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UNIVERSITY OF NEW MEXICO

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JOURNAL OF ENGINEERING DRAWING

PUBLISHED IN THE INTEREST OF TEACHERS OF ENGINEERING DRAWING AND RELATED SUBJECTS

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He who knoweth not what
he ought to know, is a br-
ute beast among men;
he that knoweth no more
than he hath need of, is
a man among brute beasts,
and he that knoweth all
that may be known, is
a god among men.

Pythagoras

JIM BLACKMAN

GRAPHICS RE-EXAMINED

by

John Rule
Section on Graphics,
M.I.T.
Chairman Drawing Division, A. S. E. E.

In these post war years the fundamental background of our educational processes is being carefully examined by those who are responsible for American education. There is at the moment much criticism of the content and scope of all education. It is therefore advisable for each field to carefully re-examine its purposes and aims and the means by which they are effected. Since such examination will inevitably occur from the outside as a part of the broad movement of readjustment, the more clearly we understand our own aims the more capable we shall be to fit them into whatever broader pattern may eventually prevail.

Thus, those of us who are engaged in the field of Engineering Graphics should as a group be prepared to state clearly and convincingly the purposes we now have and the broadest horizons we may envisage in the future. We must furthermore be absolutely clear concerning the value to the student, both with respect to his training and his character, of the work we are now doing or may propose to do. The purpose of this short article, therefore, is to examine the merits of our field and to develop a fundamental philosophy concerning it. Much of what follows has been said many times but will bear repeating.

We may most easily begin by examining our primary subject - Engineering Drawing. What of indispensable value does the student acquire from the subject? It seems to me that there are two major accomplishments, one objective and the other subjective.

A great portion of the world of science and engineering has to do with objects of varying complexity, objects which are either in existence or to be produced. Desired knowledge concerning objects may be very rough in outline or may require the highest degree of accuracy. It is obviously impossible to describe complex objects accurately with words. It is therefore necessary to describe them visually by means of drawings in order that knowledge concerning them may be transferred to other persons. The engineer must accordingly be acquainted with the only adequate language for communicating information about objects -- that of drawing. This means, as in any language, that he must learn two things, acquaintance with arbitrarily assigned meanings, that is, acquaintance with a code of symbols, and skill in their use.

The necessary skill requires training in the use of the instruments involved. In oral languages, the instruments are the vocal chords, the palate, etc. It is trite to state that in drawing these are the eyes and the hands, and the auxiliary equipment of the T-square, triangles, pencils, etc. In either case skill is acquired relatively slowly and competence is not achieved until the physical processes become reasonably automatic so that the focus of attention may be removed from structure to meaning. The symbols of arbitrary meaning in the case of drawing are, of course, the code of lines, the accepted methods of projection, the standard views, etc.

The objective and tradional purpose of Engineering Drawing is to give the student the ability to use and understand this language. This is practical and straightforward. Its importance can scarcely be overrated. It is difficult to visualize how lost the engineer would be if he had no acquaintance whatever with the drawing board.

Our treatment of this aspect, of our work is excellent and vital. New techniques are being quickly grasped and taught. We are certainly fulfilling our mission in this respect.

Subjective values in Engineering Drawing of great importance also need emphasis. The subject is, in general, the only course that the entering freshman takes that deals specifically with practical details. It is, in effect, his introduction to the necessary discipline of paying attention to minor detail; for an extreme example take the standard shape of an engineering letter such as the letter "M". Such a detail usually seems completely unimportant to the student. Narrowly interpreted, the student is correct. The specific detail is unimportant since it can be acquired at any time simply by looking in a text book. However, the habit of paying attention to detail and of being professionally workmanlike, however tedious, is a habit which the engineer must acquire. He must learn to give the necessary attention to the enormous minutiae of engineering. More broadly he must acquire the disciplines necessary to translate his thinking into practical and precise forms which are communicable without misunderstanding. He must also achieve the ability to observe visual details accurately and carefully. Some training of the sort must occur at the freshman level if the student is to obtain the full benefit of his courses in the upper years. The student's first contact with this aspect of science and engineering is in Engineering Drawing. The training in care with, and observation of, apparently unimportant visual details sharpens and keys-up his observational powers. In this sense Engineering Drawing is the gateway to the Laboratory, the first full bridge between the mental pleasure of abstract theory and the annoying and recalcitrant minutiae of nature. It seems to me that we could well increase our efforts to impress on the student the value of the subject in this respect.

There is inherent in all of the above discussion an implication which leads us into the realm of theory. This is that it is possible to represent completely objects of the three dimensional world on a two dimensional surface and, in addition, to solve problems concerning them. This, of course, is Descriptive Geometry.

Descriptive Geometry is one of the most powerful tools in the kit of the scientist. It offers first a complete method for the geometric analysis of space problems. It enables the scientist to operate on space problems geometrically or graphically by establishing an exact one to one correspondence between a two dimensional surface, on which he can operate with ease, and the three dimensional world. It enables him to reduce to simple terms and thus to classify his thinking about geometric space problems. It allows him to bring the complex space world within the scope of his power to visualize. It is thus a mental discipline of the first order yielding clarity, orderliness, and the tendency to look for and the ability to perceive hidden relationships. It differs from, but complements Euclidean geometry in this respect in that it is an attack upon, rather than an analysis of, space relationship. It is active in that it seeks graphical answers rather than passive like geometry which seeks logical proofs.

As a personal aside, one of the strongest impressions I received from working with scientists and engineers on war projects was the inexcusable handicap placed on them by their failure to appreciate the possibilities of and consequently to employ the methods of Descriptive Geometry. Toward this end, I believe we might well increase our efforts to demonstrate to the student the full power of the subject as applied to his chosen field. This demands an increased effort to develop and point out its applications to other fields than the traditional ones of machine drawing, sheet metal work and other purely mechanical aspects. Many important applications which will increase the student's ability and instil in him the Descriptive Geometry habit lie relatively undeveloped in physics, crystallography, mathematics, and allied fields. It is imperative that we broaden the knowledge of our scientists concerning the power of the subject by a full development of its possibilities in all these fields.

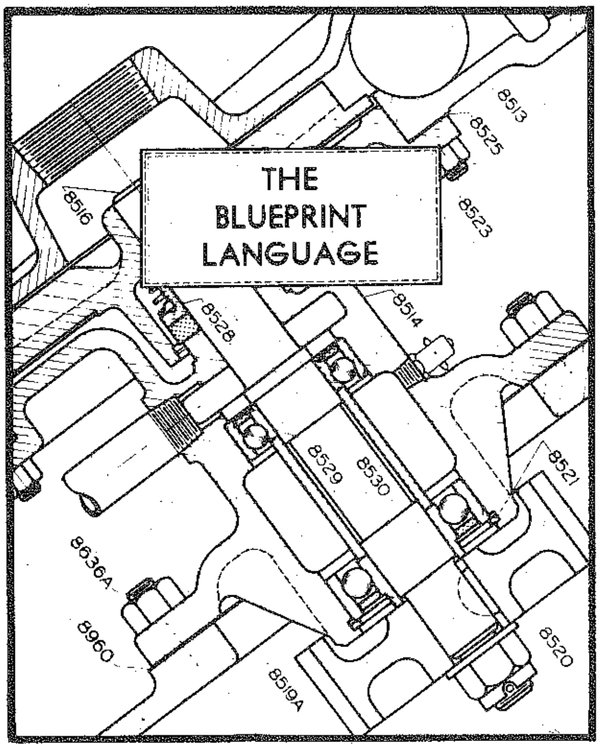
One further controversial factor concerning Descriptive Geometry has never been adequately explored. That is its ability to teach the student to visualize -- a process in itself very little understood. We are told that psychological experiments prove that the power to visualize cannot be taught but is inherent. Whether this is true or untrue is of little importance for it is a purely static statement. We are primarily interested in the ability of the student to operate with whatever power to visualize he may have. What is of importance to the creative scientist is not so much his ability to visualize a static situation, but his ability to follow through in his mind a dynamic situation -- that is, the ability to operate on visual images according to his creative notions, and to maintain his visualization through the resultant alterations. This seems to me to be exactly what Descriptive Geometry teaches the student to do and is, I believe, a fact of the greatest importance. Further understanding of the mental processes involved should certainly be striven for.

There is in all this discussion of Engineering Drawing and Descriptive Geometry the suggestion of a much broader concept. A method of attack on all physical problems is implied. It is apparent that these two subjects of ours describe and analyze graphically without recourse to words or numbers. The possibilities here have scarcely been scratched for nowhere in American education have the full possibilities of graphical methods been explored. In fact, graphical methods now in existence have not even been correlated. They crop up sporadically in various fields but have never been brought together as a fundamental discipline.

Let us state as precisely as we can the philosophy involved. Nature is graphical. All data from nature involving time, mass or distance are inherently continuous for these are continuous phenomena. They consequently are graphical and must at the outset be measured with devices which convert the graphical to the numerical -- the clock, the balance, the yardstick. The numerical data may then be attacked by means of the symbolism of mathematics as we use it.

But the original graphical data might just as well and as accurately be attacked

(Continued on page 20)



THE BLUEPRINT LANGUAGE

By Henry C. Spencer, *Chairman of the Technical Drawing Dept., Illinois Institute of Technology,* and

H. E. Grant, *Associate Professor and Chairman of the Department of Engineering Drawing, Washington University.*

This new combination text and workbook provides an unusually complete and realistic training in the essentials of blueprint reading for the machine industries. Over 100 major industrial companies have cooperated with the authors in the development of problems and illustrative material toward making *The Blueprint Language* meet the practical requirements of industry. Emphasis is placed on the visualization of machine parts and their uses. The book contains extensive chapters on shape description, including views of objects; normal, inclined, oblique, and cylindrical surfaces and edges; and sectional and auxiliary views. There is a whole section on modern shop processes.

The Blueprint Language is profusely and entirely illustrated with facsimiles of actual commercial blueprints which cover general principles thoroughly and provide a wide variety of typical industrial problems. Pictorial drawings of the production-illustration type are used liberally throughout. Work sheets are provided for each blueprint, and problem sheets are given at the end of each chapter. A teacher's key, providing solutions for all work sheets, will be available for use with this text.

Winter, 1947. $4.75 *(probable)*

AIRCRAFT DRAFTING

By Hyman H. Katz, *Supervisor of Engineering Training, Republic Aviation Corporation*

Written by an "insider"—a design engineer who has worked in a number of large aircraft companies and has supervised the training of hundreds of draftsmen for the aircraft industry—this book includes much practical information useful to the aircraft draftsman in addition to full training in the essentials of technical drawing and their application to aircraft. There is, for instance, considerable aircraft design data, information on lofting technique and processes, and information on such matters as change groups, bills of materials, and weight calculations. All the fundamentals of drafting are very clearly explained and fully illustrated. Wherever possible, illustrations are used in place of lengthy explanations, and the basic topic of orthographic projection has been presented in color to facilitate rapid comprehension. Pictorial drawing, now widely used in industry, and particularly in aircraft design, is stressed. All drafting fundamentals are specifically applied to aircraft problems. All illustrations have been done by skilled draftsmen, experienced in aircraft design.

386 pages, $5.00

MAKING PATENT DRAWINGS

By

Harry Radzinsky

Patent Attorney

Complete, step-by-step instructions for making drawings for all types of patents and trade-marks according to the special requirements of the U. S. Patent Office. Includes much expert advice on all aspects of patent drafting. Fully illustrated, $3.00

THE MACMILLAN COMPANY • 60 FIFTH AVENUE • NEW YORK 11, N. Y.

VISUAL AIDS FOR ENGINEERING DRAWING

by

Justus Rising
Professor of Engineering Drawing
Purdue University

Since all learning is by observation, reading, or hearing, fundamentally education and it's audio-visual aspects are inseparable, and any attempt to discuss fully the topic of audio-visual aids would require a complete discussion of education. The currently accepted meaning of audio-visual aids refers to those devices and methods which promote more efficient classroom instruction and by which better understanding can be imparted to more persons in less time and with less effort on the parts of both teacher and students.

"More Learning in Less Time", the training aids manual of the U.S. Navy, answers "Why use training aids?" as follows:

"1. LEARN MORE.
Tests show that students learn up to 35% more in a given time."

"2. REMEMBER LONGER.
Tests show that facts learned are remembered up to 55% longer."

"3. INCREASE INTEREST.
Training aids command attention and cause students to want to learn."

"4. MAKE TRAINING UNIFORM.
They help to get similar results from different schools which teach the same subjects."

"5. BUILD MORALE.
They give trainees confidence in their ability to do the job."

"6. SAVE TIME.
Training aids make it possible to meet Navy standards in less time."

This same manual gives the following general rules for insuring the effective use of any type of training aids:

"1. EXAMINE THE AID TO BE USED.
The instructor should see the film, hear the recording, or examine the model, and consult the accompanying study guide. Full knowledge of the training aid will enable the instructor to use it in the right place, at the right time, and in the right way."

"2. ARRANGE TO USE THE AID.
The instructor should obtain the proper equipment and material, arrange the classroom before the class meets, and check on the operation of equipment. The assistance of a trained projectionist, or someone to handle the equipment, or to help conduct the demonstration, will save time."

"3. PREPARE THE CLASS.
The instructor should inform the men as to the purpose of the training aid, what it will do, why it is presented at this time, what they will learn from seeing or hearing it, and how they should be able to apply the information gained."

"4. PRESENT THE AID TO THE CLASS.
The training aids should be used by the instructor in the classroom as a definite and important part of his instruction for that period."

"5. FOLLOW UP THE USE OF THE AID.
The instructor should make a summary statement, invite comment and questions, conduct a discussion, give a test, or provide for actual practice and use of the information gained."

"6. RETURN THE AID TO STOWAGE.
All equipment and other material should be returned to stowage as soon as it has served its purpose in the class room. Other instructors will need it soon."

A complete visual aids program, in addition to planning, procurement, and utilization, should provide for evaluation of results. The figures published by the Navy appear to indicate that the combined effect of more learning and increased retention due to the use of training aids doubles the effectiveness of the training program (1.35 x 1.55 equals 2 plus). Whether this ratio applies to engineering education in general at the college level, and to engineering drawing in particular merits investigation. The inauguration of a visual aids program will involve considerable expenditure of time, effort and money, and objective data from which to determine how far to go is essential. The relationship between effectiveness and unit costs will depend on whether it is determined on a short time or long time basis. At present, little or no data is available, nor will there be until those who attempt the use of visual aids, provide in their programs, for the evaluation of results and the determination of the point of diminishing returns. A cooperative program of evaluation among several institutions will provide more reliable data in a much shorter time than can be accomplished by one agency working alone.

Teaching aids may be divided into three general classifications: (a) those which deal with real situations or things such as inspection trips, objects, specimens, models, mock-ups, laboratory equipment, exhibits, etc; (b) those which deal with representations of real things such as illustrations, photographs, lantern slides, film strips, and motion pictures; (c) those which use symbols such as charts, diagrams, graphs, etc. This classification is of importance mainly because the effectiveness of the teaching aids is directly related to their approach to reality; the classification is not clean-cut because models may be projected on a screen by means of a reflecting lantern and charts and diagrams are frequently made into lantern slides for use by projection.

The inspection trip is much too seldom used as an aid to instruction in drawing. Visits to the shops and laboratories of your own institution and of local industries will contribute much to the effectiveness of the drawing work. To be most effective inspection trips should be carefully planned and carried out in accordance with the principles set down in the visual aids texts and handbooks.

Because models are usually relatively small, they are most effective for small groups, although still models may be presented to large groups by projection methods and working models may be presented by means of motion pictures. Professor C. E. Rowe, at the University of Texas has made a hobby of model building and the results of his efforts have been published in a bulletin by the University of Texas.

Many schools possess quantities of exhibit material but make little if any regular use for teaching purposes. Many exhibits are poorly housed, poorly arranged and dirty. Attention to these details and the replacement of obsolete items with up-to-date material will make exhibits a valuable teaching aid. Most manufactures are willihg to furnish exhibit materials. Consult the ads in your technical magazines.

Flat pictures are the cheapest and most plentiful of all the aids. Not only are our best texts profusely illustrated, but magazines and trade papers offer a wealth of material. Manufacturers catalogs are a fertile source for material of this type. For effective use without mutilation, and for filing for future use, pictures should be mounted. Flat pictures may be used with large groups by projection on a screen with a reflecting lantern.

The most versatile of the still picture projectors is the stereoptican or lantern slide projector whose uses are limited only by the imagination of the user. Most lantern slides are made photographically, although they may be drawn on etched glass in pencil or ink; they may be drawn paper and mounted between glass for projection; they may be typed on cellophane by placing the cellophane between two pieces of carbon paper. India ink may be used to make drawings on plain glass; a china marking pencil is also quite effective on plain glass or cellophane or other plastic sheets.

A photographic lantern slide may be made in several ways. It may be a contact print or a projection print from a photographic negative, or the lantern slide may be exposed in a camera and given reversal development and used directly in the projector.

There are two types of projector for lantern slides. The regular steroptican must be located at the rear of the room and operated in one of three ways. If the lecturer operates his own projector, his remarks will be more effective if he uses a microphone, and a loud speaker at the front of the room. He may stand at the front of the room and have the projector operated by an assistant, or he may use an automatic slide changer operated by a push button.

The overhead projector is located on the lecture table at the front of the room and permits the lecturer to handle his own slides and point out important items on the slide instead of on the screen. By substituting plain glass or cellophane and using a wax pencil, the lecturer may make his sketches on the slide and each movement will be projected on the screen. By equipping the projector with a roll of cellophane, the sketches may be preserved for future reference. The Victorlite Industries of Los Angeles has recently announced a "VisualCast" (Overhead projector) having a work surface $8\frac{1}{2}$" x 11" for which plastic work sheets may be obtained.

Negative lantern slides of figures represented by lines, may be projected on the blackboard for the instructor to add the solution to the problem. Experience has shown that these negative slides are even more effective if projected on a cream colored chalk board. The effectiveness of this type of projection is still further increased if positive or black line slides are used on the cream colored board and dark colored chalk used.

The lantern slides thus far referred to are standard $3\frac{1}{4}$" x 4" slides. The production of 2" x 2" slides by means of miniature cameras is extremely simple. With a photoelectric light meter and a miniature camera, anyone can make 2" x 2" slides in black and white or color at a very moderate cost by following some very simple directions. Film for miniature cameras may be purchased in cartridges of 18 or 36 exposures or black and white film may be purchased in bulk and the individual load his own cartridges. After the pictures have been exposed, they may be developed in daylight by using a light proof tank, or they may be developed by a commercial photographer. After the negatives are finished, they may be used for making projection prints on paper, for making projection prints on standard lantern slides, they may be used for making contact prints on 2" x 2" lantern slides, or contact prints on film may be made and the film mounted between glasses. Eastman Kodak Company furnishes a direct positive film which can be given reversal development so that the original film is used in the projector.

One method of making colored slides is to purchase Kodachrome film and expose it according to instructions. The Company processes the film free of charge and returns it to the sender as a set of 2" x 2" colored slides in pasteboard mounts ready for the projector. The Company manufactures a projector with an automatic magazine designed especially for pasteboard mounts. Because the paste board mounts offer no protection to the film surfaces, part of the processing consists of coating them with lacquer. For real protection the films should be removed from the pasteboards and placed between glass. The Society for Visual Education supplies pasteboard mounts with glass inserts which not only protect the film but also minimize breakage. Recent developments in photographic materials and processes have provided means by which one may make and process his own colored transparencies and his own color prints on paper or film. See your local photographic dealer for details.

If the 2" x 2" pictures are arranged in proper sequence in the film strip, it is not necessary to cut them apart and mount them in slides to project them on the screen. A film strip projector with a double frame aperature is used and the pictures will always be in the same sequence.

Commercial film strips with printed titles interspersed between pictures are available in a wide variety of subjects. Most commercial film strips are of the single frame variety.

Film strips with accompanying lectures recorded on phonograph discs are in common use. A standard sound film strip projector operates at 33 1/3 rpm so that two sides of a 16" disc will provide for a 30 minute lecture. The sound of a gong indicates when the next picture is to be shown. A series of lantern slides could be used in a similar manner with a recorded lecture. The recently perfected magnetic wire recorder offers several advantages as a substitute for the disc recordings. This device will record and playback a lecture 66 minutes long, the spools of wire may be removed for filing if the recording is to be preserved or the recording may be erased wholly or in part and a new recording made.

By adding motion to the projected picture, its simulation of reality and therefore its power as a teaching aid is enhanced. The development in the late 20's of 16 mm pictures with reversal development by the manufacturers of film has reduced to cost of motion pictures to the point where anyone with the slightest inclination can prepare his own teaching films.

The photographing of motion pictures is even simpler than making still pictures because the speed of the movie camera shutter is fixed. A viewer shows the operator what will be recorded on the film, a critical focuser assists in adjusting the lens to produce a sharp image, and a light meter tells how large a lens opening to use. Film is purchased on daylight loading spools, and processing is done by the manufacturer free of charge, and the film which goes through the camera, because it is given reversal development, is the one which goes through the projector. It has been said by one producer of 16 mm movies that pictures made by the reversal process are superior to those made by the negative process. Furthermore, dupe prints may be made from the original reversal, or a dupe negative and positive prints may be made if desired.

The addition of sound to motion pictures greatly increases their effectiveness because both the hearing and seeing senses are used simultaneously, and the sound and action can be correlated accurately. A silent movie can be given the effectiveness of a sound movie by reading, through a public address system a carefully correlated commentary.

A silent movie may be made into a sound movie by making a dupe negative from the original picture and recording the sound on another negative as the picture is projected on the screen. From these two negatives combined prints for classroom use are made. Sound pictures may also be made by recording the sound on the same film while the picture is being made. A phonograph may be used to provide the sound, although synchronism of sound and picture is difficult to maintain unless turntable and projector are coupled together. A recent advertisement in the Educational Screen announces a "Voca-Film" in which the phonograph is started and stopped by notches in the edge of the film. A recent experimental development in magnetic recording which will shortly

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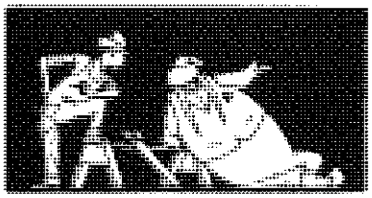


"The time has come" the Walrus said, "to talk of many things"
"Of shoes, and ships, and sealing wax –" *"Of cabbages, and kings –"*

The WALRUS and the CARPENTER

I am sorry that authorship of "The Freshman Mural" appearing on the front page of the November issue of the Journal of Engineering Drawing was not properly acknowledged in that issue. This very fine picture was submitted by C. Higbie Young, Cooper Union, New York. --The Editor

* * *

From Ohio State University we have the following news of promotions and appointments in the department of Engineering Drawing: Professor Charles J. Vierck from Associate Professor to Professor and Paul E. Machovina from Assistant Professor to Associate Professor. Harry H. Hawley, formerly with the Civil Engineering Department and later Major in the Corps of Engineers, U. S. Army, has been appointed Assistant Professor in Engineering Drawing.

* * *

One of Fred Higby's students, after listening to his lecture on standardization of fasteners, handed in the newspaper clipping that follows, with a London dateline.

Why War Costs Money

LONDON—Disagreement as to how many threads per inch a screw should have added 100 million dollars to the cost of the war.

How many threads per inch per screw?
Americans say thirteen will do.
The British say twelve—or else sixteen,
And are not quite sure which they really mean.
But in any event, the difference,
If you figure it out in cents or pence,
Adds up to a hundred million dollars,
Posing a pretty problem, scholars.

So the British say, "We must have our way,
And if we don't, we'll refuse to play."
The Americans send for a man named Batt,
"Thirteen is right," he says. "That's flat."
And what if both sides forever refuse
To get together on threads for screws?
Perhaps when the confab finally fails
They'll finish the job with hammer and *nails*.

Professor Grant of Washington University has been appointed co-chairman of the bibliography committee. His principal job, we understand, is to report on foreign publications in the field of Engineering Drawing and Descriptive Geometry. Perhaps he will have a report for us in the May issue of the Journal.

* * *

Professor J. Amaral de Mattos of Rio de Janeiro, who submitted a solution for a descriptive geometry problem for the November issue of the Journal has just received his Doctor's degree in Ciencias Fisicas e Matematicas. He not only renewed his subscription to the Journal of Engineering Drawing, but in addition, obtained nine new subscriptions.

* * *

Professor Rule, the amiable chairman of our division, writes that he would appreciate your comments on the ideas expressed in his article published in this issue. He believes that discussion of our basic problems is necessary and valuable and feels that his policies should, to a large degree, be guided by your own expressions of opinion. Won't you write to him?

* * *

The following report comes from J. Lawrence Hill, secretary of the Division of Engineering Drawing:

Returning together from the St. Louis meeting last June were Rising of Syracuse, Howe of RPI, Cleary and Jenkins of Cornell and Hill of Rochester. During the course of our conversations in the lounge car following breakfast, it was suggested that a meeting of Drawing teachers be held in conjunction with the upper New York State Section meeting, scheduled for November 4th at Cornell University. The thought was again expressed by Jim Rising when the program for the Section meeting was announced. Accordingly, simultaneous plans were undertaken to find a suitable meeting place and to develop an interesting program.

(Continued on page 30)

When the heat comes from within

Applying heat to the outside of a material in order to heat it within is an inefficient method . . . slow, uncertain, wasteful—as technical men have always known. Hence their eagerness to seize upon a tool which science has newly given to industry . . . the tool of electronic heating which, by reversing a flow of electrons millions of times a second, generates heat *within* a material so rapidly, uniformly and efficiently as to revolutionize many processes, notably in plywood and plastics.

Many educators will be struck by a parallel here. They have seen how attempts to *coerce* a lad into right habits of thought nearly always fail of their purpose. Applying "heat" to a boy from the outside is more likely to arouse his resistance than his compliance. But when the heat comes from within, when the educator can kindle a flame inside the boy, it will inspire him with ambition for success, with uprightness of soul, with sublime sincerity . . . it will radiate outwards and guide all his actions toward his goal.

Anyone with a sense of modern psychology knows that seemingly trivial events and things can help strike the spark that kindles the flame within. The drafting instruments a boy uses when he first comes to mechanical drawing class are a good example. Actually, these instruments, sometimes so casually treated, are tools in the act and art of creation, of construction, of building and progress . . . instruments by means of which scientists and engineers gift the world with tall bridges, peering Palomars, the miracles of radar and fission, all the wonders of the Industrial Age.

Seen more sensitively and imaginatively, finely crafted instruments are things of beauty in themselves, perhaps more appealing and compelling to boys because their functional beauty is allied to practicality.

But beyond all these attributes, drawing instruments carefully chosen may help the boy find his road of personal salvation, attracting him to the disciplines of honest, consecrated work, inspiring him to a full gift of his energy and his talents to a needy world. Certainly such tools must be worth time and care in their selection. Certainly they should be worthy of the respect the instructor and after him the student should bring them. Can even the best be good enough?

Courtesy Duramold Division of Fairchild Engine and Airplane Corporation

(Printed in U.S.A.)

(Continued from page 10)

be available commercially, is the application of a magnetic sound track to motion picture film and the development of attachments by which the pictures may be used in an ordinary movie projector. The magnetic track will have all of the properties of magnetic wire recording.

Prior to the war, most of the truly instructional films were distributed by Encyclopedia Britianica Films of Chicago, although many industrial concerns sponsored considerable numbers of films having more or less educational value.

The almost unlimited use of training aids in the war effort had two important results for postwar training: (a) it provided a lot of materials which can be used directly; (b) the "know how" developed by the collaboration of experienced film producers, technical experts, and visual educationists during the war is already paying off in the increased numbers and improved quality of the training aids that are being produced since the war.

The Armed Forces, during the war, produced thousands of training aids of all types, of which many dealing with basic subject matter, and not restricted, are being made available for civilian use. The U.S. Office of Education, for civilian war training, produced over 450 sound movies with accompanying film strips and manuals which may be purchased at very moderate cost from Castle Films, Inc. of New York or rented from local film libraries. Many of these materials have useful application in Engineering Drawing. Because the teaching power of visual aids is so great, careful planning by the classroom teacher is of prime importance if maximum value is to be obtained.

In using the Encyclopedia Britianica Chemistry films, the department of Chemistry at Purdue provides each student with a set of questions to be answered from the films. Each film is presented in sections, each preceded by an explanation of what is to come, followed by a brief period for making notes. A second showing permits a check-up on points missed during the first.

The Purdue Engineering films were originally shown in a standard lecture room, after which the students returned to the drawing room to apply as much as they could remember. The success of the lettering pictures, in which time is allowed after the explanation of each letter for the class to make it on a specially designed work sheet, was responsible for all subsequent drawing films being accompanied by work sheets so that the student makes from two to four sketches or drawings in a 45 minute motion picture lesson. A specially arranged lecture room, equipped with drawing boards and T-squares is used, so that instruments may be employed in completing the work sheets if desired. The room is equipped with a cream colored "Nucite" chalk board on which the work sheet layouts may be projected by black line lantern slides, so that when the class has finished each problem it's solution may be demonstrated and discussed by the instructor.

The stereograph is an extremely valuable teaching aid in subject matter areas where pictures in the form of stereographic pairs can be provided. The scene will appear to have depth if two pictures are taken from points equidistant from the object and separated by a distance equal to the distance between a pair of eyes, and these pictures viewed simultaneously in such a way that the left eye sees only the left hand picture and the right eye the right hand picture.

A stereographic pair may be made by drawing two mechanical perspectives provided the points of sight are inter-ocular distance apart, measured parallel to the picture plane.

There are several makes of stereo-cameras by which stereo-pairs may be made practically as simply as ordinary photos; stereo-pairs may be made by the use of two identical cameras, similarly adjusted and operated simultaneously. A "stereoly" attachment permits stereo-pairs to be made with a Leica camera; the "Stereo-tack" is a similar device that fits other makes of camera.

Stereo-pairs may be made with a single camera by shifting the camera the interocular distance between shots; if the interocular distance is exceeded, the apparent depth of the picture will be increased but objects close to the camera will be distorted. Slightly more realistic appearance is obtained if the camera is rotated about the center of the scene.

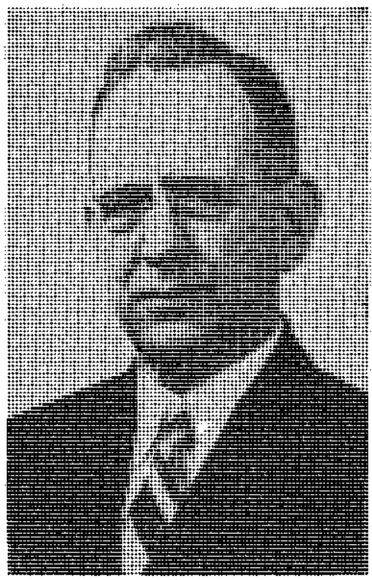
For viewing standard stereographs a regulation stereoscope is used; for stereographs made with miniature cameras, miniature viewers are available. A stereograph may be viewed without special apparatus by interposing a card edgewise between the eyes and the dividing line of the stereograph; with a little practice even the card may be eliminated and the stereographs viewed by adjusting the axes of the eyes parallel. First looking at a distant object, then bringing the stereograph into the field of vision and refocusing the eyes without shifting the axes does the trick. A variation of this method is to interchange the halves of the sterograph and view it thru a hole in a card with the axes of the eyes crossed. A paper "butterfly" mounted on the nose so that each eye sees only its half of the stereograph is said to be effective.

(Continued on page 28)

PROFESSIONAL DEVELOPMENT OF THE ENGINEER

by

Carl L. Svensen
Author, Architect, Engineer



CARL L. SVENSEN
Past President
National Council State
Board of Engineering Examiners

The address published herewith was delivered at the Tenth Annual Convention of the National Society of Professional Engineers in New York on December 2, 1944. Dr. Svensen is Past President of the National Council of State Boards of Engineering Examiners and his views, expecially those dealing with the unity of the engineering profession are most timely. That good progress toward the objectives of Registration is being made, is the definite opinion of one who is in a position to pass judgment.

"It is singular that so little interest should heretofore have been taken in the history of those to whom we are indebted for the arts and inventions best promoting the comfort and elegance of life. Although much has been done, more remains to be accomplished. This new world is to be a theatre of mighty structures for the development of resources, advancing, beyond present conception, the welfare and happiness of our race."

This introduction which points to the development of the engineer and of engineering was not written for this address. Nor was it written in recent years but formed a part of the preface to a book by that early American engineer Henry Howe published in 1846. The title was "Memoirs of the Most Eminent American Mechanics."

It indicates a sense of the relation of the engineer to society and a certain pride in the engineering achievements of that time, while anticipating great developments to come in the future. And so it is that the engineer of every year has developed a forward looking philosophy--of expecting greater achievements and of searching all that is available in science, in materials, and in methods to bring about still greater progress.

The professional development of the engineer as related to registration is well exemplified by this Tenth Anniversary Meeting of the National Society of Professional Engineers composed exclusively of registered engineers--a society devoted to the professional development of all engineers regardless of the branch in which they may practice.

Thus we see this Society as an important factor in the development of the engineer. It is a factor directly related to registration. But this is not one-sided for registration owes much to the N.S.P.E. It is after registration that the N.S.P.E. enters the picture in a big way and provides the machinery for the development of the engineer *"professionally."*

A century or more ago the individual engineer could understand and apply all the known principles of engineering. He could know what science had discovered and could work out the adaptations for use in civilian and military engineering. He was in many ways a scientist, a mechanic, an inventor, and a constructor, with a mental grasp of available knowledge which enabled him to do many kinds of engineering.

With the development of steam power and of electricity, the developments of the age of steel, the developments of the machine age, and the applications of marvelous scientific advances, there have been wrought great changes in the everyday life of all the people. Thus it is that engineering has developed from the simple practices of not many years ago to the complexities of the present with greater changes and advances in the last one-hundred years than in all the years before. All of this progress has come from the utilization of scientific discoveries by the engineer. From this we can expect great changes in the future which will influence civilization in ways undreamed of at present.

The professional development of the engineer parallels the momentous changes in civilization or shall we say that the momentous changes in civilization parallels the professional development of the engineer?

As engineering became a factor in the progress of civilization and affected the everyday life and existence of mankind, it approached the practice of a profession as set out in a Supreme Court definition of a profession which is often quoted and which will stand repetition:

"A vocation involving relations to the affairs of others of such a nature as to require for its proper conduct an equipment of learning or skill, or both, and to warrant the community in making restrictions in respect to its exercise."

Here the interest of the public enters as a factor in the practice of engineering and points to the necessity of setting up certain qualifications to insure competence. One of these qualifications is suitable education. Engineering as a profession had its beginning when it is received recognition in the colleges and universities of our country. It was then that the engineer emerged from the status of of "mechanic" through "eminent mechanic" to "engineer," and registration or license to practice could be expected in the course of events.

So rapid has been the development of engineering that even now the association of "engineer" with "mechanic" still persists but the registration of professional engineers has done much to clarify the terms and enable engineers as well as society in general to distinguish the procedure of the professional engineer from that of the mechanic.

It was not until 1907 that the first engineering registration law was passed in Wyoming. At the end of ten years there were four states, at the end of twenty years there were twenty-three states, at the end of thirty years there were thirty-eight states and Puerto Rico and Hawaii, and in 1944 only two states Montana and New Hampshire, and the District of Columbia do not have registration laws. A registration law was passed in Alaska in 1938. Engineering registration is almost universal as a requirement for practice in this profession.

Registration has many relations to the professional development of the engineer. Its influence is exerted before registration and after registration. Before registration there is the influence on meeting the requirements of education and preparatory experience.

An important correlation is the accrediting of engineering courses by the Engineering Council for Professional Development which originated in a conference on Certification into the Engineering Profession held on February 3, 1932. The National Council of State Boards of Engineering Examiners is one of the sponsoring organizations of the E.C.P.D.

Another relation of registration to professional development which is receiving thoughtful consideration is the classification of "Engineer in Training." Two states, New York and Ohio, have already introduced this classification. The National Council of State Boards has approved this as a desirable relation of the young man to engineering registration and as a means of expressing the intention of becoming professional as soon as the necessary experience has been completed. This appears to be a step in the right direction for the professional development of the engineer. This relation to legal registration may be the way for the maintenance of a professional status and make it possible to remain aloof from labor organizations.

Registration is not the culmination of effort but is simply the beginning of professional practice. It is a time for the engineer to take an inventory of his qualifications and to search out the meaning of the profession of engineering.

The requirement of registration as a condition for the practice of engineering, as a means to obtain employment, or for advancement has made the engineer conscious of the necessity for competence.

The purpose of registration as contained in the Model Law is briefly "to safeguard life, health, and property." Such is a worthy purpose however was bound to have many other good effects. Thus it is that the relation of registration to the development of the professional engineer has been one of many influences.

A most valuable influence on professional development as related to registration is the growing sense of oneness or of professional unity. Registration has taken down the fences which separated engineers into the many and increasing fields of practice. It has furnished a common ground upon which all can meet as just one kind of engineers--registered professional engineers.

Call it a development of engineering consciousness or call it the spirit of a profession, by whatever name or though, registration has rescued engineering from a mixture of trades, crafts, and professions. Registration has revealed the essentials of the profession of engineering and made possible that unity which can only exist in a true profession.

Principle, integrity, independence--these are the elements which characterize a profession.

The engineer has been one who gives and does. He gives himself to the tasks assigned to him and he does them. His interest has been in the successful completion of the work to be done. His work has been so much with the materials and forces of nature that he has given too little attention to his relation to society in general and to the protection of himself and of his profession.

Dr. Wickenden in his excellent re-survey of the Engineering Profession published as "The Second Mile" includes the following paragraph which is packed with thoughts:

"The Engineer, in a society based largely on group relations, needs his profession to safeguard his occupational and economic welfare. He needs protection against unethical competition, against indiscriminate use of the title "engineer," and against all influences which might undermine public confidence in his integrity and competence. He needs protection against those who assume that he is 'just another employee' and against sub-professional groups seeking to act for engineers in the process of collective bargaining. He needs protection against the levelling influences of unionism and of civil service. He needs the benefits of prestige built up through group publicity. He needs a collective instrument for shaping public policy in the realm of his responsibility. It is true that a professional organization is primarily a moral agency and not in itself an economic or political pressure group, but in the long run moral agencies as the more powerful and enduring."

What is the answer to all these needs for the professional development of the engineer and for the development of a public recognition of the profession of engineering? Protection against unethical competition and against indiscriminate use of the title "engineer" is provided in the legal registration of qualified engineers by the State Boards with provision for reciprocal registration.

A natural outgrowth of the passage of registration

(Continued on page 22)

A TALK TO BEGINNING STUDENTS IN ENGINEERING DRAWING

by

C. Higbie Young
Professor of Machine Design
Cooper Union

I have asked your instructor to permit me to say a few words of welcome to you from the Department of Machine Design and Engineering Drawing. We, in this department, are proud of the students that we have turned out in the past and it is in this connection that I want to talk about the work you will do while you are under our jurisdiction this year.

First of all, I probably ought to tell you that we cannot expect to make good draftsmen of you. In the time allotted to us by the schedule this would be impossible. Nor do we feel that it is necessary that you should be an expert draftsman. We do feel, however, that every engineer should have some facility with the language of his profession. Consequently, while we are not attempting to make expert draftsmen of you, we must demand a certain amount of proficiency in your work for this department. Let me show you why this is necessary.

Up to now you have been studying in the public schools, both grammar and high school, and your education has been largely a matter of obtaining factual information or training in simple techniques. From now on, your education will take on a broader aspect; not only must you have the facts, but you must know how to interpret them and how to use them. This is education in its broadest sense. If it were not so, this book, "Marks' Mechanical Engineering Handbook," would be well educated because it has nearly 2200 pages of facts. I am sure you will agree with me that we do not refer to this as an educated book. However, the engineer who uses this book is educated because he knows where to find the facts and how to use them to his advantage. We know that we can't do all this in one year of Engineering Drawing. It will take the four years of your college course in which many departments will contribute their share and it will take many more years of your professional work before you can consider yourselves "educated engineers."

We are going to make a start in this subject. We are going to try to have you learn to think and to act like engineers. For instance, you are going to learn to recognize and define a problem. This is one of the prime requisites for a good engineer. It means that you must be able to take certain data that is given to you and from it recognize what the problem is and so define that problem that you can start working on it. In your Engineering Drawing work, this means that you will have to decide what views are necessary to best picture the object you wish to portray and what dimensions are necessary so that the man who is making the part will get it to the proper size. Early in your work, your instructor will teach you these things, at the same time telling you the "why." Later on in the term you yourself will be required to make the proper selections.

Another thing that is necessary in an engineer is the ability to plan a method of solution. This means establishing a logical attack on the problem and doing first things first. For instance, in Engineering Drawing it may be necessary to make a preliminary sketch, freehand and not to any definite scale, but roughly in proportion. This will aid you in determining what views are necessary, what scale to select so that the drawing will fit on the paper, and to find out what details should be worked up first. Here again, the amount of this type of reasoning which will be left to your discretion will be progressively greater as the subject develops and you become accustomed to this type of thinking.

Probably one of the most important characteristics of an engineer is the ability to do careful and accurate work. Work that is hurriedly or sloppily done generally tends to be inaccurate. Unfortunately in school work we have to expect errors and mistakes, and many of you will probably feel that the errors you make are not really glaring mistakes. But remember that the bridge can fall down for a mistake in the decimal point just as readily as it can from a mistake in theory. We are going to emphasize this in our teaching by requiring you to be painstaking and careful in the execution of your work. We are going to demand relatively high standards. Not only because such standards are necessary to make you a draftsman, but because such standards are the earmarks of a good engineer. This means that your lettering will have to be neat, that your linework will have to be sharp, with careful attention to the alphabet generally used in Engineering Drawing. Here again, we are not going to expect the impossible at first, but we will demand that you show progress throughout the whole term.

This leads to still another characteristic of a good engineer. He is a man who is always growing in his profession. So throughout the year, we are going to expect you to grow; that is, we are going to expect you to assume more and more responsibility in your work. For instance, when we feel we have given you sufficient instruction in letering or in linework, the two first projects in your course, we will hold it as our prerogative that you are no longer to be merely criticized for poor lettering but you will be penalized for lettering if poorly done. And so, in all other phases of the subject, we will not consider that, once you have been given the instruction in any one phase, you can then put it away in a pigeon hole and forget about it. We will expect you to make use of the instruction you have been given and will grade you on the application of the principles you have been taught.

If we are successful in this type of instruction, you will find occasion to use the ideas and techniques that we have been discussing in all of your engineering work. You will find these a very important tool in the work of the upper years of your college course.

Please do not misunderstand me. The primary reasons for the subject of Engineering Drawing being included in the curriculum is to teach you good drafting techniques. You are going to have to learn to make acceptable drawings because an engineer must be able to convey his ideas to others from his sketches and drawings. But we, as well as the other instructors in your freshman year, feel that it is essential that we start this early in your training to teach you as well, some of the methods and thinking an engineer uses in his everyday work.

Let me close by wishing you a profitable and interesting year and expressing the desire that all of you successfully pass the course.

(Continued from page 6)

by graphical methods, as they are as valid and can be as accurate as numerical solutions. Therefore, the full development of graphical methods of attack on physical problems is as important and as necessary as the development of algebraic and functional mathematics, for the former in many instances will prove more illuminating and predictive than the latter.

With two possible methods of attack on physical problems, it is little short of ridiculous that we should develop one systematically and intensively while we develop the other only as a byproduct and in isolated instances. The failure fully to systematize, correlate and develop the possibilities of graphical methods seems to me to be one of the great failures of American scientific education.

This failure is, however, our great challenge for the future. It says that the full possibilities and the ultimate stature of Scientific and Engineering Graphics are only beginning to be seen. Certainly the possibilities of developing a basic tool for all science is the most important challenge that we could possible have. It seems to me to be of the greatest importance for us to emphasize this broader concept of our work so that it may become an integral part of American education.

OBITUARY NOTICE OF PROFESSOR PHELPS, RENSSELAER

THE DRAWING DIVISION OF THE AMERICAN SOCIETY OF ENGINEERING EDUCATION

Professor Guy M. Phelps, Head of the Department of Engineering Drawing at Rensselaer Polytechnic Institute was a member of The Drawing Division for over a decade. He was Chairman of The Division's Drawing Competition in 1941 and for the past three years served as a Director. He was active, interested, and always willing to cooperate in the interest of the Society.

We as members, are deeply conscious of the fact that in his passing we have lost a loyal friend and earnest worker. Therefore be it

Resolved

That the Drawing Division of The American Society of Engineering Education unite in expressing their appreciation of his work, his devotion and friendship and request that this expression be spread on the minutes of The Division and a copy be published in the Journal of Engineering Drawing.

(Continued from page 16)

laws was the inception of the National Council of State Boards of Engineering Examiners in 1920. The National Council composed of the State Boards provides an advisory and coordinating agency to assist in a more efficient and uniform administration of state registration laws. It provides a national clearing house and information bureau for matters pertaining to the legal registration of professional engineers. It serves State Boards, State Committees, Engineering Societies, individual engineers and the public. This Council now has a membership of forty-eight legally constituted Boards of Registration with a total of over 75,000 registrants. Through the influence of such a Council and these thousands of registered engineers the public is learning to understand the value of integrity and competence in engineering work. When such knowledge becomes more universal the incompetent will no more attempt to use the title of engineer than a "quack" to assume that of a doctor of medicine.

Registration has made possible the professional development of the engineer as a recognized member of a legalized profession. But after he is registered the engineer has found many difficulties which will have to be overcome just as other professional men have to overcome difficulties affecting their profession.

As Dr. Wickenden has stated in the quoted paragraph, the engineer needs protection against those who assume that he is just another employee and against sub-professional groups seeking to act for engineers in the process of collective bargaining.

What is the answer? With registration it has become possible to identify the engineer. This has made possible the development of group consciousness--of recognizing the unity of a profession and of those who compose the profession. From such a consciousness has developed this National Society of Professional Engineers which provides for the protection of all professional engineers and for their professional development. It is a society with certified members, every one certified by a legally constituted State Board. Thus we find the important relation of registration to the professional development of the engineer.

This relation provides the basis for the uniting of all engineers regardless of branch or specialized practice into one single body of professional engineers with a single purpose--professional development. In this relation of registration to the professional development of the engineer, is found the means, through the National Society of Professional Engineers to provide for the needs as stated in the quotation:

The need for prestige through group publicity.

The need for a moral agency in support of the professional elements of engineering.

Registration has developed a broader view of engineering--a national in place of a local view--a sense of the inclusiveness of all engineers in place of an individualistic attitude--in short the development of a cooperative viewpoint. The extent to which engineering has become inclusive of so much that is scientific, theoretical, and systematic in study and in application to design, construction, and operation has caused the dawn of a new era which requires the services of many highly specialized engineering consultants. This is inherent in any profession. The general practitioner cannot be expected to know and to do everything that is included in his profession. Registration has brought this forcibly to the attention of the engineer and the public is beginning to have a clearer conception of the professionalism of engineering. Through registration there has developed the identification of the engineer of the practice in which he excels. This in turn has spurred him to greater development of his particular talents. Registration has thus developed a consciousness of the interrelation of the various branches of engineering, of the consulting specialists in each branch, and of the distinction between a skilled technician and a professional engineering specialist.

This development has led to an increasing use of the specialist, for engineering matters which are beyond the particular field of the general practitioner. Of the greatest value is the development of the professional engineer in coordinating the work of these many specialists and of being able to locate or to know them through the facilities of legal registration.

Registration has quickened the development of a professional consciousness in the engineer. Nowhere is this more apparent than in the engineer who has obtained his certificate of registration by successfully passing a written examination. Study and review in preparation lead to self-examination of qualifications and of the meaning of professional engineering. This professional development of the engineer leads further to a realization of the necessity for a continuation of studies and research and association with other engineers for discussion and mutual stimulation.

From the simple past to the complex present how is registration related to the professional development of the engineer?

Registration has developed in the engineer, a quickening interest and an understanding of his responsibility to society.

Registration has developed in the engineer, thoughts which point along the path to leadership in the councils of society, to participation in civic affairs, in the executive and legislative branches of government, and in all the spheres of influence in life and in living.

Registration has provided a screening medium to eliminate the unqualified.

Registration has spot-lighted the necessity for adequate education, adequate preparatory experience, adequate standards, and adequate ethics.

Registration has started to focus the light of public attention on the profession of engineering.

Registration has established the identify of the engineer.

The relations of registration to the professional development of the engineer are suggested by such words as: education, experience, culture, ethics, responsibility, public trust, professional tradition, competence, and progress.

The professional development of the Engineer is evidenced by the examples of individual practice, dissemination of knowledge of engineering registration to the public and the strength and representative character of the engineers in this National Society of Professional Engineers.

As a closing thought the following quotation from Oliver Wendell Holmes may well be kept in mind by the professional engineer.

"I find the great thing in this world is not so much where we spend, as in what direction we are moving."

Reprinted from THE AMERICAN ENGINEER, February, 1945

Determine the center and radius of a sphere that contains two given points and is tangent to two given planes.

* * * * *

This column is designed for the entertainment and improvement of those who enjoy putting descriptive geometry to work for the thing it is credited with doing best--training one in clear, logical and constructive thinking. It is open to contributions of progressive professors' pet personal puzzling problems. A year's free subscription to the Journal will be entered for the reader who first submits any problem accepted for publication. A correct solution shall accompany each problem offered.

A year's subscription is also presented the reader who submits, in time for publication in the ensuing issue, the best solution. If a drawing is required, one done in ink shall accompany it as copy for reproduction. All constructions must be Euclidean.

It is planned to make this corner a continuing feature of the Journal. The question mark as its head for this initial appearance has a dual significance: first, to warn the reader that he is about to be challenged intellectually; second, to inquire of him an appropriate name for permanent use. Here are some suggestions, none of which seems quite right: Brain Teasers; Can You Solve It?; Euclid Gone Mongean; Euclid Turned Descriptive; P.P.P.P.P. (Pet Personal, etc.). A free subscription for the first acceptable suggestion.

HOUSE PLANNING AT THE OHIO STATE UNIVERSITY

by

Wooster Bard Field

For about 35 years the Department of Engineering Drawing at The Ohio State University has been scheduling classes in House Planning designed chiefly for students in the School of Home Economics.

Until about ten years ago the work extended over two quarters, the first quarter being devoted to a study of orthographic projection fundamentals as they would be employed in our house planning projects and the second quarter to House Planning itself. In recent years it has become necessary to administer the work in but one quarter which reduces our orthographic projection study to about eight contact hours and slows down our subsequent house planning graphics accordingly. Classes are scheduled in three two-hour periods each week with no scheduled lecture hour. (Naturally an ability to plan well can come only by evolving plans under various problem conditions.) Our textbook "House Planning" (McGraw-Hill Book Co.) enables us to assign for outside study much that was formerly presented in lectures. With the book on the drawing table, the student has detailed direction in working through each project.

The student is urged to do her own thinking with the attitude that she is the prospective owner of the house and that the instructor is the architect who is counseling her in the planning; that it is the function of the architect to suggest rather than to dictate and to point out fallacies in the students thinking and to make general suggestions for improvement.

This type of instruction creates enthusiasm on the part of the student who feels that the house is her own creation rather than a dictated solution to her problem. Many of our students have successfully planned or remodeled their own homes and in one outstanding case designed and built quite a number of houses for sale.

House planning obviously is not a "drawing a house plan". It is an intricate thought process that involves study in many fields. The following outline will give some idea as to its extent and help us to realize that the actual drawing of the preliminary sketch floor plans on paper is the veriest skeleton representation of the whole picture.

HOUSE PLANNING OUTLINE

- Information that must be furnished by the owner
  - Family personnel.
  - Mode of living.
  - Family budget and amount allowed for housing.
  - Type of loan. Various amortization periods.
  - An idea as to type of architecture, details, etc.
  - An idea as to the type of plan favored.
  - One or two stories.
  - A description of the building site. (Sometimes a contour map, tree locations, etc.)
- Problems normally solved by the architect
  - Determination of the amount of house to build for money allowed.
  - Approximate and accurate methods of estimating cost.
  - Orientation
    - for insolation.
    - for view.
    - for entrance facilities.
  - A study of general plan schemes (in consultation with the owner.)
  - Circulation systems
    - Halls and passageways.
    - Stairways.
    - Doorways and doors.
  - Facilities opening into hallways.
    - Closets for outdoor clothing.
    - Lavatories.
    - Linen storage.
    - Clothes chute.
    - Telephones, etc.
  - Detailed study of each room
    - Living room.
    - Dining room.
    - Kitchen.
    - Bedrooms.
    - Dressing rooms.
    - Baths and lavatories.
  - Material textures and color study.
  - Fenestration (in connection with each room and house as a whole.)
  - Artificial lighting, etc.
    - Electric circuits.
    - Fuse panels.
    - Location of light outlets.
    - Type of luminaires.
    - Foot candles required in each location.
    - Switches and switch locations.
    - Glare and other eye strain.
    - Convenience outlets.
  - Heating systems.
  - Finished hardware.
  - Insulation.
  - Weather stripping.
  - Interior decoration including wood finishing, color schemes, etc.
  - Landscaping.
  - General architectural service, contracts, superintendent, etc.

(Continued on page 26)

(Continued from page 24)

With the outline shown on page 24 before us we can readily envision what a complete study of House Planning must mean.

The problems listed as "solved by the architect" are so noted because very few prospective home builders have the slightest idea as to how to go about their solution. The student broadly educated in Home Economics should certainly know how to at least criticize intelligently the work that the architect has done on her housing problem.

What is even more to the point, every woman should be able to walk into the home she proposes to rent or buy and look at it intelligently and in detail. The above outline might just as well be titled "A House Buying Outline". In renting, buying or building a house the problem is largely the same and perhaps in the last analysis our course should be called "Personal Housing" rather than anything else.

One of the very important things that any prospective house builder should know is the meaning of "architectural service". The common idea that an architect merely "draws plans" is about as narrow as the statement that the physician merely "writes prescriptions". The architect's preliminary sketches, his working drawings and details together with his written specifications are but the visable documents that have evolved out of his study of the problem. His services are personal and very involved and their extent is appreciated by only those who have worked with him or by one who has had some training in house planning.

The architect's training and above all his experience and natural ability enable him to inject into the home building project much that is intangible but nevertheless of greatest import in the production of true excellence which means economy, comfort, efficiency and beauty.

At the end of the quarter a rather complete planning problem is solved and carefully graded. The grade on the problem usually fixes the student's grade in the course.

The final problem is graded with the following items in mind and the student has a copy of this list to serve as an outline for her work.

1. Comparison of the house coat with family income and accepted budget.

2. General orientation of rooms as to the site and the directions.

3. Interrelation of rooms:

   Family mode of living.
   Sizes and proportions of each room.
   Furniture spaces. Watch the swing of doors.
   Closet space.
   Fenestration.

4. Circulation:

   Halls and passageways.
   Space occupied in the plan.
   The stairway:
      Riser and tread proportions and dimensions.
      Type of plan for given conditions.
      Head room at closest places.
      Stair wells.
      Ballustrades and handrails.

5. Fireplaces and flues:

   Special attention to flues in second floor plan.
   Proportion of flue sizes to fireplace openings.

6. Walls to take plumbing pipes.

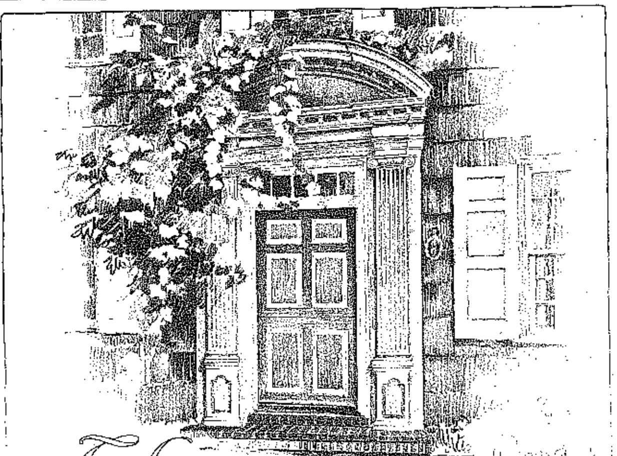
   Be careful about soil stacks in both stories.

7. Show location of plumbing and light outlets and switches.

8. The north point must be noted so that the plan may be judged for orientation.

9. Delineation and scale.

The view of the subject that we are able to open up even in the restricted time alloted to us has caused many students to inquire as to the possibility of further study along this line. Unfortunately we are not at present able to satisfy this demand.



The DOORWAY

seems very like a person recognizing the importance of his guardianship over the household. He may greet the stranger quite simply or with the formality of a dignified old gentleman and, though he may look askance at first, who could be more gracious than he when he stands aside to let me enter!

The STAIRWAY,

the fireplace in the living room and the main entrance doorway are the natural focal points for architectural accent in the well designed residence.

The LIVING ROOM

where quiet comforts reign
And all the family rests from daily toil,
Enjoying each the other, or fine books
Or friends we love and like to entertain:
What matter be it great or small, we know
It is beloved and always will be so.

W.B.E.

The Beauty of the house is Order. The Blessing of the house is Contentment. The Glory of the house is Hospitality and the Crown of the house is Godliness.

HOUSE PLANNING

is the effort to create a structure in which these Qualities may grace the home life of the dweller.

(Continued from page 14)

While the application of stereographic illustrations to textbooks has been attempted with limited success, filter systems using color separation or separation by polarized light yield better results and are also applicable for projection on a screen.

For text illustration by color separation, the halves of the stereograph are superimposed, one half being printed in blue or green and the other in red. When the combined picture is viewed thru a pair of filters of identical color qualities, the stereoscopic effect is obtained. Stereographic projection by color separation is accomplished by using two projectors with a green or blue filter on one and a red filter on the other and viewing the projected images thru a similar pair of color filters.

Stereoscopic vision by polarized light offers two principal advantages over color separation by providing pictures in their true colors and with about 90% of unfiltered brilliancy.

"Polaroid" has the property of polarizing practically all of the light passing thru it. One method of projection is accomplished by substituting for the color filters a pair of "Polaroid" filters oriented at 90° to each other and viewing the picture thru "Polaroid" spectacles similarly oriented. An aluminized screen must be used to preserve the polarization.

There are available several stereoscopic projectors in which two complete projectors are incorporated in a single unit. Stereographs made with the "stereoly" and "stereotack" may be projected by attaching these devices to suitable projectors and using either color or "Polaroid" filters for projection and viewing.

Just prior to and during the war, there was developed a method whereby "Polaroid" material is used in photographic emulsions instead of silver. Transparencies in which the halves of a stereographic pair, made with properly oriented "Polaroid" material, are superimposed, appear in 3-dimensions when viewed thru "Polaroid" spectacles. They may be used in an ordinary slide projector and an aluminum screen for stereoscopic projection, or they may be applied in reverse to the back of a sheet of plastic and coated with aluminum for use as stereographic pictures and illustrations.

Outstanding work in the development of 3-dimension projection by means of "Polaroid" has been done by Professor John T. Rule of Massachusetts Institute of Technology; "Vectgraph" slides for Descriptive Geometry authored by him are available from the Society for Visual Education of Chicago.

There have been limited applications of the color-separation and "Polaroid" methods to motion pictures, but the results obtained thus far have not been sufficient to justify the extra effort required to make and use them. From time to time information has been published describing methods of obtaining the depth effect with standard films and specially constructed screens but to date nothing tangible is available. Television in full color is a reality; perhaps electronics holds the key to simplified 3-dimension projection.

This discussion has been rather superficial due to lack of space and scope of subject matter; for those desiring further information on the items mentioned the following references are recommended:

Texts: Preparation and Use of Visual Aids, by Hass & Packer, Prentice-Hall, 1946

Visual Handbook, by E. C. Dent, Society for Visual Education, Chicago

Audio-Visual Aids by McKown & Roberts, McGraw-Hill, 1940

Magazines: Film World, VerHalen Publications, Hollywood, Cal.

Business Screen, Business Screen Magazines, Chicago

Educational Screen, Educational Screen, Inc., Chicago

Reports on Use of Training Aids in War Effort

"More Learning in Less Time" - U.S. Navy Training Aids Manual

Business Screen:
- #5-1945 "Training Film Program for U.S. Navy"
- #1-1945 "Army Pictorial"
- #3-1946 "Film Training program for Industry"

Department of Public Instruction, Lansing, Michigan - "Swords into Plowshares" - A survey of Armed Forces Training Methods.

U.S. Office of Education, Bulletin #9 "Use of Training Aids in the Armed Forces".

The texts contain detailed information on the preparation and use of the various types of Aids and the appendices contain complete lists of sources of materials and equipment. The magazines contain up to the minute information on equipment, materials, and methods in the form of Articles and advertisements. The reports on the war effort reveal how the much talked of results were obtained and suggest how civilian education may profit by the use of similar methods.

NOTE: Professor Rising would be glad to attempt future articles in particular areas of the field of Visual Aids in Drawing if there is a desire on the part of the subscribers to have them. I will be pleased to have you write and give me your reactions and thoughts. --The Editor

(Continued from page 12)

Professor Cleary secured a private dining room for off-campus luncheon and Professor Rising prevailed upon Prof. Howe to present the highlights of the St. Louis summer school. Your secretary sent out notices to Drawing Department heads of all eight colleges in the Section, inviting both members and non-members of ASEE to attend.

Twenty-five representatives from six of the eight schools met for luncheon at Coddington Tavern prior to the first meeting of the whole Section. Prof. Cleary reminisced about our bull session on the train, which culminated in the luncheon and Prof. Howe gave an excellent paper on the Highlights of the Summer School. Prof. James Rising of Syracuse was the emcee.

Everyone seemed to appreciate and enjoy the opportunity afforded to talk with others in the Drawing and Descriptive Geometry field and plans are underway to organize a Division within the Section. The meeting in the Fall of 1947 will be at Schenectady, with Union, R. P. I. and General Electric Company co-hosts and tentative plans call for another Drawing Division luncheon.

The Kansas-Nebraska section of A. S. E. E. resumed their annual meetings on November 22nd and 23rd of 1946. At the University of Kansas, these pleasant and helpful get-to-gethers had been discontinued through the war years. The meetings of the ENGINEERING DRAWING DIVISION were presided over by Professor F. A. Russell of the Department of Engineering Drawing of the University of Kansas. Discussions were conducted on the subjects:

1. Visual Aids in Engineering Drawing by F. A. Smutz, Kansas State College
2. A report on the St. Louis Engineering Drawing school, by T. T. Aakhus, University of Nebraska and J. N. Wood, Kansas State College
3. Your Teaching Load, What are you doing about it? by E. Bruce Meier, University of Nebraska and C. J. Baer, University of Kansas.
4. Outline of and advance course in descriptive geometry by E. J. Marmo, University of Nebraska.

J. S. Blackman of the Department of Engineering Drawing of the University of Nebraska was elected chairman for the year 1947. The 1947 Meeting is to be held on the campus of Kansas State College at Manhattan, Kansas.

* * *

The mid-winter meeting of the drawing division of A. S. E. E. was held at Brooklyn Polytechnic Institute on Saturday, February 1st. Some papers were presented, but the principal business transacted was the lay-out of the program for our annual meeting. The annual meeting of A. S. E. E. is to be held at the University of Minnesota June 18th-21st. Details of the program will be published in the May issue.

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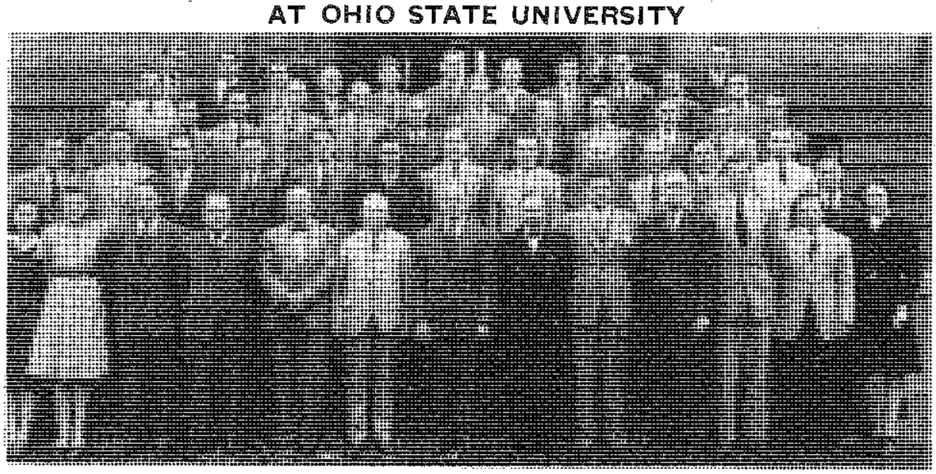
The alphabet used in the Frontispiece for this issue of the Journal is adapted from an old Spanish "work book" from Madrid dated 1513 A.D.

ENGINEERING DRAWING DEPARTMENT STAFF AT OHIO STATE UNIVERSITY



DEPARTMENT OF ENGINEERING DRAWING
OCTOBER 31, 1946

Row 1—Martha Merwine, Eileen Chandler, Charles Vierck, Lawrence Jones, Allen McManigal, Robert Meiklejohn, Ralph Paffenbarger, Owen Williams, Hollie Shupe, Wooster Field, Laurence Soderberg, Harold Whittemore, Wilma Russell.

Row 2—Dallas Dupre, William Kearns, Norman Gatsch, Harry Hawley, Samuel Rickly, Clyde Kearns, Eldis Reed, Fairfax Watkins, Charles Cooper, Alfred Philby, Richard Parkinson, Frank Koran, Wilson Long.

Row 3—Charles Murray, Max Puderbaugh, Loren Staker, Selden Steiger, Glen Hoover, Henry Harris, Keith Jacobs, Harold Oglevee, Paul Machovina, Harry McCully, Lloyd Yates, James Tilberry.

Row 4—Billy Eads, Stanley Ashyk, Thomas Smith, Richard Kelly, Harvey Appleman, Howard Goard, Harry Brueggeman, Charles Hall, Willard Andrews, Alvin Cooper, Harold Rainforth, Willard Brown, David Ekey.

This group from Ohio State University exemplifies in numbers what has happened to the size of drawing departments in most engineering schools throughout the United States.

REPORT OF THE BIBLIOGRAPHY COMMITTEE

by

Professor H.H. Fenwick, Co-Chairman of the Domestic Division
University of Louisville

(For period from May 1946 to December 1946)

NEW AND REVISED BOOKS

AUTHOR	TITLE	ED.	PUBLISHER	YEAR	PAGES PLATES	PRICE
Carini L.F.B.	Drafting for Electronics.	I	McGraw-Hill	'46	506	$6.00
Carter I.N. & Thompson H.L.	Engineering Drawing Practice and Theory.	II	International Textbook Co.	'46	462	3.00
Coover	Workbook in Mechanical Drawing.		McGraw-Hill	'46		
Hoelscher R.P. & Springer C.H. & Pohle R.F.	Industrial Production Illustration.	II	McGraw-Hill	'46		
Hood G.J.	Geometry of Engineering Drawing.	III	McGraw-Hill	'46	387	2.75
Katz H.H.	Aircraft Drafting.	II	MacMillan Co.	'46	392	4.75
Lawson P.J.	Perspective Charts.		Reinhold Pub. Corp.	'46	8 charts	2.50 1 set
Luzadder W.T.	Fundamentals of Engineering Drawing.	Rev.	Prentice-Hall	'46	621	
Mummert H.B.	Problems in the Geometry of Engineering Drawing.	I	John S. Swift St.Louis, Mo.	'46	100	
Orth H.D. & Worsencroft, R.R. Doke H.B.	Basic Engineering Drawing.	I	Irwin-Farnham Pub. Co. Chicago, Ill.	'46	346	3.50
	Problems in Basic Engineering Drawing.	I	"	'46	82	2.50
Spencer H.C. Grant H.E.	The Blueprint Language.	I	Pitman Pub. Co.	'46	440	5.00
Standards	Drawings & Drafting Room Practice (1946 American Standards)	Rev.	A.S.M.E.	'46		1.50
Teichmann	Airplane Design Manual (For students and Draftsmen)		Pitman Pub. Co.		440	5.00
Turner W.W.	Free Hand Sketching for Engineers	Rev.	Ronald Press	'46	97 sheets	2.50
"	Basic Problems in Engineering Drawing	Rev.	Ronald Press	'46	102 sheets	2.50

MAGAZINE ARTICLES

AUTHOR	TITLE	PUBLICATION	VOL.	PAGE	MONTH	YEAR
Allen A.H.	Layout Reproduction Systems. (Photography)	Steel	117	98-6	Nov. 26	'45
Archer N.B.	Layout of Cam Locks.	Am. Mach.	90	139	Apr. 25	'46
Cavern G.	Combined Drawing and Instruction Sheets.	Am. Mach.	90	111	Oct. 24	'46
Cole G.N.	Dual dimensioning of drawings for machining and casting uses.	Product Eng.	17	398-400	May	'46
Drafting aids	Drafting aids to relay profiling, contourograph for profiling terrain etc.	Electronics	18	316.	Oct.	'45
Drafting practice	Drafting-room practice with respect to interchangeable components on unification of engineering standards.	Machine Design	18	133-6	Feb.	'46
	Drawing-office Radius curve	Engineer	102	152	Aug. 16	'46
	Robot Rembrandt, a new device facilitating drafting-room work.	Mach.	52	186	Aug.	'46
	Robot pencil for quick sketches.	B.S.N.S.W.	--	60	June 29	'46
	Universal Boardmaster Drafting Machine.	Mach.	52	203	Aug.	'46
Gladman C.A.	Drawing office practice in relation to inter-changeable components.	Institute Mech. Eng. Jour. & Proc.	152	Proc. 388-401	-	'46
Halden	Halden continuous photo-printing machine.	Engineering	160	306-7	Oct. 19	'45
Harker G.F.H.	Drawing tangents and normals to plane curves.	Engineering	161	209-211	Mar. 1	'46
Haworth A.M.	Cylindrical draughting machine. (New type of drawing board)	Electrician	135	480	Nov. 2	'45
Illumination	Lighting the drafting room. Fluorescent lighting.	Arch. Record.	99	64	Jan.	'46
Knickerbocker C.J.	Calculating cement raw mix graphically	Rock Product	49	77	Mar.	'46
Steinberg E.B.	Simplifying the Construction of Nomographs.	Mach. Design	18	123-6.	May	'46
Stephenson E.A. Hains D.D.	Preparation of Contour Maps.	Oil & Gas. Jour.	45	115-116	Aug. 17	'46
Stowell H.W.	Graphical division of the circle.	Am. Mach.	90	147	Mar. 14	'46
Tharratt G.	Production Illustration.	Jour. Eng. Edu.	37	140-8	Oct.	'46
Thompson J.E.	Handling drawing changes to insure promptness and accuracy.	Product Eng.	17	226-9	Mar.	'46

INTERNATIONAL TEXTBOOK COMPANY

Scranton 9, Pennsylvania

February, 1947

To Professors of Engineering Drawing and Descriptive Geometry:

Two important books in our Mechanical Engineering series are Carter and Thompson's ENGINEERING DRAWING, PRACTICE AND THEORY, Second Edition, and Bradley and Uhler's DESCRIPTIVE GEOMETRY FOR ENGINEERS, Second Edition. You may be familiar with these books, but if not, here are a few brief facts; and we hope you will allow us to send examination copies at our expense.

ENGINEERING DRAWING, PRACTICE AND THEORY ($3.50) meets the needs of engineering students for a textbook covering fundamental elements of engineering as outlined in conventional drawing courses. Larger than most books on the subject because of an 8½ x 11 format, this work offers 869 valuable illustrations, sharply reproduced for a clearer understanding of complex layouts. Prepared in logical order, and offering an appropriate selection of topics for comprehensive problems, this 462 page book avoids waste motion and time. A problem book ($2.50) containing 160 perforated, 11 x 8½ plates, accompanies this textbook.

DESCRIPTIVE GEOMETRY FOR ENGINEERS first supplies fundamental principles, then their application to engineering problems. A special feature is the chapter on Hip and Valley Angles for Roofs of Buildings, the connecting link of the fundamentals in the application to practical problems. The 10 principal angles and bevels are solved by the successive projection and revolution methods. The authors introduce the method of traces for more economical solving of many of the problems. Throughout, methods most essential in making drawings have been developed to a high degree of utility. Totaling 266 pages, with a format 5 3/4 x 8 3/4, and 246 illustrations, this textbook is accompanied by a problem book ($2.00) containing 157 perforated plates, measuring 9 x 12.

Let us be of service.

Yours sincerely,

Lawrence W. Tice

Lawrence W. Tice, Manager
College Department.