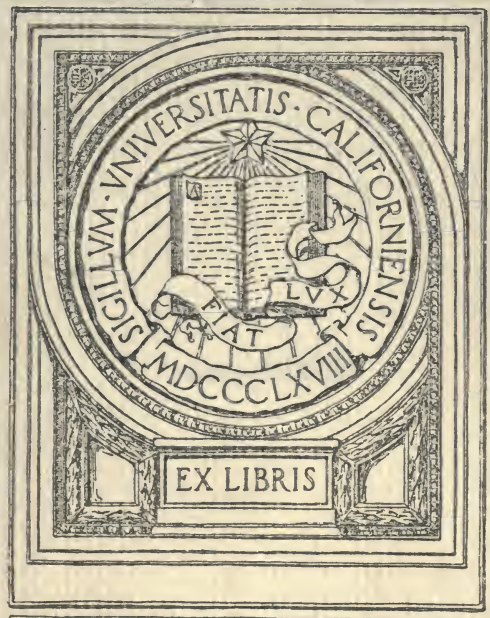
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BULLETIN OF THE UNIVERSITY OF WISCONSIN
No. 546: High School Series No. 11

THE TEACHING OF MANUAL ARTS

BY

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The University of Wisconsin

ASSISTED BY

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SECOND EDITION

The University of Wisconsin
MADISON
1912

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GRADE AND HIGH SCHOOL FURNITURE.

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LIST OF ILLUSTRATIONS

PREFACE

The introduction of departments of Manual Arts in a few American universities and the rapid increase in the number of teachers of manual arts subjects in the public schools make a hand book on this field seem advisable. This bulletin is presented to meet the needs of those who desire information concerning the introduction and maintenance of manual arts work. In addition to information of this character there is given some of a more general nature, that this bulletin may serve the purpose of a handy reference book.

The courses of study contained herein are not alone the individual drafts of the authors, but are the result of revisions and combinations of courses of study made and adopted by different associations which have given special attention to such courses during the past few years. The courses presented are suggestive only and should be regarded as such. They should express close coordination in the handling of all manual arts materials.

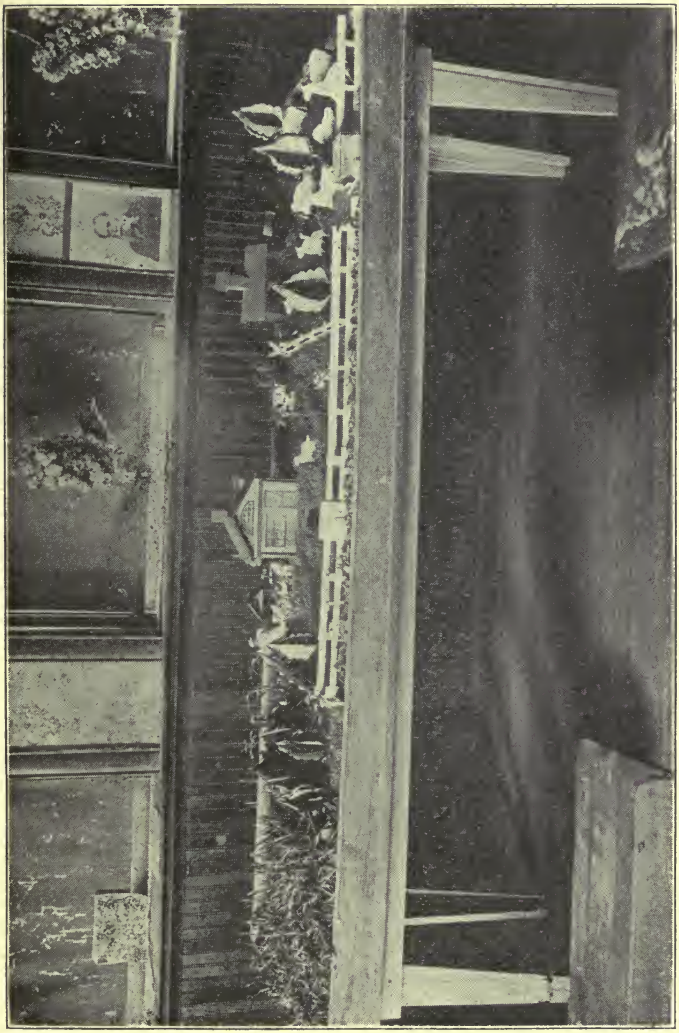
The illustrations are introduced as a supplementary text. They suggest the type of work considered in the courses of study outlined and represent good examples of present day design and construction.

The methods suggested for teaching the subjects for which outlines are presented are intended to aid materially in standardizing the manual arts work. The great demand for teachers of the subject has resulted in the employment of many who have had little or no instruction in teaching methods. For these and others it is hoped that the suggestions referred to will be of material value both as direct aids in teaching and as hints for supplementary study.

The authors are indebted to all those who have made this bulletin possible by furnishing material for both text and illustrations. They wish especially to recognize among

others, Professor J. D. Phillips of the College of Engineering for his helpful suggestions concerning Wisconsin conditions, and Professor Charles A Bennett, Editor of the Manual Training Magazine, Professor G. F. Buxton, Stout Inst., Menomonie, Wis., and Mr. Cheshire L. Boone, Supervisor of Manual Training, Mont Claire, N. J., for the loan of valuable photographs and cuts. Their thanks are due also to all who read the original manuscript, among them Prof. E. B. Skinner of the University of Wisconsin, W. F. Faulkes, Appleton, Wis., and State High School Inspector, H. L. Terry.

FRED D. CRAWSHAW
ROBERT W. SELVIDGE.



LOWER GRADE CLASS PROJECT WORK.

GENERAL EDUCATIONAL VALUES OF THE MANUAL ARTS

If we trace the history of the teaching of the manual arts from the days of such great educators as Pestalozzi and Froebel, down to the present time, we find that in increasing numbers with each decade educational specialists have given more and more importance to physical and manual activities in the educative process. But this development has produced a danger. So much has been said regarding the influence of sensori-motor activity upon mental development that many careless thinkers upon theories in education have come to look upon the manual arts as a sure cure for all educational ills. Teachers feel so surely that hand training strengthens the child, that they may grow careless about the real content back of the material. There has come into the shops and drawing rooms a form of hand work which can be characterized perhaps by no better term than "busy work", in which there may be little or no educational value. Teachers in this field then, need to look to the motivation of its subject matter quite as much as do those who are teaching language, mathematics and other subjects older than the manual arts, which deal with the more abstract educational material. When we find many boys and girls in manual arts classes who fail to be interested in their hand work, it is an indication that the proper mental stimulus is lacking. Apology need not be made for most of the work, but for some there is great need for reorganization.

Theoretically, training in the manual arts is a valuable means to an educational end because it takes account of the natural demand in children for a physical activity to accompany mental development. Practically, it always serves its purpose as a means to this end when by proper motiva-

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Note:—Herein "*manual training*" refers to a process whereas the "*manual arts*" suggest the different subjects included in manual training.

tion it creates an interest in the pupil. The motivation may be secured as a rule by one of three natural means, viz.:—

1. The desire to create because the creation satisfies a personal demand in the life of the creator. Ex.: The making of something which the maker will use.
2. The desire to create because the creation satisfies a demand in the life of someone in whom the creator is interested. Ex.: The making of something which will be used as a gift.
3. The desire to create because in the process of creation the creator will achieve a new goal. Ex.: The making of something for the sake of accomplishment.

By any one or all of these means of motivation, the manual arts will secure interest on the part of the individual creator. Attention will necessarily follow; attention will demand concentration; and it is through concentration that achievements in life are possible. By means of such a process many if not all of the character building qualities attributed to manual training will accrue, viz.:—accuracy, neatness, precision, carefulness, etc. It should be understood of course that manual training is only one of many educational means. If properly taught it will at least help to develop those sterling qualities which are enumerated above.

In addition to these there are other peculiar qualities which make for manual training certain so-called values in developing an individual socially, ethically, artistically, and industrially. We shall attempt to show very briefly its possibilities in these directions.

First, socially. In his daily environment the child sees and feels the great physical activity of the community. He is an imitative being; consequently he strives to copy the movements of his fellows among whom are his elders. Now there are mental ends to attain in the copying process. The teaching of manual arts offers an opportunity for the school tc give the individual this peculiar mental attainment which results from an intercommunication between members of a group.

The exercise of the fundamental types of community activity in the intercommunication results in social progress

and economic progress as well. The school of the past has not fitted the child for the industrially practical things of life, because the fundamental industrial activities have not been given due consideration in school processes. It has dealt with the theoretical almost to the exclusion of the practical. And yet, the work which demands the use of the hands in skilled labor must be the means of livelihood for the major portion of the adult population. Such being the case, the school has an obligation to the community to give its pupils knowledge of a functioning sort. If, then, the shop and the drawing room, the kitchen and the laboratory, will serve to furnish children information which later on will give them a community standing, these instruments point the way toward desirable social and economic ends. Ideals in life are established in the manual arts work which cannot be conceived by the non-participant therein. We cannot fully appreciate the viewpoint of the worker in any walk in life until we ourselves are put in his place.

Second, ethically. By this term we mean to express that quality which leads one to discriminate between those things which emphasize the best in life and those which are commonplace or even bad. Now in recitation work it is not impossible for one to deceive his fellows and even himself as to the degree of his understanding of a subject. The recitation may be based upon a clear, an acquired, or a borrowed understanding. It may be the audible form of any one of these and yet in reality be either of the other two.

When, on the other hand, the recitation takes the form of a finished project worked out in some tangible material, there can be no mistake as to its representing just what the maker understands about his subject. The exact measure of his ability is shown in the finished product. It is good, bad, or indifferent, depending upon a clear, a poor, or a partial understanding of all the elements which enter into it. Thus ideals are established.

The word education carries with it the acquisition of ideals,—the ideals of true living. The appreciation of these comes as a result of co-operation. Nowhere in school or out of school can such an appreciation be gained except as we individually in a group attempt the solution of simi-

lar problems. By comparison we discover our possibilities and limitations. Manual training affords an opportunity for this comparison, and because of it and the constructive criticism of classmates, there results the establishment of a mental unity which raises and standardizes ethical ideals.

Education which builds a mental unity also results in the ability to think consecutively to definite ends. By doing, and thus making use of the visual image, which in most people is strong, one is aided in logical thinking. The actual doing is a check upon the thought process. We take pride in having the things that can be seen by others show our full possibilities. The shop and the drawing room each afford a means by which the mental process can be readily estimated because its results can be seen.

The education of man in school up to comparatively recent times has consisted of a mental development by the exercise of the mental faculties alone. The teaching of manual arts recognizes the fact that man has motor as well as mental capacities, and that by exercising both, the whole individual is developed. It is true, also that one is educated only when he is able to use the finer sensibilities in promoting a project which requires the use of any or all of his faculties. Interest, therefore, is an essential factor in bringing to a satisfactory conclusion any piece of work. One must have his heart in his work if he obtains results which are better than mediocre. The natural demand for physicial activity, therefore, makes possible the enlistment of the heart in work which makes use of the hands as well as the mind.

Third, artistically. It is a sad commentary upon the average appreciation of the artistic in life that men are constantly deceived into believing that the elaborate rather than the simple is good, artistically speaking. Only within recent years has it been possible to purchase well made and well proportioned furniture in simple line patterns. Likewise in such materials as fabrics for clothing and house decorations, wall coverings, etc., it is within one's own memory that the plain and harmonious has taken the place of the complex, ornate, and incongruous. In the study of soft tones, pleasing colors, harmonious lines, and satisfying proportions, as well as in good construction, do the students of manual training become better able to appreciate the true meaning of artistic.

Repeatedly have the manufacturers of furniture threatened to return to the design of former periods. Efforts are made to renew the ornate and elaborate designs in decorative materials. Notwithstanding these facts, craft furniture is more in demand now than ever before. Our walls continue to be covered with paper which is marked off in simple patterns; or they are given simply a soft one-tone wash of color. We venture the assertion that the manual training and drawing work in the public schools is in some measure responsible for this condition which makes retrogression in these matters seem impossible.

It may be stated further under the head of educational values, and before considering the industrial significance of the manual arts as one of these values, that the modern school takes account of the fact that most text-book work deals with a vast amount of abstract material. Dealing with this alone tends to render the active child passive To counteract this effect teaching of manual arts is introduced, either to supplement the work of the class room or to furnish a means of dealing directly with materials and conditions about which the text-book gives some information. It, therefore, connects the theory of the book with the facts of life's later problems, and tends to vitalize the whole process of thinking and doing. In this way the child gets definite and tangible results.

There is a certain relaxation, too, in changing from the mental activity of the class room to that of the shop and drawing room, where the mind works to the accompaniment of the hand and eye. In the shop there is a certain review of the mental impressions obtained in the class room. It is here that the pupil works out in materials the theory of the book. Such a carying-over process tends to develop discrimination and organization. But these abilities call for the use of their prerequisites, such as care, precision, neatness, and accuracy; and a recurrence of these in motor activity where tangible results can be seen and compared by all classmates must result in higher standards of living, socially and economically.

By his intimate contact with classmates all of whom are working upon problems which have an individual meaning but which have a group and therefore a social significance,

the pupil appreciates perhaps for the first time, but certainly more thoroughly than ever before, the meaning of human relationship. His desires and ambitions are changed to accord with those of the individual whose point of view differs from his. He even subordinates his will to that of his classmate or teacher. He feels his importance not alone as an individual but as a member of a group—the community—and of society. The social interest is thus born. It is the altruistic spirit of doing things for others or because others—his fellows—will that he should work for the common good instead of the individual good, as such, that gradually controls him. The analysis of problems begins, and this must be one basis of all educational handwork. If, perchance, the pupil is allowed to work upon a community project during a part of his course, and preferably after he has completed certain individual work, his obligations to society will be further emphasized and the analysis he makes of new and larger situations will become clearer.

HIGH SCHOOL FURNITURE.

THE RELATIONSHIP BETWEEN THE MANUAL ARTS AND VOCATIONAL EDUCATION

In the foregoing discussion on the educational value of the manual arts, little mention was made of the element of skill which so often is considered the preëminent value of this particular educational work. If we study carefully outlines for courses of study we shall discover that little emphasis is laid upon skill in the program of work for the lower grades. Beginning with the fifth or sixth grades, however, outlines are distinguished from those of the earlier school period by laying emphasis upon accuracy and precision in technical processes.

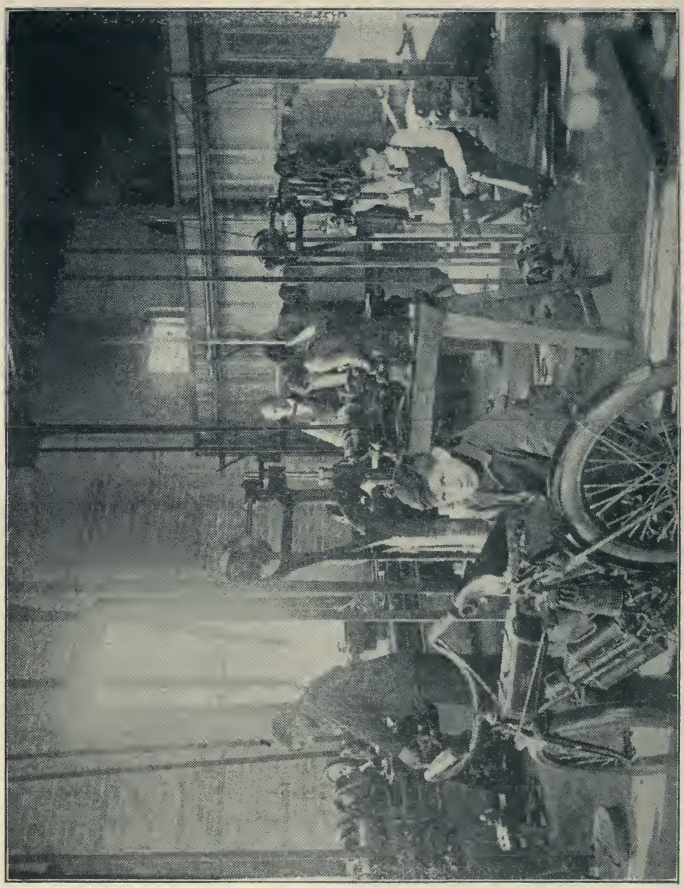
That one part of every individual's education should be vocational and at least semi-technical is self-evident when it is realized that the great majority of the American public is occupied in life's work in some form of manual labor. As the child reaches the age when the state relinquishes its hold upon him as a school subject, he realizes somewhat his possibilities as a wage earner. He sees everywhere about him men and women whose daily life is spent in an activity of which he knows little or nothing. He begins to feel that the information which he is getting from books has almost no relation to the work which he apprehends will be his when he leaves school. As a result, he longs to join the great army of his fellows who early leave school to accept wage-earning positions. It is at this point—in the grammar grades—that the teaching of manual arts should offer a real point of contact with the workaday world. It should begin to deal with materials of industrial significance, and in a way which will train the youth in processes which the industrial worker follows in his life in the factory and business house.

If the manual arts shop will provide a form of industrial work which is based upon the principles of educational handwork, and if, in addition to this, the bookwork and laboratory work of the school will take a practical turn, there will be

fewer boys in the sixth, seventh and eighth grades who leave school. At this stage in a child's life there is little he can do out of school which will train him for increased efficiency. The average boy who leaves school at the age of 14 and 16 years will find only such employment as that which may bind him forever to an unproductive service. On the other hand, his retention in school for three or four years will mean a preparation for lifework, especially so if during this period he is learning things which, when he leaves school, will give him the ability to take up work offering opportunities for growth. School work which will do this for a boy has an industrial value. Manual training should play no small part in making evident to boys the fact that the school is the best place to acquire a knowledge and skill for the future activities. It must promote efficiency both in intellectual and industrial attainments and it will do so if the best in manual training is retained and the best in industrial education is appropriated.

Industrial education, so called, and manual arts work must be essentially the same. Each must have for its purpose the

CORNER OF SCHOOL PRINT SHOP.

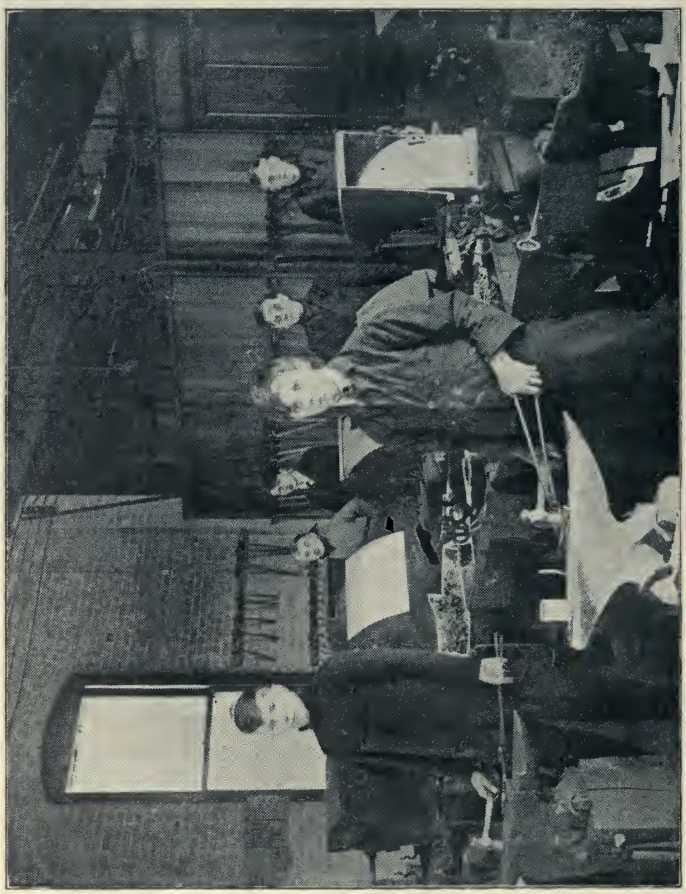


CORNER OF SMALL HIGH SCHOOL MACHINE SHOP.

acquisition of a fund of knowledge capable of making its possessor an efficient future worker in the industrial world. It must acquaint the individual with the tools and materials used in industrial processes. It must do more than this—it must give him a broad outlook upon industrial conditions; it must help so to organize his individual forces that he may have as a result of his knowledge and skill, a mental, moral, and physical control of himself; it must do its part to make him, in a word, a useful, helpful citizen.

The schooling that provides discipline and culture alone is insufficient. From the beginning, children must be taught to magnify the importance of their future usefulness in the community in which they are to live. The manual arts work has its part to play in this process by training for the vocational and industrial activities of life. It must be a leavening influence to uphold the dignity of labor, to make labor with the hands as honorable as any other. It will do this if it can hold in school the large number of boys who now leave at an early age to enter life with limitations which make a vocation an ever-present necessity and an avocation next to an impossibility. One of the products of the teaching of manual arts and the result of its influence in the public schools should be intelligent industrial workers.

Too strong a point cannot be made of retention in school. It is generally conceded that there are two points in the public school system as it is at present organized where there is either a lack of continuity in the work, or where there may be used inadequate material and methods to hold boys and girls in school. One of these is in the upper grammar grades and the other is at the end of the high school period. Of the two, the first is where the largest number of pupils drop out of school. It would seem that as many individuals as may should remain in school to the end of the high school period. The opinion has been advanced that manual training should materially aid in bringing about this desirable condition. Doubtless it has been the means of interesting many in school work and has helped to keep them in school after the state relinquished its hold upon them. The fact still remains, however, that many who complete the



CORNER OF SMALL HIGH SCHOOL FORGE SHOP.

fifth or sixth grades do not continue in school work thereafter or at least do not enter the high school.

Believing that manual training is not doing what is desired to accomplish the end sought, many are industrializing it or performing experiments which may result in not only changing its outward form but which may cripple it as an educational subject. We believe there should be involved in manual training processes, beginning with the sixth grade, as many industrial methods as may be and still retain all else in the subject that has been proved worth while. We have therefore said in this chapter that manual arts work and industrial education must be essentially the same. There is a grave danger, however, that in endeavoring to meet the demands of those who are advocating the use of trade methods in the grammar grade teaching of manual arts, there may be losses which will not be compensated by any possible gains.

We believe that beginning very early in the school process the course of study should include both vocational and non-vocational subjects. In doing this it is quite possible, without sacrificing anything of the broad, general foundations which it is the duty of our elementary school to lay, so to arrange the shop curriculum that as early as the sixth grade the motor element in the school work shall have a strong industrial significance. Indeed if this is not done we shall continue to have the great gulf which now exists between the elementary school and the high school, and in which so many lose themselves forever to school work.

The high school should offer opportunity for specialization from the very first day of the first year throughout the entire course. The field of choice should be much broader than it is now. There is no reason why it should be confined to the rather narrow field of industrial life represented in the traditional manual training courses. We must give some specific knowledge and power in the line of work in which the student will probably engage. In addition to this training for a specific occupation we must give as broad a knowledge as possible of our social and industrial problems. The useful citizen is not only a good producer but he is a good consumer, and must understand the social and industrial significance of modern methods of production and distribution.

THE NECESSITY FOR GOOD CONSTRUCTION AND APPROPRIATE DESIGN

It should go without saying that one of the dominant elements in teaching manual arts should be good construction; another should be good design. In fact, if these are not considered fundamental the subject cannot have the educational values claimed for it. If it were not for the fact, however, that both of these are often sadly neglected, space would not be given here for emphasizing their importance.

Early teaching of manual arts in this country laid considerable stress upon technique and skill. The form of work adopted at first was of the Russian type, which called for precise tool manipulation and emphasized the development of skill as one of the most important factors in the use of tools. The first instructors of manual arts, too, were either trained mechanics or engineering school graduates. The training of these men made it necessary for them to lay stress upon accurate workmanship. Of late years men not trained as mechanics or engineers have filled manual arts positions.

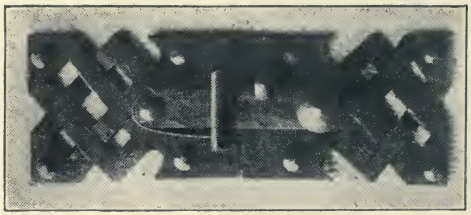
As manual arts in the United States have found their place in the lower grades, and as instructors in recent years have come from institutions which have given less emphasis to the value of skill and more to the educational values of the subject, it has been found that poorer construction has been accepted. Without entering into a discussion on values and comparing the value of one element with that of another, it is safe to say that no construction which is not the best that might be expected from pupils should be tolerated. This is not saying that pupils in all grades should reach the same standard of excellence in construction. Neither is it saying that any, necessarily, should be expected to attain a skill comparable with that of a mechanic. It implies this, however, that emphasis in teaching should be laid upon the best pos-

ART METAL WORK—COPPER, BRASS, AND SILVER.

sible construction resulting from the best accepted methods of handling tools. It also implies that no work should be accepted which is not the individual's best. Much will be lost in the establishment of high moral standards as well as in technical accomplishment if the work is otherwise considered.

But good construction is only one part of good design. In no part of our public school work is there greater opportunity for the satisfactory teaching of design than in the courses in manual arts where drawing, both freehand and mechanical, should be an integral part of every course of study. A "paper" design may be good, but one which is not carried out in constructive material certainly does not make its best impression. Where designs are being worked out in different media, as they are in the manual training shop, they should be most carefully considered. This is not for the purpose of educating designers but rather for the development of an appreciation of good design; in this the American people are lacking. and in this they are imperfectly instructed, also.

It is not an easy matter to present and develop problems in design to classes in public school work unless one has been first given instruction in this subject. However, it is not the teaching of design but rather the teaching of some of the fundamental principles of design and their application to different materials that is needed. This anyone can do if he will familiarize himself with some of the most recent literature setting forth principles in design and the method of their presentation in school work. Attention is called to the bibliography in this bulletin for reference to such material.



DOOR CATCH—HAND FORGED.

THE ORGANIZATION AND ADMINISTRATION OF MANUAL ARTS IN DIFFERENT PARTS OF THE SCHOOL SYSTEM

In this chapter it is the purpose of the writers to offer a few suggestions concerning methods of introducing and maintaining manual arts work in the public schools. To do this some special reference must be made to methods as adopted in different grades of school work in a particular locality and also to the methods prevalent in similar grades in different localities.

In general, it is safe to say that in the rural districts at the present time the work must be undertaken by the regular school teacher. Possibly time will need to be taken for manual arts which is not usually given to regular school work. This may be done by securing an equipment for one or two outlines of work and for two or three individuals only. Those students who complete the regular school work in less time than is required of the class might be given the privilege of doing the manual arts work as a reward of merit. Recesses, noon periods, and after-school time can be utilized by carefully arranging a schedule so that all who are interested may make use of the equipment furnished. A systematic plan of introduction and maintenance for manual arts work in rural districts has been given in a later chapter.

As in the rural district, so in the urban district, or in the isolated city school, manual arts will have to be taught, probably, by the regular teachers, and, if possible, supervised by the principal or by some member of the corps of teachers who is most competent to do this work. A sincere desire to have manual arts a part of the school curriculum is the first requisite; and a sympathetic helpfulness on the part of the teaching staff and Board of Education will contribute much to the success of the work.

In the city system, however, there should be as careful supervision as there is of any special school subject. Some

individual should be selected to outline a course of study and supervise its use in all the schools. He should have high ideals concerning the educational values of manual training, and he must of necessity be tactful in getting the work started and continued. Very often he will have to allow standards which are low to exist for a time, but he must raise these gradually until he has the hearty co-operation of all with whom he works. He may then realize ideals through the careful presentation of the subject matter, and the results will become as satisfactory as time and teachers' ability will permit.

Considering now the character of the work for different grades in the school process, we present the following:

The work for the first period, viz., the first three or four years of school life,—commonly called the elementary grades —should be based upon the fact that the child's powers of appropriation are far more developed than are his powers of expression. The sphere of thought and action of the six-year old is limited to the home. With his introduction into the school room this sphere is enlarged to take in some of the conditions of other homes than his own. This is because he immediately comes in contact with children from many homes, and through the language work, which is at first entirely conversational, he learns how his playmates live as compared with the way he lives. This broadening of home experiences determines and emphasizes a starting point for work in manual arts, viz., the study and construction of home objects.

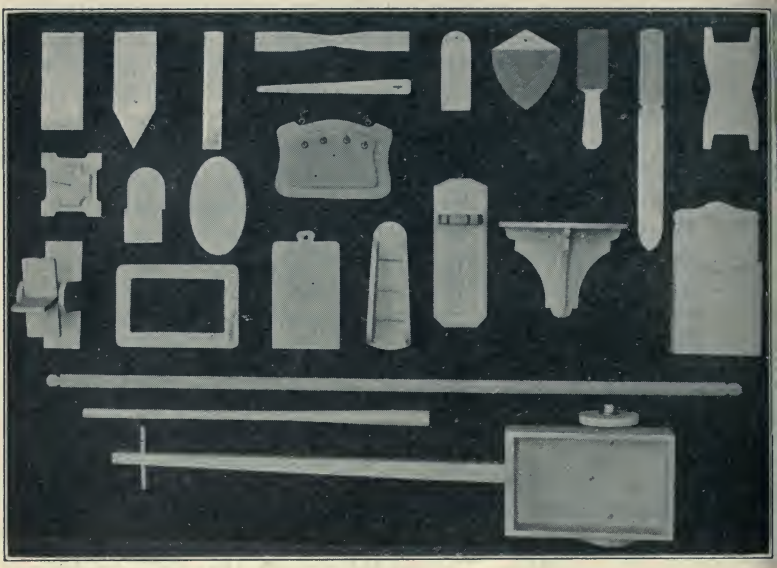
Thus it is that the construction of a "play" house is a problem for the first and second grades. But the study should not be limited to an individual home and its furnishings. We believe the opportunities to lay the foundation for future work are neglected if one fails to make also a comparative study of other homes and their furnishings. To do this the sand table may be used to construct the homes of the Indian boy, the Esquimo boy, and other types which will give play to the child's intense curiosity. Through the hand work then, by harnessing the play instinct, one immediately makes use of history and geography to aid in the construction work. This emphasizes what seems to be a fact,—

that the manual arts teacher must be a storehouse of knowledge, and that to impart this knowledge properly must be with him almost a mania. As G. Stanley Hall has written: "If there is a plenum of knowledge in the teacher's mind and a hungry vacuum of interest in that of the child and they are brought together, the pedagogic interest will establish an equilibrium between the two."

This broad play study of the homes of children gives a large opportunity for individual hand work. There is the cord and yarn for weaving, the paper for construction work, the clay for modeling, and many other materials which are used daily and which are found at our very doors. These may all be used in individual projects. When the individual project is introduced, one is confronted at once with the questions of drill, repetition, and accuracy. Regarding these it may be said that we believe often too little consideration is given them in the lower grades. We agree with the theory that they should be given far more as hints and suggestions and less as examinable knowledge in the lower grades; but at the same time the teacher should not lose sight of the fact that in these grades he is dealing with the children who are in the age of habituation, and that their automatic powers are plastic and receptive. To use this means that drill, within the child's capabilities of acquiring skill, that repetition, carried somewhat short of the point of discouragement, that accuracy, in its place but guarded by its limitations—all have their place in the manual arts work of these early years. In the introduction of these elements into courses of study, one needs only to plan with the child standards in mind rather than with those of mature years.

At the end of the fourth grade the child should have a fairly good knowledge of how distinct types of people have lived and are now living, and should be familiar with the hand process of producing many things which these people use in their daily lives. This means that weaving, modeling, folding, scoring, cutting, and pasting have all been done by them, not as an end in themselves but as a means to an end; viz., "the acquirement of a certain knowledge of facts and of a certain amount of skill which later on, when

the child fully understands them, he will find himself already the proud possessor of."*



THIN WOOD CONSTRUCTION.

During the second period—that of the upper four grades—the child's work should be of such a character that he will naturally analyze his experience of the first four grades. This he will do with the aid of the history and geography of this period; and as a result of this work, which calls for analysis, he will grow into social efficiency. This means that his manual arts work should gradually become more technical. The work of the first four years is given a community setting; that of the upper grades is given the individual setting, or that of a unit in the community. We cannot afford to lose sight of the fact that in these grades and before the high school period is reached, the great bulk of our American youth drop out of school.

Here is the place where teachers of manual arts above all

*Quotation from G. Stanley Hall.

others, have an opportunity to present school work as real work. Such a presentation must be made in order that the boys' education may be continued in school, or if not in school, in some vocation for which he has had some real preparation in school.

It may be said that the age of the child in these grades prohibits industrial methods. Perhaps so, but it does not prohibit industrial tendencies. We are inclined to believe that, when the industrial education agitation finally settles into definite molds, it will have introduced into the upper grades of our grammar schools a phase of industrial manual arts which will save a great part of the present waste product—the boys who leave school because they see in it nothing which points the way to future life work.

Differentiated courses of study for boys and girls in the upper three or four grammar grades will do much to hold them in school. If they are so held they will get the benefit of a full day in school, one-half of which may be spent in construction work taught in accordance with good commercial standards, and the other half in the academic school work which should be closely related to the construction work. Pupils who will thus be segregated in differentiated courses will be saved from early entrance into wage earning positions where they would receive the benefit of a vocational continuation school for only a few hours each week.

In these upper four grades, too, the differentiation in the use of materials should begin probably about the fifth or sixth grade. In the sixth grade we believe boys are capable of beginning the use of woodworking tools and girls the use of the needle, as these tools are used in practice. We would guard against the too frequent dissipation of energy in the grammar grades, often caused by introducing too many media of expression. Hence in these upper grades it is suggested that work be confined to one or two lines until it is well ununderstood. It must be remembered that the work is tending toward definite and fixed useful hand processes; and the old motto,—"A thing worth doing at all is worth doing well"—applies with boys and girls from eleven or twelve to fifteen or sixteen years of age. These are the years in the child's life which mark the greatest gap in the educational process.

In the upper two grades of the grammar school, sewing, cooking, and applied art work for the girls; bench woodwork and art metal work, together with freehand and mechanical drawing for the boys, seem nearly to complete the field of possibilities for the teacher of manual arts unless he adds to this list of subjects those designed to prepare one directly for the trades.

It is important to note that under present upper grammar grade conditions girls get the advantage of a greater variety of forms of hand work than do boys. Drawing, sewing, and cooking are common vocational subjects for girls in the upper grammar grades, while boys usually are taught drawing and woodwork only. Also it is true that the woodwork in these grades is not essentially vocational in character. Much of it consists of the making of small exercises and projects difficult to make because of their size. From an educational point of view the first bench woodwork might better be the making of medium sized box constructions which would involve duplicate measurements, considerable laying out, squaring with pencil and square and sawing *on* the line rather than *to* the line. Such projects as the following are suggested: small boxes and bins, feeding troughs, egg testers, forms for concrete work, etc. If such work is done in the sixth or seventh grade then the smaller projects necessitating more accurate construction might be undertaken the next succeeding year to be followed in a third year—probably the eighth grade—by small pieces of furniture. Simple framing, too, such as the framing of a dog house, chicken coop, poultry house or even a shed or garage, would be a natural step in advance of the work suggested for the first two years of woodwork.

The high school organization provides for four years of handwork. The subjects in the following order are usually given: Bench work in wood, wood turning, furniture and cabinet making, pattern making, moulding, forging, and machine shop practice. To this list might be added any subject which represents a community industry or trade.

The first two years of high school are the ones uniformly used for manual arts. Bench woodwork is the subject usually taught in the first of these two years. If the suggestions

offered for the sixth, seventh, and eighth grades are followed then the first year high school woodwork may well do two things. First, set adult standards in technique and shop methods, particularly in the use of machines in getting out stock for large pieces of furniture and cabinets, some of which should be made as community pieces by groups of boys working under the leadership of a student foreman. Second, continue the framing begun in the eighth grade. It is believed that carpentry and architectural drafting must be given a larger place in the high school. The framing of the eighth grade would naturally be followed by the problem of framing and finishing the outside of a small barn, lake cottage or some similar structure. Second year high school boys would then be able to finish such a building on the inside.

It is suggested that what is now accomplished in four years might be considered with equally good results in three years, with a slight increase in time devoted to any one subject. By this plan the fourth high school year would be available for specialization.

However, it must not be supposed that all specialization must be reserved until the fourth high school year. We have advocated a specialization through differentiated courses and special schools for the upper grammar grades. In the high school there must be an opportunity for specialization from the first day on. For those who will remain in the high school for only one or two years and then leave to enter a vocation there must be an opportunity for election. For those who will remain until the end of the high school period specialization may be withheld for two or three years. In any event the opportunity for concentration upon some vocation and the allied academic work should be given at all times. When one will avail himself or herself of this opportunity depends upon the length of time to be spent in education in school. We do not believe industrial conditions will ever prevail in the school if school men organize the work of industrial courses, unless perhaps they have had the special industrial training needed. On the other hand, we maintain that the executive heads in the school system must remain in general control. Germany and France give us the best illustrations of what can be done in this direction—one of coöperation.

It is believed that the high school organization herein considered will provide for a solution of some of the perplexing problems in industrial education now confronting high school teachers. Especially will this be true if, as it is hoped, by means of industrializing manual arts work in the upper grammar grades, boys are induced to enter the high school.

WOODWORKING EQUIPMENT USED AT BRADLEY POLYTECHNIC INSTITUTE, PEORIA, ILL.

SUPPLIES AND EQUIPMENT

The following notes on supplies for manual arts classes are suggested as a result of some experience in handling such classes under average public school conditions. It should be understood that supplies for the lower grade construction are, comparatively speaking, inexpensive.

Primary Grades

The usual supplies for the first four grades in an urban community are: Folding paper, card board for scoring, cutting and pamphlet making; raffia, yarn, cord, small reeds, clay, and thin and strip wood. Paper should be furnished in subdued colors. It is well to have the paper both plain and coordinate; the latter ruled to one inch squares. In addition to the above mentioned supplies, water-color paints and colored threads for outlining may be added. While water color has been a common drawing medium in lower grades for many reasons it is believed that crayons are more satisfactory to use. Water color may be introduced in the third or fourth grade with good results.

Attention is again called to the position taken by the authors on the use of materials in the lower grades. They are used not so much to develop technique as to suggest industrial processes. Primarily speaking then they serve as illustrative material in this school period. They are used to function in educational method rather than subject matter. It must be apparent therefore that supplies cannot well be listed by grades.

Paper—Colored, for folding and scoring, $4.00 to $15.00 per ream of 500 sheets, 20 x 25 inches. Book paper, $4.00 per ream, 28 x 42 inches. Wrapping paper in neutral tones, $3.00 per ream, 42 x 28 inches. Heavy cover paper, $3.50 to $4.00 per ream, 22 x 28 inches. Tag paper, 100 to 140 pounds per ream, 24 x 36 inches, about 3 cents per pound. Heavy cover paper in neutral tones in weights corresponding

to tag paper may be secured for about three times the cost of tag paper, namely: 8c or 9c per pound.

Raffia, yarn, cord, and small reeds—$.75 to $.80 per hank for raffia and reed; $.40 to $.60 per pound for rug yarns, chenille and cord.

Thin and strip wood—Bass, yellow poplar or soft pine. This material is used for coping saw and knife work and light construction work where a handy saw, a try-square, and hammer and nails are the principal tools. The material in boards surfaced on both sides need not cost more than five or six cents per board foot. An extra charge would be made for sawing stock into strips.

Acessories for Primary Grade Work.—Sand table, or class project box, minimum size—3 x 5 feet, may be made by upper grammar grade or high school classes in woodwork. Such a box should be lined with zinc to protect the box from the moisture in wet sand or clay. Sand from a neighboring sand pit may be purchased for approximately $1.25 per cu. yd.

Potter's clay, reground to secure a fine texture may be purchased in barrel lots for one cent per pound. From seventy-five to one hundred pounds of clay is sufficient for a class of thirty-five or forty pupils for a school year, provided it is not used for permanent projects until rather late in the year.

Looms for rug and hammock weaving cost from $.20 to $.30; but these may be made by manual arts classes costing not to exceed $.05 each. Sack needles are servicable for weaving. They cost about $.10 per dozen, or $.80 per gross. A good substitute for the sack needle is a strip of some close grained tough wood about three thirty-seconds of an inch thick by three-eighths of an inch wide. The wooden needle should be a little longer than the loom is wide. It should have a hole bored in one end for the insertion of the yarn or cord. The opposite end may be sharpened to a blunt point.

For general use the following articles will be needed:

Latshaw rulers; $.06 each in quantities.

Three or four inch blade scissors, one point blunt; $1.20 to $1.75 per dozen.

Daisy compass; $.20 each, in quantities.

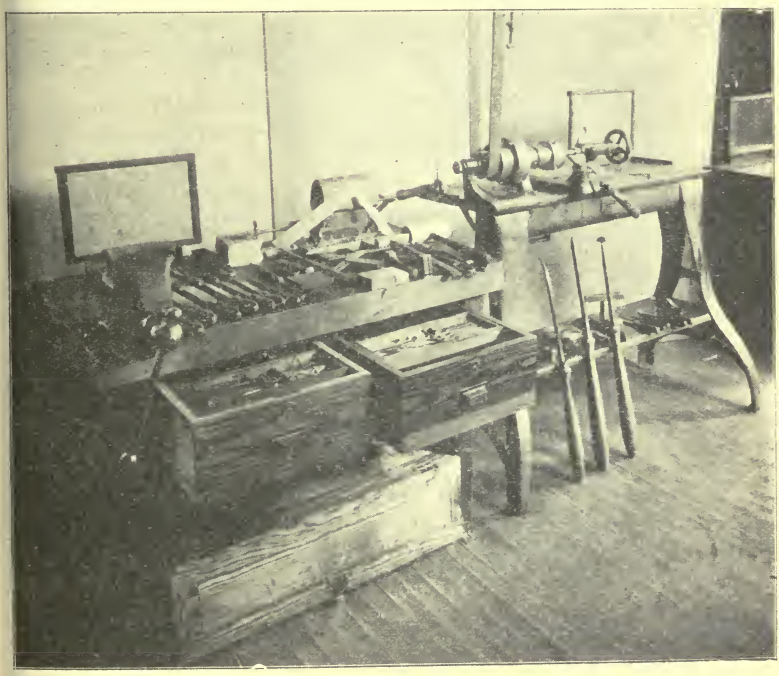
Four or five inch solid triangles; $.15 to $.20 per dozen.

A few knives (Sloyd, H. & S. No. 5), $2.50 per dozen.
Colors in tubes in three primary colors, $.25 per dozen.
Brushes; $.38 to $.40 per dozen.

Flour paste or cheap bulk paste may be used. Library paste or tube glue is preferred. If either of these is used a small amount may be placed upon a bit of paper placed on the desk of each pupil. These papers may be collected and put in the waste basket at the close of an exercise.

Grammar Grades

The work in the upper grades, beginning with the fifth, is designed to emphasize more praticularly, technique and processes comparable with those of good commercial practice.



METAL WORKING EQUIPMENT USED AT BRADLEY POLYTECHNIC INSTITUTE, PEORIA, ILL.

Heavy papers and other book making materials may be used in a course in pamphlet and book making. Clay will continue to be a prominent material in technical clay work, especially pottery. Cement and concrete also will take their places as manual arts materials in the seventh and eighth grades. Wood of the thin variety will gradually give way to thicker stock purchased in stock sizes for bench wood work and light framing.

There will be a segregation of classes about the sixth grade. Girls will take up the work of the arts and crafts and sewing and cooking. The sewing equipment for the upper grades including needles and thread and sample equipment need not cost more than $.10 or $.20 per pupil per semester. All material for projects which will be taken home by pupils should be purchased by them. This applies to the boys as well as to the girls. Thirty lessons in cooking can be given for $1.00.

For the upper grammar grade clay work at least one stock modeling tool should be purchased. This need not cost more than $.25. Other tools may be made by the woodworking classes. Tin cracker or cake boxes will serve as receptacles for unfinished clay work and will keep material moist for a number of days. A large box lined with coarse plaster of Paris (which should be kept wet) will keep the prepared clay in excellent condition. A very good kiln may be purchased for from seventy-five to one hundred dollars.

Leather is often used in the upper grammar grades for tooled leather work and to some extent in book making. One-half dozen hides per year is sufficient for a normal amount of work for three average sized classes. A very fair individual leather working equipment can be purchased for $.50. Many of the tools may be made from needles, files, and nails.

It is difficult to estimate the cost of supplies for bench woodwork and other work which boys may undertake in the upper grammar grades. It is safe to say, however, that no line of work need cost more than $.25 or $.30 per pupil per year after the equipment is installed. (Woodworking and mechanical drawing equipments are given on succeeding pages.) This does not include the cost of material which will go into projects to be the property of individual pupils.

CORNER OF SMALL HIGH SCHOOL DRAFTING ROOM.

It is practically impossible to give satisfactory data concerning the cost of supplies for high school work because the character of the manual arts as taught in the high school differs materially in different localities. It is customary for high school manual arts work to include courses in freehand and mechanical drawing; in technical woodwork such as framing, pattern making, and wood turning; in forge work, foundry, moulding, and machine shop work. A course in freehand and mechanical drawing should be considered a part of every shop course. In addition to these subjects the following are sometimes given attention: Carving and art metal and tooled leather work, on the side of the arts and crafts; and plumbing, concrete construction and brick laying, on the side of the industries. In no case should it be necessary for the cost per pupil per year to exceed $2.50 to $4.00.

Inasmuch as courses in mechanical drawing and woodwork are generally offered among high school manual arts courses the following equipment lists are given. It should be understood that the individual prices are given as estimates only.

MECHANICAL DRAWING EQUIPMENT

Minimum Equipment (Individual)

Regular 12″ triangular boxwood scale graduated 3-32, 3-16, 1-8, 1-4, 3-8, 3-4, 1-2, 1, 11-2 and 3″ to the foot. One edge inches and sixteenths	$.50
1 Eberhart-Faber No. 112 eraser	.05
1 doz. ⅜″ stamped steel thumb tacks	.05
1 pencil pointer, sandpaper pad	.10
1 5–H drawing pencil	.10
1 2–H drawing pencil	.10
1 bottle black waterproof drawing ink	.25
1 pen holder, rubber or cork end	.05
3 303 Gillott's pens	.03
3 404 Gillott's pens	.03
3 Spencerian No. 1 pens	.03
3 Lady Falcon pens	.03
1 17″x24″ seasoned pine drawing board	.65
1 24″ pearwood T–Square, fixed head	.30
1 6″ 45° pearwood triangle	.15
1 8″60–30° pearwood triangle	.15
1 set of drawing instruments, including: Ruling pen, highest grade; compass with pen, pencil point and lengthening bar, medium grade; dividers, medium grade. Price of set	4.00

General Equipment and Materials

1 set of 6 irregular pearwood curves	$1.50
6 sets of bow instruments, second grade, pen, pencil and dividers	22.00
24 sheets of 11″ x 15″ medium grade drawing paper, for each pupil	.40

6 erasing shields	.75
1 set of American drawing models	1.50
24 sheets of letter size cross-section paper for each pupil. Divisions ¼″ x ¼″, lines printed in faint blue	.10
1 sq. yard of Imperial tracing cloth for each pupil	.40
2 sq. yards of blueprint paper for each pupil	.15

Complete Equipment (Individual)

12″ triangular boxwood scale graduated 3-32, 3-16, 1-8, 1-4, 3-8, 3-4, 1-2, 1, 1 1-2 and 3″ to the foot. One edge inches and sixteenths	.50
1 Eberhart-Faber No. 112 eraser	.05
1 Hardtmuth gray flexible eraser	.10 to .50
1 erasing shield	.15
1 doz. ⅝″ stamped steel thumb tacks	.05
1 pencil pointer, fine flat file	.15
1 5–H drawing pencil	.10
1 2–H drawing pencil	.10
1 bottle black waterproof drawing ink	.25
1 pen holder, rubber or cork end	.05
3 303 Gillott's pens	.03
3 404 Gillott's pens	.03
3 Spencerian No. 1 pens	.03
3 Lady Falcon pens	.03
1 17″ x 24″ seasoned pine drawing board	.65
1 24″ mahogany ebony lined T-Square fixed head	.65
1 6″ 45° celluloid triangle	.45
1 9″ 60–30° celluloid triangle	.50
1 irregular curve	.25
1 4-H lead for compass	.10
1 set of drawing instruments, including ruling pen, highest grade; compass with pen, pencil point and dividers; bow pencil; bow pen; bow dividers	$10 or more

WOODWORKING EQUIPMENT

Minimum Equipment (Individual)

1 bench and vise	$8.75
1 Bailey No. 4 smooth plane	1.60
1 2″, two fold rule	.12
1 12″ back saw	1.10
1 No. 162 Stanley marking gauge	.15
1 No. 20 Stanley try square	.20
1 Sloyd knife 2⅛″ blade	.18
1 ¼″ firmer chisel	.30
1 1″ firmer chisel	.40
1 spoke shave, Stanley No. 64	.12
1 maple bench hook	.18
1 bench brush	.25
Total	$13.35

General Equipment

1 Disston No. 7 crosscut saw, 10 points, 24″	$1.25
1 Disston No. 7 rip saw, 8 points, 24″	1.25
1 bit brace, 8″ sweep	1.00
1 Millers Falls hand drill, No. 2	1.30
1 Keyhole saw	.40
1 14″ turning saw with frame	.90

1 screw driver, 4" blade	.18
1 screw driver, 6" blade	.20
2 6" wing dividers	.30
p 6" T bevels	.40
2 adz eye claw hammers, 10 oz	1.00
6 ¾" gouges, outside ground	3.00
1 set auger bits	3.00
3 scrapers	.25
3 nail sets, assorted	.20
4 10" hand screws	2.70
6 7" hand screws	2.50
1 mounted oil stone	.75
1 steel oiler	.10
1 mounted grindstone	6.00
Total	$26.68

Medium Equipment (Individual)

1 bench and vise	$10.00
1 jack plane, Bailey No. 5	1.80
1 block plane, Stanley No. 220	.45
1 2 ft. two fold, boxwood rule	.12
1 12" back saw	1.10
1 2½" mallet	.15
1 marking gauge, Stanley No. 162	.15
1 try square, 6" blade, Stanley No. 20	.20
1 6" wing dividers	.15
1 Sloyd knife, 2½" blade	.18
1 screw driver, 4" blade	.18
1 ¼" dowel bit	.20
1 ½" dowel bit	.30
1 ¼" firmer chisel	.30
1 ½" firmer chisel	.35
1 1" firmer chisel	.40
1 spoke shave, Stanley No. 64	.12
1 maple bench hook	.18
1 bench brush, (bristle)	.25
Total	$16.58

General Equipment

3 Disston No. 7 crosscut saws, 10 points, 24"	3.75
3 Disston No. 7 rip saws, 8 points, 24"	3.75
1 set auger bits, 3-16" to 1", inclusive	3.00
1 Miller's Falls hand drill No. 2	1.30
1 keyhole saw	.40
1 14" turning saw	.90
1 screw driver, 6" blade	.20
4 6" T bevels	.80
3 nail sets, assorted	.20
4 10 oz. adz eye claw hammers	2.00
3 ratchet bit braces, 8" sweep	3.00
6 ¾" gouges, outside ground	3.00
1 set J. S. Addis carving tools	4.00
1 framing square	1.10
4 scrapers	.35
6 10" hand screws	4.00
6 7" hand screws	2.50
2 Carpenters' steel clamps, 48"	3.60
2 mounted oil stones	1.50
2 steel oilers	.20
1 mounted grindstone	9.00
Total	$48.55

Very Complete Equipment (Individual)

1 bench and vise, with lockers	$16.50
1 Stanley "Bed Rock' jack plane No. 605	2.10
1 Stanley block plane, No. 15	.80
1 2 ft. two fold rule	.12
1 12″ back saw	1.10
1 Disston No. 7 crosscut saw	1.25
1 Disston No. 7 rip saw	1.25
1 ratchet bit brace, 8″ sweep	1.50
1 10 oz. adz eye claw hammer	.50
1 2½″ mallet	.15
1 Stanley marking gauge, No. 165	.28
1 Stanley try square, 6″ blade	.20
1 6″ T bevel	.20
1 6″ wing dividers	.15
1 Sloyd knife, 2½″ blade	.18
1 screw driver, 4″ blade	.18
1 ¼″ dowel bit	.20
1 ½″ dowel bit	.30
1 ¼″ firmer chisel	.30
1 ½″ firmer chisel	.35
1 1″ firmer chisel	.40
1 spoke shave, Stanley No. 64	.12
1 nail set	.08
1 maple bench hook	.18
1 bench brush (bristle)	.25
Total	$28.64

General Equipment

1 Disston No. 7 crosscut saw, 8 points, 26″	1.50
1 Disston No. 7 rip saw, 6 points, 26″	1.50
1 set auger bits, 3-16″ to 1″, inclusive	3.00
1 Clark expansive bit	1.00
1 Miller's Falls hand drill No. 2	1.30
3 keyhole saws, assorted	.80
2 14″ turning saws with frames	1.80
1 Langdon mitre box with saw	9.35
1 drawing knife, 8″ blade	.95
1 framing square, rustless	1.10
1 Stanley universal plane with bits	12.00
6 1″ gouges, outside ground	3.60
6 ¾″ gouges, outside ground	3.00
1 set J. S. Addis carving tools, No. 12	5.75
6 scrapers, assorted	.50
6 brad awls, assorted	.25
1 Bailey No. 8 jointer	3.00
6 10″ hand screws with iron screws	4.80
6 8″ hand screws with iron screws	4.40
4 Carpenters' steel clamps, 48″	7.20
2 oil stones, mounted	1.50
2 steel oilers	.20
1 mounted grindstone, treadle attachment	12.00
Total	$80.50

Equipment for Rural Schools

Handy saw, Bishops	$.70
Brace (second grade)	.60
Augur bits, 3-16″, 3-8″, 1″, Russell Jennings	1.00
Bit stock drills 4-32″, Russell Jennings	.10
Counter sink (second grade)	.15
Sloyd knife No. 6	.25
Foot rule, flat edge	.05

Spoke shave, Stanley No. 54	.25
Firmer chisels, ⅛", 1" Barton	.60
Gouge, 1", Barton	.40
Jack plane, Stanley No. 5	1.75
Block plane, Stanley No. 91½	.75
Hammer, 6", Stanley No. 12	.25
Marking gauge, Stanley No. 64½	.25
Screw driver, 4", Champion	.17
Combination oil, India No. .029	.50
Bench hook, Van Deusen	.25
Winding sticks, Van Deusen	.15
Bench stop, Van Deusen	.20
Brush, 7" back	.25
Dowel plate, Van Deusen	.10
Pencil compass, Eagle	.10
Nail set	.10
Total	$9.27

In making an estimate of the cost of an equipment, about 10 per cent should be added to the estimate given here. This will be needed for extras and unforseen wants.

The authors of this bulletin understand the difficulties of giving a list of tools and equipment which would be satisfactory to all manual arts teachers. This has not been attempted. The equipments here given may not be the best possible, but they represent very satisfactory selections for the money invested. The outlines are given in response to many inquiries concerning cost of equipment.

For the general equipment for normal school woodwork, we quote Mr. W. T. Bawden, formerly of Illinois Normal University, as follows:

> "For the shopwork I can give you a rough approximate list: Junior Shop, 15 benches, besides teacher's demonstration bench, three each of five different makes, so that our special students may make some study of the different benches and vises; a few individual tools on each bench: brush, rule, try-square, jack-plane, block-plane, marking gauge, Sloyd knife, chip carving knife for laying-out work, ¾" chisel, general tools in racks on walls: total, about $350. Senior Shop: 20 benches, besides instructor's demonstration bench; individual and general tools about the same as in the Junior Shop. Power equipment in Senior Shop: Clement Jointer, 12", with Badger guard, $145; Colloday Band-saw, 36", $110; jointer and band-saw are run by one 3 h. p. motor, which stands on the floor, $67; four speed lathes, 12", one each, F. E. Reed Co., American, Fay & Egan, and Oliver, aver-

age about $65 each: Fay-Egan Double Circular Saw, 205, $325; 5 h. p. motor to drive same, on floor, $72; 3 h. p. motor, on ceiling, to drive the four lathes and grindstone, $67; Athol Machine Co., iron grindstone frame, complete, $25; Oliver Single Surfacer, double-belted, 24", with 7½ h. p. motor, on floor, to drive same, $515; Oliver Trimmer, $31.50; labor, freight, belting, etc., $400.

The above power equipment is given because it offers good suggestions for a high school equipment.

Space will not permit of a series of complete itemized equipment lists for courses of study in all materials, but the following references are given as those which may be considered most helpful in comparing figures and determining upon essentials:—

The Economics of Manual Training, by Louis Rouillion, M. A., Norman W. Henley Publishing Company, 132 Nassau Street, New York City. (This book is out of date. It is understood, however, that the author is revising it.)

Bulletin No. 3 of the Stout Manual Training Schools, Menomonie, Wisconsin, August, 1906.

Articles on Equipment, by Charles H. Bailey, Director of Manual Training, State Normal University, Cedar Falls, Iowa, in the Manual Training Magazine, published by the Manual Arts Press, Peoria, Illinois, December, 1907, and February, 1908.

An Equipment for a School Print Shop, by Leonard W. Wahlstrom, Teacher of Manual Training, Francis W. Parker School, Chicago, Illinois. Manual Training Magazine, December, 1908.

An Equipment for metal working (hand tool and speed lathe) in an article entitled, The Organization of Manual Training in High Schools, by Professor Charles A. Bennett of Bradley Polytechnic Institute, Peoria, Illinois, Manual Training Magazine, April, 1902.

High School Equipments, Supplies and Courses of Study, in a series of articles entitled: The Organization of Manual Training in the High School, by Principal Gilbert B. Morrison, McKinley High School, St. Louis, Mo., Manual Training Magazine, 1907–'08.

The following references refer to supplies:

"The Cost of Manual Training," by Supervisor William E. Roberts of Cleveland, Ohio, The Manual Training Magazine for 1907.

Stout Institute Bulletins, School year 1909–1910.

Articles by James P. Haney and Julia Cremmins in the Year Books of the Council of Supervisors of the Manual Arts.

A very complete syllabus on "Wood and Wood-working," by William Noyes of Teachers' College, Columbia University, New York, N. Y|, gives general information on reference material (which may be considered under the head of "supplies") for assigned readings and themes.

The following named articles published in the Manual Training Magazine, Manual Arts Press, Peoria, Ill., furnish valuable suggestions for special equipment:

"Bookbinding in the School," Oscar L. McMurry & George W. Eggers, beginning October, 1910.

"Metalwork with Inexpensive Equipment for the Grammar and High Schools," Arthur F. Payne, beginning April, 1910.

"Rooms in Paper, Problems in Construction and Design," Nama A. Lathe and Esther Agold, beginning October, 1911.

HIGH SCHOOL FURNITURE.

COURSES OF STUDY IN OUTLINE

The following courses of study up to and including the outline on Textiles have been adopted by the Illinois Manual Arts Association as tentative. They are presented here as among the best of their kind that can be recommended at this time.

The outlines following the one on Textiles are given as particularly suggestive for high school work. All outlines are given with the idea that appropriate freehand and mechanical drawing will be given as a part of the shop work or as a separate course planned in close co-relation with the constructive problems.

The following outlines for the elementary and grammar grades were planned on the supposition that at least five periods a week during half the year will be devoted to the work. One-half as much time, or two and one-half periods per week, should be used for drawing.

Woodworking Outline

Grades I to VI

In these grades problems involving construction with saw, hammer, and nails may be used for expression work, in connection with other school work. This work should not be required in certain grades but should be used where the other school work offers a good opportunity for its use. The expression idea should be given more attention than the woodwork, but an effort should be made to get good technique for the grade doing the work.

Grades V and VI

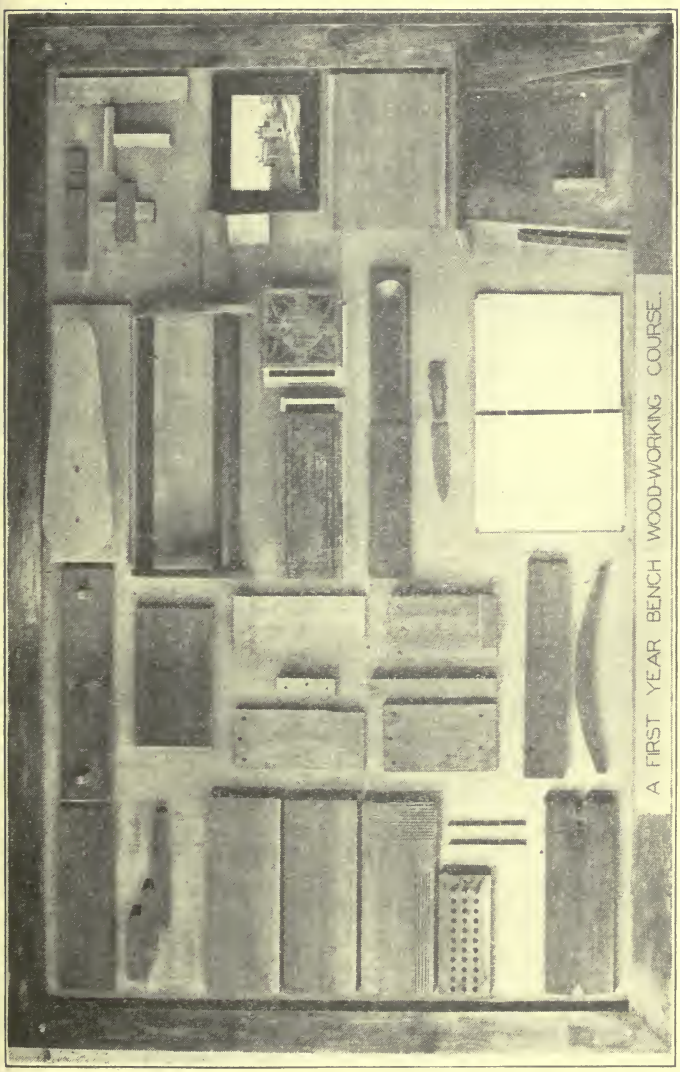
Knifework and coping-saw work are appropriated for these grades. Those interested in coping-saw work are referred to a pamphlet entitled Coping Saw Work, by Ben W. Johnson,

published by The Manual Arts Press, Peoria, Ill. This pamphlet describes the work as it is conducted in the public schools of Seattle, Wash., where Mr. Johnson is supervisor of manual training.

Whittling

Group or Type of Work	Processes	Problems
Straight cut with the grain; across the grain	Lining, squaring, testing: study of grain. Holding knife to cut with grain. Holding knife to cut across grain.	Garden stake (cylindrical.) Plant label. Match scratchers. Calendar back. Sandpaper block. Emery stake or any normal sized, rectangular or cylindrical piece.
Long and short taper cuts over and into the grain.	Bevel square. Guarding knife. Drawing as well as pulling or pushing knife.	Garden stake (flat taper.) Tag. Fish line wind. Yarn wind. Picture mount.
Curve cuts—convex.	Special use of thumb in drawing knife. Wrist movement.	Table mats. Buz buttons. Parts for doll. Furniture. Pieces included in groups 1 and 2, but of different design.
Curve cuts—concave.	Special use of point of knife blade. Cutting out on end grain. Cutting out on side grain.	Any two-dimension piece in thin wood. Special emphasis laid upon pieces for construction.

NOTE: This outline is made brief, purposely.



DEVELOPMENT OF COURSE BY GRADES—STEPS SHOWN FOR ONE PROJECT IN EACH GROUP.

Bench Woodwork.

Grade VII

Group	Processes	Suggestive Problems
Laying out and sawing.	Gaging, knife-lining, cross-cut sawing, testing with try square.	Puzzle boards, game boards, target, window stick.
Free planing.	Adjusting and using jack and block planes for securing smooth surfaces. (Start with rough stock.)	Rope wind, swing board.
Accurate planing.	Planing true surfaces and to dimensions, testing for trueness and squareness, planing chamfers.	Chiseling board, bread-cutting board, hat rack.
Simple modeling.	Use of turning saw and spokeshave, producing a curved surface by increasing the number of plane surfaces tangent to the desired surface.	Coat hanger.
Gouging.	Use of outside-bevel gouge.	Pen tray, desk tray.
Vertical chiseling.	Use of chisel in vertical position to produce a convex surface by increasing the number of plane surfaces tangent to the desired surface.	Tool rack, sleeve board.
Simple construction.	Fastening parts together with nails or screws.	Broom holder, letter rack, shelf, loom, bird house, waste paper box.
Simple joinery.	Method of laying out lap joint and bridle joint, accurate sawing, paring with chisel.	Flower-pot stool, wind mill, picture frame.

Grade VIII

Group	Processes	Suggestive Problems
Glue joint.	Accurate planing for glue joint, fastening with glue.	Solitaire board (made of two pieces), bread board.
Advanced modeling.	Producing outline form from two directions, then increasing the number of plane surfaces tangent to the desired form.	Hammer handle, swingle-tree, canoe paddle.
Advanced construction.	Combining processes previously learned into more difficult constructions.	Hygroscope, coat and trousers hanger, towel roller, sled, snow shovel, book-rack, drawing board, T-square, knife box, wagon jack.
Mortise-and-tenon joint.	Laying out and cutting mortise-and-tenon joint.	Mortise-and-tenon joint, tie-rack, ink stand, wind mill frame.
Simple furniture construction.	Cutting duplicate parts, finishing.	Stool, taboret, plate rack, umbrella rack.

Outline of a Course in Freehand and Mechanical Drawing

Grades 1 to 8

Principle	Problem	Medium
Grade 1		
1. Observation of form.	Drawing from common objects, as kites, sleds, natural forms.	Mass with brush, colored crayon or pencil.
2. Arrangement; repetition.	Simple border repeats of straight lines in connection with 3.	Colored crayon outline.
3. Straight line terms: square, diagonal, opposite side, parallel.	Folding square, etc., applied to boxes, envelopes, etc.	Cutting and folding paper 1-4 in. square.
Grade 2		
1. More accurate observation.	Groups of rectangular and cylindrical objects: baskets, books.	Pencil outline, brush silhouette or colored crayons.
Freedom of expression and action.	Nature drawing for use with 2.	Pencil or colored crayon.
2. Repetition of natural unit.	Border repeat from natural unit, for decoration of 3.	Colored paper, colored crayon.
3. Terms: oblong, etc., parallel oblongs in increasing ratio of size.	Folding book covers, trays.	Paper with square corner given.
Grade 3.		
1. Visualizing form and mass.	Groups of cylindrical objects: baskets, pans, apples, with straight base.	Pencil, crayon, brush: outline and mass.
Proportion and action.	Animals and plants.	Pencil and colored crayons; outline and mass.
2. Plant or animal motives in all over repeat.	Spot repeat of unit to be used as decoration for 3.	Ink, pencil, colored crayons.
3. Circle and its parts.	Triangular box and tray, vertical sides.	Use circle finder.
Diameter, arc, radius.	Circle combinations. Make model from sketch on board.	Triangle.
Grade 4		
1. Representation by more accurate observation.	Groups of rectangular and cylindrical objects: books with vase forma.	Pencil outline.
Proportion in mass.	Simple sprays of leaves.	Flat tones with brush.

Outline of a Course in Freehand and Mechanical Drawing

Grades 1 to 8 (Cont.)

Principle	Problem	Medium
2. Line spacing.	Agreeable spacings for shelves and picture frame in 3.	Outline and water tinting of spaces.
3. Complete square, hexagon, circle with compass.	Various geometric applied forms based on circles, squares, hexagons. Picture frames connecting with 2.	Compass, triangle of 45°; bisecting, erecting perpendicular.
Grade 5.		
1. Application of perspective principle.	Judging of angles of inclination and convergence.	Pencil.
2. Relation between mechanical and pictorial views.	Foreshortening.	
Uni-lateral and bi-lateral units.	Tubular flowers. Curves of force and beauty seen in plant units. Principles of structural design.	Pencil and water color.
3. Tangents. Top, front and side views.	Explanation. Working drawings of simple type solids where two views only are required.	Same as Gr. 4. Freehand and mech. rendering.
Grade 6.		
1. Memory drill. Foreshortened and true view of circles.	Leaves and flowers. Draw solids from all positions.	Pencil.
Perspective by observation and explanation. Careful drawing of nature for variety.	Circles and cylinders. Plant and vegetable form : trees.	Pencil and water color.
2. Conventionalized forms. Foreshortening.	Leaf and flower units. Application to material and kind of project.	Decorative treatment.
3. Three dimension working drawings of simple models.	Simple familiar object.	Working drawing and pattern if possible.

Outline of a Course in Freehand and Mechanical Drawing

Grades 1 to 8 (Cont.)

Principle	Problem	Medium
Grade 7.		
1. Light and shade.	Rectangular objects turned at various angles.	Pencil.
Perspective.	Rectangular objects turned at various angles.	Pencil.
2. Section views for design.	Purposes of section of milkweed pod, etc., stems branching. Simple construction design for 3.	Pencil and color.
Color analysis and synthesis from same. Sectional views of shells.	Lines supporting structure.	Pencil.
	Lines weakening structure.	
	Section of nautilus and its pencil and water color arrangement into bilateral and unilateral motives.	Pencil and water color
3. Working drawings with simple kit. No inking. Cross sections.	Practical patterns and working drawings of useful objects.	Freehand sketch of object translated into mechanical drawing. Mechanical instruments.
Grade 8.		
1. Parallel, angular and oblique perspective. Water color painting.	Groups of objects.	Pencil and ink.
2. Degrees of conventionalism.	Treatment of flower through 5 stages of convention from the naturalistic to the abstract. Constructive design.	Pencil and color.
3. Theory of projections. Intersections. Working drawings.	Cube, rectangular prism, pyramids, etc.	Drawing kit.

Note:
1. Representative drawing.
2. Decorative design.
3. Mechanical drawing.

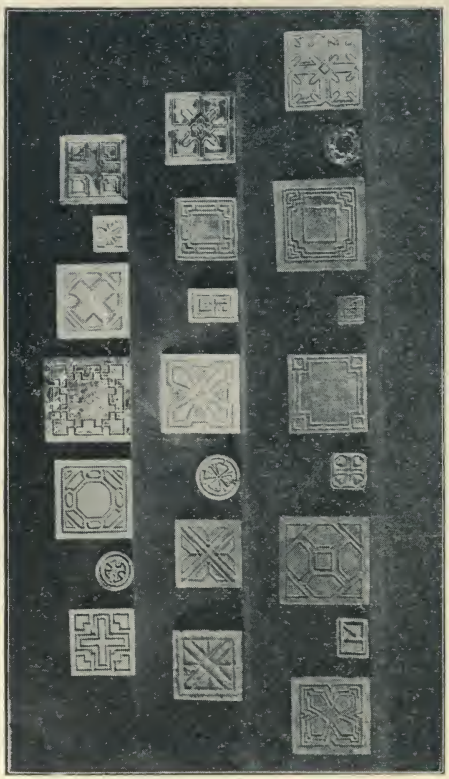
Clay Work

Modeling is one of the most effective means known for developing ability to understand and delineate form. It demands clear and accurate observation, deft manipulation, and some exercise of taste. In connection with work on the sand-table, modeling is especially valuable. The unusual possibilities for the correlation of clay study with nature work, literature, history, drawing, and design, make it a desirable medium in the public schools.

Primary Grades

Process	Suggestive Problems
I. Develop familiarity with material, ease in handling and shaping it.	Free work on part of pupil.
II. Repetition of I. Stress laid on quality of work instead of mere activity. a See object, model from memory, compare with original, re-model. b Study some detail or characteristic, model whole, improve on part studied. c Demonstration lesson in which teacher builds up form step by step and pupils follow. d Representation of action.	*Animals.* Bear, Rabbit, Dog, Deer, Elephant *Birds.* Crow, Robin, Goose *Vegetables.* Onion, Pumpkin, Turnip, Carrot *Fruits.* Apple, Lemon, Pear Selection of Models— 1. Modeling possibilities. 2. Correlation; Literature, History, Home Life. *Actions.* Dog barking. Rabbit jumping. Squirrel climbing. *Illustrations.* Little Boy Blue. Tom, the Piper's Son. Hiawatha's Brothers. Robinson Crusoe's Home and Family. Scenes from Life of the Eskimo. Landing of Mayflower. Going to Church. First Thanksgiving. Coasting. Playing Marbles. Leap Frog. Lion and Mouse. Crow and Pitcher.
III. Repetition of Unit, singly or in groups. (Border)	*Units.* Pine-tree, Holly leaf, Acorn, Owl, Rabbit, Boat

Note: Roman numerals refer to groups: not to grades.



CLAY TILES.

Grammar Grades.

Group	Process	Suggestive Problems
Modeling Flat	I. Shape outlined with coil; inner space filled, building piece by piece; wedging; smoothing; use of thumb.	*Tile* (Square, oblong, round) a Tea-tile b Tile for Flower-pot c Paperweight
Design	II. a *Incised.* Design drawn on paper, transferred to clay; design marked with pencil end of tool; clay removed back to edge of line of design (broad end of tool); smoothed with moistened fingers. b *Low Relief* (background removed). Design transferred to clay, incision (1-8 in. deep) made along lines of design; background removed; smoothing. Broad chisel-shaped end of tool used for larger spaces. narrower tool for smaller parts. c *Inlaid.* Incision made while clay is firm but moist; design or background removed, incisions moistened, colored clays pressed firmly in with aid of tool.	a Border b Subdivided rectangle or area. (Decoration should always be in keeping with the shape, structure and use of the object.)
Relief	I. Form sketched upon background, then outlined with clay coil, well pressed down on inside; inner space filled bit by bit; wedged, brought to desired relief. Use of thumb. Tool used for undercutting and for picking out more detailed parts. (Uuder-cutting adds to effectiveness of model.)	*Nature.* Milkweed pods. Acorns and oak leaf. Jack-in-the-Pulpit Iris Onion (with sprouts) Apple (fruit and spray) Bananas (grouped) (Many natural forms may be simplified and repeated to make a decorative border.)

Grammar Grades

Group	Process	Suggestive Problems
	II. Figure or form reduced to essentials, important direction lines drawn upon tile, figure sketched abont these; sketch built up piece by piece. Figure worked all over, brought up to required degree of modeling. Relief kept low.	*Pose* Boy skating Boy shoveling Throwing the discus Trial of the bow Story of Ulysses *Animal Forms* Lion Camel Buffalo Giraffe
	III. Build upon drawing of front view of model. Outline form with clay, coils well pressed down on inside—inner space, built up with due reference to difference in relief; wedging; smoothing. (For capitals three drawings should be made; front view, side view, sectional view.) (Flutes in column formed by controlled movement of thumb.)	*Architecture* Lotus bud Lotus blossom a Anthemion Egg and dart (border) Fleur-de-lis Gothic window (Gothic arch and trefoil or quarter foil) Egyptian pylon b Campanilo Triumphal arch Egyptian capitals c Doric and Ionic capitals Front view of Parthenon (Rosettes may be modeled from drawing taken from top view of the lotus blossom.)
	IV. Story discussed with aim of bringing out moment of supreme action, or point of most vital interest. Illustration planned by drawing; distributed over entire tile. Composition sketched with pointed tool or pencil. Illustration modeled bit by bit. Relief kept low, detail eliminated. Whole worked over and brought gradually to desired degree of modeling.	*Illustration* Pied Piper. Barbara Fritchie. Ride of Paul Revere. Circus Parade. Hiawatha— Childhood. Boyhood. Hiawatha and Mudjekeewis. Hiawatha and Pearl-feather. Hiawatha's Departure. (Different parts or chapters of a story in which there is a series of events may be assigned to different pupils for illustration. When completed, these may be cast in plaster and so placed as to form a decorative freize. These [may be tinted.)

Grammar Grades

Group	Process	Suggestive Problems
Round.	I. Necessary proportions decided upon, tile serving as base, important masses secured and general position of figure indicated. Bits of clay added until form grows to shape of model. Model studied from all sides Entire form worked over. Note.—If standing figure is made, sticks or wires are used as supports and clay moulded about them.	a. Girl (sitting on floor) b. Boy (reclining on elbow) Turtle. Lion. a. Alligator Catfish b. Camel Buffalo c. Shells
Pottery.	I. Base built on damp plaster bat (see modeling of tile.) Coil fastened to outer edge of base and coiled upon it. Coils wedged together, smoothed, top leveled, edge rounded. Form studied from all sides. The slightly concave effect is given to the bottom by pressing with thumb slightly inward upon center and rounded to outside edge. Note I—In smoothing and wedging, one hand should be kept outside of form while working inside, thus keeping inside pressure from destroying contour. When working from outside, wall should be braced from inside. Note II—Coils are made by rolling out a piece of clay on the table, using fingers of both hands. With the outward movement of hands, fingers spread apart and clay is drawn out.	a. Low bowl (no shoulder) Tray Saucer Match holder Toothpick holder b. Japanese spill Candlestick Flower-pot Fern-box c. Bowl or vase (with shoulder) d. Inkstand Jars (with cover)
Pottery design.	*Incised.* Form is divided into halves, fourths, etc., design unit placed in each space. Pointed end of tool used for incising line, and broader end for rounding edges, *Inlaid.* (See tile decoration.)	a. Border b. Decorative motif (repeated)

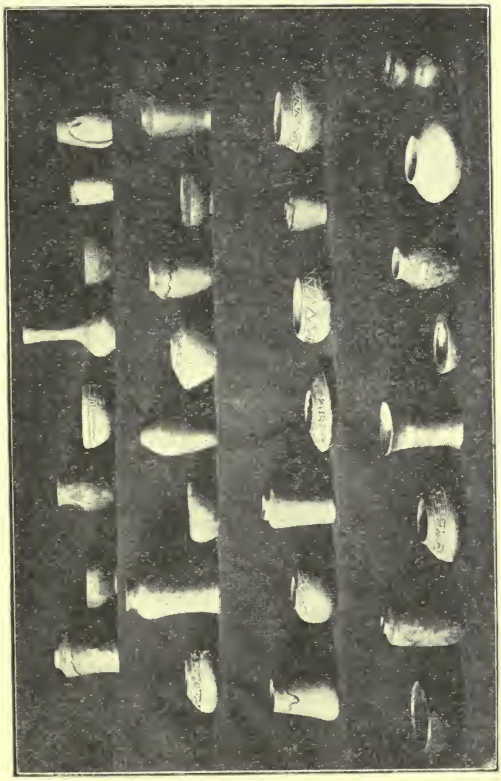
Grammar Grades

Group	Process	Suggestive Problems
	Painted. Circumference of form obtained by fitting slip of paper about it. Paper spaced, design unit drawn in each space, paper placed about form, design transferred to clay. Colored clay applied with brush. Note.—(Dry clay pulverized and mixed with gum trazacanth dissolved in water. Clay and coloring material should be ground together, using palette knife on glass slab. Enough water added to make a thick cream and all ground well together.)	
Design	*Modeled.* (See modeling in low relief.)	

Note 1.—Before attempting the building of any pottery, a lesson on form of bowls, vases, etc., should be given. Pupil should make a drawing of form which he wishes to build. If one-half of the design is drawn on heavy paper, it can be folded on center line and entire form cut out. This should be taken to class by pupil and serve as reminder of shape to be developed.

Note II.—The outward curve of bowl or vase form is secured by placing successive coils upon outside edge of preceding coil. If the walls of a form are to curve inward, coils should be placed on inner edge of preceding coil.

Note III.—The bowl or vase form may be built one coil at a time. After some skill in handling has been acquired. walls may be built up spirally and several coils added before smoothing is done.



POTTERY.

Bookbinding

The aim is to develop in the grades an industrial line of work rich in design and constructive possibilities, and rich in problems in sequential series; to acquaint the worker with fundamental processes in the preparation of materials required in bookmaking; to develop on the part of the pupil an appreciation of handmade constructions in contrast with those made by machine.

Grades I–IV

Group	Processes	Problems
I. Blank books.	(1) Sheets unfolded, punch and cord lacing, flexible or board covers.	Word book (1). Clipping or picture book, calendars (4).
	(2) Sheets folded and sewed through the fold, cutting, pasting. Flexible covers.	Dictionary (3), pencil note books (4), telephone list (3), art books (4).
II. Printed matter.	(1) Books made up of one section. sewed, pasted, trimmed. Flexible or board covers.	Supplementary reading (4), pamphlets (4), Bibelot (4,) (Mosher Publications) or repairing school (3) and library books (4).
III. Portfolios.	(1) Sheets of crash finish paper or manila laid out, cut, folded and pasted.	Envelopes for clippings (1)
	(2) Flexible covers, manila, board, cloth or paper cover and lining.	Portfolios with tapes (3–4)

The climax in work of Fourth Grade is attained in binding a Bibelot or similarly constructed book, in which children gain experience in sewing, pasting, trimming, making corners, finishing backs, devising good color schemes and good proportions.

Grades V–VI–VII–VIIII

Group	Processes	Problems
I. Blank books.	(1) Made of unfolded sheets secured by rubber bands or punched for rings and cords. Flexible or board covers.	Class or shop notes (7 or 8). Art sketch book (8), Art book (5).
	(2) Books made up of (a) folded sheets secured by sewing through the fold.	Note books (5), scrap books (6), and recipe books (7–8).
	(b) folded sheets forming sections sewed on tapes. Board covers, case binding.	Science note books (8), record books (6), post card books (6–8).
II. Printed books.	(1) Those made of one section with board or flexible covers.	Government pamphlets (6) reading matter (5), maps, drawings (7) library books (8), Mosher or Jacobs publications (6), books cleaned and repaired (5–8), library books (8).
	(2) Those made of several sections sewed on tapes, case binding. Board covers, case binding.	
	(3) Those sewed on tapes, board covers, hollow backs.	
III. Portfolios.	(1) Those with flaps and pockets, board covers	Art portfolios (8), magazine covers (7–8), bill books (7–8), card cases (8).
	(2) Those with leather covers, flexible, tooling and printing.	

Pupils reach one climax in Sixth Grade in case bindings, and a second climax in Eighth Grade in hollow back library bindings.

Note: The figures in parentheses in the third column indicate the grade in which the problems should be undertaken.

METAL SPINNING.

METALWORKING

Metal working as an elementary school subject is easily subdivided and classified in accordance with the equipment emloyed; as (a) metalwork that may be done in the regular schoolroom at the schcol desks with little equipment, (b) metalwork in a shop equipped with benches and small tools. (c) metalwork in a shop equipped with benches, small tools, and power machinery.

The first of these may consist of: (1) work with round wire; mostly cutting and bending; (2) work with "ribbon iron"—cutting, bending, binding—popularly known as bent iron work, (3) work with thin sheet metal—usually done over a wooden block and consists in punching around designs with tools of different shapes.—(4) etching designs on sheet copper, together with a little cutting, filing, and finishing. While all of these have been found possible and more or less practicable in the schoolroom, there is still much doubt whether they can be taught with sufficient effectiveness to displace work in materials more easily adapted to schoolroom work. In the opinion of the authors it is best to reserve metalworking for the upper grammar grades and usually for schools where a shop equipment for metalwork is available.

While the third class of metal work mentioned—that involving power machinery—is possible in elementary schools, and excellent educational results may be obtained from it, there is no necessity for incurring the expense of equipping a grammar grade shop for such work unless a much larger

time allowed than three hours a week can be given to manual training. It is therefore wiser to consider metalwork with power machinery as belonging either to the high school or to a special elementary vocational or industrial school.

The first and third classes of work being disposed of, there remains the second:—metalwork in a shop equipped with benches, vises, and small tools, but no power machinery, except possibly, a small tool grinder and drill press driven by an electric motor. Under these conditions of equipment, metalworking may and should become a manual training subject of great value, taking its place educationally beside benchwork in wood. The following outline suggests a suitable course in benchwork in metal. The first two groups of work may be taught in the regular classroom without shop equipment, though better with such equipment.

Kind of Work	Processes	Suggestive Problems
1. Wire work.	Cutting with pliers, bending with fingers, and pliers, forming by wrapping around a cylinder, sharpening or smoothing end of wire with file.	Staple, skewer, loop, chain, ring, tweezers, hinge, cork screw, spiral spring.
2. Etching.	Designing, etching, coloring, cutting with shears, soft soldering.	Watch fob, bag tag, blotter, hat pin, blotter corners, belt pin, tie pin, calendar.
3. Strip brass work.	Cutting with snips or chisel, bending with pliers or over cylinder, or in vise with hammer, drilling, riveting.	Picture hook, angle iron, spring, bracket, curtain rod fixtures, bracket hook.
4. Sheet metal work (without solder).	Cutting with snips, bending against straight edge.	Book corner protectors, blotter pad corners, box with cover pan.
5. Sheet metal work (with solder).	Pattern cutting, bending, folding, wiring, soldering.	Pipe, cookie cutter, cup, funnel, pail.
6. Chipping and filing.	Chipping cast iron with cold chisel and hammer, filing plane and curved surfaces, testing, polishing.	Chipping block, door key, wrench, escutcheon.
7. Shaping.	Sawing, raising, filing, finishing, etching, annealing, coloring with heat and chemicals, brazing.	Escutcheon, hinge, drawer pull, bowl, plate, tray, lantern, candlestick.

Textiles

A course of study for the first four grades of the elementary schools should consist of several lines of work, one of which is textiles.

The plan should be such as to use the child's desire for play and to give relaxation from books.

Designed plays or set tasks of this kind of work with a well formed purpose should be used to train the pupil to think with his hands.

The locality, experience and home life of the pupil will do much in helping the teacher to choose what work to give, and how to connect it with other subjects to make the most of *simultaneous* training of eye, ear, and hand.

First and Second Grades

Processes	Problems
Card work: Braiding. Knotting.	Horse reins. Whip. Scissors guard. Curtain cord for doll house. Bag. Hammock.
Raffia: Winding about a cardboard. Braiding for decoration and handles. Braiding raffia or rags.	Whisk broom holder. Picture frame for doll house. Napkin-ring. Rug for doll house.
Burlap: Squares, edges fringed, threads drawn, space filled with colored yarn or cotton for decoration.	Table mat for doll house.
Coarse sewing: Doll-house furnishings.	Portieres. Curtains. Comforters. Pillow-cases.
Yarn or Tilo Strands: Weaving on loom. Study color and pattern.	Rug.

Third and Fourth Grades

Raffia: Knotted. Braided and sewed with strand of raffia in tapestry needle. Use of thimble.	String balls. Bags. Basket.
Reed or Raffia: Simple stitches used in basketry.	Mats, coiled baskets.
Tilo Matting: Overstitching with raffia. Long stitches forming designs. Cross stitch.	Tooth brush holder. Pencil case. Card case. Handkerchief case.
Burlap or Canvas: Decoration, stencil, cross stitch, blanket stitch, basting stitch, running back stitch, outline stitch, chain stitch.	Hair receiver. Table mat. Cushion top. Bag for books, pencils or shoes. Needle books. Handkerchief cases.

Sixth and Seventh Grades

Time, 60 Minutes Each Week

NEEDLE WORK AND TEXTILES

Study of	Application	Design	Supplementary problems
Cotton: Source, growth, varieties, manufacture of cotton goods. Cotton material: Muslins, unbleached, half bleached, bleached, gingham, calico, India linen, lawn.	Collection of cotton materials Examine cotton exhibit	Study of pattern and color in fabric	
Width and prices of common varieties used in the home.	Composition in connection with language work		
Weaving: Warp, woof, selvedge, plain, twilled, basket weave.			
Pin, Needle, Thimble: Kinds, method of manufacture. How needles are numbered. Number of needle to be used with different thread. Threading needles. Making knots.	Needle and thread exhibits		

Sixth and Seventh Grades—Continued

Study of	Application	Design	Supplementary problems
Measures: Cardboard gauges showing 1 in., 3-4 in., 1-2 in., 1-4 in., 1-8 in., 1-16 in.			
Stitches—Method of making and use: Basting, Running, Combination	Sewing bag	Planning shape and size of bag	Hem. dish-cloth, wash cloth
Back and half back, Hemming, Overcasting, Overhand		Decoration Stencil, cross stitch or outline	Baby's bib, marble-bag, thimble-bag, circular button bag.
Ornamental Stitches: Blanket stitch, Chain stitch, Outline stitch, Catch stitch, Hem stitch	Needle-book, Pin-cushion	Border or motif in cross stitch	Emery bag
Seams: Single (1) plain, overcasted; (2) overhanded	Sewing bag, Sewing bag		Doll's undergarments
Double (1) French; (2) single fell	Apron, Outing flannel shirt		Kimona, Dusting cap
Where and why above seams shall be used			Over-sleeves, Pillow-cases, Sewing apron, Darning bag
Gathering: Gauging, Stroking, Sewing on band	Apron or underskirt		
Plackets: Hemmed, Bound	Underskirt, Drawers		Corset cover or underwaist
Button-holes and sewing on buttons			
Material suitable for undergarments			
Trimmings adapted to material used			
Care of Clothing: Patching	Model or garment from home		
Stocking darning	Model or stocking from home		
Neatness in Care of Clothing: Brushing, Pressing, Hanging, Providing place for soiled clothing			

Sixth and Seventh Grades—Continued

Study of	Application	Design	Supplementary problems
Linen: Source, growth, manufacture, comparison with cotton as to durability, warmth, price	Collection of linen materials	Design and pattern in material	
Varieties of linen			
Damask: French hem, hemstitch, mitering corners, initial embroidery	Damask model	Drawing for initial	Table mat, pin cushion, tray cloth, dresser scarf, tie
	Napkin or handkerchief	Corner design	
Wool: Source, varieties, manufacture: compare with cotton as to strength, warmth, extent of use for clothing, width and price of material	Collection of woolen and worsted materials	Design in material, color, harmony	
Cloth darning	Model or garment from home		
Art Needle Work Stenciling (Studied at Christmas time)	Bag, doily, pin cushion top, pillow, table runner	Original design	Portfolio, centerpiece, dresser scarf
Review of stitches, seams, gathering, button-holes, etc.; materials suitable for cooking aprons and other aprons, cost, selection, shrinking.	Cooking outfit, dish-cloth, dish-towel, kettle-holder, oversleeves, apron	Design for quilting	

Note:—The course in textiles may profitably be extended through the eighth grade by (1) using the proposed outline through the sixth, seventh, and eighth grades, or (2) by extending the outline in the eighth grade to include garment making. In this case the sewing machine should be used to some extent. It is supposed, however, that if the outline of work given is completed in the seventh grade, cooking will be given in the eighth grade.

HIGH SCHOOL

The courses of study given in outline form for the high school should be used in about the following order.

1. Mechanical Drawing, first and second year.
2. Machine Drawing, third year and first half of fourth year.
3. Elective course in drawing, suggested in Group VIII of outline for Machine Drawing, last half of fourth year.
4. Freehand Drawing and Perspective Drawing should be given special attention during the first and second years, but should also be considered a necessary part of shop courses in the third and fourth years.
5. Elementary Woodworking, first year.
6. Wood Turning, the second half of first year or the first half of second year.
7. Furniture and Cabinet Making, the second year.
8. Pattern Making and Molding, the second half of second year or the first half of third year.
9. Forging, the first half of third year.
10. Machine Shop, fourth year (possibly begun the second. half of third year).

No. 1 should be considered a prerequisite for No. 2.

No. 5 should be considered a prerequisite for Nos. 7 and 8.

No. 8 should be considered a prerequisite for No. 10.

Note: In high schools where vocational classes are established the order given above is suggestive only for those who will complete four years of high school work.

Mechanical Drawing

It is recognized that there are two general types of courses in drawing: first, a course in which lettering, instrumental exercises, and the theory of projection precede the working drawings; second, a course based on a progressive series of working drawings, extending throughout the course, with auxiliary work in lettering, instrumental exercises, orthographic,

isometric, and cabinet projections introduced as needed. In making the following outline the latter type of course is considered.

While many problems suggested are of a practical nature, the necessity for a thorough drill in the fundamental principles and operations should not be lost sight of. Pupils should be brought to understand the purpose of each drawing. As far as practicable, drawings made in the drawing room should be used by pupils in the shops. Where this is not possible, instructors in drawing should familiarize pupils with the shop processes involved in making the objects represented.

A reasonable amount of outside work, including reading and the solution of supplementary problems should be assigned. A large part of the auxiliary work may be given as home work.

Work in design should be emphasized throughout the course. A concise treatment of a few fundamental principles of design is recommended. Pupils should be trained to make an intelligent selection from a group of designs.

In the development of each working drawing the following steps are recommended:

1. The free hand sketch (working and perspective).
2. The pencil mechanical drawing.
3. The tracing.
4. The blue print.

This outline in drawing is based upon the assumption that before entering the high school, pupils have had a training in accurate, freehand, pencil drawing. It is therefore recommended that the instructor in the high school embellish the course as outlined below by making freehand perspective drawings of objects which are used as illustrative material. The perspective drawings of students should be required either as regular or supplementary work.

In presenting problems in any individual course of study, the following procedure is recommended:

1. The object with a complete free hand working sketch and a mechanical drawing. (First two or three problems.)
2. The object with a working sketch. (Fourth, fifth, sixth, and seventh problems.)

3. The object with written data. (Eight, ninth, and tenth problems.)

4. The written data without the object, illustrated by the use of similar objects. (All problems subsequent to those included in 1, 2, and 3.)

Mechanical Drawing Outline

Time:—Two ninety-minute periods per week for two schoo years of ten months each

Auxiliary Work	Working Drawings
Upright single stroke Gothic capitals and numerals. General directions for strokes. Suggestion: A practice plate containing each letter and numeral drawn to a large scale.	
Use of instruments and materials. Suggestion: A few exercises involving the use of each tool of the drawing outfit at least once.	Talks on the purpose of working drawings.
Step 1.	
Construction of regular polygons. Views of prisms and pyramids. Simple sections.	Objects having straight edges. Example: Bench stop. Sandpaper block. Cutting board. Game board. Book end. Butt joint box, and other early shop models. (Have drawing correlate with shopwork throughout.) Simple castings as angle plate. Keyway.
Step 2.	
Views of cylinders, cones and spheres. Simple sections.	Objects having circular edges. Example: Counting board. Circular pottery pieces and beaten metal forms. Pin tray. Face plate, web handle.
Step 3.	
Geometrical constructions involving tangents.	Objects having tangent edges. Example: Book ends. Bracket backs. Blank for wrench. Pipe fittings. Pillow block. Sheet metal patterns.
Step 4.	
Geometrical constructions involving irregular curves.	Objects having irregular curved edges. Example: A variety of shop pieces involving design:—Towel roller, tie rack, letter rack, picture frame, clock frame. Simple irregular castings.

STEP 5.	
Planes of projection. Auxiliary planes and views. The presentation of this theory should be made in the simplest possible manner. Inclined sections of prisms, pyramids, cylinders, cones, and spheres. Developments.	Objects having inclined parts. Example: Type solids intersected by planes. Pipe fittings. Funnel. Dustpan. Flour sifter. Measuring dishes. Stove pipe elbows. Designs for turning (wood).
STEP 6.	
Intersections: Prisms, pyramids, cylinders, cones, spheres. Developments.	Objects having intersecting parts.
STEP 7,	
Inclined single stroke Gothic capitals and lower case letters, and numerals. Bills of material.	Details from assembly drawings. Example: Globe valve. Monkey wrench.
STEP 8.	
	Assembly drawings from details. Example: Headstock of lathe. Vise.
STEP 9.	
Isometric and cabinet projections. Suggestion: Only a limited amount of this work.	Applications of isometric and cabinet projections to working drawings.

The following notes on "Working Drawings" are an analysis of the steps recommended for each working drawing found in the preliminary remarks upon the preceding outline.

WORKING DRAWINGS

1. FREEHAND SKETCH

Pencil. (Use ⅛" x ⅛" cross section paper.)

(a) Relation of views.

(b) Arrangement. Distance between views. Location of dimension lines. Distance between group of views and the border line. Location of title and notes.

(c) Dimensions.

(d) Title and notes. Design of title.

(e) Sections. Simple sections where needed properly to represent the object.

2. PENCIL MECHANICAL DRAWING

(a) Pencil layout. Layout of plate with light indefinite lines.

3. TRACING. Tracing paper or cloth.

(a) Ink. Conventions.

4. BLUE PRINT

A study of the requirements of a good tracing. A study of the blue printing process.

Course of Study in Machine Drawing for High Schools

Time required:

Single periods of not less than 40 minutes five times per week, through two school years of ten months each, or double 40 minute periods five times per week through one school year of ten months, is suggested as ideal.

Aims:

1. To teach the application of projection to the drawing of machinery.
2. To teach the principles of machine construction and design.
3. To teach commercial drafting-room practice.

Contents:

1. Machine Lettering and Conventions.
2. Sketching.
3. Designing from Tables.
4. Mechanism.
5. Drafting Room Practice.
6. Machine Details and Assembly.

A One Year Course in Machine Drawing

Subject	Contents	Problems
I. Study of Machine. Lettering	Purpose Operation Design	Power saw Lathe Pump Steam Engine Gas Engine or Dynamo
II. Sketching of Machine parts Lettering	Classes of Drawing Assembly Details Diagrams Erection	Monkey wrench Globe valve Lathe parts Engine parts
III. Mechanism	Use. Design Construction Odontographs Motion diagrams Mechanism diagrams	Levers Belts Gears Cams A few abstract problems
IV. Detailing	Distribution of parts Arrangement of plates Shop requirements Indexing	From sketches made in Group II.

A One Year Course in Machine Drawing—Continued

Subject	Contents	Problems
V. Checking	Methods Corrections	Detail drawings of a machine
VI. Assembly Drawing	Assembly of details	Group IV parts assembled
VII. Tracing and Blue Printing	Drafting room practice	Details Drawings of engine or other machine previously drawn
VIII. Special work in some particular line of drawing found in practice	Mechanical and electrical Machine drawing Structural Architectural Patent Office Engineering Topographical	

Suggestive Methods of Teaching Course in Machine Drawing

Group I

Classify simple, complex, and compound machines. Study transmission by direct friction contact; belts and gears. Method of varying speed. Economy of transmission. Overhead, floor and underfloor hangers. Size of shafting. Method of fastening pulleys and gears on shafting. Bearings. Diameter and width of driving pulleys.

Group II

First lay-out for sketch. Place for dimensions. Conventions and sections. Necessary views. Auxiliary planes.

Consider method of representation by freehand perspective, mechanical perspective, cabinet perspective, and isometric drawing. Secure work in these lines from all students. Use outside time.

Group III

Use of simple formulae. Mechanics' handbooks. Use of motion diagrams.

Group IV

Necessity of detail sheet. Study of detailed drawings of manufacturing firms. Each detail a complete drawing. Arrangement of sheet. Use of notes. Necessity of good drawing technique. Special care in making arrow heads, letters, and figures.

Group V

Checking system. Necessity for checking. Methods of correcting drawings.

Group VI

Use of assembly drawing. Relation to detail drawing. Assembly drawing for reproduction in catalogues, etc. Assembly sections, conventions, etc.

Group VII

Tracing paper and tracing cloth. Blueprint machines. Van Dyke prints. Study reproduction methods.

*A One Year Course in Architectural Drawing.

Time: Two ninety-minute periods per week for one school year of ten months.

Principle	Problem	Medium
"Construction Framing"	Walls Floors Roofs Cornice section Sill section Sectional detail of whole wall.	Pencil
"Decorative Construction"	Mouldings Cornice	Pencil
	Inside work.	
Constructive Design	Freehand sketching of many details in perspective	Pencil
Dwelling House Design	Preliminary sketch. Two plans Two elevations (possibly more) Construction Details	Pencil Ink and Tracing
Rendering	Shadows Perspective and Perspective of Shadows	Pencil and Wash.

*Arranged by Mr. Alexander Miller, Brookline, Mass.

A One-Year Course in Woodworking

Time: Single periods of not less than 45 minutes; double periods preferred. At least the equivalent of six single periods per week.

Group	Processes	Problems
I. Giving the first use of the saw and the laying-out tools, such as the gauge. trysquare and rule	Measuring Squaring Gauging Sawing Boring Making dowel	Game board Counting board Laundry list
II. Emphasizing the first use of the plane	Planing— (1) Surface (2) Edge (3) To dimensions (4) Chamfering	Swing-board Hat-rack Bread-cutting board
III. Teaching the first use of the chisel	Vertical chiseling Gouging Paring Sharpening chisel	Shelf and brush-rack Tray Sleeve-board
IV. Involving "form work" and the first use of the spokeshave	Bow-sawing Modeling Sandpapering	Coat hanger Tool handle Canoe paddle
V. The construction of objects by means of some form of the groove joint	Housing Halving Nailing Carving Finishing	Waterwheel Test-tube rack Book-rack Flower-pot stand Loom Sled Box-trap Bracket-shelf Knife-polishing board Towel roller
VI. More exact work in planing in order to make a glue joint	Planing joints Gluing Clamping	Bread-moulding board Drawing board Bench-hook
VII. Construction by means of the mortise and tenon joint	Laying out duplicate pieces. Cutting a mortise, sawing, tenon, finishing	Stool Plant stand Taboret Umbrella rack Table
VIII. Construction involving the miter joint	Planing parallel edges and sides Use of miter box Laying out brace	Miter-box Framing a picture Box Bracket

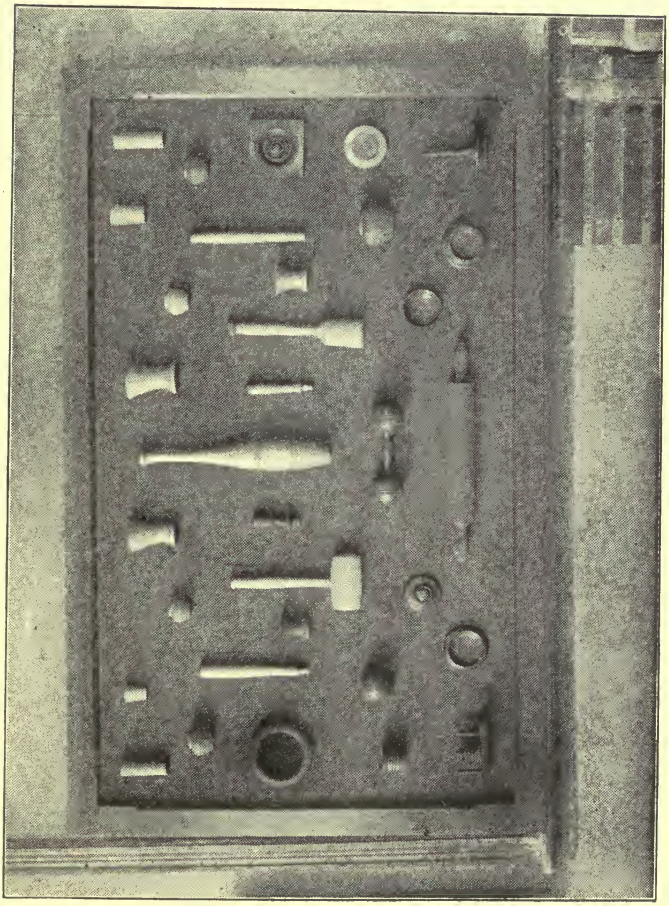
A One-Year Course in Woodworking—Continued

Group	Processes	Problems
IX. Elementary cabinet making involving the use of panel	Plowing Fitting Putting on hinges	Sewing cabinet Music cabinet Plate rack Screen Bookcase

Note 1.—This course is outlined for those who have not had woodwork in the upper grammar grades and is essentially a combination of the outlines for Grades VII and VIII.

A high school course in woodwork for those who have had work in the grades similar to that suggested in outlines for Grades VII and Grades VIII, should include problems which will develop a strong technique and should be vocational in character. Such courses will emphasize a high standard of technique in the construction of the common joints used in furniture and cabinet construction. They will require considerable work on woodworking machines and will provide for the construction of large projects by groups of pupils who will use methods followed in good commercial practice. Problems in house framing will be common.

Note 2.—The problems are selected with reference to the processes involved. Problems relating to the vocational or industrial activities of a community are recommended.



HIGH SCHOOL WOOD TURNING

A One Semester Course in Wood-Turning

Time: Single periods of not less than 45 minutes; double periods preferred. At least the equivalent of six single periods per week for one semester.

The following outline in wood-turning is based upon the theory that any object which may be turned in wood can be produced by a student when he understands the *reason* for handling a tool in a particular way for each cut. The outline is arranged, therefore, with reference to a logical series of cuts underlying all wood-turning.

Group	Processes	Problems
I. The use of the gouge and skew in turning cylinders.	Centering stock. Use of gouge to turn stock of cylindrical form. (a) To take off corners. (b) To turn cylinder to given dimensions. Use of skew to turn perfect cylinder. Use of outside calipers.	Exercise piece. Any model requiring plane cylinder turning only.
II. Squaring ends and cutting shoulders.	Laying off consecutive length dimensions. Use of parting tool. Use of toe of skew to cut a square end. Use of heel of skew to cut to a shoulder.	Exercise piece involving square ends. Body of rolling pin. Mallet head. Square shoulder. Spindles. Cylinder patterns.
III, Long taper cuts.	Use of skew chisel to start taper with heel and to continue taper with center of cutting edge of skew.	Exercise piece. Stakes. Stool legs. Taper handles. Taper patterns.
IV. "V" cuts.	Use of toe of skew to cut half and full V's.	Any spindle involving straight cuts only.
V. Bead or short convex cuts.	Use of heel of skew to turn convex forms.	Chisel and mallet handles involving straight cuts and convex beads. Furniture spindles. Appropriate patterns.
VI. Concave cuts.	Use of small gouge to turn concave forms.	Furniture parts as spindles not involving long convex cut with gouge.

A One Semester Course in Wood-Turning

Group	Processes	Problems
VII. Long convex cuts.	Use of gouge to turn spindle forms involving long convex curves.	Any spindle form. Indian clubs. Dumb bell. Darners. Furniture parts turned. Patterns.
VIII. Inside and outside screw face plate.	Fastening stock to face plate. Use of gouge and skew chisel in blocking out form. Use of round nose and skew chisel on face plate work.	Rosettes. Any low dish form which may be turned without use of chuck. Simple patterns.
IX. Face plate and chuck work.	Use of chucks and their construction. Inside and outside chucks and their relation to work which they are to hold.	Complex patterns. Cups and trays. Goblets. Napkin rings. Towel rings. Face plate pattern. Pipe fittings. Pulleys. Wheels.

Note 1.—Groups VIII and IX involve work which is sometimes considered as preliminary to that of Groups I to VII. They may, therefore, be given first place in the outline on Wood-Turning.

Note 2.—Sections VIII and IX may be omitted if course in turning is to be combined with course in Furniture and Cabinet Making.

It is suggested that wherever possible the course in Wood-Turning should be given simultaneously with or as a part of the course in Pattern Making.

Suggestive Methods of Teaching Course in Wood-Turning

Make a careful study of the relation between the tool and the revolving wood in each group. Show the pupil the necessity of keeping the tool in a position to insure tangency. Study the reason for "runs" and "bites." Show that they are a result of neglecting to conform to the rule of tangency.

Analyze each cut and explain its applications.

Study commercial turning methods, screw cutting devices, and use of templets.

A One-Year Course in Furniture and Cabinet Making

Time: At least three double 45 minute periods per week

Group	Processes	Problems
I. Review of the fundamental tool processes taught in the first year high school course in wood working.	Mechanical drawing of project. Bill of stock. Plan for cutting up a stock board. Cabinet makers' method of working stock at bench.	Stool. Taboret. Book shelves. Shoe polishing box.
II. Design of a small piece of furniture involving simple joint construction. Note: This group should be preceded by talks on design and construction.	Preliminary freehand working sketch of project showing proportions and giving dimensions. Mechanical drawing from approved sketch. Review of cabinet makers' method of working stock at bench, including use of power saw and planer to size stock.	Any small piece of wood construction making use of simple joints, not including door and window framing and paneling.
III. Design of a larger piece of furniture than would be included in Group II. Note: Talks on constructive design and difficult construction.	Same as for Group II, and for complete use of woodworking machines to get out stock according to most approved methods. Bench work should be omitted as far as practicable.	Large stool. Chair. Music rack. Tables or any normal sized piece of furniture not including much paneling or drawer construction.
IV. Design of a cabinet involving paneling and door and drawer construction.	Tool and machine construction for all details in furniture and cabinet making.	Wall cabinet. Music cabinet. Book case. Chest of drawers. Desk. Repair of furniture.
V. Finishing. Note: Talks on wood finishing.	Scraping and sandpapering, staining, filling, waxing, varnishing, etc.	Finishing of all projects and refinishing one piece of old furniture.

Suggestive Methods of Teaching Course in Furniture and Cabinet Making

Group I

Collect catalogues giving good illustrations of furniture. Reference reading in books on woodwork. Consider in detail the handling of tools. Short cuts. Methods of duplication. Economy of time in systematic methods.

Group II

Consider the good and bad in design. State principles in designing which can be used by class. Outline steps in designing some particular piece of furniture. Emphasize necessity of working over a design until it is as nearly perfect as possible. Work for a growth in appreciation.

Explain use of machines. Dangers. Give cautions. Explain order in which machines should be used. Economy of time in use of machines.

Group III

Required readings. Shop trip to furniture factory, with report. Consider methods of factory not possible in school shop. Classify woods as soft, medium, hard.

Group IV

Differences between cabinet and furniture construction. Details of clamping and fastening. Schools and periods of design. Use of heavy cabinet machinery. Factory methods.

Group V

Talks on finishing. Samples of finishes. School and commercial manufacture of finishes. Classify finishes and their ingredients.

A FRAMING DETAIL

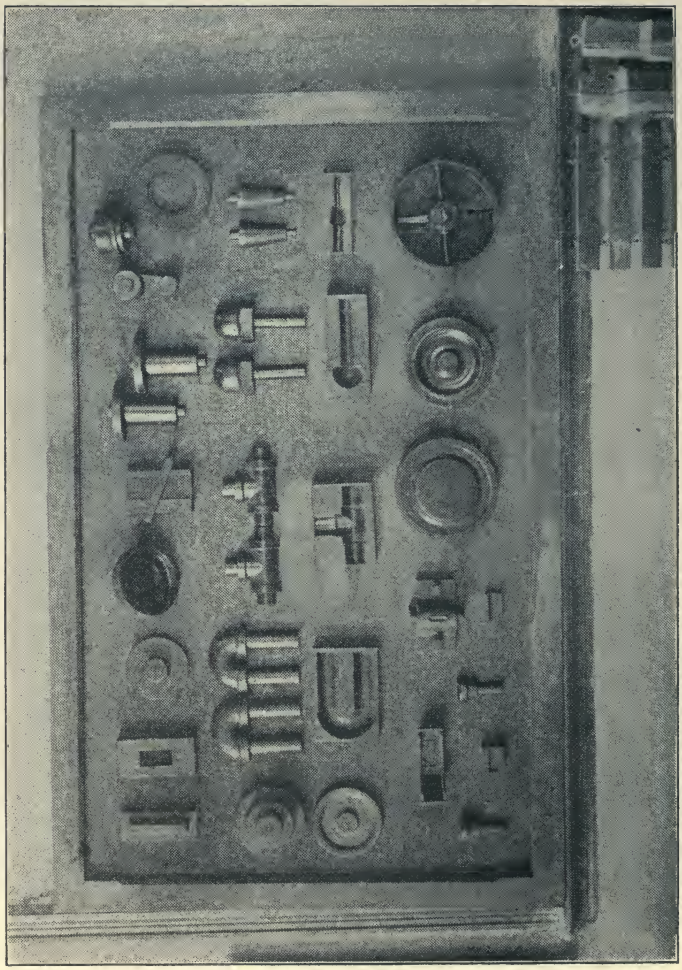
Stock—Full Size

*Architectural Construction

Minimum time: Three ninety-minute periods per week for two school years. Suggested time: Two three hour periods per week for two school years.

Principle	Problem	Medium
1. Laying out	Batter boards Mason's square	Wood
2. Foundation	Walls Concrete work Drains and cesspools	Brick Concrete Stone
3. Materials.	Discussion of timber	
4 Framing	Common joints Sill and post details Sills: Post and braces Posts and girts Plates, ledger and rafter Partition cap and sole Bay window Furring	Wood
5. Outside finish.	Cornice construction Piazza details Porch work	
6. Interior details.	Window detail Cellar frame Doors and standing finish	
7. Stair building.	Cut and mitered string stair Housed stair Outside steps	
8. Steel square.	Reading rules and tables Uses for rafter work Plumb, seat and side cuts	
9. Roofs.	Pitch, hip and gambul Dormers Steeple detail	
10. Building.	Frame of dwelling Barn construction	

* Arranged by Mr. Augustus Booth. Providence, R. I.



HIGH SCHOOL PATTERN MAKING

A One-semester Course in Pattern Making Supplemented by Principles in Molding

Time: At least three double 45 minute periods per week

Group	Processes	Problems
I. Draft and Shrinkage.	Pattern Making: Planing stock to maximum dimensions. Laying out draft for outside and inside drawing surfaces. Shrink rules. Molding: Flask work or patterns to be placed in one half only of two part flask. Parting line.	Ribbed patterns. Small bracket. Ring. Eye bolt. Tool post slide.
II. Finish and double shrinkage.	Pattern making: Same as for group I plus calculations for finish and use of "Lay Out." Molding: Coping out in drag.	Face-plate. Cone-pulley. Ring. Hand wheel. Flat wrench.
III. Simple coring.	Pattern Making: Use of core prints. Core box. Molding: Setting vertical cores.	Gland. Crank. Stuffing box. Simple vertical core patterns.
IV. Simple split patterns.	Pattern Making: Fastening pieces together for a split pattern, centering and turning same in lathe. Core box. Molding: Green sand cores. Simple dry cores. Three part mold. Balanced cores.	Sheave pulley. Jack. Foundry rammer. Cap-nut. Simple pipe fittings. Any pattern involving a single simple horizontal core.
V. Split patterns involving construction.	Pattern Making: Special tools as core box plane. Pattern construction. Difficult core box construction. Molding: Setting cores with chaplets. Right and left coring. Strengthening and venting cores.	Complex pipe fittings. Any pattern involving horizontal cores.
VI. Building up loose piece patterns. Sectional patterns.	Pattern Making: Laying out segments. Construction of gear teeth. Piece construction for core box. Molding: Stop-off prints. Sand & plaster matchboard. Molding machine. Core machine.	Pillow block. Arm pulley. Gear wheel. Glove valve. Machine parts to be finished in the machine shop.

NOTE—A course in Pattern Making should be conducted to give all possible consideration to both foundry and machine shop practice. Pattern drawings calculated from machine shop blue prints should be required of all students for each pattern made.

SUGGESTED METHODS FOR TEACHING COURSE IN PATTERN MAKING

Group I

Emphasize relation between pattern and casting. Consider shrinkage of different metals. Use of shrink rule. Necessity for draft. Amount of draft depends upon position and length of drawing surface. Demonstrate with moulders' flask the making of a mold.

Group II

Distinguish between finish and draft. Require freehand working sketch of pattern with dimensons to account for both finish and draft. Show reason for allowing for finish on certain surfaces only; also for additional finish. Require mold by student.

Group III

Emphasize relation of core to core box, core print and casting. Economy of coring process. Making of cores: green and dry. Study of sands used in foundry. Require mold by student.

Group IV

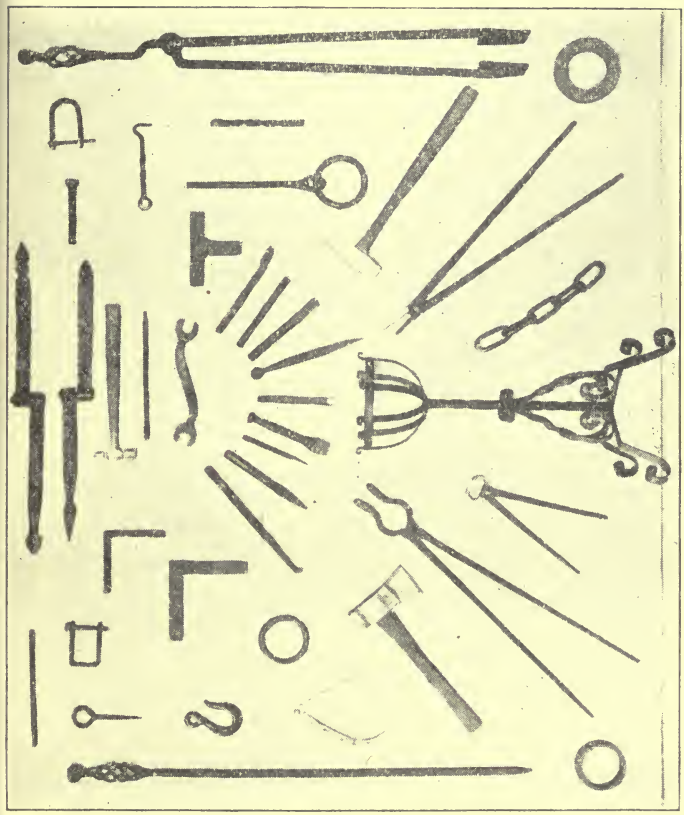
Consider pattern constructions and pattern woods. Necessity of two-part flask to acommodate split pattern. Visit foundry. Study foundry methods.

Group V

Furnish students with specimens of good pattern construction for difficult coring. Special study of single and double core box. Visit pattern shop. Assign readings.

Group VI

Make special study of segment patterns, box constructions, loam molding. Reports on commercial foundry practice. Study methods of economic production.



HIGH SCHOOL FORGE WORK

A One Year Course in Forging

Time: At least three double 45 minute periods per week

Group	Processes	Problems
I—Drawing out Bending and Twisting	Management of fire and forge. Stock reduction. Twisting	Wedge Meat Hook, Spanner wrench Gate Hinge Staple, Gate Hook Poker
II—Upsetting	Enlarging stock Splitting	Bolt head Angle iron Drawer pull Grapnel
III—Punching Fullering Swaging	Eyes Spreading out stock Stock reduction	Hasp, Door plate Trace link Eye Bolt Hat Hook Door knocker Door plate
IV—Welding	Joining Building up	Straight Weld Rings Ring and Eye Bolt Tongs Chains Grapnel Clevis
V—Case Hardening	Hardening iron Softening iron	Screw Threads Small Castings and Forgings
VI—Tool Making	Forging Steel	Punch Scriber Chisels Lathe Tools
VII—Hardening and Tempering	Water and Oil tempering of metal-working tools, bushings, drills and reamers.	Metal-working Tools Bushings and Drills
VIII—Project involving Assembling	Drilling, Fitting, Forming. Fastening of parts	Lantern Lamp bracket Umbrella rack

Note: Group I should be preceded by talks and demonstrations on fuel, the forge, the blacksmith's fire tools, etc.

The above outline for forging should be accompanied by talks on the manufacturing of iron and steel and their use in the industries. The course in forging should be supplemented by work with the power hammer, power punch, and power shears whenever possible. It should be given with careful consider-

ation shown at all times for constructive design as applied to wrought iron. Machine shop manipulations should be considered in the forging of pieces to be machined.

Suggested Methods for Teaching Course in Forging

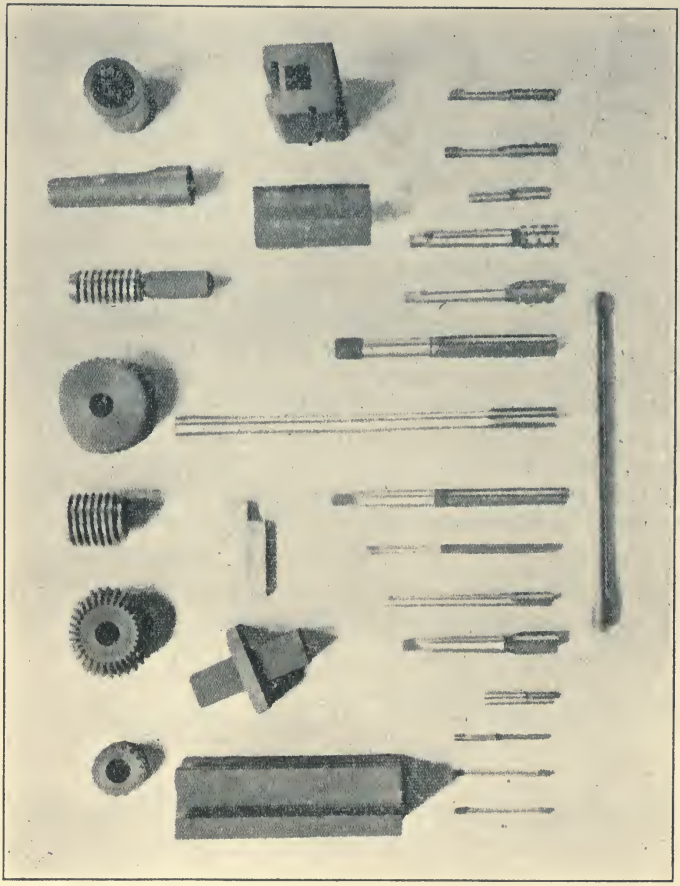
Throughout the course attention should be given to careful demonstrations by the instructor. Attention should be paid to the methods used in handling different materials in the fire, such as soft and hard iron, steel, etc.

Commercial methods in forging should be considered and observed, such as the use of the rolls, hammer, crane, etc.

Special emphasis should be laid upon the subjects of hardening, welding, and tempering.

No subject in the manual arts offers a greater opportunity for a study of design than does forging. Without running into decorative wrought iron work to the detriment of that part of the course having to do with good black-smithing and tool making, one should emphasize the possibilities in design and the necessity for conventional forms rather than natural forms.

Working sketches showing the progressive steps in the construction of any piece should be required of all students.



MACHINE SHOP WORK INCLUDING TOOL MAKING

A One-year Course in Machine Shop

Time: At least three double 45 minute periods per week

Group	Processes or Operations	Problems
Bench Work	Chipping—Grind chisels. Chip to dimensions. Test surfaces with square and straight edge. File to true surface. Polish.	Paper weights
	Thread cutting with taps and dies.	Bolts, screws, nuts
	Scraping.	Surface plates
Drill Press	Locate hole. Outline and punch reference marks. Start drill and draw to position with chisel. Spot face with counter-bore. Boring with boring bar.	Bolt and other holes Finish seats for bolt heads or nuts Cylinders Pulleys
Lathe Work	Center work with drill and countersink. Drive on centers with lathe dog. Setting tool. Face ends to length. Turn to size. Caliper accurately. Cutting speed, roughing and finishing cuts Taper work: Set over tail stock Use of taper attachment Use of compound rest Screw cutting: Ratio of gearing Right and left hand threads Form of tool Chuck work: Face work with power cross feed Boring Inside threads Filing and polishing	Lathe center Drill sockets Drill blanks Screws. Planer bolts Tool post screws Jack screw, cylinder cover, machine parts, body of jack screw
Speed Lathe	Hand turning	Finish machine parts Brass oil cups Plumb bob
Shaper	Study the action of the machine. Quick return motion Set over head for vertical or angular feed. Hold work in vise or bolt it to the knee.	Surface plate to be scraped as bench work

A One-Year Course in Machine Shop—Continued

Group	Processes or Operations	Problems
Milling Machine	Study the machine: Index head, feeds, adjustments Secure work: Between centers, strap to plates in chuck, in vise Divide with the index head. Gear for spiral cutting.	Machine parts Gears, Reamers, Drills Milling cutters
Grinding Machine	Study the machine, same as for the milling machine. Cylindrical grinding Internal grinding Cutter grinding Accurate measurements Micrometer calipers	Machine parts Mandrels, Reamers Cutters

Note: A course in Machine Shop Practice offers exceptional opportunities for the study of machine construction and operation. Shop trips should be made and reports written on them.

Some attention should be given to shop management and economic production.

MACHINE SHOP PROJECTS

PRESENT OUTLOOK AND TENDENCIES

Although handwork for children in the elementary school has become well established the general character of the work is not well defined. There seem to be general principles determining the character of this work but the methods of presentation are varied and often unpedagogical.

In the examination of courses of study in forty-three schools it has been found that the methods varied from absolute dictation in producing a fixed series of models to methods which have no definite purpose in view. Of the forty-three schools examined three have a set series of exercises to be made at the dictation of the teacher; twenty-six have a small number of required exercises, in different media, dictated by the teacher. The order in which these are taken up is defined but there is considerable latitude in the matter of supplementary work. In the twenty-six schools referred to above, the work is taught as a subject, but its relation to the other subjects in the school is incidental. Of the remaining 14 schools of the list eight give the work as a separate subject but plan it about certain centers, as Indian life, village life, etc.; four use forms of handwork which grow naturally out of the regular school work. In these schools handwork is used as a *method* and not as a *subject.* In two of the schools the work is given, apparently, without plan or purpose.

Out of sixteen courses of study for 1904 it was found that fourteen gave "courses" in paper and cardboard work, basketry, raffia work, or bent iron, without any apparent attempt to relate the handwork to any of the other subjects of the curriculum.

From the above investigation it appears that the tendency is to depart from the long and fixed series of exercises in a single medium, and to move toward a much wider and freer use of materials in a way which supplements other school experiences. In some quarters there is a tendency to go much further and regard all primary handwork only as a good method of teaching history, geography and various other subjects in the elementary curriculum. Handwork is not regarded as a subject to be taught but rather as a method of teaching all

subjects. This view is voiced in a recent report of a "Committee on Manual, Domestic, and Vocational Training" appointed by the Indiana Town and City Superintendents Association, 1908.

> "The best form of manual training work that can be done in the first, second, and third grades, is the work that is being done in almost every city by the regular teacher. The use of paper folding and cutting, clay modeling, cardboard construction, weaving, etc., that arises in these grades as an outgrowth of the regular work, is by all means the best practice known. Here the correlation is close, the regular teacher does the work and is in sympathy with it. She can also utilize all the additional training gained from this activity, in the regular work of the school. In the judgment of the committee, this practice with construction work, including clay, paperfolding, cutting, weaving, etc., is the best possible form of manual training in the first three grades."

Cheshire L. Boone, in the Manual Training Magazine, April, 1907, says the various forms of handwork "are useful to the teacher in just such a degree as they are suitable to illustrate the children's ideas in her particular grade."

In an article in the Educational Review, December 1909, Dean Russell of Teachers College, Columbia University, has taken a most unusual stand in this matter. Dean Russell would classify all instruction in the public schools under three heads: (a) The humanities, including language and literature, history and civics, and the fine arts; (b) the sciences including mathematics, geography, physics, chemistry and biology; (c) the industries, including the study of materials and processes of production, manufacture, and distribution. In this scheme there would be no definite hours set apart for handwork; but handwork would be used wherever and whenever it would aid in the teaching of any subject. Many who in a general way, favor this scheme are inclined to the opinion that it is not adequate for the fifth and sixth grades. It is generally held that by the time the fifth or sixth grade is reached special attention should be given to technique. Whenever technique or skill is the goal of handwork it becomes a subject with a definite content of its own and may be given a strong vocational or industrial value.

In the grammar grades we have two rather distinct lines

of work; first, the older form which is an outgrowth of the Sloyd and is distinctly cultural. This is usually in wood and copper and is closely related to the art and science work. Second, a line of work which consists largely of toy machine construction. Such handwork is a direct outgrowth of the demand for industrial education. The work appeals to most boys, but the expense and want of facilities for carrying it out makes it impracticable for most schools. It has received considerable criticism but perhaps all would agree that, where it can be used, it is a fairly good laboratory method of studying certain machines. There is little question, however, concerning its sufficiency as manual training. It offers little opportunity for a sequential study of tool processes and requires the use of many materials for work which may be termed "tinkering." The grammar grade manual arts should emphasize a logical progression in tool processes and at any particular time those used in some *one* rather than *many* lines of hand work. Manual arts of an industrial character may do both of these things. At least a partial specialization then is advocated for these grades.

High school courses in manual arts are planned to prepare students for future work with one of three objects in view:—(1) Entrance in colleges of engineering; (2) Vocational work in the trades and industries; (3) A general motor training and knowledge of mechanical processes.

There seem to be good reasons for less emphasis upon the preparation through the manual arts for courses in engineering. Probably only a small percentage of the high school students studying manual arts will continue in school after leaving the high school. For these the usual amount of manual arts work in the high school is regarded by college instructors in engineering as doubtful preparation for engineering courses. Either advanced credit must be given in college for the high school manual arts work or the student must repeat in college essentially the work of the high school. The college is loath to give the advanced credit, usually, and the student considers it an imposition if he is required to repeat shopwork in his college course. From the standpoint of the college of engineering it would seem advisable to require a normal amount of manual arts work of high school students, allowing some entrance

credit for this work; and to have them devote more of their time to work in mathematics and language, principally English.

It is generally conceded that the manual arts have a certain cultural or general educational value. Whether then a student enters college or immediately on leaving the high school begins life's work for a wage, he has been benefited presumably by his having done some shopwork and drawing. As a general educational subject, it would seem that the high school student might advantageously devote some time to the acquirement of skill in the handling of tools and a knowledge of the use of materials in manufacturing pursuits. The aesthetic value coming from the art relations which the work should bear, the economic value resulting from a study of hand-tool and machine processes and their use in the problems dealing with man's relations to his fellows are worthy of some attention and should give the manual arts a place in every high school curriculum.

For the student who studies the manual arts because he wishes it to prepare him for some particular vocation, there must be a positive good in continued and consecutive handwork which emphasizes industrial methods. The manual arts courses should be designed to be of the greatest assistance in aiding students to supplement the work of the book subjects so that their hand will earn them a living when they are required to leave school. In a sense, this work for boys who do not go to college is a substitute for the old-time work of the apprentice, only that it must do much more for him than the apprenticeship system did for his grandfather or his father. It must not only teach the fundamentals of a trade; it must give the specific training and the general education for industrial efficiency.

The present outlook for the manual arts in the high school then indicates that in the near future all high schools will furnish an opportunity for all students to study some of the manual arts, just as they now are given an opportunity to get instruction in some of the modern languages. Perhaps later this opportunity will become a requirement. For those high school students who will complete their formal education in the high school, it now appears that cities will make some provision for an intensive work on the side of mechanical and indus-

trial training. This need not be done necessarily by establishing special schools, but may be done by permitting major credits to be taken in shop and drawing and by giving the strongest possible application value to theoretical subjects. Some space has been given to the tendencies in certain parts of the school system. A few words with reference to the introduction of the manual arts in different communities may not be out of place here.

It is safe to say that at present the teaching of the manual arts is being introduced in cities and large towns more rapidly than at any time in its history; and too rapidly, possibly, for its best welfare. The demand for teachers is so great that it is not only difficult but impossible to secure the service of well trained individuals. The more or less recent movement on the part of universities to establish departments for the training of teachers of manual training and drawing is one which promises relief for this situation in the larger school systems.

It is in the smaller towns or still more so in the rural schools, that one finds the least effort to teach the manual arts in a graded or progressive way. The Normal Schools and the County Training Schools have done much to provide teachers for these respective fields but there are obstacles which stand in the way of their meeting the needs for manual arts instruction in either the small town or the rural district. One of these is the inability both to introduce and to maintain the work on account of expense. This difficulty is being overcome, however, in one way or another.

The Illinois Manual Arts Association is working on the problem, and in Rockford County, Illinois, much has been done which points toward an established form of rural teaching of manual arts. In time it will be as much a part of the regular school work for the little red school house as that now done in the cities.

In the chapter on equipment, we present a list of tools appropriate for rural districts. It is the one which was given by Mr. C. S. Van Deusen of Bradley Polytechnic Institute, Peoria, Ill., at a meeting of the Illinois Manual Arts Association held in Jacksonville, Ill., in February, 1910. Mr. Van Deusen's method of supervising the work in the rural districts is indicated

by the following, which is a quotation from a report made by him at the meeting referred to above:

POSSIBLE WAYS OF CARRYING ON BENCHWORK IN WOOD IN RURAL SCHOOLS.

Under regular teacher:
1. Teacher giving the instruction—Not practical.
2. Boys following printed instructions—Possible.

Under supervisor:
1. Instructing boys—Practical but expensive.
2. Directing the work of boys, who work from printed instructions—Practical and economical.

PROPOSED CO-OPERATIVE PLAN FOR SCHOOLS.

Supervisor—
- Plans the course.
- Provides material.
- Has general care of the equipment.
- Provides printed instructions.
- Directs and criticizes the work of the boys.
- Visits each school once a week.

Work by definite schedule:

Possible schedule for five boys in one school using one bench.

	8—9 a. m.	12—1 noon	4—5 p. m.
Mon.	A	B	D
Tues.	B	C	E
Wed.	C	D	A
Thur.	D	E	B
Fri.	E	A	C

Regular teacher cooperates with supervisor.

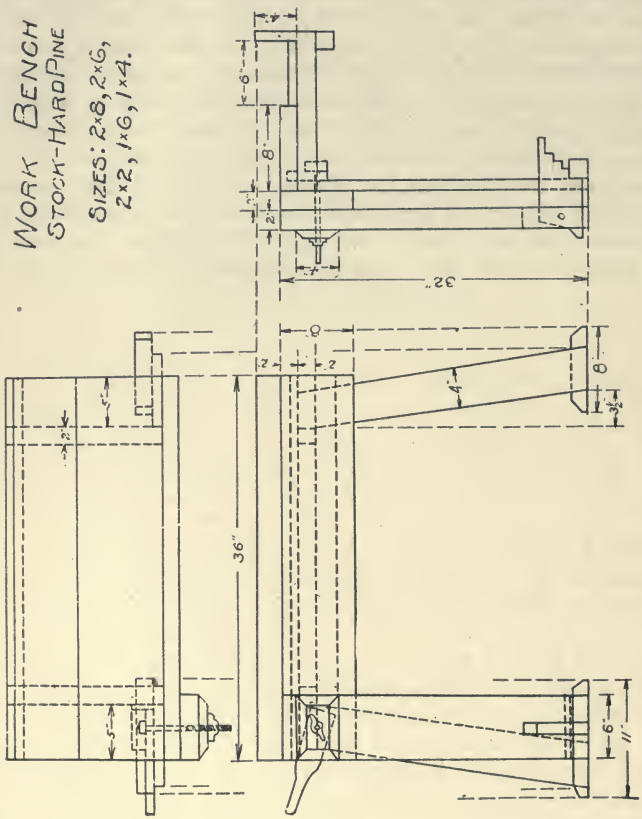
Note: Letters A, B, C, D, and E, stand for the five boys.

In explanation of the extract given from Mr. Van Deusen's report it may be said that his plan suggests the employment of a supervisor or instructor by a few school districts, each of which would share the expense of instruction. The instructor rides a circuit not too large to permit him to visit each school in it at least once each week. When visiting a school he would plan the work for the succeeding week with the teacher of the school and criticize the work done since his last visit. He would also leave with the school the necessary material and instructions for the succeeding week's work. Each boy electing the course would work independently with the assistance given by the typewritten instructions and with such additional assistance as might be given by the regular teacher of the school.

The plan is one which has been tried, though not extensively, and is now being followed near Columbus, Ohio. We believe it has promise in it. The bench shown on page 100 is the one de-

vised by Mr. Van Deusen for use in the one room rural school and is designed to be fastened to the wall of the building.

A plan somewhat similar to the one just considered might prove successful in small high schools where the employment of an instructor for each school is impossible. Such a plan has been followed in Wisconsin during the past year. A manual arts circuit of five towns was organized during the summer of 1911. An instructor was employed personally to conduct classes in each of these towns, *one* day each week. He left with each member of a class each week blueprints and written instructions which would enable the individual student to continue work during the absence of the instructor. The result of the year's work has shown that the plan is feasible. The quality and quantity of the work done was uniformly good.


WORK BENCH
STOCK-HARD PINE
SIZES: 2×8, 2×6,
2×2, 1×6, 1×4.
36"
32"
8
6
11
4
2

NEEDS FOR FUTURE STRENGTH AND PERMANENCE

We have said that the development of the teaching manual arts has been so rapid that the demand for well trained teachers exceeds the supply. Under such conditions it is inevitable that in some localites the work is poorly done. One of the most pressing needs is for better trained teachers in the work. There is a strong movement in the leading institutions of collegiate grade, giving courses for teachers of this subject, to raise the standard of requirements for graduation. School boards and superintendents should aid in this movement by requiring more thorough training. It should be understood that a few weeks of work in a summer school does not qualify a teacher to teach manual arts. The ability to teach the subject means something more than the ability to do, even fairly well, certain forms of handwork. Time and money should not be wasted on teachers who have not had adequate training.

Another important need is a clear understanding of the purpose of handwork. Handwork may be taught as a subject or it may be used as a method of teaching other subjects. These different aims require work of a different character and a different method of treatment. It is necessary, therefor, for the teacher to have a well defined conscious purpose.

The situation will be much improved if it is kept in mind that the work in the primary grades does not have the same purpose as the work in the eighth or ninth grade. It seems quite clear that it is not the purpose of the work in the primary grades to teach the technical process. Here skill in manipulation is of minor importance. Quite a different phase of work is presented in the sixth, seventh, eighth or ninth and succeeding grades. Here are students somewhat mature physically and mentally. They are using the tools of the trained mechanic and are engaged in the same kind of mechanical processes the mechanic performs. Under these conditions it seems quite clear that handwork is, or should be, taught as a subject in itself. If at this stage the teacher fails to teach the analysis of mechanical problems and skill in mechanical processes, he fails to teach manual training. It may be well to take advan-

tage of this opportunity to teach many other things, but the ability to analyze mechanical problems, and to develop skill and technique, should be the direct aims of the work. It is not necessary that the training have a direct vocational value provided one can find a reason, not an excuse, for it on some other grounds, but one must know *what* he is teaching and *why* he is teaching it.

The teacher, therefore, must be well trained. More and more are school administrative officers demanding of manual arts teachers a training comparable with that of other members of the instructional staff. This means a broad academic training and a special preparation to teach some particular subject or subjects. A commercial shop experience is becoming an essential feature in the preparation of one who is to teach a special line of manual arts work. But the man who has this alone must supplement his shop training with that for teaching.

Perhaps one of the most urgent needs for systematic teaching of the manual arts which will become permanent in character is uniform supervision throughout the state. It is the opinion of the writers, therefore, that there should be a state agent or supervisor whose duty it shall be to determine local conditions, to present plans for organization, and to standardize work now in progress. In this direction it is suggested that one of the probable teaching combinations of the near future, if indeed it is not one of the present, is that of agriculture and manual training.

Such a plan as Mr. Van Deusen's which is presented in the previous chapter has merit not only because it makes manual training in the small school possible but because it will permit of correlation between this subject and agriculture. For this reason it is highly desirable that teachers of either of these subjects in the smaller high schools should be prepared also to teach the other.

BIBLIOGRAPHY

In this brief bibliography we make no attempt to list all of the good books treating the various subjects. We have tried, however, to include none but the best of their respective classes.

The Elementary School

The Basket Maker, by Luther Weston Turner. The Davis Press, Worcester, Mass. This is a beautiful little book full of the very best ideas on basket making.

Clay Work, by Katherine Morris Lester. Manual Arts Press, Peoria, Ill. This book will be found helpful to the teacher in acquiring technique. It contains valuable suggestions concerning the teaching of the various types of clay work in the elementary school.

The Manual Arts for Elementary Schools. Drawing, Design, Construction, by C. S. and A. G. Hammock. D. C. Heath & Co., Chicago, Ill. This series of eight books presents the work in a most attractive form for the various grades. The work is quite superior to that usually offered in the grades. The construction work receives comparatively little attention but what is given is worth while.

Elementary Sloyd and Whittling, by Gustaf Larsson. Silver, Burdett & Co., Chicago, Ill. Contains outlines and working drawings for models in whittling and elementary bench work.

Paper and Cardboard Construction, by George F. Buxton and Fred L. Curran. The Menomonie Press, Menomonie, Wis. A handbook for teachers, covering book problems, box problems, card problems, and envelope problems for the first four grades.

Wood Work

Handwork in Wood, by William Noyes. Manual Arts Press, Peoria, Ill. This is the most complete book on woodworking ever written for teachers of manual training. It is a scholarly work and stands at the head of the lists of books on this subject.

Woodworking, a series of four books:

1. Correlated Courses in Woodwork and Mechanical Drawing.
2. Projects for Beginning Woodwork and Mechanical Drawing.
3. Advanced Projects in Woodwork.
4. Essentials of Woodworking.

No. 1 is a manual training teacher's every day helper. No. 2 is a book of projects for 7th and 8th grades. No. 3 is a book of projects for high school students. No. 4 is a student's text book for the grades and high school. The series is written by Ira S. Griffith and published by The Manual Arts Press, Peoria, Ill.

Elementary Woodworking, by Edwin W. Foster. Ginn & Co., Chicago, Ill. This book is divided into two parts, (a) Tools and their Uses, (b) Woods. It is an excellent little books for seventh and eighth grade work.

Beginning Woodwork, by Clinton S. Van Deusen. Manual Arts Press, Peoria, Ill. The book gives a clear description of the fundamental processes in making a number of useful articles. It is well illustrated and can be used to advanage by beginners who do not have the services of an instructor.

Bench Work in Wood, by W. F. M. Goss. Ginn & Co., Chicago, Ill. A good treatment of tools and the elements of wood construction. It also contains some valuable information on timber and its preparation. This has been a standard book on woodwork for many years.

Problems in Woodworking, by M. W. Murray. Manual Arts Press, Peoria, Ill. This is a collection of problems for the upper grammar grades or the first year of high school. It contains some excellent suggestions.

Problems in Furniture Making, by Fred D. Crawshaw. Manual Arts Press, Peoria, Ill. This book presents a series of problems in furniture construction which can be worked out in the high school. The working drawings are very complete. The book also contains a discussion on design, construction and wood-finishes.

Sloyd in the Three Upper Grammar Grades, (Teacher's Edition) by Gustaf Larsson. George H. Ellis Co., Boston, Mass. This book contains a brief discussion of Sloyd and presents a number of working drawings.

Problems in Wood-Turning, by Fred D. Crawshaw. Manual Arts Press, Peoria, Ill. This is a text-book giving a clear straight-forward treatment of the subject. It shows the *reason* for handling the tool in a particular way for each cut. It gives a series of good working drawings for a number of problems, which are arranged to give a logical progression in thought and application of principles. The necessary cuts used in wood-turning are classified with the geometrical basis for the handling of the tools for each cut.

Wood-Turning, by George Alexander Ross. Ginn & Co., Chicago, Ill. A very satisfactory little text.

Wood Pattern-Making, by Horace T. Purfield. Published by the author. This is the most satisfactory text-book published for use in school pattern shops.

Pattern Making, by G. H. Willard, with three chapters on *Moulding* by Fred D. Crawshaw. Popular Mechanics Co., Chicago, Ill. Very satisfactory for reference but is not arranged for use as a text.

Metal Working

Foundry Practice, by Tate and Stone. The H. W. Wilson Co., Minneapolis, Minn. A good text for elementary foundry work.

Forge Practice, by John Lord Bacon. Wiley & Sons, New York City. A very satisfactory book but the arrangement of subject matter is not such as to make it entirely satisfactory as a text.

Notes for Forge Shop Practice, by Littlefield, The Taylor–Holden Co., Springfield, Mass. A good book on forge shop exercises. It is satisfactory to describe processes to high school students.

Mechanical Engineering and Machine Shop Practice by Stanley H. Moore. McGraw–Hill Book Co., New York City. This is not a satisfactory text-book but it comes nearer meeting the needs of the school machine shop than any other single book so far published.

Copper Work, by Augustus F. Rose. The Davis Press, Springfield, Mass. An excellent book, well illustrated. It gives

instruction concerning basic principles involved in art-metal work.

Metal Spinning, by Fred D. Crawshaw. Popular Mechanics Co., Chicago, Ill. An interesting little book on this fascinating art.

Metal Etching. Popular Mechanics Co., Chicago, Ill. A book of good designs for enriching small metal projects by means of etching.

Mechanical Drawing—Perspective Drawing

Problems in Mechanical Drawing, by Charles A. Bennett. Manual Arts Press, Peoria, Ill. This book consists of 80 plates with explanatory notes. In a wide range of problems offered for solution it presents the essential principles of mechanical drawing.

Notes for Mechanical Drawing, by Frank E. Mathewson. The Taylor-Holden Co., Springfield, Mass. Problems in projections and working drawings. Together with the supplementary notes on machine drawing it makes a very satisfactory text for high school work.

Applied Mechanical Drawing, by Frank E. Mathewson. The Taylor-Holden Co., Springfield, Mass. A book of practical problems for first and second year high school classes.

Elements of Mechanical Drawing, by Gardner C. Anthony. D. C. Heath & Co., Chicago, Ill. This is a standard text on mechanical drawing.

Freehand Perspective and Sketching, by Dora Miriam Norton. Published by the author, Pratt Institute, New York, N. Y. This book presents the principles of freehand object drawing through a series of carefully selected exercises with explanatory text.

Perspective Sketching from Working Drawings, by Frank E. Mathewson. The Taylor–Holden Co., Springfield, Mass. A valuable book to show the principles of perspective and to give their application in perspective drawings to supplement and explain working drawings.

Educational Principles

Hand and Eye Training, Woldemar Goetze. McClurg & Co.

Mind and Hand, by C. H. Hamm. The American Book Co.

The School and Society, by John Dewey. The University of Chicago Press.

The Educational Foundations of Trade and Industry, International Educational Series, edited by William T. Harris. D. Appleton Co.

The Place of Industries in Elementary Education, by Katherine Dopp. The University of Chicago Press.

The Educational Meaning of Manual Arts and Industries, by Robert Keable Row. Row, Peterson and Co., Chicago.

Principles of Educational Woodwork, by C. L. Binns and R. E. Marsden. E. P. Dutton & Co., New York.

Handwork Instruction for Boys, by Alwin Pabst. The Manual Arts Press, Peoria, Ill.

Design

Classroom Practice in Design, by James P. Haney. Manual Arts Press, Peoria, Ill. A most satisfactory presentation of the subjects of design for classroom use.

Principle of Design, by Earnest A. Bachelder. This book besides giving a comprehensive discussion on the principles and terms used in design presents a series of problems for solution. It may be used as a text-book in normal classes.

The Basis of Design, by Walter Crane. Macmillan Co., N. Y. This is a book which should be in the library of every teacher of manual arts, for the helpful suggestions it contains.

Architectural Composition, by Robinson. The Architectural Record. This book furnishes many suggestions helpful in structural design because of its careful analysis of problems involving fundamental principles in architectural design.

History of Manual Training

The development of the manual arts as an educational force is shown best in the annual reports of the National Educational Association from 1880 to 1890. Here we have presented

the views of the leading educators of that period. There is much repetition from year to year, but it is interesting to note the development of the idea.

The following Reports of the Commissioner of Education contain valuable historical data:

1893–94, chapter V, volume I. This is a good review of the early development of manual training in the United States. It is written by Professor C. M. Woodward.

1899–1900, volume II, gives a statistical review of the development of manual training.

Another valuable report issued by the Bureau of Education has the title: Art and Industry.

Education in the Industrial and Fine Arts. Part II deals with Industrial and Manual Training in the public schools. This report was issued in 1892.

The "Eighth Annual Report of the Commissioner of Labor" deals with Industrial Education, and the Seventeenth Annual Report deals with Trade and Technical Education.

The Manual Training School, by C. M. Woodward. D. C. Heath & Co., Chicago, Ill. This is a good account of the development of the St. Louis Manual Training School.

The 1900 Report of the Superintendent of Public Instruction for Michigan gives valuable historical data.

The Theory of Educational Sloyd, by Otto Salomon. Silver, Burdett & Co., Chicago, Ill. This book gives an historical sketch of Sloyd and a clear statement of the principles on which the system is based.

Art Education in the Public Schools of the United States, by James P. Haney. Published by the author, New York City.

Vocational and Industrial Education

1. *The Problem of Vocational Education*, by David Snedden. Houghton, Mifflin & Co., A monograph giving a discussion of the needs for different forms of vocational education and distinguishing between these forms. The book shows clearly the difference between manual training and vocational education.

2. *The Vocational Guidance of Youth*, by Meyer Bloomfield. Houghton, Mifflin & Co. A monograph describing the

Boston, Mass., plan of vocational education, and showing how boys and girls are assisted in the selection of the right occupation.

3. *Beginnings in Industrial Education*, by Paul Hanus. This book considers the changing conceptions in education which demand vocational and industrial training. It also discusses the preparation of teachers for the newer forms of manual arts work.
4. *The Worker and the State*, by Arthur Dean. The Century Co. This book gives one a very good idea of the needs of vocational education. It describes plans now being used and schools in which vocational work is being done.
5. *Education for Efficiency*, by Eugene Davenport. The McMillan Co. A book which is suggestive of methods which will make the good in the manual arts universal in the public school systems.
6. *Manual Arts for Vocational Ends*, by F. D. Crawshaw. The Manual Arts Press, Peoria, Ill. A strong plea for the development of the present school machinery to serve the ends of vocational education.
7 *Examples of Industrial Education*, by Frank M. Leavitt. Ginn & Co. This book classifies vocational education and describes types of industrial schools.

Periodicals

School and Home Education. The School & Home Education Publishing Co., Bloomington, Ill.

The Manual Training Magazine, Manual Arts Press, Peoria, Ill.

Vocational Education, Manual Arts Press, Peoria, Ill.

The School Arts Book, The Davis Press, Worcester, Mass.

Wood Craft, The Gardner Printing Co., Cleveland, Ohio.

The American Blacksmith, Prudential Bldg., Buffalo, N. Y.

The American Machinist, Hill Publishing Co., New York City.

Machinery (Shop Edition) Industrial Press, 66 W. Broadway, N. Y.

The Foundry, Penton Pub. Co., Cleveland, O.

The American Carpenter and Builder, 196 5th Ave., Chicago, Ill.

Reports

National Educational Association.
Western Drawing and Manual Training Association.
The Society for the Promotion of Industrial Education.
Massachusetts and other State Commission Reports on Industrial Education.
Bureau of Education for the State of New York.
Year Books, Council of Supervisors of the Manual Arts.
Twenty-fifth Report, Bureau of Labor, Washington, D. C.
Bulletins of the Wisconsin State Board of Industrial Education, Madison, Wis.
Vocational Training in Chicago and Six Other Cities, City Club, Chicago, Ill.
A Report on "Education for Industrial Purposes," by John Seath, Supt. of Education, Toronto, Canada.

APPENDIX A

A BRIEF REVIEW OF THE MANUAL ARTS MOVEMENT

The development of the teaching of the arts in America is so intimately related to the development of shop work in the technical schools that it is impossible to give an adequate account of either without also considering the other. In this brief review it is our purpose to direct attention chiefly to hand work in the schools below college grade. We shall consider, only incidentally, the work in engineering and technical schools.

There were many sporadic attempts to introduce handwork into the schools prior to 1876, but they had little direct and permanent influence on the subsequent development of manual arts work. The first of these attempts was represented by what were generally known as "Manual Labor Institutes." Nearly all of the denominational and philanthropic schools established in the United States, from 1820 to 1840, were dominated by the manual labor idea. This idea was taken from the Fellenberg School at Hofwyl, Germany, but the directors of American schools, in most instances, had grasped only the outward form and did not understand the pedagogical principles on which the work of Fellenberg was based. If one may judge by the published statements of the time the manual work had but two motives; first, the student could greatly reduce the expense of obtaining a higher education; second, the exercise incident to the manual work resulted in better health and greater mental vigor. Apparently no attempt was made to put the work into educational form. The chief purpose was to sustain the student while in school. This accounts, very largely, for the ultimate failure of the scheme. Improved economic conditions and increasing social relations and formalities made manual work less necessary and less popular. Hence the number of students demanding manual work decreased and most of the institutions giving it failed before the middle of the century. Some of them, such as Oberlin, developed into colleges. A few still

exist and retain the manual work; but it has been placed upon an educational basis.

A second introduction of tool work in schools, an experiment of somewhat greater significance, was known as "The Whittling School." This was opened in the chapel of the Hollis Street Church, Boston, 1871, under the charge of Mr. Frank Rowell. In 1876 it combined with the "Industrial School" of Boston, which had been organized in 1874, and the friends and supporters of the two schools formed an association known as "The Industrial Education Society." This society provided for the maintenance of the school until it was finally taken over as a part of the public school system of Boston and established in the Dwight School Building, 1882.

In 1877 this society issued a report, "An Account of an Industrial School in Boston for the Season 1876–'77." The following extracts from the report show something of the character of the school:

> "The city gave us the use of the ward-room on Church street, and there, on the evenings of Tuesday and Friday of each week, from 7 to 9 o'clock, the school has been held. * * * Thirty boys were admitted to the school. Their ages ranged from twelve to sixteen. About half of them were still attending the day school; the others were employed in stores and offices."

This was followed by an outline of the work:

> "A course of twenty-four lessons in wood-carving was prepared, with special reference to securing the greatest amount of instruction with the least expenditure for tools and materials. It was not designed to make finished workmen in wood carving, but to take advantage of the natural inclination toward handicraft—the Yankee taste for whittling which belongs to most boys, and to develop and guide it to useful applications."

The following statement of the object of the school was made:

> "The object of the school was not to educate cabinet-makers or artisans of any special name, but to give the boys an acquaintance with certain manipulations which would be equally useful in many different trades. *Instruction*, not *Construction*, was the purpose of this school."

This report is of special interest for two reasons. It pre-

sents a developing series of exercises in tool-work for boys of the grammar school grade. These exercises were given for the purpose of instruction and were apparently uninfluenced by ideas from any other country. The second important point is a suggestion that instruction in the use of a half dozen universal tools be given in the grammar school course. It seems strange that such a significant experiment and such definite suggestions should have no important and direct influence in the immediate subsequent development of manual training in the United States. Professor Woodward is of the opinion that the reason for this failure lies in the fact that "tool work was all or nearly all that was taught. There was no drawing worthy of the name and no science and no mathematics to stimulate a taste for the element of construction."

An interesting little manual was the outgrowth of the work in this school. It was published by Ginn, Heath & Company, 1882, under the title, "Wood-Working Tools; How to Use Them." It was the first manual training work published in America and is still issued by Heath & Company.

The exercises in the manual are unmistakably Russian, and are quite similar to those used in the shops of the Massachusetts Institute of Technology at that time. There is not a trace of the old carving exercises which were mentioned in the report of the Writtling School, 1877. The carving exercises were abandoned during the winter of 1877–78 for the Russian exercises which had been made popular by the report of President Runkle of the Massachusetts Institute of Technology upon the tool work which had but recently been begun in that institution.

An interesting experiment was made at the Worcester Free Institute, Worcester, Mass., now the Worcester Polytechnic Institute. This school was opened in 1868 with a machine shop in which skilled workmen were engaged on contract work. The students of mechanical engineering worked in the shop with these workmen when doing the shopwork stipulated in their course. Practical trade instruction was given but there was no attempt to put the work on a pedagogical basis.

Prudue University was one of the pioneers in the introduction of shopwork, which was under the direction of Professor W. F. M. Goss, who is now Dean of the College of Engineering, University of Illinois. The work of Dean Goss, both

as a teacher and as a writer, was an important factor in the development of manul arts teaching, especially in the west.

In 1870 the University of Illinois established a woodworking shop in connection with the course in architecture, and an iron-working shop for students in mechanical engineering.

In 1871 Stevens Institute, Hoboken, N. J., established a series of shops in which students receive instruction in several lines of construction work.

In 1872 the Polytechnic School of Washington University, St. Louis, established a large and well equipped shop for working in both wood and metals. The University Catalogue of 1875 says:

> "The general method of conducting the work is as follows: A sketch of the piece or task to be constructed is given a class with all needed dimensions. Each student then makes a drawing of it to some convenient scale, with details and exact measurements.
>
> "The class then goes to the shop, is furnished with the requisite materials and tools, and each member is shown by an expert how to execute the work. Every piece must be reasonably perfect or it is rejected and a new one required. Although the students work in the shop no more than four hours a week, the experience is valuable. It is not supposed of course that skilled work can be produced by this method, but it is certain that such training will make better judges of workmanship."

This shows something of the progress that had been made, prior to 1875, toward putting manual work on an educational basis.

In 1874 the Kansas State Agricultural College, Manhattan, Kansas, established a shop and made tool work required for all male students.

These early introductions of shop work in schools indicate a wide-spread dissatisfaction with the educational methods of the time. There was a feeling that the schools were too academic and too far from the real problems of life. The movement represented an effort on the part of the schools to meet the somewhat vaguely understood demands of industry.

To Victor Della Vos belongs the honor of offering the first solution of the problem of tool instruction, although consider-

able progress in the solution of the problem had been made before America, in 1873, witnessed the results of his work.

Della Vos was a Russian engineer in charge of the Imperial Technical School at Moscow, the purpose of which was to train engineers for the government service. The students of this school, members of a selected class, had to be at least eighteen years of age at the time of entering the school. Their instruction was given for a definite and specific purpose; i. e., the production of efficient engineers.

In 1868 Della Vos issued a report in which he gave an exposition of what has been known as the "Russian method," but this report did not reach American school men until some eight years later. This system of instruction, as he outlined it, was based upon three things:—the analysis of tools and tool processes, the analysis of material, and the analysis of construction problems. On the basis of these analyses he arranged a series of problems, or exercises, in which the various elements or processes were arranged in a logical and systematic order. The exercises thus arranged were taught without any appreciable regard for the principles of psychology or pedagogy as this great Russian engineer was probably not familar with the doctrines of interest and motive.

However, the Russian educational exhibit at the Centennial held in Philadelphia, Pa., in 1876 contained a full account of Della Vos's work and was full of interest for educators. Models were presented showing the chief elements in construction problems and exemplifying the principles in the correct use of tools. The significance of such work was at once recognized by some of the leading American educators of that time. President John D. Runkle of the Massachusetts Institute of Technology was among the first to recognize it as the basis of work which might be introduced in educational institutions in this country. It is quite apparent from President Runkle's report on the Russian exhibit that he recognized the general educational value of shop instruction—a thing which the Russian teachers had not done.

While the Russian system had been developed for the instruction of mature young men in technical processes, it was capable of modification. The analysis of the processes had been very thorough and complete, but it was necessary to adapt the Russian ideas to American conditions if the work was to be introduced

into our schools. Professor Charles A. Bennett, editor of the Manual Training Magazine, says of the Russian system: "What is known as the Russian system of manual training was not originally designed as a system of manual training at all, using that term in its best sense, but simply as a means of teaching the mechanic arts to students of engineering. Strictly speaking, it bceame a system of manual training only when Dr. Runkle, Dr. Woodward and others adapted it to American school conditions and made it a part of the scheme of general instead of technical education." (Art Education, Feb.—July, 1896.)

The result of President John D. Runkle's investigation was the establishment of a system of tool instruction in the Massachusetts Institute of Technology in 1877. This being a technical school with mature students, the Russian system was adopted with a few changes. It was later found advisable to make some modifications, but the example thus set was followed by other technical schools and today we find a large number of the old Russian exercises in the shop course of nearly every technical school in the country.

President Runkle not only demonstrated the desirability of shop work in technical schools; he was one of the leaders also in the effort to establish the work in schools of lower grade. However, it remained for Professor Calvin M. Woodward of Washington University, St. Louis, to demonstrate the possibilities of shop work for boys in the high school.

The shop, established by Professor Woodward at Washington University in 1872, had been continued. In 1877 this shop was greatly enlarged and its privileges were extended to the students in the preparatory school. This arrangement continued until 1880, when the St. Louis Manual Training School was established. (This is the name suggested by Professor Woodward, and after much discussion and considerable opposition it was finally adopted.)

The founding of this school was an epoch-making event in the educational world. It was the first well organized and successful effort to introduce regular shop work into schools of high school grade. Here was a school for general education, offering shop work to boys at fourteen years of age, and making it a part of their daily work. The course offered was the typical American interpretation of the Russian system, which was fol-

lowed with little modification until a new factor, namely the Sloyd movement, entered some ten years later. The extremely orthodox adherence to the Russian system, as maintained in the St. Louis school, is shown in Professor Woodward's book: "The Manual Training School." In 1893 he issued the following statement:

> "The curriculum of the manual training school has undergone very few changes since the first one was established in St. Louis in 1880. In all independent manual training schools the length of courses is three years. The daily programme contains six periods, each period being either fifty or sixty minutes. Each pupil has mathematics one period, science one period, language or literature one period, drawing one period, and shop two periods. Working sections contain from 20 to 25 pupils, who are taught as a unit, each section having its own order for the day. Most schools offer French and German, as may be elected, and some offer Latin. All prepare pupils for admission into colleges and technical schools not requiring a preliminary knowledge of Latin and Greek. All aim to give a thorough laboratory training in chemistry and physics, and require constant study of literature and practice in English composition. Some have good facilities for the study of biology. In all, the tool work embraces:—
>
> "*Woodwork.*—Joinery, turning, wood carving or parquetry, and pattern making.
>
> "*Plastics.*—Molding, casting or modeling.
>
> "*Hot-metal Work.*—Forging, tempering, soldering and brazing.
>
> "*Cold-metal Work.*—Bench and machine cutting, fitting and finishing of iron, steel, and brass; the thorough study of elementary forms, and project work.
>
> "The method of instruction employed in the shop varies doubtless in different schools, but it probably varies less than do the methods of teaching Latin or Physics."

During this period of development of manual arts work in the high schools, Boston and Springfield, Massachusetts, and a few other cities were making an effort to introduce the work into the grades. The difficulty was to arrange a course pedagogically sound yet to bring it within the power of the

child to execute. Mr. Frank Leavitt of Boston introduced scroll saw work, and Mr. C. R. Richards of Pratt Institute worked out a scheme known as "slip work" or "flat-woodwork" which was distinctly Russian. The plan was to make a number of the principal joints in the flat. For this he used thin wood and the chisel knife. Although some progress was made it was soon demonstrated that the Russian system was inadequate in the grammar grades. The Sloyd system of work was given recognition about this time in grades below the high school. In 1888 Mrs. Quincy A. Shaw founded the Sloyd Training School in Boston and brought Mr. Gustaf Larsson from Sweden to take charge of the school. It was destined to have an important influence on the development of manual arts work in the United States.

The Sloyd movement in Sweden was a result of the somewhat belated industrial revolution in that country. The increasing use of machinery and the development of the factory system was destroying the home industries. The evils which usually accompany great economic changes were present here. Intermittent employment led to complete idleness and resulted in the increase of bad habits. The peasant class was restless. The social readjustment to the changed method of production was slow. It takes a people a long time to learn that we cannot turn back, nor long delay, the march of economic forces; so there was heard in Seweden the cry for the return to "the good old times." The movement was distinctly reactionary as it was an attempt to revive a decadent industry. The general characteristics of the movement in its earlier stages are shown in a report of A. Sluys to the minister of education in Belgium, from which the following is an extract. (This report was published in full by the New York Industrial Education Association, 1889, under the title, "Manual Training in Elementary Schools for Boys," by A. Sluys.)

> "The nature of the objects to be manufactured by the children is also important. It touches considerations of a high order, which at first sight do not appear, and in connection with which we are about to make some suggestions. At Nääs, every work of luxury, or pure fancy, or for mere ornament, is prohibited; the method only includes the construction of useful objects which can be employed in the families of the children attending school. Their nature

is determined by the social position of the parents of the pupils; they belong generally to the farming or working class, as do the great majority of those in other places who go to the public schools. Such an object while useful in the home of a rich citizen, would be out of place in the humble lodging of a workman or peasant. For these last, everything is a luxury which has no direct value in the housekeeping. * * * Besides, this question has a moral aspect which should engage our attention. Experience proves that children who have been altogether taught construction of objects of luxury feel afterwards a strong dislike for making useful and indispensable ones. * * * We insist upon the importance of this principle, because in highly civilized countries many children of workmen and peasants show a strong tendency to despise manual labor, aspire to abandon the condition of their parents and to embrace professions that they consider more superior, such as clerkships in mercantile houses or public offices."

In 1872 Herr Abrahamson opened a work-school for boys at Nääs, Sweden. Herr Otto Salomon was made director of the school. In 1874 he organized a department for the training of teachers which afterwards developed into a great school for the training of Sloyd teachers. In the school Salomon undertook to put the work on an educational basis and make it distinct from what was known as "practical Sloyd." He selected a series of exercises to secure certain educational ends. The work was carefully arranged with respect to difficulty of process, and the sequence of the models was strictly maintained. The typical Sloyd course consisted of fifty models embracing eighty-eight motor exercises. Most of the exercises were small and the knife was the chief tool used. The cost of material and equipment was not great. This, together with the fact that the tools and the models were easily handled by boys of twelve years of age, commended the system for use in the grades.

In his "Theory of Educational Sloyd", Salomon gives the following statement of the aims of the work.

"The formative aims are:—

1. To install a taste for, and a love of, labor in general.

2. To inspire respect for rough, honest, bodily labor.

3. To develop independence and self reliance.

4. To train in habits of order, exactness, cleanliness, and neatness.

5. To train the eye and sense of form. To give general dexterity of hand, and to develop touch.

6. To accustom to attention, industry, perseverence, and patience.

7. To promote the development of the physical powers.

"The utilitarian aims are:—

1. To give directly dexterity in the use of tools.

2. To execute exact work.

Some of the most striking characteristics of the Sloyd methods and practices may be stated as follows:

1. All instruction must be individual.

2. In the early stages the pupil works from models instead of drawings.

3. The exercises are selected for their educational value in inculcating habits of order, exactness, cleanliness, and neatness.

4. The articles made are useful—in the peasant homes of Sweden.

5. The work has little significance from the standpoint of industrial or technical training.

The Sloyd work in America has developed into something quite different from the work as organized and carried on by Herr Salomon. Mr. Larsson has studied with Salomon at Nääs and he came to America a worthy exponent of the ideas represented by that school. In America he found conditions vastly different from those in Sweden, and he began at once to modify the system to meet the requirements of the new situation. This meant a modification of some of the old models, the introduction of new ones, and the development of a satisfactory system of working drawings. While based on the same general principles, the modifications resulted in a much broader system of training than that developed at Nääs. Special attention was given to the arrangement of the work for the upper grammar grades, and it is in this field that sloyd has had its greatest success.

It was not long after the introduction of the Sloyd system that its influence was felt in the high schools, where the Russian system was used. The useful model appealed to many high

school teachers as well as to the high school boys. On the other hand, the sloyd was influenced by the technical character of the Russian system. As a result there was in many schools a system which was a combination of the two. The Russian system had stood for class instruction; the sloyd system for individual instruction; but there was developed a system of class instruction supplemented by individual instruction which was more efficient than the one and more economical than the other. This breaking away from an orthodox adherence to either of the systems was regarded as heresy by the adherents of the respective systems, but it was the first step toward the creation of a distinctly American system of manual training—a system which is quite generally followed in American high schools today.

Another important factor in the creation of the American system was the development of the Arts and Crafts movement. William Morris, the artist and craftsman, was the leading spirit in its organization. It was a revolt against the ugliness and dishonesty of our commercial products. The plea was for a return to the old methods of hand production where, it is sometimes assumed, every artist was a craftsman and every craftsman was an artist. This was another attempt to go forward by going backward. Such production cannot exist to any extent beside the labor saving devices in the modern factory. However, the movement had a profound influence on design, especially in house furnishings. It taught the association of beauty and usefulness and helped to bring into closer relations the handwork and the art in the schools.

The Arts and Crafts furniture was full of suggestions for the school shop. Its chief characteristics were beauty of design and simplicity of construction. It contained, in a very pronounced way, five of the six most important requisites of manual training shop work, to wit:

1. It furnished a useful model.
2. It supplied a great variety of the most importnat construction problems with a motive for working them out.
3. It gave an opportunity and a motive for the study of drawing and design.
4. It furnished a motive for the study of materials.
5. Such work had a distinct cultural or general educational value, in so far as that means the ability to appreciate the service the society renders us.

The Arts and Crafts movement made a substantial contribution to the development of manual training. This new work, however, was to be influenced by industrial conditions, and what may be termed the "movement for industrial education."

The recent demand for industrial education has called for another principle—that manual training must have a direct industrial significance. This has led to the establishment of special courses in some of the manual training schools so that students may specialize in some particular line of industrial work. It has led also, to the co-operative or school-factory plan of developing tool instruction. We have seen also the development of a class of schools known as industrial schools and trade schools. These schools are intended to give special training for industrial pursuits. Doubtless they are destined to play an important part in the future development of our educational system, but up to the present time only a few have been established as a part of the public school system. We may now look for the development of an American Continuation School patterned after the schools of that name in Germany.

It is interesting to note that, at Moline, Illinois, a movement to introduce the school-factory system of instruction in industrial work has resulted in the initiation of such a plan this year, 1910. The plan as outlined provides for one week in the high school and the suceeding week in some manufactory of the city for all boys sixteen years of age or more. It is doubtful if interest in school work can be maintained under such conditions, but the authorities at Moline feel that the plan is worth trying. A somewhat similar plan is being tried at Cincinnati, Ohio, Fitchburg, Massachusetts, and other eastern cities in the United States.

The foregoing discussion, it is hoped will enable the reader to form a comprehensive idea of the failures and successes which have led to the present status of the manual arts in American public school systems. The development of the subject for any particular territory can be traced by studying the reports of state superintendents of public instruction, reports of the Bureau of Education, Washington, D. C., and the reports and proceedings of the National Educational Association. Henry Turner Bailey's Statistical Monograph for 1909, issued by the Bureau of Education, is full of information for the student interested in the recent history of the teaching of manual arts.

APPENDIX B

THE DEVELOPMENT OF THE TEACHING OF THE MANUAL ARTS IN WISCONSIN

In a history of the teaching of the Manual Arts in the United States, Eau Claire takes its place with a few other cities which were first to establish the work as a public school subject. A department was opened in the basement of the high school in 1880. Since that date, work has been carried on with considerable success at times, in spite of some interruptions. No recognition was given the subject except by the city school authorities until 1895, when the state legislature authorized Boards of Education having charge of high schools to establish and maintain departments of manual arts. The law which was enacted at this time directed the State Superintendent of Public Instruction to assist in organizing departments in high schools and arranging courses of study for them. The law further provided that the State Superintendent in his report should give full information concerning the number of departments organized, their character and efficiency, and the value of manual training as an educational means. Provision was further made that a state aid of $250 should be granted to each of not more than ten high schools which would carry on work in manual training during at least six months of a year.

This law resulted in an investigation of methods and purposes in the manual arts work and the establishment or recognition of departments in the high schools of Eau Claire, Menomonie, Appleton, Janesville, and Florence, which conformed to requirements fixed by the State Superintendent, for receiving the state aid. Some of these requirements are set forth in a circular which was issued from the office of the State Superintendent of Public Instruction in the Fall of 1895, and which read in substance as follows:

"Work should cover two years. It might include freehand and mechanical drawing, bench work in wood, black-smithing, lathe work in metal, molding and pattern making."

The maximum of time per week per pupil was set at four and one-half hours. Of the subjects suggested drawing was made compulsory.

Of the five cities which received state aid during the first year after this law became effective Eau Claire and Menomonie were the only ones which had departments established previous to the time when the law became operative. The work in Menomonie was started in 1891.

During the school year 1895-96, manual arts work in the five cities above mentioned was reported upon as follows:

	Work maintained	No. of hours per wk	No. taking work	Cost of plant	Cost of additions	Cost of material	Total cost.
	Days.						
Menomonie...	176	4½	254	$45.000	$300 00	$368 57	$3,663 82
Eau Claire....	180	6	179	500	.....	60 17	1.510 17
Appleton.....	180	7½	9	250	291 80	27 50	769 30
Janesville.....	120	3	20	100	100 00	25 00	350 00
Florence.....	120	5	24	500	183 50	15 00	365 16

An investigation of recent records shows an enrollment in Wisconsin in manual arts, domestic science and sewing for 1909-10, of over 3,000, and an expenditure for salaries, materials, etc., of about $90,000.

The above data are suggestive of the conditions under which the teaching of manual arts was begun in the state of Wisconsin. The sums given in any one column for the different schools may not represent an expenditure of money for the same items in all cases. The table has been made from figures given in the biennial report of the State Superintendent for 1895–96. During this year a private manual arts school was begun in Racine and conducted by Mr. N. Johnson, a graduate of the University of Christiania, Norway, and maintained by himself.

During the years 1897–1898 the following cities inaugurated work in manual arts: Burlington, Mayville, Fond du Lac, Waupaca, and Oshkosh. This completed the list of ten provided for in the law granting state aid. The department started in Burlington was discontinued during 1898 but resumed work in 1899. Menomonie, also, on account of a fire, in 1899, which consumed the high school building, was forced to discontinue its department. As in the case of Burlington, however, work was begun again the next year. This time, however, while the department was under the nominal control of the Board of Education of

Menomonie, it was made possible, through the beneficence of Mr. J. H. Stout, to accommodate public school children in what was then probably the best equipped manual arts school in the United States, if not in the world. The history of the Stout school which in 1903 was reorganized to include courses for the training of teachers of art, manual training and domestic science, is well known.

At the close of the school year 1898–99, in the biennial report of the State superintendent of public instruction, a statement is made regarding the four years' experience in manual arts work under the state supervision which indicates that it was looked upon generally as having strong educational value.

In 1899 Mr. L. D. Harvey, now President of the Stout Institute, was elected state superintendent of public instruction. The legislature of that year increased the number of schools which might receive state aid for teaching the manual arts from ten to twenty. The suggestions of the former superintendent, Mr. Emery, concerning courses of study remained unchanged. In Mr. Harvey's first report attention was called to the fact that the work could not progress as it might because of the difficulty experienced in securing teachers. For this reason he advocated the establishment of departments in the state normal schools to train teachers for this work. The first department of this kind to be opened was the one now operating in the Oshkosh Normal School, opened in 1903 by order of the Board of Normal School Regents.

At the close of the year 1902, the teaching of manual arts was carried on in the following cities of the state: Fond du Lac, Mayville, Washburn, Menomonie, Janesville, Eau Claire, Oshkosh, and in three high schools in Milwaukee. A report issued from the state superintendent's office at the close of this year shows the total disbursements for state aid in all cities receiving it up to this time to be $13,250.

During Mr. Harvey's incumbency as superintendent some changes were made affecting the granting of state aid for teaching manual arts which encouraged the work in grades below the high school. This resulted in the introduction of hand work in the grammar grades and a corresponding increase in the number of high schools receiving state aid. At the close of 1906 there were twenty high schools on this list.

Mr. C. P. Cary, who became state superintendent of public instruction in 1903, has encouraged the teaching of manual arts. He has made the following formal requirements for the state aid grant:

"Seventy minutes daily in manual arts for two years in high school, where the work should be preceded by preliminary preparation equivalent to one period weekly for one year in the grammar grades."

The high school outline provides for two optional courses, one in woodwork and drawing, the other in domestic science. Outlines for the first course are given in bench woodwork and in lathe work. The last High School Manual for Wisconsin, 1910, gives suggestions for manual arts work in a number of media. None of these, however, are introduced as definite requirements for high school work. They are suggestive only.

During the past three years a committee of the Wisconsin State Teachers Association has been working on outlines of courses of study for the manual arts. At the meeting of the Association held in Milwaukee during November of 1911, the committee was asked to continue its work and to report again in 1912, when it may be expected that outlines will be ready for adoption. The probablity is, however, that they will be regarded as tentative only and will be suggested for use subject to change and to meet local conditions.

The following table which was prepared by a committee of the Wisconsin School Arts and Home Economics Association gives valuable information concerning the variety and the distribution in grades of manual arts work now being done in Wisconsin. It is estimated that approximately eighty-five cities in the state are supporting manual arts work in some form. Thirty-eight cities in 1909 offered shop courses.

Building Trades	Grades				High School			
	5th	6th	7th	8th	1st	2nd	3rd	4th
Woodwork:								
Bench Carpentry	8	17	24	25	18	9	3	....
Cabinet Making	2	4	7	9	17	4	2	....
Interior Finishing	....	....	....	2	1	2	....	....
Stair Building	....	....	....	....	....	1	....	1
Mill Work	....	....	....	....	1	3	2	....
Home Repair. Work	....	1	4	4	4	4	....	....
Bricklaying	....	....	....	1	....	....	1	1
Concrete Work	....	....	....	2	....	1	1	1
Stone Cutting	....	....	....	....	....	....	....	....
Plumbing	....	....	....	1	....	....	1	1
Steam and Gas Fitting	....	....	....	1	....	....	1	2
Plastering	....	1	....	....	....	....	....	....
Paper Hanging	....	....	1	....	....	....	....	....
Painting and Varnishing	1	3	4	5	6	6	1	1
Structural Iron Work	....	1	....	....	....	1	....	1
Sheet Metal Work	1	1	3	5	1	3	1	....
Architectural Design and Drafting	....	....	1	2	7	9	4	2
Manufacturing Trades								
Pattern Making	....	....	....	....	....	14	1	....
Molding and Core Work	....	....	....	....	....	7	1	....
Cupola Work	....	....	....	....	....	1	....	....
Machinist's Work:								
Vise Work	....	....	....	....	....	....	1	3
Machine Tool Work	....	....	....	....	....	1	1	3
Erecting	....	....	....	....	....	....	....	....
General Blacksmithing	....	....	....	....	....	....	2	....
Tool Smithing	....	....	....	....	....	....	2	1
Brass Work	....	....	....	....	....	....	....	1
Cooperage	....	....	....	....	....	....	....	....
Wheelwrighting	....	....	....	....	....	1	....	....
Boat Building	....	....	....	3	....	3	....	....
Commercial Design and Drafting	....	4	8	7	12	14	5	2
Miscellaneous Trades and Crafts								
Wood Turning	....	....	1	2	9	23	1	....
Wood Carving	....	2	2	2	1	1	1	....
Veneer Work	1	1	....	....	1	2	1	....
Furniture Making	....	3	7	10	19	19	5	....
Upholstering	....	1	1	2	7	6	....	....
Paper Box Making	1	1	2	1	....	....	....	....
Printing	....	1	1	1	....	....	....	....
Book Binding	....	2	1	1	....	....	....	....
Hammered Copper, Brass and Silver Work	....	....	1	1	2	3	1	....
Pottery	2	1	....	....	1	1	1	1
Leather Work	....	....	....	....	....	1	1	1
Textile Work	1	3	3	2	....	....	....	....
Basket Making	3	2	2	1	....	....	....	....

It will be noticed from the above table that bench woodwork is given largely in the upper grammar grades. Furniture and cabinet making, including wood turning, together with drafting, are the subjects taught in the first two years of the high school. Pattern making and foundry practice serve as the popular subjects for the second year of high school work, while forging and machine shop work are carried on principally during the last two high school years.

There is a growing feeling that all high school work in the manual arts should be given with greater emphasis laid upon it as a direct preparation for industrial occupations. The last United States census report gives data relative to the percentages of males gainfully employed. This data, summarized below, should serve to emphasize the need of making high school courses directly useful for life activities.

39.6% of males in U. S. gainfully employed in Agriculture.

24.3% of males in U. S. gainfully employed in Manufacturing and Mechanical Pursuits.

17.9% of males in U. S. gainfully employed in Trade and Transportation.

14.7% of males in U. S. gainfully employed in Domestic and Personal Service.

3.5% of males in U. S. gainfully employed in Professional Service.