A REVIEW AND EVALUATION OF

EIGHTEEN POPULAR MECHANICS HANDBOOKS

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CHAPTER I

THE PROBLEM AND THE HISTORY OF THE POPULAR MECHANICS PRESS

Practically no class can be taught successfully without securing some current information in regard to the subject. Industrial arts, economics, vocational education, science and other subjects change periodically in the changing world. One way of keeping informed of the changing times is to have home and school libraries well filled with current reading materials. Of course the radio, television, and newspaper are good sources, but many times they only give an introduction to a subject. Many mistakes are being made in the industrial arts shops today in regard to library service. It has been noticed that most homemaking departments are very much aware of the importance of good library service and usually have a table or bookcase with current reading materials present at all times. The industrial arts departments in most all schools need this same kind of service. The shop is usually distant enough from other classes to contain a library of its own. It has been noticed that many of the leading magazines, School Shop, Popular Mechanics, Industrial Arts and Vocational Education, and many others fail to reach the shop when a library does exist.

Part A

The Problem

The purpose of this study is to discover and report on means of improving the teaching in the field of industrial arts by reviewing and evaluating eighteen Popular Mechanics Handbooks for junior high and senior high school shop libraries.

The origination and present status. The students in many classes get tired of using only the textbook as a source of information. Many times they will not hesitate to let it be known to the teacher. The teacher can make the class period more interesting by having at his disposal prepared teaching aids, well introduced, which will furnish a practical basis for information. This problem originated as an attempt to improve the teaching field by reviewing and evaluating eighteen Popular Mechanics Handbooks and introducing them to the industrial arts field. The present status of the problem is by no means complete, leaving much to further study. All of the handbooks have been found to supplement the industrial arts field in some way or another.

Contributions to industrial arts. The demonstration method of instruction is used to a great extent in most all teaching fields. These Popular Mechanics Handbooks are a source of many teaching aids that will clarify instruction when giving a demonstration. Teaching aids are physical means used by the teacher to strengthen the instruction and to make it more effective.

Ericson[1] lists a number of the more common teaching aids for industrial arts. Many of these teaching aids are present in the Popular Mechanics Handbooks. The teaching aids mentioned by Ericson include books, shop manuals, drawings of projects, instruction sheets, motion pictures, still films, advertising, catalogs, models, mock-ups, cutaways or sectional equipment, sample projects completed or disassembled, printed designs and magazines.

The need for the study. Since the industrial arts field includes such a wide variety of manipulative skills and an understanding of how economic goods are produced, there is a great need for additional reference materials.

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[1]Emanuel E. Ericson, Teaching the Industrial Arts, page 148.

These Popular Mechanics Handbooks contain a good source of information for preparing class demonstrations, lectures, and notes.

Aims of the study. The purposes of this study are included in the following five statements.

(1) To stimulate the desires of teachers to search for new teaching techniques and to keep informed about the changing times.

(2) To make available some sources of supplementary teaching aids.

(3) To emphasize the importance of a separate library of industrial arts information.

(4) To review and evaluate the eighteen Popular Mechanics Handbooks as appropriate reference materials for a junior high or senior high school industrial arts department.

(5) To inform the teacher about different types of teaching aids.

Methods of selecting data. When the report was begun only about half of the Popular Mechanics Handbooks to be reviewed and evaluated were available at the Oklahoma A. and M. College library. The other half were requested through the main library office. They were soon ordered from the Popular Mechanics Press, 200 East Ontario, Chicago 11, Illinois, and added to the Oklahoma A. and M. College library as reference books. The majority of the books may be found in the Engineering Library. Other methods of selecting data were through individual statements and through corresponding with the Popular Mechanics Press.

Part B

The History of the Popular Mechanics Press

For forty-eight years the Popular Mechanics magazine has been a great American institution. Four foreign language editions of Popular Mechanics

began publication during the past four years and despite their American editorial content, have won amazing acceptance wherever the French, Spanish, Danish and Swedish languages are spoken. As an international magazine it satisfies the desire of its readers throughout the world for the latest information on science, mechanics, business, industry, and how-to-do-it.

Since 1922 Popular Mechanics has had its own big seven-story building on Chicago's North Side. This splendid modern building has housed the editorial, executive, advertising, art, photographic, composing, printing, binding, wrapping, shipping, and circulation needs of the magazine. H. H. Windsor, founder of the publishing company, was convinced the building was built large enough to satisfy every need of his magazine for generations to come.

Circulation. The circulation has risen to 1,100,000 copies per month. As a result the Popular Mechanics Press and bindery machines have been working three shifts — completely around the clock; and there is much evidence that the world's increased interest in mechanics, science, and how-to-do-it will result in even larger circulation.

Foreign editions. The Popular Mechanics magazine has over 125,000 average net paid circulation in France; 100,000 in Latin America; 30,000 in Denmark; and 30,000 in Sweden.

Personal correspondence with Popular Mechanics Press. To get a complete story of the press it was necessary to write a personal letter to the Popular Mechanics Press. In a very short time a letter was received from Mr. Norman Guess, book manager of the company.

> The whole concept of POPULAR MECHANICS and Popular Mechanics Press was originated by Mr. Henry Haven Windsor in the 1890's. However it was not until 1902 that POPULAR MECHANICS was actually begun, and for several years it was nip and tuck as to whether

Mr. Windsor would have enough money to keep it going. However by great perseverance he was able to do so, and from then on it has been a miracle of increasing circulation.

SHOP NOTES was the first additional publication to our original venture, and this was started in 1904. Shortly after the Magazine was started, a Book Department was originated, and its sole purpose was to be of the utmost aid to our readers in encouraging them to read and study for better salaries. Naturally the profit motive does enter, but by and large the prime aim of this Department as well as the Magazine has been the dissemination of knowledge for better living in all respects.

Mr. Windsor, Sr., died in 1924, and since that time his son, Henry Haven Windsor, Jr., has been both publisher and editor, and has ably carried all the work and organization founded by his father. During World War II there seems to have been a terrific impetus given to "how-to" reading, and our circulation has more than doubled since 1941. The enclosed Catalog will show you the development of the Book Department to almost 40 titles, and practically all of these books sell consistently well. Our outstanding ones as far as large sales concerned are as follows:

FORTY POWER TOOLS YOU CAN MAKE
FARM MANUAL
BOY MECHANIC
YOUR HOME AND HOW TO BUILD IT YOURSELF

The above of course is necessarily a rough outline of our growth, and if you wish to put some specific questions to us, we shall be delighted to answer them to the best of our ability.

The prime aim of the Department as well as the magazine has been the dissemination of knowledge for better living in all respects. This has proven to be true by their large circulation. It is very common to see the Popular Mechanics magazine in school libraries and in many homes.

Validation of industrial arts textbooks. First of all industrial arts textbooks should be published for specific grade levels. There should be a wide variety of textbooks from which to choose for industrial arts classes, because of the variation of shop programs over the state. Certain textbooks are selected for many common reasons such as color of the cover, design, the author, and the arrangement and organization of the content. Industrial arts textbooks must possess instructions of how tools and machines are used

correctly. There should be a limited number of projects and each should offer something new in regard to design. There is a great need for a textbook on the senior high school level on the subject of tool and shop care, containing a limited amount of information in regard to safety.

CHAPTER II

HISTORY AND PHILOSOPHY OF INDUSTRIAL ARTS

This is an attempt to build up in ones own mind an adequate historical background of industrial arts. Such a background of the subject is essential to understand the present-day problems of public education. Industrial arts was brought into existence by attempts of many educators to help the poorer class of boys, and later was introduced into public education.

Part A

The History

Origination of industrial arts. Johann Heinrich Pestalozzi, son of a Zurich physican, was called the "father of manual training" which now is known as industrial arts. His father died when Johann Heinrich was only six years of age. He, with a brother and sister, was brought up by a pious and self-denying mother and a faithful servant. Learning was always difficult for the young Pestalozzi, but his unselfishness gained the good will of others.

Events that led to the development of industrial arts. Pestalozzi entered the University of Zurich to prepare for the ministry. At the end of his theological course, however, when he attempted to preach, he found his thoughts had been going in another direction to such an extent that he gave up the ministry and began to study law. This study was soon given up also.

Another occupation which led indirectly to the first school being originated that was related to our present-day industrial arts was agriculture. Pestalozzi became a student of agriculture and later purchased a farm. He was not successful as the land did not prove to be very fertile.

Pestalozzi became impressed with Rousseau's Emile and The Social Contact, which were centered on human welfare. He later became interested in helping poor children. Out of this grew the Neuhof Industrial School. The children were fed, clothed, and taught handicrafts. After they learned to carry on conversations, they were taught lessons. The children shared work in the garden and would spin cotton in large outhouses. This theory was put to test in 1774. Within five years the school had to be abandoned and it took all of Pestalozzi's property and part of his wife's to settle his debts. Later he organized similar schools at Stanz, Burgdof, and Berne.

Pestalozzi had his own philosophy of instruction and states this in regard to his method:[2]

> There are two ways of instructing, either we go from words to things or from things to words. Mine is the second method.

This method is not always true since it is usually necessary to introduce orally anything that is new. However, some instruction is based too much on theory. Pestalozzi always emphasized definite knowledge and judgment.

Followers of Pestalozzi. Two of the greatest followers of Pestalozzi were Fellenberg and Wehrli and their Trade Schools of Hofwyl prepared the way for a type of industrial school that we know today. The schools were to help orphans, paupers, and deserted children who were in need of a practical education. The moral, social influences and training of home life were also objectives of the schools.

Manual training and German pedagogy. Bennett[3] states that there has been much controversy as to when manual training started.

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[2]C. A. Bennett, History of Manual and Industrial Education Up to 1870, page 119.

[3]C. A. Bennett, History of Manual and Industrial Education, 1870 to 1917, page 169.

> One often hears the statement that manual training grew out of German pedagogy. In general this is true; yet the manual-training movement, as such, in Germany as in the north countries, manual training, or educational sloyd, was a confluence of three streams of ideas. The first of these was economic, embodied in domestic industries; the second was social, as represented in the elementary public school; the third was pedagogic, exemplified in the Russian system of tool instruction on the one hand and the Swedish sloyd on the other -- one emphasizing class instruction and the other individual instruction, but both based on a pedagogical analysis of tool processes. Salomon received the fundamental idea of educational sloyd from Cygnaeus and Cygnaeus obtained his writings from Froebel, and Froebel was a student of Pestalozzi. By this process, manual training can be traced to Central Europe, except for one vital spark, namely, adequate analysis of processes.

All of these statements are true but the one that had most to do with the origination of manual training was economic, embodied in domestic industries. The other origin was the professional men of those days who wanted to help the poor by financing homes where domestic industries were taught.

The Russian system. There seems to be no available evidence that any adequate analysis of the mechanic arts was made until 1868 when the Russian system of workshop instruction was devised by Della Vos and his associates for use in the Imperial Technical School at Moscow. Before this school was devised, the learner attained his information by looking on and helping such as serving an apprenticeship. Bennett[4] has this to say in regard to the fundamentals of mechanic arts:

> The consciousness of the lack of any effective system or method in the shop instruction led the director, Victor Della Vos, and his shop instructors in 1868, to work out a new system that involved organization of instruction shops separate from the construction shops where orders for private individuals were filled. The end sought in the new system was to teach the fundamentals of the mechanic arts (a) in the least possible time; (b) in order to give the student study of practical shopwork;(c) the character of a sound, systematical acquirement of knowledge; (d) so as to enable the teacher to determine the progress of each student at any time.

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[4] Ibid., pages 15, 16.

The fundamentals of the mechanic arts taught in those days seemed to be a change from the apprenticeship method of instruction to something similar to the present-day industrial arts programs. Possibly the instructors giving apprenticeship training did not have enough general education.

The Scandinavian sloyd. New pedagogical ideas were formulated in the northern countries of Europe, Finland, Sweden, Norway, and Denmark. In the winter when the nights were long, the rural folks spent many hours within the four walls of their own cottages making ax helves, hammer handles, rakes, pins for yokes and other devices needed for farm use. The first sloyd schools were greatly interested in domestic industry.

Sloyd in the normal school. Many of the early sloyd schools were taught on the economic basis rather than on the pedagogic, but the promoters of these schools developed skill and character in the students. Along about this time Cygnaeus had spent fifteen months, visiting schools in Finland, Sweden, Germany, Switzerland, and Holland. Bennett[5] has this to say in regard to sloyd being established in the normal schools:

> In 1863, Cygnaeus established a normal school in Jyvaskyla, Finland, known as the folk school. This school was patterned after those in Switzerland. It was a residential school conducted on Pestalozzian principles, the time of the student being divided between studies, domestic industries, and work in the garden and fields.

This kind of school in which handwork was taught led toward practical efficiency. The handwork was taught by the same teacher who gave instruction in other subjects. The school retained its pedagogical aims continually, the development of the eye, of the sense of form, and the provision of a general manual dexterity, and not of some particularized and insisted skill.

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[5] Ibid., page 58.

Shopwork instruction in the United States. In the early seventies, Calvin Milton Woodward, who later became the great American champion of manual training, was professor of mathematics and applied mechanics, and dean of the Polytechnic faculty of Washington University. The first school on secondary level containing an industrial arts program was organized by Woodward at St. Louis in 1880. The school consisted of five fundamental lines of study conducted simultaneously. The studies were mathematics, science, language, drawing and shopwork.

Industrial activities in elementary education. John Dewey[6] placed industrial activity at the very center of elementary education and in his book entitled School and Society, has this to say in regard to what is now called industrial arts and home economics.

> When we turn to the school, we find that one of the most striking tendencies at present is toward the introduction of so-called manual training, shopwork, and the household arts -- sewing and cooking. It keeps the students alert and active instead of passive and receptive; it makes them more useful, capable, and hence more inclined to be helpful at home; it prepares them to some extent for the practical duties of later life.

Dewey believed a school was no place to find students sitting with their hands folded. He maintained the best discipline was found where the school was considered a busy workshop. Among these schools was found a social and cooperative discipline born of its own kind.

Teacher training established. Since manual training had been established in elementary and secondary schools, it was evident that good teachers must be made available.

Schools found their best source of supply for manual training in those days to be the Worcester Polytechnic Institute of Worcester, Massachusetts,

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[6]John Dewey, School and Society, pages 10, 11.

and later the School of Mechanic Arts of the Massachusetts Institute of Technology, Boston, and also the Manual Training School of Washington University, St. Louis. None of these gave professional courses for teachers, but they did give well organized courses in various types of shopwork and drawing that were beginning to be taught in high schools.

Professional courses developed at teachers colleges. When the Industrial Education Association was organized in New York City in April 1884, the proposal was introduced to train teachers professionally for teaching purposes. Bennett[7] has this to say concerning the establishment of teacher training:

> In 1887, the New York College for the training of teachers was founded by the Industrial Education Association. Nicholas Murray Butler, professor of philosophy and education at Columbia University, was elected president.

This school admitted both men and women. Instruction was being given to 992 pupils, with 65 having been teachers. Applicants to enter the school were required to be at least eighteen years of age and to pass examinations in arithmetic, plane geometry, English, history and composition.

Transition from manual training to industrial arts. Soon after John Dewey, in 1899, placed manual training at the very center of the elementary school curriculum, Charles R. Richards[8] suggested, in an editorial in the Manual Training Magazine, that the term "industrial arts" be substituted for the term "manual training".

> Not so long after Dewey's philosophy was given great consideration, in 1904, Professor Richards, in an editorial in the Manual Training Magazine, suggested that the term "industrial

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[7]Bennett, The History of Manual and Industrial Education, 1870 to 1917, page 467.

[8]Ibid., page 453.

> arts" be substituted for the term "manual training". He contended that owing to a change of viewpoint, "we are rapidly leaving behind the purely disciplinary thought of manual training". Now we are beginning to see that the scope of this work is nothing short of the elements of the industries fundamental to modern civilization.

Due to changing times, considering the increasing production of consumer's goods, Richards seemed to apply his concept of manual training more to the fundamentals of American industry. He thought of manual training other than to maintain discipline, but means of teaching practical education that could be used in industry.

In 1913, Fredrick G. Bonser[9], Professor of Education at Teachers College, Columbia University, contributed an article to the School Arts Magazine that emphasized his conception of industrial arts in the elementary school.

> Industrial arts was considered as both a subject and a method -- an end and a means.
>
> While the term "industrial arts" was first used to designate work that developed as a reaction against the formalized courses inherited by Froebel, the term has become so popular in the United States that it is coming to include all instruction in handicraft for general education, whether formalized or not. Its meaning is essentially the same as the term "manual training" though its connotations are different. In the term "industrial arts", the "industrial" is emphasized; while in "manual arts", the "arts" is historically the distinctive word and, in the term "manual training", "manual" is the important word.

It is evident that Bonsers' definition of industrial arts included all instruction in handicraft for general education. He also emphasized that industrial arts was both a subject and a method -- an end and a means. The term "manual training" was in common use in 1910 when Bonser went to Teachers College as professor of education. Within a comparatively few years, as historical periods go, "industrial arts" became more and more generally the accepted term. Bonser did a great amount of extracurricular work in the form

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[9] Ibid., page 455.

of public addresses, contributions to professional and other journals and therefore was able to influence people's acceptance of these terms.

Leadership in industrial arts education. Gordon O. Wilber,[10] President of the American Industrial Arts Association, has this to say about professional leadership in industrial arts:

(1) First of all one must have a sound philosophy covering the field of his interest.

(2) He must be progressive in thought and action.

(3) Leadership requires courage, willingness to work and sacrifice.

(4) Leaders must be able to speak and write.

(5) A profession must have leaders to survive.

The first two qualities that go to make for good leadership usually have been accomplished over a period of years before any recognition has been given to any one individual. All men in all professions are not leaders, however they may do their work well.

Perhaps the possessed quality in an individual that makes leadership always present is courage, willingness to work and being able to sacrifice. A recognition of this necessity for work and sacrifice -- which frequently affect home life, finance and recreation -- is possibly the greatest single factor limiting the number of the potential leaders who actually achieve positions of recognition. Willingness to work and sacrifice is made possible through courage.

Finally, a true leader must be able to articulate. He must be able to write and speak in a way that will be convincing and that will result in

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[10]Gordon O. Wilber, "Leadership in Industrial Arts Education," Industrial Arts and Vocational Education Magazine, 40(September, 1951), 259-261.

action. If a person is a clear, concise writer, and if he is in addition a fluent speaker, he can go far as a leader in his chosen field, because he has the tools and ability to inspire others to progress.

To survive, all professions must have some leaders. One does not become a leader overnight. It is usually necessary to begin at the local level. No matter how small the unit with which a person may be connected, however, there will always be some group with which he can work.

Industrial arts and achievement standards. Arthur B. Mays[11] has this to say regarding industrial arts achievement standards.

> The industrial arts teacher is in a position for developing in his pupils high standards of achievement and habit of doing well whatever is undertaken. This is true because of the inherently concrete, interesting, and practical character of the work of school shops and drafting room. The ends can be clearly visualized, the means fully understood, and the skills necessary for achievement thoroughly mastered. Therefore, a major obligation of the industrial arts teacher is to maintain high standards of accomplishment in all that is attempted in the shop and drawing room. One of the fundamental weaknesses of much modern educational practice is the failure to insist upon high standards of achievements in the school work of pupils.

This seems to be a concern of the teacher to get the best work from his students. A problem is created when the good is mixed with the bad. The major purpose of every teacher should be so to teach that his pupils will form the habit of achieving whatever they set out to accomplish.

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[11] Arthur B. Mays, "Industrial Arts and Achievement Standards", Industrial Arts and Vocational Education Magazine, 41 (February, 1952): 23.

Part B

Philosophy of Industrial Arts

Industrial arts is a study of a varied number of manipulative skills performed with tools and machines that lead to a knowledge of industry.

Good[12] has this to say concerning the definition of industrial arts.

> Industrial arts is a phase of the industrial educational program concerned with orienting individuals through the study and experience to the technical-industrial side of society for the purpose of enabling them to deal more intelligently with consumers' goods, to be more efficient producers, to use leisure time more effectively and enjoyably, to have a greater appreciation of material culture, and to act more intelligently in regard to matters of health and safety.

This definition is somewhat lengthy but it covers the general objectives of industrial arts. It gives a broad view of the whole industrial arts program including its relationship to industry, economics, safety, health, avocations, and appreciation. An understanding of these subjects will help create vocational stability and secure happiness, the first four strictly pertaining to direct school curriculum studies. The other two subjects are general but necessary for one's achievement. Both a well liked vocation and avocation will promote happiness and improve the standard of living of the American citizen.

There seem to be some conflicting theories in the definitions of industrial arts by many of the industrial arts men when reviewing the book written by Bawden[13]. This book is concerned with life histories and philosophy of industrial arts of nine men Bawden believes are significant. Possibly he had opportunities to know these men well. Only two of these men seem to have

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[12] Carter V. Good, Dictionary of Education, page 216.

[13] William T. Bawden, Leaders in Industrial Arts Education, pages 24-38.

stated much concerning the transition from manual training to industrial arts. They are Bonser and Richards and their definitions seem to correspond more to the present-day industrial arts program.

> Industrial arts is the elements of the industries fundamental to modern civilization. — Richards

> Industrial arts is the study of the changes made by man in the forms of materials to increase their values, and of the problems of life related to these changes. — Bonser

These definitions are not so lengthy and agree to some extent. Both men seem to apply their definition to converting raw materials into something useful and are also interested in how these changes affect modern civilization. They were interested in placing industrial arts in public education for purposes other than for disciplinary reasons. They emphasize technical instruction in the schools and develop insight into the basic industries of the present time.

Interpretation of industrial arts. There are many classes offered in the junior and senior high school curriculum that have no real significant value for many students. Through the study of industrial arts there is a great extent of appreciation received that keeps the student alert and aggressive. This alertness is obtained because of the industrial arts program which pertains to reality through working with tools and materials and the making of direct applications. The aggressiveness is present because the student can readily see his progress. In many classes testing is the only way to measure achievement, which sometimes is found unsatisfactory.

Through good instruction in industrial arts classes, there is much learned concerning shop care which may be compared with good housekeeping. Those things learned such as cleanliness of person, tools, materials, and information regarding health and safety, give the student an integrated personality. There are a large number of manipulative skills learned that

furnish a good background for a vocational choice. Industrial arts experiences can help pupils develop intelligent attitudes, understanding, and skills involved in the selection and use of the products of industries.

Industrial arts gives an insight of many occupations that will help an individual in his chosen career because of being able to understand a variety of conversations and problems from many occupational walks of life. This is made possible because of the close relationship that industrial arts has to economics and vocational education.

Objectives of industrial arts. A definition of industrial arts must be interpreted in terms of objectives which will show the teacher what he should expect to accomplish. The following list[14] of objectives represents the result of the thinking of the Policies Bulletin Committee acting as a group.

(1) Industrial arts is complementary to other school subjects and provides opportunity to apply knowledge learned in other school subjects.

(2) Develops an appreciation of applied knowledge and skills.

(3) Provides a knowledge of industrial drawing, the language of industry, and methods of expressing ideas by means of drawing.

(4) Contributes to later vocational efficiency.

(5) Stimulates students knowledge and appreciation of good design.

(6) Instills a satisfaction in personal creative achievement.

(7) Develops the ability to analyze a job into its processes and organize them into correct procedure.

(8) Contributes to consumer knowledge and induces an appreciation of the value of industrial materials and the need for their conservation.

(9) Trains in industrial and home safety (including fire prevention).

(10) Acquaints students with industrial information and induces a

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[14]State Department of Education, Industrial Arts in Oklahoma, pages 1-3.

recognition of the standards of industrial attainment.

(11) Develops avocational interests.

(12) Trains individuals to be more resourceful in dealing with problems of life.

(13) Stimulates correct attitudes toward an orderly shop and their home environment.

(14) Aids in making vocational choices.

(15) Develops qualities of leadership.

(16) Develops cooperative attitudes in work habits.

(17) Develops an appreciation of the dignity and importance of the occupation of one's neighbor.

Industrial arts as an area of general education cannot be defined as something separate and apart from general education. It is an integral part of it. Therefore, industrial arts must be defined in terms of general education. Industrial arts, being one of the several areas of general education, contributes to the realization of this objective through five channels.

(1) Extension of the progressive education of the individual.

(2) Development of manipulative skills in the use of tools and materials.

(3) Promotion of the conservation of human and material resources.

(4) Providing avocational opportunity.

(5) Aiding social and personal development.

The first seventeen objectives are general and cover the industrial arts program rather fully. They give a good understanding of the program and how it helps the student when he has finished school and entered his chosen career. These other five objectives, narrowed into terms of general education, seem to contribute to industrial arts programs very definitely and in a concise way.

The bulletin Industrial Arts in Oklahoma[15] gives a definition of industrial arts.

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[15] Ibid., pages 1, 2.

Industrial arts is a group of school subjects that contribute to the attainment of the goal of general education by furnishing guided experiences in the use of tools, materials and machines, and insight into those phases of industry that have become an important part of our social culture.

The group of school subjects that constitute industrial arts in Oklahoma are:

(1) Automobile Mechanics
(2) Ceramics
(3) Crafts and Handicrafts
(4) Electrical Work
(5) General Metal Work
(6) Industrial Drawing
(7) Machine Shop Practice
(8) Printing
(9) Woodworking
(10) Plastics

This definition brings out the importance of industrial arts in attaining the goals of general education by instruction and experiences in the use of tools, materials and machines. These phases of industry have become important in our social culture, because over fifty per cent of all the workers in the United States are employed in them.

Methods of introducing need for industrial arts reference materials. Most schools usually allot and equally distribute references to each department. However in certain departments such as home economics, industrial arts and science there is a need for additional references because of their continual change. There are several magazines published that are good references for these subjects. One of the best methods of introducing the need for additional references for industrial arts to the administration is to explain their necessity in such a broad field such as the work stations in a general shop.

CHAPTER III

REVIEW AND EVALUATION OF EIGHTEEN POPULAR MECHANICS HANDBOOKS

There are many sources of additional information that can be selected for industrial arts. The following eighteen parts constitute a review and evaluation of eighteen Popular Mechanics Handbooks, how they contribute to industrial arts as teaching aids, and whether they are appropriate for junior high school and high school shop libraries. The reviews are not complete summaries of the books. They are a review of what may be found in each book which may be of interest to industrial arts students. The books are listed in chronological order in the reviews.

Some of the books are reviewed more fully than others because they have been more interesting to the writer. However, all of the books were interesting and will supplement the industrial arts field. The books having the most significant value and which are reviewed are listed here.

Your Home and How to Build It

Planning Your Home Workshop

Concrete Handbook

Boy Mechanic

The Young Craftsman

Photo Handbook

Famous Concrete Block House

What to Make

Christmas Handbook

Primer for the Home Builder

Radio-Television and Electronics Handbook

Welding, Brazing and Soldering

Popular Mechanics Handbook for Farmers

Forty Power Tools You Can Make

Home Repair and Improvement

23 Boats You Can Build

The Garden Book

100 Beautiful Pieces of Furniture You Can Build

The eighteen books are reviewed in the following chapter sections.

A. Popular Mechanics Handbook for Farmers[16]

This Handbook is a collection of 861 methods of how to make and repair things on the farm. This book records the experiences of farmers everywhere and tells how to handle almost any emergency that is likely to occur about the farm or farm home.

How to use this book. There are two ways to use this book and both should be followed if the greatest value is obtained. One way is to study through the pages frequently for the purpose of fixing the various articles in mind.

The other way is to use the index. Whenever an emergency arises, consult the index and find listed there the names of the articles that need repair, or the names of the jobs on which help is wanted. By studying the specific articles on the work in hand, there is an opportunity to put into immediate use the ideas found.

In addition to the articles on outdoor work, there are many ideas for making housework easier that will be of help to women. All ideas are clearly explained and illustrations make it easy for women to learn the use of simple tools needed to make these helpful household devices. None of the articles described in this book are patented. Any of them may be made or used when desired.

Many of the out-buildings are built of rough lumber. Air dried oak is often used because it is cheaper and more durable. The author of this book made the following statement concerning oak lumber.[17]

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[16] Popular Mechanics Handbook for Farmers, Popular Mechanics Press, 1924, 270 pages.

[17] Ibid., page 110.

> More than 50 species of native oak assume the proportions of the trees, and about 25 are used for lumber. After the oaks are cut into lumber, there is no means known by which they can be identified as to the exact species. By examination of the wood alone, however, it is easy to separate the oaks into two groups -- the white oaks and the red oaks; and for most purposes, fortunately, it is not necessary to classify them any further. The oaks all average about the same in strength, but those of the white oak group are much more durable under conditions favorable to decay than those in the red oak group.
>
> The white oak group includes true white oak, swamp oak, burr oak, cow oak, post oak, and chestnut oak. The red oak groups includes true red oak, yellow or black oak, black jack, water oak, willow oak, and laurel oak.

It is difficult to distinguish all the oak by color. One of the best tests is to cut the end grain smoothly and notice the annual ring growth. With the aid of a hand lens, examine the small pores in the dense summer wood. If the pores in this part of the growth-rings are plainly visible as minute rounded openings and are not so crowded but that they can be readily counted, the wood belongs to the red oak group. If the pores are small, angular, and numerous, the wood belongs to the white oak group.

Discoveries introduced by the farmer. From the 861 discoveries of how to improve the farm, only the most interesting will be described. The farmer is a natural born inventor because he has to face reality each day. Many of his make-shift devices are really new inventions. When the binder is crippled by a broken casting, something has to be done to keep the machine in operation while a new part is sent for. When the harness breaks it must be repaired immediately. No matter what goes wrong, a farmer must know how to repair it immediately or suffer loss of time.

Removing a broken screw. The removal of a broken stud screw that has rusted in place usually requires considerable time and patience. If it is necessary to resort to drilling the following method should be tried. Invert

the piece in which the screw is situated and drill a small hole into the screw hole. Fill this with kerosene and insert a short rod in the opening. By hitting the rod a hard blow, the kerosene will be forced around the screw threads, after which it is easy to remove the screw with a hammer and chisel.

Guard for paintbrush. The amateur house painter is apt to overfill his brush which means trouble when working on wainscoting or window sashes. An easily made appliance to remedy this consists of a zinc or tin sheath fitted tightly to the brush handle and fastened by a hinge to a metal guard. The sheath can be slid up the handle far enough to leave the bristle projecting one-half inch below the guard, which must be of sufficient curvature to prevent a contact with the bristles except at the lower end where it presses against them. The hinge pin should project beyond the hinge at one side so that a small coil spring may be used to hold down the guard which is raised for dipping by a lug or handle made of a strip of heavy metal. Solder and small rivets are used in fastening the parts together.

Method of finding cracks in tools. Small cracks in tool and machine parts are difficult to find, but can be found more easily by using petroleum and chalk. The former is rubbed over the surface where the crack is suspected to be, and then removed with a rag. The chalk is then applied to the same surface. If a crack exists, the petroleum which has been forced into it will come out at this time, and the line of the fracture can be seen in chalk.

Conclusion. The Popular Mechanics Handbook for Farmers is evidently helpful to farmers because the 861 discoveries will be helpful to the farmer when needed. There are many attractive improvements such as fencing, gates, barns, poultry houses, etc., that may be built with skill in the same way

as a contractor. All of these out-buildings add beauty to a farm home. This book is a source of information for building and repair work.

Many of these ideas would make good projects in a farm shop. Each item has a dimensioned drawing and instructions for constructing the item.

B. Concrete Handbook[18]

Concrete is a universal building material which is necessary to some extent in every building that is built. If a good mixture is not provided for specified work, it becomes more expensive and results in a poor job. Where sand and gravel are available locally, it is profitable to plan the home possibly with a basement, if desired. There are three important phases of work to be done before a good sound concrete is perfected. They consist of mixing, finishing and curing.

Mixing. It has been discovered very recently that strength, durability and water-tightness of concrete are dependent upon the proportion of water to cement, sand and gravel. The modern practice is to state the amount of mixing water for each sack of cement, varying according to the class of work. The use of too much mixing water thins or dilutes the paste, weakening its cementing qualities. It is important that cement and water be used in the correct proportion to get the best results. The trial batch for sidewalks is one part cement to two parts sand and three parts gravel. It may be necessary to change the amounts of sand and gravel so as to obtain a smooth plastic workable mix. The amount of water is determined by the wetness of the sand. These proportions (1:2:3) may result in a mixture that is too stiff, too wet or which lacks smoothness and workability. This is remedied

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[18] Concrete Handbook, Popular Mechanics Press, 1943, 96 pages.

by changing slightly the proportions of sand and pebbles, not water. If the solution is too stiff, cut down the amounts of sand and gravel in the next batch.

A workable mixture is one of such wetness and plasticity that it can be placed in the forms readily, and that with spading and tamping will result in a dense concrete. In other words, the cement mortar should completely fill the spaces between the gravel and insure a smooth plastic mix.

Finishing. Newly placed concrete is leveled off in the forms with a strikeboard or wood float, then the wood float is used to make an even surface. Further finishing is delayed until the concrete hardens. If a gritty, nonskid floor is desired, a wood float is used to produce the final finish. If a smooth, dense surface is required, a steel trowel is employed in finishing.

When the forms are removed and stony parts are found, the work may be patched with a mixture of one part portland cement to two and one-half parts sand, working this rather stiff cement mortar with a wooden float.

Curing. After concrete has been placed, care should be taken that it does not dry too quickly, and in hot weather it must be protected from the sun and dry wind. Exposed surfaces and objects made of dry mixtures should be sprayed thoroughly with water twice or three times a day or otherwise be kept moist for a week or ten days. Materials commonly used for protecting concrete while curing are canvas burlap, boards, layers of moist sand, and straw. These should be placed as soon as practicable without marring the concrete surface and kept continuously moist. Vertical surfaces are more difficult to protect than horizontal surfaces; forms lest in place during the curing period afford good protection. Cold weather is more difficult weather in which to lay concrete foundations than in hot or warm weather.

Conclusion. The building trade could not be complete without some concrete construction. It has been rather fully discussed as to how to mix, finish, and cure concrete. This book contributes to industrial arts in several ways as a source of many concrete projects. One interesting project is the building of a septic tank for farm homes. Other projects consist of concrete lawn furniture such as benches, vases and bird baths.

C. The Young Craftsman[19]

The book titled The Young Craftsman is one that very strictly contributes to industrial arts. It gives descriptions of over 450 easy craft projects reprinted from past issues of the Popular Mechanics Magazine, What To Make, and other publications. The greater per cent of the projects could be constructed in a good high school shop. Many of them are new in origin and would be very attractive to both young people and adults. The projects for the most part can be constructed from wood, leather, linoleum or metal. Some are of the novelty or miniature style, while many are capable of providing a service. There are some new ideas given on hunting and fishing equipment.

There are several good projects that are given in this book for a childs room. Many times children are neglected in the home by not being provided conveniences their size and taste. There is good childhood training in having children take care of a well furnished room. Ordinarily the child's room is the smallest room. In this book is included a drawing and instructions on how to make a gate-leg table that saves space in the child's room.[20]

> The space-saving possibilities of a gate-leg table led a father to make one for his daughter's room. The room being

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[19] The Young Craftsman, Popular Mechanics Press, 1943, 224 pages.

[20] Ibid., page 63.

> small, it was necessary to conserve as much space as possible yet have a table around which she could seat her friends for the tea parties and games. The table was made of plywood and assembled with screws, brads and hinges, as indicated. Four discarded play blocks were used for the feet. Shelves provide space for dishes, toys and books. Half-round molding was glued to the edges of the top to finish it off.

This table seems to be the answer to many a child's desire. By having shelves for the children's play things it would be easy for them to keep their belongings properly stored. If a child is given something and told that he is the owner, ordinarily it will receive better care.

A list of projects from this book. Since this book contains information and projects that contribute definitely to industrial arts, it is believed to be desirable to list a number of the projects that may be produced in the general shop.

1. Magazine rack
2. Bookshelf
3. Book ends
4. Sewing cabinet
5. Towel rack
6. Schoolboy's desk
7. Shoe rack
8. Toy motors (electric, DC)
9. Buzzers (electric, DC)
10. Boats

Conclusion. This book seems to contribute to industrial arts on the junior and senior high school level more than any of the other books reviewed in this report. The projects are varied and lead to the more complex gradually, leaving only a few very advanced projects.

D. The Boy Mechanic[21]

The book titled The Boy Mechanic, Book I, is a book that contributes to industrial arts. It consists mainly of descriptions of projects. About

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[21] The Boy Mechanic, Book I, Popular Mechanics Press, 1945, 224 pages.

seventy-five per cent of the projects could be constructed in a junior or senior high school shop. There are a number of projects that are very appealing.

Anyone who has a drawing set without a table and cabinet will find a very interesting design in this book. A brief description of this combination of a drawing table and cabinet is given below.[22]

> Drop front of cabinet forms a drawing table: Craftsmen will find that this handy wall cabinet keeps T-square, triangles, drawing instruments and paper altogether for instant use. The front, which is hinged along the bottom edge drops down and becomes a drawing table that can be adjusted to any convenient angle by means of telescoping legs. These are hinged to the outside of the front at the top. They hang flush against it when the front is closed and are supported on two small blocks when it is dropped. The cabinet is made of 1/2 or 5/8 inch plywood, except the sides, shelf and the cleats inside the front. Window-sash locks located at the top are used to hold the front closed, while pins set in the edge of the sides, near the top, fit into ferrules pressed in the front to keep the latter in alignment when closed. A drawing board is screwed to the inside of the front, the shelf being set back to provide space for it when the cabinet is closed.

The reason this project has attracted so much attention is its desirability to a person possessing a drawing set. It would be handy at all times and would not take up any floor space. The instruments are always in place and ready for immediate use.

A list of projects contained in this book. This book contains a number of projects that may be appropriate for the junior and senior high school general shop. A few of them are considered fairly complex, but could be produced in a first class shop.

1. Porch mail box
2. Row boat
3. Sewing box
4. How to mount small animals
5. Wallboard playhouse
6. Backyard slide

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[22] Ibid., page 19.

7. Container for fish line
8. Canoe
9. Picture projector for slides
10. Bird hut

Conclusion. This is another book that contributes directly to industrial arts because the majority of the projects are simple; some more complex projects consisting of boat building, mounting of small animals or taxidermy, and fundamentals of radio. There are some projects included in the front of the book that very definitely contribute to the junior and senior high school shop as appropriate projects. This book is also one of the choice books and is among the ones that are in great demand, as indicated in the personal letter received from Norman Guess, Book Manager of the Popular Mechanics Press.

E. Primer for the Home Builder[23]

Most all people desire a home. Many people refuse to attempt building their own home. Many of them have had no previous experience, and yet it is one of their greatest ventures. An individual would not want to begin such a task without knowing something concerning home building. This book has been developed to fill this need. It is a simple, straightforward book explaining the important points that must be considered in building a home. It is written by twelve of the nation's noted building authorities, each an expert in the field.

Planning for building. This is one of the most important steps. If it is improperly done, it can become the cause of expense, unhappiness and despair. This planning step is considering everything that is needed from the

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[23] Allen Carpenter and Norman Guess, Primer for the Home Builder, Popular Mechanics Press, 1947, 171 pages.

blueprints to the checking of the specifications. People dream up wonderful ideas but never use enough effort to make them come true.

Choose your type of community. A good site may cost two or three times as much in a new area than in an older one. The houses surrounding the proposed site should not have cost much above or below the planned price. Not only will an individual feel uncomfortable if his house is substantially larger or much smaller than the others in the block, but its resale value will be less because of its unconformity. Such important elements of modern living as schools, churches, playgrounds, shopping centers and transportation should be investigated.

Select the lot. The chief factors to consider in selecting a lot are the type of house to be built, its relation to the lot, the community and the houses near it, the utilities available, assessments, drainage, zoning and restrictions, topsoil, landscaping possibilities and proper conditions for excavations.

Plan from the inside. If an architect is hired to draw the plans, he must know the family's needs. List the rooms that the family activities require with the proposed size of each room. Most families find they have planned too much house for their building budget. A house should be planned from the inside because closet space and convenient kitchen are more important than unused shutters and dormer windows.

Financing a $6000 home. In a typical community the first monthly payment might add up as follows for a 20 year mortgage of $6000.[24]

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[24] Ibid., pages 33-34.

Interest at 4½ per cent	$22.50
Mortgage insurance at ½ per cent	2.38
Payment on principal	15.48
Local property taxes	9.00
Fire and wind insurance	1.20
Total	$50.56

It can be readily seen that out of the total payment only $15.48 goes to reducing the $6000 owed. This means that $35.08 is nonequity payment, that is, part of which is roughly equivalent to rent. Each month the interest decreases slightly and the payment to principal increases by the same amount. At the end of one year the nonequity part would be $34.29. At the end of ten years it will be $5.48. The reduction in nonequity payment cannot be used for upkeep because the total payment is reduced very slightly.

This is believed to be important because it shows how much is paid on the principal toward paying off a loan. It can readily be seen that less than half of the first payment is actually paid on the principal. Industrial arts gives an insight into building a home, especially on the finishing and cabinet construction which usually is the most expensive labor. If a person chooses to borrow money to build a home, it is important that he know something about finance.

Conclusion. There has been an emphasis toward information concerning planning, selection of the lot, financing, and many other important matters that one should give special attention before attempting to build a home or have one constructed by a contractor. This book gives information on the owner's legal rights and an insight on apprasial of real estate. It was not intended to involve many procedures of construction. It contributes to industrial arts in that it gives several ideas concerning planning and designing a home. Drawing and design should be among the first courses offered in a junior high school shop class.

F. Your Home and How to Build It[25]

This book is written to assist the person who wishes to build his own home. It would be helpful to contractors because there are many good diagrams that are shown in detail which would speed construction of any home. To show that anyone could build a home, Popular Mechanics Press officials commissioned a 23-year-old veteran to pioneer the construction of a modest home which the editors felt most people would desire. It was discovered that satisfactory results were achieved in this experiment.

Planning features before starting construction. The book contains all the information from choosing the location to the last swipe of the paintbrush. A good neighborhood should be chosen in order that the children will have a good environment in which to live. Be sure the plans are complete with ample accomodations including bath, closets, kitchen, living room, dining room and preferably two bed rooms. The cost is an important item so it should be figured as the planning progresses. It is estimated that around $1500 can be saved on a $5000 to $7000 home by doing the building work. Anyone with an industrial arts background is very well qualified to do all the interior work and a considerable sum can be saved because in most cities a finish man will cost $2.50 per hour.

Expediting construction. This is another phase of building with which the average individual is not familiar. This book covers this phase very thoroughly from selecting the lot and checking on the zoning laws, availability of sewage, gas, electricity, water and telephone to checking on back

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[25]Wayne C. Leckey, Your Home and How to Build It, Popular Mechanics Press, 1947, 104 pages.

taxes, paving assessments, fire protection, and accessibility to schools, stores and churches.

Building lay-out. This phase of the building trade is very important. It has to do with placing the building correctly on the lot. The author[26] of this book has devised the building lay-out of a house in this specific way.

> Before locating the house on the lot, the lot should be surveyed accurately to be sure to be within boundry rights. Some localities require that the building be aligned with dwellings on adjacent property. Use the boundry stakes or a sidewalk at the front of the lot as a base line in locating the house squarely on the lot. Measure in from the base line an equal distance and drive the two front corner stakes of the building 35 ft. 9 in. center to center, and drive a nail in the top of each stake. Then check the height with a line level or straight edge. Now, by using the "right triangle" method, check the angle formed at the corner stake with a triangle with dimensions of 6, 8 and 10 feet on the side. Next, the two rear stakes are set a like distance apart and 25 ft. 2 in. from the front ones. Drive these temporarily at first until the 6, 8 and 10 feet measurements coincide. Then double check by stringing chalk lines diagonally from the four corners. Now, batter boards are set up around each stake, and notched in line with the nails in the tops of the stakes. A second notch is made 10 in. from the first to establish the form or the inside wall line. The front batter boards are made somewhat longer to care for the 3 ft. 9 in. projection of the front gable. With index notches in the batter boards, permanent reference points are maintained after the corner stakes are destroyed in excavating.

Not all building lay-outs are made this way, but the drawing of this plan seemed to be accurate, and it could be drawn by most any person.

The construction phase of building. The book contained all phases of construction of the building from laying the foundation to doing the finish work inside. It gives all the different construction operations such as laying the sills, floor joist, subfloor, top and bottom plates, etc., that go to make for construction of a home.

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[26] Ibid., pages 18-19.

Conclusion. This book contributes to industrial arts in many ways because of the many skillful operations that are similar to those taught in industrial arts classes. Some of them are the making of certain joints used in carpentry and correct ways of doing certain finishing work. It tells and shows by drawings how to construct your own home. A person who has any building talent at all can use this book as a guide and build his own house. The Popular Mechanics Press Book Manager, Norman Guess, stated in a personal letter, which is in the first chapter of this report, that this building book is among those found to be most desirable. This book would be of great value in an industrial arts shop to assist in teaching the fundamentals of carpentry.

G. Popular Mechanics Photo Handbook[27]

This book is very interesting with many practical ideas of taking and developing better pictures and making equipment. Most people looking at pictures have a difficult time explaining why they like or dislike certain ones. Often people are surprised when some photographs turn out better than expected or are worse than anticipated.

Types of photographs. Not every photograph is designed to please all observers. Many pictures are intended to focus attention on nature and the seasons. Everyone at some time experiences a desire to venture into the universe and find some scenes of new beauty, which is the factor that makes a picture from just a photograph.

There are many interesting ways to take pictures shown in the Photo Handbook. One example is to lower the camera in order to make a person

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[27] Popular Mechanics Photo Handbook, Popular Mechanics Press, 1948, 158 pages.

look taller. There are also ways in which the subject can be put at ease or made to look natural. Many good points are given to relieve an individual from self-consciousness which is the psychological factor that causes poor poise. There is nothing better than natural poise and good posture. Many of these factors have to do with building good personality traits. The scenes are given much emphasis. A good picture must have a good foreground and background, and ample lighting.

Use of films. Other than stressing beauty and poise, another interesting factor concerned with the picture industry is that films are used for training purposes in the field of education. The skills being performed in demonstrations on films are found very satisfactory because of different speeds which they may be run. Slides are found to be satisfactory at all times. Demonstrations and certain operations can be shown moving or on the slides in the correct or incorrect manner in order to diagnose the good and bad features. Sometimes comparing the incorrect way of performance with the correct will make a lasting impression on the student. When using slides, there are many opportunities to stop for class discussion, whereas in moving pictures the discussion usually takes place after the whole reel is shown.

In taking and developing pictures, lighting is of the utmost importance. The dark room and the science of developing the film and paper are also of great importance.

Making one's own equipment. Industrial arts teaches the fundamentals of drawing and blueprint reading which for some students leads to a study of architecture. With a reasonable amount of sketching and drawing experience one may be able to plan something new to improve his photography equipment. It takes proper planning and construction procedures to make what is

needed. This book includes the following about making equipment.[28]

> Some of the equipment that has been bought can be improved. This section of the book is written for the photographers who want extra accessories and are willing to invest some of their spare time in making them for themselves. There are some things that are impractical to name alone. However, there are scores of items which can be made and will save a photographer money. Some of them consist of camera stands, shelves and other fixtures in the developing room. There are many hints for the man who loves to help himself. It is needless to describe all of the equipment or fixtures that can be made.

Anyone who possesses a reasonable supply of tools, who exhibits some degree of hand dexterity, who can make drawings of what is needed, and who can read a drawing will be able to go about providing some of these extra accessories and fixtures.

Conclusion. This book was divided into three sections: types of photographs, use of films, and how one may make some of his equipment. It contributes to industrial arts in several ways such as a source of photography projects, an insight of how pictures are taken and developed, and offers much other information that one would need to know before he could offer photography in a general shop. The book would be appropriate for the junior high and senior high school shop library because it has pictures, projects and drawings that would be of interest.

H. 40 Power Tools You Can Make[29]

This book has plans of how to make forty power tools of which most are used in the woodworking shop. It is evident that the person who undertakes to make them would have to be in a first class general shop where there

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[28] Ibid., page 97.

[29] 40 Power Tools You Can Make, Popular Mechanics Press, 1948, 96 pages.

would be access to the machine shop, welding shop and foundry. It would be possible to make a portion of them in the average shop. An example of one that could be made in the average shop is the sanding machine. Since sanding equipment is overlooked in many high school shops, and since it is very useful in woodworking, this machine could be made by the teacher and student. A brief description will be given of a sander and its construction from this book.[30]

> Built of odds and ends easy to get most anywhere, this belt sander will handle practically all sanding operations on flat work of the average size. The design permits a delicate control over the cutting action of the belt and you can see what is being done as the work is in full view.
>
> Although you can use any wood or iron pulley to carry the abrasive belt, the center section of each pulley is made up of twelve disks of one-fourth inch wallboard glued together with casein glue. Then on each side of the center section, glue one and one-half inch disk of hardwood, such as birch or maple. After turning, four equally spaced holes are bored through the web of each pulley. These take small stove bolts. Now center a hole through the hub of the pulley to take the shaft. The method of keying the pulley to the three-fourths inch shaft is also shown in this book. To carry the pulleys, mount four self-aligning shaft hangers on a hardwood table top, the latter slotted for the V-belt to the motor, and also for the angle-iron stop against which the work is placed. This assembly is mounted on an angle-iron stand made with a hardwood shelf underneath on which the motor is mounted. The motor is mounted on rubber bushings to lessen vibrations. Use a rubber V-belt to drive. Speed of the pulley carrying the sand belt should not exceed 1000 rpm. Two small bolts with wing nuts provide the necessary adjustment. The rubbing blocks are made of hardwood, with the ends curved upward and the bottom sanded smooth so it does not damage the belt.

When using this machine, keep the work moving in a slow back and forth motion across the table. Press the sand belt into contact with the surface. Suitable endless belts in various grades are available in the length and width required.

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[30] Ibid., page 63.

Other machines. There are several other machines mentioned in this book with drawings and instructions for construction. Among them are just about all the machines needed to start a woodworking shop. It is evident that a first class shop would be necessary in order for these machines to be constructed. Some of the other machines consist of the universal saw, jig saw, jointer, cordwood saw, and power drill.

Conclusion. This book contains a list of forty power machines and tells how they are drawn and constructed. It contributes to industrial arts because it gives an insight into how shop machinery is drawn, constructed and operated. A few of these machines have been seen in school and home shops. They are found especially in industrial cities where men are employed in industry. Of course, most of the machines are found in the home shop.

I. Popular Mechanics' Famous Concrete Block House[31]

This book is for the person who likes to do things with his hands. It describes step by step the construction of a five room, concrete-block house from the first shovelfull of soil for the foundation excavation to the last swipe of the paint brush. Here the reader will find the answer to the problem of owning an attractive, comfortable home on a fairly small investment, and also the type of construction that is easiest for the amateur builder to understand and put into practice.

Even though the description and details cover only one house, it is the belief of the author that after a careful study of the plans and information given, the average handyman can adapt the information to building

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[31] Popular Mechanics' Famous Concrete Block House, Popular Mechanics Press, 1948, 60 pages.

any concrete-block structure of medium size, whether it be only a simple shower stall or another house of different size and shape. The house may be built with most any type of available materials, such as brick and rock.

The tools for the construction of the house are of the simplest type and inexpensive. A couple of handsaws, two shovels, hammers, a carpenter's level, etc., will just about take care of the job. Concrete for the footings and floors can be mixed by hand, although the rental of a small power concrete mixer will save enough labor to make the expenditure well worthwhile.

The floor plan can be changed to suit the individual tastes, but if this is done, it is advisable that a small model of the house be built and the desired changes incorporated. Miniature models may save many dollars and much disappointment.

All specifications for building this home are included in the book. There are also many good ideas given concerning the building layout and the foundation excavation that are of utmost importance in finishing with a good job.

When laying the cement blocks, use for the mixture portland cement 1 part, hydrated lime 1 part, and sharp sand 6 parts. Mix the aggregate very thoroughly. Experiment to get the correct consistency for easy working.

Conclusion. This book could be used in the industrial arts classes because the complete task of construction of the concrete-block house consists of many phases of the industrial arts program. The house is built with simple tools and by hand. The book is especially dedicated to the man who wants to build his own home from concrete blocks, describing completely how the task is performed. Ideas are given to the person, whether experienced or inexperienced, as to the drawing and construction of the building. This book is recommended because of its simple instruction and new idea.

J. Home Repair and Improvements[32]

Every year the editors of Popular Mechanics receive thousands of letters from home owners all over the world asking for help with their problems. Craftsmen want help in building everything from a bird house to a seven-room home. This book, kept on the shelf in readiness, will meet almost any household emergency. It was aimed at complete coverage of the field in a text "written so you can understand it" and supported by plenty of photographs, diagrams and drawings. The book is organized and indexed so that the answer to any home problem can be found very readily. It is a complete maintenance reference. The hints on complete maintenance will save money and time for the home owner.

Contribution to industrial arts. This book was mainly written for home use, but it contributes to industrial arts in many ways as it is a dictionary of useful projects. Many of the projects are of the handyman type, including refinishing floors, remodeling the home, adding new rooms to the home, etc. Some of the simple projects could be made in the school shop. Among the simple projects are such things as refinishing furniture.

Conclusion. It was noticed that this book was the only one reviewed that covered a wide variety of home repair and improvement projects. It would be useful in the home or school shop because it has the answer for many practical problems.

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[32] Popular Mechanics Complete Handbook of Home Repair and Improvement, Popular Mechanics Press, 1949, 512 pages.

K. Planning Your Home Workshop[33]

The small home workshop equipped with small power tools has only come into existance the last quarter of a century. Any newcomer into this diversified hobby field is faced with hundreds of new tools and methods. There are puzzling questions about how to get started, what machines to buy, and how to arrange a practical workshop. Since the subject carries the reader a considerable distance along the woodworking techniques, this book should be of interest to people in the home who want to do their own building and repair.

Kinds of shops. There are no two homes with workshops that are identical. Home workshops may be broadly classified according to the type of raw materials which are used. These main types of materials are wood, metals and plastics. A beginner should start with a wood shop because there is more variety possible in wood. The equipment cost is moderate and the skill required is not so advanced that it demands a lot of reading and manual practice.

The woodworking shop. Woodworking leads all the other home shops. It is the most lasting and the most satisfying. One of the most powerful appeals of wood to all workers is the ease with which it can be fashioned into useful products. Power tools have made it possible for the average skilled worker to finish a good table all in one afternoon.

A description of a home workshop. The author[34] of this book has given a description of a home workshop as follows:

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[33] Sam Brown, Planning Your Home Workshop, Popular Mechanics Press, 1949, 128 pages.

[34] Ibid., page 6.

The shop is located in a basement and measures about 12 x 20 feet. The cost of the shop is about $500 to $1200. Buy a jigsaw and a circular saw first. Then add to them as soon as possible. Also buy a good selection of hand tools and build a tool panel. Unless a person is able, it is best not to try to make the shop complete all in one year because of having to do without other things that may be more necessary. There is a lot of pleasure in watching the shop grow and being able to use the machines and tools expertly. Later, purchase a drill press, jointer, bandsaw and lathe, which will make a fairly complete home shop.

A list of hand tools.[35]

There are two rules governing the selection of hand tools. (1) Buy what is needed and as it is needed. It is a waste of time to do without some tool which is actually needed. (2) Buy only good quality.

1. Nail set
2. Center punch
3. Cold chisel, 5/8"
4. Wood chisels, 1/2 and 1"
5. Adjustable wrench, 6"
6. Pipe wrench, 10"
7. Hand saw, 26" blade, 8 point
8. Compass saw, 12" blade
9. Hack saw, 10" or 12"
10. Combination square, 9" or 12"
11. Tin snips, 12"
12. Utility pliers, 6"
13. Dividers, 8"
14. Pull-push steel rule
15. Bench vise, $3\frac{1}{2}$" jaws
16. Sandpaper holder
17. Oil can
18. Auger bits, 3/8", 1/2" and 3/4"
19. Twist drill, set of 10 to 1/4
20. Claw hammer, 16 oz. head
21. Push drill, with points
22. Screwdrivers, 4", 6" and 10"
23. File, 6" slim taper
24. File, 12" bastard
25. Clamps, bar and C, 6 each
26. Bit brace, ratcheted 10 sweep
27. Jack plane, 14" long
28. Hand screw, 4
29. Combination oil stone
30. Pocket knife

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[35] Ibid., pages 20-21.

31. File, 12" rasp
32. Level, carpenter
33. Jointer plane

This home workshop is well supplied with tools and machines, but most any location is better than in the basement. It costs just about as much to concrete a basement as it does to add a room of the same dimensions at the rear of the house or possibly between the house and garage. A ground floor is a much safer place in which to work and natural lighting would then be available.

Additional woodworking machines. Sanding machines seem a luxury in a lot of school shops, but actually they do not cost much. Their real value is overlooked. Prices for sanders start at about $40.00 and it takes a little choosing to decide just what is needed, but definitely it must be belt faced and 4 to 6 inches in width.

The floor plan. The average home shop usually covers an area of 250 square feet. A separate area should be provided for finishing and should be equipped with a cabinet for paints and a low saw horse on which the work can be placed. If a spray gun is used, set up a booth or small separate room for spray finishing, fitting it with a turntable and exhaust fan.

Home shop care. The home shop should be kept in order just the same as in the factory or school. If a person does not have interest in the shop it will become a place for junk. There should not be any junk stored in the shop. A place should be provided for junk until it is hauled away or destroyed. There should be cabinets built for hardware and repairs of tools and machines. The tools must be kept in place and well sharpened. A scrap box must be built to take care of small blocks and trash. A good lumber rack can be constructed from old pipe.

Recommendations. This particular shop described in this book is located in a basement. With very little more expense, if any, it could be placed at the rear of the house or near the garage. It is very difficult to keep the tools from getting rusty when the shop is in the basement. A room above the ground level usually has better lighting. Especially students that have completed courses in the industrial arts field have often wished for a shop of their own. This home shop description is of the average, but may not be approved by everyone. Sometimes people do not have the money to build a shop of this quality; where others are able to build one much better. This book contributes to industrial arts because it gives new ideas concerning shop care and tool panel design.

L. Welding, Brazing and Soldering[36]

This Handbook gives a brief discussion on the three phases of the metal-working industry, welding, brazing and soldering. It is said to be the latest information on this subject that Popular Mechanics has in publication. The book has many interesting diagrams that will aid in giving instruction to the student.

Types of welding. Welding is a process of bonding metals. The heat of the welding machines is often used for cutting purposes. A good welder must know about metals and their constituents. Theory and practice are necessary in order to become an excellent welder. The two types of welding are arc and oxy-acetylene.

Arc welding. There are two different types of arc welding, alternating welding current and direct welding current, commonly called A.C. and D.C.

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[36] Welding, Brazing and Soldering, Popular Mechanics Press, 1949, 96 pages.

respectively. Most A.C. machines have transformers designed and built for a special input. This becomes useful when repairing car bodies and fenders made of materials as thin as 20 gauge. The D.C. welder consists of an electric generator which produces D.C. for arc welding. It is driven by an electric motor or a gasoline engine. Although higher in initial cost, the engine-driven machine has a distinct advantage over the A.C. because it is portable. Regardless of the type, each has two flexible cables. One cable is a ground and the other is an electrode holder.

Oxy-acetylene welding and brazing. Gas welding is a different kind of welding because its source of energy is from a mixture of oxygen and acetylene stored in metal bottles being permitted to escape through flexible hose to a torch controlled by valves. The torch has fitted on it what is called a tip, of which there are several sizes designated for different work.

The flame temperature produced is dependent upon the relative proportion of the two gases. This being true makes the adjusting of the flames very difficult. The neutral flame is most generally used for all heating and welding operations. The type of rod and material have to be determined for work on specific metals. There are two general methods of oxy-acetylene welding known as "forehand welding" and "backhand welding". In forehand welding, the rod precedes the tip in the direction in which the weld is being made, and the tip is also generally pointed in this direction. In backhand welding the tip precedes the rod in the direction of travel and is pointed back at the molten puddle and completed weld. In either type of weld the base metal is heated thoroughly before the rod is applied. Then the rod is brought near the heated base metal and flame. With a slight movement of the rod and torch the base metal and the metal from the rod are fused together. The art of welding has a lot to do with knowing the metals and rods to be

used for each specific job and also learning the "feel" of the torch and rod.

Brazing. Brazing is using a bronze rod especially on cast-iron. The repairing of broken gray-iron casting by the oxy-acetylene process is readily accomplished by fusion, cast-iron welding rods being used and sometimes bronze rods are also used. When broken castings are bronze welded, comparatively little pre-heating is necessary.

Soldering. Soldering is the fusion of lighter metals such as tin and aluminum. It is usually performed in the schools with a soldering copper.

Conclusion. This book contains brief discussions on welding, brazing and soldering and how each are performed that would be information suitable for the senior high school level. It does not contain too much theory as is true of some of the other reference books studied. This book is similar to those manuals and handbooks used in the war training programs. The handbook would be a good reference in the general shop where instruction is given on welding, brazing and soldering. The diagrams and drawings contained would be very helpful to the beginners in the courses.

M. What To Make and How To Make It[37]

This book is another in a series of annual collections of popular workshop projects compiled for the home craftsman by the editors of Popular Mechanics Magazine. It contributes strictly to industrial arts on the junior and senior high school level because of the type of projects. Most all the designs of the projects are modern and up-to-date. Much time is

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[37]What To Make and How To Make It, Popular Mechanics Press, 1949, 112 pages.

lost in the school shop when there are no references containing suitable projects.

Kinds of projects the book contains. Most of the projects in this book consist of home improvement and school shop projects. About half of the projects are of the home improvement and repair type while the other half is concerned with the novelty and home furniture projects.

Conclusion. The book should be suitable for a junior high and senior high school library because one of the most difficult problems in teaching a junior high and senior high school shop is getting the students started to work on their projects. Once they are started, it is usually the most interesting class in their school curriculum. Most of the projects seem to be rather new in origin, which is one reason they would be good to use on these levels of teaching because students are always searching for something new.

N. Radio-Television and Electronics Handbook[38]

This book provides a non-technical guide for all owners and prospective owners of radio and television sets. It will save unnecessary service calls that cost money and time. It supplements textbooks in providing non-technical and practical what-to-do and how-to-do information for millions of radio beginners, students and experimenters in diagrams and illustrations that are easy to understand.

How the book contributes to industrial arts. The book would be an excellent reference where electronics is a part of the general shop. This

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[38]F. L. Brittin, Radio-Television and Electronics Handbook, Popular

unit of the general shop does not require many expensive tools as one may think. The essential tools needed include needle nose pliers, a 4" screwdriver with $\frac{1}{4}$" tip, an inexpensive hand drill and a soldering copper. A tapered hand reamer, inexpensive chassis punch for tube-socket holes and an ordinary ice pick which makes a handy scriber, are recommended as useful additions.

Conclusion. The book contains information that would help the person who wishes to learn the fundamentals of radio and television. It introduces the necessary standard parts in the study of electronics repair and maintenance, and informs of the ones that more commonly cause trouble to the set when worn out. Among them are the tubes, condensers, coils and resistors that are used in the radio and electronics circuits. The handbook gives information regarding the history of the television including how Dr. Valdimir Zieverykin made modern television transmission practical. The book would be of special importance to industrial arts classes where the fundamentals of radio and electronics are taught.

O. 23 Boats You Can Build[39]

Popular Mechanics writers have carefully chosen the craft that make up the contents of this book. Boats built from these plans are now in successful operation in various parts of the country. The instructions, pictures and plans were prepared for ease in understanding. Those who like boating, whether rich or poor, can find his choice of boat plans. The plans consist of various types of boats, from the expensive yacht to the simple paddle boat. When the boat has been built by its owner there is an abundance of

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[39] 23 Boats You Can Build, Popular Mechanics Press, 1950, 191 pages.

joy and enthusiasm received from its use. Today boatbuilding is no longer a part of everyday life except in some fishing communities where boats still are built by men who earn their livelihood from them. However there are a surprising number of boatbuilders who are amateurs.

The handbook's application to industrial arts. This book has in its content the plans and instructions of how to build twenty-three boats. The book contributes to industrial arts as a source of advanced projects. The construction of a boat is a very skillful task if it is constructed correctly. A boat selected as a project will require considerable time before completion. This type of project is a senior high school project and should not be permitted to students in lower grade levels. The book gives considerable information on different kinds of glue joints used in boatbuilding that would be good exercises in a woodworking class. It also gives information on bending plywood, and how these parts are assembled in the boatbuilding industry.

Conclusion. This book consists of complete plans of twenty-three boats and how each is constructed. The plans are in blueprints and have details of how each is assembled. The book contributes to industrial arts as a reference because it gives information on methods of making watertight glue joints and gives an insight into the boatbuilding industry which is becoming a thriving industry. The method used for bending plywood may be used on other types of projects in woodworking where curved surfaces are desired.

P. Popular Mechanics Christmas Handbook[40]

This handbook contains hundreds of plans, suggestions and hints that

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[40] Popular Mechanics Christmas Handbook, Popular Mechanics Press, 1949, 144 pages.

will help the reader spread Christmas cheer in ever widening abundance among loved ones, friends and even the stranger who passes by.

How Christmas came to be. This book tells a complete story of how Christmas came to be. It states that at first it was celebrated in months other than December. Most western churches celebrated December 25, and this was the date finally established by Pope Julian in 386 A.D.

The first Christmas card. Christmas greeting cards grew out of two customs in England during the reign of Queen Anne (1704-1740). The children of this time wrote Christmas "pieces" for their parents and relatives. These were specimens of their handwriting, designed to show the progress of the children in penmanship from year to year. The other custom was that of adults who wrote letters at Christmas to their friends.

The first Christmas card anything like those we send today was given to Queen Victoria in 1845 by W. C. Dobson, one of the Queen's favorite artists.

The "National Christmas Tree" of the United States. It is interesting to notice that our "National Christmas Tree" is the famous General Grant tree in Sequoia National Park, California. The General Grant is one of the oldest living things on earth. Some of these trees began to grow hundreds of years before the birth of Christ and still have centuries of growth before them.

How the book applies to industrial arts. This book contributes to industrial arts in that its contents consist mainly of projects that are appropriate for children to receive for a Christmas gift. Most of the projects are of the novelty origin. They would make good projects on the junior high

school level. They consist of childrens toys, bookshelves, table lamps and many other small projects.

Conclusion. This book contains an interesting story of the celebration of Christmas, how it came to be, history of the first Christmas card, and a story on our "National Christmas Tree". Other than the stories concerning Christmas, the book would be a good source for projects for the junior high school shop. Most of the projects are simple, something that could be used, such as bookshelves, table lamps and childrens toys.

Q. The Garden Book[41]

The Garden Book has been written for the purpose of improving the lawns and gardens of homes. This adds to the value of property, but does not require much money to keep them repaired if done in time.

Lawn furniture. There are many interesting designs of lawn furniture in the book. They consist of chairs, benches and tables. Many are constructed from tree trunks and branches which give it a rustic design. This wood cannot be used entirely green; it must be placed in a warm, dry place before it can be used. Such furniture as this is very appropriate around a private cabin where it is used only seasonally and then fits the occasion.

Conclusion. This book is more on the avocational side, but it would be of interest to the high school student because of the outdoor projects that could be selected from it. The Garden Book was written to give information on improving lawns and gardens. Improvement of the land around the home increases both the beauty and financial value of the home. All the projects

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[41] The Garden Book, Popular Mechanics Press, 1949, 96 pages.

illustrated in this book would be good for the junior high school students because they are simple and most of the materials are inexpensive.

R. 100 Beautiful Pieces of Furniture You Can Build[42]

This is an indexed handbook of 100 pieces of furniture. The book has a good many projects in it, but the majority of them are too advanced for high school shops. However this is one of the best lists of projects the writer has reviewed. With careful selection, the book can be used to good advantage on the high school level. This book would make a very good source for many things that could be built in the home or school shop. Often times textbooks and other types of references do not fulfill the requirements for certain grade levels or these levels are overlooked by the authors. The projects are either too simple or too complex.

Conception of good high school projects. The first good quality of a project is that it must be simple and something the student desires to make. Secondly it should be approved by the instructor along with a knowledge of the capability of the student. If the instructor is new at the location, an exercise or a very simple project assigned to all will help determine capability. The third point is that it must be something that can be used to show the parents what is being done in the shop. Then appreciation will be received from two sources.

Examples of projects contained in this book. The main reason this book attracts so much attention is that it has the latest new designs in furniture. It all seems to be modern, divided into three classes: living room,

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[42] 100 Beautiful Pieces of Furniture You Can Build, Popular Mechanics Press, 1950, 160 pages.

dining room and bedroom. There are also occasional pieces for each room and also some office furniture. Only a few of the pieces will be described.

Magazine rack swings into bookcase. One of the designers[43] in this book has this to say concerning this project.

> Housed in the lower section of this bookcase, a hinged rack holds the current magazines in order, out of sight, yet instantly available. It swings outward like a bin to show its contents, but when closed, its front side comes flush with the front of the case. It can be made from walnut or oak, depending upon what is intended to be matched. Both side pieces can be sawed out together, then mortised for the shelves, which are not all of the same thickness. The lower one is of the heavier stock so that it can be recessed for hinges on which the rack pivots. For trim, glue and nail two six inch extension pieces on the lower end of the sides, and a strip of three-eights inch molding along the front edges, with a length of flat molding across the upper shelf. The back panel extends from the lower shelf and overlaps the top one-fourth inch to fit into the rabbet on the lower edge of the pediment. A stop strip should be glued and screwed to the under-side of the shelf above the rack to prevent the rack from swinging forward too far when opened. A hardwood pull is made and attached by screws.

This book has pictorial representations of the projects and also details of how they are assembled. This particular project is simple and something new.

Complete living room unit. There are several good furniture designs by John Bergen, a noted furniture designer. One of these is a complete living room unit of sectional pieces. They consist of the secretary, a three-drawer chest, and a two door chest that may be used individually. These units are enclosed with open end book cases. This whole unit would be too difficult for a high school senior to make, but perhaps certain parts of it could be constructed and the more difficult ones added in later years.

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[43] Ibid., page 16.

Conclusion. This book deserves to be placed on any public library shelf and should be in every home. It contains several new ideas in furniture design. The public schools need more books of this kind to keep modern projects available for the students. The book contributes to industrial arts because it contains one hundred furniture projects, of which perhaps thirty or forty could be constructed in the junior high and senior high school shop. The industrial arts departments need special books on the junior and senior high school level that give information on modern furniture and home planning.

CHAPTER IV

A FINAL STATEMENT

The purpose of this report has been to review and evaluate the eighteen Popular Mechanics Handbooks in order to acquaint the reader with some information selected as industrial arts reference material. The reviews have indicated briefly what each book contains. The handbooks have been evaluated as they contribute to the industrial arts field as appropriate reference material. The report has been produced mainly for the purpose of stimulating teachers to introduce these handbooks to their shop classes. These Popular Mechanics Handbooks have been found to be a good source for preparing class demonstrations, lectures, notes and an excellent source for projects.

The Popular Mechanics Handbooks have been found to be appropriate reference material for the junior high and senior high school shop. The Popular Mechanics Press has a historical background that always has contributed to industrial arts. The original title of the Popular Mechanics Magazine was Shop Notes. Today the magazine has the latest information on science, industry and mechanics. The handbooks contain information indicated by the titles and are written in a condensed form which is easy to understand. Some of the books have been found to be of the vocational type while others are of the avocational. Regardless of the purpose, the books were found to contribute to industrial arts. Since the industrial arts field covers such a wide area in general education, it is almost impossible for one textbook to contain suitable reference material on the subject. These handbooks furnish some of the latest information to about all of the work stations of the general shop.

Recommendations. The Popular Mechanics Handbooks that have been reviewed and evaluated would be a desirable source from which to select a number of projects and draw them to scale and present them as problems. This report gives a brief description of some of the most useable projects and where they may be found.

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