DEPARTMENT OF THE INTERIOR BUREAU OF EDUCATION .

BULLETIN, 1924, No. 11

MANUAL ARTS IN THE JUNIOR HIGH SCHOOL

В

WILLIAM E. ROBERTS SUPERVISOR OF MANUAL ARTS, CLEVELAND



WASHINGTON
GOVERNMENT PRINTING OFFICE
1924



ADDITIONAL COPIES OF THIS PUBLICATION MAY BE PROCURED FROM THE SUPERINTENDENT OF DOCUMENTS GOVERNMENT PRINTING OFFICE WASHINGTON, D. C. AT 15 CENTS PER COPY

11



CONTENTS.

| Introduction J Purpose of the report 1 Purpose of the report 1 Terminology 2 Juaior high schools in typical cities 3 Special features 3 Generalizations 1 The junior high school 1 Development 13 Claims and objectives 14 Manual arts in the junior high school 15 Functions 15 Determining objectives 15 Methods 18 Basis for determining subject matter 25 Measuring attainment in manual arts 26 Courses of study in manual arts 28 Factors limiting selection and organization 28 Mechanical drawing 29 Mechanical drawing 37 Woodwork 37 General metal work 50 Printing 64 Assignment of subjects to grades and time 68 Program 68 Manual arts rooms 72 Manual arts equipment 77 Mechanical drawing room 78 Elementary woodworking shop 79 Advanced woodworking shop 77 | | |
|--|---|-------|
| Introduction | Foreword | Page. |
| Purpose of the report | | |
| Terminology Jusior high schools in typical cities Special features Generalizations The junior high school Development Claims and objectives Manual arts in the junior high school Functions Determining objectives Methods Basis for determining subject matter Measuring attainment in manual arts Factors limiting selection and organization Mechanical drawing Simple mechanics Woodwork General metal work Printing Assignment of subjects to grades and time Program The manual arts teacher Manual arts equipment Mechanical drawing room Elementary woodworking shop Advanced woodworking shop Print shop Print shop General shop Bibliography Bibliography Bibliography Simple metal shop Bibliography | Purpose of the report | |
| Junior high schools in typical cities Special features Generalizations | | - |
| Special features | Juaior high schools in typical cities | |
| Generalizations 10 The junior high school 13 Development 13 Claims and objectives 14 Manual arts in the junior high school 15 Functions 15 Determining objectives 16 Methods 18 Basis for determining subject matter 125 Measuring attainment in manual arts 126 Courses of study in manual arts 128 Factors limiting selection and organization 128 Mechanical drawing 129 Simple mechanics 137 Woodwork 147 General metal work 159 Printing 168 Program 168 The manual arts teacher 169 Manual arts cooms 172 Manual arts equipment 177 Mechanical drawing room 178 Elementary woodworking shop 179 Advanced woodworking shop 179 General metal shop 181 General shop 181 | | |
| The junior high school Development Claims and objectives Manual arts in the junior high school Functions Determining objectives Determining objectives Methods Basis for determining subject matter Measuring attainment in manual arts Measuring attainment in manual arts Fuctors limiting selection and organization Mechanical drawing Simple mechanics Mechanical drawing Simple metal work General metal work Printing Assignment of subjects to grades and time Program The manual arts teacher Manual arts cooms Manual arts cooms Manual arts equipment Mechanical drawing room Elementary woodworking shop General metal shop General metal shop General shop General shop Sibbliography Sibbliography Sibbliography Sibbliography Sibbliography 13 13 13 13 14 14 14 15 15 15 15 15 15 15 15 16 16 16 16 17 18 18 18 18 18 18 18 18 18 18 18 18 18 | | |
| Development Claims and objectives | | - |
| Claims and objectives | Development | _ |
| Manual arts in the junior high school Functions | Claims and objectives | |
| Functions Determining objectives 16 Methods Basis for determining subject matter Measuring attainment in manual arts 25 Measuring attainment in manual arts 26 Courses of study in manual arts 28 Factors limiting selection and organization Mechanical drawing 29 Simple mechanics 37 Woodwork General metal work Printing Assignment of subjects to grades and time Program The manual arts teacher Manual arts teacher Manual arts equipment Mechanical drawing room Elementary woodworking shop General metal shop General metal shop General shop General shop General shop 83 Bibliography 85 | Manual arts in the junior high school | - |
| Determining objectives | Functions | |
| Basis for determining subject matter | Determining objective | |
| Basis for determining subject matter Measuring attainment in manual arts Courses of study in manual arts Factors limiting selection and organization Mechanical drawing Simple mechanics Woodwork General metal work Printing Assignment of subjects to grades and time Program The manual arts teacher Manual arts cooms Manual arts equipment Mechanical drawing room Elementary woodworking shop Advanced woodworking shop General metal shop General shop Sibbliography Sibbliography | Methods | |
| Measuring attainment in manual arts 26 Courses of study in manual arts 28 Factors limiting selection and organization 28 Mechanical drawing 29 Simple mechanics 37 Woodwork 50 Printing 64 Assignment of subjects to grades and time 68 Program 68 The manual arts teacher 69 Manual arts cooms 72 Manual arts equipment 77 Mechanical drawing room 78 Elementary woodworking shop 79 General metal shop 79 General shop 81 General shop 83 Bibliography 85 | | |
| Courses of study in manual arts Factors limiting selection and organization Mechanical drawing Simple mechanics Simple mechanics Woodwork General metal work Printing Offiniting Offiniti | | |
| Factors limiting selection and organization Mechanical drawing Simple mechanics Woodwork General metal work Printing Assignment of subjects to grades and time Program The manual arts teacher Manual arts rooms Manual arts equipment Mechanical drawing room Elementary woodworking shop Advanced woodworking shop General metal shop General shop General shop General shop Bibliography Simple mechanical drawing 37 47 48 68 68 79 68 70 78 81 69 81 69 81 69 81 69 81 60 81 82 83 84 85 86 | Compact of attacks in manual and | |
| Simple mechanics 37 Woodwork 47 General metal work 59 Printing 64 Assignment of subjects to grades and time 68 Program 68 The manual arts teacher 69 Manual arts cooms 72 Manual arts equipment 77 Mechanical drawing room 78 Elementary woodworking shop 79 General metal shop 79 General shop 81 General shop 83 Bibliography 85 | Fuetors limiting selection and argumentar | |
| Simple mechanics 37 Woodwork 47 General metal work 59 Printing 64 Assignment of subjects to grades and time 68 Program 68 The manual arts teacher 69 Manual arts cooms 72 Manual arts equipment 77 Mechanical drawing room 78 Elementary woodworking shop 79 General metal shop 79 General shop 81 General shop 83 Bibliography 85 | Vachunical drawing | |
| Woodwork | | |
| General metal work | Woodwark | - |
| Printing 64 Assignment of subjects to grades and time 68 Program 68 The manual arts teacher 69 Manual arts cooms 72 Manual arts equipment 77 Mechanical drawing room 78 Elementary woodworking shop 79 Advanced woodworking shop 79 General metal shop 81 General shop 83 Bibliography 85 | Congrel motel work | |
| Assignment of subjects to grades and time Program The manual arts teacher Manual arts rooms Manual arts equipment Mechanical drawing room Elementary woodworking shop Advanced woodworking shop General metal shop Print shop General shop Bibliography S5 | Printing | |
| Program 68 The manual arts teacher 69 Manual arts rooms 72 Manual arts equipment 77 Mechanical drawing room 78 Elementary woodworking shop 79 Advanced woodworking shop 79 General metal shop 81 Print shop 81 General shop 83 Bibliography 85 | | |
| The manual arts teacher 60 Manual arts rooms 72 Manual arts equipment 77 Mechanical drawing room 78 Elementary woodworking shop 79 Advanced woodworking shop 79 General metal shop 81 Print shop 83 Bibliography 85 | | |
| Manual arts vooms | | |
| Manual arts equipment | | |
| Mechanical drawing room | | |
| Elementary woodworking shop: 79 Advanced woodworking shop. 79 General metal shop. 81 Print shop. 81 General shop 83 Bibliography 83 | | |
| Advanced woodworking shop | | |
| General metal shop 81 Print shop 81 General shop 83 Bibliography 85 | Liementary woodworking snop | |
| Print shop 81 General shop 83 Bibliography 85 | Advanced woodworking shop | |
| General shop | General metal shop | 81 |
| Bibliography85 | Print shop | 81 |
| | | 83 |
| | | 85 |

FOREWORD.

The preparation of this bulletin has been made possible through the assistance of my associates in educational work in Cleveland, and through the suggestions and encouragement of a host of professional friends in education work throughout the country. It would be impossible to name here all who have contributed to the work.

The writer is particularly indebted to the superintendent of schools and the members of the board of education in Cleveland, through whose kindness the necessary leave of absence was granted

for making the preliminary survey.

Thanks are also due to Mr. W. R. McCornack, chief of the division of the architect, for his cooperation in furnishing most of the drawings.

THE AUTHOR.



MANUAL ARTS IN THE JUNIOR HIGH SCHOOL.

INTRODUCTION.

Mr. Charles A. Bennett, in summarizing the work of a recent conference, said: "It has been characterized by emphasis on definiteness of aim, definiteness of statement, definiteness of results. evidently a consciousness that we need to know more confidently whither we are tending." It has seemed to the writer that this statement should serve as a text typifying the purpose, method, and

material of the present report.

There is available a large amount of valuable material upon the subject of manual arts in the junior high school? This material is, however, very largely general in character: or, if specific, deals with individual or isolated special features of the work. In treating of specific problems of the administration of manual arts in the schools, there are wide differences of opinion; so that, while the general aims and purposes of the work are understood and accepted, there is much doubt and confusion in the minds of administrators as to the expression of these aims in terms of more specific objectives, methods, subject matter, courses of study, and organization.

PURPOSE OF THE REPORT.

. The purpose of this report is to give somewhat definite answers to the questions: "What are the aims of manual arts in the junior high school, and how are they to be attained in terms of teaching, methods, subject matter, and organization "? The method is the reverse of the customary procedure, that of presenting the broadest type of generalization from which the reader is to particularize. It is rather that of presenting definite data which may be differentiated to meet existing needs and conditions. This method of organizing the report is entirely without intention of being dogmatic, or assumption of knowledge that should not be questioned. Its purpose is rather to deal as clearly and logically as possible with the underlying principles of manual arts in the junior high school and to set up a rather specific course of procedure as a definite point of departure for the organization and development of manual arts work as a basis for such differentiation as may be demanded by local needs and conditions.



TERMINOLOGY.

A brief statement concerning terminology is necessary. It is utterly hopeless to expect to bring order out of the confusion of terms that designate hand activities in the schools or to expect the universal adoption of any term or group of terms that may be presented. The best that can be done is to interpret this terminology in the light of experience and observation, in order that the reader may understand the significance of terms used in this report.

Chief of the offenders is the term "vocational education." It has been broadly misinterpreted to include all of those activities, for whatever purpose, which may be related to handwork or commercial work in the schools. No situation can be more absurd than the classification of hand activities of the elementary and junior high schools under vocational education. In this writing vocational education is understood to include only such forms of public education as deal directly with preparation for a specific life vocation.

"Industrial education" is here interpreted to mean vocational education within the field of industry—specific training in industry.

"Prevocational education" is interpreted to mean study and investigation in a variety of activities which may suggest later vocational education and training in some specific field.

The terms "manual arts," "practical arts," "mechanic arts," "industrial arts," and "manual training" have been variously used to mean the same thing or different things. Some one of them has been used at different times to express different meanings or degrees of meaning. For purposes of this discussion they have been accepted as synonymous and as defining hand activities given in school for general education purposes, providing life experiences within the field of industrial activities which may serve as means of concrete expression in other school work, as opportunity for discovery of individual abilities and aptitudes, and as sources of information which may serve for educational guidance toward the later choice of a life career.

The term "manual arts" is chosen to designate the work presented in this report. "It is the historic term, and defines and limits most clearly the work with which we are concerned; it is more definite than practical arts, which includes household arts and agriculture; it is less restricted than mechanic arts; it avoids the possible confusion of industrial arts with industrial art and industrial education and training. The term "manual training" has in recent years fallen into such disuse that it is doubtful if it will in the future be recognized in educational work.



JUNIOR HIGH SCHOOLS IN TYPICAL CITIES.

As preliminary to this report a survey was made of junior high schools in a number of typical cities and towns, including visits to Detroit and Jackson (Mich.), St. Louis, Kansas City (Kans.), Richmond (Ind.), Buffalo, Rochester, Trenton, Johnstown, Pittsburgh, Minneapolis, Duluth, Flint, Cleveland, and several consolidated or township schools in rural communities.

Brief statements of special features observed, and generalizations and conclusions drawn therefrom, serve as a basis for this study of the problem of manual arts in the junior high schools.

SPECIAL FEATURES.

The outstanding or special features characterizing manual arts work in certain schools or school systems are interesting and often suggestive.

Detroit.—In Detroit the activity adopted for the seventh grade of the junior high school is household mechanics, although the policy varies in different schools, woodwork sometimes being substituted. For the eighth and ninth grades three courses are offered-academic, technical, and industrial. In the technical course four subjects are required-woodwork, electricity, machine shop, and automechanics each 10 weeks, 6 hours per week, with mechanical drawing 2 hours per week. In the ninth grade, pattern making 6 hours and drawing 3 hours per week are given throughout the year. The industrial courses are vocational and include automechanics and machine shop 3 hours each day for one year. Boys must be 15 years of age and bring letters from home stating that they will leave school at the end of one year in order to be admitted to the industrial courses. There are many variations from this program in different schools. A very noticeable feature of the manual arts work of the junior high schools in Detroit is its work in household mechanics, carried out through the medium and organization of the general shop. This work is given in the seventh grade, the adjustment year of junior high school. The organization and equipment are for work under four general topics-woodwork, electricity, sheet metal, and general work, including unclassified subjects.

The work in household mechanics in Detroit is the best observed in this survey. The best examples of the work are conducted under conditions hardly possible of general application in the junior high school. It is doubtful if conditions will often permit of two teachers for a single class in a single room. In Detroit there is manifest evidence of a fine spirit of cooperation, of thoughtful and scientific study and analysis of the work, and of sympathetic administration.



Jackson.—The regular manual arts work of the seventh and eighth grades in Jackson is woodwork, including elementary and advanced woodwork and cabinetmaking. The work is elective beyond the 7R grade and has an optional elective in printing. Election in drawing is required with the woodwork. The activity of the ninth grade is sheet-metal work, elective. An outstanding feature of the work in Jackson is the large amount of time given to electives. About onefourth of the boy's points in the seventh grade may be made through electives, one-third in the eighth grade, and one-half in the ninth This is justified in the objectives of holding the child in · school through interest, of recognizing frankly differences in child nature, of providing not the same but equal educational opportunity, of developing abilities, of discovering powers, tastes, and aptitudes, and of sending forward children to higher education. Manual arts work is required in the seventh grade only. Some rather striking work in vocational or educational guidance was found in Jackson.

St. Louis.—The work in St. Louis is acknowledged to be in the experimental stage. The Ben Blewett School is at present the only junior high school. The manual arts department is not well developed. A course in what is termed "tinker work" is provided for seventh-grade pupils. It consists almost wholly of a familiar type of elementary woodwork. The point emphasized is that the boy chooses what he wishes to make. In higher grades advanced woodwork, wood turning and pattern making, and forge work of a rather traditional type, as well as mechanical drawing, are provided. A well-equipped print shop is doing creditable work. The characteristic feature of the manual arts work of the school is the variety of required subjects and comparatively few electives.

Kansas City, Kans.—In Kansas City, Kans., the manual arts work is all elective. In the seventh grade woodwork is provided, in the eighth grade a course in trade information, and in the ninth grade mechanical drawing. The unique feature of the work in Kansas City is a course in what is termed "trade information for educational guidance" in the eighth grade. As an illustration of this work a journeyman plumber is employed at journeyman's wages, or such arrangements as can be made, to bring his equipment to a . room in the junior high school and give a four-week course in plumbing. The regular trained teacher of the room assists in class management and organization and interprets the work pedagogically to the class. In the same way the class has contact with sheetmetal work, carpentry, electrical work, and autorepair work for periods varying from four to seven weeks, one hour each day. The work in carpentry is given by the regular room teacher. In connection with the work in the various subjects discussions are held under the direction of the regular instructor on estimating costs, specifications, contracts, labor conditions, etc., and visits are made to buildings in process of construction and to factories. The pupils are evidently interested in the work. The results in products are rather meager. The question is whether the information obtained in this way is of sufficiently greater value to justify two teachers to a class. It would seem that well-trained and skillful teachers in the school could accomplish practically the same results.

Richmond, Ind.—In Richmond woodwork is given in the 7B, 8B, and 9B grades, and general metal work in the 7A, 8A, and 9A grades. The primary objective of the work is general education through self-expression and interpretation of experiences in the general field of woodwork and metal work. This is perhaps one of the best examples noted of the organization of manual arts in a small or medium-sized junior high school through the means wof related activities work in a wood shop and metal shop, with incidental provision for drawing related to shop activities. A wellequipped shop was provided for woodwork, including a few typical machines, and a metal shop with general equipment for simple work in sheet metal, electricity, forge, and machine work. Printing was originally included in the program as a third activity, but has not yet been developed. With this subject an almost ideal organization for junior high school manual arts would have been set up. A situation of the kind found at Richmond requires fine organization and skillful teaching.

Buffalo.-Buffalo as yet has no junior high schools, strictly speaking. The distinctive manual arts work seems to be that of the vocational schools. The nearest approach to the junior high school problem is found in several special elementary schools. In one district the seventh, eighth, and ninth grades are organized on the basis of special work. All of the boys interested in shop activities are gathered in one building, those in commercial work in a neighboring building, and those in academic subjects in a third building. Shop activities are located at school No. 47. The striking feature of the work in this school is that half of a six-hour day is given to shopwork and half to academic subjects. The pupils are normal boys who have chosen this type of school work. The academic work is that of the regular grades, reduced to essentials. Pupils receive regular regent's credits advancing them to high school. Through a period of six years the average number of pupils going from the regular grade school to higher work was about 66 per cent. average from this school was 844 per cent. Facilities for manual arts work are poor, and teachers are to be commended for the high order of accomplishment under such conditions. In the seventh grade the shop activities are machine work and sheet metal, one



semester each of 20 weeks, the classes shifting in the middle of the year. In the eighth grade the work is divided into five subjects for periods of 8 weeks each—manual training woodwork, cabinetmaking, pattern making and simple foundry practice, electrical work, and mechanical drawing. The drawing covers about 8 weeks, but is scattered through the year's work. Similar types of work are carried on at school No. 17 under a modified elementary school organization. The organization necessary in a school of this type imposes conditions making impossible the highest type of manual arts work.

Rochester.—In the typical junior high school visited in Rochester four courses are offered-foreign language, commercial, technical, and industrial. The seventh grade is a try-out year in which manual arts work is provided in household mechanics and elementary machine shop. The seventh grade work is given with a view to decision as to the course to be followed in succeeding years. In the technical and industrial courses in the eighth and ninth grades, theoretically pupils have a choice of electives in production in wood, sheet metal, machine shop, electricity, commercial art, printing, and lithography. Organization seems to play a large part in determining elections. The noticeable characteristic of the work is the emphasis placed upon vocational preparation. Pupils in the industrial or vocational course, including overage boys from the lower grades, are given preference in the shops. Club work is an important feature in some of the schools, in which the shops of the manual arts department play an important part.

Trenton.—The objective of the work in Trenton is general education through the development of character-forming habits and aptitudes. Woodwork and printing are given in the seventh grade, sheet-metal work and electricity in the eighth grade, the election in any manual arts subject and mechanical drawing in the ninth grade. Conditions have made it impossible to deal with the overage problem thus far. The work is characterized by a fine spirit of unity and cooperation, carefully planned outlines of work, thoughtful methods and splendid organization, including methods for evaluat-

ing work and estimating progress of students.

Johnstown.—In Johnstown, manual arts work in the seventh grade is exploratory for all pupils in anticipation of elective courses in the eighth grade. Six weeks are given to each—woodwork, metal work, drawing, building construction, electricity, and printing. In the eighth and ninth grades election is made in one of four courses, general, commercial, technical, or vocational. The vocational courses are conducted in the vocational school. In the technical and vocational courses choices are made from four subjects, wood, metal, electricity, building construction, and possibly printing. The junior



high schools are in a transition period from the 6-3-3 to a 6-4-2 plan, a rather exceptional situation due to local conditions. The work of the tenth grade under this organization is to be vocational. The vocational influence characterizes the work of the schools. An interesting feature is the organization of the new Cochran Junior High School Building. The building is composed of six separate units connected by corridors, one of which is devoted entirely to manual arts work. Some rather impressive work in educational guidance was seen at this school.

Pittsburgh.—The Latimer and Irwin Avenue Junior High Schools were visited in Pittsburgh. In the Latimer School, which is typical, . manual arts work in the seventh grade is given in a general shop, equipped for instruction in six types of work-woodwork, wood turning, printing, sheet metal, electrical work, and machine shep. No evidence of the influence of the household mechanics idea was shown in the work of these classes. In the eighth and ninth grades' the pupils elect an academic, commercial, technical, or vocational course. In the technical course boys are assigned to shops for periods of 10 weeks, rotating through eight subjects-autorepair, cabinetmaking, carpentry, electrical work, sheet metal, machine work, printing and sign painting and finishing. The vocatinoal course is planned to give foundations in particular trades. The occupations chosen are cabinetmaking, electrical work, machine work, printing, and sheet metal through two years, pupils working in a single subject. The work in the Pittsburgh schools is almost wholly on the production plan. A fine spirit pervades the work in all the schools visited, due apparently to sympathetic leadership on the part of superintendents, supervisors, and principals. Work in vocational or educational guidance is interesting and suggestive.

Minneapolis.—The manual arts department in each of the junior high schools in Minneapolis is equipped with shops for woodworking, electricity, sheet metal, printing, and mechanical drawing. Pupils are required to rotate through each of these five rooms in periods of 10 weeks, one hour each day, through the entire seventh grade and the first 10 weeks of the eighth grade. In a second round of these shops pupils may elect their work through a first, second, or third choice, depending upon conditions of organization. After the second 10 weeks of the eighth grade, the pupil may in most cases choose whatever subject he wishes, the boy who is about to leave school being favored in choice. Every boy must have at least 30 weeks of drawing as a prerequisite to entering the tenth year of school in any course. The work in Minneapolis is characterized by splendid organization, well-equipped and well-conducted shops, and thoughtfully planned courses of study based upon a careful analysis



of industrial activities into educational working units. Methods and courses are thoughtfully conservative, but sufficiently elastic to pro-

vide for the individuality of teachers and pupils.

Duluth-In Duluth two courses are offered in the seventh and eighth grades in the junior high school, an academic course and a prevocational course, and three courses in the ninth grade, academic, industrial, and commercial. Two periods of shopwork in wood are required in the academic course, conditions in the school permitting, but preference seems to be given to the prevocational pupils. In the prevocational course seventh-grade pupils must take two shop subjects each semester, four within the year, each subject 10 periods each week, woodwork, wood turning, sheet metal, and forge work. In the 8B grade prevocational boys who have finished the required shopwork take science and typewriting. On advice of the principal, certain pupils may specialize on some industrial subject in this grade. In the 8A grade these classes take electricity or printing 10 periods each week. In the industrial course of the ninth grade boys take art, mechanical drawing, and machine woodwork. The outstanding feature of the work in Duluth is the emphasis placed upon the prevocational course, in which 95 per cent of the boys are registered, as compared with five per-cent in the academic course. It should be noted that the work is most strongly emphasized in the seventh grade. The fact is attributed to the large industrial population in the city. The importance of industrial work for overage pupils is recognized, but as a problem incidental to the regularly constituted work of the junior high school.

Flint.—Junior high school organization in Flint has been temporarily abandoned, pending the construction of buildings adapted to junior high school work. Policies have been outlined, but the place of the manual arts is not yet definitely defined. The manual arts program contemplates required work in the seventh grade, with a large use of the general shop. On tentative plans for buildings, two such shops are shown in each junior high school. In the eighth and ninth grades courses are planned in academic, commercial, and industrial work. The shop activities of the industrial course include sheet metal, auto mechanics, woodwork, and electricity, two subjects being required. In the ninth grade a vocational program is planned

for overage pupils and for those leaving school.

Cleveland.—The 18 junior high schools in Cleveland have uniformly equipped departments of manual arts. In the 7B grade a course in simple mechanics is given, organized to rotate pupils through the wood and metal shops. This work is gradually superseding the woodwork formerly given in grade centers and later transferred to the junior high school. The course covers elemen-



tary processes in woodwork, sheet metal, electricity, and general repairs. Woodwork, printing, and general metal work are given in the 7A, 8B, and 8A grades, respectively. As far as possible, optional elective courses are given in the ninth grade in cabinet making. quantity production work in wood, building construction, sheet metal, general metal, and printing. A course in mechanical drawing parallels the work in the 7A to 9A grades, inclusive. The work is required of all pupils in the seventh and eighth grades. eighth grade additional work may be elected. In the ninth grade the work is all elective. Both the craftsman and quantity production methods are used in all grades. Emphasis is given to related work and to correlation with other school subjects through the making of projects combining the work and interests of several departments. The work is characterized by emphasis upon definite educational values and by courses of study, based upon a scientific analysis of objectives, methods, and subject matter. The problem of the overage pupil is recognized as an obligation of the junior high school to be met largely through the manual arts department, but as incidental to, rather than a primary function of, the school.

Consolidated or township schools.—Three township schools were visited, all in Ohio. In Ravenna Township school a single shop is equipped with woodworking benches, four forges, and a bench for harness repair and leather work. Drawing tables are provided in a small adjoining room, really a part of the shop. Elementary woodwork is required in all seventh and eighth grades, and cabinetmaking, forging, harness repair, and mechanical drawing may be elected by pupils of the four high-school grades. In these grades all of the activities are carried on at the same time, under a single teacher, in a large mixed class of pupils, shop and drawing sections changing in the middle of the year. Adjustments must be made to utilize equipment, but it is evident that pupils can secure such work as they wish in the course of the four years. It was noticeable that a large percentage of boys elect manual arts work in all high-school grades.

In the South Euclid Township school the manual arts work is limited to elementary woodwork in seventh and eighth grades and cabinetmaking and mechanical drawing in the high-school grades. Aside from these limitations the conditions are very similar to those in Ravenna. The work in this school is of high grade.

In Parma Township school woodwork and mechanical drawing are given, required in seventh and eight grades, and elective in the four high-school grades. Mechanical drawing is given in all grades through the first semester, and woodwork in the second semester.

In general, working conditions in these schools are very poor, partly due to insufficient financial support. Disorder and lack of



system were in evidence, due undoubtedly in a large measure to conditions under which the work must be conducted. In all instances much more comprehensive work could be given with practically the same original expenditure for equipment and supplies.

It seems evident that the work has been imposed from the outside, with little consideration for existing conditions. Undoubtedly a careful study of the problem of manual activities under rural conditions would be a valuable aid to work in these schools.

GENERA LIZATIONS.

Junior high school an established institution.—There can be little doubt that the junior high school has become an established institution in the organization of our public school system. All of the cities visited in the survey are fully committed to the junior high school organization and program. The extent to which plans have been carried out varies in accomplishment from 90 per cent down to practically nothing, for in some communities which express themselves as fully committed to this type of organization there is very little as yet to show in concrete results.

Junior high school a se parate organization.—There is unquestionably a very general belief in the junior high school as an entity in itself, separate in both buildings and organization, from the elementary work below and from the senior high school above. The junior high school deals with an entirely different problem physiologically, educationally, and socially. Pupils of this period are recognized as different beings from children of the elementary school or from youth of the senior high school. Ideas of social benefits to be derived from association between junior and senior high school pupils have been found to be false. Pupils of the junior high school do not look up with reverence to pupils of the higher grades, and there is little of the spirit of altruism expressed by pupils of the higher grades for those of junior high school age and experience. Superintendents, principals, and teachers are generally of the opinion that the senior and junior high schools are separate problems.

Manual arts objectives.—Considering the problem of industrial activities in the junior high school, there can be no doubt that there is a rapidly growing feeling that the primary objective of manual arts in the junior high school is educational rather than vocational. This thought finds different expression in different parts of the country. In many eastern cities emphasis is laid upon vocational or prevocational aspects of the work. This emphasis is hardly justified by the types of work presented and by results. The atmosphere seems to result from the tidal wave of vocational education which



swept over the country about 1907 and 1908, practically inundating manual arts activities. This influence was never so strongly felt in cities of the Middle West, and there is very little evidence of its influence upon the work of the junior high schools west of Ohio. The work emphasized in the East as vocational or prevocational finds expression farther west in the work for overage and backward boys, a problem incidental to the recognized function of the junior high school. Pressed to a definite answer, school administrators invariably admit that the industrial activities in the junior high school are given primarily for their educational value, have little of prevocational value, and only incidentally vocational guidance value.

Better thinking.—In general, there is a very evident tendency on the part of manual arts workers to think more clearly, to fix definite objectives, to evaluate these objectives, and to meet them in terms of methods and subject matter. In other words, there is a more definite understanding of what we want to accomplish and of the means we should take to reach results.

The overage boy.—There is a clearly recognized obligation on the part of junior high school workers to meet the needs of the overage boy who has failed to master the requirements of the elementary school or who is failing to keep up with the demands of the junior high school. The problem is recognized as incidental to the junior high school, but an obligation nevertheless.

Single courses versus varied courses.—There is a noticeable tendency to eliminate separate courses in the junior high school, such as academic, technical, industrial, prevocational, and commercial, and to establish a general course with variables in the form of electives. Almost universally the work of the seventh grade is uniform, all pupils being required to take manual arts in varying amounts. In the eighth grade definite courses are also required, including manual arts, with opportunity for added elective work in language, manual arts, and commercial subjects. In the ninth grade, there is usually a broader field for electives, which in a general way will indicate future educational or vocational work.

Simplification of terminology.—Another indication of the trend of manual arts in the junior high school is the growing inclination to avoid such terms as vocation, prevocation, and vocational guidance, or to use them, if at all, in the same sense that they are used in connection with other school work of these grades. This unifying of the work of the junior high school is indicated by changes in terminology and by the disappearance of such terms as "technical course," "industrial course," "elective courses," etc.



Consolidated and township schools.—Too few schools of this type were visited to justify conclusions and recommendations of general application. Further information was supplied by the supervisor in Ravenna County, which supplements the visits and suggests general comment.

It is evident that the manual arts in these schools is limited almost wholly to woodwork, and possibly drawing, the Ravenna school being an exception. Practically all of the work is of the traditional type given as manual training in city schools for many years. Comparatively few of the teachers are specialists in manual arts work. Often the work is added to coaching, science, mathematics, or other school subjects. In many instances the teachers have had no experience in manual arts work, and the results in most cases are very inadequate. The suggestion was made that county superintendents should require teachers not prepared for this work to take a summer course in manual arts. A further suggestion was that adjoining townships combine in securing the services of a thoroughly trained teacher, with little or no added cost for school organization, conditions of travel at the present time making such an arrangement feasible. It was further suggested that there should be appointed in each county a competent supervisor of manual arts.

Teachers.—There is every indication of a demand for a higher type of teacher than has been acceptable in the past. Better professional training, more culture, and a broader educational outlook, as well as skillful craftsmanship are demanded. This general tendency was more apparent to the writer in communities of the Middle West than in many of the industrial cities of the East.

Time allotment.—The time allotment for industrial arts in the junior high school varies considerably in different localities. The minimum seems rather definitely fixed at four 45-minute periods per week in double periods of 90 minutes. In a large number of the schools covered in the survey, the minimum was one 60-minute period each day, five days each week. The maximum is about ten 45-minute periods each week, to which four to six periods in mechanical drawing are added in some instances. Many variations as to time allotment in grades and to subjects are found.

Rooms and equipments.—A very wide range of difference is noticeable in buildings, rooms, and equipments for manual arts, from the very poor and inadequate to unjustifiably elaborate and expensive. Very noticeable, even in some of the most expensively equipped buildings, is the generally inadequate provision for the storage of tools, lumber, and general supplies, and provision of space for teachers and for demonstration.



The general shop.—The general shop as a factor in manual arts is certainly in the experimental stage, with ample reasons for question-, ing its value where conditions make possible a different type of organization. But two examples were met in the entire survey that would at all justify its claims to a place in the organization of mannal arts in the junior high school, and in both of these cases the personal element or a local condition were the large factors of success. The prevailing impression of work in the general shop is one of confusion, disorder, and waste of material and equipment and of time and energy on the part of both pupils and teachers. At the present stage of development, successful work in the general shop must depend upon conditions hardly possible in the organization of the junior high school, small classes or two teachers to a class. Except in small schools where the manual arts must be conducted by a single teacher in a single room, an organization which will accomplish more effectively all that is claimed for the general shop is entirely possible. This point is considered later in this report in connection with suggested organization of courses of study.

Vocational guidance.-Vocational guidance, strictly speaking, is not a part of the work covered by this survey and report. Incidentally it has a relation to manual arts in the junior high school, through shop activities, as it should have to other school activities. There is evidence of a marked change in the spirit and purpose of vocational guidance in the junior high school. The trend is in the direction of educational rather than vocational guidance. The best work is directed by trained and competent counselors, most of whose time is given to following up failing pupils and those who leave school, and in endeavoring to guide them in the selection of courses and studies best fitted to their individual needs. Gridance and direction into industry are of minor significance at this period of school life. Aid in discovering what type of educational work is best adapted to the needs of individual pupils is vastly important. Incidentally the counselor directs studies of occupations, based usually upon local industries, from class data secured in the community. Talks by people in industry, moving pictures, and visits to plants, with reports on findings, are important features of these studies.

THE JUNIOR HIGH SCHOOL.

DEVELOPMENT.

The development of the junior high school has an impressive history, an analysis of which is not essential to the purpose of this report. There can be no doubt of the fundamental importance of the

91048°-24-2



junior high school movement. It is the greatest and most farreaching influence in public education in the past three decades. It
is a factor to be reckoned with in every department of educational
endeavor. It is influencing the work of the elementary schools below and is vitalizing and giving new life to the work of the senior
high schools above. It is vitally a ffecting institutions of higher learning through departments of education and for the preparation of
teachers. It is recognized as a factor to be considered by all of the
agencies associated with public education. It is the one really dynamic influence in the traditionally static field of educational work.
Not the least significant feature in the history of the junior high
school is that it must acknowledge a large debt to experiments in
which the manual arts and their interpretation in pedagogical terms
have played an important part.

CLAIMS AND OBJECTIVES.

Many claims are advanced in support of the junior high school, most of which have to do with the mechanics of organization. Four educational functions are generally recognized as important. These deal with purely physical and mental attributes of child life and are therefore fundamental. They find expression through—

1. Recognition of the nature of the child at the various stages of the junior high school as expressed by physical and mental attitudes and aptitudes.

2. Recognition of individual differences.

3. Meeting demands for educational and socializing opportunities.

4. Providing exploratory opportunity essential to guidance.

In child life the junior high school covers the variable, unstable, impulsive period of adolescence, where individuality is beginning to assert itself in varied and erratic, rather than in stable or well directed, ways. This is a fact to be recognized and provided for as a responsibility of the school.

The junior high school focuses attention upon the recognition and direction of the varying manifestations of individuality in the child. Heretofore the efforts have been to meet the problem without sacrificing uniformity. The very nature of child life at this critical period implies the necessity for the greatest possible diversity consistent with efficient organization.

The demands for educational and socializing opportunities in the junior high school are met through the various subjects and related activities of the school and classroom; through more adequate provision for assembly halls, gymnasiums, play grounds, shops, and home economic facilities and the cooperative activities which they present, and through closer contact with teachers of varying personal interests.

The widely diversified life experiences demanded by the organization and activities of the junior high school provide ample scope for the exploration essential to educational guidance which may lead to the discovery of a life vocation.

The objectives of the junior high must find their basis in these fundamental functions.

Response to these demands finds ready expression through the manual arts activities and should be amply provided for in manual arts courses.

MANUAL ARTS IN THE JUNIOR HIGH SCHOOL.

The fundamental aim of the junior high school is to provide equal opportunity for every child, taking into consideration his individual abilities and aptitudes. To all pupils the manual arts present an added means of expression, and to many their most natural means of expression. The ultimate aims of manual arts are those common to all public school education, and the manual arts work and the manual arts teachers should contribute their share to the fulfillment of these aims.

There are two rather definite functions of manual arts work that should especially be considered in the junior high school:

First. To provide a means of general development and education. It may justly be claimed that this work, properly presented, furnishes a general discipline and training of great value, as well as a large amount of information concerning industry and industrial methods which has a distinct educational and social value. This consideration in itself justifies the manual arts as a requirement of the junior high school even though a large percentage of pupils will never become industrial workers.

In this connection the manual arts will make a large contribution to school work both through service it may render in providing related material and in the unifying relation it may have with other school activities. The manual arts should render an important service to the schools in furnishing a great variety of problems and illustrative material for use in connection with other school subjects, and through the direct products of the shops and the drawing rooms, but its chief service will come through a cooperative relationship with other departments of the school. There must be cooperation between teachers, leading to mutual recognition of common factors in their work, to the fixing of common objectives, to the discovery of contacts, and the mutual use of common problems. Association and conference must lead to common understanding of the interrelation of school work. Such projects as the



making and publishing of books, school papers, school dramatics, the school pageant, projects of service to the school and the community, school club work, etc., provide means for interrelated work

in which the manual arts may play an important part.

Second. To provide a medium for educational guidance. Properly organized and conducted, work in manual arts may constitute an important factor in the study of industrial vocations essential to guidance, as well as a fundamental background for later preparation for an industrial vocation, for leadership in industry, or for engineering activities. In this sense the work may be considered prevocational, in so far as the term applies to other school activities which have bearing upon the later life occupation of the pupil. The importance of this feature of the work increases as the grades advance.

A word concerning vocational training seems necessary. It is difficult to follow the reasoning leading to the conclusion that vocational preparation and training is a charge of the junior high school. Such a conclusion is based upon a misunderstanding of the function of the work, and attempts at trade preparation have not justified its claims. The fact that children have been taken from the elementary schools and placed in the junior high school adds nothing to their maturity and life experience. They are still children, and it is too early to determine the type of work best fitted to their individual needs. The school offers insufficient time to develop necessary skill, and, even if this were possible, immaturity debars them from the industries where skill is demanded. None of the results thus far shown justify vocational work in the junior high school. The original conception of the function of the manual arts, with a broader interpretation, is manifestly the dominant conception at the present time. The problem of the overage boy is as yet unsolved. It may be assumed as an incident of the junior high school organization.

It should be stated incidentally that the manual arts subjects, rightly conceived and correct as to methods, lay the foundation for

vocational training in industry.

DETERMINING OBJECTIVES IN MANUAL ARTS TEACHING.

A skillful leader of a conference in the organization of courses of study, of which the writer was a member, made this statement: "No part of the making of a course of study is more important than a clear statement of aims or objectives. Indeed, I can conceive of an effective course of study made up wholly of objectives."

This would certainly mean a new conception of curriculum building, for with such a course of study each detail of work to be mas-

tered would have to be presented as an objective.



The statement does, however, imply a close relationship between objectives and subject matter, which we have failed to recognize in the past. The usual procedure has been to make up an impressive list of high-sounding terms as objectives and then to select subject matter without any serious thought of its relation to these objectives. Our objectives should really grow out of the developmental possibilities and needs of the boy, and our subject matter should be chosen primarily to meet these needs. We should study our proposed objectives for their relative values, and within our larger blocks of subject matter we should carefully select and apportion material in such a way that we may feel assurance that our aims will be attained in proportion to their relative values.

What is meant is that high-sounding objectives mean very little unless there are specific subject matter and methods for developing these objectives.

Distinctive general statements of objectives in the manual arts are difficult or impossible, for without qualification or explanation they are merely statements of objectives common to all educational work.

As an illustration the following general objectives seem to cover a the field of manual arts in public education:

1. To contribute to general intelligence and education.

2. To provide the basis for educational and vocational guidance and training.

As objectives these statements are merely generalizations applicable to the entire field of public education. But as such they are not sufficiently definite for expression in our work. If objectives are to have significance, they must go further than mere generalizations. They must be specific statements of what should be accomplished by specific subject matter. They must be studied for relative values and to determine what subject matter and methods will accomplish desired objectives. Furthermore, at this stage of school life and development, objectives should be expressed in terms of boy attributes and boy accomplishment rather than in terms of material accomplishment or industrial units to be mastered. Each subject is capable of analysis into definite objectives, and these should be clearly before the teacher as a guiding influence, as definite aims to be accomplished in his work through choice of material and adaptation of method. Different subjects may have common objectives, but each will have objectives not found in other subjects.

In formulating objectives for the different manual arts subjects, distinctive and tangible statements can be made. This is illustrated in the following statement of objectives for elementary mechanical drawing.



Two objectives of elementary mechanical drawing seem fundamental:

1. Ability to express simple mechanical ideas clearly in drawing, using accepted methods and conventions.

2. Ability to interpret the ideas of others as expressed in drawing. These might be designated as concrete or tangible results of the work, successful attainment of which should establish a series of less tangible but equally important objectives and results:

1. Mastery of an added means of expression through the acquired ability to use the universal language of drawing.

2. Increase in power of correct and accurate expression.

3. Increase in power of visualization.

4. Development of accurate and precise thought habits.

5. Development of the reative instinct.

6. Development of appreciation through ability to intelligently interpret mechanical phases of environment.

7. Broadening the educational and social vision through a better understanding of industry.

8. Aid to other school activities.

9. Preparation for more advanced technical work.

10. Broadening the field of vocational choice.

Here we have a more specific statement of objectives from which to organize this definite unit of manual arts subject matter.

The most important work of the teacher in the administration of a course of study in the manual arts is a just evaluation of objectives, expressed in terms of analysis of principles involved, a wise choice of subject matter to cover these principles, and skillful teaching. It means focusing attention upon the development of elements of character rather than upon the drawing of a base block or a pulley, or the making of a table or a water pail; these are merely means to an important end.

This means that the teacher must select his subject matter and develop his methods with a definite assurance that his work is so balanced as to give a justly proportioned emphasis to all of the elements set up in his statement of objectives.

METHODS IN MANUAL ARTS.

Specific methods are suggested in connection with detailed courses of study later in the report. General statements applicable to all courses are here considered.

Broadly speaking, there are two methods of accomplishment in the manual arts:

First, the individual craftsman method of production. Second, the method of quantity production.



THE INDIVIDUAL CRAFTSMAN METHOD OF PRODUCTION.

The individual method has been accepted since the beginning of manual training work; and its process is generally understood. It implies systematically organized courses of work, based upon fundamental principles, sequentially arranged, and applied in projects made by individual pupils. By this method a knowledge and mastery of tools and fundamental processes is acquired, and if the courses are well devised, opportunity is provided for originality and initiative and for the development of appreciation and the creative impulse through selection and design. This method also fosters a just pride in individual achievement. The individual method will continue to be fundamental. It is basic, and the successful conduct of the manual arts work depends upon it.

THE METHOD OF QUANTITY PRODUCTION.

Quantity production has no place in the manual arts on the basis of material product alone. The educational value of the work is the first consideration.

There can be no doubt about the educational value of properly conducted production work. A large amount of information about industry and the industrial world can be given which is hardly possible under the craftsman method of teaching. Much of educational value comes through the discipline of organization and cooperation, and there are many opportunities for the development of natural aptitudes and abilities along the line of planning and leadership. Through a simulation of the methods of industry there may be presented a large amount of knowledge which has a direct informational and social value and which may be made a means of educational and vocational guidance.

As supplementing the craftsman method, any project in a well-organized course may be worked out on the quantity production plan. As a course in itself, there must be a rather definite outline of work based upon a more or less definite sequence of principles involved in selected projects, which may serve as standard products. For standard projects or products, substitutions may be made as needs require, provided they meet educational requirements.

The projects given under production methods, as in other manual arts work, should have educational value and be adapted to the average ability of the pupils and to the shop equipment. They should appeal to the interests of the pupils through the school, the home, or the community. The projects should be carefully analyzed to determine the nearest simulation of industry that can be adopted in the execution of the work. Some work upon the quantity pro-



duction basis should be given in all grades of the junior high school.

Briefly stated, the following fundamentals should be recognized in

the development of quantity production projects:

1. First and foremost, the projects should have educational value and be adapted to the average ability of the pupils and to the shop equipment.

2. Projects should be selected that appeal to the interests of the pupils through the schools, the home or the community.

3. Problems that are to be worked out on a quantity production basis should be subjected to a painstaking analysis to determine the commercial, economical and practical means of performing the work.

4. Machinery, jigs, fixtures, etc., should be used when possible and

practicable.

5. The work should be carefully organized, as far as possible by the pupils, under the supervision of the instructor.

6. The organization should be such that each pupil shall partici-

pate in all operations.

7. Repetition beyond the point of mental activity and interest

should be avoided.

8. Shop forms, such as shop orders, time cards, production control sheets, and other approved industrial devices, should be used as far as practicable.

9. The use of blue prints, drawings, specifications, and instruction or job sheets should be an important feature of production

work.

10. In the use of machinery emphasis should be given to safety methods.

The difficulties of handling quantity production work in the schools are due mainly to two things:

1. Failure to recognize differences in conditions of work and aims in the factory and the schools.

2. Lack of effective organization in the school shop.

Comparing conditions in industry and the school we find in industry largely skilled adult workers, modern specialized equipment, an eight-hour day, one learner to perhaps 20 skilled workers, steady work of the individual on one kind of work, the work of primary importance in the life of the worker, the aim a material product; in school unskilled children, very limited equipment, at most one and one-half hours work each day, 20 or more boys to one teacher, constant shifting of workers so all may participate in all operations, the work but one of many equally important interests, the aim a boy product. Under such conditions there can be only a simulation



of the methods and results of industry in the schools. For this reason the teacher should make a definite effort to explain to the pupil the actual working conditions prevailing in industry. Where possible the classroom work should be supplemented by visits to industrial plants.

Successful quantity production work depends upon systematic organization; upon a more or less definite sequence of principles, a carefully selected sequence of projects involving these principles, and careful-class organization.

As aids to organization, a series of shop forms is herewith submitted. A production control chart is also suggested. This chart is to be reproduced as a wall chart about 3 feet high. Large figures placed in the spaces indicate the number of pieces assigned under each operation. Small figures above the larger figures may be used to indicate the order in which the pupils follow the assignments. Papils check assignments as finished. A glance at the chart at any moment shows approximately how many of each operation have been completed and how many pupils have participated in each operation.

Since the methods of quantity production are not well defined or understood in their relation to manual arts, they have been considered somewhat in detail.

The four shop forms as here printed are much reduced in height. The originals are printed on paper 6 inches wide by 9 inches high, with added space or ruling.

WEST JUNIOR HIGH SCHOOL

SHOP ORDER

| Order No. | | Dept. | of | |
|------------|--------|-------|----------|--|
| Ordered by | | Deli | ver to | |
| Date | Wanted | | Promised | |
| | | | | |

Specification:

[The original blank had a 5-inch space here.]

| Checked by | Rec'd in Shop |
|------------------------|-------------------------------|
| Make out in duplicate, | The state of the state of the |
| copy to go to Shop. | |
| | |

Cleveland Public Schools

Form I-I



WEST JUNIOR HIGH SCHOOL JOB TICKET

| | Wan | ted | | | Promised | | | - |
|-----|---------------------------------------|---------|--------|------------|---|-------|---------|-------|
| tem | Pc's Thick-ness Width Length Material | | | Material , | Ch'k | Ren | narks | |
| | | | | | | | | |
| | | | | | [The original blank had a 6-inch space here.] | | | |
| 3 | | | | | • | | | |
| | | | | | | | | |
| | | | chools | 3 | | | | |
| | Dep | t. of _ | | west | T JUNIOR HIGH SCHOOL TIME CARD Workman | | | • |
| ī | Dep | t. of _ | r Lo | WEST | CIME CARD Workman | Iburs | . ('nst | Grade |
| I | Dep | t. of _ | r Lo | WEST | CIME CARD Workman | | | Grade |
| 1 | Dep | t. of _ | r Lo | WEST | OPERATION H | | | Grade |

Form 1-3



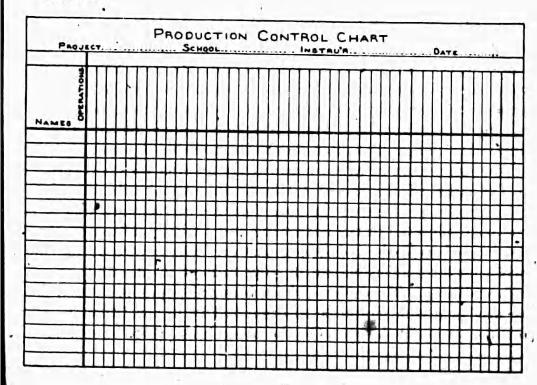
WEST JUNIOR HIGH SCHOOL

SUMMARY SHEET

| Order No. | | |
|---------------------------------------|-----------|-----------|
| Ordered by | Completed | Delivered |
| Specification: | | |
| | | |
| Materials | | |
| · · · · · · · · · · · · · · · · · · · | | - |
| | | |
| | - | |
| | | |
| Operations | . Time | |
| | | |
| | 1 | 4-1 |
| | | |
| Indirect Cost per cent | | |
| Total Cost | | |
| Profit per cent | | |
| Selling Price | | |
| Discount | | |
| Net Price | | |
| | | |
| Cleveland | | |

Cleveland Public Schools

Form 1-4





DETAILS INCIDENT TO METHOD.

Incident to the development of these general methods are many devices essential to successful teaching of the manual arts. Most important are those that multiply contacts between teacher and pupils, for from these personal relationships come fundamental-values of the manual arts work. Demonstrations by the teacher and pupil, brief talks, conferences and discussions upon the work and related subjects, assignment of problems for investigation and report, individual help and advice, the use of references, drawings, specifications, instruction or job sheets, collection and use of illustrated material, and utilization of special interests of the pupil are all devices leading to this personal relationship. Emphasis upon one of these devices to the exclusion of others uses it as a prop rather than as a lever. The experienced teacher of manual arts is inclined to view with concern the tendency to single-track methods.

Particular importance should be attached to correct practice based upon the standards of the industry which serves as the basis for the work. Formerly variations from accepted practice were justified on the ground that the practice of the craftsman was not always the best practice for educational work. To-day the tendency is to measure accomplishment in terms of industrial and commercial practice and standards. The right way is usually the best way, and conversely the best way is the right way.

Skillful workmanship is given much less emphasis than its educational value demands. The best that the pupil is capable of doing is the least that should be expected of him. This is a fundamental principle of teaching in all other work and of life in general. The normal boy takes pride in the results of skillful workmanship, and every possible device should be used to help him to know and strive for a high standard. It is easier to cultivate good habits than to overcome bad habits. Skillful workmanship is usually the expression of intelligent thought, and both are valuable assets in the affairs of life. Certainly both are a valuable foundation for later industrial training. Too often arguments against a demand of skillful expression in manual arts are manifestly an alibi for poor work.

The value of the use of textbooks in manual arts is seriously questioned. It is one of the good fortunes of the work that it has not been subjected to the narrowing and limiting influences of predetermined methods and subject matter. The nature of the work precludes texts as insufficient in scope to meet the demands of varying conditions. The outlines of teachers and pupils, with such notes as may be given, should be so organized as to constitute the texts for the various subjects. On the other hand, there should be the



widest possible range of reference books and material to which the teachers and pupils alike may turn for information and help.

Another point of importance pertaining to methods in the manual arts is correlation of this work with other school subjects. This is perhaps one of the most difficult problems of relationship between the regular and special work and the regular and special teachers of the school. The difficulty is not so much in finding material and contacts for correlation between the manual arts and other school activities as in finding the organization and securing the cooperation that will get it across. It has been tried without significant success. The traditional methods of decades are against it. Practical life experiences and relationships as illustrations are impossible to the average teacher. Their significance and value must be demonstrated primarily by the manual arts teacher in the manual arts room. The problem is worthy of intelligent investigation and study.

BASIS FOR DETERMINING SUBJECT MATTER.

The organization of subject matter in the manual arts for the junior high school means the selection and adaptation of existing activities in industry to the educational needs of children of the seventh, eighth, and ninth school years. The process must be one of selection and adaptation upon the basis of an understanding of the physical being, mental attitudes, and capabilities of children of these grades.

The traditional method has been that of selecting typical trades or trade units, analyzing these into fundamental processes, and devising methods of presenting to classes. This method is a tradition inherited from the early days of manual training, strengthened by the wave of vocational education which later submerged the manual training work and which is still the prevailing influence. While it is probably the best procedure in the selection of subject matter for special and trade instruction, it fails to meet the requirements of manual arts in the junior high school. It prescribes the work and prohibits significant accomplishment in more than a very few of the industrial activities adapted to junior high school work.

A broader conception of manual arts work is presented in what might be termed related activities included within certain of the larger units of industry. A study of industrial occupations reveals the fact that almost all are included in or closely related to the activities that have to do in some form with wood, metal, and the materials of the typographic arts. It would seem logical, therefore, that activities adapted to manual arts in the junior high school, with the major objective of general education, should find their best expression through related work in the three fundamental occupational



fields of woodworking, metal working, and printing. Within these fields, including drawing, will be found latitude for the broadest possible interpretation or expression of the manual arts. This basis of organization is further justified on grounds of economy in space and equipment.

MEASURING ATTAINMENT IN MANUAL ARTS.

There is at present a general interest in establishing measurable standards of attainment in manual arts. The interest centers largely in attempts to determine what pupils should know and be able to do as a result of shop experiences. The commonly accepted statements of things to be accomplished and knowledge to be acquired manifestly mark them as incidents to well-organized courses in manual arts work. Their significance lies in the fact of leading us to clearly state our objectives of accomplishment in manipulative processes and information, to fix upon the methods and processes necessary to reach our objectives, and to provide the means for measuring attainment.

It is not essential that the information or processes be classified with reference to industries. The facts of importance are that we determine what the pupils need to know, that our courses be planned to give information and skill with a definite purpose, and that they provide for a definite measure of attainment.

A point to be emphasized is that the type of work suggested does not furnish subject matter for a particular time or place in manual arts work. It should be incidental to all courses throughout the

years of the junior high school.

Suggested subject matter takes largely the form of manipulations, repair work, and study of materials. The following statements, taken at random, are typical. Extended lists are given later in connection with an outline of work in simple mechanics. Not all of the topics listed will be considered important. Others may be added.

Saws:

Know kinds. Know use of each.

Saw a board to measure.

Saw a round hole with a compass saw.

Nails and screws:

Kinds commonly used. How designate sizes.

Drive and draw hails. Drive screws.

Sharpening:

How to sharpen a knife, plane, auger bit, chisel, shears, lawn mower,

etc.

Kind of cutting edge required for each

Soldering:

Tin h soldering iron.

Solder holes in a piece of tin plate.

Solder joints in pieces of tin plates.

Solder household utensils.

Solder a connection.



Faucets:

Reseat faucets.

Replace worn washers (hot and cold water).

Rewasher automatic faucet, compression bath cock, fuller ball faucet, ball cock in closet tank.

Meters:

How to read gas, water, electric.

How to figure costs.

Windows:

Cut glass to size

Replace broken lights (putty or wood strips).

Renew weight cords or chains.

Repair or put up window shades, rollers, brackets, curtain rods,

Turn shades (how fastened).

Make a screen to fit a window.

Finish:

Kinds of finish.

How to apply paints and simple finishes.

How to clean and refinish floors.

When and how to use paint, stain, shellac, varnish, filler.

Mix and use whitewash.

Apply kalsomine.

How to remove varnish, shellac, paint, etc.

Care of painting tools.

Rebronze pipes or radiators.

Apply enamel (wood and metal).

Repair holes in plaster.

Metals:

Kinds commonly used—sheet iron, cast iron, wrought iron, steel, tin, brass, copper, aluminum.

When each kind is used.

Cut iron with cold chisel.

Hack saw and file a piece of iron stock to size.

Drill in iron.

Tap a small thread in piece of iron.

Make a rectangular hole in a piece of iron.

Make a knife blade.

Make a bracket (metal) for shelf.

Cement:

Different mixtures of cement, sand, and gravel.

When each is used.

Mix cement.

Electrical work:

Make dry and wet cell, use of each.

Kinds of splices, when each is used.

Solder a connection.

Connect one push button, one bell, and one battery.

Connect one push button, two bells, and one battery.

Connect two push buttons, one bell, one buzzer, and one battery.

Adjust breaker points in a bell or buzzer.

Wire one switch to operate one lamp.

Wire two three-way switches to operate one lamp.

Install a transformer.

Wire a lamp socket.



Electrical work-Continued

Wire different attachment plugs.

Wire a small lamp.

Make a heating element.

Locate and refill a burned-out fuse.

Learn principal rules for electric wiring.

Types of insulations.

Connect an extension cord.

Trace door-bell trouble.

Repair an electric iron, toaster, heater, curling iron, etc.

Drawing:

Make simple sketches.

Make simple working drawings.

Read simple working drawings.

COURSES OF STUDY IN MANUAL ARTS.

The selection and organization of courses of study in the manual arts is premised upon previously determined objectives, methods, and subject matter, within the limitations fixed by maturity and development of pupils and conditions under which the courses must be administered.

FACTORS LIMITING SELECTION AND ORGANIZATION.

The selection of subject matter in the manual arts is limited by the accepted meaning of the term to the field of industrial activities. In outlining the following courses the necessity for a more or less orderly analysis of principles and arrangement of subject matter as background for differentiation and adjustment to varying conditions is assumed. It seems obvious, from the principles before established, that courses should have a practical content to be presented in compliance with the standards and practices of industry.

In general the courses here outlined are organized upon the group plan, the various groups presenting limited fundamental principles which may find practically unlimited application in a great variety of projects. With this plan, vertical development may be compassed within a minimum of time, with opportunity for horizontal development where added time is required or elected. The projects or problems named in the groups are intended to be suggestive. Any work may be substituted that meets the fixed requirements of the group.

Provision should be made in every course for extension of the household mechanics idea in its application to repair and construction work for the school or home, and for cooperative effort in the working out of school projects, within the limitations of time and the ability of the pupil.

The aim is definite organization of courses so broad and elastic as to meet the requirements of widely varying conditions.



MECHANICAL DRAWING.

General statement.—Mechanical drawing is an important element of the universal language of drawing. A knowledge of its fundamental principles, with ability to apply them in interpreting thought, should constitute a part of the educational equipment of every adult. It is important as a unifying influence in the manual arts work of the junior high school, as well as an aid to other school activities. It has a thought and subject matter content of value in itself, which can be made of greater service to the pupil and to the school if taught as a related subject in a drawing room, rather than as an incident in a variety of shops.

An attempt to formulate an elementary course in mechanical drawing meets with difficulties inherent in the development of the subject itself. The underlying principles are derived from descriptive geometry, a highly abstruse mathematical subject particularly emphasized in technical schools of engineering. As a result, practically all of the works upon mechanical drawing are dominated by the traditions and teachings of these schools. So strong is this influence that it is exceedingly difficult for the technically trained engineer or teacher to approach the subject with methods sufficiently simple to meet the needs of immature pupils.

The problem, then, is one of determining the simple elements of the subject and of presenting these in terms of the needs and capabilities of children of the earlier junior high school grades.

OBJECTIVES.

Two objectives of elementary mechanical drawing seem fundamental:

- 1. Ability to express simple mechanical ideas clearly in drawing, using accepted methods and conventions.
- 2. Ability to interpret the ideas of others as expressed in drawing. These might be designated as concrete or tangible results of the work, successful attainment of which should establish a series of less tangible but equally important objectives and results:
 - Mastery of an added means of expression through the acquired ability to use the universal language of drawing.
 - 2. Increase in power of correct and accurate expression.
 - 3. Increase in power of visualization.
 - 4. Development of accurate and precise thought habits.
 - 5. Development of the creative instinct.
 - 6. Development of appreciation through ability to intelligently interpret mechanical phases of environment.
 - 7. Development of habits of neatness, care, and accuracy.

- 8. Broadening the educational and social vision through a better understanding of industry.
- 9. Aid to other school activities.
- 10. Preparation for more advanced technical work.
- 11. Broadening the field of vocational choice.

The most important work of the teacher in the alministration of this course of study is the just evaluation of these objectives, expressed in terms of analysis of principles involved, a wise choice of subject matter to cover these principles, and skillful teaching. This means focusing attention upon the development of the elements of character rather than upon the drawing of the base block, or the wheel, or the taboret: these are merely means to an important end:

METHOD.

1. General.—The primary aim of the course in mechanical drawing for seventh, eighth, and ninth grades is to develop in the pupil the ability to represent objects in working drawings. The mere making of drawings is in itself unimportant. The simple principles should be mastered so that the pupil may make his own application to the problem which confronts him.

2. Organization and development of the course.—The course is organized into "groups" presenting principles, under "purpose," "suggestions for lesson outlines," and "plates."

The process of developing the course implies a sequence of difficulties in subject matter and a sequence in presentation. The first is suggested by the "groups" into which the course is divided; the second must be the work of the teacher in building up a series of progressive steps in planning the individual and successive lessons. Too much emphasis can not be placed upon the carefully planned

The process of development should suggest certain progressive steps covering the course and leading to a mastery of simple working drawings, such as:

(a) Discussion of the relation of working drawings to industry and life experiences.

(b) First lesson or lessons more or less dictation, teacher working at the blackboard and pupils following.

(c) Work from blackboard sketches made in discussion, the teacher following the pupils.

(d) Pupils work from blackboard sketches without instruction by the teacher.

(e) Drawing from individual sketches of models by the pupils with suggestions from the teacher.

- (f) Drawing from sketches of simple models by pupils without instruction.
- (g) Work from specifications.

Representation in mechanical working drawing is based upon the principles of descriptive geometry, or orthographic projection. These principles are fundamental, and their development should be constantly in the mind of the teacher throughout the course.

The traditional method of developing these principles has been through the medium of abstract geometrical figures. The desired end may be better accomplished through the use of concrete objects represented in view and working drawings. Avoid all reference to planes of projection, lines of intersection, etc. Designate the different views of the object as top view, front view, and end or side view, because they are what we would see if we looked at the object from the top or the front or the side. Show, or lead the pupil to discover, that there are definite reasons for the placing of the different views, such as clearness of interpretation, facility in making the drawing, convenience in placing dimensions, etc.

Free-hand drawing of a very simple character, both in working and perspective sketches, should have an important place in the course. Suggestions will be found in Perspective Sketching from Working Drawings, by Mathewson, and Mechanical Drawing in the High School, by French.

Emphasis should be given to lettering. A later page is devoted to this subject, giving standard letter copies.

It is understood that the constructive work of the shop should be the fundamental basis for work in mechanical drawing. Shop problems with which the pupil is immediately concerned, or with which he is familiar, should furnish the drawing subject matter when possible. It is not essential that a shop drawing be limited to the principle under consideration at any particular point in the outline. Principles may appear in any drawing, which are assigned for more careful consideration to a later place in the outline.

3. Devices.—Use models of the objects to be represented in the drawings. In the early stages of the work a large model in the hands of the teacher may best serve the purpose. Later, the pupils should work from individual models.

Much illustrative material should be collected by the teacher in the form of drawings, blue prints, and particularly objects from which the pupils may work, such as models, tools, machine parts, etc. Pupils should be encouraged to furnish such material.

Other devices for developing self-expression will occur to the teacher, such as the constant use of blackboard sketches, working from perspective and isometric drawings, etc.



4. Technique.—Particular attention should be given to the technique of drawing—the correct use and care of instruments, and materials, methods of procedure, neatness, care and accuracy,

quality of workmanship, etc.

5. Inking.—In practice ink work is confined very largely to tracing. For practical and informational purposes the pencil drawing meets most requirements. In general, ink work should not be introduced until the work of the ninth grade is well under way. Occasionally exceptional boys in the early ninth grade, or even in the eighth grade, may be allowed to ink their pencil drawings.

TIME SCHEDULE.

A minimum of one double period of 90 minutes each week is recommended for required work in the 7A, 8B, and 8A grades, with provision for election of one added double period of 90 minutes in the 8B and 8A grades, and the election of three double periods of 90 minutes in the 9B and 9A grades, ninth grade election in drawing to be required if ninth grade shopwork is elected.

The amount of work that can be covered in a given grade or given period of time is, of course, problematic. With the same conditions, the amount will differ slightly under the instruction of different teachers. It is, therefore, essential to the organization of the work in a system that definite limitations be fixed to the principles that shall be covered in any one grade. It is recommended that the work of the 7A grade be limited to Groups I and II; the 8B grade to Groups III and IV; the 8A grade to Groups V and VI; the 9B grade to Groups VII to X inclusive, and the 9A grade to succeeding groups.

Within these vertical limitations will be found in supplementary work, or in shop or other correlated work, ample scope for horizontal development both for required and elective work. Under this arrangement classes that have for any reason missed the work of an earlier grade may, within a limited time, cover the principles of

earlier work as well as those of the present grade.

LETTERING.

1. General.—No part of a drawing is more important than the lettering, and every effort should be made to develop, on the part of the pupil, skill and appreciation of good practice in lettering.

2. Method.—All lettering should be strictly free-hand. In general, skill should be acquired through the lettering of titles and records on the various drawings. It may be advisable to have additional practice in dealing with the principles underlying the construction of letters. Such instruction should be given in the form of



small practice sheets, accompanied by blackboard illustration and the use of letter copies. Lettering plates as such should be avoided. Use horizontal guide lines and in earlier practice, at least, vertical or inclined direction lines.

- 3. Style of letters.—The standard alphabets to be used in lettering should be the gothic capitals and Reinhardt lower-case letters, vertical c^n inclined 30° to the vertical. Standard height for the large caps and figures should be $\frac{3}{16}$ inch and for small caps and lower-case letters $\frac{1}{8}$ inch. In the seventle and eighth grades the gothic caps should be used exclusively; in the ninth grade the lower-case letters may be used for notes.
 - 4. References.—The following references are suggested: Essentials of Lettering, by French and Meiklejohn, Engineering Drawing, by French, Chapter V.
 - 5. Standard letters .-

ABCDEFGHIJKLMNO PQRSTUVWXYZ ABCDEFGHIJKLMN OPQRSTUVWXYZ abcdefghijklmnopqrstuvwxyz 1234567890& 2 4 18

FIGURE 1 .- Standard letters,

STANDARD SIZE OF DRAWINGS.

The standard size drawing should be 9 by 12 inches, with border lines placed ½ inch from the upper, lower, and right-hand edges, and 1 inch from the left-hand edge. When a larger drawing is needed it should be 12 by 18 inches, with border lines placed ½ inch from upper, lower, and right-hand edges, and 1½ inches from the left-hand edge.

RECORD STRIP.

The record should be placed in the lower right-hand corner of the drawing and should be as restricted in vertical space as possible.



A record strip § inch high and 10½ inches long is suggested, with two lines of lettering. The lettering in the record strip should be gothic capitals, vertical or inclined 30° to the vertical. See plate.

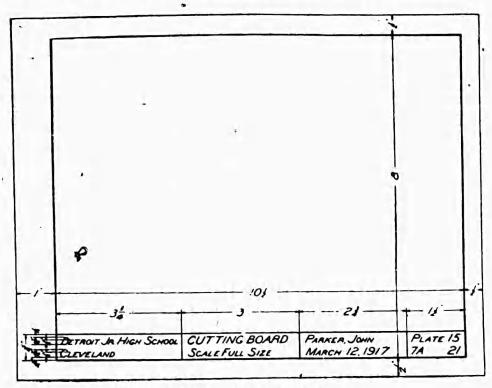


FIGURE 2 .- Standard drawing.

OUTLINE.

In the following outline "suggestions for lesson outlines", are omitted.

Group I.

Purpose: Simple two-view drawings of objects in horizontal and vertical lines with all edges visible.

Plates:

Plate I-a.—Base block, 1 by 3 by 6 inches, or the sandpaper block, 1 by 2½ by 4 inches.

Plate I-b.—Clamp or rabbeted block, 1 by 3 by 4 inches, rabbet 1 by 1 inch.

Additional plates.—Added plates should be of selected problems involving the principles of this group, at the option of the teacher, governed by the time allotted to required or elective work.

Group II.

Purpose: Drawings involving invisible edges in two or three views. Plates:

Plate II-a.—Hollow block.

Plate II-b.-Guide block or single hollow tile.

2 w 4

Plate II-c.—Box.

Additional plates.—Added plates should be of selected problems and appropriate shop drawings involving the principles of this group, at the option of the teacher, governed by the time allotted to required or elective work.



Group III.

Purpose: Simple view and working drawings involving inclined lines.

Plates:

Plate III-a.-Shelf bracket.

Plate III-b.-Angle block.

Plate III-c.-Match-box holder or paper weight.

Plate III-d.-Garden marker.

Additional plates.—Added plates should be of selected problems and appropriate shop drawings involving the principles of this group, at the option of the teacher, governed by the time allotted to required or elective work.

Group IV.

Purpose: Simple view and working drawings involving circles.

Plates:

Plate IV-a.-Solid and hollow cylinders.

Plate IV-b.-Tray or mallet head.

Plate IV-c.-Circular frame or wheel.

Plate IV-d.-Cast-fron washer or collar.

Additional plates.—Added plates should be of selected problems and appropriate shop drawings involving the principles of this group, at the option of the teacher, governed by the time allotted to required or elective work.

Group V.

Purpose: Working drawings involving simple tangents.

Plates :

Plate V-a.-Chain link.

Plate V-b.—Slotted link, magnet, or ring.

Plate V-c.-Bread board,

Plate V-d.-Sleeve board.

Additional plates—Added plates should be of selected problems and appropriate shop drawings involving the principles of this group, at the option of the teacher, governed by the time allotted to required or elective work.

Group VI.

Purpose: Shop problems involving the principles which have been thus far introduced.

Plates:

Plate VI-a.-Broom holder.

Plate VI-b .- Bird house.

Plate VI-c. -- Cookie cutter.

Plate VI-d.-Cup.

Additional plates—Additional plates should be selected from appropriate shop or other problems, at the option of the teacher, governed by the time allotted to required or elective work.

NINTH GRADE DRAWING.

Assuming the beginning of ninth grade drawing at this point, the election of this subject is more or less indicative of a future vocational choice. Its aim is therefore partly prevocational, preceding preparation for trades or a higher technical education. For this reason it seems necessary to deal more fully with the technique and



conventions of mechanical drawing, and with the reasons for their use, than would be required for a purely educational presentation of

withe subject.

Emphasis should be given to method in letter construction, to perspective sketching for the purpose of giving added means of expression and help in interpretation, and to orthographic free-hand sketching as preliminary to each mechanical drawing.

The theory of projections should be given some consideration as explaining the principles upon which working drawings are based.

A limited number of geometrical construction problems which have concrete application in drawing, cabinet, pattern, and machine work should be introduced.

Working drawings of greater difficulty, in detail and assembly, should be emphasized, teaching more fully accepted conventions for working drawings.

Group VII.

Purpose: Study of the principles of projections as related to working drawing.

Plates:

Plate VII-a.—Problem 1: Square prism. 1½ by 1½ by 2½ inches, long edges perpendicular to H. two long faces parallel to V.

Problem 2: Tip prism on lower right edge, parallel to V, through 30°. Draw projections.

Problem 3: Draw side view of problem 2.

Plate VII-b.—Draw square pyramid 1½ by 1½ by 2½ inches perpendicular height as in Plate VII-a.

Plate VII-c.—Detail of mirror frame. Working drawing in three projections.

Plate VII-d .- Stretcher detail. Optional.

Plate VII-e.-Box. Draw from specifications.

Specifications: 3 inches high, 4 inches wide. 10 inches long, outside dimension. End boards set 1 inch from ends of side boards.

Partition in center. Partition and ends housed 1 inch into side boards. Bottom extends all over box; 2-inch material used.

Scale, one-half size.

Group VIII.

Purpose: Working drawing in detail and assembly.

Plates:

Plate VIII-a.—Footstool. Draw in assembly. Choice of three types. Plate VIII-b.—Taboret, umbrella stand, plane bench, telephone stand, table, etc.

Plate VIII-c .- Detailed drawings of Plate VIII-b.

Plate VIII-d.—Compound rest.

Plate VIII-e.-Planer V block.

Group IX.

Purpose: Applied geometrical construction problems.

Plates

Plate IX-a.—Geometrical problems. Selection of six from list.

Additional plates.—Selected problems.



Group X.

Purpose: Technical skill and knowledge of drawing conventions. Plates:

Plates X-a-b-c.—Machine details involving circles.

Additional plates.—Additional plates should be made from similar problems, and appropriate projects in the various shops.

Succeeding groups.

For succeeding groups constituting the work of the 9A grade, two lines of work are suggested:

- 1. A continuation of detailed machine drawing, including careful study of drafting room conventions, and anticipating the pattern work of a higher grade. Tracings, blue prints, etc., redrawing from reduced drawings with emphasis upon the development of technique demanded in commercial drafting rooms, problems involving auxiliary views in oblique projections.
- 2. An elementary course in architectural drawing.

SIMPLE MECHANICS.

General statement.—The term "simple mechanics" is used in designating the following course of work as rather more inclusive than the commonly used terms "home mechanics" or "household mechanics."

Investigation makes it apparent that while the general trend of thought is along the line of this type of work, no very definite or conclusive courses of study have thus far been developed. A complete and significant course of study in simple mechanics for the junior high school will require much more careful thought and time than has hitherto been given. The course here outlined is in the experimental or "try-out" stage.

The period covered by the 7B grade is that of transition from childhood toward youth. It is a period of unrest, of protest against restraint, of changing ideals and purposes. Boy interest is in experiences rather than in their influences upon life, in results rather than processes; and these interests center largely in the home and play life of the boy. To the boy knowledge is worth while largely in proportion as it contributes to his immediate plans or needs, and these are widely diversified and little concerned with sequence or method. To him emphasis is upon the objective—the need or result, rather than the process—the doing or making.

The following suggestive course of study in manual arts for 7B grade boys is based upon certain considerations that seem fundamental:

- 1. The physical development and mental attitude of the boy at this period of school life.
- 2. That actual experiences in living are more important at this period of child life than preparation for later living.



- 3. The interests of the boy and how the school and the home may cooperate in utilizing these interests.
- 4. What particular knowledge is worth while to the boy, and why.
- 5. Should the course deal with a specific or a diversified subject matter?

OBJECTIVES.

Based upon these general considerations it would seem that a course of study in manual arts for the 7B grade should deal with the broad general aspects of industrial activities rather than with a specific industrial subject, and that the objectives of such a course should anticipate general rather than specific accomplishment. The following are suggested as objectives that the teacher should anticipate in a well-planned and well-administered course in simple mechanics:

- 1. To give a practical working knowledge of the fundamentals of a number of industrial occupations.
- 2. To train the pupil to plan and execute necessary repairs and necessary ar desirable simple constructions.
- 3. To develop self-reliance, confidence, and initiative in emergency.
- 4. To develop habits of observation and appreciation and a just pride in personal accomplishment.
- 5. To teach habits of thrift and a wholesome respect for the furnishings and appliances of the home, the school, and the community.
- 6. To give opportunity to try out simple processes in a variety of simple industrial activities.
- To give a practical knowledge of simple mechanical devices and of materials of common use.
- 8. To teach the typical uses of common tools.
- 9. To train the pupil to work from verbal and written directions and from drawings.
- 10. To give an insight into a variety of industrial occupations which may discover interests, aptitudes, and skills which will be suggestive in guidance.

The most important work of the teacher in the administration of this course of study will be the just evaluation of these objectives, expressed in terms of a wise choice of subject matter and in skillful teaching. This means focusing attention upon the development of elements of character rather than upon material results of the work.

METHOD.

The aim of the course is to develop in the pupil interest, thought, initiative, self-reliance in emergency, and a certain amount of skill, as well as to impart information concerning industry and materials.



Within the limits of time the teacher must select from the suggested outlines material that will best accomplish the initial purpose. Class conference and discussion, the assignment of problems for investigation, demonstration, individual instruction, the use of instruction sheets, related material, and, where possible, visits to industrial plants, are all means to the desired end. Typical teacher's lesson plans and instruction sheets accompany the outlines.

OUTLINE OF WORK.

The outlines of work submitted are purely tentative and suggestive. Within the time limits it will not be possible to accomplish more than a fraction of the work outlined. The work is new, and, for the present, selection must be left largely to the wisdom of the teacher.

ORGANIZATION.

As usually organized, work in simple or home mechanics is given in a single room, equipped for the varied activities of this type of work. It would seem that a better organization could be developed by dividing the work between two rooms and two teachers. In this way pupils would have the advantage of more complete equipments, utilizing with very small additions the regular equipments of the standard shops. Teachers would have fewer activities to direct and supervise, and both rooms would be available for regular class work in the subjects for which they were equipped.

In the following list of suggestive activities shop No. 1 and shop No. 2 indicate, respectively, wood shop and general metal shop. The desirable organization will give continuous work in either the woodworking shop or the metal working shop, classes rotating in the middle of the semester. With an even number of classes this arrangement is convenient. An odd number of classes causes complications in program making. To obviate these difficulties, classes may be assigned half time each week to the wood shop and half time each week to the metal shop throughout the semester, or the odd class may work to this program and the remaining classes to be balanced against each other as suggested above.

SUGGESTED SHOP OUTLINES.

SHOP I-WOODWORK.

Fundamental processes:

- 1. Working to dimension.
 - a. Garden marker.
 - b. Cutting board, etc.
- 2. Assembling parts—box problem.
 - a. Salt box.
 - b. Knife and fork box.
 - c. Tool box, etc.



Fundamental processes-Continued.

- 3. Form work.
 - a. Knife handle.
 - b. Trowel handle.
 - c. Hammer handle, etc.
- 4. Fitting lock.
- 5. Fitting hinges.
- 6. Study of materials.
- 7. Related work.

Related repair and construction projects:

- 1. Doors.
 - a. Repairing locks-adjusting springs, oiling.
 - b. Door knobs, hooks, stops, checks.
 - c. Sagging doors.
- 2. Windows.
 - a. Replacing broken glass-putty, molding.
 - b. Adjusting weight cords.
 - c. Fitting window screens.
- 3. Window shades.
 - a. Rollers and brackets.
 - b. Cutting and fitting rods and brackets.
 - c. Turning shades.1
- 4. Furniture repairs.
 - a. Chairs, tables, seats, bels.
 - b. Seating chairs-composition, wood, cane.
 - c. Simple upholstering repairs.
 - d. Refinishing and painting.
- 5. Painting and finishing.
 - a. Outside painting.
 - b. Inside painting.
 - c. Staining and finishing.
- 6. Toy repairs.

Repairs on various toys related to woodwork.

- 7. Individual construction.
 - a. Nail box.
 - b. Tool box.
 - c. Window box.
 - d. Screens.
 - e. Trellis work.
 - f. Bird house.
 - g. Kite.
 - h. Sled.
 - i. Cart.
 - 1. Scooter, etc. .

SHOP I.—ELECTRICAL WORK.

Fundamental processes:

- 1. Simple electromagnet.
- 2. Construction of wet and dry cells (demonstration by teacher).
- 3. Types of splices, connections, and insulations.
 - a. Extension cord.
 - 8. Attaching plug and socket.
 - c. Test.



Boys may bring shades and rollers from home for class lesson.

Fundamental processes—Continued.

- 4. How to read an electric meter.
- 5. Wiring a lamp—one socket, two or more sockets.
- 6. Replacing of fuses.
- 7. Wiring door bells.
 - a. Batteries.
 - b. Transformers.
- 8. Related work.

Related repair and construction projects:

- 1. Repair of electrical appliances.
 - a. Iron.
 - b. Toaster.
 - c. Heater.
 - d. Curling iron, etc.
- 2. Principle of simple motor.
- 3. Radio.
 - a. Repair.
 - b. Assembly, etc.
 - c. Making simple radio.
- 4. Semaphore.
- 5. Repair of electrical toys.
 - a. Trains.
 - b. Signals.

SHOP H .- METAL WORK.

Fundamental processes:

- 1. Measuring and cutting.
 - T Puzzle.
- 2. Soldering.
 - a. Small openings.
 - b. Sweating on patches.
 - c. Seams-single, double.
- 3. Folding, seaming, and forming.
 - a. Cookie cutter (from cover).
 - b. Sugar scoop (from baking powder can).
- 4. Drilling and riveting.
 - a. Knives (hack saw blades).
 - b. Trowel.
 - c. Pancake turner, etc.
 - d. Mail box.
- 5. Related work.

Related repair and construction projects:

- 1. Repairing of kitchen ware.
 - a. Pans.
 - b. Boilers.
 - c. Kettles, etc.
- 2. How to clean and polish kitchen utensils.
 - a. Materials.
 - b. Methods.
- 3. Sharpening tools and kitchen utensila
 - a. Grinding and whetting.
 - b. Kinds of edges required for various cutting tools.



Related repair and construction projects-Continued.

- 4. Repairing metal toys.
 - a. Soldering.
 - b. Riveting, etc.
 - c. Replacing parts.
- 5. Metal constructions.
 - a. Wire holders.
 - b. Chopping tools.
 - c. Punches.
 - d. Foot scrapers, etc.
- 6. Art metal work.
 - a. Paper knife.
 - b. Letter opener.
 - c. Watch fob.

 - d. Blotre ack. e. Postá dod holder.
 - f. Book ends.
- 7. Tin toys.
 - a. Toy come-back.
 - b. Toy tank.
 - c. Heliocopter, etc.

SHOP II.—GENERAL REPAIRS.

- 1. Garden hose,
 - a. Putting on couplings.
 - b. Splicing and repairing.
 - c. Care of hose-handling, draining, storing.
- 2. Wash wringers.
 - a. Care—cleaning, oiling, adjusting.
 - .b. Replacing worn rollers.
- 3. Faucets.
 - a. Resenting.
 - b. Replacing worn washers-hot water, cold water.
 - c. How to read a water meter.
- 4. Drains and traps.
 - a. Adjusting tank floats.
 - b. Replacing and adjusting bali floats.
 - c. Cleaning traps.
 - d. Replacing gaskets.
 - e. How to use suction plunger.
- 5. Stoves and ranges.
 - a. Cleaning and adjusting burners, mixer tubes, and nozzles.
 - b. Adjusting burners, valves, and mixer tubes.
 - c. Cleaning grates, flues, and pipes.
 - d. Adjusting dampers.
 - e. How to read a gas meter.
- 6. Lawn mower.
 - a. Adjustment and care.
 - b. Sharpening.
 - c. Repairing and replacing parts. ; ,
- 7. Blcycle.
 - a. Oiling, greasing, and general care.
 - b. Adjusting wheels, bearings, chain, seat, and handle bar.



Related repair and construction projects—Continued.

- 8. Carts, baby buggies, etc.
 - a. Oiling, greasing, and care.
 - b. Adjusting bearings.
 - c. Repairing tops, running gear, tires, etc.
- 9. Garden implements.
 - a. Care, cleaning, and handling.
 - b. Sharpening and repairing.
- 10. Automobile details.
 - a. Oiling, filling, and turning up grease cups.
 - b. Tightening nuts and adjusting cotter pins.
 - c. Cleaning and adjusting spark plugs.
 - d. Patching tubes and filling tire cuts.
 - e. Testing and replacing tube varves.
 - f. Renewing hose connections.
 - g. Replacing and adjusting fan belt.
 - h. Cleaning and polishing.
 - i. Putting on a tire.
 - j. Repairing tire pump.

LESSON PLAN.

Garden marker.

Project: Garden marker.

Aims:

Major—To acquaint the pupil with some simple, practical uses of wood.

To give the boy an idea of opportunities and requirements of the industrial life.

Minor—The making of a garden marker. Familiarizing the student with tools that are to be used through entire course.

Suggestive method:

- 1. Class discussion of practical use of garden marker.
- 2. Thorough demonstration of making the garden marker from instruction sheet.

Summary of lesson: Questions on above demonstration.

Application: Class to make garden marker from instruction sheet.

Testing: Instructor to check up on technique and time consumed.

INSTRUCTION SHEET.

Garden marker.

Project: Garden marker.

Material required: White pine, 1 piece 1 by 11 by 13 inches.

Tools:

Pencil.

Saw.

Rule.

Jack plane.

Square.

Bench hook.

Knife.

Cutting board.

Operations:

- 1. Plane ope edge straight and square.
- 2. Mark width from finished edge, measuring at two points—use back of knife and rule.
- 3. Plane to width 11 inches-Watch your line.
- 4. Square one end-bench hook,



MANUAL ARTS IN THE JUNIOR HIGH SCHOOL.

44

Operations-Continued.

- 5. Mark length, 12 inches, from squared end—square mark around stock with sharp edge of knife.
- 6. Saw near line in waste-square to knife line.
- 7. Mark length of taper for point 4 luches from one end.
- 8. Square pencil line around stock.
- 9. Mark surfaces A and B.
- 10. At taper end on A, mark center of width and measure 1 inch to right and left.
- 11. Draw pencil lines from 1 inch marks to ends of 4-inch squared line.
- 12. Repeat process on surface B.
- 13. Show your work to instructor.
- 14. Whittle taper to within & inch of lines.
- 15. Plane taper in bench hook.
- 16. Smooth surfaces—plane as little as possible.
- 17. Corners at top optional.
- 18. Write your name and grade on your work,

LESSON PLAN.

Cutting board.

Project: Cutting board.

Alms:

Major.—To demonstrate fundamental principles of planing. Method of procedure in squaring board to size, two dimensions. Purpose and principles of sandpapering.

Minor.—The making of a cutting board. Familiarizing the student with new tools.

Suggestive method:

- 1. Class discussion of practical use of cutting board, wood used, etc.
- 2. Demonstration of method of procedure in squaring board to size, two dimensions only.
- 3. Explain method followed in mill when squaring boards to size.
- 4. Explain operations, referring to instruction sheet.

Summary of lesson: Questions on above demonstration.

Application: Class to make cutting board.

Testing: Student to check up on technique by comparing with drawing. Instructor to check on technique and time consumed.

INSTRUCTION SHEET.

Cutting board.

Project: Cutting board.

Material required: White pine, 1 piece—2 by 42 by 14 inches (see drawing).

New tools:

Compass.

Bit.

Spokeshave.

Sandpaper block.

Brace or handle.

Sandpaper.

Operations:

- 1. Plane one edge straight and square.
- 2. Mark width from finished edge, measuring at two points—use back of knife and rule.
- 3. Plane to width, 41 inches; watch your line.
- 4 .Measure 21 inches from one end and square peucil line around stock.
- 5. Find centers of lines on both surfaces.



Operations-Continued.

- 6. With compass and 21-inch radius draw semicircles. Be sure circles are tangent to the edges.
- 7. Cut near to the line—saw and knife, or coping saw.
- 8. Spokeshave to line.
- 9. Show your work to instructor.
- 10. Measure length from the finished end. Square knife line around the stock using sharp edge of knife.
- 11. Saw in waste and plane in bench hook.
- 12. Bore § inch at center of semicircle; bore from both sides.
- 13. Plane surfaces.
- 14. Sandpaper-Use block.
 - (a) Ends and edges.
 - (b) Surfaces-With grain.
- 15. Your name and grade.

LESSON PLAN.

Electromagnet.

Project: Electromagnet.

Aims:

Major—To demonstrate elementary principles of magnetism as the basis for the study of electricity.

Minor—The making of a simple electromagnet. Familiarizing the student with tools that are to be used through entire course.

Suggestive method:

- 1. Class discussion of practical use of magnet.
- 2. Demonstration of principles by teacher, assisted by students.
 - (a) Explanation of the magnetic field. Two boys from the class operform an experiment with a bar magnet, the rest of the class looking on. Place a sheet of paper over the magnet and drop iron filings upon it, the class noticing what happens. Observe how the filings take a definite position around the magnet.
- 3. Practical demonstration of making magnet from instruction sheet.

Summary of lesson: Questions on above demonstration.

Application: Class to make bar magnet from instruction sheet.

Testing:

Student to test his magnet by method previously demonstrated.

Teacher to check up on technique and time consumed.

INSTRUCTION SHEET.

Electromagnet.

Material required: 10 pieces of No. 14 iron wire, 4 inches long. Fiber, 2 pieces, 1 inch thick, 1 inch square. 50 feet, No. 22 cotton covered wire. 2 batteries. Nails.

Tools used:

Scale.

Cutting pliers.

Hollow punch, 1-inch.

Hammer.

Wing dividers.

Drill press.

91048°-94-



Operations:

- 1. Cut 10 pieces of No. 14 iron wire 4 inches long.
- 2. Bind together with paper to make a tight handle.
- 3. Cut out two fiber washers.
- 4. Center fiber pieces and punch &-inch holes in each washer.
- 5. Drill two 10-inch holes in each washer as per drawing.
- 6. Assemble washers to iron core.
- 7. Pass end of magnet wire through hole in washer, leaving 12 inches to attach to battery.
- 8. Wind on five layers and pass the other end through second hole in washer.
- 9. Attach to battery and pick up some iron brads.

LESSON PLAN.

Electric batteries.

Project: Construction of wet and dry cells (electric batteries).

Aims:

Major-The demonstration of the source of electrical energy.

Minor—The making of a simple wet cell, and discussion of dry cells, covering the use of zinc, copper, carbon, and acidulated solutions, circuits, etc.

Suggestive method:

- Class discussion of the use of wet and dry cells.
- 2. Demonstration of principles by teacher, assisted by pupils.
 - (a) Polarity test. Two boys from the class assist the teacher in the demonstration. Fill a glass tumbler containing a spoonful of salt with water. Connect two wires to a dry cell, place free ends of wires into salt water. Bubbles will be noticed forming around one wire only, and this indicates the negative pole. By tracing the wires it will be noticed that the negative is the zinc part of cell.
 - (b) Provide an old dry cell and with a hacksaw remove a portion of the zinc near the upper end, exposing zinc cup, blotting-paper lining, filling paste, carbon pole, and sealing wax.
- 3. Practical demonstration of making a wet cell from instruction sheet Summary of lesson: Questions on above demonstration.

Application: Class to make wet cell from instruction sheet.

Testing:

Student to test his cell by polarity test and by connecting to small lamp, buzzer, or meter.

Teacher to observe results and time required.

INSTRUCTION SHEET.

Electric batteries,

Material required:

Pint fruit jar.

Wood-1 by 11 by 31 inches.

Zinc-any suitable thickness or width about 5 inches long; copper or carbon may be used.

2 small wood screws.

2 connecting screws and nuts.

Electrolyte or solution sait, sulphuric acid, or salammoniac.



Tools used:

Knife.

sa-inch drill.

Hand drill.

Screw driver.

File.

Operations:

Make wooden spacer 1 by 11 by 31 inches, soft wood.

2. Cut zinc element and drill two fa-inch holes. See drawing for dimensions.

3. Cut copper or carbon element and drill.

4. Attach elements to wood spacer with wood screws.

5. Wash jar thoroughly.

6. Mix electrolyte solution-one required, given in order of preference.

(a) Salammoniac 2 ounces, water 1 pint.*

(b) Sulphuric acid, 10 per cent solution.

(c) Salt 4 ounces, water 1 pint.

7. Place assembled elements in jar of solution.

8. Test-polarity, lamp, buzzer, meter.

WOODWORK.

General statement.-Educationally, woodwork ranks first among the manual arts subjects. It was the first of the industrial occupations to be subjected to educational analysis and teaching methods, and it has served as the basis for the development of shop activities in all of the manual arts subjects. It has a more general appeal and a wider range of contacts than other occupational work in the schools.

The application of woodwork is more universal than that of other industries. Few households are without tools of some sort, and there are comparatively few adults but make some shift to use them. The woodworking courses of the school should definitely aim to give a practical acquaintance with the principal woodworking tools which will function in the later life of the pupil.

As a manual arts subject, woodwork provides unlimited opportunity for mechanical skill, combined with artistic expression. To some it will have a strong appeal as a diverting avocation. Some knowledgé of the use of woodworking tools should constitute a part of the educational equipment of every adult.

The preliminary woodwork given earlier in the course in simple mechanics is intended to be simple in character and of application to more or less immediate needs. The purpose of the woodworking courses is to give a general survey of the field of woodworking activities through training in the systematic use of tools and materials and through related subjects and information about the woodworking industries.



The sal ammoniac or salt solutions are harmless, but care must be exercised in handling sulphuric acid; it will discolor hands, eat holes in clothing, and spoil bench tops if allowed to spill,

OBJECTIVES.

1. Aid, through concrete relationships, in giving meaning and purpose to other school subjects.

2. Develop the social spirit through cooperative relationship with

other departments in the school.

3. Add to the pupil's educational and social development through acquaintance with industrial activities.

4. Develop personal traits of patience, perseverance, industry, re-

sponsibility, and integrity.

5. Develop habits of accuracy, thoroughness, and neatness.

6. Encourage a just pride in personal achievement.

- 7. Provide opportunity for development of the creative instinct and originality and initiative in selection, design, and execution.
- 8. Give application to some of the fundamental principles of design.
- 9. Develop appreciation of good workmanship and good taste in home furnishings.

10. Contribute to the economy of the home.

- 11. Give a knowledge of the practical use of woodworking tools.
- 12. Render service in the school, home, and community.

13. Enlarge the field of vocational choice.

These statements of objectives are significant only when the teacher recognizes them as such and definitely plans to attain them in proportion to their relative values through methods, subject matter, skillful teaching, and personal relationship with the pupil.

METHODS.

In general, the purposes of the woodworking courses are more easily and effectively accomplished through the individual method of work and instruction, and the subject matter in the suggested courses is largely chosen to this end. This is particularly true of the more elementary work. Any of the suggested projects may be worked out on the quantity production basis, and some of them, or substitutes for them, should be developed upon this plan. Certain types of work or constructions for specific purposes readily lend themselves to the group method of production. Projects in construction of articles for equipment and furnishing of the school may be given to the small group of pupils as problems to be worked out. Certain projects in concrete work are also well adapted to this method of production. Leadership will always develop in a group of four or five pupils, and with slight direction by the teacher a problem will be organized and carried forward by the group.



Ample opportunity should be provided for development of initiative and originality in design and execution, within the limits of accepted principles and good taste. All possible devices should be used in making personal contacts between pupils and teacher. Types of instruction or job sheets and teachers' lesson plans are given in connection with the work in simple mechanics. Similar sheets are submitted in connection with the advanced woodwork. Talks and conferences on related subjects and material should be employed. A suggestive list of topics is appended.

The courses here outlined assume an acquaintance with the simple woodworking tools, as a result of work in simple mechanics. In projects in that course pupils are required to work material to two dimensions only. "Operations" and "tools" are omitted in the following analysis.

OUTLINE OF COURSE.

Group 1.

Purpose: Squaring material to three dimensions-thickness, width, and length.

Projects: Hat and coat rack, cutting board, line reel, broom holder, simple 'shelf, etc., one or more required as limited by time schedule.

Group II.

Purpose: Making a dado joint.

Projects: Kitchen rack, table bookrack, footstool, bookshelf, etc., one required.

Group 111.

Purpose: Cross lap joint.

Projects: Flower-pot stand, fern stand, simple taboret, table lamp, costumer.

The following groups are intended for advanced elective work in ninthgrade cabinetmaking.

Specific objectives:

- To give a practical knowledge and skill in the more advanced woodworking tool processes.
- To develop appreciation and judgment through simple design in construction, form, and finish applied to furniture making.
- 3. To give a knowledge of cabinetmaking as an industrial activity.

Group IV.

Purpose: Mortise and tenon joint.

Projects: Footstool, taboret-one required.

Group V.

Purpose: The making of optional pieces of furniture by individual pupils.

Use of machinery if available.

Projects: Jardiniere stand, umbrella stand, seats or benches of various types, tables of various types, etc.

Wood turning.—Where lathes are available a small amount of wood turning is recommended in connection with woodworking courses. With three or four lathes in a classroom, each member of the class may devote an average of at least two weeks to turning. The work may be applied in the making of various tool handles, mallets, vise handles, legs for stools and seats, table lamps, etc.



Gement work.—Where feasible, cement work may be given as a subject related to woodwork. The making of necessary forms is distinctly a woodworking problem. The work may find application in such projects as making caps for piers, porch rails and post foundations, dwarf walls for steps and chimneys; foundations for rod or pipe posts, fence posts; flower boxes, concrete dishes; pedestals and bases for lawn, bird bath, garden benches and seats; sections of sidewalk or automobile track. Projects in concrete work are readily handled by the group method of production.

Related subjects.—The following outline is by no means complete. Other topics will suggest themselves to the teacher. The topics should be presented in brief talks and discussions, illustrated as fully as possible by exhibits, samples, pictures, catalogues, slides when possible, references to museum exhibits, etc.

1. Lumber:

- (a) Kinds of wood in common use.
- (b) Characteristics and uses.
- (c) Lumbering.
- (d) Milling.
- (e) Transportation.
- (f) Plane sawing and quarter sawing.
- (g) Air drying and kiln drying.

2. Nails:

- (a) Brads.
- (b) Common.
- (c) Finish.
- (d) Casing.
- (e) Classification.
- (f) Uses.
- (g) Manufacture.

3. Screws:

- (a) F. H. bright or blued.
- (b) R. H. bright or blued.
- (c) F. H. or R. H. brass.
- (d) Classification.
- (e) Uses.
- (f) Manufacture.

4. Sandpaper:

- (a) Kinds-flint, garnet.
- (b) Method of grading.
- (c) Manufacture.
- (d) How to use.
- (e) Sanding machinery.

5. Glue:

- (a) Cold.
- (b) Hot.
- (c) Manufacture.
- (d) Preparation for use.
- (e) Conditions of use.

6. Finishes:

- (a) Kinds of finish-paints, stains, varnishes.
- (b) Object of finishes.
- (c) Oil paints.
- (d) Water paints.
- (e) Stains-water, oil, spirit, chemical.
- (f) Fillers-paste, liquid.
- (g) Varnishes-spirit, oil.

7. Talks on typical tools:

- (a) History of development.
- (b) Manufacture.

8. Period furniture:

Brief talks upon typical styles of furniture. Recognition of typical examples.

- (a) Jacobean:
- (b) William and Mary.
- (c) Queen Anne.
- (d) Chippendale.
- (e) Adam. Brothers.
- (f) Heppelwhite.
- (g) Sheraton.
- (h) Colonial.

TEACHER'S PROJECT PLAN.

Footstool.

Individual handwork project.

- General talk on cabinetmaking and review of previous experiences in woodwork. This may be best accomplished in several well-planned talks and discussions.
- 2. Class study of blue print and specifications.
- Discussion of materials to be used, best method of getting stock from **
 board sizes, rough sizes, and finished sizes, etc.
- Demonstrations, limited in length and number to the needs of the class or group. For outline of operations see instruction sheet.
- Incidental talks, as needed; on design of details, sandpaper, glue, pressure devices and their uses, finishes and their application, etc. (See outline of related subjects.)

INSTRUCTION SHEET.

Footstool.

Material-Chestnut or oak.

Drawing—Read drawing carefully for dimensions and construction. Operations—Complete each operation on all pieces.

- Legs—Finished size, 1# by 1# by 8 inches.
 - (a) Rip to rough width, 13 inches.
 - (b) Cross cut to rough length, two legs, 161 inches.
 - (c) Joint working face-
 - (d) Joint working edge.
 - (e) Plane to thickness, 14 inches.
 - (f) Plane to width, 11 inches.
 - (g) Work to finished length, 8 inches.



Legs, etc.—Continued.

- (h) Lay out length of mortises, 21 inches, 11 inches from top end. Use knife lines.
 - (i) Lay out width of mortises, # inch wide, # inch from outer surfaces. Gauge lines to exact width of chisel (chisels of given widths vary in size).
 - (j) Bore one or two \interpretation inches to depth of mortise, 1\int inches.

(k) Cut mortise with 1-inch chisel.

- (1) Work legs to selected lesign 1% inches at bottom.
- (m) Work top ends to selected design. Sandpaper all surfaces with No. 1 sandpaper, slightly softening all edges.
- 2. Rails-Finished sizes, 1 by 21 by 131 inches and 81 inches.

(a) Rip to rough width, 21 inches.

- (b) Crosscut to rough length one long and one short rail, 224 inches.
- (c) Surface one face.
- (d) Joint one edge.
- (e) Plane to width, 21 inches.
- (f) Plane to thickness, ? inch.
- (g) Cross cut to exact lengths, 131 inches and 81 inches.
- (h) Lay out length of tenons with 11% inches and 6% inches between shoulders.
- (i) Gauge thickness of tenons i inch from outer surfaces, inch thick. Gauge lines to exactly correspond with gauge lines for mortises.
- (j) Work tenons to thickness, fitting mortises snugly, numbering each joint.
- (k) Cut inner edges of tenons at 45 degrees to fit corners in mortises.
- Bore 4-inch holes 14 inches deep for screws to hold top, two in long rails, one in short rails.
- (m) Bore holes for 11-inch No. 12 screws.
- (n) Sandpaper outer surfaces with, No. 1 sandpaper,
- 3. Top-Finished size, 2 by 91 by 141 inches.
 - (a) Rip to rough width, 97 inches.
 - (b) Crosscut to rough length, 151 inches.
 - (c) Surface one face.
 - (d) Joint one edge.
 - (e) Plane to width, 97 inches.
 - (f) Plane to thickness, \$ inch.
 - (g) Work to length.
 - (h) Lay out corner cuts accurately with knife lines, measuring from rails.
 - (i) Work carefully to lines.
 - (j) Sandpapering should be done after final fitting of top, top surface and exposed edges only, with No. 1 sandpaper.

4. Assembly:

- (a) Assemble and glue legs and short rails under pressure and allow glue to set. (Adjust clamps so that inner surfaces of legs, those having remaining mortises, test exactly in the same plane.)
- (b) Assemble with long rails and fit top exactly.
- (c) Glue long ralls under pressure, using top to square, and allow glue to set.
- (d) Sandpaper top (see (f) above) and secure with screws.
- 5. Finish-To be selected by student and teacher, and detailed by teacher.

TEACHER'S PROJECT PLAN.

Taboret.

Individual handwork project.

- 1. General review connecting up with earlier work and leading up to new project.
- 2. Make a careful study of drawings and specifications, giving the responsibility of interpretation and planning as largely as possible to the pupils.
- 3. Discuss the getting out of materials.
- 4. Demonstrations, when needed. For outline of operations, see instruction sheet.
- Give incidentally carefully planned talks on related subjects. As the work goes forward give added emphasis to design and to the development of appreciation (see outline of related subjects).

INSTRUCTION SHEET.

Taboret.

Individual handwork project.

Material—Chestnut, oak, or other appropriate wood. Operations—Complete each operation on all pieces.

- 1. Legs-Finished size, 13 by 13 by 15 inches.
 - (a) Rip to rough width, 11 inches.
 - (b) Crosscut to rough length, 151 inches.
 - (c) Joint working face.
 - (d) Joint working edge.
 - (e). Plane to width.
 - (f) Plane to thickness.
 - (g) Work to finished length.
 - (h) Lay out length of mortises from top end. Use knife lines.
 - (i) Lay out width of mortises from outer surfaces. Gauge lines to exact width of chisel (chisels of given widths vary in size).
 - (i) Bore one or two 1 inch holes to depth of mortise.
 - (k) Cut mortise with chisel from which width is measured.
 - (1) Work legs to selected design.
 - (m) Sandpaper all surfaces with No. 1 sandpaper, slightly softening all edges.
- 2. Ralls—Finished sizes, 4 by 24 and 2 by 104 inches.
 - (a) Rip to rough width, 21 inches and 21 inches.
 - (b) Crosscut to rough length, 2 rails, 21 inches.
 - (c) Surface one face.
 - (d) Joint one edge.
 - (c) Plane to width.
 - (f) Plane to thickness.
 - (g) Crosscut to exact length.
 - (h) Lay out length of tenons between shoulders.
 - Gauge thickness of tenons. Gauge lines to exactly correspond with gauged lines for mortises.
 - (j) Work tenons to thickness, fitting mortises snugly, numbering each joint.
 - (k) Cut inner edges of tenons at 45 degrees to fit corners in mortises.
 - (1) Bore 1 inch holes 11 inches deep for screws to hold top, two in each rail, 1 inch from shoulders.
 - (m) Bore holes for 11 inches No. 12 screws. (Note.—Clip blocks may be used with grooved rails, two on side grain, one on end grain.)
 - (n) Sandpaper outer surfaces with No. 1 sandpaper.



- 3. Top—Finished size, 7 by 13 by 13 inches, 1 glue joint.
 - (a) Rip to rough width, 131 inches. Allow 1 inch or more for glue joint.
 - (b) Cut to rough length. 131 inches.
 - (c) Plane gine joint and glue under pressure.
 - (d) Surface one side.
 - (e) Joint one edge.
 - (f) Plane to finished width.
 - (g) Plane to finished thickness.
 - (h) Square one end.
 - (f) Work to finished length.
 - (f) Sandpaper all exposed surfaces with No. 1 sandpaper.

4. Assembly-

- (a) Assemble and glue legs and rails of two opposite sides under pressure and allow glue to set (adjust clamps so that inner surfaces of legs test exactly in the same plane and rails exactly square with legs. Use blocks with clamps to protect finished work from bruises).
- (b) Assemble and glue remaining rails under pressure (adjust clamps so that rails are square with legs, the taboret square at top and bottom and the tops or bottoms of legs in the same plane).
- (c) Clean up joints if necessary.
- (d) Secure top to rails with screws.
- 5. Finish-To be selected by students and teacher and detailed by teacher.

QUANTITY PRODUCTION IN CABINETMAKING

Some work on the quantity production plan should be given in all grades and courses. In advanced work it may constitute a course in itself, covering a definite period of time.

Specific objectives of such a course in cabinetmaking may be enumerated as:

- 1. Education through discipline and through information about industry.
- 2. To teach organization, supervision and subordination, and cooperation.
- 3. To discover and develop natural aptitudes and abilities.
- 4. To render service to the home, the schools, and the community.
- 5. To give vocational guidance through acquaintance with industry and industrial methods.

Quantity production methods and organization are discussed earlier in this work. The following is a limited suggestive list of projects:

1. General equipment:

Art tables.

Book cases.

Book racks.

Book shelves.

Chairs.

Costumers.

Unabanda

Cupboards.

2. Home and community projects:

Selected furniture, etc.

Serving trays.

Stepladder.

Desks.

First grade stools.

Office tables.

Science tables.

Teachers' tables.

Typewriter tables.

Stepladder chair.

Telephone stand and seat.

ERIC

3. Household arts equipment:

Cooking tables. Footstools.

Costumers. Lunch-room tables. Cutting tables. Lunch-room stools. Fitting stands. Sewing tables.

4. Kindergarten equipment:

Chairs. Rocking horses.
Doll beds. Tables.

Doll dressers. Tea tables.
 Rocking boards. Trays.

5. Manual arts equipment:

Benches. Drawing boards.

Cupboards. Drawing board cabinets,

Drafting tables. Drawing stools.

Special references-Quantity production.

The Manual Arts. Chap. VII. Bennett. (Note especially the conclusions, page 100.)

Production Work in the Manual Training Shop. Biesemeier.

The Industrial Arts Magazine, March, 1921.

Productive Work in the Industrial Arts Class. Roberts.
The Manual Training Magazine, December, 1919.

BUILDING CONSTRUCTION.

This course opens up a large field of industrial information. It has a very practical immediate application in the service of the schools, the home, and the community, as well as a practical bearing upon the later life experience of most people. It has also a significant vocational outlook.

The work is outlined under three suggested divisions:

- I. Shopwork.
- II. Field work.
- III. Classroom talks and discussions upon details and related materials.
- I. Shopwork.—In this division projects in joinery are recommended, developed upon both the individual and production basis. They should be arranged so far as possible with reference to increasing difficulty and to the demand that may arise for a particular type of project. In a sense the work of this division is preparatory to, and may in part parallel or supplement, the field work.

Suggested projects:

1. Saw horse.

Individual or productive problem. As an individual problem, variation may be made to meet the needs of individual pupils. As a productive problem the horse used in the school shops or as other standard requirements suggest.

2. Ladder:

Individual or group problem.



Suggested projects—Continued.

3. Scaffolding bracket:

Individual or group problem.

4. Saw filing clamp:

Individual or group problem. Incident to this problem, lessons in saw filing might be introduced.

5. Miter box:

Individual problem emphasizing the use of the framing square in laying out cuts.

- 6. Details of building construction in field work:
 - (a) Window and door frames.
 - (b) Doors.
 - (c) Sash.
 - (d) Interior finish.
 - (e) Door and window screens.
 - (f) Window boxes.
 - (g) Steps.
 - (h) Columns.
 - (i) Porch lattice.
- 7. School garden equipment:
 - (a) Cold frames.
 - (b) Cucumber frames.
 - (c) Flats.
 - (d) Forcers.
 - (c) Gates.
 - (f) Markers.
 - (g) Poultry equipment.
 - (h) Sash-hot and cold frames.
 - (i) Signs.
 - (i) Stakes.
 - (k) Tomato frames.
- 8. School projects: Such as-
 - (a) Bulletin boards.
 - (b) Lumber rucks.
 - (c) Bicycle racks.
 - (d) Shelving.
 - (e) Tool racks.
 - (f) Stage properties.
 - (g) Details of building construction—sections of cornices and sills, window frames, door frames, doors, sash, etc.—to be used as illustrative material in connection with class talks and discussion and for architectural drawing.

II. Field work.—The work of this division consists of the erection of small portable building projects which may be used by the schools or sold to cover expenses of construction. The success of the work will depend largely upon careful organization. The methods and devices of industry should be followed so far as practicable: The use of estimates, bids, contracts, etc., foreman, timekeeper, assignments of work to groups of workers.

Suggested projects:

- 1. Playhouse.
- 2. Single machine garage.
- 3. Tool house for school gardens.
- 4. Small camp cottage.
- 5. Chicken house. -
- 6. Dog house.
- 7. Pergellas.
- 8. Summer houses, etc.

special references:

Solution of Lumber Problem in High School Carpentry. Ericson. Manual Training Magazine, September, 1920.

How to Draw a Bungalow. Brigham.

Home Builders' Plan Book-Bungalows.

Home Builders' Plan Book-Garages.

Tool house.

The Industrial Arts Magazine, November, 1915.

A movable poultry house. Frudden.

The Industrial Arts Magazine, April, 1916.

Making Stage Scenery for School Purposes. Webb.

The Industrial Arts Magazine, November, 1917.

III. Classroom talks and discussions upon details and related materials.—In this division there should be class talks and discussions upon the details of building construction. The work should be illustrated by a great variety of related material, such as charts, slides, pictures, catalogues, models, materials, samples, etc. Notebook work should be required of the pupils, and a test at the end of the semester based largely upon the notebook contents.

In connection with this work visits should be arranged to buildings under construction for the purpose of studying details which have been discussed in the classroom. Such visits should be anticipated by special preparation.

The following outline is suggested:

- 1. Mason work.
 - (a) Stone, brick, tile, concrete.
 - (b) Chimneys and fireplaces,
 - (c) Fruit cellars.
- 2. Framing, sheeting, and roof boards.
 - (a) Uses of framing square in building.
 - (b) Sills, plates, joists, studding, rafters.
- 3. Roof coverings.
 - (a) Asbestos shingles—submersion tests.
 - (b) Wood shingles-staining.
 - (c) Asphalt shingles, slates, tiles—sizes and grades.
 - (d) Roofing papers, rubberold, etc.
 - (e) Composition roofing-tar, etc.
 - (1) Canvas decking.
 - (g) Tin flashing and copper valleys.



- 4. Floors and partitions.
 - (a) Deadening sound or sound proof.
 - (b) Wood floor-parquetry, etc.
 - (c) Mosaic, tile, concrete, composition.
 - (d) Lathing-wood, metal.
 - (e) Plastering, etc., types of finish.
 - (f) Plaster boards—composition paper boards.
- 5. Heating and ventilating.
 - (a) Hot air.
 - (b) Hot water.
 - (c) Steam.
 - (d) Vapor.
- 6. Wiring.
 - (a) Open system of wiring.
 - (b) Conduit system of wiring.
 - (c) Safety codes.
 - (d) Bell wiring and burglar alarms.
- 7. Lighting.
 - (a) Sunshine and artificial light.
 - (b) Different kinds of illuminants.
 - (c) Principles of radiation and illumination-absorption and refraction of light.
 - (d) Proper location for fixtures and switches.
- 8. Plumbing.
 - . (a) Gas piping.
 - (b) System of water circulation for sink, bath, etc. .
 - (c) Tests, regulations, etc., applied to trade.
- 9. Exterior walls.
 - (a) Lap and matched siding.
 - '(b) Shingles.
 - (c) Brick and brick veneer.
 - (d) Stone.
 - (c) Stucco.
- ≥ 10. Painting, decorating, fixtures, and hardware.
 - 11 Fireproofing.
 - (a) Precautions taken in average residences, such as fire cuts on joists.
 - (b) Fire-clay bricks.
 - 12. Damp proofing, drainage, and cellar bottoms.
 - (a) How foundations are treated.
 - (b) Samples of commercialized patented products for clay bricks.
 - 13. Types of residences.
 - (a) Elizabethan.
 - (b) Queen Anne.
 - (c) Colonial, etc.
 - (d) Space allotments in rooms-dining, living, bedroom, kitchen, basement.
 - 14. Preliminary details of building.
 - (a) Location.
 - (b) Loans, mortgage.
 - (c) Terms of payment.
 - (d) General building code.



15. Landscape gardening.

- (a) Grading.
- (b) Trees.
- (c) Shrubs.
- (d) Walks.

SUGGESTIONS FOR CORRELATION.

English:

Words for spelling.

Subjects for class talks, oral and written themes.

Suggested magazine and other articles for school and home reading.

The literature of industry (see suggestive list).

Illustrative materials placed on bulletin boards.

Lantern slide talks.

Excursions with written reports.

Mathematics:

Shop problems in measurements and cost involving application of fundamental processes: Fractions, measures, percentage, and mensuration. The use of time cards, costs, including overhead, estimates, etc.

History-Geography:

The development of industry with particular reference to woodwork.

A study of materials, forestry, lumbering, milling, transportation, building, manufacture, and their relation to local industry.

Art :

The application of art principles to projects in outline, form, and color. Designing special projects in bench work, cabinetmaking, and production work.

Mechanical drawing:

Working drawing, specifications and estimates of shop projects.

GENERAL METAL WORK.

General statement.—The problem of organizing the subject matter of a course in general metal work is approached with hesitation, for as yet this subject stands without the field of systematized work in manual arts. Thus far there has been no serious or eminently successful attempt to organize the various elements of metal work into a practical unit of subject matter. At its present point of development the work is in the experimental stage. Assuming the soundness of the premise, the problem is one of selecting appropriate material as subject matter and of organizing it into a workable course adapted to the needs of the junior high-school period.

In the following suggested course in general metal work, the subject is analyzed into groups under four headings: Sheet metal, elementary machine work, forging, and electrical work. The subjects are developed beyond the possibility of accomplishment within the time that can be devoted to the work, if they are to be combined as a unit. This is done for three purposes: First, in analyzing each subject somewhat completely, a broader viewpoint and a larger field for selection of material are possible; second, teachers whose experience does not compass the entire field of the metal working activi-



ties may be provided with material in the subjects with which they are most familiar, and to which they naturally give emphasis, during the development of a well-rounded course in general metal work; third, provision is thus made for added elective work in the required course, or in an advanced elective course. The suggested outlines have developed from actual experience. Teachers who have covered successfully the entire field of work have selected their beginning projects from the elementary groups in the different subjects. Later in the course the class may be organized for individual or group projects or for quantity production work under one of the subjects, or several subjects combined.

Metal work gives an added medium of expression in the manual arts. The properties of metal present new problems, experiences, difficulties, sensations, and reactions. The "feel" of metal is in marked contrast with that of wood, and the reactions of the various metals to tools are characteristically different. Metal work, of all the industrial activities, provides the best medium for concrete application of mathematics, particularly of geometry. Some of the minor proc-

esses are economic factors in the lives of all.

OBJECTIVES.

1. Present relationships giving meaning and significance to other school activities, particularly mathematics.

2. Develop the social spirit through cooperative relationship with

other departments of the school.

8. Add to the pupil's educational and social development through acquaintance with industrial activities.

4. Develop desirable personal traits, particularly persistence in

meeting difficulties.

5. Cultivate habits of precision and an appreciation of the extreme accuracy of measurement required in mechanisms.

6. Give acquaintance with various metals in common use, their

properties and action.

7. Give practical working knowledge of the use of some of the essential metal working tools.

8. Contribute to the economic upkeep of the home.

9. Render service to the school, the home, and the community.

10. Contribute to educational guidance and vocational outlook through knowledge of the various metal working industries.

Through organization of subject matter, related material, and teaching methods, the teacher must plan to contribute definitely to the accomplishment of these objectives in proportion to their relative values.



METHOD.

Both the individual and quantity methods of production may be readily applied in general metal work. The earlier projects will necessarily be made by individual pupils. Later and larger projects may be worked out by groups on a quantity basis. Obviously, the class will be organized largely into groups representing two or more of the different types of work. Instruction and demonstration will be given to the class as a whole, or to groups, supplemented by individual help. Instruction or job sheets, drawings, models, related material, and other devices should be used in developing method and organization.

OUTLINE OF COURSE.

SHEET METAL.

Group I.

Operations-New: Measuring, cutting, punching.,

Tools-New: Rule, scratch awl, snips, pliers, solid punch, hammer, mallet.

Projects: Helicopter, tin puzzles, book ends.

Group II.

Operations-New: Folding, soldering, breaking.

Tools-New: Folding machine, forming machine, conductor stake, hatchet stake, soldering copper.

Projects: Cookle cutters, napkin rings, blotter holders, pencil trays.

Group III.

Operations—New: Peening.
Tools—New: Brake machine.

Projects: Diamond cookie cutter, jewel box, handkerchief box.

Group IV.

Operations-New: Burring, beading.

Tools-New: Burring machine, blowhorn stake, beading machine.

Projects: Doughnut cutter, candy box, cake box.

Group V.

Operations-New: Grooving.

Tools-New: Groover, breakhorn stake, circle snips.

Projects: Food containers, cup, furnace pipe, sugar scoop.

Group VI.

Operations—New: Pocket seaming.
Tools—New: Needle case stake.

Projects: Match box, candle holder.

Group VII.

Operations-New: Turning, flanging, wiring.

Tools-New: Turning machine, wiring machine, hollow punch:

Projects: Funnel, fruit jar filler, megaphone, waste basket, fern stand pan. Group VIII.

Operations-New: Double seaming.

Tools-New: Vise, beveled-edge square stake, hollow mandrel stake.

Projects: Bread tins, bread box, pudding pan, garbage can, water pail, oil pans, measures.

91048°-24-5



Group IX.

Operations—New: Riveting. Tools—New: Rivet set.

Projects: Nail box, fern stand base, elbows, drip pans.

ELEMENTARY MACHINE WORK.

Group 1.

Purpose: Measuring, filing, and sawing.

Operations-New: Measuring, sawing, filing, squaring, grinding.

Tools—New: Rule, hack saw, 8-inch bastard file, calipers, square edge, hammer (machinist), surface plate, protractor, center punch, mallet. H. R. file 8-inch.

Projects: Scratch awl, nail punch, drill gauge, book ends, milk bottle opener. Group 11.

Purpose: Drilling, riveting, bending, grinding, and elementary assembling. Operations—New: Riveting, bending, drilling, sharpening drills, use of forming rolls, assembling.

Tools-New: Drill, rivet set, ball peen hammer, dividers, square.

Projects: Pancake turner, toy sand shovel, fern stand, basket-ball ring, Christmas tree stand.

Group III.

Purpose: Chiseling, chipping, and polishing.

Operations-New: Chiseling, etching, soldering, buffing, chipping.

Tools—New: Cold chisel, soldering outfit, buffing wheel, square, scratch awl, hammer, drills, 8-inch bastard file, 8-inch smooth file.

Projects: Calender, sink shovel, garden trowel, tack hammer.

Group IV.

Purpose: Tapping, thread cutting, hardening, reaming.

Operations—New: Hardening, polishing, threading, reaming.

Tools—New: Chisel, drills, die stock, tap, reamer, square file.

Projects: Clamps, table lamps, marking gauge.

Group V.

Purpose: Assembling, chiseling, tapping, drilling, turning, hardening, molding.

Operations—New: Peening, turning, sharpening diamond point on lathe tool, cutting slots in metal, molding.

Tools—New: Ball-peen hammer, lathe tools, pliers, stock and die, chisels, dividers.

Projects: Auto stool, auto luggage carrier, blcycle carrier, jar opener, horseshoe puzzle, floor lamp.

FORGING.

Group I.

Purpose: Forging and heating.

Operations—New: Building and care of the fire.

Tools—New: Poker, rake, shovel, sprinkler, blower.

Projects: Correct fire.

Group II.

Purpose: Forming.

Operations—New: Drawing, measuring, forming, straightening, twisting, shouldering, pointing.

Tools-New: Rule, center punch, hammer, square, anvil, hardie, scriber.

Projects: Hammer wedges, braces, forging, a soldering copper. •



Group III.

Purpose: Tempering.

Operations-New: Annealing, hardening, tempering.

Tools-New: Hardening furnace, emery cloth.

Projects: Lathe tools, drills, center punches, cold chisels, screw drivers,

knives, hand punches.

ELECTRIC WORK.

Group 1.

Purpose: Wiring and circuits.

" Operations-New: Splicing, soldering, tapping, connecting.

Tools-New: Knife, screw driver, pliers, hammer,

Projects: Splices, extension cord, lamps, bells.

Group 11. "

Purpose: Heating.

Operations-New: Measuring, marking, punching, drilling, folding, bend-

ing, winding unit, assembling, testing.

Tools-New: Punch press, punches, drill press, drills, bar folder, brake,

winder, tin snips, mallet, rule.

Project: Toaster.

Group 111.

Purpose: Magnetism.

Operations-New: Tapping, insulating, coil winding.

Tools-New: Taps, lathe, back saw, file.

Projects: Radio, telegraph set, electromagnet, buzzer.

Group IV.

Purpose: Alternating current magnetism.

Operations-New: None.

Tools-New: None.

Projects: Bell transformer, power transformer, shocking machine.

Group V.

Purpose: Magnetic motion.

Operations-New: Armature winding.

Tools-New: None.

Project: Electric motor.

SUGGESTIONS FOR CORRELATION.

English:

Words for spelling.

Subjects for talks and composition, lantern slide talks.

The literature of industry.

Suggestive material placed on bulletin board.

Mathematics:

Shop problems in measurements and cost, involving applications of the fundamental processes, viz, fractions, measures, percentages, and mensuration. The use of time cards, costs, including overhead, estimates, etc.

History-Geography:

The development of industry with particular reference to metal work. A study of materials, mining, and manufacture of tin and sheet metal. Their uses in building and relation to local industry.



Science:

Science in a study of heat, fluxes, effect of acids, solder and other alloys, tinning and galvanizing, and manufacture of sheet iron and tin plate.

Art:

The application of art principles to projects, outline, and form.

Mechanical drawing: Working drawings, specifications, and estimates of shop projects.

PRINTING.

General statement.—Of all the manual-arts subjects adapted to the junior high school, none offers greater general educational possibilities than printing. The subject in itself suggests an air of refinement and culture. It presents very great opportunity for cooperative relationships in the school. If wisely administered and efficiently taught, it may become an important unifying influence in the school, the home, and the community. It offers very great correlative possibilities with practically all of the other school activities. It has many points of contact with academic work, particularly with English. It provides definitely for practical application of many art principles. As an industry, it offers splendid opportunities for development, advancement, and education.

OBJECTIVES.

1. To provide experiences which will show the practical application and value of academic subjects.

2. To aid in the mastery of other school subjects, particularly

English.

3. To broaden the educational and social outlook through added knowledge of industry.

4. To develop appreciation of art in printing.

5. To give mastery, through application, of many of the principles of design.

6. To give opportunity to produce things of value, use, and beauty.

7. To create a wholesome respect for books and a desire for their care in the home, school, and the library.

8. To develop a just pride in personal achievement.

9. To cultivate an appreciation of the value of cooperation and service.

10. To help in forming habits of accuracy, thoroughness, neatness, and industry.

. 11. To broaden the field of vocational choice.

These objectives must be evaluated and subject matter and related material selected which will look to the definite attainment of each in proportion to its relative value.



METHODS.

By careful organization of the fundamental processes of printing, opportunity is provided for both class and individual instruction. Class or group instruction is very desirable in the teaching of fundamental processes, such as the layout of the case, printers' materials, proofreading, estimating, and the first exercises in setting type, while productive work offers an excellent opportunity for individual instruction. Carefully developed job or instruction sheets for the various processes are indispensable.

OUTLINE OF COURSE.

1. Learning the case:

- (a) Lay of case, caps, lower case, and other characters.
- (b) How to stand at case.
- (c) How to hold a composing stick.
- (d) How to pick up type, slowly at first, but gaining speed continually, with due regard to accuracy in the construction of the work at hand.
- (e) Falling of type.
- (f) How to empty type from stick, and the care to taken of same after being deposited on galley.
- (g) The use of leads and slugs, and their care.

2. Spacing and justification:

- (a) Spacing between lower case.
- (b) Spacing between small capitals.
- (c) Spacing between capitals.
- (d) Spacing between lower case leaded.
- (e) Spacing between small capitals leaded.
- (1) Spacing between capitals leaded.
- (g) Spacing between lower case double leaded.
- (h) Spacing between small capitals double leaded.
- (i) Spacing between cupitals double leaded.
- (j) Spacing between italics and kerned letters.
- (k) Spacing between condensed and extended letters.
- (1) Spacing around initial letters of various sizes.
- (m) Type alignment with initial letters.
- (n) Selecting initials as regards body matter used.
- (o) Spacing before and after punctuation marks.

3. Indention:

- (a) Indention of poetry of various kinds.
- (b) Hanging indentions.
- '(c) Pyramidal indentions.
- (d) Indention of paragraphs.
- 4. The use of punctuation marks.

5. The point system:

- (a) Thoroughly explained and adhered to throughout.
- (b) Study of type according to point system.
- (c) Picking up and pasting up of different type faces.
- (d) Picking out samples of various kinds of type according to name; becoming familiar with faces, characteristics, adaptabilities, etc.



6. The distribution of type:

- (a) Preparation of inked type before distribution:
- (b) How to distribute and the care necessary in handling the many different faces and sizes, i. e., a place for every character and that in its proper place.
- (c) Preparation of new type before laying.

7. The taking of proofs:

- (a) How to prepare type for proofing.
- (b) How to take galley proof on proof press.
- (c) How to tie up forms without using knots.
- (d) How to take proof on stone.

8. Proofreuder's marks:

- (a) Proofreader's marks and their meaning. Why used.
- (b) Reading own proof, correct marking, thorough knowledge of same. (Practice sheets to be provided.)

9. Reading proof and editing copy:

- (a) Reading aloud, correct enunciation.
- (b) Correcting improperly worded and badly arranged sentences.
- (c) ('hanging phraseology, eliminating superfluous words, etc.

10. Making up jobs:

(a) Care necessary in making up jobs before locking into form

11. Stone work-Imposition:

- (a) Locking up of small forms. Envelopes, letterheads, business cards, tickets, etc.
- (b) Determining proper position for above forms in order that best results may be obtained.

12. Press work:

- (a) Names of parts of the press and care of same, including the composition of rollers. (Use C. & P. chart.)
- (b) Oiling of press; its necessity.
- (c) Learning to feed sheets into press, without form.
- (d) Putting form into press.
- (e) Setting grippers away from type.
- (f) Putting on new tympan.
- (g) Taking proof.
- (h) Setting gauge pins and grippers.
- (i) Making ready simple forms.
- (f) Feeding the press slowly with form on.
- (k) Proper way to lak press with form on.
- (1) Care of stock while feeding, and its disposition when taking from
- (m) Care of type form after job is completed.
- (n) Care of inks, their perishable qualities.
- (a) Use of wood and steel bearers in a form, their care and resultant damage from carelessness.
- (p) Various technical terms in both branches of the trade explained in conferences following shop experiences, visits to industrial plants, etc.

13. Mathematics:

- (a) Mathematics applied to paper, estimating and figuring stock for
- (b) Keeping record of time on each piece of work in course of construction. Figuring cost of all work turned out, including inks, paper, wrapping, etc.

14. Principles of design:

The application of the elementary principles of design to every job.

. 15. Related work:

- , (a) Reading books on printing and making reports.
- (b) Talks on related subjects:

Paper making.

Plate making, including electrotyping, zinc etching, half tones, and stereotyping.

Various composing machines in use and their adaptabilities.

Shop practices and customs.

Printing as a vocation.

Visits to some of the leading plants, with reports.

Trade hygiene.

Writing instructions.

An advanced course in printing, given as an elective course in the ninth grade, would retrace the principles here outlined. The course would be more broadly developed with much attention to details. Projects of greater difficulty would be required, demanding initiative and emphasizing technical skill.

SUGGESTIONS FOR CORRELATIONS:

English:

Publication of booklets on-

Punctuation.

Capitalization.

Division of words.

Spelling lists.

Writing articles for school paper, etc.-

Writing advertisements for school paper and other school publicity material.

Journalism-

Publishing of school paper.

Writing articles.

News gathering, etc.

Soliciting and writing advertisements.

Business management.

Mathematics:

Estimating costs of-

Printing.

Production costs.

Amounts of paper required.

Computing type masses, etc.

History:

History of printing.

Block printing in China.

Invention of printing-1450, Gutenberg.

Effect of printing on civilization.

Development of printing in America.



Art:

Color harmony.,

Application of color to the printed page.

Design as applied to printing.

Relation of type to shape of page.

Printing of designs cut from linoleum.

Methods of illustrating.

Study of type faces and related ornaments, borders, etc.

Layouts.

School:

Record cards.

Filing systems.

Making up office systems from standpoint of efficiency.

ASSIGNMENT OF SUBJECTS TO GRADES AND TIME.

The junior high school covers the grades between elementary and higher secondary education. This interval may be divided in a general way into:

1. A period of self finding or adjustment.

2. A period of exploration and discovery.

3. A period of tentative choice.

The following order of assignment of subjects to grades and time is suggested:

1. The finding period.

7B grade, simple mechanics.

A minimum of five 60-minute or three 90-minute periods each week required.

2. The exploratory period.

7A grade, woodwork.

8B grade, printing.

8A grade, general metal work.

A minimum of two 90-minute periods in shopwork and one 90-minute period in mechanical drawing each week required. Two added 90-minute periods each week elective.

3. The period of tentative choice.

9B and 9A grades, election in any of the above or related subjects for

educational value and vocational outlook.

Three 90-minute periods in shopwork and two 90-minute periods in mechanical drawing each week. Two added 90-minute periods for pupils intending to enter a technical high school. All ninth-grade work elective.

PROGRAM.

The accompanying program is a reproduction of the plan of organization of a typical junior high school, showing the place of the manual arts activities in the work of the school.

The first column on the left of the program is an index column. It shows the grade, section, home-room number, name of home-room teacher, composition of class by sexes, and the type of section on an ability basis. The exponent shows the section number, and the



type of section is indicated by the capital letter A, B, or C in the corner. A indicates a superior section, B a section of medium ability, and C a section of low ability.

All periods which show blank on the program are study hall

periods.

The 15-minute period between 8.80 and 8.45 in the morning is spent by all classes in home rooms.

The 30-minute periods between 11.45 and 12.15 and between 12.30

and 1 are lunch periods.

Shopwork for 7B boys is a course in simple mechanics. The boys rotate through the woodwork, sheet metal, and electric shops, spending a six weeks' period in each shop. In all other grades the nature of the shopwork is indicated on the program.

THE MANUAL ARTS TEACHER.

Conditions surrounding the manual arts worker in the schools have changed very materially since the advent and acceptance of the

junior high school idea.

Formerly he was an isolated teacher of an isolated subject in an isolated room, perhaps a mile from the building from which he received his class for a period of 60 or 90 minutes a week, perhaps never meeting the so-called regular teacher of his class and having little more acquaintance with his principal than an annual telephone conversation in organizing classes.

Now he suddenly stands very much to the front as an important factor in a large and intricate organization, a teacher among teachers of other subjects, with the responsibility of placing himself and his work upon an equal social and educational footing with other departments of his school. The social aspects of his work are vastly more important than ever before. He is much more in the light, and his acts are subjected to inspection and evaluation, in themselves and in their relation to others, as they have never been before.

The importance of the manual arts teacher in the new organization is recognized in the new demands upon him, both in preparation and in the duties of the school. In many communities it is required that he have an educational equipment equal or equivalent to that of other teachers of the same grade, and this demand will be extended as trained teachers can be more readily secured. The special training and abilities of the manual arts teacher make him an important factor in the junior high school, and the demands upon his time and experience will be increasingly greater. In addition to broad, general, and special training, it is essential that he be high-minded and have a sympathetic regard for boys. In no department of school work are opportunities for personal relationships greater than in the manual arts, and the influences for good should be correspondingly great.



| _ |
|-------------------|
| SCHOOL |
| 0 |
| I |
| O |
| S |
| I, |
| 00 |
| = 7 |
| 70 |
| a - |
| 0 7 |
| - 4 |
| Z |
| 24 |
| h? |
| |
| w. |
| Œ |
| MPIRE JUNIOR HIGH |
| = |
| 2 |
| |

| | The second second | | | 1 | n | | | 1 | |
|--------------|-------------------|------------------|---------------------|-------------------------------|--------------|--------------|--------------------------|---|----------------------------------|
| | | ~ | - | 28.91 | | The second | 1 00: | 1.45 2:30 | 3.15 |
| 9.5 | 845 | 30 1015 | | 00 | 6 7 | S HT TOOH | SHOPT TH. SEWING T.TH. | | MATH. |
| A DORN A | ENGLISH | GEOG. | 1 | 103 MILLES | | | HYGIENE F.IIO | | 102 LOOMIS. |
| 10000 | 103 MILLES | ENGLISH | GEOG. | MATH | 5 | HOP T. TH.S | SHOP T. TH. SEWING M.W. | 103 HILLES. | |
| 78 103 | | 103 HILLES | 107 DORN | IO4 BALD WIN | - | HOPETHS | SHOP LTH SEWING M.W. | | ENGLISH |
| TESTOOMIS . | | 6YMTH | ENGLISH | 107 DORN | | | MYSIENE MAIO | | IOS HILLES. |
| 2000 | SHOPMIN SE | PHIM SEWING M.W. | ENGLISH. | | | | OLLOOMIS | 107 DORN | IOI LEHR. |
| 100 | HYGIENE TIOE | GYM TN. | IOI LEHR. | | | | 6206. | ENGLISH | |
| S. CHR. | SHOP MW. SE | 3 | TANK. | I EHR | | | 107 DORN | 101 LEHR. | |
| B.19 10 8.19 | HYGIENETHAB | ENGLISH | WOODWOOK | WOODWORK H. THE SOUTH SHE TH. | | | GEOG. | HIST. | 104BALDWIN |
| 7. | 106 MEADE | IOZ HARTINGER | WOODWOOK T | WOODWOON TE COSHURET F. | | ENGLISH | 96.06 | MATH. | HIST. |
| 74 DOW | 212 BOYD | | HYGIENE THAILE | , Dr. Fr. | | DI LEHR. | 1900 | 66.06 | HIST. |
| WIND THE | | GVM.F. | TANOMONO A | WOODWOOM TR. COOKING PLIN | - | I DA BALDWIN | JOZ HARTINGER | 115 BOOTH | 114 WAGNER |
| BOOTH | DRAMATICS | HIST. | THE PERSON NAMED IN | ENGLISH | GEOG. | | MATH. | WOODK | COOKING MLW. |
| 1136.1 | BLANE | LE HUNTER | ENGLISH F | MATH. | DRAMATICS | 0 | HIST. | WOODWOON T.T. | DELW. |
| 7AS - 3ME | | IIS BOOTH. | DEHARTIMEER | TO SHERMAN | 9 LANE | | וופונים ו | WOODWORN T.TH | COOKING M. W. |
| TAMPER P | | HIST | MATH. | IIS BOOTH | 102HARTINGER | - 4 | T DISOLE | | DR.W. |
| SCATTER . | MATH. | - | GYM.F. | HIST. | | JODOWORN M | WOODWORN MW. COOKING MW. | 110 LEWIS | IOT DORN. |
| W 6/10 | 113 SHERMAN | 1 | 2000 | | 3 | OS DWORK H | M. COOKING H.W. | GYM. F. | CNGLISH |
| THO WALL | 114 Dow | 1135HERMAN | MOD +II | | - | | HABIETEE TH. ITO | BOOKBINDING M. TH. SEWING | MIKSEWINGHA |
| VI TAN | | H.3T. | LATIN | HYE IE NE TE 10 | - | A PETTY | EOB HITZ | MECHOR, T. W. | T. W. |
| SECTION S | HOLEWIS | GYM.TMUSICH | - | - | HIST. | E.B. | " MATHY | _ | PRINTING MITH SEWING WIT. |
| AT NAME A | MATH | 1 | | NINT NO | | | VOCATIONS IL ET | HIST. | SOI DAVID |
| MEADE | MOSIC W | + | 3 | HIST | ENGLISH | | VOCATIONS TEN | VOCATIONS TELE PRINTING WESEWING W.F. GYM. F. | NG WE SEWING W.F. MECH. DR.T. |
| 85.106 618 | | 104 PETTY | - 1 | | _ | | PRINTING | ENGLISH | MATH |
| App GIESE. | HIST. | MUSICAL DYNET | 0000 | $\overline{}$ | | | ART. T. TH. | SOT DAVID | II SOMERFIAM |



| BKH175 | ENGLISH | LATIN | HIST. | | | GOOK HE T. | COOKING T.P. ANT M. | 202 HANN. | HYBIENE W. EM |
|-----------------------|---|-------------------------------------|------------------------|-----------------------|-----------------------|---------------------|---------------------------|-------------------------|--|
| BA ZOSC | MUSICM GYMM | FRENCH E12 BOYD. | | ENGLISH 204 DAVID | HIST. | R. | 202 HANN. | SHEETMETAL COOKINGT. | SHEETMETAL T.TH. MECHDRIM. COOKING T.TH. ART.W. |
| • | HYGI ENEM 102 | SPANISH | ENGLISH 201 DAVID | TYPE WR. | | SHEET METAL | SHEET METAL WE MAY WOR M. | EO! WOLFF | SOE PETTY |
| - | HYGIENE M. 102 MECH. DR. T. TH. MUSICE, GYMAN | 202 GEHLKE | 1000 Erec | COOKING. | | | 201 WOLFF | ENGLISH ZIOMILLER. | |
| | 202 HANN | DRAMATICS 9 LANE | WICHTONSTRIN | GYM.T. | | HIST. | ENGLISH 210 DAVID | COOKING M. | THINECH DAK |
| Breating | TYPE. WR. | TYPE,WR. | SOZ HANN | HIST. | ENGLISH | SH. | MCATIONS F. EIE | GOOT NOT THE | COOKING MAY ART. T. |
| BATDEVER C | COOKING | AL. | MECH. DR. T.TL. | MATH 202HANN | | MUSIC W. GYM. F. | | HIST. | ENGLISH 210 MILLER |
| SB 204 TECK | COOKING MW. SEWI | NE T. TH | ENGLISH 204 DAVIS | SCIENCE 211 TITUS | | MECH. DR.M.F. | M.W.F. | 104 GEHLKE | |
| 98 FITUS | ENGLISH 204 DAVIS | | MECH DR.MWF. | FO ART. | | MATH | SCIENCE 211 SENSEL | Vacoby | WOODWORK. |
| 98 SEHLKE 206 COM. | IOS JOSEPH | | HATH. | HIST. | | | ENGLISH 204 DAVIS | MUSIC T.TH. | SCIENCE 215 TI TUS |
| 98 JOSE PH | | ENGLISH 204 DAVIS | MUSICM.W. GYM.T.TH. | | | SCIENCE | MATH 214 SPIERS | SPANISH IT | 207 LEWIS. |
| BB BAYNE | MATH. | SCIENCE | | ENGLISH 210 MILLER | | BOOKKEEPING! | GYM. MW. | LATIN IE. | |
| 98 WHEATLEY | | MATH. 210 SPIERS | SCIENCE | | ENGLISH 204 DAVIS | T 90 | | FRENCH IE | ZIZ BOYD |
| SA WEYER. | COOKING MECH. | MECH.DR.MWF. 6MW.F. SEWING T.TH. | MCOE | WCOD WORK. | ENGLISH 214 WEYER | EB | PATH. | SCIENCE 215 SENSEL | |
| SA HUGHES | нээм | MECHIDRIMIMIE. | ENGLISH 214 WEYER | SCIENCE 215 SENSEL | | Mood | Моормовк | MATH. | |
| SAWRIGHT | SCIENCE 215 WRIGHT | COM. BE 06. | ZI3 SPIERS | ENGLISH 207 LEWIS | | | 105JOSEPH | MUSIC M.W. | |
| SA LEWIS | PATH. | 106 JOSEPH | SCIENCE Ell SENSEL | GYM. MW. | | | COM. GEOG. | ENGLISH 214 WEYER | |
| BA SENSEL | 209 SPIERS | SCIENCE 215 SENSEL | 207 LEWIS | LATIN T. | , | | ENGLISH 207 LEWIS | APPL | APPLIED ART 105 JOSEPH |
| SA SPIERS | ENGLISH E14 WEYER | MATH. 213 HUGHES | FRENCH II | FRENCH T | SCIENCE 215 WRIGHT | C.E. GHT | BOOKEEPING 103 TITUS | | |
| 94 BOYD. | ENGLISH 207 LEWIS | MUSICT.TH | SPANISH IL | SPANISHT | ZISSPIERS | HS. | MUSIC MW. GYM.T. TH. | | |
| . V6 | | ENGLISH | SCIENCE | 213 HUGHES | | | LATIN I | | |
| STUDY | BALDWIN. | LOOMIS. | LEWIS. DAVID. | PETTY. | HITZ SI | SHERMAN. | GEHLKE. | SPIERS. | |

Flours 3 .- Typical junior bigh-school program.



MANUAL ARTS ROOMS.

The survey revealed the fact that the range of provision for housing the manual arts department in junior high schools is apparently almost as great as the number of schools or school systems. It reaches all the way from lavishly wasteful expenditure to a meagerness almost incredible. Unintelligent expenditure of money, ignorance of the requirements of manual arts on the part of designers and of school officials, and personal whims are all evident factors in this diversity of existing conditions.

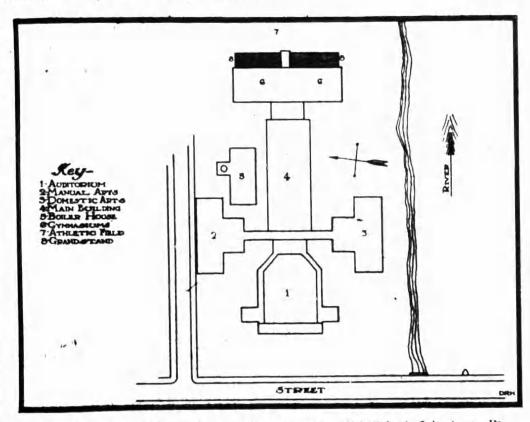


FIGURE 4 .- Group plan, William A. Cochran Junior High School, Johnstown, Pa.

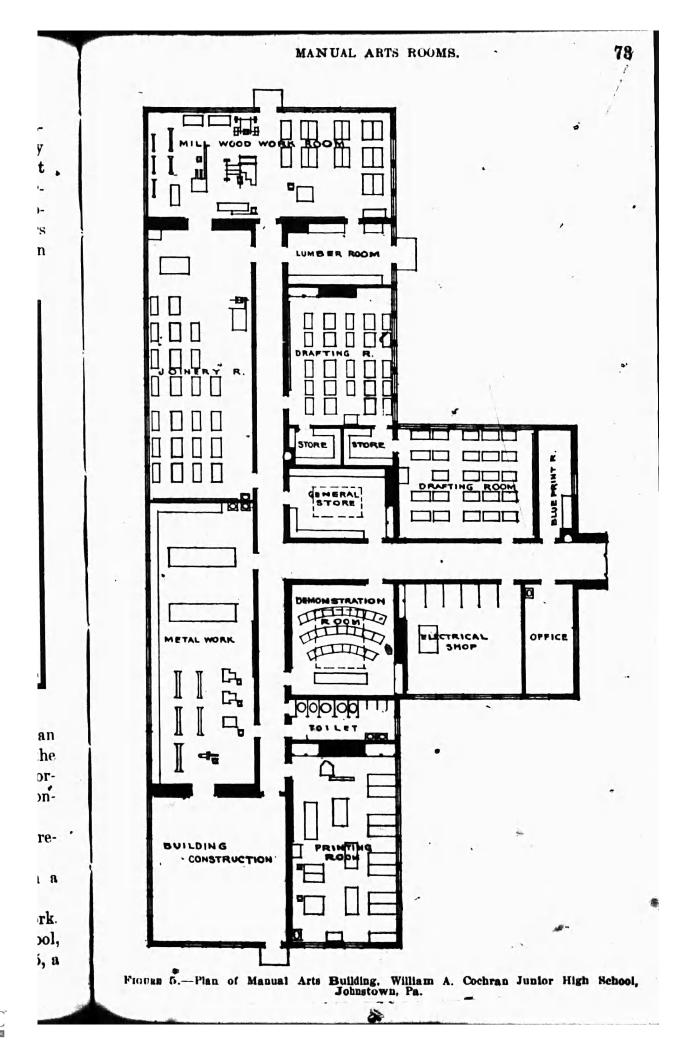
In old buildings the rooms are almost invariably those that can not be used for other purposes. A very general characteristic is the lack of adequate provision for tool and supply storage, lumber storage, space for teachers, and seating space for conference and demonstration.

A study of this phase of the junior high school problem with report and recommendations would be of great value.

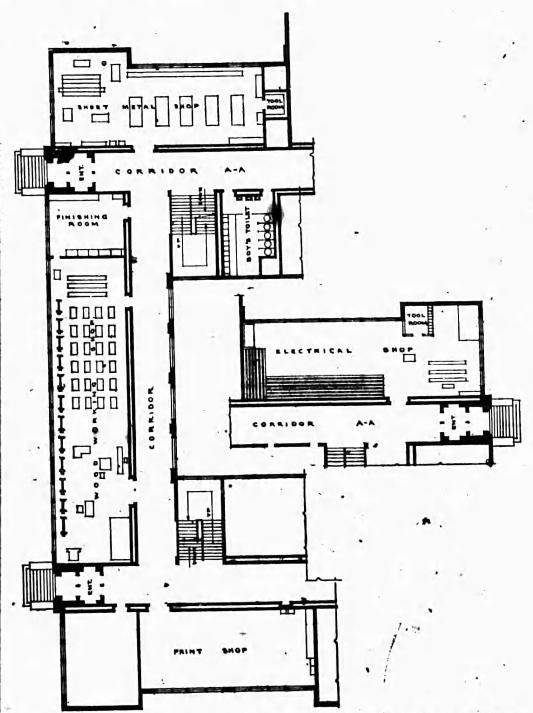
The accompanying drawings were selected as illustrating in a general way types of plans for housing this department:

1. A group plan with a separate building for manual arts work. This is illustrated in the William A. Cochran Junior High School, in Johnstown, Pa. Figure 4 gives a plan of the group; Figure 5, a plan of the manual arts building.





2. Separate rooms for manual arts in the school building. This type is illustrated in the manual arts department of the Jefferson Junior High School in Minneapolis, Figure 6.



Flourd 6.—Manual arts department, Jefferson Junior High School, Minneapolis, Minn.

3. Large areas in the school building devoted to manual arts, divided to meet the needs of the school by movable partitions. Patrick Henry and Audubon Junior High Schools of Cleveland illustrate this type, Figure 7.



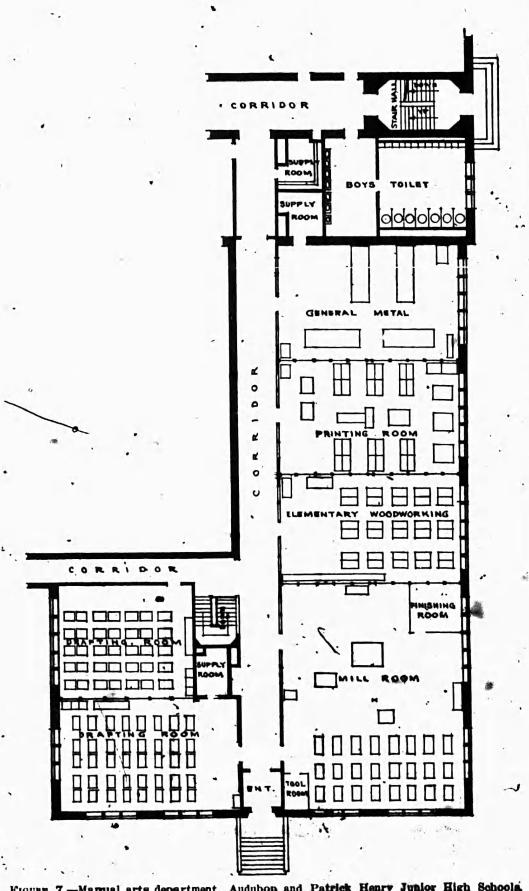
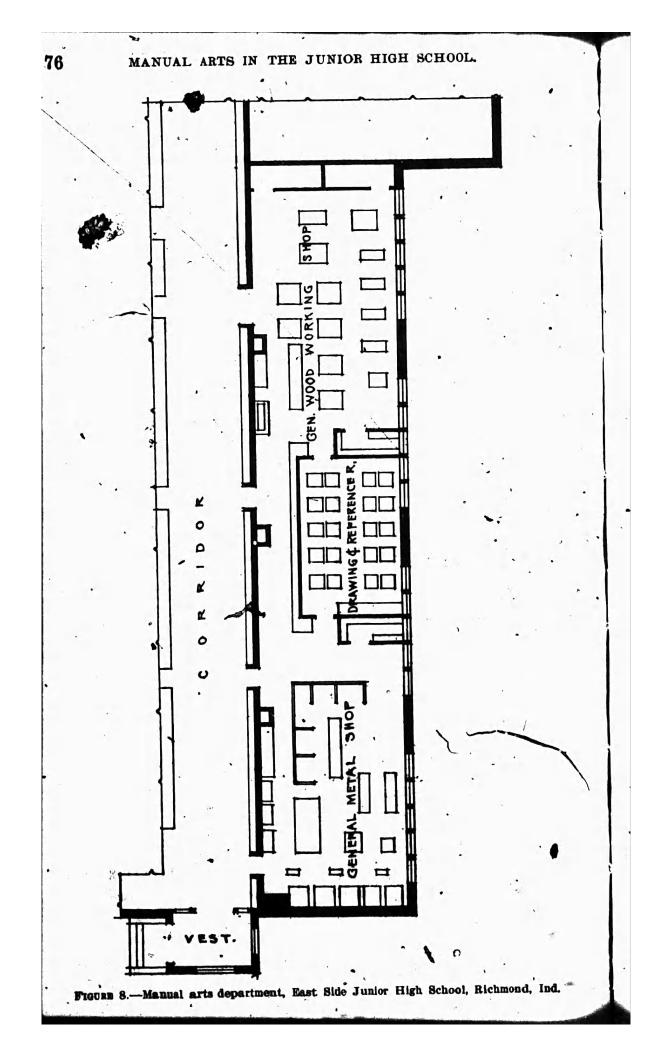


Figure 7.—Manual arts department, Audubon and Patrick Henry Junior High Schools, Cleveland, Ohio.







- 4. Arrangement for a moderate sized school with two shops and a drawing room. An excellent example is found in the East Side Junior High School of Richmond, Ind., Figure 8.
- 5. The general shop, Figure 9, is a suggestive plan to meet the needs of the general shop, for household mechanics, or for the one-room department in consolidated schools.

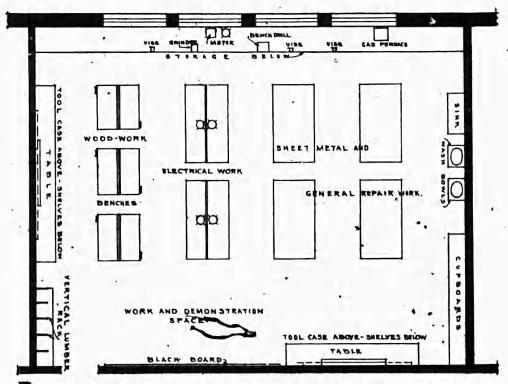


FIGURE 9.—Suggested plan for a general shop.

MANUAL ARTS EQUIPMENT.

The selection of equipments should be influenced, to some extent, ocal conditions. Such selection will always be influenced by the training and experience of teachers and supervisors.

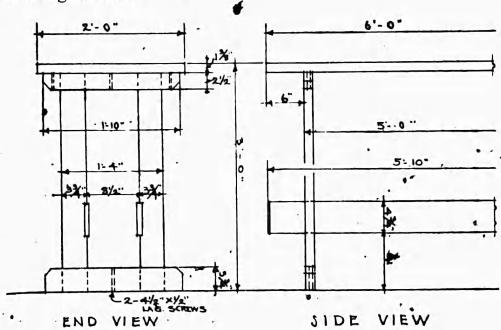
In general, special tools for special purposes should be avoided—in school work. The work that would be accomplished with such tools can be done with simple, ordinary equipment to the advantage of the pupil.

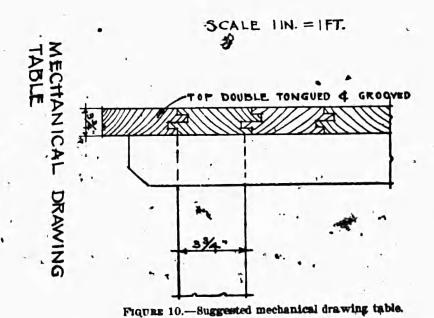
Equipments should be as limited as consistent with effective work. Such equipments have the advantage of economy in original cost and economy in time of teachers in care, checking, and storage. The best standard tools and equipments always give the best results and are cheapest in the end.

91048°-24---



The following lists are intended to be suggestive. They are conservative but sufficiently complete to meet all the requirements of the junior high school:





MECHANICAL DRAWING ROOM.

- 16 two-student type mechanical drawing tables. See drawing, Figure 10.

 8 drawing board and storage cabinets, 32 stools.
- · 64 drawing boards.
- 32 T squares, 20-fach. 32 12-inch triangular boxwood scales
- 32 pencil compasses.
- 32 triangles, 8-inch 80° to 60°
- 32 triangles, 6-inch 45°.
- 2 irregular curves, amber, Nos. 6 and 7.
- 4 sets of drawing instruments.
- 12 ruling pens, extra.



ELEMENTARY WOODWORKING SHOP.

- 25 benches 31 feet, open. See drawing, 25 bench hooks or jack boards.
- 2 bevels, 8-inch sliding T.
- 1 set auger bits, 1 inch to 1 inch, in case.
- 6 bits, 1-inch, anger dowel, long.
- 8 bits, 1-inch, auger dowel, long.
- 8 bits, 1-inch, auger dowel, long.
- 1 bit, expansive, No. 2.
- 2 bits, 4-inch, twist drill, wood.
- 2 bits, A-inch, twist drill, wood.
- 2 bits, A-inch, twist drill, wood.
- 2 bits, 3-inch, twist drill, wood.
- 8 bit handles (chisel handles fitted to bit shanks).
- 1 brace, 8-inch.
- 25 brushes, 7-inch, counter, good grade.
- 1 burnisher, 3-inch.
- 12 chisels, 1-inch, handled, tanged firmer.
- 4 chisels, 4-inch, handled, tanged firmer.
- 4 chisels, 1-inch, handled, tanged firmer.
- 4 chisels, g-inch, handled, tanged firmer.
- 4 chisels, 1-inch, handled, tanged firmer. 2 chisels, 1-inch, handled, tanged firmer.
- 4 clamps, 4-inch, malleable.
- 4 clamps, 36-inch, door.
- 25 compasses, pencil.
- 2 countersinks, rose.
- 25 cutting boards.
- 2 dividers, 6-inch wing.
- 1 file card.
- 8 files, 8-inch half round bastard.
- 1 file, 8-inch flat mill, one safe edge.
- 2 fites, 5-inch taper slim,
- 25 gauges, marking.
- 1 glass cutter, 6-point.
- 6 gouges, I-inch tanged firmer outside bevel.

- 6 gouges, 1-inch tanged firmer outside bevel.
- 12 hammers, 7 ounces.
- 1 hammer, 12 ounces.
- 6 handscrews, 10-inch.
- 2 horses, 86-inch.
- 25 knives, sloyd, 21-inch.
- 6 mallets, bickory, 21 by 6 inches.
- 8 nail sets, it-inch.
- 1 oiler.
- 1 of slip, No. i Washita.
- 1 oil stone, No. 1 Washita, 1 by 2 by 7 inches, mounted.
- 1 oil stona medium India, 1 by 2 by 7 inches, mounted.
- 1 plane, 6-inch block.
- 25 planes, 14-inch jack.
- 1 plane, 22-inch joint.
- 2 planes, 9-inch smooth.
- 6 plane irons, extra.
- 1 plier, 5-inch flat nose.
- 1 plier, 5-inch round nose.
- 2 routers.
- 25 rules, 12-inch, No. 341.
- 25 saws, 12-inch, handy or cabinet.
- 6 saws, coping, No. J 100.
- 1 saw, key-hole, 10-inch.
- 4 saws, crosscut, 22-inch, 9-point.
- 4 saws, rip, 24-inch, 7-point.
- 2 saws, turning, 14-inch.
- 2 scrapers, 3 by 5 inches, cabinet.
- 1 screw driver, 8-inch.
- 12 screw drivers, 4-inch.
- 1 snip, 10-inch.
- 12 spokeshaves.
- 2 squares, try, 10-inch or 12-inch.
- 25 squares, try, 6-inch.
- 1 square, framing, 24-inch.
- 1 wrench, 8-inch monkey,

ADVANCED WOODWORKING SHOP.

For advanced woodworking the elementary woodworking equipment may be supplemented by the following added tools and machinery:

- 5 braces, 8-inch.
- 10 clamps, 24-inch door.
- 2 clamps, 86-inch door.
- 6 clamps, 48-inch door.
- 6 clamps, 72-inch door.
- 12 hand screws, 10-inch.
- 6 mallets, hickory, 21 by 6 inches.
- 1 oiler.
- 1 plane, 8-inch, rabbet.
- 2 sawk, crosscut, 22-inch 9 pt.
- 2 saws, rip, 24-inch' 7 pt.
- 4 scrapers, 8 by 5 inch cabinet.
- 1 wrench, 12-inch monkey.
- Individual motor driven machinery and accessories as follows:
- 1 band saw, 80-inch.
- I variety saw, with mortising and boring attachment.

- 1 jointer, 12-inch.
- 8 wood turning lathes, 10 inches by 4 feet 6 inches.
- 1 grinder, oil.
- 1 glue pot, 1-quart, electric.
- 2 band saw blades, i-inch.
- 2 band saw blades, 1-inch.
- 2 band saw blades, 1-inch.
- 2 circular saw blades, crosscut.
- 2 circular saw blades,
- 1 circular saw blade, miter.
- 1 circular saw blade, dado.
- 2 hollow chisels and bits, 1-inch.
- 2 hollow chisels and bits, A-inch.
- 2 hollow chisels and bits, I-inch.
- I hollow chiset and bit, & inch.
- 1 hollow chisel and bit, 1-inch.
- 2 jointer knives, sets.

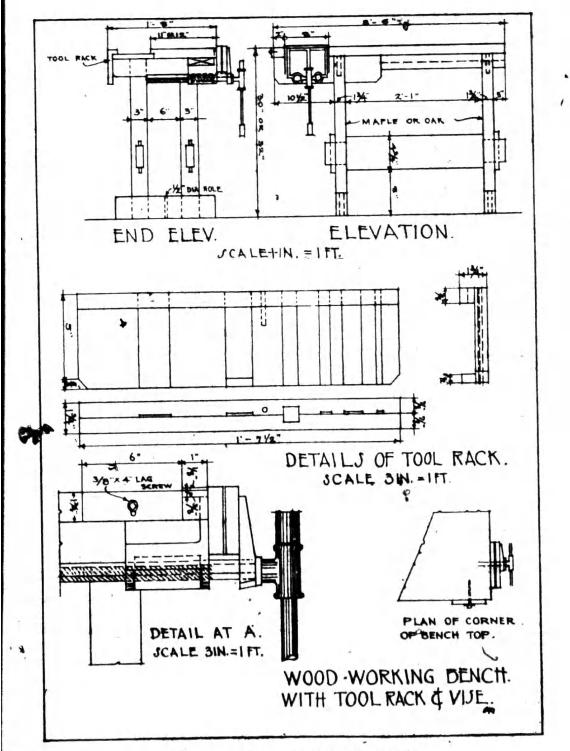


FIGURE 11. Suggested woodworking bench.

GENERAL METAL SHOP.

- 6 forged-steel snips, 131-inch.
- 2 forged-steel snips, curved, 14-inch.
- 1 breast drill, with 3-jaw chuck, 0 to inch.
- 12 scratch awis, 81-inch.
- 6 4-inch cold chisels.
- 6 4-inch cold chisels.
- 1 set 1-inch steel letters.
- 1 set 1-inch steel figures.
- 1 blow torch.
- 12 6-inch spring dividers.
- 1 8-inch pipe wrench.
- 1 14-inch pipe wrench,
- 2 6-inch monkey wrenches.
- 2 12-inch monkey wrenches.
- 6 center punches, 2-inch.
- 1 set hollow punches, 1 to 11 inches diameter, complete.
- 7 rivet sets, Nos. 2-8.
- 1 wire gauge.
- 6 5-inch screw drivers
- 6 8-inch screw drivers.
- 6 mallets, 2 inches diameter, rawhide.
- 1 blacksmith's anvil, 100-pound, with base block.
- 6 6-inch combination pliers.
- 6 6-inch side cutting pliers.
- 1 dozen 12-inch steel rules.
- 12. vises, 4-Inch, machinist's, stationary base.
- 1 new combination square, 12 inch set.
- 2 toolmaker's calipers, 5 inches outside.
- 2 toolmaker's calipers, 5 inches inside.
- 2 18-inch steel squares.
- 1 24-inch steel square.
- 12 16-ounce ball-pein hammers.
- 12 hacksaw frames, 10-inch.
- 3 dozen 10-inch hacksaw blades (24 teeth per inch).
- 1 dozen 10-inch backsaw blades (14 teeth per inch).
- 3 steel oilers, 1 pint capacity, 4-inch spout.
- 3 file cleaners.
- 6 6-inch slim-taper saw files, single cut, with handles.
- 12 8-inch second cut mill files, with handles.
- 12 8-inch mill smooth files, with handles.
- 12 6-inch mill smooth files, with handles.
- 6 10-inch hand bastard files, one safe edge, with handles.

- 6 half round files, 8-inch second cut, with handles.
- 1 tap and drill gauge.
- 1 set screw plates, 2-56, 3-48, 4-36, 7-32, 8-32, 10-24, 12-24, 14-20.
- 1 set screw plates, 1 to 1 inch, U. S. standard.
- 3 jewelers' saws.
- 1 gross assorted blades for jewelers' saw.
- 1 set of twist drills, is inch to i inch by 64ths.
- 1 stake holder, with beakhorn, blowhorn, needle case, creasing and horn, and conductor stakes.
- 1 hollow mandrel, 40-inch.
- 1 pair dividers, 12-inch.
- 1 pair trammel points.
- 1 pair nippers, 12-inch reversible.
- 6 counter brushes, 7-inch.
- 1 set easy outs.
- 6 2-pound soldering coppers, with handles.
- 3 gas soldering furnaces.
- 2 malleable iron pipe vises, 1 inch to 21 inches, hinged.
- 1 set pipe stock and dies, cutting 1-inch, 1-inch, 1-inch, 1-inch, R. H. thread.
- 1 pipe cutter, 1 inch to 21 inches, 2 rollers, 1 extra cutter.
- 1 11 by 3-inch quick change gear, engine lathe with chip pan, fully equipped, electrically driven.
- 2 10 inches by 4 feet speed lathes, with hand compound rests, electrically driven.
- 1 10-inch sensitive bench drill press, with three-jaw chuck, 1-inch capacity.
- 1 2-wheel electrically driven grinder, with pedestal, wheels 8 by 11 inches, 3,400 R. P. M.
- 1 30-inch squarity shears.
- 1 30-inch bar folding machine.
- 1 punch and shear combined.
- 1 30-inch forming rollers.
- 1 burring machine, 21 pounds.
- 1 turning machine, 22 pounds.
- 1 wiring machine, 31 pounds.
- 1 beading machine, 50 pounds, 4 sets of rolls.
- 1 hand forge, 28 by 40 inches.
- 4 standard benches, see drawing, Figure 12.

PRINT SHOP.

- 20 pounds 6-point Century Old Style, letter work only, no small caps.
- 60 pounds 8-point Century Old Style, letter work only, no small caps.
- 3 pounds 8-point Century Old Style, extra figures.
- No. 2 letter work only, no small caps.
- 5 pounds 10-point Century Old Style, extra figures.
- 60 pounds 12-point Century Old Style, letter work only, no small caps.
- 20 pounds 14-point Century Old Style,
- letter work only, no small caps.

 3 fonts 18-point Century Old Style.
- 8 fonts 24-point Century Old Style.
- 3 fonts 30-point Century Old Style. 3 fonts 36-point Century Old Style.
- 2 fonts 8-point Engravers' Old English.
- 2 fonts 12-point Engravers' Old English,

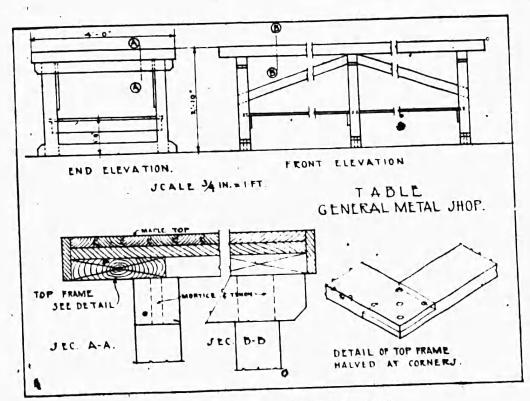


Figure 12.—Suggested metal working bench.

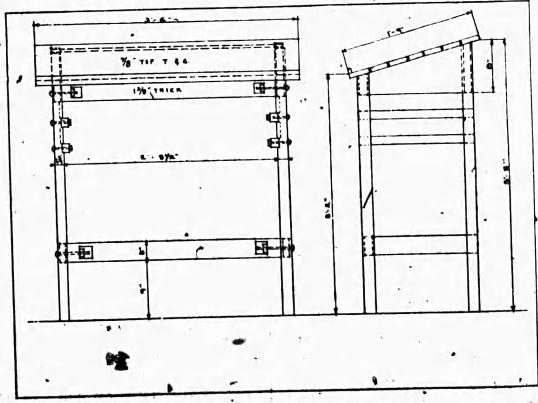


FIGURE 13.-Suggested type setting stand



PRINT SHOP—Continued.

2 fonts 18-point Engravers' Old English, 2 fonts 24-point Engravers Old English. 2 fonts 36-point Engravers' Old English. 10 pounds 8-point Century Old Style Bold. 20 pounds 10-point Century Old Style Bold. 20 pounds 12-point Century Old Style Bold. 4 fonts 14-point Century Old Style Bold. 4 fonts 18-point Century Old Style Bold. 4 fonts 24-point Century Old Style Bold. 2 fonts 30-point Century Old Style Bold. 2 fonts 36-point Century Old Style Bold. 5 pounds 6-point quads and spaces. 15 pounds 8-point quads and spaces. 100 pounds 10-point quads and spaces. 20 pounds 12-point quads and spaces. 20 pounds 14-point quads and spaces. 20 pounds 18-point quads and spaces. 20 pounds 24-point quads and spaces. 10 pounds 30-point quads and spaces. 10 pounds 36-point quads and spaces. 10 pounds 8-point hyphen leaders. 15 pounds 10-point hyphen leaders. 1 font 6-point Hylite border No. 6. 1 font 6-point Engravers' border No. 601. 1 fout 12-point Engravers' border No. 1201. 1 font Chic decorators, series 1. 1 each Cloister ornaments Nos. 47 and 48. 1 each Bodoni mortised ornaments Nos. 7201 and 7203. 200 pounds 2-point labor-saving leads. 20 pounds 2-point leads cut 15 ems extra. 200 pounds 6-point labor-saving slugs. 10 pounds 6-point slugs cut 15 ems extra. 75 pounds labor-saving metal furniture. 10 pounds 2-point labor-saving rule No. 1002. 10 pounds 2-point labor-saving rule No. 2082. 10 pounds 2-point labor-saving rule No. • 1082. 25 8 by 2 graduated job sticks. 4 10 by 2 graduated job sticks. 1 15 by 2 graduated job stick. 5 leader boxes. 1 31 by 6 maple planer. 1 type cabinet with 47 California job cases,

1 blank case, specing materials case E. lead and sing rack, and mortised label

holders.

- 1 imposing table, with coffin, labor-saving reglet, labor-saving furniture, sort drawers on one side, drawer, letter boards and galley shelves on the other side, with 36 by 60 marble imposing surface.
- 4 benzine cans, pint size.
- 2 dozen small quoins with 3 keys.
- 2 dozen spring tongue gauge pins.
- 1 benzine brush No. 20, medium bristle.
- 42 8 by 13 pressed steel galleys.
- 6 61 by 23% all brass galleys.
- 4 compact rule cases,
- 3 6-inch square end pallet ink knives,
- 1 10 by 15 press, complete with gear and pinion guard, crankshaft, treadle fixtures, 3 semisteel chases, 1 set roller trucks, 2 sets roller stocks, 2 wrenches, and 1 brayer.

Casting 1 set rollers and brayer.

- 1 fly-wheel guard.
- 1 platen guard.
- long fountain.
- press brake.
- sets 10 by 15 roller supporters.
- 1 12 by 18 press, complete with gear and pinion guard, crankshaft, treadle fixtures, 3 semisteel chases, 1 set roller trucks, 2 sets roller stocks, 2 wrenches, and 1 brayer.

Casting 1 set rollers and brayer.

- 1 fly wheel guard.
- platen guard.
- I long fountain.
- press brake.
- 2 sets 12 by 18 roller supporters.
- 1 26-inch lever paper cutter.
- 1 extra knife for same.
- 1 proof press with stand.
- 1 wire stapler, with pedestal.
 - 5,000 1-inch staples. 5,000 1-inch staples.
- 25 individual typesetting stands, with two runners for cases. Accompanying drawing, Figure 13.
- 32 California job cases, with handles and label holders.

GENERAL SHOP.

Two types of equipment for the general shop are most commonly used in practice; first, a shop equipment for a single occupation, as woodwork, with supplementary equipment for a variety of additional activities, utilizing woodworking benches for the various types of Such equipment may be of original planning or the result of remodeling or adapting existing shops to more general purposes; second, a shop equipment definitely planned for general work for small groups in a variety of industrial activities, varied to some ex-



tent by local environment, particularly as distinguishing between urban and rural conditions.

For the first type the suggested equipments may serve as a basis, and a judicious selection of added equipment may be made from the following suggested equipment for the general shop. This equipment is adapted to use in the general shop planned in Figure 12.

WOODWORK.

```
6 benches, 81 feet, with vises.
6 bench hooks or jack boards.
1 bevel, 8-inch sliding T.
1 set augur bits, i to 1 inch, in case,
2 bits, 1-inch auger dowel, long.
2 bits, 1 inch auger dowel, long.
2 bits, 1-inch auger dowel, long.
2 bits, Ainch twist drill wood.
2 bits, A-inch twist drill wood.
2 bits, A-inch twist drill wood.
2 bits, I inch twist drill wood.
4 bit handles (chisel handles fitted to bit
  shanks).
1 brace, 8-inch.
6 brushes, 7-inch counter, good grade.
1 burnisher, 3-inch.
2 chisels, 1-inch handled tanged firmer.
2 chisels, 1-inch handled tanged firmer.
2 chisels, I-inch handled tanged firmer.
2 chisels, 1-inch handled tanged firmer.
2 clamps, 4-inch malleable.
2 clamps, 36-inch door.
6 compasses, pencil.
 1 countersink, rose.
 1 divider, 6-inch wing.
 2 files, 8-inch half round bastard.
 1 file, 8-inch mill, safe edge.
 1 file, 5-inch taper slim.
 6 gauges, marking.
```

2 glass cutters, 6 point. 1 gouge, 2-inch, tanged firmer, outside bevel, 1 gouge, 2-inch, tanged firmer, outside bevel. 3 hammers, 7 ounce. 2 handscrews, 10 inch. 6 knives, sloyd, 21 inch. 1 mallet, hickory, 21 by 6 inches. 2 nail sets, & inch. 1 oiler. 1 oil slip, No. 1 Washita. 1 oil stone, medium India, 1 by 2 by 7 inchés, mounted. 6 planes, 14-inch jack. 1 plane, 9-inch smooth. 1 plier, 5-inch flat nose. 1 plier, 5-inch round nose. 2 putty knives. 6 rules, 12-inch, No. 341. 6 saws, 12-inch handy or cabinet. 1 saw, crosscut, 22-inch 9 point. 1 saw, rip, 24-inch 7 point. 1 saw, turning, 14-inch. 1 saw, coping, No. J100. 2 scrapers, 3 by 5 Inch cabinet. 1 screw driver, 8-inch. 2 screw drivers, 4-inch. 2 spokeshaves. 6 squares, 6-inch try.

ELECTRICAL WORK.

8 bells, 3j-inch.
1 box assorted fuse blocks.
1 box assorted fuses.
1 brass key socket.
2 buzzers, 3j-inch.
50 feet bell wire.
6 dry cells.
3 electric meter cards.
1 motor, 1-borsepower universal current.

2 pliers, 6-inch side cutting.
5 plugs, attachment.
3 push buttons,
2 sockets, chain pull.
2 sockets, key.
1 socket, two-way plug.
1 transformer.
1 wiring board.

1 square, 12-inch try.

METAL WORK.

3 6-inch spring dividers.
3 hacksaw frames, 10-inch adjustable.
3 ball-pein hammers, 16-ounce.
3 centers punches, g-inch.
1 1-inch hollow punch.
1 1-inch hollow punch.
1 1-inch hollow punch.
4 river sets; Nos. 2, 4, 6, 8, 6 acratch awis.

file cleaners.

2 6-inch slim-taper saw files, single cut, with handles.
4 8-inch second-cut mill files, with handles.
4 6-inch mill smooth files, with handles.
5 6-inch mill smooth files, with handles.
2 10-inch hand bastard files, one safe edge, with handles.
5 haif-round files, 8-inch second-cut, with handles.
6 inch pipe wrends.

METAL WORK-Continued.

- 1 gas soldering furnace.
- 2 2-pound soldering coppers.
- 2 tin snips, 131-inch.
- 1 tin snip, curved, 14-inch.
- 1 blacksmith's anvil, 50-pound.
- 1 breast drill, with stand, 3-jaw chuck, 0 to 1 inch.
- 1 bar-folding machine, 30-inch.
- 1 set forming rolls, 30-inch.
- 1 small gas-heating forge.
- 1 grinder, small, with pulley.

- 4 vises, 4-inch machinists', stationary base,
- 2 riveting hammers.
- 1 from bench plate.
- 1 blow-horn stake.
- 1 needle-case stake.
- 1 square stake.
- 1 hollow mandrel.
- I squaring machine, 22-inch.
- 1 turning machine, 22-pound.
- 1 wiring machine, 31-pound.

PLUMBING.

- 1 bell-drum trap.
- I kitchen sink.

- 1 set kitchen and bath faucets.
- 1 S trap.

BIBLIOGRAPHY.

The junior high school:

The junior high school. Briggs.

The junior high school. L. V. Koos.

The junior high school idea. Van Denburg.

Junior and senior high school administration. Johnston, Newlon, and Pickell.

National Society for the Study of Education. Fifteenth Year-book. Part III. The junior high school. Douglas.

Secondary education in England and United States. Norman.

Methods and courses:

The elementary school curriculum. Bonser.

Essentials of woodworking. Griffith.

Projects for beginning woodwork and mechanical drawing. Griffith.

Correlated courses in woodwork and mechanical drawing. Teaching the manual and industrial arts. Griffith.

Design and construction in wood. Noves.

Handwork in wood. Noyes.

Problems in woodworking. Murray.

Shop problems. Siepert.

Bird houses boys can build. Siepert.

Boy activity projects. Blackburn.

Problems in farm woodwork. Blackburn.

Elementary woodworking. Foster.

Elements of woodwork. King.

Elements of construction. King.

Teacher's handbook. King.

Educational woodworking for home and school. Park.

Beginning woodwork. Van Deusen.

Selected shop problems. Seaton.

Handcraft projects. Baxter.

The school and society. Dewey.

Prevocational education in the public schools. Leavitt-Brown.

The manual arts. Bennett.

Manual arts for vocational ends. Crawshaw.

Classroom management. Bagley.

The instructor, the man, and the job. Allen.



Methods add courses-Continued.

How to teach a trade. Selvidge.

The place of industries in elementary education. Dopp.

Beginning of industrial education. Hanus.

The idea of the industrial school. Kerschensteiner.

Examples of industrial education. Leake.

Industrial education. Russell and Bonser.

Mechanical drawing:

Mechanical drawing for high schools. French.

Engineering drawing. French.

· Correlated courses in woodwork and mechanical drawing. Griffith.

Grammar-grade problems in mechanical drawing. Bennett.

Problems in mechanical drawing. Bennett.

Mechanical drawing. Svensen.

Essentials of drafting. Svensen.

Mechanical drawing for secondary schools, Crawshaw.

A brief course in mechanical drawing. Mathewson.

Elementary mechanical drawing. Weick.

Mechanical drawing problems. Weick

Mechanical drawing-Standard conventions. Kepler.

Effective methods in mechanical drawing. Evans.

Mechanical drawing. Cross.

Essentials of lettering. French and Meiklejohn.

Letters and lettering. Brown.

Lessons in lettering. French and Turnbull.

Mechanical drafting. Howe.

Perspective sketching from working drawings. Mathewson.

Lettering for draftsmen. Reinhardt.

Practical perspective. Richards and Colvin.

Mechanical drawing. Ermeling.

Simple or household mechanics:

Advanced toy making. Mitchell.

Mechanical devices in the home. Allen.

Radiocraft. Solar.

Farm mechanics. Crawshaw.

Job sheets, household mechanics. Bedell.

Lesson sheets in elementary electricity. Willoughby.

Cabinetmaking: . .

Problems in furniture making. Crawshaw.

Furniture design for schools and shops. Crawshaw.

Furniture making-Advanced projects in woodwark. Griffith.

Woodwork for secondary schools. Griffith.

Furniture designing and drafting. A.C. Nye.

Seat weaving. Perry.

Modern cabinet work, furniture, and fitments. Wells and Hooper.

·Furniture upholstery. Johnson.

Period furniture. Clifford.

Antique furniture. Burgess.

How to know period styles. Kimerly.

Furniture weaving projects. Hyatt.

Furniture for the craftsman. Otter

ERIC

Building construction:

Carpentry. Griffith.

Roof framing tables. Griffith.

Constructive carpentry. King.

Problems in carpentry. Ruehl.

Agricultural woodworking. Ruehl.

Practical carpentry. Radford.

Framing. Radford.

Steel square and its uses. 2 vpls. Radford.

Radford's portfolio of details building construction. Radford.

Modern carpentry and building. Sylvester.

Practical house framing. Fair.

Framing. Radford.

Carpentry and joinery. Townsend.

Practical course in roof framing. Gagsbeek.

Finishing:

Problems in furniture making. Crawshaw.

Problems in woodwork. Burton.

Easy methods of wood finishing. F. Maire.

Modern wood finisher. F. Maire.

Painter, gilder, and varnisher's companion. Brannt.

Expert wood finisher. Kelly.

Natural woods and how to finish them. Berry Bros.

Wood turning and pattern making:

Art and education in wood turning. Klenke.

Problems in wood turning. Crawshaw.

Wood turning. Golden.

Wood pattern making. Purfield.

Pattern making. Willard.

Pattern making. Turner and Town.

Forestry and lumbering:

Wood and forest. Noyes.

Handwork in wood. Chapters I-III. Noves.

The primer of forestry. 2 vols. Pinchot.

Woods-their characteristic properties. Snow.

Lumber and its uses. Kellogg.

The kiln drying of lumber. Liemann.

Sheet metal:

Sheet-metal workers' manual. Broemel.

Modern sheet-metal workers' instructor. Rose.

The universal sheet-metal pattern cutter. 2 vols. Neubecker.

Sheet metal for the Junior High School, Manual Training Magazine, January, 1922. Aberg.

Sheet-metal pattern drafting. Daugherty.

Printing:

The art and practice of typography. Gress

Principles of design. Batchelder.

Plain printing types. De Vinne.

Correct composition. De Vinne.

Title pages. De Vinne.

Printing for school and shop. Henry.

Selected references.

(Taken from Industrial Education Circular No. 15, Department of the Interior, Bureau of Education, Manual Arts in the Junior High School.)

- Aberg, Charles. Sheet-metal work for junior high schools. Manual Training Magazine, 23: 229-41, January, 1922.
- Bedell, Earl L. Household mechanics in the Detroit public schools. Manual Training Magazine, 22: 316-23, April, 1921.
- Bennett, Charles A. Manual arts in the junior high school. Manual Training Magazine, 23: 73-77, September, 1921.
- The new intermediate school plans of Buffalo. Manual Training Magazine, 21: 273-74, April, 1920.
- Benson, A. F. Industrial work in the junior high schools. Industrial Arts Magazine, 10: 339-44, September, 1921.
- Brewer, J. M. The need for try-out courses in the junior high school. Industrial Arts Magazine, 11: 85-8, March, 1922.
- Practical arts for vocational guidance in the junior high school. Manual Training Magazine, 23: 69-72, September, 1921.
- Edgerton, A. H. Experimental work in junior high school industrial arts. Industrial Arts Magazine, 8: 251-55, July, 1919.
- Industrial arts and prevocational education in our intermediate and junior high schools. Industrial Arts Magazine, 10: 365-71, 407-11, 453-6; 11: 23-25, October, 1921-January, 1922.
- Emerson, E. C. Advance work in war time for prevocational and junior high schools. In Eastern Arts Association. Proceedings, 1918, p. 98-103.
- Foulkes, Thomas R. A course in home mechanics. Manual Training Magazine, 21: 269-72, April, 1920.
- and Diamond, Thomas. A study of some practical values of public-school manual training in 36 cities of Wisconsin. Manual Training Magazinc, 20: 305-9, 339-44, May-June, 1919; 21: 79-83, 166-69, November, 1919. January, 1926.
- Griffith, Ira S. The field of manual arts in terms of present needs. Manual Training Magazine, 21: 1-5, September, 1919.
- Leavitt, F. M., and Brown, Edith. The nature and purpose of prevocational education; and personal characteristics of prevocational boys. In their prevocational education in the public schools. Boston, Houghton Mifflin Co. [1915.] P. 1-2, 58-69.
- McKinney, James. The high-school manual training teacher and his job. Manual Training Magazine, 23: 243-46, February, 1921.
- Noyes, William. The junior high school and industrial education. Manual Training Magazine, 19: 158-57, January, 1918.
- Roberts, William E. Productive work in the industrial arts class. Manual aining Magazine, 21: 119-21, December, 1919.
- Sawyer, R. G. Industrial information courses in the junior high school.

 Manual Training Magazine, 20: 316–18, May, 1919.
- Sewrey, U. Roy. How Rockford, Ill., is meeting the industrial education problem. Manual Training Magazine, 20: 272-75, April, 1919.
- Shapleigh, Frederick E. Educational preparation of working boys and girls.
 Industrial Arts Magazine, 8: 805-7, August, 1919.
- West, R. D. Manual training in the junior-senior high school. Manual Training Magazine, 20: 231-36, March, 1919.
- Winslow, J. L. Constructive plan for the organization and administration of junior high school courses in industrial arts for boys. Industrial Arts Magazine, 10: 243-47, July, 1921.

Added references.

- Bedell, Earl L. Household mechanics and the general shop. Industrial Education Magazine, 25: 14-16, July, 1923.
- Methods of teaching in a general shop. Industrial Education Magazine, 25; 38-41, August, 1923.
- Bowman, C. A., and Justison, F. E. Home mechanics instruction at Stout. Industrial Arts Magazine, 12: 453-60, December, 1923.
- Eckert, Dana Z. Exploratory opportunities of the junior high school. Industrial Arts Magazine, 12: 171-74, May, 1923.
- McKinney, James. The manual arts in the junior high school. Industrial Education Magazine, 25: 93-97. October, 1923.
- O'Rourke, Ralph W. The correlation of academic subjects with the practical work in printing. Industrial Arts Magazine, 12: 61-64, February, 1923.
- Selvidge, R. W. The job sheet. Industrial Education Magazine, 25: 12-13, July, 1923.
- The real job. Industrial Education Magazine, 25: 35-38, August, 1923.

