | 10.0 |

further peculiarity is that in the seventh and eighth grades, industrial arts is usually required while in the ninth grade it is ordinarily offered as an elective.

The Senior High School Industrial Arts Program. Industrial arts on the senior high school level is not vocational in its intent nor is it a decidedly general knowledge course. Struck, in his Foundations of Industrial Education, makes this comment: (20, page 36-40)

Industrial arts education is essentially a part of general education

> that forms a necessary general foundation and background upon which specialized vocational education may be built. It is the connecting link between the broad general education on the one hand, and narrower specialized education on the other.

Some of the general outcomes of this type of instruction are well summed up in the United States Office of Education bulletin, Industrial Arts - Its Interpretation in American Schools, (16, page 1-2):

> Industrial arts education is a phase of general education that concerns itself with the materials, processes, and products of manufacture, and with the contribution of those engaged in industry. The learnings come through the pupil's experiences with tools and materials and through his study of the resultant conditions of life. It is a curriculum area rather than a course, being comparable in this respect to the language arts.
>
> Industrial arts, therefore, has general values that apply to all levels, and in a continuous program these values are progressively intensive and are cumulative in their effect as the pupil advances in maturity. Through such a program the pupil:
>
> 1. Gains knowledge of the changes made in materials to meet the needs of society, of tools and industrial processes used to effect the changes, of the constant adaptation of materials, tools, and processes to meet changing needs and conditions, and of industrial workers and working conditions.
>
> 2. Grows in appreciation of the value of information regarding occupations as a background for a wise choice of a career, of the importance in modern life of tools and industrial processes, of the industrial processes, of the artistry of the designer and skill of the artisan, and of the dignity of productive labor.
>
> 3. Increases in ability to plan constructive projects, to select and use sources of industrial and related information, to handle tools and materials, to express with material things his individual interests, to use effectively his recreational time and to evaluate work and its products.
>
> 4. Develops attitudes of concern for safety practices, of considerations for workers in all fields, of regard for cooperation among the members of a group and of respect for property.
>
> Largely manipulative in character, yet affording content of an informational, technical and social kind, industrial arts contributes to complete living because it meets needs that are real and satisfies impulses that are inherent, reading, discussion, observation, and experiment are combined with participation in activities which permit discovery and development of creative and artistic abilities.

Contrast of Industrial Arts and Vocational Education in the Senior High School. Manipulative experiences may be offered in the secondary schools from the seventh year through the twelfth year; as previously indicated, these courses are usually either elective or required. In the grades, seven through nine, these subjects are usually in industrial arts, while grades ten through twelve can be either industrial arts or some form of vocational education. Therefore, shopwork in junior high school provides the opportunity for exploration and the discovery of individual interests and aptitudes while the acquiring of saleable skill is reserved for the senior high school period. On the other hand, vocational education as it is generally defined, includes training of less than college grade in the fields of trades and industries, agriculture, home economics, or commerce. In public schools, vocational education ordinarily is maintained under the auspices of the Smith-Hughes Act and its subsequent revisions. Three requirements which must be observed are: (1) The manipulative experiences must consume half of the total time or three hours of the daily program. (2) The affiliated courses such as drawing, English, and mathematics must be directly related to the vocation which the student is learning, and (3) the pupil is to be prepared or receive training in one specific trade or occupation. The assumption made in vocational education is that its graduates shall find employment in their prepared vocations that will furnish them a livelihood.

The Function of Adult Education in Industrial Arts. Night school classes for adults in secondary schools have become quite common. In industrial arts the demand is usually for avocational or hand craft type of courses. Adult education offers the teacher an opportunity to meet parents and advertise the shop program. The writer personally knows of several situations in which industrial arts departments received additional equipment as a direct result

of the teachers' having gained public respect and confidence through adult night classes. Wilber, in his book, Industrial Arts in General Education, makes this statement: (22, page 226)

> Helping to promote sound public relations is an important duty of every industrial arts teacher. A strong public relations program is essential, because it is helpful in winning support for the school from the community; it wins support for the department from the administration; and it helps to sell the total school program to the people. Methods commonly and effectively used to promote public relations include: (1) pupil-teacher relationships, (2) exhibits, (3) talks before the P. T. A., service clubs, etc., (4) open house nights, (5) newspaper publicity, (6) school assemblies, (7) show cases, (8) radio programs, and (9) adult classes.

## PART B

### A Proposed Plan for a Secondary Industrial Arts Program

There are two phases of secondary education: the junior high school and the senior high school. The activities of these two schools must be correlated in each individual city system. The junior high school shop experience is generally exploratory and pre-vocational in character. The senior high school while being exploratory can also be vocational as well as pre-vocational in its intent. The senior program offers experience, information, and projects of somewhat advanced complexity as compared with the instruction presented in the junior high school laboratories.

A Proposed Program for the Junior High Schools of Oklahoma City. The junior high schools of Oklahoma City are of sufficient size to warrant establishment of three full time shops and the employment of three teachers. The instruction, to be in harmony with the Oklahoma City administration of industrial arts, must be exploratory and pre-vocational. The objectives thus stated can best be achieved through general shop activities. Dr. Chester J. Swanson, Deputy Superintendent of the Oklahoma City schools, has advocated the establishment of the following general shops in each junior

high school:

1. Woodwork, Plastics, and Leather.
2. Mechanical Drawing, Photography and Printing.
3. Automobile Mechanics, Electricity, and General Metals.

Courses in the first two shops will be required of seventh and eighth grade students, while the third will be maintained for elective courses for the ninth grade pupils. The instruction in all three shops should observe the following methods: (1) a few required projects should be demanded of all students in each division; (2) such projects must be useful or practical, well designed, and inspiring to the pupils; (3) following the completion of the basic projects the student should select or design a project of interest to himself, prepare a procedure of operations, and follow that plan, insofar as possible, to the ultimate completion of the project; (4) approximately one-fifth of the total class time available each semester should be devoted to demonstration or related information lectures by the instructor, and (5) instruction sheets should be used to supplement the formal instruction.

Student interest must be a controlling criterion of general shop management. The instructor should never permit tedious time-consuming projects to be attempted by a junior high school student.

A Proposed Program for the Senior High Schools of Oklahoma to Augment the Previously Discussed Junior High School Plan. In planning a senior high school industrial arts program, the writer determined that the limiting factor is the actual needs of the pupils. The industrial arts subjects are entirely elective, therefore, they must appear attractive to the students by making available the activities which the student desires. Many students express a tendency to specialize. For them there must be provided unit shop opportunities. Other students have many shop interests or else a desire to discover

some field of work in which they might desire to procure future employment. For these individuals the general shop seems desirable. The following organization will be in effect at Classen High School in Oklahoma City in the fall of 1950: there will be (1) a unit shop in woodworking, (2) a unit shop in drawing, and (3) a general shop featuring electricity, automobile mechanics, and general metal working.

The general shop will serve: (1) as a finding course for some students who later might possibly wish to transfer to a vocational program while still in high school, and (2) to acquaint students with many of the various phases of the modern industrial world.

With the various fields of work rapidly approaching the saturation point for new employees, the writer anticipates a continuing increase of emphasis on general education. With this standpoint it would seem most desirable for industrial arts courses, whether they be unit or general shops, to follow rather completely the principles of general education as prescribed in an earlier section of this report.

# CHAPTER IV

## AN OVERALL VIEW OF THE GENERAL SHOP

What is a general shop? Wilber, in his book Industrial Arts in General Education, (22, page 168), defines the general shop as, "A general shop is distinguished from a unit shop by the fact that activities in two or more industrial areas are carried on simultaneously." There is a decided trend at present toward offering industrial arts through the general shop type of courses. This is clearly illustrated in the following excerpt from the United States Office of Education pamphlet by Maris M. Proffitt, Trends in Industrial Arts, (17, pages 12, 13).

> If a single outstanding trend of the present were to be used to predict the future of industrial arts work, it would most certainly be the trend toward the organization of pupil experiences for instructional purposes around the central idea of the general shop. Probably nothing in industrial arts work has shown the growth on a country wide basis as has the general shop, especially for the junior high school level. That this will continue seems to be beyond the shadow of a doubt. The reasons for this are obvious. The general shop form of organization: (a) provides for a variety of media and, consequently, of activities for pupil experiences in manipulative work for self-expression and exploratory values; (b) provides an excellent opportunity for acquiring, in a realistic way, information about industry and our industrial society; (c) offers a large variety of activities that make it more nearly possible to provide pupils with experiences in accordance with their interest and developmental levels than does the unit shop; (d) accords well with the educational objectives and principles underlying the organization of the junior high school, in which industrial arts work is now generally required in the first two years; and (e) makes it administratively possible, due to the form of organization and the content of instruction that characterizes the general shop--to offer industrial arts in a larger number of communities than would otherwise be possible.

A knowledge of the history of the general shop movement will help in understanding this recent development of industrial arts methodology.

PART A

## Historical Aspects of the General Shop

The advent of the junior high school movement brought about many drastic changes in the subject organization of grades seven, eight, and nine. Teachers were compelled to reorganize their courses to be in accord with the objectives and aims of the new type of school. The general shop represents the answer of industrial arts teachers to the demands of the junior high school.

Developmental Criteria as Affecting the General Shop Movement. While it is true that the general shop movement was related to the establishment of junior high schools, the general shop itself proved to be the answer to many industrial arts programs bordering on stagnation. John R. Ludington in an article in School Life under the title, "Enrichment of Pupil Experiences Through Industrial Arts," makes this statement: (24, page 12).

> School communities can no longer be content with a unit course in woodwork or mechanical drawing inherited from the "manual training" era in their attempt to achieve the functions of industrial arts. Woodworking and mechanical drawing cannot be thought of as constituting a complete industrial arts program, but rather as only two phases or areas which, along with others such as printing, metals, electricity, ceramics, automotives, and plastics, go to make up a total program. Industrial arts should be a medium of interpretation through a wide range of practical experience which involves both manipulation and understanding on the part of the pupil.

The general shop and the unit shop are both very valuable types of shop organization. Under certain circumstances, such as limited funds or physical space the general shop makes possible a well rounded program where single unit shop programs would prove inadequate.

Early Applications of the General Shop Principles. The first apparent organization of industrial arts instruction on a general shop basis was accomplished by Bonser and Russell in 1910 at the Speyer School of Columbia University. This type of shop was referred to as a general or composite shop

and the designation remains today. However, William E. Warner substituted a new term for general shop in 1930, "Laboratory of Industries," and some writers use this designation. The term general shop first appeared in print as a part of the title of an article in 1923, "Household Mechanics and the General Shop," by Earl Bedell, which appeared in the Industrial Arts and Vocational Education magazine.

By 1930 the following various types of organizations were reported by Luehring and Yager in the bulletin, A General Shop, its Equipment and a Suggested Curriculum for the Smaller High School. (13, page 52.) "These plans have been experimented with in various parts of the nation:"

1. The Ettinger Plan. In this plan the individual is routed through a series of specialized shops for periods varying, as a rule, from six to twelve weeks.
2. The Bonser Plan (Russel - Bonser) (Multiple Activity Shop). In this plan the pupil is given a variety of experiences, with industrial materials, tools and processes in a general industrial shop.
3. The Gary Plan. In this plan the pupil gets his industrial experiences working on productive work, under the direction of an experienced tradesman.
4. The Pittsburg Plan. In this plan the student spends the first year in a general shop (Bonser Plan), the second year in a series of special shops (Ettinger Plan), and the third year spends all of the shop time in one special shop which he has chosen, "pre" to entrance.

The writer wishes to emphasize that even today there is no one best plan of general shop organization. A combination of the principles from several types might seem desirable for any individual teaching situation.

Current Status of the General Shop. The general shop today remains much as it was twenty years ago; it is still being utilized more on the junior high school level than on the senior high. This is understandable for the junior high students are fundamentally curious and eager to explore. They need to explore the industries in order to understand, appreciate, and learn

to manipulate tools, materials, and products. Unfortunately the interest span of seventh, eighth, and ninth grade pupils is limited and the students soon tire of work in one area. The general shop permits students to work with many different tools and materials, which is the reason for its popularity in the junior high schools. However, an increasing number of communities and shop teachers are discovering that the general shop is also highly suitable for offering industrial arts experiences in senior high schools. A well planned, organized, and administered general shop program will be effective and successful on any school level in which a course in industrial arts is desired.

As indicated previously the major application of the general shop principle has been on the junior high school level. This does not necessarily mean that its only application is there. The general shop principles are pedagogically sound for all phases of industrial arts instruction, and all of the objectives of the general shop are the same as those stated for industrial arts.

## PART B

### Selected Objectives for the General Shop

There is little basis for maintaining a set of objectives for general shop which are different than those claimed for industrial arts. Essentially, the general shop is comparatively a recent advancement in the field of industrial arts and as such the objectives of either program coincide. However, in some situations additional objectives are utilized so as to satisfy environmental factors.

Stated Objectives of the General Shop Type of Instruction. Williams, in "Building a General Shop Curriculum," Industrial Arts and Vocational Education magazine, listed the following specific objectives: (25,pages 307-309).

1. To introduce common materials of industry.
2. To acquaint students with the basic tools and processes of industry.
3. To provide pupils of all degrees of aptitudes an opportunity to engage in wholesome, creative endeavor.
4. To develop in each pupil a certain degree of skill in the hand processes of industry.
5. To provide related information incident to the manufacturing and building industries.
6. To develop in each student an attitude of pride and joy in wholesome accomplishment.
7. To develop in each pupil safety consciousness, and thoughtful procedure.
8. To provide a teaching situation of cooperative group activities.

TableIII is quoted from Luehring, and Yager, A General Shop, Its Equipment and a Suggested Curriculum for the Smaller High Schools. It represents a study of eight published sources of objectives.

The objectives of industrial arts as a phase of general education are listed by Wilber, in his book, Industrial Arts in General Education: (22, page 43).

1. To explore industry and American industrial civilization in terms of its organization, raw materials, processes and operations, products, and occupations.
2. To develop recreational and avocational activities in the area of constructive work.
3. To increase an appreciation for good craftsmanship and design, both in the products of modern industry and in artifacts from the material cultures of the past.
4. To increase consumer knowledges to a point where students can select, buy, use, and maintain the products of industry intelligently.
5. To provide information about, and in so far as possible--experiences in, the basic processes of many industries, in order that students may be more competent to choose a future vocation.
6. To encourage creative expression in terms of industrial materials.
7. To develop desirable social relationships, such as cooperation, tolerance, leadership and followership, and tact.
8. To develop a certain amount of skill in a number of basic industrial processes.

The objectives of general shop instruction are essentially the same as those listed for any industrial arts program. However, there are dissimilarities between general shops and units shops on the basis of organization. General shop situations introduce many distinct advantages and disadvantages when compared with the unit type of shop.

TABLE III

OBJECTIVES OF INDUSTRIAL ARTS EDUCATION

IN THE JUNIOR HIGH SCHOOL

| Objectives | Times Mentioned | Lists Reviewed | Per Cent |
|---|---|---|---|
| Develop skill in workmanship | 7 | 8 | 87 |
| Develop acquaintance with materials and processes of Industry | 4 | 8 | 50 |
| Reveal to pupils their interests and aptitude | 4 | 8 | 50 |
| Development of vocational, civic, avocational, and moral efficiency | 3 | 8 | 37 |
| Develop appreciation of good workmanship | 2 | 8 | 25 |
| Give all around training | 2 | 8 | 25 |
| Develop resourcefulness | 2 | 8 | 25 |
| Develop creativeness | 2 | 8 | 25 |
| Educational guidance | 2 | 8 | 25 |
| Knowledge of constructive principles | 2 | 8 | 25 |
| Instill desirable character traits | 2 | 8 | 25 |
| Instill cooperation | 2 | 8 | 25 |
| Develop consumer knowledges | 2 | 8 | 25 |
| Occupational information | 2 | 8 | 25 |
| Related information | 2 | 8 | 25 |
| Develop self-confidence | 1 | 8 | 12 |
| Develop inventiveness | 1 | 8 | 12 |
| Develop skills in home maintenance | 1 | 8 | 12 |
| Opportunity for growth through manipulative activities | 1 | 8 | 12 |
| Develop interests and aptitudes | 1 | 8 | 12 |
| Instill a respect for property | 1 | 8 | 12 |
| Instill a respect for safety for others | 1 | 8 | 12 |
| Develop thrift | 1 | 8 | 12 |
| Retention in school | 1 | 8 | 12 |

## PART C

### Problems Peculiar to the General Shop

The general shop could be compared to a new model of an automobile. The engineers must eliminate the "bugs" or imperfections before the unit can be classified as a success. Likewise the problems or the disadvantages of the general shop must be eradicated before the general shop can achieve the popularity of which the program is capable.

Advantages of the General Shop. Luehring and Yager in A General Shop, Its Equipment and a Suggested Curriculum listed the following advantages of general shop: (13, page 53).

1. Pupils can have an experience with a greater variety of materials.
2. Makes possible a contact with a greater variety of tools and tool processes.
3. Makes a provision for taking care of individual differences.
4. Makes possible a closer connection between the school and home (chiefly through work in home mechanics.)
5. Participation in several activities requires a wider range of thinking and thus is more educational.
6. Provides better opportunity for pupils to discover their own interests, aptitudes, and capacities.
7. No loss of time in the completion of a project in more than one material.
8. It makes possible the development of initiative on the part of the pupil, or stimulates individual thinking on the part of the pupil.
9. It makes for economy in both equipment and teaching force.
10. It makes possible the more extensive use of the project method of teaching.
11. It eliminates waste of time caused by a duplication of processes in the one industry shop.
12. It enables a pupil to learn to do a great many things which all men should know and be able to do without respect to their vocations.

E. E. Ericson in Teaching the Industrial Arts, (7, pages 128-29), makes this comment:

> The general shop offers the teacher the opportunity to be of more than ordinary service to his students. Compared to the single woodworking shop so prevalent in many small communities, it furnishes breadth of subject matter and experience, appeal to interest, variety in operations, and preparation for care and upkeep of a home.

With all of these advantages it would seem apparent that this type of shop is the answer to the demands of the leaders of industrial arts for a better program, however, it is far from being a decided solution for it possesses many disadvantages.

Disadvantages of the General Shop. Luehring and Yager also submitted the following disadvantages: (13, page 53).

1. Well trained instructors are not as yet available for teaching in the general shop.
2. Class teaching with careful demonstration and discussion is possible only when all are doing similar kinds of work.
3. Proper teaching cannot be done in a general shop without a great number of instruction sheets to explain the work. The teacher has little time to make such teaching helps with drawings, directions, etc., and have duplicate copies made.
4. The equipment and supplies are more difficult to take care of than in the one industry shop.
5. The general shop, because of the diversified character of the work done tends to look like a "junk shop," while the one industry shop can be kept in better order.
6. It is difficult to organize the work in order to keep everyone busy in a general shop.
7. The instruction given by the teacher, when spread out over so many groups, can only be fragmentary.
8. It is practically impossible for any man to become an expert in several unrelated industrial activities; therefore, strong teachers cannot easily be prepared for a general shop.
9. Discipline is made more difficult.

One of the most common weaknesses of the general shop as reported by recent leaders of industrial arts seems to be in the manner of demonstrations, especially at the beginning of a course. This problem, as well as the others that were listed, has been apparent for at least fifteen years. Some of these problems have been solved in varying degrees, but several are still in need of additional professional investigation and research.

What Has Been Done to Solve the Limitations of the General Shop. The present writer would like to restate the disadvantages denoted earlier in this chapter and discuss each in terms of a possible solution.

1. "Well trained instructors are not as yet available for teaching in the general shop." This situation is not a fault of the colleges and universities preparing teachers; the programs of which are founded upon the regional demands of the teaching profession. The demand for teachers of general shop is decidedly increasing. Bourne, in his Masters Thesis, A Curriculum Study of the General Shop, ( 5,page 61), reported that a survey of the North Central Association indicated that of the eighty-four schools investigated, seventy-five per cent were organized on a general shop basis. Van Reen in another Masters Thesis study, Current Theories and Practices in Industrial Arts, (21, page 20), made a survey of 101 schools in fourteen states and three-fifths of the respondents reported an organization of the general shop type. The writer anticipates better general shop teacher preparation as the demand for general shop teachers increases.

2. "Class teaching with careful demonstration and discussion is possible only when all are doing similar kinds of work." Wilber, in Industrial Arts in General Education, (22, pages 109-113), suggests there are two answers to this problem: (1) multiple demonstrations or (2) single demonstrations. Under the multiple demonstration, one short demonstration in each industrial arts subject is presented before the students are allowed to begin working. This consumes the first two or three days and unless the teacher has extraordinarily interesting methods, the receptivity of the pupils will probably decrease. The single demonstration plan entails one short lecture then the students all go to work in one department, all doing the job demonstrated. This job should consume one to two weeks by the end of which the instructor will have presented one basic lecture in each of the various departments. As the students complete the starter project they are assigned to certain

departments and commence new projects. There is probably a better solution, it involves a short basic lecture, after which the students commence work in the various departments as assigned, employing detailed instruction sheets to supplement the instructor-supervision. The teacher must be alert in such a situation and constantly move about the shop presenting brief demonstrations and giving information and help as the students require it.

3. "Proper teaching cannot be done in a general shop without a great number of instructions sheets to explain the work. The teacher has little time to make such teaching helps with drawings, directions, etc., and have duplicate copies made." Instruction sheets are to be used only to supplement formal demonstrations and individual instruction. It is true, however, that a too frequent use of instruction sheets with improper supplementation will result in ossified teaching. There are some commercially prepared instruction sheets available, but it would seem advisable for the instructor to prepare his own. This perhaps cannot be accomplished in a semester or even a year, but eventually an intelligent, aggressive teacher with adequate instruction sheets should make a success of the general shop. If textbooks and reference books are available in the shop the students will be able to find many answers by themselves.

4. "The equipment and supplies are more difficult to take care of than in the one industry shop." If one or two basic projects are required at the beginning the materials can be cut to approximate size and assembled in "kits" before school commences. During the semester a personnel system should include a responsible individual to be assigned the duty of issuing supplies. The instructor will have to devise a bookkeeping system that is fitted to the conditions.

5. "The general shop, because of the diversified character of the work

done, tends to look like a 'junk shop', while the one industry shop can be kept in better order." A certain amount of this objection will always exist, however, with color dynamics, modern designing of benches and cabinets, proper arrangement of equipment, and an adequate maintenance program much of this unsightliness can be avoided.

6. "It is difficult to organize the work in order to keep everyone busy in a general shop." It is the writer's sincere belief that if the shop is organized with the interest of the students as a prime factor there will be no necessary idleness. A shop library and a planning area should be located in each general shop where students could profitably spend their time browsing through related information publications or designing future projects while waiting for a machine or tool.

7. "The instruction given by the teacher, when spread out over so many groups, can only be fragmentary." The entire group should listen to lectures only when they are seated in the lecture area. Each student should be required to keep a notebook for the express purpose of taking notes in the general shop class. These should be turned in every six weeks or so to be graded. It is suggested further that designs and plans of articles suitable for general shop projects be accumulated by the student as a homework-assignment and be pasted in a section of his personal notebook.

8. "It is practically impossible for any man to become expert in several unrelated industrial activities; therefore, strong teachers cannot easily be prepared for a general shop." Perhaps this could best be answered by a quotation from Newkirk, Organizing and Teaching the General Shop: (14, page 22).

> Since there are a large number of mechanical trades and a great mass of related information, it is not possible to become thoroughly proficient in more than one or two at most. This is no great handicap; there is considerable sentiment to the effect that the best teachers

> for the general shop are not tradesmen but men of wide shop training who know how to organize their materials and present them to the class in a clear and forceful manner.

9. "Discipline is made more difficult." This is very true. The general shop itself is an interesting place to an inquisitive youngster and as a result there is a tendency for students to explore the shop whenever they have a free moment. Much of this can be prevented at the start of each school year. Williams in his article "Building a General Shop Curriculum," (25, page 307-309), suggests that the students should go directly to their seats in the lecture area upon entry into the room and return and remain there, after the conclusion of their personnel duty, at the end of the period. This also gives the instructor and the shop superintendent a better opportunity to check the shop for orderliness. Another method to maintain discipline was mentioned previously, that is attention to the interest factor. Keep the students doing approximately what they want to do and interested, then there will be few 'idle minds--devil's workshops' appearing.

The general shop is acclaimed as one of the most significant changes in industrial arts instruction in the past twenty-five years. Its advent was not realized without some opposition. As a matter of fact it has many disadvantages which have had to be overcome before it achieved universal acceptance. Its problems are not entirely solved today; however, there is a conscious effort by many leaders in the field to improve general shop instruction.

# CHAPTER V

## PLANNING THE GENERAL SHOP

In this chapter the conditions concerning the planning of a general shop program for Classen High School are established. There is also included a suggested arrangement of the equipment, a tool list, and a list of the proposed textbooks and reference materials.

### PART A

### Conditions Controlling the Planning of a General Shop Program for the Classen High School

The following factors will be considered as the delimitations affecting the planning of this individual situation: (1) maximum number of students to be enrolled in any one class, (2) the type of shop work to be offered, (3) the amount of time the students will spend in each department, (4) length of course, (5) the nature of the course (required or elective), and (6) the grade level and shop experience of the students.

Maximum Enrollment in Any One Class. The total enrollment at Classen High School averages about 1900. If forty per cent of these were boys there would be a total of 760 male students from which the general shop enrollment is to be expected. The existing Classen shop classes average between twenty and thirty students. The administration is in favor of limiting the enrollment to thirty or less; therefore, the plan proposed here will be based upon a maximum of thirty students.

Shop Subjects to be Offered. J. Chester Swanson, Superintendent of the Oklahoma City Public Schools, made this response to the writer concerning

what the content of the general shop should be: "The general metal shop, we feel, should have some sheet metal, some hand metal work, some machine tools, some electricity, some automobile mechanics, and any other area in the general field of metals which you feel you would like to include in such a shop." Using the previous statement as a guide the writer has selected the following industrial arts subjects for inclusion in the general shop curriculum:

1. Electricity (Capacity, 10 students)
    a. Practical
    b. Radio
2. General Metal Work (Capacity 15-20 students)
    a. Sheet metal work
    b. Bench machine work
    c. Machine shop work
    d. Art metal work
    e. Foundry
    f. Forging
    g. Welding
    h. Metal spinning
3. Automobile mechanics (Capacity 10 students)

Amount of Time to be Devoted to Each Industrial Arts Subject. The entire instructional program at Classen is founded on an interest basis. It is a recognized pedagogical fact that a student who is doing something he is interested in will offer a negligible disciplinary problem. Therefore the general shop will be maintained on an interest basis with a few necessary limitations, i.e., the students will be permitted to work in any of the three basic areas the entire semester, however, only ten students can be assigned to either the electrical or the automobile mechanics departments at any one time. There is sufficient equipment available to allow 15 to 20 to work in the general metal department simultaneously. If any student desires to change departments the privilege should be granted if there is a vacancy in the desired department.

The Credit-Basis of the General Shop Course. While it is true that the general shop and most of the subjects at Classen are maintained on a semester-

length basis, it is possible for any student to enroll in two or more semesters of general shop. If a student works in automobile mechanics for two semesters and wishes to enroll in the general shop again he will be permitted to do so; however, he must be assigned to either the general metal work or the electrical department. This condition must exist for there is not sufficient space to allow both an advanced class and a beginning class to work in the shop at the same time. A student who has completed two years in the general shop, say one in metal work and one in electricity, will be accredited with one credit in metal work and one in electricity, rather than two credits of general shop.

The Nature of the General Shop Course. In the past the students at Classen High School have expressed a desire for the opportunity to enroll in additional industrial arts activities. Also, many students complained that the shop course they wanted was not being offered at the time which was available in their schedule.

To understand fully this situation it should be explained that the Classen High School curriculum is essentially college preparatory. And justly so, for approximately eighty per cent of the graduates attend college. The curriculum has been established in such a manner as to allow each student to select a course of study which will better prepare him for future studies in his major field in college. To accomplish this it has been necessary to offer an engineering curriculum, an English curriculum, a music curriculum, etc. Students in each field have a few electives; however, these electives can be selected only after the periods have been established for offering the required courses. This circumstance explains the complaints mentioned earlier about courses not being offered when the students had elective periods open. The new general shop program will be on an elective basis and the same subject will be taught in each of the five periods daily. This will permit any student

to take a general shop course regardless of when his elective period occurs, providing their elective periods occur in a normal distribution.

Experience and Scholastic Standing of the Male Students at Classen High School. Classen is a senior high school which includes grades ten, eleven and twelve. The majority of the boys will have completed two to three semesters of junior high school shopwork. In the near future all of the junior high schools of Oklahoma City will offer the following three general shop courses:

1. Woodworking, Plastic, and Leather
2. Drawing, Printing, and Photography
3. Electricity, Automobile Mechanics, and General Metal Work.

The first two are compulsory for seventh and eighth grade students respectively, while the third is elective for the ninth grade students. Number 3 above is basically similar to the general shop being installed at Classen; therefore it is apparent that the Classen general shop program must be offered on a more advanced level than is possible in the junior high shops.

## PART B

## Arranging the Equipment

Teaching in a general shop requires the maximum of efficiency on the part of the teacher. The proper arrangement of the shop will ease the burdens of the overloaded teacher tremendously. Newkirk, in Organizing and Teaching the General Shop, makes this statement: (14, page 80)

> The floor plan of the general shop must be carefully laid out in order to provide the most convenient and efficient teaching facilities for the type of general shop course that is to be presented. The teacher and supervisor will do well to make a careful study of the factors which are involved in setting up a workable, efficient, well-lighted and ventilated general shop room.

Factors to be Considered in Shop Planning. Thorough discussions concerning this subject appear in several published forms; however, only the following

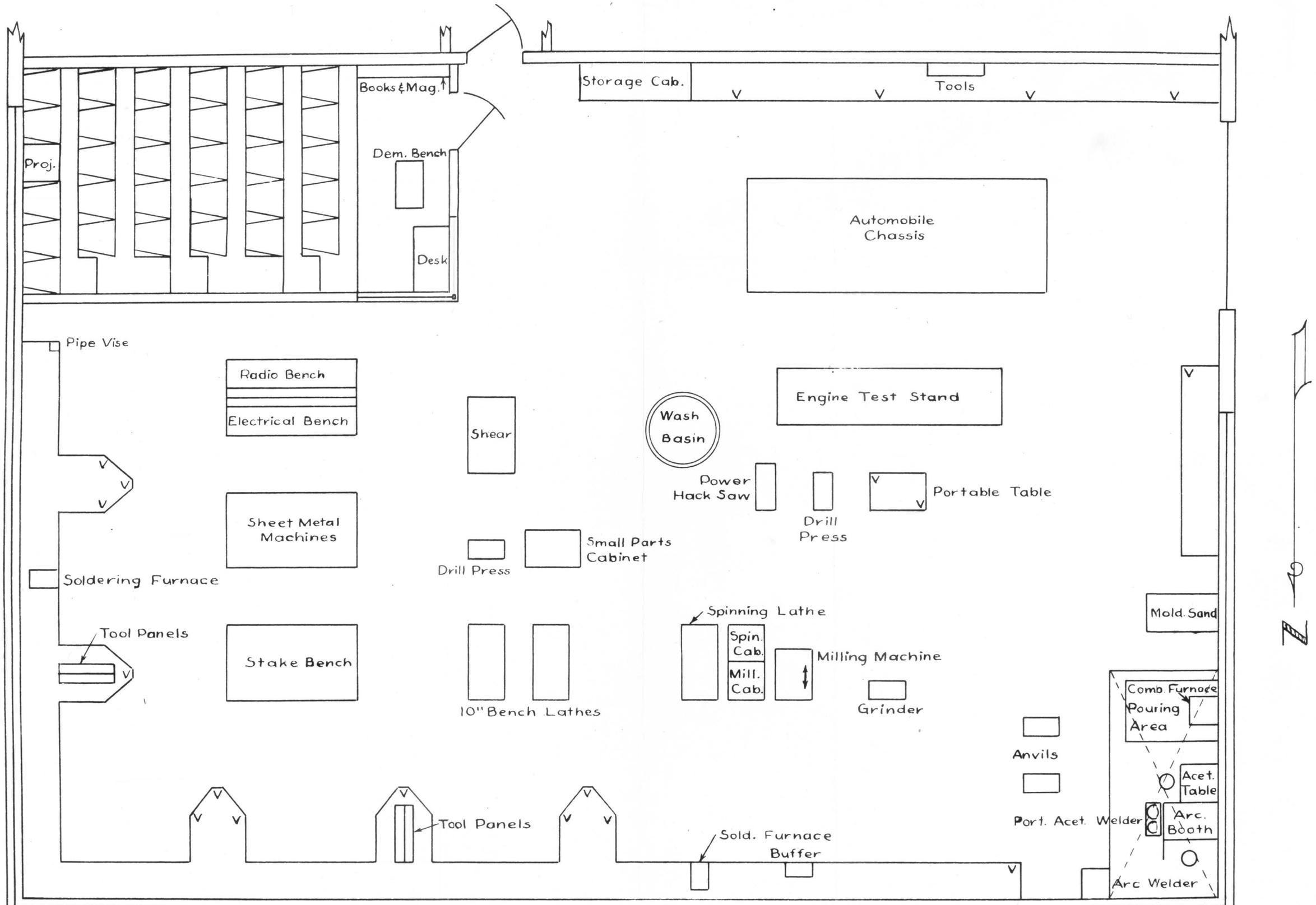
factors will be discussed in this section: (1) lighting, (2) location of convenience outlets, (3) positions of the departments, (4) placement of the tools, (5) arrangement of benches and equipment, and (6) storage facilities.

Adequate lighting has been obtained in the shop by constructing three walls of the room in continuous windows. Artificial lighting will supplement the natural light.

A buss-duct system is utilized in the ceiling on ten foot centers. This factor will permit easy rearrangement of the equipment or the addition of new equipment with a minimum of installation expenditure. Both 110 volt and 220 volt current convenience outlets are located around the perimeter of the room at ten foot intervals.

The detailed floor plan (see page 46) has been arranged so as to group the industrial arts subjects according to the cleanliness of the operations. For instance the electrical department has been placed as far away, as is possible, from the forging-foundry-welding area. The lecture room windows are provided with light-proof shades in order that projected pictures may be shown to the general shop classes as well as other classes. The lecture room is also to be used as an office and as a student planning center.

The tools of the majority of industrial arts laboratories are stored either in a central tool room or in several cabinets in areas where the tools are used most frequently. Both methods have advantages and disadvantages. There are these two basic methods of storing tools in the general shop. The one preferred by the writer is by areas; the other involves a centrally located tool room with a student tool room clerk spending the entire period checking tools, With the latter arrangement, the clerk duties are rotated so that all will share in the responsibility. The central tool room requires




CLASSEN GENERAL SHOP

SCALE $\frac{3}{16}$" = 1'-0"

the students to move around considerably and a lot of horseplay is induced. The multiple tool panels eliminate this moving about; however, the tool lossage averages a little higher with this method. The writer is in favor of giving the students an opportunity to practice honesty, but is also fully aware that in some localities the central tool room is a necessity in order to keep down petty larceny. The tool checking responsibility will be discussed in a following chapter.

In arranging the work stations where the individual students will work, the writer has been partially guided by his experience that it is easier to maintain discipline when the students are separated as far apart as is possible. The work benches have been placed near or around the outer walls while the machines have been located in the center of the room in such a manner that each student will have ample room to operate the equipment without undue distraction from others who are working around him.

Exhaust outlets are provided for all engines which will be operated in the shop. The welding-forging-foundry area is covered by a hood to which is attached an exhaust fan. There is sufficient space to bring an automobile into the shop in addition to the chassis unit which is located in the department; however, the writer does not plan to make a practice of permitting publicly owned vehicles to be repaired in the shop. An exception to this is cases where small adjustments are to be made. A suggested floor plan of the Classen High School general shop is included as page 46 of this thesis.

Special tools and supplies are stored in wall cabinets, while bar stock is stored under the lecture stands. Sheet metal can be kept below the sheet metal and stake benches. Seventy-five lockable storage spaces for the students will be located below the benches around the walls. Two students will be assigned to each locker and the keys for each class will be kept in a separate

locked cabinet which the instructor will open at the beginning of each period.

In this section the convenient arrangement of equipment was stressed. A subject which is closely allied to this topic is the matter of what tools should be included in the general shop. In Part C the tools which are so essential to any shop are listed.

PART C

Selection of Equipment

Quite often a shop cannot be maintained at maximum efficiency due to the lack of tools or equipment. The diversified activities of a general shop necessitate a wide variety of tools, but in no great quantities. The Oklahoma City School Board representatives have indicated that the general shop at Classen will contain quality tools only and will be equipped sufficiently to allow any phase of the general field of metal work to be taught in addition to electricity and automobile mechanics. In this unit the proposed tools are listed by departments. The supplier or manufacturer, size, name, and quantity are presented for each item.

SHEET METAL

| | |
|---|---|
| 5 | Straight Snips, Pexto #219, 3" cut |
| 2 | Curve Snips, Pexto #15, 12½" |
| 1 | Hand Grooving Tool, Pexto #6 |
| 1 | Hand Grooving Tool, Pexto #2 |
| 1 ea. | Hollow Punch, Pexto, ¼, 3/8, ½, 5/8, 3/4 |
| 5 | Scratch Awls, Pexto, #22, 3½" blade |
| 2 ea. | Riveting Hammer, Pexto, #3, #4, 12 oz. |
| 1 ea. | Setting Hammer, Pexto, #2, #3, 12 oz. |
| 2 ea. | Solid Punches, Pexto, #2, #8 |
| 5 | Prick Punch, Pexto, #38, 5½ by 3/8" |
| 3 ea. | Wing Dividers, Pexto, #165, 8", 10" |
| 3 | Steel Square, Pexto, #14, 16" x 24" |
| 3 ea. | Slip Joint Pliers, Pexto, #5, 8", 6" |
| 2 | Gas Furnace, Pexto, #333, Dbl. Burner |
| 2 pair | Soldering Copper, Pexto, 2 lb. |
| 1 pair | Bottom Soldering Copper, Pexto, 2 lb. |
| 1 ea. | Rivet Set, Pexto, Size 3, 4, 6, 8 |
| 1 set | Universal Stake Holder and Stakes, Pexto, #964 |

| | |
|---|---|
| 1 | Hollow Mandrel Stake, Pexto, #910, 40" |
| 1 | Monkey Wrench, Coes 12" |
| 5 | Machinist's Vises, 3¼" jaw; Opens 4", Desmond |
| 1 ea. | Cold Punch, Pexto, #100, Size ¼, 3/8, 7/16, ½ |
| 5 | Hickory Mallet, Pexto, #3, 2 3/8 x 5¼ head |
| 1 | Universal Combination Rotary Machine, Pexto, #1544 |
| 1 | Squaring Shear, Pexto, #132, 30" cut |
| 1 | Bar Folder and Brake, Pexto, #63, 36", 30" capacity |
| 1 | Slip Roll Forming Machine, Pexto, #382, 30" capacity |
| 3 | Screwdrivers, 6" Common, Stanley, #25 |
| 1 | Brake, Pexto, #64, 30" capacity |
| 1 | Adjustable Wrench, Williams, 10" |
| 1 ea. | Files, Flat, 10", Bastard, 2nd cut, Smooth, Disston |

ELECTRICITY

| | |
|---|---|
| 1 | Bench Pipe Vise, 1/8" - 2", Ridge |
| 1 | Claw Hammer, 16 oz., Plumb |
| 3 | Electric Motors, Used, (Fan or appliance) |
| 1 | Pliers, Elec Side Cutter, 8", Kraeuter #1830 |
| 3 | Pliers, Diag. Cutters, 6", Kraeuter #4501 |
| 1 | Blow Torch, Unique #1, 1 quart size |
| 3 | Electric Soldering Iron, 3/8" tip, 100 Watts, Hexacon #P-100 |
| 2 | Hack Saw Frame, Adj. 8" to 12", Disston #110 |
| 4 Doz. | Hack Saw Blades, 12", 24 teeth, Disston #1224 |
| 1 | Ratchet Pipe Threading Set 1/8" to 3/4" pipe, Toledo # 00 |
| 4 | Headphones, 8000 ohm type H S 23 |
| 1 | Nut Driver Set, Xcelite #127 |
| 2 | Pipe Wrench, 12", Ridge |
| 6 | Dry Cell, 6" Bright Star #6 |
| 5 | Wiring Boards, Shop Made |
| 1 | Wire Gauge, American Standard, Starrett #281 |
| 1 | Volt Meter, 0-150 volts, Triplet #221 T |
| 1 | D. C. Ammeter, 30-0-30, Triplet #221 T |
| 12 | Cleat Receptacles, Porcelain, Brodhead-Garrett #715 |
| 2 ea. | Sockets, Pull Chain, Key, Push-Thru, Keyless |
| 6 | Door Bells, Broadhead-Garrett #657 |
| 2 | Door Bell Transformer, Wizard |
| 2 ea. | Files, Flat, 10", Disston, Bastard, 2nd cut, Smooth |
| 1 ea. | Ball Pein Hammer, Plomb, 12 oz., 16 oz. |
| 2 | Screwdriver, 4" Phillips, Stanley #25 |
| 2 ea. | Screwdriver, Electrician, 3", 6", 10", Stanley #1008 |
| 3 | Screwdriver, Instrument, 1½", Stanley #1011 |
| 3 | Pliers, Extra Long Nose Cutter, 7", Kraeuter #1781 |
| 1 | Brace, Ratchet Bit, 10", Stanley # 923 |
| 1 | Bit Extension, 15" Yankee #2150 |
| 1 ea. | Auger Bits, Irwin #65 T, Sizes 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16 |
| 4 ea. | Drills, Straight Shank Twist, HS, National #266, 1/8", 3/16", ¼", 3/8" |
| 1 | Hand Drill, Yankee# 1435 A, 11" length |
| 1 | Pipe Cutter, 1/8" - 2", Ridge |

| | |
|---|---|
| 1 | Crosscut Saw, 8 pt., 26", Diston #D-23 |
| 1 | Wrecking Bar, 24" |

## BENCH MACHINE

| | |
|---|---|
| 1 | Universal 3-Jaw Lathe Chuck, 6", Union #153 |
| 2 | Independent 4-Jaw Lathe Chuck, 8", Union #518 |
| 1 | 3-Jaw Keyed Chuck, #2 Morse Taper, 0-3/8", Jacobs #32 |
| 5 | Machinists' Vises, 4" Jaw, 6" Open, Swivel Base, Athol #624 |
| 3 ea. | Cold Chisels, Plomb #86A, $\frac{1}{4}$, $\frac{1}{2}$, 5/8, 3/4 |
| 6 ea. | Files, Flat Lathe, 12", Disston, Single Cut and Double Cut |
| 3 ea. | Files, Flat, 10" Disston; Bastard, 2nd Cut, Smooth |
| 3 | Files, Half Round, Bastard Cut, 12" Disston |
| 3 ea. | Files, Round, Bastard Cut, Disston, 4", 6", 10" |
| 2 | Calipers, Outside, 6", Lufkin #141 |
| 2 | Calipers, inside, 6", Lufkin #142 |
| 3 | Dividers, 6", Lufkin #140 |
| 2 ea. | Lathe Dogs, $\frac{1}{2}$, 3/4, 1, $1\frac{1}{2}$, Williams #'s 72-H, 73-H, 74-H, 76-H |
| | Cutting-off Tool Holder, Straight Shank, 3/8 x 13/16, Williams #NS20 |
| 1 | Combination Screw Plate Set, NC and NF, Taps and Dies, Little Giant # 317 |
| 12 | Combined Drill and Countersink, .300 Body, 3/32 Drill, H. S. Steel, National #266 |
| | Drill Gauge, 1/16" to $\frac{1}{2}$" by 1/64ths, Starrett #187 |
| 3 ea. | Tool Bit Cutters, Turning, $\frac{1}{4}$", H. S. Steel, L H, R H, and Round Nose Tools; threading Tool, Brass Tool, Williams |
| 2 | Micrometer Calipers, 0-1", Starrett #436 |
| 2 | Micrometer Calipers, 1-2", Starrett #436 |
| 1 | Surface Gage, 3" Base, 9" Spindle, Starrett |
| 1 | Screw Pitch Gage, Starrett #473 |
| 2 | File Card and Brush, Disston #2 |
| 1 | Bench Layout Plate, 24" x 23", Challenge #G 24242 |
| 2 | Combination Square Sets, 12", Starrett #9 |
| 3 | Combination Squares, 12", Starrett #33 |
| 1 | Drill, Straight Shank, Carbon Steel, Fractional, Set 1/16" to $\frac{1}{2}$" by 1/64ths, National #6 |
| 1 | Boring Bar and Holder, 5/16" x 3/4 " x 5" Holder, Capacity 3/16" to $\frac{1}{2}$" Bar; $\frac{1}{2}$ Bar, Williams #080 |
| 1 | Knurling Tool, Self Centering Head, Medium Knurls, 5/16" x 3/4" x 5" Holder, Williams #00-K |
| 2 | Tool Holder, Turning, Straight Shank 3/8 x 13/16, $\frac{1}{4}$" Cutter, Williams )-SH |
| 2 | Tool Holder, Turning, R H Offset Shank 3/8 x 13/16, $\frac{1}{4}$" Cutter, Williams #ORH |
| 2 | Tool Holder, Turning, L H Offset Shank 3/8 x 13/16, $\frac{1}{4}$" Cutter, Williams OLH |
| 2 ea. | 'C' Clamp, 2", 4", 6", 8", Jorgenson #5 |
| 1 | Countersink, Rose Type, 82°, Straight Shank $\frac{1}{2}$" O. D. Cutter, Stanley #137 |
| 1 | Hand Drill, 11" Length, Yankee #1435 A |
| 1 | Drill Press Vise, 4" Jaw, 4" Open, Palmgren #14 |
| 1 pair | V' Blocks and Clamp, Starrett #278 |

| | |
|---|---|
| 5 | Center Punches, $\frac{1}{4}$", 5/16", 3/8", 7/16", $\frac{1}{2}$", Plomb #41 |
| 1 ea. | Telescoping Gages, $\frac{1}{2}$ - 3/4, 3/4 - $1\frac{1}{4}$, Starrett #229 |
| 1 | Dial Test Indicator, Universal Set, Starrett #196 |
| 1 | Speed Indicator, (Tachometer) Hand 0-4000 RPM, Stewart-Warner #757-W |
| 1 ea. | Chisels, Cold, $\frac{1}{2}$, 5/8, 3/4, Plomb #86A |
| 1 | Chisel, Cape, 3/8 Plomb #72 |
| 1 | Chisel, Diamond Point, 3/8, Plomb #76 |
| 2 | Chisels, Round Nose, 3/8, Plomb #80 |
| 1 | Steel Square, Machinists', 6", Starrett #20 |
| 1 | Drills, Straight Shank, High Speed Steel, Numbered Set from 1 to 60, National #9 |
| 1 | Drills, Straight Shank, High Speed Steel, Letter Set A to Z |
| 1 | Drill Case, Index, for Fractional Drills 1/16" - $\frac{1}{2}$" by 1/64ths, Huot #29 |
| 1 | Drill Case, Index, for Numbered Drills 1 - 60, Huot #72 |
| 1 | Drill Case, Index, for Letter Drills, A to Z, Huot #26 |
| 1 ea. | Drills, Taper Shank Twist, High Speed Steel, Sizes $\frac{1}{2}$" to 1" by 1/64ths, National #200 |
| 1 ea. | Reamers, Hand, H. S. Steel, $\frac{1}{4}$", 3/8", $\frac{1}{2}$", 5/8" 3/4", National #220 |
| 1 | Handwheel Type Draw-In Collett Attachment for Lathe, Southbend #4310 |
| 1 | Arbor Press, 15" Throat Opening, Framco #3R |
| 1 | Circle Cutter, Adjustable, 3/4" - 8", Round Shank |

## AUTOMOBILE MECHANICS

| | |
|---|---|
| 1 | Chassis (Minus Body Only) |
| 1 | Live-Test-Engine 6 or 8 cyl. |
| 1 | Socket and Attachment Set $\frac{1}{2}$" drive, Plomb #5400-OC |
| 1 | Vise Grip Wrench, 7" Petersen #7 |
| 1 | Wrenches, Open-End, Set of 12, $\frac{1}{4}$" to 1", Williams # 1712 |
| 1 | Wrenches, Box-End, 15° Angle, Set of 10, 5/16" to 1 1/8", Plomb #1100F |
| 1 | Trouble Lamp, 25', Hvy. Duty, with Tool Outlet in Handle |
| 2 | Ball Pein Hammer, 4 oz. Plomb #1304 |
| 2 | Putty Knives, $1\frac{1}{4}$", Red Devil #P1-$1\frac{1}{4}$ |
| 1 | Screw Extractors, Set, Little Giant #1816 |
| 1 | 1-Gallon Safety Containers, Justrite 'A' |
| 1 | Set Allen Wrenches, 9 Piece, All state |
| 4 | Axle Stands 18", (Shop Made Possible) |
| 1 | Storage Batteries, 6 volt |
| 1 | Rubber Mallet, 24 oz., Taylor #3 |
| 3 | Generators, Assorted (from Salvage) |
| 1 | Rawhide Mallet, Loaded, 20 oz., Chicago |
| 3 | Starters, Assorted (from Salvage |
| 3 | Carburetors, Assorted (from Salvage) |
| 3 | Distributor Assembly, Assorted (from Salvage) |
| 1 | Thickness, Gage (Leave Type) Starrett #66 |
| 1 | Offset Screwdriver, 6", Plomb #36 3/8 |
| 1 ea. | Phillips Screwdriver, 3", 4", 6", Stanley #2501 |
| 3 | Live-Test-Engine 1 cyl. |
| 1 ea. | Adjustable Wrenches, 4", 6", 8", 10", 12", Williams |
| 1 | Monkey Wrench, 10", Coes #92 |

| | |
|---|---|
| 1 | Bearing Scrapers, Set of Three, Kraeuter #1202 |
| 1 | Tap Extractors, Set, Walton #1 |
| 1 ea. | Spark Plug Sockets, 9/16, 5/8, 11/16, 13/16, 7/8, 15/16, Plomb #5018 SP - #5030 SP |
| 1 | Differential Chain Hoist, 1 Ton, Union |
| 2 | Creepers, Brodhead-Garrett #223 |
| 1 | Tire Gauge, Heavy Duty 10-130 lbs. |
| 1 | Tube Vulcanizer Kit, Allstate |
| 1 | Antifreeze Hydrometer, Allstate Best |
| 1 | Battery Hydrometer, Allstate Best |
| 1 | Battery Charger, Taper, 10 amperes, Allstate |
| 1 | Brake Band Relining Kit, Allstate |
| 1 | Armature Growler, Allstate |
| 1 | Timing Light, Allstate |
| 1 | Compression Gauge, Allstate |
| 1 | Vacuum Gauge, Allstate |
| 1 | Cotter Pin Puller, Allstate |
| 1 | Ridge Reamer, Allstate |
| 1 | Piston Ring Compressor, Allstate Craftsman |
| 1 | Tire Iron Set, Craftsman |
| 1 | Tire Hammer, Craftsman |
| 1 | Valve Grinder, Hand, Craftsman |
| 4 ea. | Files, Flat, 10", Bastard, 2nd Cut, Smooth, Disston |
| 3 | Slip Joint Pliers, 6", Utica #511 |
| 1 | Water Pump Pliers, Champion #420, 9½" |
| 1 | Battery Pliers, 7", Utica #524 |
| 1 | Chain Nose Pliers, 6", Utica #22 |
| 1 | Hydraulic Jack, 5 Ton, Blackhawk AA10 (Under axle) |
| 1 | Jack, Floor, Hydraulic, 2 Ton, Allstate |
| 1 ea. | Cold Chisels, ½", 5/8", 3/4", 1", Plomb #86 A |
| 2 ea. | Screwdriver, Square Blade, 4", 5", 6", 8", 12", Rhino #343 |
| 4 | Combination Vises, 3 3/4 Jaw, Opens to 5", Desmond # CP33 |
| 1 | Wheel Puller, 3 Arm, 12" Diam., Armstrong #1033 |
| 1 | Transmission, (from Salvage) |
| 1 | Differential, (from Salvage) |
| 2 | Carbon Dioxide Fire Extinguishers, C-D Fog, #4-A |
| 1 | Grease Gun, 902 Capacity, Alemite #55852 |
| 1 | Alemite Hose for Above Gun, #A-1039 |

FORGING

| | |
|---|---|
| 1 | Blacksmith Sledge, 8 lb., Stanley # 830 |
| 2 | Blacksmith Tongs, Curved Lips for ½" rounds, 20" Long, Stanley #12D |
| 2 | Blacksmith Hand Hammer, 4 lb., Stanley #860 |
| 2 | Blacksmith Tongs, Straight Lip, 20" Stanley #110 |
| 2 | Cross Pein Hammer, 2 lb. |
| 1 | Portable Electric Forge, 18" Diameter, Brodhead-Garrett |
| 2 | Anvils, 70 lbs. and Wood Base 16" x 16" x 24" high, Vulcan |
| 1 | Machinists' Vise, 4" Jaw, 6" Open, Columbian #504 |
| 1 | Swage Block, Brodhead-Garrett #1 |
| 1 | Water Bucket, 2 gallon |

## ART METAL

Hammers
- 1 Chasing, Brodhead-Garrett #308/5
- 1 Forming, Brodhead-Garrett #11
- 1 Raising, Brodhead-Garrett #33
- 1 Planishing, Brodhead-Garrett #47

Anvil Heads, Art Metal
- 1 Valley Anvil Head, Brodhead-Garrett #540
- 1 Slope Anvil Head, Brodhead-Garrett #541
- 1 Flat Anvil Head, Brodhead-Garrett #544
- 1 Square Anvil Head, Brodhead-Garrett #547
- 1 Dome Anvil Head, Brodhead-Garrett #542
- 2 Anvil Base, 4" High, Brodhead-Garrett #575

- 4 ea. Files, 10" Flat, Bastard, 2nd Cut, Smooth, Disston
- 2 Files, Half Round Vixen 10"
- 1 Needle Files, Set of 12, 5½", Brodhead-Garrett
- 3 Jeweler's Saw Frames, 5" Deep, Brodhead-Garrett #143
- 12 ea. Jeweler's Piercing Saw Blades, 5", #'s 00, 3, 6, Brodhead-Garrett
- 1 ea. Wiss Aviation Snips 10", Cut Left; Cut Right
- 3 ea. Wiss Tin Snips 3" Cut, Wiss #10
- 2 ea. Hammers, Ball Pein, 2, 4, 8, 12 oz., Stanley
- 5 Dogwood Mallet, 1-Round End, Brodhead-Garrett #33
- 1 Steel Figure Set 0-9, 3/16", Brodhead-Garrett #9
- 1 pr. Trammel Points, Brodhead-Garrett #4
- 1 Anvil Extension Arm, 7", Brodhead-Garrett #574
- 5 Utility Bench Vise, 4" Jaw, Columbian # C 44
- 2 ea. Cold Chisels, ½, 5/8, 3/4, Plomb #86 A
- 4 Combination Squares, 12", Starrett #33
- 2 Countersinks, 82°, Stanley #131
- 2 File Card and Brush, Disston
- 12 File Handles, 10" Files, Disston #2
- 1 U. S. Standard Gauge Metal, Starrett #283
- 1 American Standard Wire Gauge, Starrett #281
- 5 Scratch Awl, 6", Stanley #6
- 5 Center Punch 3/8", Stanley #637
- 1 ea. Screwdrivers, 4", 6", Stanley #26
- 1 pr. Arbors for Buffing Motor Shaft

## MACHINES

- 2 Bench Grinder 3/4" x 6", Stanley #286
- 1 Portable Electric Drill, ¼", Jacobs Key Chuck, Stanley #24

Spinning Tools
- 1 Tool Rest (to Fit Lathe) Walker Turner #1123
- 1 Flat Tool (26) Walker Turner #1125
- 1 Point Tool 5/8", Walker Turner #1126
- 1 Cut-off Tool, Walker Turner #1128
- 1 Beading Tool, Walker Turner #1129
- 1 Ball Point, Walker Turner #1130
- 1 Spinning Center, Walker Turner #10

- 2 Drill Press, 15" Standard, Walker Turner #D950

| | |
|---|---|
| 1 | Bench Grinder, 10", 1HP, Stanley #610 |
| 1 | Pedestal for 10" Grinder, Stanley |
| 4 | Eye Shields for 10" Grinder, Stanley #600 |
| 1 | Motor, Electric, 1/3 H.P., Double Shaft, Split Phase for Buffing, Dunlap |
| 2 | Buffing Wheels, 6", Double Thickness, Craftsman |
| 1 | Drill Press, 15", Slow Speed, Production Table, Walker Turner Floor Model #D938, 0-½" |
| 1 | Drill Press, 15", Bench Model, Standard Slotted Table, 0-½" Walker Turner #D950 |
| 2 | Motors, Single Phase, ½ H. P., 1740 RPM 110-220 V. 60 Cycle, A.C. Walker Turner #PAB5E |
| 2 | Switches, Tumbler Type for Drill Presses, Walker Turner #6808 |
| 1 | Portable Electric Drill, ½", Jacobs Key Chuck, Stanley #121 |
| 1 to 2 | 10" Bench Lathe, 3½', Quick Change Gears and Motor and Stand, South Bend #199 ZN |
| 1 | Spinning Lathe, 12" Swing, Motor, Switch, Stand, Walker Turner #L951 |
| 1 | Ball Point, Walker Turner #1130 |
| 1 | Spinning Center, Walker Turner #10 |
| 1 | Compressor, Tank, 2 Cyl. ½ H.P. Motor, 2.5 cu. ft. per Minute, Brunner, H333 |
| 1 | Tool Post Grinder, 1/14 H. P., Dumore #14-011 |
| 1 | Power Hack Saw and Motor, 12" x 5/8" Blade, Excel Floor Type |
| 1 | Acelytene Welding and Cutting Outfit, Airco #756 |
| 1 | Cylinder Truck, Brodhead-Garrett #815-2514 |
| 1 | Arc Welder, Transformer, with Standard Accessories, 180 Amperes Lincwelder |

FOUNDRY AND WELDING

| | |
|---|---|
| 1 | Melting and Pot-Hardening Furnace, Johnson #500 |
| 2 | Welding Goggles, Trojan |
| 2 | Arc Welding Helmets, Brodhead-Garrett #75 |
| 2 | Safety Goggles, Shatter Proof Lens |
| 1 | Bench Hammer, 3½" x 14", Brodhead-Garrett |
| 1 | Spoon and Gate Cutter, Brodhead-Garrett |
| 1 ea. | Foundry Riddles, 8 Mesh-Z Mesh, Brodhead-Garrett |
| 1 | Sprue Cutters 5/8" x 10" |
| 2 | Cope and Drag (Flask) 12" x 12" |
| 1 | Moulders Shovel, Brodhead-Garrett #306 |
| 2 | Wire Brushes, Brodhead-Garrett #1781 |
| 1 | Weld-Cleaning Tool (hammer) Atlas 11 oz. |
| 2 pr. | Leather Welding Gloves, Oxweld |

MISCELLANEOUS

| | |
|---|---|
| 1 | Grinding Wheel Dresser, Huntington #0 |
| 1 | Set, Drawing Instruments, Norris #1300 |
| 2 | Oilstone, 8" x 2" x 1", India, (Medium and Fine) #68 C |
| 6 | Oil Cans, Standard Bench Type, ½ Pint, 4" Straight Spout, Gem #3004 |
| 1 | Oily Waste Can, Justrite #1, 8 gallon |

| | |
|---|---|
| 6 | Bench Brushes, Brodhead-Garrett #78 |
| 8 | Safety Goggles, Shatterproof Lens |
| 1 | First Aid Kit, Woods #6 |
| 1 | Standard Drawing Outfit, Brodhead-Garrett |
| 1 | Oil Can Pump, 1 Pint, Brodhead-Garrett #28 |
| 1 | Flexible Spout Oiler, Eagle #3000 F, 6½" Spout |

PART D

Textbooks and Reference Materials

The matter of textbook selection for the general shop is a complicated problem. No one textbook contains the necessary related information or sufficient projects for a complete general shop course. There are several possible solutions; however, the writer has chosen to indicate the basic textbook or books for each department and the other books which are needed as primary references. Of course the project books are in addition to the reference and textbook lists and are intended to be located in the shop library.

Suggested Textbooks and Reference Books. Since no one textbook can be used for all departments the writer has selected a primary textbook and two reference books for each phase of the general shop. These books are listed here in a formal bibliography. The numbers in front of each bibliographical entry will be referred to in a later chapter dealing with the course of study for the general shop. The book list has been separated into the departments of the general shop, with the first book being the textbook, and the remaining two books are primary reference books. The automobile mechanics list includes five basic text books which the writer believes to be the best for this situation. Only three sets of these five books would be needed for a class of ten students.

Electricity

1. Jones, E. W., Essentials of Applied Electricity, Bruce Publishing Company, New York, 1935, 254 pages.

2. Dragoo, Alva W. and Dragoo, Kenneth T., General Shop Electricity, Mc Knight And Mc Knight, Bloomington, Illinois, 1935, 124 pages.

3. Crawford, John E., Practical Electricity, Bruce Publishing Company, New York, 1939, 288 pages.

Metal Working

4. Dragoo, Alva W. and Reed, Howard O., General Shop Metalwork, Mc Knight and Mc Knight Company, Bloomington, Illinois, 1947, 104 pages.

5. Feirer, John L., Modern Metalcraft, Charles A. Bennett Company, Peoria, Illinois, 1946, 288 pages.

6. Ludwig, O. A., Metalwork Technology and Practice, Mc Knight and Mc Knight Company, Bloomington, Illinois, 1943, 400 pages.

Automobile Mechanics

7. Kuns, Ray Q., Automobile Mechanics, Book 1, Engine, Bruce Publishing Company, Milwaukee, 1943, 265 pages.

8. Kuns, Ray Q., Automobile Mechanics, Book 2, Cooling System , Bruce Publishing Company, Milwaukee, 1943, 272 pages.

9. Kuns, Ray Q., Automobile Mechanics, Book 3, Automotive Electricity, Bruce Publishing Company, Milwaukee, 1943, 282 pages.

10. Kuns, Ray Q., Automobile Mechanics, Book 4, The Power Flow, Bruce Publishing Company, Milwaukee, 1943, 314 pages.

11. Kuns, Ray Q., Automobile Mechanics, Book 5, Chassis Units, Bruce Publishing Company, Milwaukee, 1943, 314 pages.

12. Motor's Auto Repair Manual, Motor Magazine Publishers, New York, 1949, 750 pages.

13. Dyke, A. L., Automobile and Gasoline Engine Encyclopedia, Goodheart-Wilcox Company, Chicago, 1949, 1232 Pages.

Library Materials. Since the listed textbooks and reference books are not entirely adequate for a comprehensive general shop, a number of books should be available in the shop library to supplement these. A proposed library listing follows:

Electricity

14. Collings, Merle D., Projects in Electricity, Mc Knight and Mc Knight, Bloomington, Illinois, 80 pages

15. Cook, Sherman R., Electrical Things Boys Like to Make, Bruce Publishing Company, New York, 216 pages.

16. Jones, E. W., Fundamentals of Applied Electricity, Bruce Publishing Company, New York, 348 pages.

17. Jones, E. W., General Electricity, Mc Knight and Mc Knight, Bloomington, Illinois, 1937, 90 pages.

18. Mott-Smith, Morton, Fundamentals of Electricity, Westinghouse, 1943, Free.

19. Tustison, Job Sheets for the Practical Electrical Shop, Bruce Publishing Company, New York, 35 jobs.

20. Willoughby, George A., General Electrical Work, Charles A. Bennett Company, Peoria, Illinois.

21. Willoughby, George A., General Shop Handbook, Charles A. Bennett Company, Peoria, Illinois, 96 pages.

Metal

22. Becker, William J., Metalworking Made Easy, Bruce Publishing Company, New York, 112 pages.

23. Berg, Edward, and Wing, Bristol E., Essentials of Metalworking, Charles A. Bennett Company, Peoria, Illinois, 160 pages.

24. Bick, A. J., Artistic Metalwork, Bruce Publishing Company, Milwaukee, 1940, 236 pages.

25. Bollinger, J. W., Course in Sheet Metal Work, Bruce Publishing Company, New York, 96 pages.

26. Bollinger, J. W., Elementary Wrought Iron, Bruce Publishing Company, New York, 140 pages.

27. Coleman, George J., Forge Note Book, Bruce Publishing Company, New York, 32 pages.

28. Giachino, J. W., and Fierer, John L., Basic Bench Metal Practice, Charles A. Bennett Company, Peoria, Illinois, 160 pages.

29. Groneman, Chris H., Bent Tubular Furniture, Bruce Publishing Company, New York, 109 pages.

30. Groneman, Chris H., and Rigsby, Herbert P., Elementary and Applied Welding, Bruce Publishing Company, New York, 147 pages.

31. Grayshon, Alfred B., General Metal Work, D. Van Nostrand Company, New York, 1946, 257 pages.

32. Harcourt, Robert H., Elementary Forge Practice, Charles A. Bennett Company, Peoria, Illinois, 182 pages.

33. Hobbs, Douglas B., Aluminum: Its History, Metallurgy, and Uses with Projects for the School and Home Shop, Bruce Publishing Company, New York, 126 pages.

34. Hobbs, Douglas B., Working with Aluminum, Bruce Publishing Company, New York, 126 pages.

35. Horth, A. C., Beaten Metal Work, Pitman and Sons, New York, 1930, 98 pages.

36. Jennings, Roylston F., Gas and A. C. Arc Welding and Cutting, Mc Knight and Mc Knight Company, Bloomington, Illinois, 1946, 89 pages.

37. Johnson, Harold V., Metal Spinning Designs, Bruce Publishing Company, New York, 102 pages.

38. Knight, Roy E., Machine Shop Projects, Mc Knight and Mc Knight Company, Bloomington, Illinois, 112 pages.

39. Krom, Edward F. and Paige, Peter J., Hand-Wrought Iron, Bruce Publishing Company, New York, 112 pages.

40. Kronquist, Emil F., Metalcraft and Jewelry, Charles A. Bennett Company, Peoria, Illinois, 191 pages.

41. Kronquist, Emil F., and Pelikan, A. G., Simple Metalwork, The Studio Incorporated, New York, 1940, 96 pages.

42. Lukowitz, Joseph J., Interesting Art-Metal Work, Bruce Publishing Company, New York, 64 pages.

43. Lukowitz, Joseph J., New Tin Can Projects, Bruce Publishing Company, New York, 80 pages.

44. Miller, John G., Metal Art Crafts, D. Van Nostrand Company, New York, 1948, 165 pages.

45. Osburn, and Wilber, Gordon O., Pewter-Spun, Wrought and Cast, International Text Book Company, Scranton, 151 pages.

46. Payne, Arthur F., Art Metalwork with Inexpensive Equipment, Charles A. Bennett Company, Peoria, Illinois, 176 pages.

47. Petersen, L. C., 101 Metal Working Projects, Bruce Publishing Company, New York, 214 pages.

48. Reagan, James E., and Smith, Earl E., Metal Spinning, Bruce Publishing Company, New York, 1936, 80 pages.

49. Reagan, James E., and Smith, Earle E., 50 Metal-Spinning Projects, Bruce Publishing Company, 112 pages.

50. Smith, Robert E., Machining of Metal, Mc Knight and Mc Knight Company, Bloomington, Illinois, 1949, 224 pages.

51. Smith, Robert E., Units in Bench Metalwork, Mc Knight and Mc Knight Company, Bloomington, Illinois, 1939, 48 pages.

52. Smith, Robert E., Units in Etching, Spinning, Raising and Tooling Metal, Mc Knight and Mc Knight Company, Bloomington, Illinois, 56 pages.

53. Smith, Robert E., Units in Forging and Welding, Mc Knight and Mc Knight Company, Bloomington, Illinois, 56 pages.

54. Smith, Robert E., Units in Pattern Making and Founding, Mc Knight and Mc Knight Company, Bloomington, Illinois, 72 pages.

55. Smith, Robert E., Units in Sheet Metalwork, Mc Knight and Mc Knight Company, Bloomington, Illinois, 48 pages.

56. Tustison, F. E., Kranzusch, R. F., Metalwork Essentials, Bruce Publishing Company, New York, 176 pages.

57. Whipple, G. Graham, and Baudek, Anthony C., Engine Lathe Operations, Mc Knight and Mc Knight Company, Bloomington, Illinois, 160 pages.

Automobile Mechanics

58. Everest, Ralph Jay, Motor Tune-Up Manual, Macmillan Company, New York, 1949, 355 pages.

59. Henry Ford Trade School, Automotive Mechanics, 1935.

60. Kuns, Ray F., Automotive Essentials, Bruce Publishing Company, New York, 1950, 434 pages.

61. Kuns, Ray F., Automotive Service, Volume I and Volume II, Bruce Publishing Company, New York, 544 and 592 pages.

62. Kuns, Ray F., Automotive Service Units, Bruce Publishing Company, New York, Three Units.

63. Kuns, Plumridge, Automobile Engines, American Technical Society, Chicago, 732 pages.

64. Kuns, Plumridge, Automobile Fundamentals, Chassis and Power Transmission, American Technical Society, Chicago, 754 pages.

65. Kuns, Plumridge, Automobile Ignition and Electrical Equipment, American Technical Society, Chicago, 515 pages.

66. Kuns, Plumridge, Automobile Maintenance Handbook, American Technical Society, Chicago, 754 pages.

According to the state textbook law, it is legal to charge each student for one-quarter of the new text book price, regardless of how many students in different classes use the same book. Under such a scheme the shop textbooks will be paid for the first semester. Each additional semester the students still pay the one-fourth book fee and that amount can be used to purchase additional books for the department.

The general shop of Classen will function on a student interest basis. The students will be asked to state their choice of the shop departments, automobile mechanics, electricity, and general metal work, in order of their preference. They will then be assigned by a 'draw from the hat' method. The students will be allowed to change departments after the completion of any project if there is a vacancy in the new department. To facilitate ease of instruction at the beginning of each semester a few starter projects will be required of all students. The next chapter will be further concerned with the organizational methods.

# CHAPTER VI

## THE ORGANIZATION OF THE GENERAL SHOP

One of the most apparent disadvantages of the general shop is that each class demands more attention than the average teacher is accustomed to administering. However, a successful general shop teacher is not required to possess superhuman prowess. What is required is foresight; the instructor must solve many problems before they occur. The general shop teacher cannot devote much of his classroom time to the issuing of tools or supplies, controlling light and ventilation, or record keeping. The solution of these problems must precede the instructional period. This chapter will be devoted to some proposals for eliminating problems of the general shop through proper organization. A course of study for the Classen program will be included as a part of this chapter.

### PART A

### Solving Organizational Problems

The nature of the general shop program necessitates the giving of small group demonstrations and the providing of individual instruction during the class period. Means by which the instructor can be freed for these group lectures and for individual instruction will be described in this section.

Adapting the Student Personnel System to General Shop Needs. One of the most direct approaches to conserving the teachers time involves the student personnel plan. Properly organized and administered it is an obedient servant while if it is installed in a lackadaisical manner it becomes a nuisance.

The personnel organization of a school shop pertains to an organized group of pupils who share in the management responsibilities of the shop course in which they are enrolled. Wilber, in Industrial Arts in General Education, makes these comments: (22, pages 195-208)

> The personnel organization has been referred to several times as a device for achieving several of the industrial arts objectives. The term itself has been borrowed from industry where the personnel department is an important feature of the managerial system. As applied to the industrial arts shop, the personnel system (or plan) may be defined as the organization of students for the purpose of achieving certain desirable outcomes. The nature of these outcomes will differ among schools, teachers, and student groups; hence, no specific system or plan can apply to all situations.
>
> The personnel organization is an important factor in meeting the objectives of industrial arts. Its three basic functions are: (1) to train for leadership, followership, and cooperation; (2) to explore the organization of industry; and (3) to relieve the instructor of certain routine duties. The plan may be organized by the instructor or developed from within the group. Success of the personnel system depends on its being accepted by students as "their plan" and on complete cooperation between officers and the instructor.

The general shop personnel plan should include the following duties, the majority of which were described by Wilber. (22, pages 206-7).

Superintendent:

1. Supervises the general running and cleaning up of the shop
2. Reports to instructor anything out of the ordinary, such as lost or broken tools, and inoperative machines
3. Suggests any possible shop improvements gained through experience as superintendent; also acts as class representative
4. Works with the maintenance man in the supervision of maintenance in the shop.
5. Checks requisition cards and arranges them in alphabetical order.

Librarian:

1. Assists instructor in keeping shop library and office records
2. Cleans up planning center
3. Checks shop library material daily

Safety Engineer:

1. Checks shop at beginning and end of each period for proper ventilation and light, and turns off all gas outlets

2. Is responsible for general shop safety program and its improvement
3. Posts safety posters and information; also replenishes first-aid cabinet when necessary

Foremen:

Electricity

1. Cleans benches, machines and window sills of department
2. Turns off all electrical connections, and stores test instruments at close of period
3. Collaborates with safety engineer to see that all electrical connections are in proper condition
4. Handles supplies for the electrical group

Metal

1. Appoints assistants in foundry, forge, welding art metal, sheet metal, and bench metal with whose assistance he is responsible for all benches, tools, and equipment of the metal department
2. Closes all vises and cabinets and sees that all tools and supplies are properly stored at end of period
3. Collaborates with safety engineer to see that all tools and equipment are in condition for safe operation

Automobile Mechanics

1. Cleans benches, machines, and window sills of that department
2. Collaborates with safety engineer to see that all safety rules are followed in that department
3. Handles supplies for the automobile area

Machines

1. Checks on the condition and the safe operation of all machines in the shop
2. Cleans and dusts machines

Maintenance

1. Checks on proper operation of all machines, and lubricates machines according to a posted lubrication schedule
2. Reports all necessary maintenance, and supervises maintenance work of shop during tour of duty

Tool Panels

1. Checks all tools at beginning of each period, and reports all broken or missing tools
2. Collects and replaces all tools on tool panels at end of each period

Publicity

1. Is responsible for displays both within shop and in show cases in hall
2. Writes and gives to school paper any articles for publication

Supply Clerk

1. Is responsible for arrangement and storage of supplies in bins and racks in the shop
2. Reports any noticed shortages to superintendent
3. Issues supplies at beginning of hour

Floors

1. Cooperates with members of departments in removing hazardous scrap material from the floor

Sink

1. Checks supply of paper towels and soap, replenishing before end of period

The rotation of these duties should be accomplished as follows: (1) the superintendent will be elected once every six weeks, (2) the publicity man will serve the entire semester providing he performs his duties well and providing that no other student desires to serve in that capacity, (3) all other responsibilities will be rotated once a week, every Monday and (4) a suitable responsibility board should be posted where all may see it.

A responsibility board or personnel board is a device upon which the names of all students in a class are listed and it is constructed in such a manner as to allow the names to be moved into different positions. The shop duties are mounted on the board opposite the names so that whenever the names are moved each student receives a new responsibility assignment. There are many variations as to types and operation; however, the one pictured in Figure 2, page 65 has proven very satisfactory in several schools.

Accounting for and Issuing Supplies. The general shop method of issuing supplies should be almost automatic, for the instructor has a limited amount

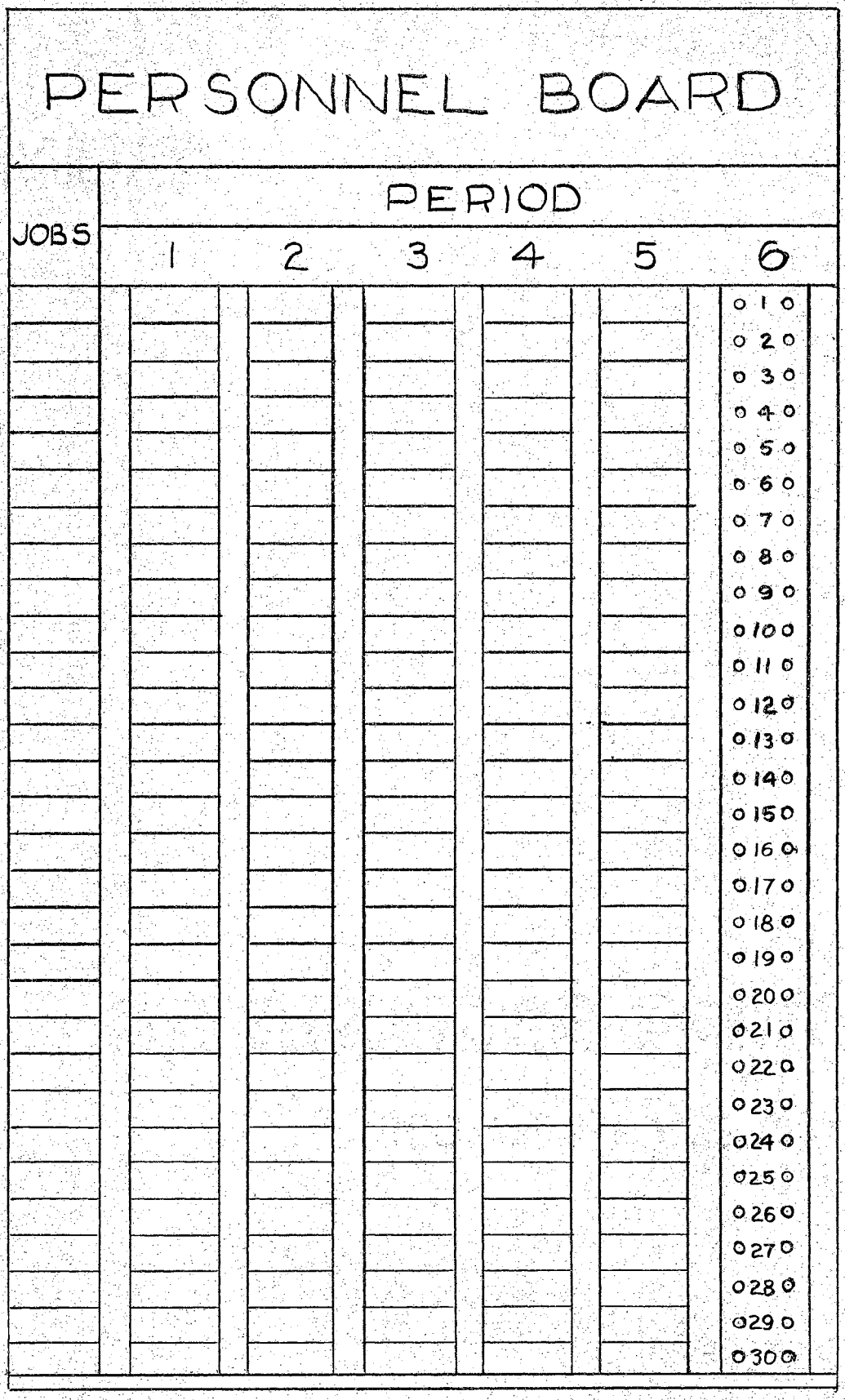



Figure 2, A Proposed Personnel Board

of time for such duties. It is suggested that the 'meal-ticket' form of collecting shop bills be utilized. Such a form is illustrated in Figure 3. These cards are to be available to the instructor only, and new cards are to be purchased as the old ones are expired. The student will receive a refund at the end of the course for the unused portion of his card. In operation the supplies are issued in this fashion; (1) each student makes out a list of the supplies needed at the beginning of each period while still seated in the demonstration room, (2) these slips are collected by the student foremen, each collecting for his own department only, (3) the foremen then procure these articles from the supply clerk and distribute the supplies to those who requested them. (4) the foreman gives the supply forms to the shop superintendent whose duty it is to check the forms for completeness, arrange them alphabetically, and submit them to the instructor, and (5) the instructor punches out the correct amount from the students supply cards, which he could carry in his shop apron. It is suggested that the instructor should issue any other supplies which the students find they did not anticipate and by carrying the supply cards with him the teacher will be required to spend only a minimum amount of time in issuing supplies. Figure 4 is a suggested form for the requisition cards.

Attendance Records and the Manner of Checking the Roll. In the last column of the responsibility board (number 6 of Figure 2) is placed a solid strip of plywood containing two columns of holes. The pairs of holes are numbered from 1 to 30, each number refers to the pair of holes between which the number is placed. At the top of the column is a strip of metal bent into a "U" shape so that a strip of paper labeled "In" may be slid along the channel to a position above either one of the columns. There is inserted

25 25 25 25

CLASSEN HIGH SCHOOL

General Metal Shop

Supply Card of

Name _____ Period _____

Instr. _____ Date _____

1 1 1 1 1 5 5 5 5 5

5 5 5 5 5 5 5 5 5 5

Figure 3, A Materials Supply Card

SUPPLY REQUISITION CARD
General Shop

Student _____ Period _____ Date _____

| Item | No. | Each | Total |
|---|---|---|---|
| | | | |

Supply Clerk Total Cost

Figure 4, A Requisition Form for Supplies

in each pair of holes one dowel. With this device the students aid in calling the roll. Figure 5 includes a detailed drawing of the "checking in" device.

In operation the system is intended to function thus, (1) before the class arrives each day the instructor places the "In" label above the column of holes that have no dowels in them, (2) each student should be assigned a number at the beginning of the course; the numbers on the column of the responsibility board are these same numbers,(3) as each student enters the room he should move his dowel to the opposite hole in the column marked "In", (4) the students should have assigned seats in the demonstration area and should be required to go directly there after checking in, (5) after the bell rings, the instructor can ascertain the number of absentees by a glance at the responsibility board and this number may be verified by counting the number of empty seats, and (6) at the end of the demonstration period the instructor can record the absentees while the students are preparing for the days work. Any standard class roll book will serve this purpose.

Recording Individual Progress. One of the recognized faults of the general shop is that it is difficult for the instructor to observe the progress of each student. In other words, the desirable degree of personal relationship between the teacher and the student tends to become obscure. If an instructor is not familiar with the student's work habits and daily progress he cannot adequately evaluate their academic standing. This undesirable tendency can probably be overcome if the general shop teacher would make a conscious effort to talk to each student in his class at least once a week. If some sort of a written comment could be recorded at this weekly conference, the problem of evaluation would be somewhat simplified. It would further simplify the administration if the instructor would keep a small note book for each class, alphabetically indexed, in which comments on each individual

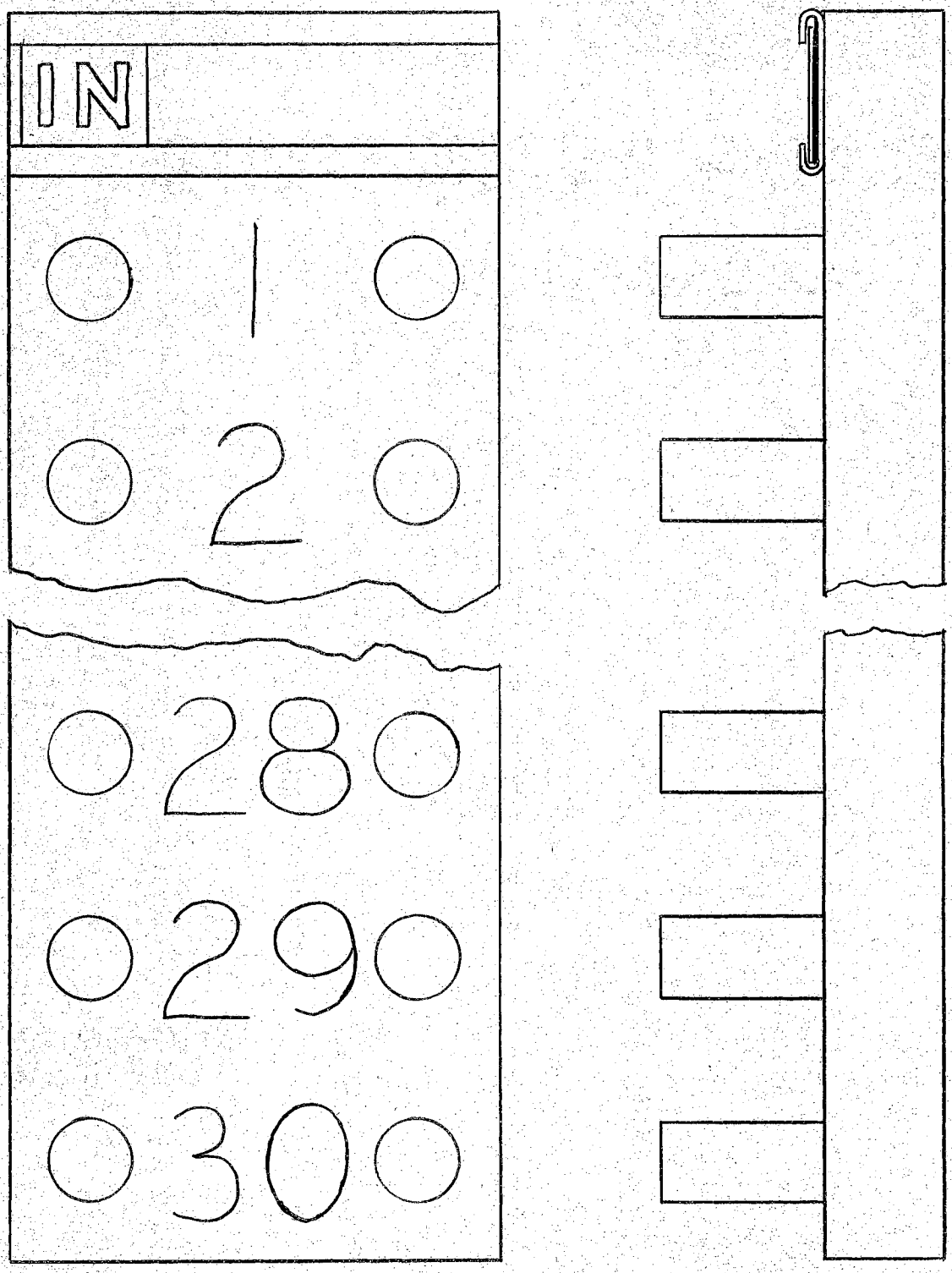



Figure 5, Checking-in Device

could be kept. The supply card mentioned earlier could also be kept with the individual progress records. Figure 6 is a suggested form for the individual progress records.

Individual Record Files. To aid in guidance and to achieve a more personal contact with the students, some form of a permanent record is convenient. Figure 7 , page 72, is a suggested form.

Method of Presenting Related Information and Demonstrations. Industrial arts instruction is characterized by its emphasis on the overall growth of the student both physically and intellectually. It is not sufficient for the student to gain skill in the use of materials and tools. He should be permitted to investigate the actual industrial processes and the social aspects of industry in order that he may become adjusted to or understand the present complex industrial age. If this concept is to be realized it is only apparent that in some manner additional information must be made available to the class. The usual manner in which this is accomplished is to lecture to the entire class at the beginning of the period, the lecture time being limited to 10 to 15 minutes. Another method is to use work books much like the history class employs; however, few such work books exist. The use of good work books would probably be of significant value in the general shop.

Demonstrations involving specific manipulation of tools or materials before the entire class are probably beneficial in only one situation. That situation is when each student will be doing that very operation at some time during the course. If the process of etching copper were demonstrated before the class, the students in areas other than art metal work would have little or no interest in the discussion and probably would indulge in horseplay which would distract the attention of all the other students. The demonstrations must of necessity be given to selected groups during the class

Name_____

Date_____

Weeks

1

2

3

4

5

6

7

8

Front

Figure 6

Individual Progress Record

9

10

11

12

13

14

15

16

17

Back

Personal Data Form

Name_____ Date Enrolled_____ Course Name_____

Home address_____ Phone_____

Occupation of father_____

Hobby_____

Do you have a home workshop?_____ If so, list tools_____

_____

_____

_____

_____

What phase of shopwork are you particularly interested in?_____

List all previous shop courses you have had_____

_____

_____

What are your post high school plans?_____

_____

Projects: Grade Cost

Comments:_____

_____

_____

_____

Figure 7

period whenever those students need information. Certain subjects should be discussed before the entire class such as safety rules, occupational information, consumer appreciation, care of tools, characteristics of materials common in everyday life, class management problems, etc.

Individual assignments should be made to be completed outside of class. Each student will be asked to keep a notebook for the general shop and in this notebook will be kept (1) lecture notes, (2) project plans and procedure lists and a supply record as used by the individual, (3) outside reports, and (4) an accumulation of pictures or plans of projects suitable for the general shop.

In this section several methods of solving organizational problems have been offered. No reference was made as to how the class is to be started or what type of work the students will do. The following section will be devoted to clarifying the remaining phases of a proposed course of study for a general shop.

## PART B

## A Course of Study for the General Shop of Classen High School

A course of study for the Classen general shop program cannot be too extensive due to the very nature of the course. As stated previously, the administration has asked for the general shop to be in harmony with the existing high school program. Therefore the general shop instruction must be founded upon student interest. This factor is certainly no hindrance in a shop class for when the students are permitted to engage in the types of activity that are most interesting to them, they learn more and certainly will not present many discipline problems. The course of study which follows is based as much as

possible on student interest.

The Type of Pupil-Enrichment Possible in the Classen General Shop. This phase of the study will be approached from the standpoint of things a boy should learn to do, things a boy should know, and what a boy should be. Much of this section was adapted from the American Vocational Association bulletin, Improving Instruction in Industrial Arts. (3, pages 12-14).

## Things A Boy Should be Able To Do

Electricity

1. Read a wiring diagram.
2. Plan a procedure for doing a job.
3. Remove insulation from a wire.
4. Make a rat-tail, tap, and Western Union splices.
5. Solder and tape a splice.
6. Prepare and attach wire to a binding post.
7. Connect dry cells in series and parallel.
8. Plan and construct a simple electric circuit which may be opened and closed from one point.
9. Plan and construct an electric circuit which may be opened or closed from either or both of two points.
10. Plan and install electric devices in a circuit in series, and parallel.
11. Make an extension cord.
12. Test and replace fuses.
13. Read an electric meter.
14. Interpret the identity marks on a motor.
15. Administer first aid in case of shock.
16. Attach a terminal to a wire.
17. Apply the principle of electro-magnetic force in order to operate a mechanism.
18. Employ resistance to generate heat.
19. Wire a circuit so as to eliminate a dangerous rise of heat due to resistance.
20. Reduce voltage on a line.
21. Locate a break in a line.
22. Tie an underwriter's knot.
23. Calculate resistance, voltage, and amperage by the use of Ohm's Law.
24. Install various switches and receptacles.
25. Measure voltage with a voltmeter.
26. Measure amperage with an ammeter.
27. Erect a good radio antenna.
28. Check a radio for simple causes of inoperativeness.
29. Make a crystal radio.
30. Make a one tube radio.

31. Construct and use simple test instruments.

General Metalwork

1. Make a bill of material.
2. Plan the procedure for doing a job.
3. Transfer patterns to sheet metal.
4. Cut with tinners snips.
5. Solder tin, copper, brass, and galvanized iron.
6. Sweat a joint.
7. Light and operate a blow torch.
8. Trim with squaring shears.
9. Form by hand.
10. Form with bar folder.
11. Roll a sheet on the slip roll former.
12. Form with the brake.
13. Use stakes in forming.
14. Drill holes in metal.
15. Use a cold chisel.
16. Prepare cut acid flux.
17. Anneal copper or brass.
18. Give hammer finish to copper, brass, or iron.
19. Apply lacquer finish.
20. Etch on copper or brass.
21. Clean and tin a soldering - copper.
22. Use a hack saw.
23. Use a file.
24. Use taps and dies.
25. Develop various patterns.
26. Bend bars or strap iron into irregular shapes.
27. Drill with a power drill.
28. Draw out hot metal.
29. Anneal steel.
30. Temper small tools.
31. Rivet joints.

Machine Shop

1. Lay out work using steel square, combination square, and dividers.
2. Measure with inside and outside caliper.
3. Measure with micrometer.
4. Grind chisels.
5. Chip by hand.
6. Cross file.
7. Draw file.
8. Sharpen a screw driver.
9. Ream with hand reamers.
10. Remove a broken tap or a bolt.
11. Harden carbon steel by quenching.
12. Case harden.
13. Determine speed by a speed indicator.
14. Determine speed by motor R P M and pulley sizes.
15. Check with test indicators.

16. Mark with steel stamps.
17. Oil, clean, and care for machinery.
18. Start, stop, and reverse lathe.
19. Use round nose tool on a cylinder turning.
20. Use facing tool on end of cylinder.
21. Use knurling tool.
22. Use cut-off tool.
23. Cut an engine thread.
24. Prepare work for mounting between cylinders.
25. Center cylindrical work in a chuck.
26. True up an armature commutator.
27. Set up work in a vise.
28. Make horizontal milling cuts.
29. Mill surfaces at right angles.

Automobile Mechanics

1. Plan the procedure in doing a job.
2. Systematic disassembly and re-assembly of machinery.
3. Test and clean spark plugs.
4. Clean and adjust or replace breaker points.
5. Grease a car.
6. Clean gasoline lines.
7. Replace light bulbs.
8. Remove sediment from the radiator.
9. Test and care for the battery.
10. Adjust tension on fan or generator belt.
11. Remove and replace a tire.
12. Repair punctures with cold patches.
13. Repair punctures with hot patches.
14. Adjust charging rate of a generator.
15. Clean the commutator.
16. Align the front wheels.
17. Adjust brakes.
18. Check electrical system for shorts and opens.
19. Inspect and adjust front wheel bearings.
20. Test for and correct lost motion in steering system.
21. Adjust a clutch.
22. Clean and adjust the carburetor.
23. Trace and test the ignition system.
24. Overhaul a magneto.
25. Test, focus, and adjust lights.

Foundry, Forging, and Welding

1. Temper sand.
2. Make a green sand mold.
3. Melt and flux metal.
4. Pour a soft metal casting.
5. Chip, grind, and finish castings.
6. Heat work in a gas forge.

7. Measure and cut stock.
8. Forge small tools.
9. Temper steel.
10. Anneal steel.
11. Weld iron.
12. Weld steel.
13. Braze a joint.
14. Weld pipe.
15. Plan a job.
16. Make a pattern.

## Things a Boy Should Know

### Electricity

1. Properties of the magnet and the characteristics of the magnetic field.
2. The source of electric current or pressure.
3. The characteristics of the electric current.
4. How the electric current is conveyed.
5. The kinds of conductors and their uses.
6. The meaning of volt, ampere, and watt.
7. The meanings of series and parallel and difference between the effect of these connections.
8. The difference between direct and alternating current.
9. Ohm's law.
10. How a door bell operates.
11. Why splices must be soldered.
12. The importance of insulation.
13. The effect of the size of the wire.
14. Symbols used in wiring diagrams.
15. Safety rules for working with electricity.
16. The construction of a dry cell and how it functions.
17. The construction of a wet cell and how it functions.
18. The types of fuses and their uses.
19. Transformers and how they operate.
20. Condensors and their purposes.
21. Resistors and their purposes.
22. Pay roll and jobs in the electrical industry.
23. Imperfections in house wiring which involve fire hazards or personal injury.
24. The basic principles of radio transmission.
25. The basic principles of radio reception.

### General Metalwork

1. The kinds of solder and their uses.
2. The kinds of fluxes and their uses.
3. The names of tools, equipment, and operations in the general metal shop.
4. How to care for tools and equipment.
5. How to identify various metals.

6. The gauges of sheet metal, how it is sold, its use and sources.
7. The principle kinds of steel, and how it is manufactured.
8. The kinds and sizes of drills.
9. The kinds and sizes of rivets.
10. Occupational information.

Machine Shop Work

1. The names of tool bits.
2. Types of chucks and face plates.
3. How an indicator is used.
4. Types of threads and threading terminology.
5. The types of taps and dies in common use.
6. Names and uses of small hand tools.
7. The classification system of drills.
8. Kinds of chisels.
9. The types and uses of files.
10. Grades of iron and steel and their forming processes.
11. Standard tapers and their uses and method of making.
12. Drill terms and kinds of drills.
13. The speeds and feeds of drills.
14. Proper use of grinding wheels.

Forging--Foundry--Welding

1. The forge and its construction.
2. The anvil and its uses.
3. Names and uses of blacksmith tools.
4. The effect of heat on steel.
5. The principles of welding
6. The tempering of tool steel.
7. Case hardening process.
8. The expansion of iron and steel.
9. Emery wheel test for determining kinds of material.
10. Reading a drawing.
11. The molding and core sands, types and sources.
12. The kinds of patterns.
13. Draft.
14. Shrinkage.
15. Cores and coremaking.
16. Metals and alloys.
17. Safety measures and health precautions.
18. Opportunities in foundry work.
19. History of iron industry.
20. Selection of proper welding tips.
21. The acetylene cutting torch principles.
22. A neutral flame and how to obtain it.
23. The transformer arc welder and how to adjust it.
24. The acetylene welder and how to adjust regulators.

Automobile Mechanics

1. The types and uses of anti-friction bearings.

2. The simple alignment of the front wheels.
3. The types of brakes and how each operates.
4. The kind, purpose, and characteristics of pistons and rings.
5. How the fuel pump operates.
6. The purpose of the carburetor and how it operates.
7. The necessity for proper lubrication and how it is accomplished, and types of lubricants.
8. Clutches and how they operate.
9. The purpose of the universal joints.
10. How the gear shift transmission functions.
11. How the starting system operates.
12. How the ignition system operates.
13. How the lighting system operates.
14. The meaning of cycle in a gas engine.
15. How the magneto system works.

Things the Boy Should Be. Upon completion of the stated learning units, each student will: (1) have a better understanding of the industrial implications of American society, (2) will have a better appreciation of the industrial skills reflected in a manufactured item, (3) will be better qualified to select good tools and consumer products, (4) will be aware of the social and economic status of many industrial occupations, (5) will have a more adequate basis from which to choose a college preparatory program or a vocational pursuit, (6) will be conscious of observing safety procedures in the shop, on the job, or at home, (7) will have acquired some handy-man abilities desirable in all individuals, and (8) will have sampled several crafts and will be able to pursue one of them as a leisure time hobby.

Starting the Class. This problem is not a simple matter in the general shop. If the class were on a rotating basis whereby the students changed to different areas several times a semester the instructor could first demonstrate how to make something and then put the entire class to work, each student doing the same job. If this basic project would take several days to complete it would allow the instructor ample time to demonstrate different operations in all the shop activities. When the basic projects are completed the students would be assigned to the different areas and would be able to start projects

in those areas for in the meantime the instructor has demonstrated the elementary processes. Since the Classen shop does not rotate activities some other method must be employed. The following procedure is recommended by the writer.

I The first day

1. Teacher should introduce himself and write his name on the board.
2. Each student should stand and introduce himself to the class.
3. The instructor should conduct a tour of the shop, explaining where supplies, tools, and storage spaces are located.
4. The students should be informed about what activities are possible in the shop and what types of projects are suitable. There are a few projects which are unsuitable: (a sheet metal boat is one example). The students must be informed that they will be required to make one starter project and the justification for doing such.
5. The problems of managing a general shop should be discussed by the group with the instructor monitoring the discussion. Things which should be covered are personnel system, issuing supplies, checking roll, the limited amount of time for individual help from the instructor, the manner of assigning students to the different areas, (there is a limitation as to the number of students which can be accommodated in the different areas), and the advantages of 'starter' projects.

II The second day

1. The students should fill out the personal data sheet.
2. The students should be assigned to the various areas.

3. The students should familiarize themselves with their areas tool panels, locate their storage lockers and receive supplies.
4. The starter project should require about five periods for the students to complete. This gives the teacher an opportunity to discover the degree of student ability and allows ample time for giving group demonstrations and planning future activities with each group. Figures 8 to 14 included in the appendix, are suggested starter projects. These have been selected for their known student interest appeal.

III Remaining days

1. After completion of the starter project the students should select projects they want to make. They should also make the drawings and procedure list. The instructor should okay the drawing and procedure list before the student commences work. Also the teacher should record the date these were approved and the name of the project.
2. Instruction sheets are desirable teaching aids when they are used to supplement the teachers direct supervision. The writer plans to construct instruction sheets as the need for them appears evident.
3. Considerable related information can be presented through various available projected films and slides. The following film list was selected from catalogs of the several state college film-loan libraries. An attempt has been made to select one film for each of the general shop activities.

Metal Craft
Flow of Electricity
Power Within

Metal Spinning
Cutting Taper with the Compound Rest and with the Taper Attachment
Making of Steel
Factory Safety
Oxy-Acetylene Welding for Industrial Products
How to Form Aluminum

Suggested Projects for the General Shop. The types of projects which can be made in the general shop may be classified as follows: (1) required projects, (2) elective projects, and (3) the home-school projects. There should be as stated previously, certain required projects in each area. After the completion of these the students make articles of their own choosing. This is the elective type of project. The home-school project is any object which the student desires to make at home, but lacks the necessary tools with which to do the job. Part of the work is intended to be done at the student's home and the remainder in the school shop. It is offered here for several reasons; (1) the limited amount of time and space available in the general shop prohibits the construction of large projects, (2) this method makes possible the interesting opportunity to make larger or more tedious articles, (3) it helps to realize an objective of industrial arts, more worthy use of leisure time, (4) it aids in the development of home workshops, (5) it promotes a more desirable relationship between the home and the school, and (6) it increases the element of interest among students. Before such a project is undertaken, the student must be aware that the project must be completed and graded as any other school-shop project.

The following list of projects has been prepared for those students who have no particular project in mind which they wish to make. The number immediately preceding the dash refers to one of the numbered books in Chapter Five, and the number following the dash is a page number in that book.

Footed Plate, 45 - 143.

Ivy Bowl, 48 - 65.

Jewel Box, 48 - 64.

Lamp, Boudoir, 48 - 69.

Lamp, Desk, 48 - 68.

Lamp, Occasional, 48 - 70.

Lamp, Radio, 48 - 71.

Lamp, Table, 48 - 72.

Nut Bowls, 44 - 156; 48 - 62.

Pen and Ink Stand, 45 - 143.

Porringer, 45 - 144.

Powder Box, 44 - 158.

Refreshment Set, 48 - 63.

Salad Bowl, 33 - 233.

Sugar and Creamer Set, 48 - 67.

Tea Pots, 45 - 131; 45 - 143; 45 - 144.

Trays, 48 - 61.

Vanity Box, 44 - 160.

Vases, 48 - 73; 48 - 74.

Vegetable Dish, 45 - 126.

Water Pitcher, 45 - 133.

In this chapter an attempt has been made to prepare a course of study for the Classen High School general Shop. The program suggested here is purposely flexible for the needs and interests of the students are the determining factors upon which the study plans are to be based. At the beginning of each semester the instructor should lead the class in a discussion of the activities for that semester. The results of this discussion should

be; (1) the students' needs and interest are established, (2) the class will be organized so that each student shares in the management responsibilities, (3) the students will select the departments of the shop in which they desire to gain experience, (4) the limitations and disadvantages of the general shop will be explained to the students and the teacher and the students together should plan a solution to these problems. In short the students should feel as though they have planned their own program and at all times the instructor should endeavor to keep the students interested in their work.

# CHAPTER VII

## CONCLUSIONS AND RECOMMENDATIONS

Recent educational movements or theories are often thought of as being original or new; however, in almost every instance one can find evidence of those very things having been experimented with at an earlier date. Therefore it should be stated that probably all of the ideas contained herein have been used by others. Acknowledgments have been made throughout this paper wherever possible and apologies are hereby extended to any whose contributions have been slighted.

## PART A

### Summary of Findings

Relationship of Industrial Arts to General Education. Industrial arts cannot be contrasted with general education for it is an integral part of it, having as much importance as English, or history, or the other academic subjects. All of the objectives of general education can be realized in an industrial arts program and probably easier than in any other school program, for in a shop the students are working in a tangible medium which has high student interest.

History of the General Shop. The first recorded adaptation of the general shop idea was made by Russel and Bonser in 1910. Since that date the number of these shops has increased steadily. Most writers relate the progress of the general shop with that of junior high schools. This is only natural for the junior high school requires a somewhat different shop program than that

offered in senior high schools and the general shop type of instruction was developed primarily to meet the needs of the junior high school.

Advantages of the General Shop. Some of the advantages of a general shop program are:

1. Pupils can have an experience with a greater variety of materials.
2. Makes possible a contact with a greater variety of tools and tool processes.
3. Makes a provision for taking care of individual differences.
4. Makes possible a closer connection between school and home.
5. Participation in several activities requires a wider range of thinking and thus is more educational.
6. Provides better opportunity for pupils to discover their own interests, aptitudes and capacities.
7. No loss of time in the completion of a project in more than one material.
8. It makes possible the development of initiative on the part of the pupil, or stimulates individual thinking.
9. It makes for economy in both equipment and teaching force.
10. It makes possible the more extensive use of the project method of teaching.
11. It eliminates waste of time caused by a duplication of processes in the one industry shop.
12. It enables a pupil to learn to do a great many things which all men should know and be able to do without respect to their vocations.

Disadvantages of the General Shop. The following disadvantages of the general shop were revealed:

1. Few well trained instructors are available for teaching in the general shops.
2. Class teaching with careful demonstration and discussion is possible only when all are doing similar kinds of work.
3. Proper teaching cannot be done in a general shop without a great number of instruction sheets to explain the work.
4. The equipment and supplies are more difficult to take care of than in the one industry shop.
5. The general shop, because of the diversified character of the work done tends to look like a "junk shop," while the one industry shop can be kept in better order.
6. It is difficult to organize the work in order to keep every one busy in a general shop.
7. The instruction given by the teacher, when spread out over so many groups, can only be fragmentary.
8. It is practically impossible for any man to become an expert in several unrelated industrial activities; therefore, strong teachers cannot easily be prepared for a general shop.
9. Discipline is made more difficult.

The Nature of the Industrial Arts Program in Oklahoma City. Primarily the industrial education program of the Oklahoma City schools has been established to meet the present and probable future needs of the students. The students who plan on attending college are permitted to enroll in a college preparatory curriculum. For these students industrial arts is maintained on an educational basis through which the students may become better acquainted with industrial processes, materials, and social problems. Many students in the college preparatory program plan on engineering futures and the industrial arts shops make it possible for these students to explore many phases of industry. This supplements the guidance program in trying to place each student in a field of specialization where the individual would be interested and successful. Many of the students do not plan on college futures, therefore the industrial education program is intended to aid these students also. The industrial arts classes for these individuals are exploratory in nature; however, the emphasis is more upon aiding the student in his selection of a vocation which he would pursue immediately upon graduation from high school. The Oklahoma City administrators expect the students to find some vocation they like in the industrial arts classes, and if this selection is made before the senior year the students are encouraged to participate in the vocational education program. The vocational department is rather extensive including courses in automobile mechanics, radio, sheet metal, machine shop, carpentry, cabinet making, and cosmetology.

Suggested Characteristics of the General Shop Program for Classen High School. The general metal shop of Classen High School will be so equipped as to permit the following activities to be taught; machine shop, bench metal work, forging, foundry, metal spinning, sheet metal work, welding, electricity, elementary radio, and automobile mechanics. The students will be allowed to

assist the instructor in planning the instructional program. Insofar as possible the students will be permitted to work in the activities and on the projects they are interested in. An extensive student personnel system will be utilized in order that the teacher may spend the majority of the class time giving individual assistance. To increase further the instructional efficiency, instruction sheets will be used and the student will be encouraged to consult the available textbooks and reference books for answers to particular problems before asking the instructor. The students may work in any department as long as they wish during any one school year, or they may spend some time in each of the departments. There will be this one limitation on enrollment; students may spend only two semesters in any one department, but may enroll for additional courses in the other departments. At the beginning of each new class the students will be expected to make a beginning project which will: (1) indicate the skill or the amount of experience the students have, (2) give the instructor an opportunity to become acquainted with the class and time to work out organizational details, and (3) will give the instructor an idea as to how complex a project each student could make. If the required project indicates that a student has little ability or knowledge of tools then the instructor should help that student select future projects which would be within his capabilities and would give the student the necessary knowledge to advance to more complex projects. Related information will be incorporated into the program through lectures, motion pictures, and individual assignments.

In short, the findings of this study include: (1) industrial arts has an interesting past and even brighter future, (2) industrial arts is an integral part of general education, (3) the general shop advantages and disadvantages and possible solutions to the problems of the general shop were revealed, and (4) some factors to be considered in the planning of a general shop

curriculum are established.

## PART B

### Recommendations for Further Study

One of the most significant facts observed in this study was the lack of published material available on the general shop. In this concluding section some topics which need further research are suggested.

What Other General Shop Teachers are Doing. A beginning general shop teacher is quite lost as to what type of program should be offered. Of course there are a few books dealing with school shop organization, but there is little information in these about what type of projects are best suited to the general shop, what are some solutions to the known disadvantages of the general shop, etc. At best the two or three available books on the general shop subject represent about as many individual ideas on what the general shop should be. The writer believes that a study concerning the organization and the administration of general shops being taught throughout the country would be of significant educational value.

The Preparation of General Shop Teachers. One of the disadvantages of the general shop is that well prepared teachers are not readily available for such programs. Few teachers are skilled in a large number of fields; as a matter of fact the majority of the college graduates in industrial arts are prepared to teach but two subjects, usually woodwork and mechanical drawing. Since the number of general shops are increasing rapidly the demand for general shop teachers will increase correspondingly. A study of the various teacher college programs as to what is being done to prepare general shop teachers would be of considerable value.

The Need for a General Shop Workbook. Related information is a necessary part of industrial arts instruction. Most shop teachers would agree to this

for without related information industrial arts classes would become either hobby shops or manual training laboratories. There are many ways to present related knowledge such as projected pictures, lectures, industry visitation, etc., and all of these are very satisfactory. However, in most shops the teachers are inclined to overlook the advantages of textbook assignments, and are content to lecture to classes that have no outside preparation. Reading assignments can be given to a shop class; however, the students do not respond well for shop books are not very interesting to high school students. The students generally do not have enough mechanical experience to judge what is important enough to be remembered. If a workbook were available to aid the student in selecting the key points of each lesson much more related information could be procured directly by the student. The writer sincerely believes that such workbooks, one for each industrial arts activity, would find a ready market and would increase teaching efficiency to a great degree.

This thesis study was conducted primarily to discover the full implications of what the general shop is, its advantages, disadvantages, limitations, and history. This information was needed to aid in preparing a course of study for the general metal shop of Classen High School, Oklahoma City. The course of study presented here does not represent a comprehensive plan but it is in as complete a form as is possible at the present time. The conditions under which this shop is to be maintained prohibits the formulation of a complete course of study until the students of each class have indicated their desires or interests. An attempt has also been made to offer a solution to many of the pressing problems which are so prevalent in general shop instruction. If this thesis is ever of value to others who might find need for it or if it inspires someone to make an advanced study on any general shop problem, the writer will be more than repaid for his efforts.

# APPENDIX A

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# BIBLIOGRAPHY

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# APPENDIX B

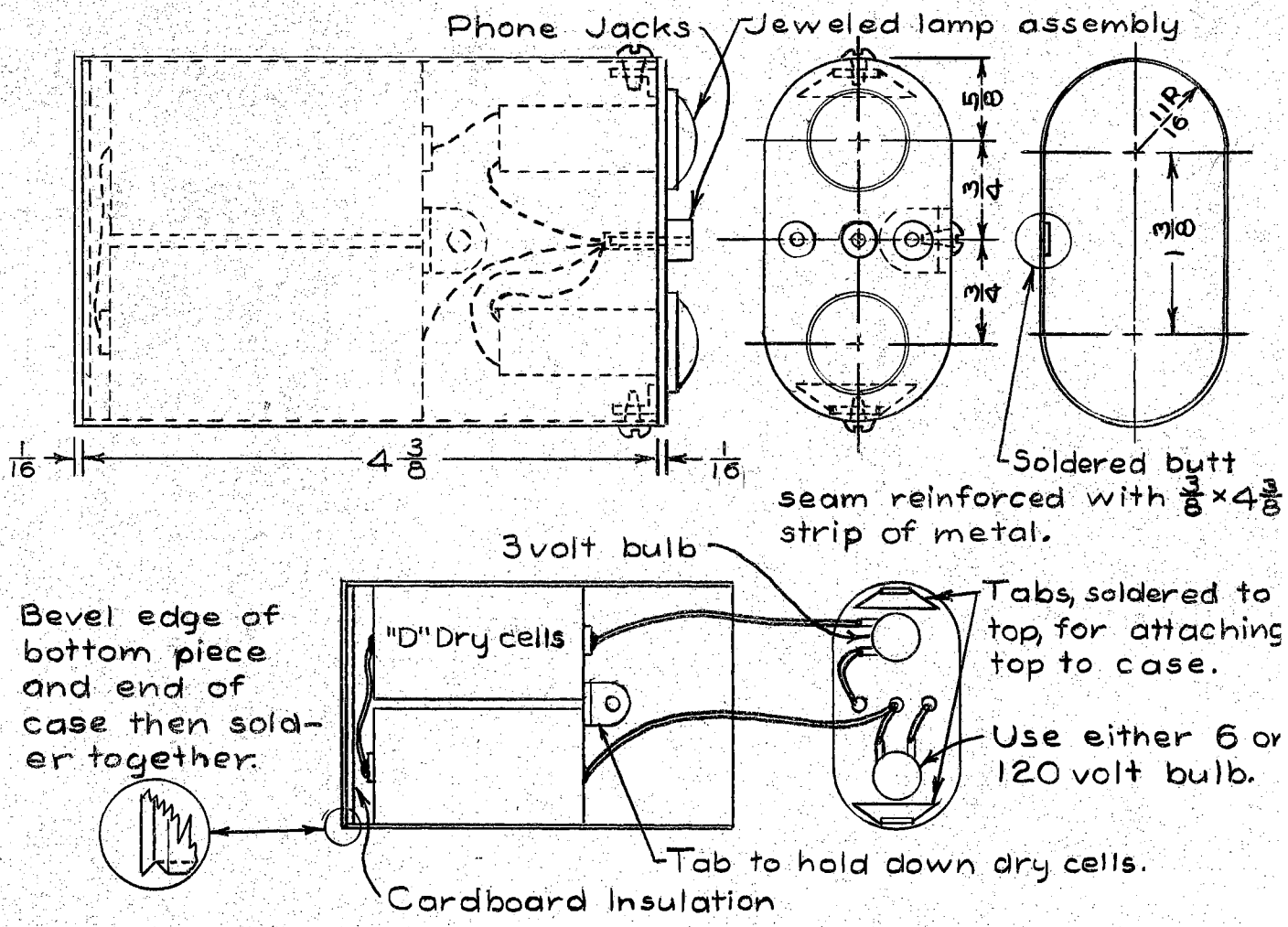
## PROJECTS PLANNED AS "STARTER" ACTIVITIES

## FOR FIRST PERIODS IN THE GENERAL SHOP

# CONTINUITY & VOLTAGE TESTER

Electricity

J. W. Hicks




ɔcedure:

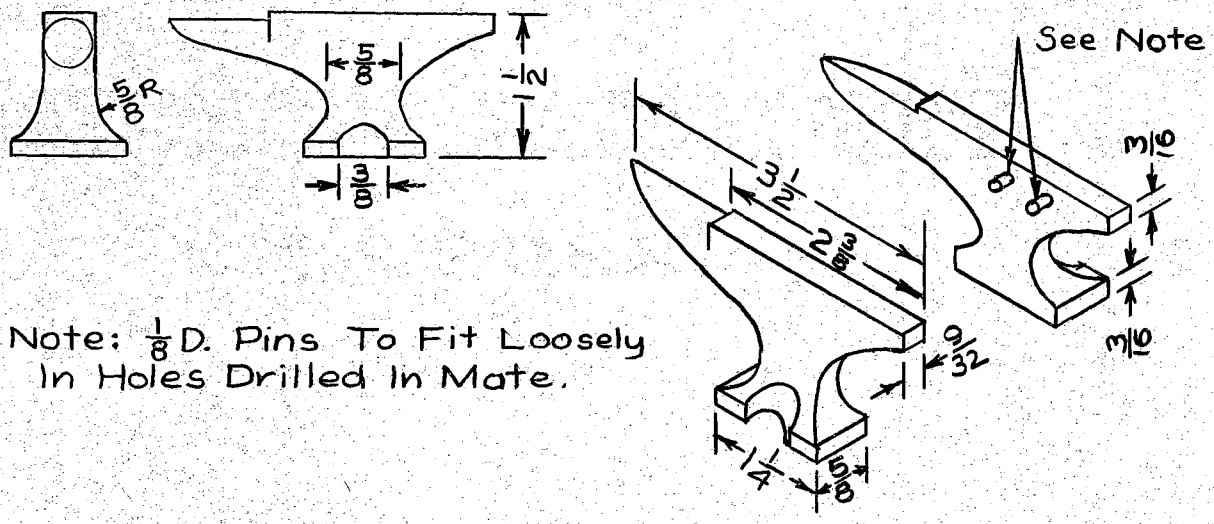
1. Cut out material for case.
2. Tin edges on two narrow ends with solder.
3. Form case into circle on slip roll former.
4. Cut out 3/8 X 4 3/8 reinforcing strip and tin on one side.
5. Sweat tinned case ends to reinforcing strip.
6. Form case to finished shape.
7. Cut out bottom piece.
8. Bevel edges of bottom piece and bottom of case then solder together.
9. Cut out lid and drill holes for phone jacks and lamp assemblies.
10. Make tabs and solder to lid.
11. Centerpunch the positions on the case for the sheet metal screws.
12. Place lid on position and drill holes for sheet metal screws through case and tabs
13. Wire the tester, solder all connections. Make the leads from the dry cells to the lid terminals about six inches long.
14. Insert insulation, then the dry cells.
15. Place hold down tab in correct position, drill hole, and secure with a sheet metal screw.
16. Fasten lid in place.
17. Make a pair of test leads.

Figure 8

# ANVIL PAPER WEIGHT

Foundry

J. W. Hicks




Note: 1/8 D. Pins To Fit Loosely In Holes Drilled In Mate.

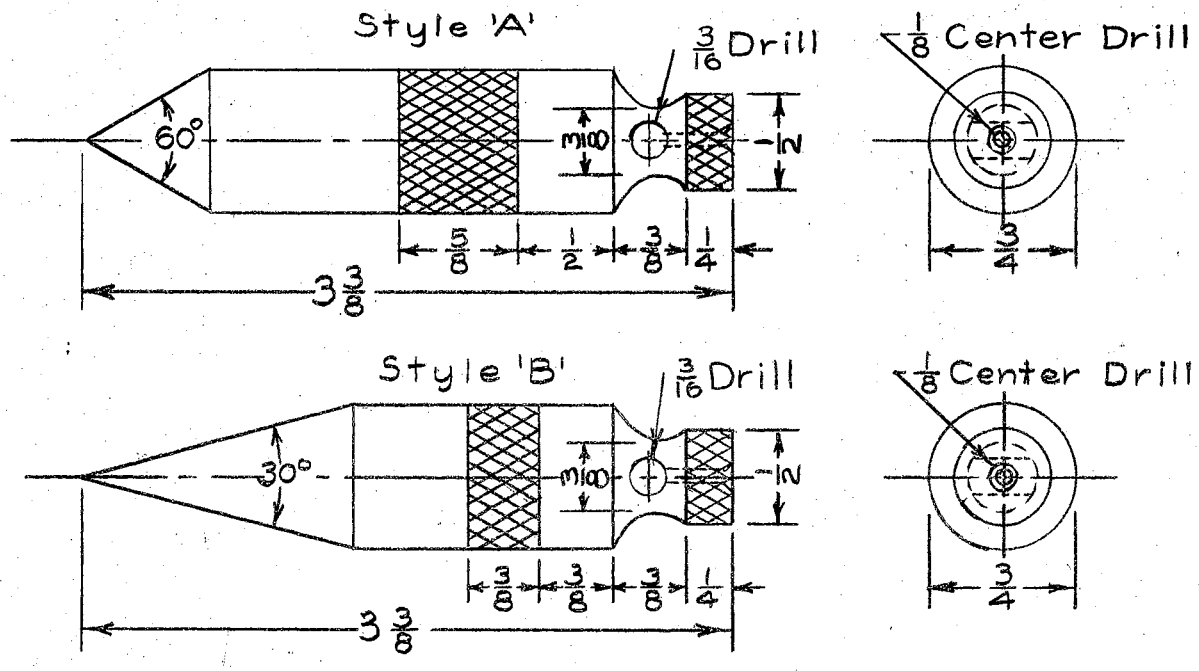
Temper the molding sand by adding water and mixing thoroughly until the sand will stick together when it is squeezed in the hand. The lump should be tested to see that sharp corners are left when the piece is broken with the hands.
Place the pattern on the molding board, use the half without the dowell pins.
Invert the drag and place it over the molding board. Sift a small amount of parting sand over the pattern.
Riddle enough molding sand in the drag to cover the pattern.
Fill the drag full of unsifted sand and ram the sand first with the peen and the butt of the rammer.
"Strike-off" the excess sand with a strike-off iron.
Place the second molding board on the drag, invert the drag and remove the first molding board.
Dust off parting sand with bellows and place second half of split pattern in position.
Set the cope on the drag, place the sprue pins in position on opposite sides of the pattern so that metal will run quickly into all parts of the mold.
Sift parting sand over the mold, riddle enough sand to cover the pattern, fill the cope with unsifted sand, and ram up the cope, not quite as tight as the drag.
"Strike-off" the cope and remove the sprue pins. With the fingers or a slick, round the sharp corners of the top of the sprue hole so no loose sand will enter the mold when it is poured.
Remove the cope from the drag and invert it on a molding board.
With a bulb sponge, dampen the sand around the edge of the pattern.
Drive the lifter into the wooden pattern or screw the lifter into the metal pattern.
Rap the pattern lightly with the rapper.
Lift the pattern from the mold.
Cut the gate, with a gate cutter, from the mold to each sprue hole. The gate should be wide and should deepen as it advances toward the sprue hole.
Carefully blow out the loose particles of sand and repair the mold with slick and spoon if necessary.
Replace the cope on the drag, and clamp the mold to keep the metal from leaking out at the parting of the flasks.
Melt the metal to be used and pour the mold. Enough metal should be available to fill the mold and sprue. The sprue through which the metal is to be poured is called the "pour hole;" the other is called the "riser." Some molds may have more than one pour hole and riser.

Figure 9

# PLUMB BOB

Machine Shop

J. W. Hicks




Note: Make medium knurls on either style.

Material:

1 piece cold rolled steel 3/4" diameter and 3 1/2" long.

Procedure:

Style A or B

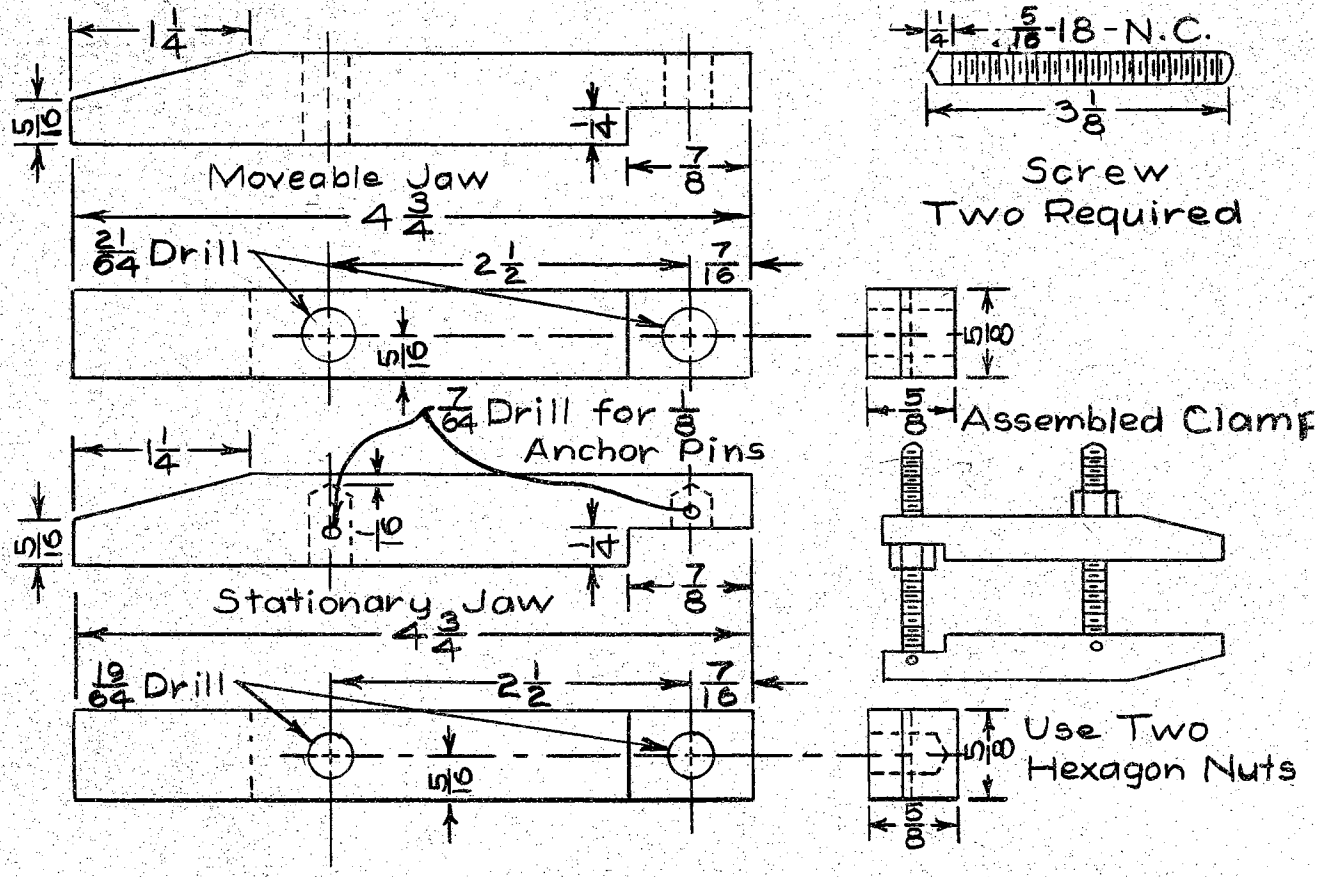
1. Cut off stock about 1/16" over length.
2. Chuck in a three jaw chuck, leave about 1 1/2" of stock protruding out of the chuck.
3. Face the end.
4. Set the compound rest of the lathe for turning the proper angle, then turn the taper.
5. Rechuck stock and face to length.
6. Turn the recess and the 1/4" shoulder.
7. Center drill then drill 1/8" hole about 5/8" deep.
8. Adjust tail stock center so as to support center drilled end.
9. Machine file all surfaces smooth.
10. Medium knurl at proper places.
11. Center punch and drill the 3/16" hole in the recess.
12. Polish.

Figure 10

# PARALLEL CLAMP

Bench Machine Work

J. W. Hicks




Materials:

5/8" X 5/8" X 9 5/8" cold rolled steel
5/16" X 6 3/8" round cold rolled steel
Two 5/16-18 N.C. semi-finished hexagon nuts
1/8" X 2" mild steel welding rod

Procedure:

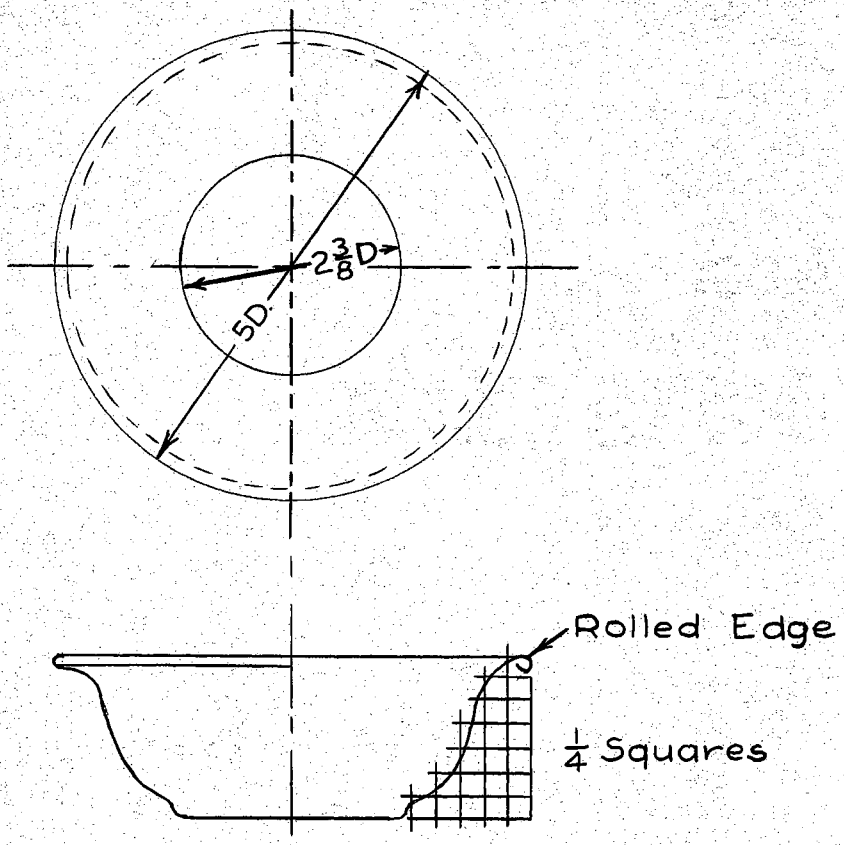
1. Measure and cut jaw pieces to length (allow 1/32" at each end for filing
2. File ends square and to exact length.
3. Lay out all necessary lines on jaw pieces.
4. Center punch for and drill the four large holes.
5. Saw and file jaw pieces to shape.
6. Draw file all over and polish.
7. Cut screw pieces to length.
8. Hold screw pieces in drill press or lathe and file ends to shape while rotating.
9. Cut threads with die just deep enough that the nut will turn freely on the screw.
10. Press screws in stationary jaw. (Be sure they go all the way to the bottom of the hole.)
11. Drill small holes and fit anchor pins in place.
12. File ends of anchor pins level with sides of jaw.
13. Assemble with the hexagon nuts as shown.

Figure 11

# SPUN NUT DISH

Spinning

J.W. Hicks




Material:

20 gauge pewter, aluminum, or copper, 7" diameter.

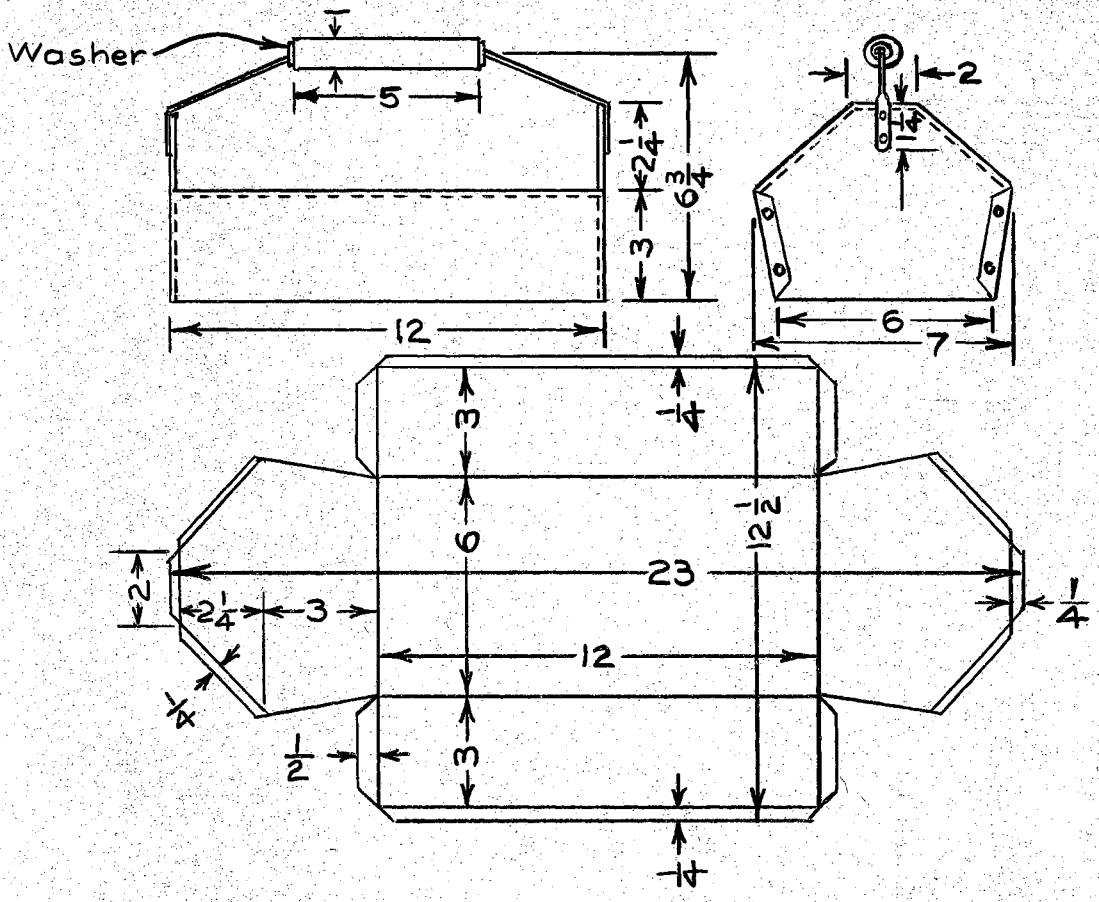
Procedure:

1. Cut a disc of pewter, 7" diameter.
2. Mount the disc on the chuck in the spinning lathe.
3. Center and lubricate the disc.
4. Spin the disc over the chuck.
5. Trim the upper edge of the dish.
6. Roll the edge as indicated above.
7. Remove the dish from the lathe and polish it with fine steel wool.
8. Buff and wax the surface.

Figure 12

# SMALL TOOL TRAY

Sheet Metal Work — J. W. Hicks




Material:

26 gauge galvanized sheet metal 12 1/2" X 23"
18" copper coated round rod
16 1 3/4 lb. tinners rivets

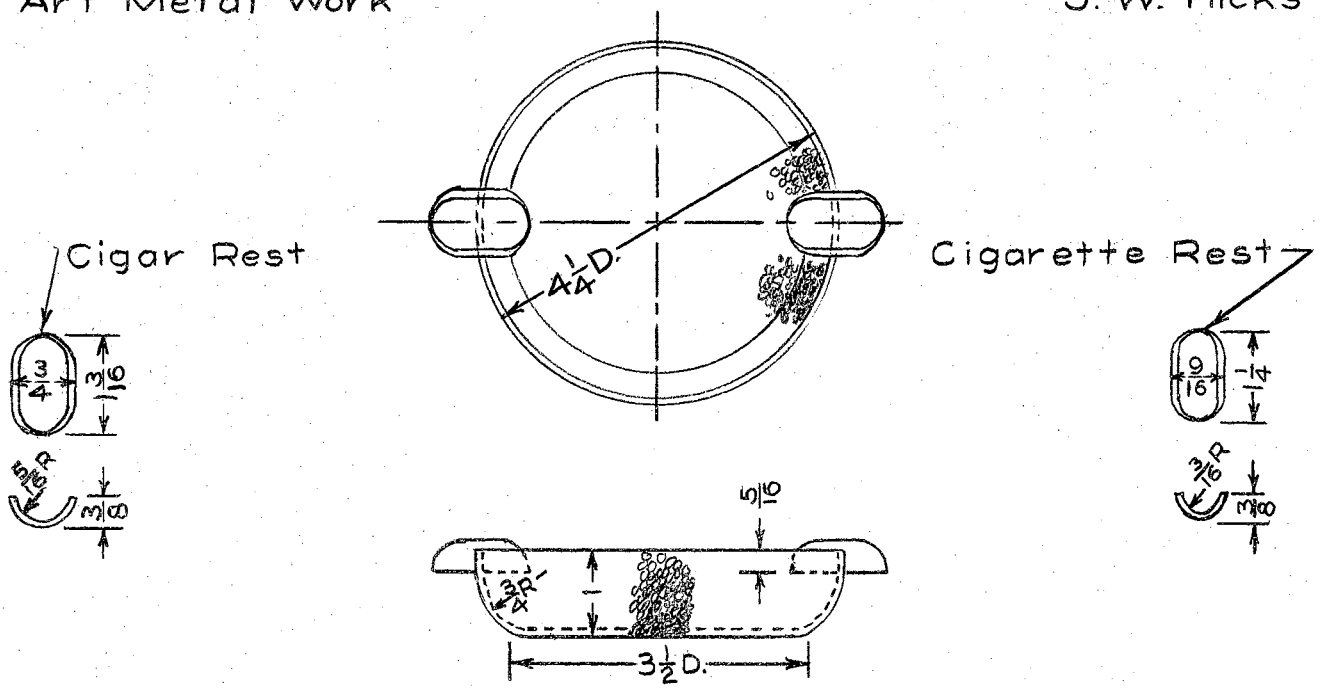
Procedure:

1. Make complete layout, scribing all lines and properly marking all fold or break lines.
2. Check all measurements carefully and call your instructor for his inspection.
3. Cut on outside lines with straight snips.
4. Make hems as indicated and make right angle bends on sides.
5. Bend the sides to shape over a stake or piece of angle iron.
6. Punch or drill rivet holes.
7. Place rivets and form heads with rivet set.
8. Make wooden grip.
9. Make handle and place grip in position.
10. Cut handle to length, flatten ends, drill holes and rivet.
11. Solder washers as indicated.
12. Enamel wooden handle black or any other desired color.

Figure 13

# ASH TRAY

Art Metal Work J. W. Hicks




Material:

1 disc of 24 ounce copper, 5 1/2" diameter.
2 pieces of 24 ounce copper for cigar or cigarette rests.

Procedure:

1. Lay out and cut a piece of 24-ounce copper to 5 1/2" circle.
2. Form the edge of the tray over a sandbag or wood form block. It may be necessary to turn in the upper edge over a metal stake.
3. Peen the outside edge of the tray.
4. Trim the edge of the tray to the desired size.
5. Lay out and cut the recesses into which the rests are to fit.
6. Lay out and cut the pieces for the rests.
7. Form the rests over a small piece of rod or pipe of the correct size.
8. Fit the cigar and cigarette rests into the recesses in the tray.
9. Solder the rests to the tray with either soft or hard solder. If the article is not to be colored, it is better to use hard solder, since it will not be so conspicuous.
10. Clean and polish the tray.
11. Color the metal to an antique finish. This is usually done so the cigarette burn stains will not be so noticeable.
12. Apply a coat of wax.

Figure 14

Typist: Grace Peebles