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T OF THE ARMY FIELD MANUAL

MILITARY TRAINING AIDS

DEPARTMENT OF THE ARMY FIELD MANUAL FM 21-8

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MILITARY TRAINING AIDS



DEPARTMENT OF THE ARMY SEPTEMBER 1950

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By ORDER OF THE SECRETARY OF THE ARMY:

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FOREWORD

This manual is designed to help you, the instructor. It is a storehouse of ideas.

First adopt, next adapt, then become adept in their use. Accept them as your own. Tailor them to fit your needs.

They are very important toward the success of your program of instruction. *Use* them.

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CHAPTER 1

GENERAL

1. PURPOSE AND SCOPE

This manual is published as a guide to provide military personnel with information pertaining to the procurement, construction, and use of training aids. This includes standardized Department of the Army training aids centrally procured and distributed through normal supply channels, and useful information in general that should be helpful in the local preparation of different types of training aids. It contains a discussion of value, use and categories of training aids, equipment, and facilities.

2. PUBLICATIONS

- a. Information on training aids also is included in many other Department of the Army publications. Utilizing these publications, an instructor can find ideas that will assist him in the development of a training aid suitable for any military subject. An index of field manuals and graphic training aids is contained in SR 310-20-3 which is a catalog of all current Army training publications. Other Department of the Army publications, many of which are of special interest to the Army instructor, are listed in SR 310-20-4 and SR 310-20-5. These Special Regulations supersede portions of FM 21-6.
- b. SR 110-1-1 is the index of Army motion pictures and film strips (see par. 7) approved by the Department of the Army. Information pertaining to the correct use of these projection aids is included in this manual.
- c. FM 21-5 covers the principles of military training and gives detailed explanations of the proper selection and use of training aids.
- d. Many publications contain suggestions for local preparation and construction of various aids. Some manuals have been published as instructional guides for the use of certain De-

partment of the Army standardized trainers and instructional kits, such as TM 5-9990, (Kit Instruction, Map Reading).

e. There also are various catalogs, indexes of training aids, and general information of available training literature published by schools of the different arms and services which usually are on sale at the school book store. Additional information may be obtained by writing to the school. A list of service schools follows:

The Infantry School, Fort Benning, Georgia.

The Artillery School, Fort Sill, Oklahoma.

The Antiaircraft Artillery and Guided Missiles Branch, The Artillery School, Fort Bliss, Texas.

The Armored School, Fort Knox, Kentucky.

The Chemical Corps School, Army Chemical Center, Maryland.

The Signal Corps School, Fort Monmouth, New Jersey.

The Ordnance School, Aberdeen Proving Grounds, Maryland.

The Quartermaster School, Camp Lee, Virginia.

The Transportation School, Fort Eustis, Virginia.

The Finance School, St. Louis, Missouri.

The Armed Forces Information School, Carlisle Barracks, Pennsylvania.

The Military Police School, Camp Gordon, Georgia.

The Chaplains School, Carlisle Barracks, Pennsylvania.

The Special Service School, Fort Monmouth, New Jersey.

The Ground General School, Fort Riley, Kansas.

The Engineer School, Fort Belvoir, Virginia.

The Adjutant General School, Camp Lee, Virginia.

- f. SR 355-310-1 contains lists and descriptions of publications, training aids, and services, including—
 - (1) Discussion material.
 - (2) Film service.
 - (3) Map service.
 - (4) Pamphlets and information manuals.
 - (5) Poster service.
 - (6) Armed Forces Press Service.
 - (7) Armed Forces Radio Service.

Although these regulations were designed primarily for instructors of the Troop Information Hour Program, information contained therein is valuable to instructors in many fields of military training.

3. DEFINITIONS

- a. Training aids consist of all physical materials (exclusive of publications and textbooks) which ar prepared especially for the teaching of military subjects or instruction in the utilization of Armed Forces equipment. Operational equipment will be considered a training aid only when used for training purposes or as a component part of a training device.
- b. Training aids can include anything used in training; however, for the purpose of this manual and in order to limit the scope, training aids are classified as follows:
 - (1) Motion pictures.
 - (2) Film strips, slides, transparencies.
 - (3) Telecasts for training purposes.
 - (4) Recordings.
 - (5) Graphic aids (consisting of printed matter, such as charts, schematic diagrams, posters, flat illustrations, pictorial literature, and similar items).
 - (6) Training devices (consisting of threedimensional aids, such as models, miniatures, "cutaways," mock-ups, and those complex mechanical or electronic special devices such as synthetic trainers, mechanized evaluators,

- simulated operational systems and similar items).
- (7) Training equipment includes such items as blackboards, chart easels, projection and sound equipment, practice rounds, and certain training equipment listed in tables of allowances and tables of organization and equipment.
- (8) Training facilities consist of permanent and semipermanent aids to training, such as ranges, obstacle courses, and all specially designed training areas.

4. VALUE OF TRAINING AIDS

- a. Studies have revealed that approximately 80 percent of all learning is accomplished through the sense of sight; therefore, the use of pictures, charts, models, and similar training aids is of great importance. Training aids cannot replace an instructor. However, a good training aid, when properly used, can help fix student attention, arouse interest, quicken the learning process, and improve retention of what the student has been taught.
- b. Training films make use of the national habit of acquiring information from motion pictures. They appeal to two senses and transfer the audience to a realistic portrayal of many phases of military training that otherwise could not be presented, without the use of expensive equipment, lengthy rehearsals, and considerable preparatory time. Procedures can be demonstrated at normal speed or in slow motion so that every member of the audience can see exactly what is taking place. Training films set uniformly high standards of achievement because they show operations and procedures as performed by experts.
- c. Graphic aids often are used to present, in miniature or in magnification, the essential elements of a situation or object. The diagram, pictorial analysis, and enlarged detail of a chart frequently are not only the best, but the only way of successfully presenting certain subject matter.
- d. Training devices often may be used as substitutes for actual objects in certain phases of applicatory training. An example is the sighting and aiming bar which assists the

soldier to learn the correct sight picture. Schematic models reduce the principles involved to their simplest possible form and bring those principles within the realm of the soldier's previous knowledge. For example, it would take considerable time to describe the mechanism of the M1 rifle to someone who never has seen the weapon: however, by means of a model, the process would be simplified. Many complex items of equipment consisting of a number of component parts can be shown to advantage disassembled and each part mounted on a display board in a manner that would indicate how a part fits into the assembled item. Special devices are used in synthetic training and are complex systems normally not produced locally.

5. USE OF TRAINING AIDS

a. The proper use of training aids requires thorough preparation on the part of the instructor. Training aids should be a planned part of the instruction in all subjects for which they are intended. Therefore, the instructor first must be completely familiar with their availability, and their advantages and limitations when used singly and in combination. Before using a training film or film strip in a class, the instructor should study it, several times if necessary, in order to become thoroughly familiar with the contents. He should plan in advance the necessary introduction and discussion that should come before and after the showing of a film. Instructors should consider such factors as-

Will it fit into the plan of instruction?
Will it help attain the objective of the lesson?

Is it adapted to the group?

b. A blackboard will be found useful both indoors and outdoors for certain kinds of illustrations. Maps or sketches, drawn or developed on the blackboard, help present a clear picture to the class.

- c. Charts and drawings made to represent a fact, or an idea, are used primarily to focus the attention of the audience. The drawing should represent the thought so clearly that few words or figures are required.
- d. Maps on which operations are indicated should be scaled large enough so that the symbols used can be seen with ease by students in the back of the room. A map scale of 3 inches to a mile is sufficiently large for use in a room that will hold an audience of 100 students. In using movable symbols, it is desirable for the instruction to have an assistant to move the symbols as the instructor proceeds with his lecture.

6. ADDITIONS AND CHANGES TO MANUAL

- a. Training aids become obsolete because of constant changes of equipment, new equipment, and newer methods of presenting military subjects. To keep abreast of such changes, alert instructors are constantly planning and using new training aids to meet new situations. Suggestions for new training aids for possible incorporation in this manual should be submitted, through channels, to The Adjutant General, ATTN: Assistant Chief of Staff, G-3.
- b. The following must accompany each suggested training aid:
 - (1) An 8 by 10 inch glossy photograph, or a clear sketch of the aid.
 - (2) Plans and specifications of the aid.
 - (3) Description and type of aid.
 - (4) Recommended use of aid:
 - (a) Place, for example, classroom, shop, outdoors, etc.
 - (b) Number of students aid will serve.

(5) Additional information:

- (a) If produced locally, give cost and production agency.
- (b) If produced commercially, give cost and source, if known.

CHAPTER 2

AUDIO VISUAL AIDS

Section I. MOTION PICTURES, FILM STRIPS, RECORDINGS, AND REPRODUCER UNITS

7. MOTION PICTURES AND FILM STRIPS

- a. SR 110-1-1 contains a complete list of motion pictures and film strips. See paragraph 2b.
- b. Information pertaining to the procurement of films and film strips may be obtained from the Signal Corps Film Library. These libraries, in addition to serving the army areas, also serve the Organized Reserve Corps, National Guard, and Reserve Officers Training Corps.
- c. Instruction pertaining to the use of films and film strips as projected training aids is contained in FM 21-5.
- d. Information pertaining to the use of projection equipment is contained in SR 110-30-5. Illustrations of this type of equipment are shown in section IX, chapter 4, this manual.

8. RECORDINGS AND REPRODUCER UNITS

a. Probably the most commonly used recording for training purposes is the slow playing $33\frac{1}{3}$ rpm record which accompanies the sound film strip.

- b. Recordings of Army bugle calls by the Army Band are available on request through channels to The Quartermaster Depot, Philadelphia, Pennsylvania.
- c. Battle sound recordings, including sounds of artillery and small arms fire, explosions, and airplanes, add realism to training, maneuvers, and Aggressor exercises. They are available at film libraries.
- d. Security violation records of dramatized incidents of radio security violations also are available at film libraries.
- e. Foreign language records are issued in kits with manuals which can be used as self-study aids. For further information regarding this type of recording, refer to the catalog of the United States Armed Forces Institute (USAFI), which also lists records on shorthand and music appreciation.
- f. Recorder-reproducer units for sound recording and instructional purposes are listed in appropriate tables of allowances. A wire recording unit and play-back machine is included in the sonic equipment used by Aggressor Forces, and is discussed in FM 30-104.

Section II. GRAPHIC AIDS

9. GENERAL

a. Graphic aids include all diagrammatic, schematic, or pictorial drawings, paintings, and photographs. Large-size charts can be made, using a balopticon projector by tracing the illustration or object on a blackboard or chart paper. This method of reproduction is economical and can be accomplished in a short period of time. Any opaque or still picture can be made into a lantern slide and projected onto a screen. Transparencies can be prepared by photography or art work on glass or film in standard 2 by 2 inch or 31/4 by 4 inch size. Still pictures

- may be projected by reflection in an opaque projector if they are of the proper size, approximately 6 by 6 inches.
- b. Department of the Army graphic training aids (GTA's) comprise military instructional charts and posters (singly or in series) and certain printed devices reproduced as visual aids. These GTA's are listed in SR 310-20-3 and can be procured through adjutant general channels.
- c. Graphic portfolios contain a special type of chart series consisting of a relatively large number of charts printed on heavy durable

paper, with explanatory notes printed on the reverse side of each chart for use by the instructor.

- d. Posters are designed primarily as reminders and supplements to class instruction. To achieve maximum benefit, they should be displayed where personnel regularly pass or gather. Displays should be changed frequently.
- e. Sample printed devices include such aids as the cardboard replica compass, paper protractors, and scales.
- f. Military maps used for instructional purposes by personnel of the Reserve components may be procured at nominal cost directly from book stores at army installations. Other information regarding maps may be secured by writing the Superintendent of Documents, Government Printing Office, Washington 25, D. C. Training literature pertaining to the various phases of military instruction may be purchased also through military book store facilities. Maps used for instructional purposes by military installations may be procured through local supply channels from Department of the Army Map Service, Washington 25, D. C., and from Director, U. S. Coast and Geodetic Survey, Washington 25, D. C.
- g. Weatherproofing of graphic training aids may be accomplished by spraying the surface (both sides) with clear outside white varnish. Lacquer also may be used for this purpose, keeping in mind that too heavy a coat of either varnish or lacquer will tend to stiffen or harden the paper, resulting in the cracking of the surface. This is one of several methods of weatherproofing which has proved satisfactory.

10. LOCAL PRODUCTION OF GRAPHIC AIDS

a. There are various ways and methods by which simple line drawings can be made. An ordinary window shade can be utilized very well for this purpose simply by drawing on one or both sides of the shade whatever dia-

gram, sketch, or chart is desired. Successive phase charts can be constructed in this manner. By pulling the shade either up or down, the subject highlighted can be illustrated rapidly with economy of motion. Right line or simple line drawings can be made easily on wrapping paper and displayed at the appropriate time during an instructional period. For more complicated pictorial or schematic drawings, trained artist or draftsman personnel should be employed. Local training aids departments usually employ civilian or military personnel for this purpose.

- b. Silk screening process is an excellent method whereby chart reproduction can be accomplished. Details pertaining to facilities needed, methods of operation in detail, including production shortcuts, are outlined in TM 28-325. For the procurement of silk screen process equipment, refer to appropriate tables of equipment.
- c. The following criteria should govern the local production of charts:
 - (1) The size must be suitable for the class. Charts that are too small to be seen easily by the entire class should not be used for group instruction.
 - (2) The detail should be selected carefully. Only that which is essential to the purpose of the chart should be included.
 - (3) Lettering should be legible. Letters 2 inches high are minimum for legibility at 75 feet.
 - (4) Color or shading should be used to emphasize the important points. This use of color has proven that student observation and learning are greatly aided.
- d. Various types of graphic training aids are illustrated in section II, chapter 4, of this manual.

Section III. TRAINING DEVICES

11. THREE-DIMENSIONAL AIDS

There are innumerable devices or models ranging from the simple marksmanship sight-

ing bar to the complicated and expensive gunnery trainer that can be classified best as "three-dimensional" aids or training devices. Relatively few of these (such as instructional kits and trainers) have been standardized for issue by the Department of the Army; most of the aids described in the illustrations following are intended as suggestions for local preparation. For convenience, they are grouped in the following categories:

Working models
Displays and exhibits
Kits and trainers
Miniatures
Terrain models
Miscellaneous devices.

Various types of three-dimensional aids and

training devices are illustrated in sections III through VIII, chapter 4, this manual.

12. SALVAGE

- a. Many items turned in for salvage can be used in constructing training aids. Such items as motors or other vehicle parts are readily adaptable as training aids, and can be secured from the unit salvage officer.
- b. The salvage officer should be contacted as a possible source for miscellaneous material that can be used to facilitate the construction of training aids.

CHAPTER 3

TRAINING EQUIPMENT AND FACILITIES

13. TRAINING EQUIPMENT

Training equipment includes projection and sound equipment which is available from film libraries or is listed in tables of allowances (par. 3b). Data on use of film strip projector and 16-mm motion picture projector are contained in SR 110-30-5. Instructors should be familiar with the uses and limitations of 16-mm sound film projectors, opaque projectors with film strip complete with 2 by 2 inch and $3\frac{1}{4}$ by 4 inch slide attachments, record players for film strip and phonograph recordings, overhead projectors and public address systems.

Associated with projection equipment are screen and shadow boxes. Suggestions for local construction of various types of training equipment will be found in section IX, chapter 4.

14. TRAINING FACILITIES

Training facilities include such permanent or semipermanent training aids as large mockups of equipment, demonstration areas, physical training areas, reaction or infiltration courses, and specially designed training areas. Information on lay-out and construction of many such facilities will be found in TM 9-855.

CHAPTER 4

ILLUSTRATIONS AND INFORMATION

Section I. GENERAL INFORMATION

15. SCOPE

- a. The illustrations and working plans found in this chapter depict various types of training aids designed to aid the present or potential instructor in his planned course of instruction.
- b. This chapter does not illustrate nor give complete references to all known aids used in the training of military personnel in the Department of the Army, but covers, in part, suggestions for training aids that can be adapted to suit present needs.
- c. Information pertinent to the types of aids shown in each section of this chapter precedes

the illustrations and is given to clarify the purpose and scope for which the aids are designed.

16. TRAINING AID CENTERS

Training aid centers being established in each Army area are centrally located training aid shops for the construction and production of training aids and distribution of these and Department of the Army training aids throughout its own area. Army commanders will issue information pertaining to the training aids available at the centers from time to time.

Section II. GRAPHIC TRAINING AIDS

17. GENERAL

- a. The graphic training aid does much to focus student attention, impart knowledge, and aid memory through the use of the sense of sight.
- b. SR 310-20-3 lists the available graphic training aids which can be procured through regular publication channels.
- c. Graphic training aids can be prepared locally. Steps to be followed in preparing a graphic training aid are as follows:
 - (1) Decide exactly what is wanted on the aid.
 - (2) Make a small pencil sketch.
 - (3) Decide whether it is to be drawn with ink, crayon, or paint.
 - (4) Decide on the type paper to be used.
 - (5) Decide on letter size. Make letters large enough to be easily seen.
 - (6) Sketch in the contents lightly with pencil.
 - (7) Draw in the contents with ink, crayon, or paint.

- (8) If ink or paint is used, allow the aid to dry and then clean it with an art gum eraser.
- d. This section illustrates various types of graphic training aids and gives information as to their use and their procurement.

18. ILLUSTRATIONS AND INFORMATION

- a. Chart, lubrication order (fig. 1). Lubrication orders similar to the one shown are listed in SR 310-20-4, and are available through adjutant general publications channels. A chart of this size can be used to teach lubrication to large classes through the use of a balopticon or it can be issued to individuals for reference and study.
- b. Map reading, coordinate scales, and protractors (fig. 2).
 - (1) This is a single sheet approximately 8½ by 12¾ inches, printed on both sides. It is arranged so that, after being cut out, the protractors and coordinate scales may be used on either side. One side of the protractor is

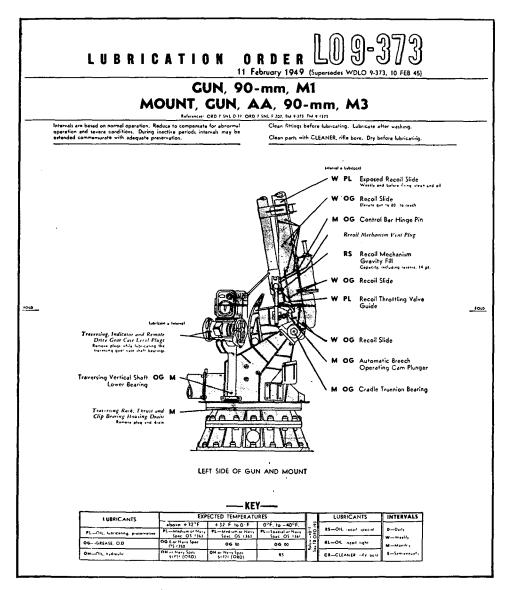


Figure 1. Chart, lubrication order.

scaled in degrees; the opposite side is scaled in mils. One side of the coordinate scale indicates yards; the other side, meters.

- (2) This training aid is to be used by personnel receiving instruction in map reading and is handy to facilitate work with maps, both indoors and outdoors. This training aid is listed in SR 310-20-3 as approved Department of the Army GTA 5-12.
- c. First aid training model (fig. 3).
 - (1) This skeletal model showing the bone and blood system of the human body

is used in the instruction of first aid technique.

(2) A human figure is drawn on a piece of plywood board $3\frac{1}{2}$ feet by $6\frac{1}{2}$ feet by $\frac{1}{4}$ inch, and then jigsawed out. The bone structure and blood system then is drawn in, resulting in a lifesized figure illustrating the important areas and pressure points where first aid measures are most applicable. This realistic type of training aid emphasizes to a better degree important facts in the teaching of first aid technique.

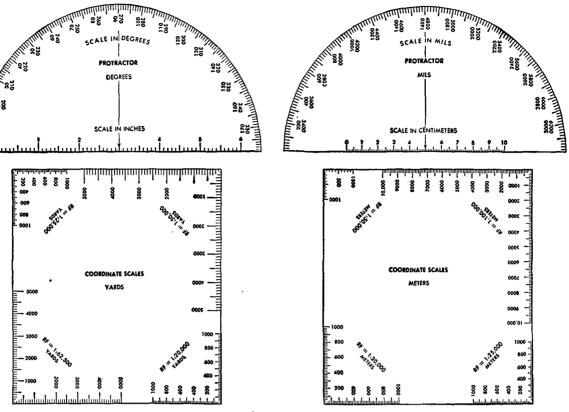


Figure 2. Map reading, coordinate scales and protractors.

- (3) If plywood is not available, stiff cardboard can be utilized, with a wooden frame in the rear to give it support when in an upright position. It easily can be constructed locally.
- d. Forceful message chart (fig. 4). An effective combination of diagram and text to present a clear and forceful message.
- e. Plain language chart (fig. 5). This chart fulfills the requirements of including only the essentials, used with plain letters large enough to be seen by the whole class, simple wording, and specific informational purpose.
- f. Humorous message chart (fig. 6). An example of the use of a cartoon, which appeals to the sense of humor and emphasizes a potent lesson for instructor and student alike.
- g. Slot type (fig. 7). Subject cards are bound at top and bottom with strips of wood slightly longer than the slots through which the cards pass; at beginning of class, only the bottom strip is visible. Instructor pulls each card through the slot at the appropriate time.
 - h. Pull-off type (fig. 8). Successive steps in

- instruction are covered with strips of heavy paper glued, tacked, or taped to the chart and pulled off by the instructor to expose the desired material.
- i. Window shade type (fig. 9). This chart is lettered on an ordinary window shade; each subject appears as the shade is pulled down.
- j. Hinged type (fig. 10). Each subject card is hinged at the top, folded up and held in place by a tack or pin until released by the instructor.
- k. Conventional signs and symbols cards (fig. 11).
 - (1) This suggested training aid is a set of forty 22- by 28-inch cards showing conventional signs and symbols. These cards are bristol board with a sign or symbol painted on each side. The set can be placed in a wooden rack for carrying and display.
 - (2) This aid is used in a classroom or sheltered outdoor area. It is designed for use with a group of 200 men or less. The aid can be produced locally from cardboard and painted in the

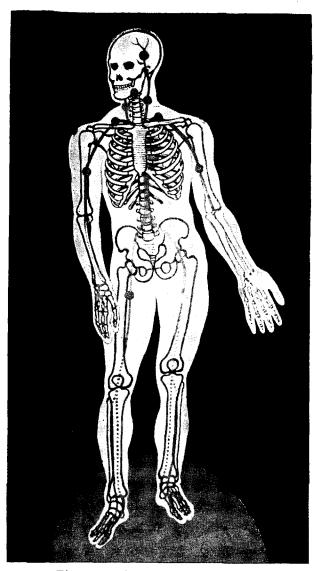


Figure 3. First aid training model.

unit silk screen shop or training aids department. These cards can be produced at nominal cost. Symbols for reproduction can be found in FM 21-25, FM 21-26, or FM 21-30.

- l. Pocket reference cards (fig. 12).
 - (1) A card which folds to a size of 3½ by 4½ inches presenting, in concise form, full information about detection of, and protection against, the six different types of chemical agents. General instructions on care of the gas mask, the use of eye ointment, protective ointment, and decontamination also are shown.

- (2) This pocket-size card can be carried by military personnel at all times, for ready reference and for selfinstruction.
- (3) Recommended basis of distribution: one per individual.
- (4) These cards, listed in SR 310-20-3 as GTA 3-2, may be secured through usual adjutant general publications channels.

m. First aid (fig. 13).

- (1) This training aid contains a series of approximately 50 charts of illustrations and graphic material, 44 by 30 inches. On the reverse side of each page, supplemental instruction is provided.
- (2) This graphic portfolio is to be used for instructional purposes in first aid. It is particularly applicable for outdoor use, but can be used indoors as well. The sequence should be followed closely throughout the entire training process. Use is most effective when limited to groups the size of a platoon or smaller.
- (3) Instructions for the preparation of an easel are included on the reverse side of the pages.
- (4) This is GTA 8-1, as listed in SR 310-20-3.

n. Rifle, M1, disassembly mat (fig. 14).

- (1) The disassembly mat shown in figure 14 is one of a number of similar mats for small arms weapons that have been standardized by the Department of the Army.
- (2) These mats can be used in the instruction of weapon disassembly and assembly.
- (3) Disassembly mats are Department of the Army graphic training aids and can be obtained through normal adjutant general publication channels.
- o. Chart, photographic mural (fig. 15). This type of chart makes excellent training aids. These can be reproduced in some training aid shops at service schools, also in Signal Corps or commercial photographic laboratories.

HOW MUCH TO TEACH

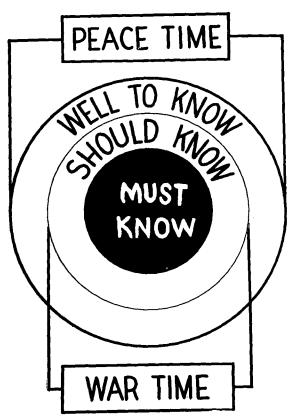


Figure 4: Forceful message chart.

WHAT A LESSON PLAN WILL DO FOR YOU

I.GUIDE FOR PREPARATION

2.GUIDE FOR PHYSICAL

ARRANGEMENTS

3.GUIDE FOR ACTUAL TEACHING

4.PROMOTE UNIFORMITY

5.ASSIST SUBSTITUTE

INSTRUCTORS

6.GIVE SELF CONFIDENCE

Figure 5. Plain language chart.



Figure 6. Humorous message chart.

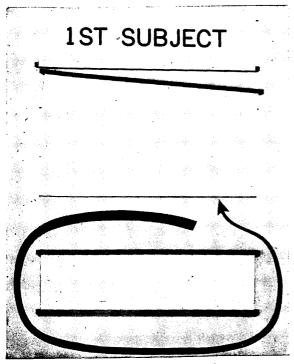


Figure 7. Slot type cards.

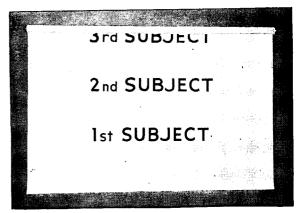


Figure 9. Window shade type card.

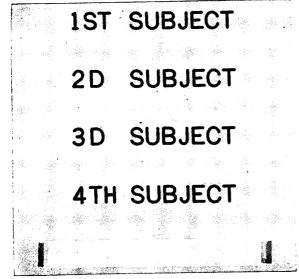


Figure 8. Pull-off type card.

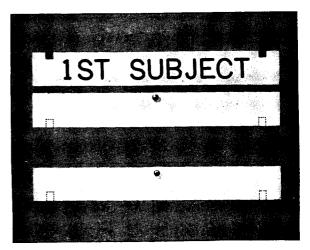


Figure 10. Hinged type chart.



Figure 11. Conventional signs and symbol cards.



Figure 12. Pocket reference cards. (Possible enemy chemical warfare agents.)



Figure 13. First aid.



Figure 14. Rifle, M1, disassembly mat.

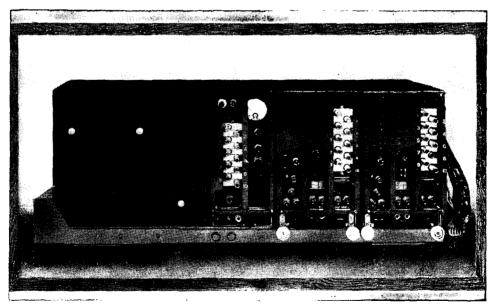


Figure 15. Chart, photographic mural.

Section III. WORKING MODELS

19. GENERAL

- a. Working models are constructed to illustrate mechanical functioning and to teach nomenclature.
- b. Many working models are constructed in scales greater than actual size, permitting large groups of students to observe the functioning process of the mechanism.
- c. Models such as the Browning automatic rifle functioning frame (fig. 17) have the various parts painted different colors to facilitate identification of each part.
- d. The working models shown on the following pages are suggested training aids constructed by skilled craftsmen using locally available materials and salvage parts.
- e. It must be kept in mind that the overuse of working models will tend to emphasize unduly the functioning of mechanisms, thereby minimizing many other important factors of operation. For example, a wooden working model of the Browning automatic rifle will not show the true cause of stoppage, misfire, or the resulting action of gases. The best working model always is the actual piece of equipment. Working models, at best, are exaggerated facsimiles of the actual object constructed specifically to teach nomenclature and the mechanical

operation of functioning parts to large groups of students.

20. ILLUSTRATIONS AND INFORMATION

- a. Automatic pistol, cal. .45, M1911 and M1911A1 (fig. 16). This is a wooden working model used in teaching nomenclature and functioning of the pistol. It is constructed of scrap lumber to a scale of approximately 7 to 1 and is mounted on a piece of plywood 43 by 82 inches. See FM 23-35.
- b. Functioning frame, Browning automatic rifle, cal. .30, M1918A2 (figs. 17 and 18).
 - (1) The purpose of this functioning frame is to demonstrate the functioning of the operating parts under the action of the expanding gases and recoil spring.
 - (2) The frame and backboard are made entirely of wood. The pieces that hold the operating part of the rifle are mounted on the backboard. The operating parts can be manipulated within the frame. The operating parts which include the slide, the bolt and bolt lock, the bolt link, the bolt link pin, the hammer, the hammer pin, and the trigger guard group are disassembled



Figure 16. Automatic pistol, cal. .45, M1911 and M1911A1, working model.

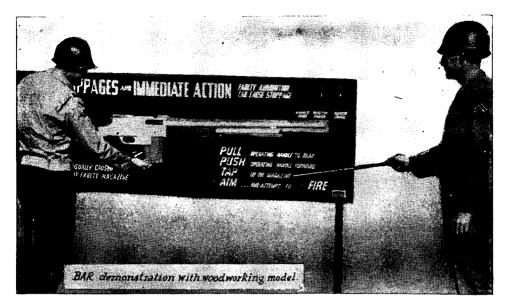


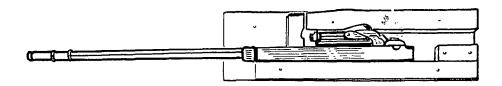


Figure 17. Functioning frame, Browning automatic rifle, cal. .30, M1918A2.

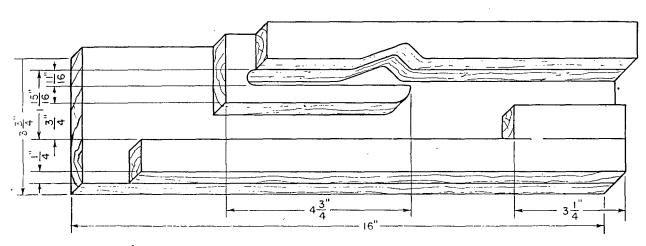
from the rifle, then reassembled in the functioning frame. The recoil spring and recoil spring guide also may be assembled in the frame, if desired.

- (3) Figure 17 shows how this functioning frame can be utilized for instructional purposes in outdoor classes. Plans for the construction of the functioning frame are shown in figure 18.
- c. Planetary gears mock-up (fig. 19). This is an 8- by 30-inch working model showing functions of the planetary gear. It can be constructed locally from salvaged material.
- d. Micrometer model (fig. 20). This wooden model of a micrometer is used to teach students the proper method of reading and using the gage.
 - e. Piston mock-up (fig. 21).
 - (1) This wooden working model demonstrates the functioning of the piston and crankshaft of a valve-in-head engine. It also can be used to advantage to show the action transpiring during each phase of the firing cycle.
 - (2) Of fairly simple construction, it can be used to facilitate understanding of

ACTION OF OPERATING PARTS



SET-UP TO DEMONSTRATE ACTION OF OPERATING PARTS



WOODEN FRAME TO REPRESENT THE RECEIVER

Figure 18. Working drawing, Browning automatic rifle functioning frame.

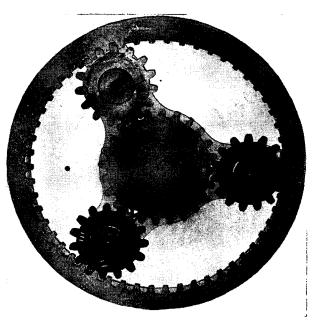


Figure 19. Planetary gears mock-up.

- automotive engine nomenclature and functioning. It is recommended that contrasting colors be used in painting.
- (3) Approximate cost should not exceed \$5. Additional information regarding construction can be obtained from The Armored School, Ft. Knox, Ky.
- f. Distributor, cam angle, mock-up (fig. 22).
 - (1) This training model is used to illustrate the working parts of the cam angle and points.
 - (2) A dial is added to the model, indicating the angle at the opening of the gap.
 - (3) It is used in a classroom to instruct 30 students or less, and can be made to any desired scale by skilled craftsmen. The approximate price of the wood and metal parts is \$9.



Figure 20. Micrometer model.

- g. Plastic distributor (fig. 23).
 - (1) This training model is used to illustrate the working mechanism of the distributor.
 - (2) Built from a plastic block, this distributor can be placed in actual operation and will show to the student the various functioning parts of the distributor.

h. Gunner's quadrant, M1 (fig. 24). By use of this enlarged wooden model, effective instruction in nomenclature and the use of the gunner's quadrant can be given to relatively large groups. Elevations can be set on the arc and

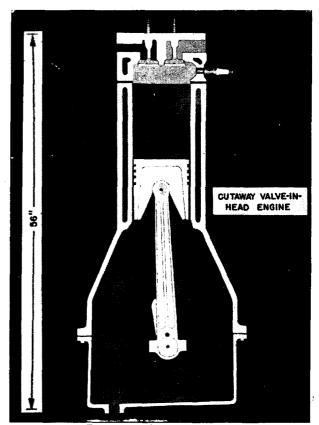


Figure 21. Piston mock-up.

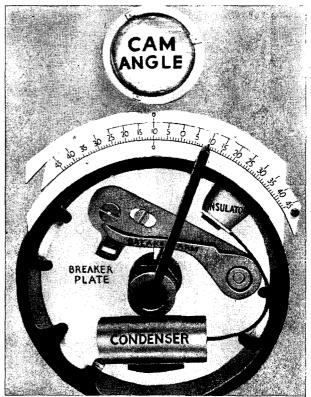


Figure 22. Distributor, cam angle, mock-up.

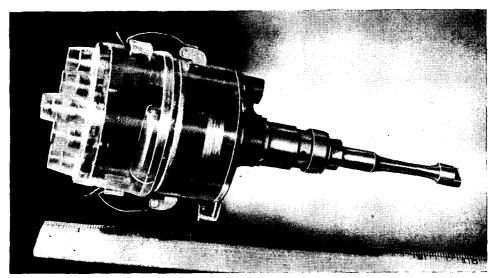


Figure 23. Plastic distributor.

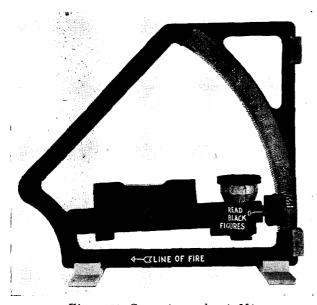


Figure 24. Gunner's quadrant, M1.

micrometer. This aid can be constructed to any desired scale by a skilled craftsman using dimensions of the actual model. A bubble can be formed in the tube by partially filling it wth No. 10 oil to the desired level. Materials used are scrap lumber, paint, small springs, and clear fluorescent lamp for the vial. See TM 9-2300.

i. Angle of site scale and micrometer with level bubble (fig. 25). This model, built to any desired scale, can be used to teach the procedure in setting off angles of site on the elevation

scale M9. Materials used are scrap lumber and a clear fluorescent lamp for a vial. The bubble can be formed in the same manner as for the gunner's quadrant (h above). See TM 9-2300 for complete information on the angle of site scale and micrometer.

- j. M15 firing lock model (figs. 26 and 27).
 - (1) This aid is a wooden working model used to demonstrate the functioning of the M15 firing lock. It is a 36- by 48- by ½-inch plywood panel, with enlarged plywood replicas of the parts of the firing lock mounted in their proper relation. The stationary parts are attached to the panel by screws. The moving parts are held in place by the stationary parts when the complete model is assembled.
 - (2) The springs necessary to make the model function can be made from heavy wire. A weight, attached to the firing pin sleeve by means of pulley and cord, is used to return the model part to its neutral position. The moving parts of the model should be painted different colors to assist in the explanation of functioning.
 - (3) The entire model is mounted on an "A" stand made of 2- by 2-inch boards. It can be used in classrooms or for outdoor classes with groups of 50 men or less. It can be produced locally. Ma-

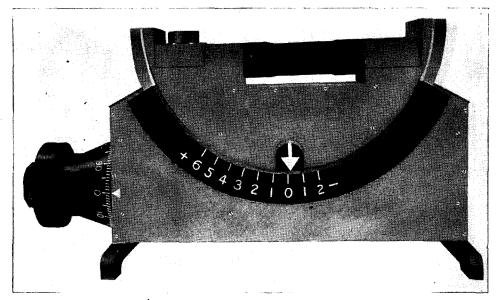


Figure 25. Angle of site scale and micrometer with level bubble.

terials needed are 24 square feet of ½-inch plywood, wood screws, paint, and 30 feet of 2- by 2-inch lumber. A diagram of specifications is shown in figure 27.

k. Plastic working model, Browning machine gun, cal. 30, M1919A4 (figs. 28, 29, and 30).

(1) This aid consists of plastic and metal and is used to demonstrate the functioning of the interior parts of the

Figure 26. M15 firing lock model.

machine gun. All of the gun which obscures the action of these parts during functioning is made of plastic. The interior parts are the actual parts from the machine gun. The plastic parts are made to scale so that the metal parts will operate smoothly in the housing. This type aid can be

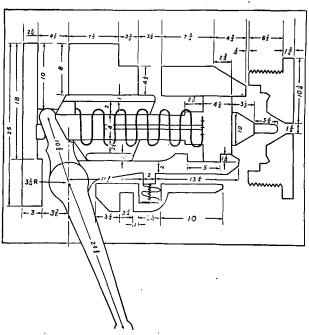


Figure 27. Diagramatic plan for construction of the M15 firing lock working model.

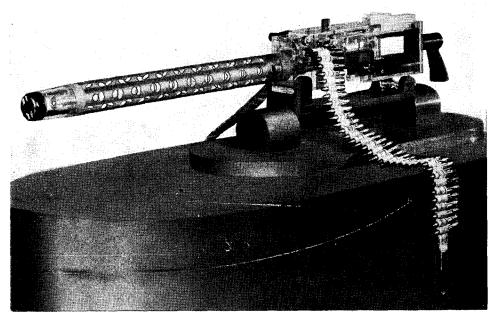


Figure 28. Plastic working model, Browning machine gun, cal. .30, M1919A4.

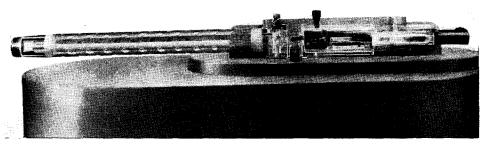


Figure 29. Top view, Browning machine gun, cal. .30, M1919A4.

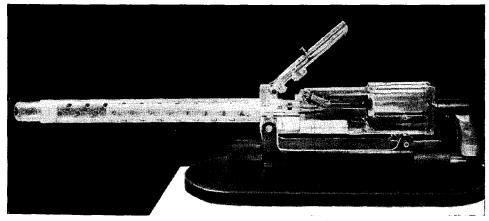


Figure 30. Side view, Browning machine gun, cal. .30, M1919A4.

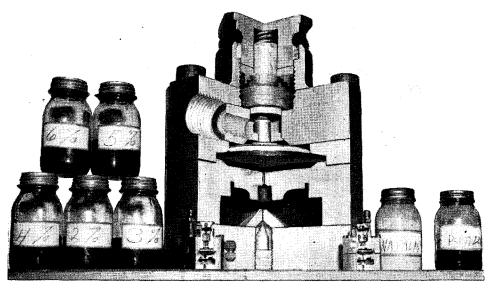


Figure 31. Portable flame thrower pressure regulator, mock-up.

- made to demonstrate the functioning of small arms.
- (2) This aid cannot be produced locally but must be procured from special training aid shops of service schools or must be contracted for locally. The aid can be used indoors or outdoors with 15 students to each machine gun.
- l. Portable flame thrower pressure regulator, mock-up (fig. 31).
 - (1) This mock-up is used as an aid in teaching classes the construction and

- functioning of the dome-type pressure regulator of the portable flame thrower M2-2.
- (2) Materials used are scrap lumber, wire screening, salvage rubber hose, and an old spring of suitable size. The scale of the mock-up shown is 5 to 1; however, it may be made any desired scale. For comparison purposes, two cutaway pressure regulators are shown in the illustration.
- (3) The jars on the left contain fuel mix-

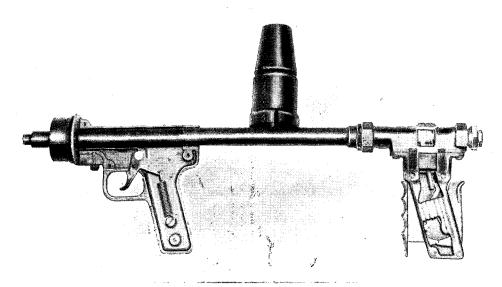


Figure 32. Gun group, portable flame thrower, M2-2.

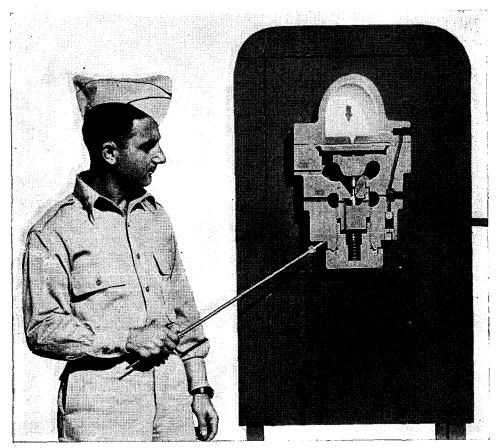


Figure 33. Wooden working model of pressure regulator M2-2.

tures in various percentages. Those on the right contain napalm and paptizer.

m. Gun group, portable flame thrower, M2-2 (fig. 32). This is a cutaway model used in teaching the action of the fuel valve and ignition head of the portable flame thrower. The model can be made from a salvage gun group by removing the ignition head cover plate and cutting away portions of the valve grip, grip support, and valve body.

- n. Pressure regulator M2-2 (figs. 33 and 34). This model can be constructed to any desired scale by skilled craftsman, at an approximate cost of \$25.
- o. M2-2 portable flame thrower pressure regulator (fig. 35).
 - This is a working model used in teaching adjustment of the dome-type pressure regulator of the flame thrower M2-2. The fuel tanks, air cylinders, pressure regulator, high pressure line

- and pressure gage are from the M2-2 flame thrower. The $\frac{1}{4}$ -inch copper tubing used to connect the pressure regulator to the fuel tanks is approximately $2\frac{1}{2}$ feet long.
- (2) The tubing and the couplings can be procured locally. The adjusting wrench shown to the left of the fuel tank is an Allen wrench, welded onto a cutoff end of an ordinary screw driver, and is used for adjusting needle valves Nos. 1, 2, and 3 shown in the illustration.
- (3) The fuel tanks are filled with 4 gallons of water up to the level indicated by the light colored paint on the cylinders. The equipment can be mounted with strap iron or heavy gage wire onto a piece of plywood approximately 55 inches high and 64 inches wide.
- (4) All the materials and parts except the copper tubing are salvaged parts from

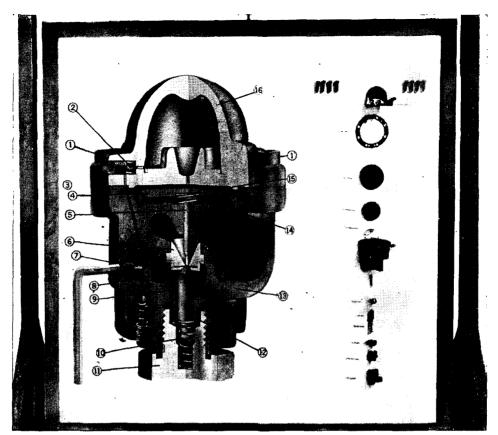


Figure 31. Large diagram and exploded pressure regulator, mounted.

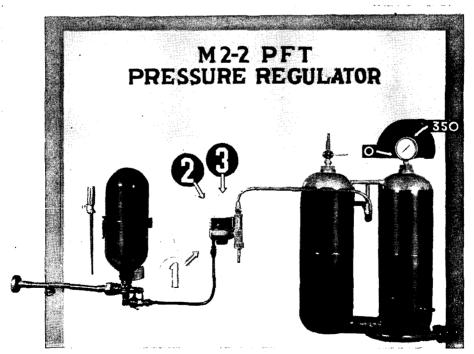


Figure 35. Working model, pressure regulator portable flame thrower M2-2

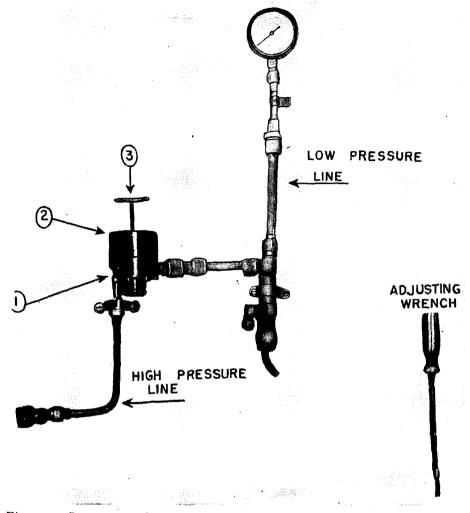


Figure 36. Pressure regulator, portable flame thrower M2-2 (hasty demonstrator).

a portable flame thrower. T/A 20-2 and appropriate tables of organization and equipment prescribe basis for issue of the portable flame thrower.

p. Pressure regulator, portable flame thrower, M2-2 (hasty demonstrator) (fig. 36).

- (1) This is another type working model used in teaching adjustment of the dome-type (groove) pressure regulator, using only the regulator, pressure line, gage, and air cylinder.
- (2) The regulator, high pressure line, and safety head are taken from a portable flame thrower. The gage is a No. 0-500-pound gage. The low pressure line and couplings can be procured locally. The adjusting wrench is the same as that shown in figure 35. A commercial

- air cylinder connected to the high pressure line is used to indicate pound pressure.
- (3) Models can be constructed from materials at hand, ranging from the precise model constructed by the post machine shop (fig. 31) to the model constructed from available salvage material shown in figure 36.
- q. Sectionalized .50-caliber machine gun. (fig. 39).
 - (1) As an aid to teaching the functioning of the Browning machine gun, caliber .50, this cutaway model may be used. It consists of a sectionalized machine gun mounted on a box containing a small electric motor. The motor causes an arm to move back and forth along

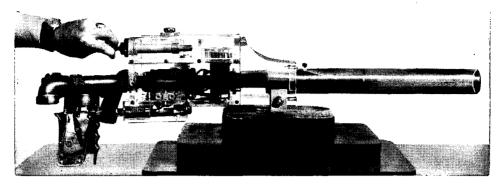


Figure 37. Plastic model, flame thrower M3. (Approximate cost, \$90.)



Figure 38. Plastic model of Browning automatic rifle, cal. .30, M1918A2. (Approximate cost, \$200.)

the long axis of the machine gun. This arm is connected to the bolt handle of the machine gun and causes the bolt to move back and forth to simulate firing. Dummy rounds of ammunition

- are used to complete the entire cycle of firing.
- (2) It is recommended that this aid be used only when the class does not exceed 15 students. The entire section-

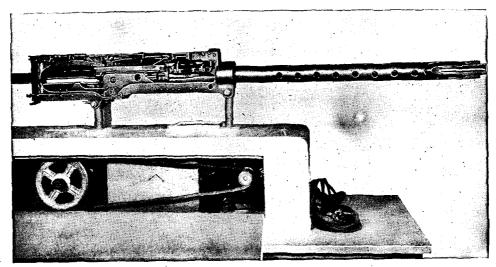


Figure 39. Sectionalized .50-caliber machine gun.

alized machine gun, complete with motor and actuating arm, can be procured through ordnance supply channels. (Gun, machine, caliber .50, Browning M2, HB, turret type, sectionalized training aid (AR) 93G980550. Manufactured by the Reflectone Corporation, Stamford, Conn.)

- r. Grenade launcher model (figs. 40 and 41).
 - (1) This model consists of a portion of the M1 rifle, M7 launcher, valve screw, M1 adapter, and fragmentation grenade.
 - (2) The M1 rifle is mounted on a plywood backboard. The weight of the model assembled is supported near the center by a removable dowel in the backboard.

- (3) The rifle, launcher, and grenade are made of wood and metal. The adapter, made of metal, is used to demonstrate the procedure for firing fragmentation grenades with the M7 launcher.
- s. Firing mechanism, cal. .30 M1917A1 Browning machine gun (figs. 42 to 50). This training aid is designed to teach, through demonstration, the trigger action, cocking, and automatic firing process of the caliber .30 Browning machine gun. Figures 43 through 50 give the specifications for the construction of each working part. Materials can be procured from salvage or local supply. Each working part should be painted a different color to emphasize its function. This model can be built by unit or post carpenter, using the specifications shown in each figure.

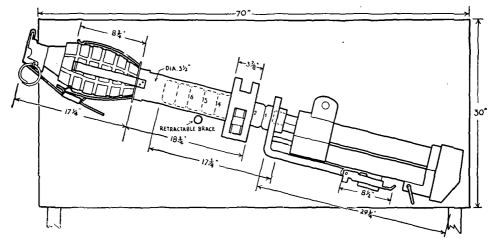


Figure 40. Dimensions of grenade launcher model.

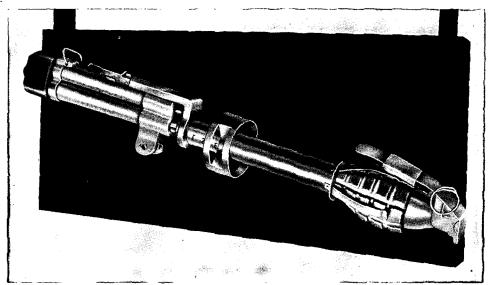


Figure 41. Grenade launcher model.

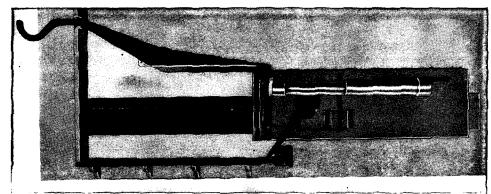


Figure 42. Wooden working model of firing mechanism of the caliber .30 M1917A1 Browning machine gun.

FRONT VIEW

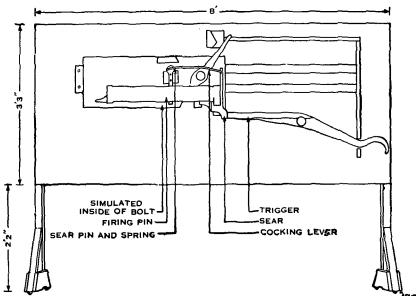


Figure 43. Wooden working model of firing mechanism to demonstrate trigger action, cocking, and automatic fire of the Browning machine gun, caliber .30, M1917A1.

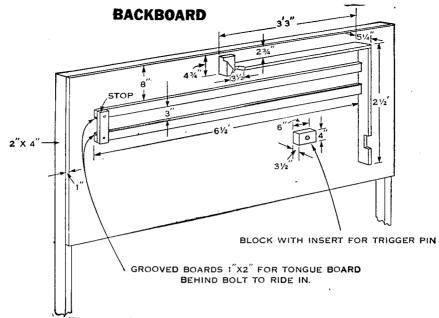


Figure 44. Construction of backboard for trigger action.

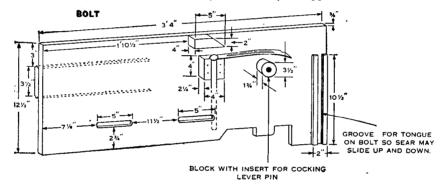
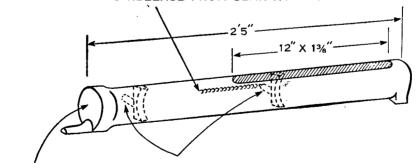


Figure 45. Construction of bolt.

FIRING PIN

SPRING IS ATTACHED BEHIND BOLT AND ACTS
AS FIRING PIN SPRING TO SEND FIRING PIN
FORWARD AFTER ITS RELEASE FROM SEAR NOTCH.



DIAMETER 3%"

PEGS EXTEND THROUGH SLOTS IN BOLT

SOLID WOOD WITH EXCEPTION OF CUT-OUT SLOT WHICH EXTENDS THROUGH FIRING PIN.

Figure 46. Construction of firing pin.

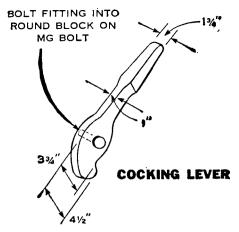


Figure 47. Construction of cocking lever.

SEAR SPRING AND PIN

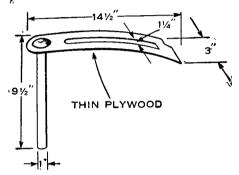


Figure 48. Construction of the sear spring and pin.

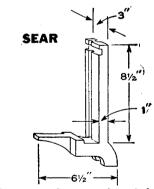


Figure 49. Construction of the sear.

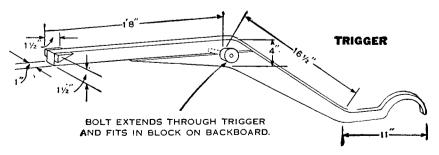


Figure 50. Construction of the trigger.

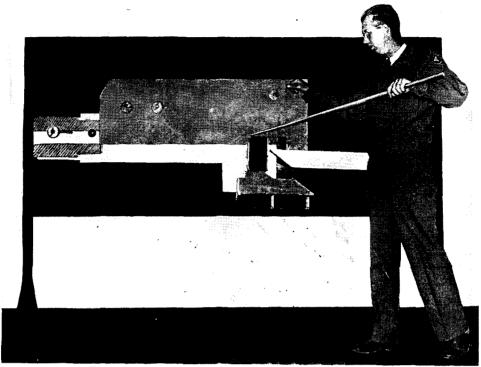


Figure 51. Wooden working model showing headspace of the Browning caliber .30 machine gun, M1917A1.

t. Headspace of Browning machine gun cal. .30, M1917A1 (figs. 51 to 59). This model is constructed from the specifications given in

figures 52 through 59. It is built from materials procured from salvage or local supply. See FM 23-55.

FRONT VIEW

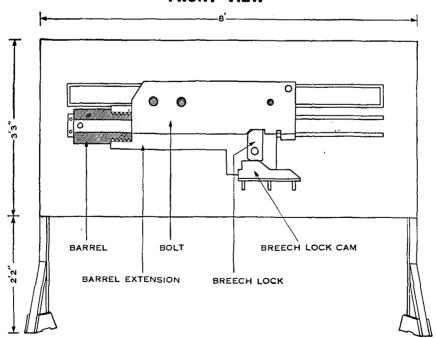


Figure 52. Wooden working model of recoiling parts to demonstrate headspace adjustment, locking and unlocking of the breech of Browning machine gun, caliber .30, M1917A1.

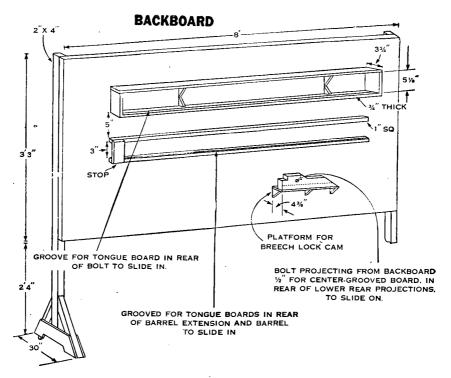


Figure 53. Construction of backboard for recoiling parts.

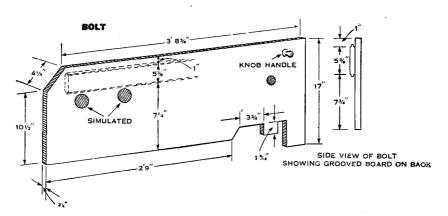


Figure 54. Construction of bolt.

BARREL EXTENSION

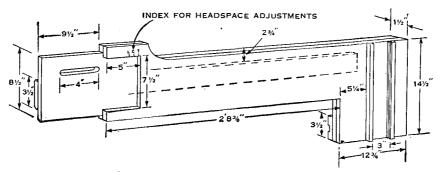
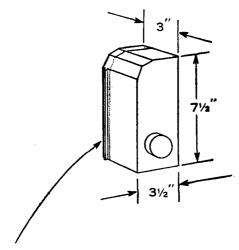


Figure 55. Construction of the barrel extension.

BREECH LOCK



BOARD WITH PROJECTIONS TO RIDE IN GROOVES AT REAR OF BARREL EXTENSION

Figure 56. Construction of the breech lock.

BREECH LOCK CAM

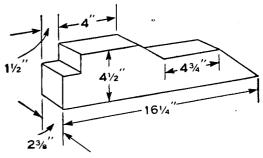


Figure 57. Construction of breech lock cam.

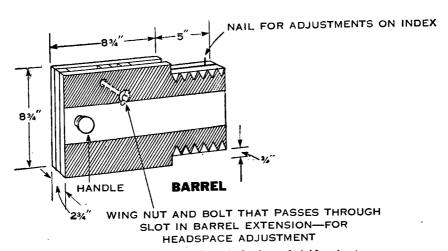
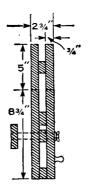


Figure 58. Construction of the barrel (side view).



TOP VIEW OF BARREL

Figure 59. Construction of the barrel (top view).

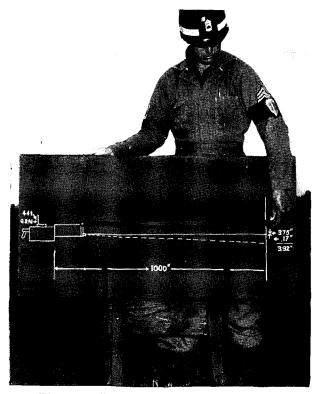


Figure 60. "441" training aid (front view).

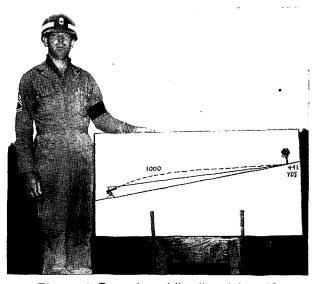


Figure 61. Rear view of "441" training aid.

u. "441" training aid (figs. 60 and 61). This training aid, particularly adaptable for the small unit instructor, is an excellent medium to describe the 441 sight setting used to "zero-in" the M1917A1 machine gun on the 1,000-inch range. The top bar in figure 60, which is

painted red, represents the line of aim. The top position in the slot (fig. 60, at demonstrator's left hand) represents the line of aim with the sights set at zero. The solid white line represents a line in prolongation of the axis of the bore. The broken white line represents the trajectory of the bullet. To substantiate the teaching, the board is turned around, as shown in figure 61. It can be constructed any desired size by the unit carpenter.

v. Working model of rear sight leaf, cal. .30 machine gun (fig. 62). This working model, constructed by the unit carpenter, is used to teach machine gunners proper adjustments of the sights. See FM 23-55.

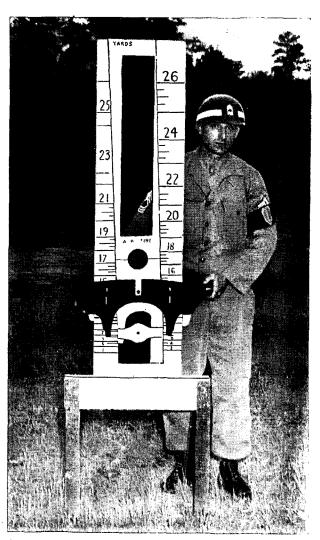


Figure 62. Working model of rear sight leaf of caliber .30 machine gun.

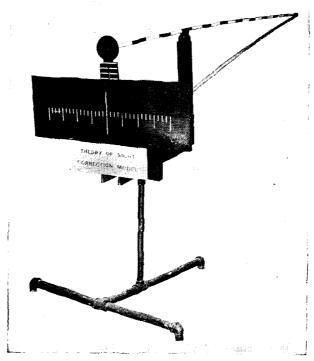


Figure 63. Theory of sight correction model.

w. Theory of sight correction model (fig. 63). This model, constructed from salvaged mate-

rials, is used to show how to adjust the sights for wind. See FM 23-5.



Figure 64. Sighting bar with adjustable front and rear miniature targets.

x. Sighting bar with adjustable front and rear miniature targets (fig. 64). This aid is used to teach the correct adjustment for windage and elevation. In addition, a group of shots can be registered by the firer on the hinged pad in front of the rear sight. When

the correct sight picture is obtained, the hinged pad is swung up to the rear peep sight. The student then registers the shot by inserting a pencil through the peep sight. This procedure is repeated until a group of shots have been registered.

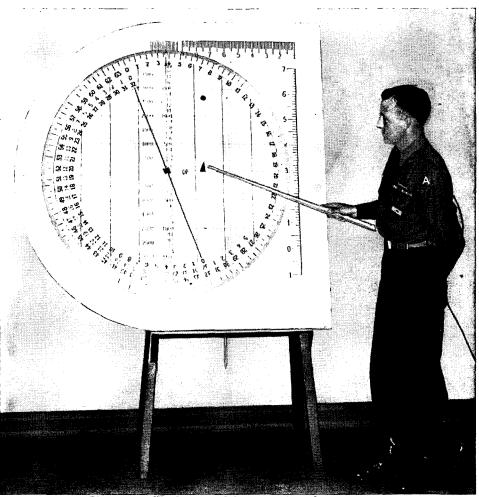


Figure 65. Working model of vernier plotting board.

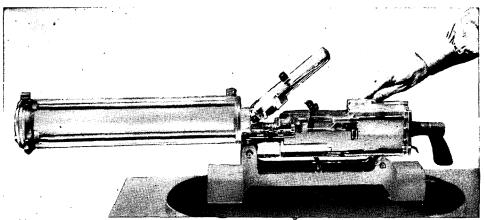


Figure 66. Plastic model of machine gun, caliber .30 (approximate cost, \$250.)

y. Vernier plotting board (fig. 65). The vernier plotting board M10 working model is constructed to a large scale and used in the

manner illustrated to teach personnel the proper usage of the board.

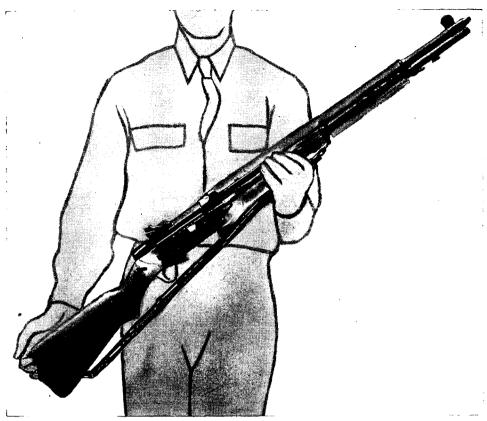


Figure 67. Plastic model of rifle, caliber .30, M1 (approximate cost \$150.)

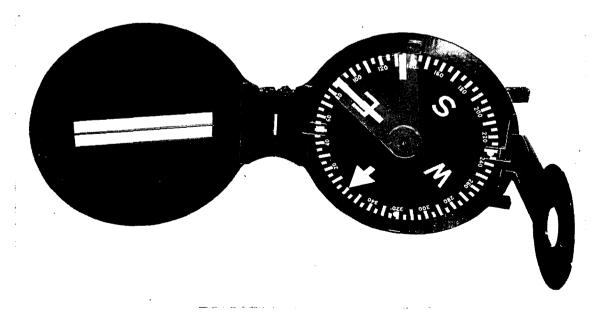


Figure 68. Model compass (oversize).

- z. Model compass (figs. 68, 69, and 70).
 - (1) This compass is made of plywood, metal, and glass. (Transparent plastic may be used in place of glass.)
 - (2) It is intended to be used before large or small groups to demonstrate sight-
- ing, setting azimuths, and other uses of the magnetic compass.
- (3) A skilled craftsman can make a model to whatever scale is desired by changing the dimensions, proportionately, of the working drawings shown in figures 69 and 70.

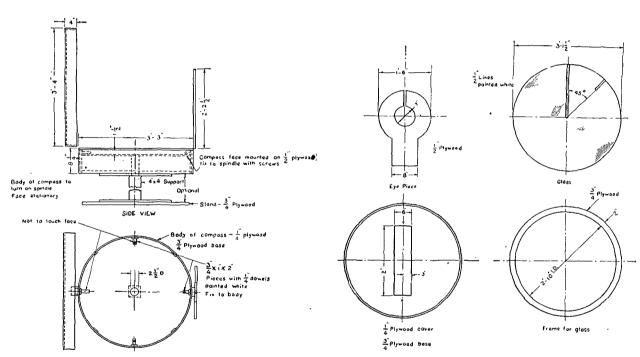


Figure 69. Side view, working plans model, lensatic compass.

Figure 70. Model lensatic compass—dimensions for eyepiece, cover, and frame for glass.

Section IV. DISPLAYS AND EXHIBITS

21. GENERAL

- a. Various displays and exhibits, including cutaway models, are illustrated in this section.
- b. Training aids of this nature tend to facilitate, through actual demonstration, teaching of large groups of students and impressing upon them the functioning of various mechanisms and complete assembly of units or objects.
- c. Cutaway models that are made by expert craftsmen are costly. Utilized properly, however, they are excellent types of instructional aids. Models shown in this section were made from salvaged and unserviceable parts.

22. ILLUSTRATIONS AND INFORMATION

- a. Sniperscope (figs. 71 and 72).
 - (1) The principal components of the sniperscope are displayed on a board 5 feet by 5 feet which is painted white. The parts are held on the board by nails and may be removed easily.
 - (2) This display can be used either indoors or outdoors with a class of 100 students. Figure 72 shows the sniperscope in use. Basis of issue is given

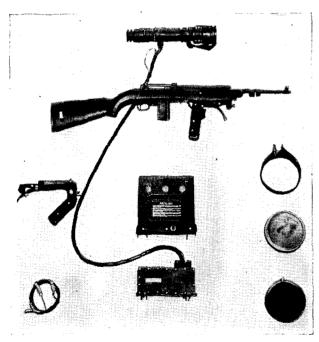


Figure 71. Sniperscope display board.

- in TA 20-2, or other appropriate tables of allowances.
- b. GMC engine (fig. 73). This training aid is an actual cutaway engine, mounted on a rotating platform. This cutaway engine is an effective aid in teaching the principles of the four-cycle engine, nomenclature, and functioning of various parts. This cutaway model must be constructed by skilled personnel having access to proper tools. Parts for this model can be procured from unserviceable GMC motors. See TM 9-801.
- c. Live power train, M24 light tank (figs. 74 and 75). A working model, diagrammatically laid out, shows the position, purpose, and function of the power units and the power transmission system of the M24 light tank. This model can be used as a display and for classroom instruction of 50 students or less. It was constructed locally of used parts and mounted on a movable platform.
 - d. Knots and hitches display board (fig. 76).
 - (1) This training aid is used by the instructor to demonstrate the different ways rope can be tied in order to achieve the best results in each situation.
 - (2) The board should be painted white with black lettering identifying the examples of each knot. Short strands of ordinary clothes line can be used by the student to tie knots and hitches from a study of each one shown on the display board.
 - (3) Knots tied by students should be compared with those on the display board in order that errors may be pointed out and suggestions given for correcting them. The examples on the board were made of 3/4-inch manila hemp that was procured locally. The board can be made of salvaged lumber.
 - (4) It can be used indoors and outdoors with groups of 50 men or less. See FM 5-35 for illustrations on knots, lashings, and rigging.
- e. Sectionalized ¼-ton truck cutaway (figs. 77, 78, and 79).

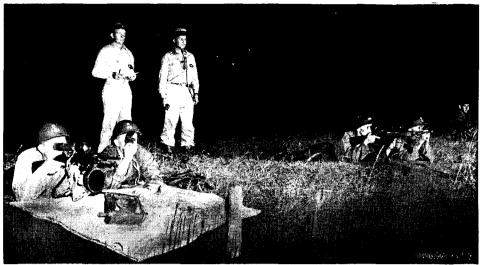


Figure 72. Sniperscope in use.

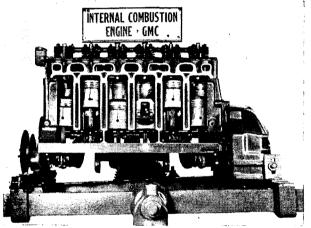


Figure 73. GMC engine.

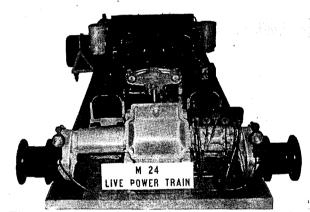


Figure 74. Live power train, M24 light tank, front view.

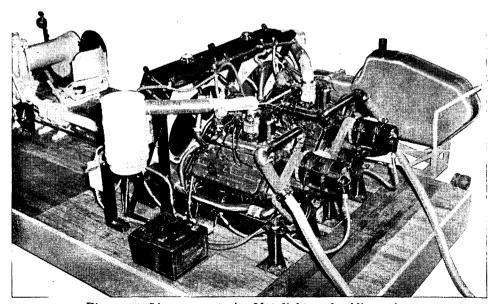


Figure 75. Live power train, M24 light tank, oblique view.

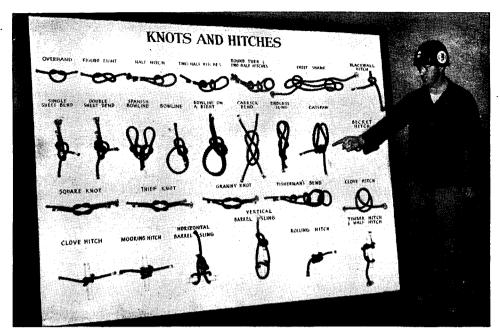


Figure 76. Knots and hitches display board.

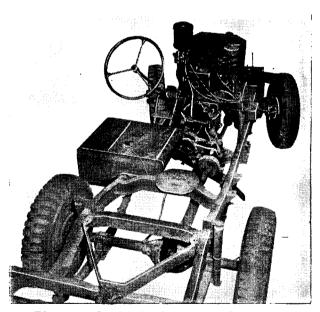


Figure 77. Sectionalized 4-ton truck cutaway.

- (1) This training aid consists of an actual \(^{1}\sqrt{4}\)-ton truck with the body removed and the various units in the power transmission system shown.
- (2) The engine can be operated; and, by placing the sectionalized truck on blocks, the operation of each unit can

be studied. This training aid is used to teach the nomenclature, functioning, and operation of the power train of wheeled vehicles. A model can be made from a salvaged \(^1/4\)-ton truck.

- f. Flywheel and clutch mechanism cutaway (fig. 80).
 - (1) This training aid consists of an exposed model of a clutch and flywheel mechanism, together with the clutch pedal for use in measuring clutch pedal free travel. The reason for clutch pedal free travel can be shown clearly on this model.
 - (2) This aid is used to teach nomenclature, functioning, operation, adjustment, and abuses of the clutch assembly. This model can be made locally, from a salvaged clutch and flywheel assembly, by a mechanic or machinist.
 - g. GMC transmission cutaway (fig. 81).
 - (1) This training aid is an actual transmission cutaway to expose the principal parts of the transmission assembly. This model is used to assist in tracing the flow of power through the transmission in the different gear positions.

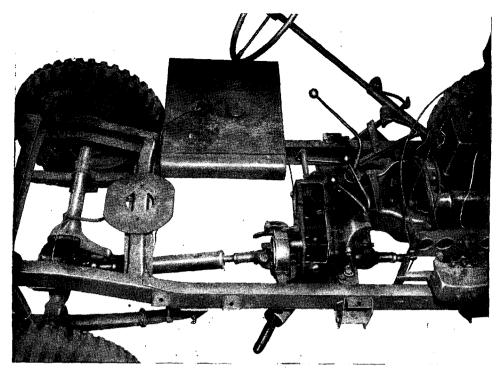


Figure 78. Sectionalized 4-ton truck cutaway.

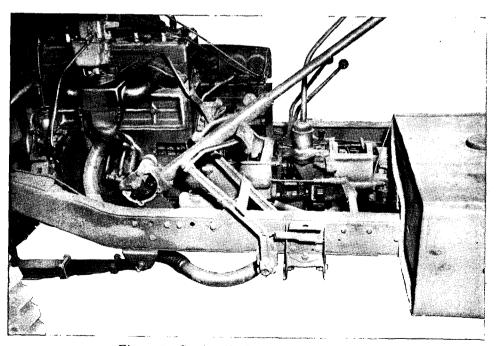


Figure 79. Sectionalized 4-ton truck cutaway.



Figure 80. Flywheel and clutch mechanism, cutaway.

- (2) It also is used in classroom instruction to explain nomenclature and operation of the transmission assembly. Proper methods of removing and replacing the transmission cover also can be demonstrated. This training aid can be made locally, from a salvaged transmission assembly, by a machinist or mechanic.
- h. Automotive fuel system display (fig. 82).
 - (1) This is a working model and display schematically laid out, showing the purpose, functioning, and relationship of the major units comprising the automotive fuel system. This model was constructed locally of used parts and mounted on plywood.
 - (2) A small electric motor furnishes the power to drive the cam shaft mounted behind the board to actuate the fuel

filter. The float bowl and the carburetor are cutaway and windowed with plastic to observe the flow of fuel and the operation of the various parts. The fuel pump is constructed of plastic. A vacuum gage and a pressure gage have been added to the system to facilitate instruction.

- i. Automotive electrical system (fig. 83).
 - (1) This is a combined working model and display board schematically laid out showing the various electrical circuits, their functions, and relationship to one another. This model, constructed locally from salvaged parts,

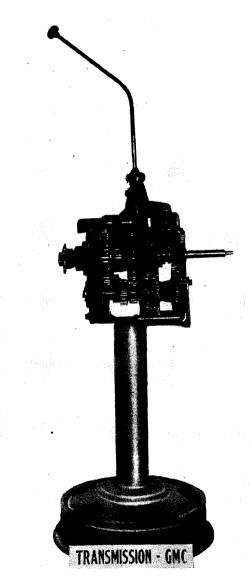


Figure 81. GMC transmission cutway.

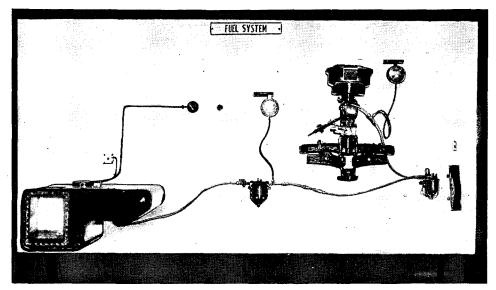


Figure 82. Automotive fuel system display.

- may be used in instructing groups of approximately 50 students.
- (2) A small electric motor provides power to drive the generator and distributor. Each electrical circuit is identified by different colored wiring. Additional ammeters have been installed in the various circuits to facilitate instruction.
- j. Cam and lever steering gear cutaway (fig. 84).
- (1) This training aid is an actual cam and lever stearing gear cutaway to show the operation of the principal parts. The steering column has been shortened to facilitate handling.
- (2) This aid is used to teach the nomenclature, functioning, operation, and adjustments of the steering gear. This aid can be constructed locally from a salvaged steering column.
- k. Final drive cutaway (fig. 85).

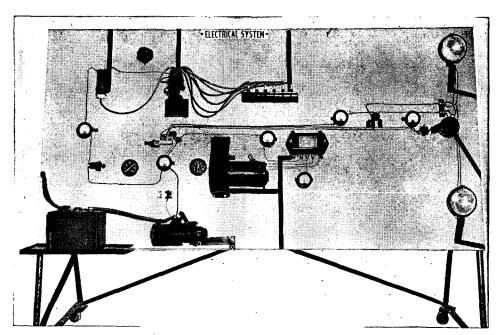


Figure 83. Automotive electrical system.



Figure 84. Cam and lever steering gear cutaway.

- (1) This cutaway model of a final drive can be utilized as a training aid to show how the differential and final drive assemblies operate. Each axle is cut off at the end and fitted with a crank, enabling the instructor to operate the aid manually.
- (2) This model can be made locally from salvaged banjo-type axles. It is mounted on an improvised steel stand made from a salvaged wheel.
- l. Exploded radial engine (fig. 86).
 - (1) A radial engine, showing one cylinder and all other parts of the engine in

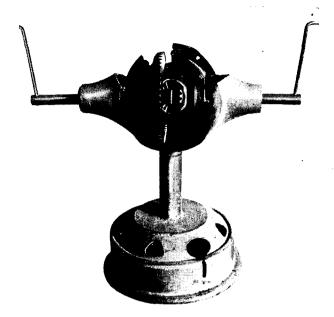


Figure 85. Final drive cutaway.

its relative position, is mounted on a table 3 feet by 10 feet. This display is valuable for instructing classes of 50 students or less in tracing the internal lubrication system.

(2) It also shows the five sections of the engine, the necessary mountings, the drives, and the diffuser or supercharger passages. It can be used also in teaching assembly, disassembly, functioning, and nomenclature of the radial engine. Similar displays can be made for any type engine and used in the same manner. This aid can be con-

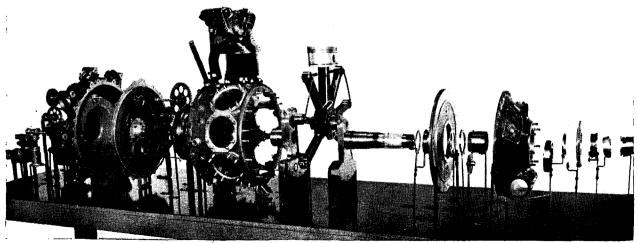


Figure 86. Exploded radial engine.

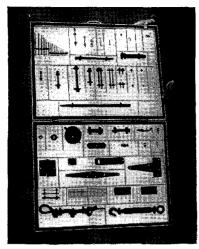


Figure 87. Portable hardware display board.

structed from unserviceable engine parts.

m. Portable hardware display board (fig. 87).

(1) This is a folding case which, when opened, can be utilized and set up as

a display board. It contains the various types of hardware used in camp structures with name and descriptions of each piece indicated. The display can be attached permanently to the classroom wall or designed to be closed and carried as indicated in the illustration.

(2) It is used for the purpose of teaching the proper nomenclature of hardware items. It may be made in whatever form is suitable and convenient to show such items as are available.

n. Tire troubles (fig. 90).

- (1) This is an excellent method of teaching vehicle drivers the common faults of tire troubles. Items can be procured from salvaged tires. Lumber can be obtained from unit supply or salvage.
- (2) Explanation cards under each example on the display panel contain the following:

Example of . . . Diagonal break.

Cause: "Overload."

Example of . . . Ply separation.

Cause: Running tires underinflated.

Example of . . . Stretched tube.

Cause: Large tube placed in

smaller tire or oldgrown tubes placed in new tire.

Example of . . . Loose cord due to running tire when flat.

Cause: "Neglect." Continued operation after tire was flat.

Example of . . . Tread separation.

Cause: Overloading.

Example of . . . "X" Break.

Cause: "Impact." Overinflation increases susceptibility to this condition.

· Example of . . . Neglected cut.

Cause: Failure to inspect and make proper repairs.

Example of . . . Tubes chafing.

Cause: Inside break in tire.

- o. Mines and booby traps (fig. 91). Mines and booby traps can be displayed in the manner illustrated. The display can be used to point out parts and construction of the items shown. Items can be procured from salvage or other sources and arranged in any manner designed.
- p. Sighting and aiming (fig. 92). This board is used in conjunction with mortar fire training. It is of simple design and can be constructed by any unit carpenter, using salvaged lumber and paint. See FM 23-90.
- q. Communications panel board (fig. 93). This enlarged panel of an electrical board is a valu-

able training aid in teaching the nomenclature and functioning of an electrical system. This type panel can be adapted to other Signal Corps equipment to facilitate instruction to larger groups.

r. Camouflage garnish patterns (fig. 94). This aid is used to demonstrate the various patterns recommended for garnishing a camouflage net. It is of simple construction and may be constructed locally from scrap lumber and parts of a camouflage net. If a camouflage net is not available, a tennis net or volley ball net may be used, or wire may be strung on a board.

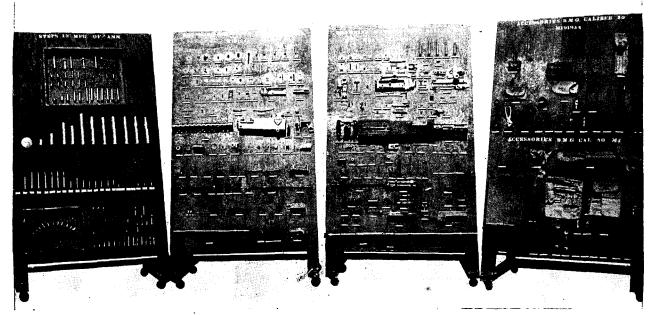


Figure 88. Ammunition and gun disassembly display panels of the Browning machine gun.

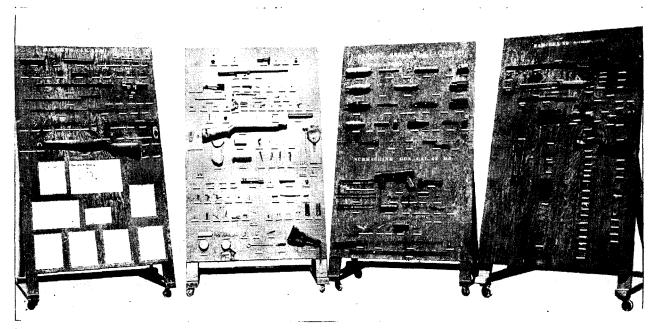


Figure 89. Disassembly display panels showing rifle, caliber .30 M1; carbine, caliber .30 M1; pistol, automatic, caliber .45 M1911; rockets, grenades, and launchers; submachine gun, caliber .45 M3; BAR, caliber .30 M1918A2. (Approximate cost of display board, \$170.)

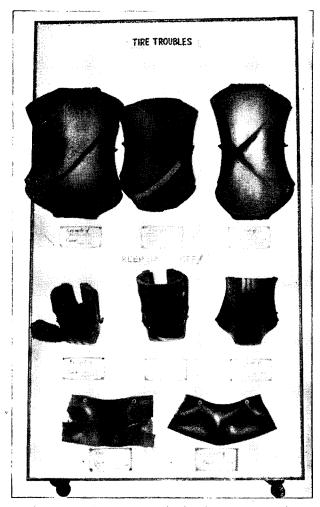


Figure 90. Display panel showing tire troubles.

MINES & BOOBY TRAPS

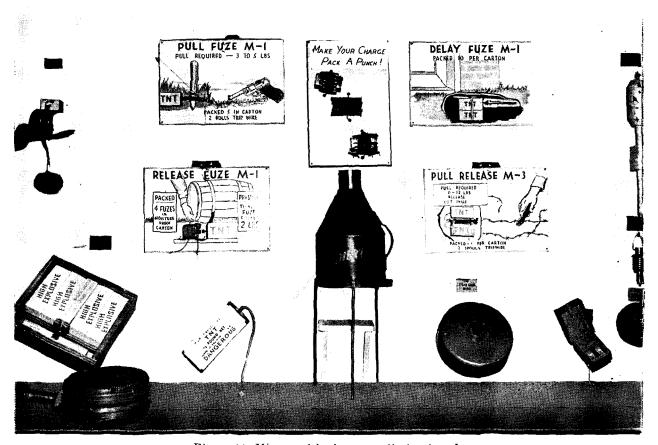


Figure 91. Mines and booby traps display board.

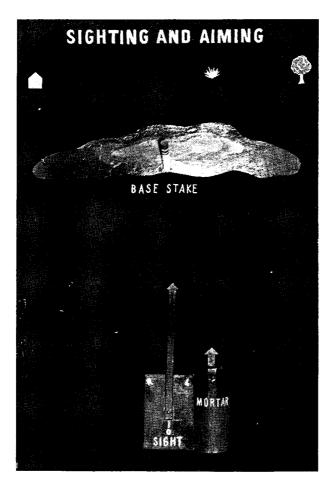


Figure 92. Sighting and aiming display board.

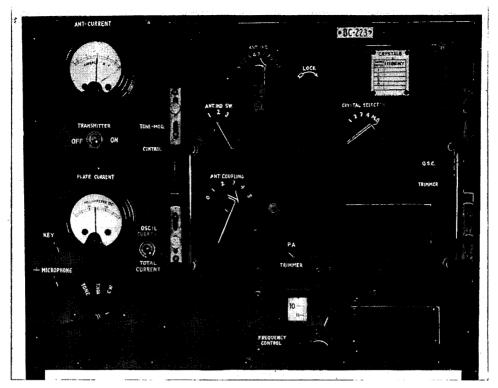


Figure 93. Communications panel board.

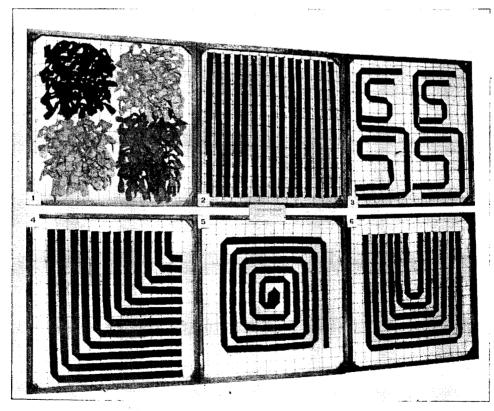


Figure 94. Camouflage garnish patterns.

Section V. KITS AND TRAINERS

23. GENERAL

This section illustrates kits and trainers, some of which have been standardized and are available for issue under appropriate tables of allowances. Trainers such as the tank communication trainer, figure 108, are actual size replicas of equipment.

24. ILLUSTRATIONS AND INFORMATION

a. Bridge model training kit, panel bridge, M2, Bailey type (figs. 95, 96, and 97).

(1) The bridge model training aid kit, panel bridge, M2, Bailey type, scale 8 to 1, is an approved Department of the Army training aid. It is designed for demonstrational use by instructors and also for practical work by stu-

dents in classes having 30 to 40 students. The model is not designed for use in capacity or physical tests. It weighs about 300 pounds including chests (fig. 95). The kit provides enough equipment to construct 10 bays (equivalent to 100 feet) of triplesingle construction with launching nose, 9 bays (90 feet) of doubledouble construction, 6 bays (60 feet) of triple-double construction, 8 bays (80 feet) of double-triple construction, and 6 bays (60 feet) of tripletriple construction. Enough additional equipment is supplied to construct 2 bays of ramp. Lengths of the model bridges are restricted by the amount of the equipment provided.

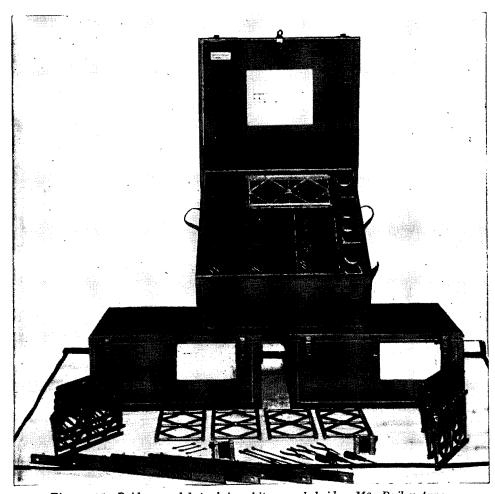


Figure 95. Bridge model training kit, panel bridge, M2, Bailey type.

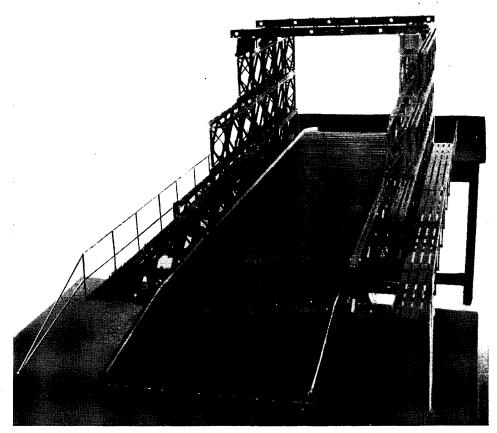


Figure 96. Front view, panel bridge, M2, Bailey type.

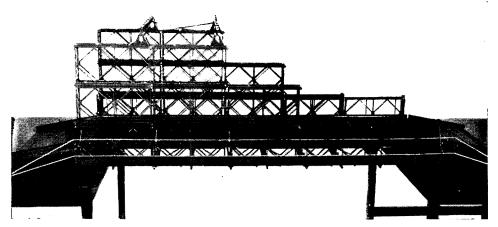


Figure 97. Side view, panel bridge, M2, Bailey type.

- (2) Assembled model bridges have an over-all width of 2 feet 6 inches without the footwalks, and 3 feet 2 inches with them. They vary in length from 1 foot 3 inches to 15 feet, and in height from 9 inches to 2 feet 3 inches. Figures 96 and 97 illustrate the 7 pos-
- sible types of standard truss construction that can be used in assembling the bridge.
- (3) Each bridge model kit is packed in three compartmental chests, (fig. 95). To aid the instructor in his presentation, one of each of the major compo-

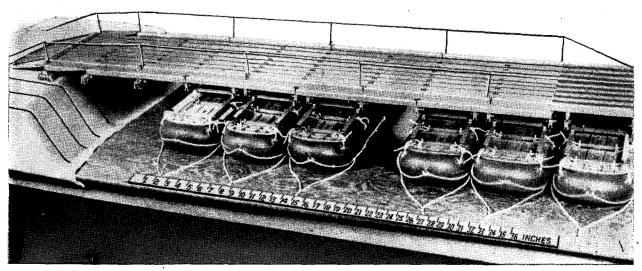


Figure 98. Bridge model, floating bridge M4A2.

- nent parts is painted an identifying color.
- (4) This kit is authorized for issue in appropriate tables of allowances. For information on the use of the kit, see TM 5-277K.
- b. Bridge model, floating bridge M4A2 (figs. 98, 99, and 100).
- (1) The bridge models shown above and on the following page are constructed from materials contained in a kit similar to that in figure 95. It weighs about 534 pounds, including chests. The equipment in the kit can be used to build models of several different types of bridges either with or without trestles.

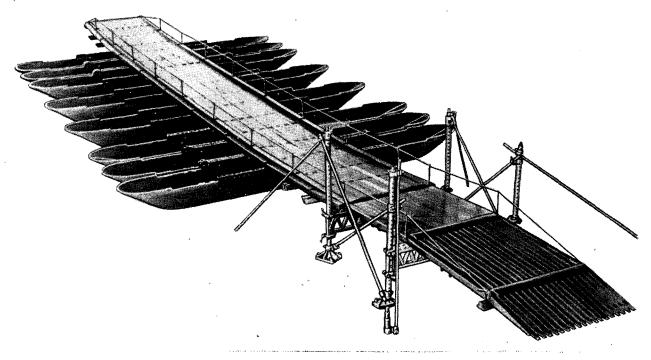


Figure 99. Floating bridge, M4.

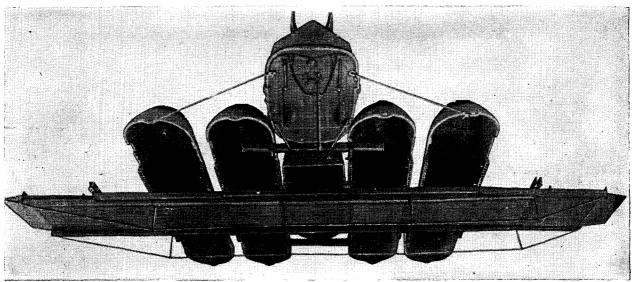


Figure 100. Raft section.

- (2) The dimensions of the finished models are as follows: M4 model bridge overall width of 4 feet 11 inches and a total length of 13 feet 2 inches (without trestle); the assembled M4A2 (class 50) model has an over-all width of 2 feet 9 inches and a length of 10 feet 7 inches. The raft section (fig. 100) also can be constructed from the kit. The bridge model kit is packed in 5 compartmental chests, similar to those displayed in figure 95. This kit is authorized for issue in appropriate tables of allowances. For complete assembly instructions, see TM 5–261K.
- c. Timber trestle bridge model (fig. 101).
 - (1) The kit, including chests, weighs about 210 pounds. When erected, its over-all dimensions are: length 11 feet 4 inches; width 2 feet 10 inches; height 1 foot 2 inches. Completely assembled, it consists of 9 spans. The major assemblies are two abutments.

- eight intermediate trestle bents, and the superstructure.
- (2) Each bridge model kit is packed in two compartmental chests similar in design to those shown in figure 95. It is designed for demonstrational use by instructors and for practical work by students in classes of from 30 to 40 students.
- (3) In order to aid the instructor in his presentation, one of each of the major parts is painted an identifying color. Three large-scale charts in corresponding colors, showing the construction details of the three types of major assemblies, are provided in a separate container that accompanies the model kit. This kit is authorized for issue under appropriate tables of allowances. For instructions in assembly of the kit, see TM 5–260K.
- d. Portable machine gun punchboard (figs. 102, 103, and 104).

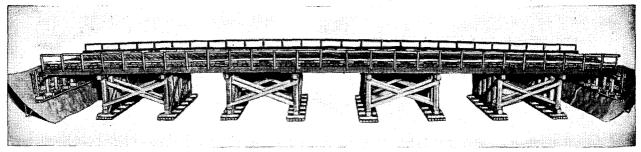


Figure 101. Timber trestle bridge model, class 50/80.

- (1) This punchboard is a 4- by 7-foot panoramic sketch of an impact area, showing targets, prominent terrain features, gun positions, and ranges. The instructor, by moving the simulated beaten zones to any portion of the target that he is discussing, teaches the technique of engaging various types of targets.
- (2) Plans for construction of the punchboard are shown in figures 103 and 104. A terrain sketch is made on the plywood front, and nails are driven in at desired places on the board to represent flanks and inner portions of targets. The elliptical-shaped pieces of plywood (resembling typical beaten zones) are attached to weighted ropes which pass through the two numbered gun positions at the bottom. Each beaten zone facsimile has a small hole drilled in the center, enabling the simulated beaten zones to be hung on nails in the desired locations.
- (3) All materials used can be obtained

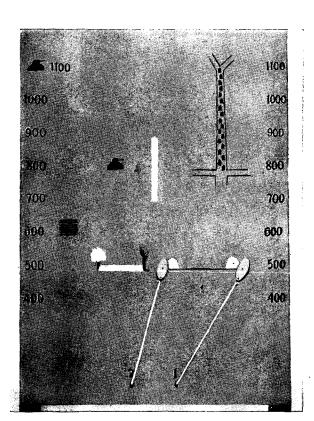


Figure 102. View of punchboard.

locally at an approximate cost of \$5. For information about the technique of engaging targets, see FM 23-55.

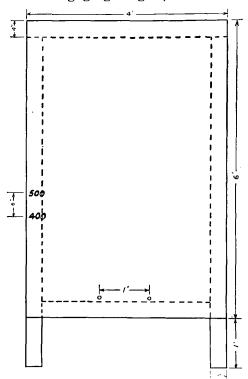


Figure 103. Diagram of punchboard frame, front view.

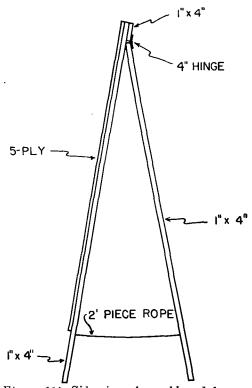


Figure 104. Side view of punchboard frame.



Figure 105. Photo interpreter kit, F2.

- e. Photo interpreter kit, F2 (fig. 105). This kit can be used by photo interpreters, G-2 sections, and other personnel engaged in photo interpretation work. The basis of issue is one kit per photo interpreter team. The illustration shows the items contained in the kit.
 - f. Artillery trainer, M3 (fig. 106).
 - (1) The trainer is a unit comprised of four miniature guns mounted on miniature carriages, each of which carries a panoramic telescope and the necessary mechanisms for moving the carriage in deflection and in elevation. The ammunition consists of com-
- pressed air as the propellant and a 1-inch commercial steel ball as the projectile. The guns may be employed singly or in groups of 2 to 4, depending upon the nature of the training.
- (2) The trainer can be used in many kinds of artillery training, one of which is conduct of fire. For additional information on training uses, operation, preparation of target area, etc., see TM 6-225. Appropriate tables of allowances cover the basis of issue of the artillery trainer.
- g. Gunnery training kit, M36 (fig. 107).



Figure 106, Artillery trainer, M3.

- (1) This standardized kit is used in field artillery training and consists of the following parts:
 - (a) Packing box. The packing box is constructed of wood and reinforced metal. The ends, bottom, and top are solid. The sides are formed by the blackboards. The interior of the box is grooved and fitted so that all components of the kit are held securely in place. The approximate dimensions are 76 by 23 by 39 inches.
 - (b) Smoke puff terrain board. This board, when assembled is 6 by 6 feet. Construction materials mainly are 1/4-inch plywood and 1/4-inch tempered masonite. For packing purposes, it folds to 6 by 3 feet. It is fitted together with wooden dowels. The scale of the terrain is 6 inches to 100 yards, making the area covered by the terrain screen 1,200 by 1,200 yards. The board is constructed so that the range from the gun position to the center of the board is 4,000 yards. The gun position may be moved to any position up to an 1,800-mil target offset on either side of the observer.
 - (c) Blackboard grid sheet. This black-

- board is gridded in white with a scale corresponding to the graduations of the plotting equipment. The blackboard forms one side of the packing box. The material is tempered masonite. Its dimensions are 6 by 3 feet.
- (d) Blackboard, computers record. This blackboard provides permanent computer's record form for fire direction center training. Its dimensions are 6 by 3 feet.
- (e) Blackboard, plain. This blackboard is for general instructional use. It forms one side of the packing box. The dimensions are 6 by 3 feet.
- (f) Blackboard, recorders sheet. This blackboard provides a permanent recorders sheet form for firing battery instruction. The dimensions are 6 by 3 feet.
- (g) Plotting equipment. Three sets of plotting equipment are included in this set. All items are constructed from tempered masonite. Each set consists of—
 - 1 range deflection fan, 40 by 18¾ inches.
 - 1 protractor, 24 by 12 inches.
 - 1 coordinate scale, 11 by 11 inches.

- 1 straightedge, 31 by 2 inches.
- (h) Aiming circle, piece and panoramic sight.
 - 1. The aiming circle consists of four thicknesses of ½-inch tempered masonite. Six model aiming circles are included in the set. The four thicknesses are the base; the lower motion, which operates independently; the upper motion, which also operates independently; and the compass needle, which moves only with the base and is always pointing "north."
 - 2. The piece and panoramic sight consists of three thicknesses of ½-inch tempered masonite. Twelve pieces and panoramic models are included in the set. The three thicknesses are the base; the piece which bears the sight index and operates independently; and the graduated circle, or panoramic sight, which also operates independently.
- (i) Vernier board. The vernier board provides a simple means of train-

- ing artillery survey personnel in reading both horizontal and vertical angles on a transit. This model is four feet long.
- (j) Military slide rule and easel. The military slide rule is universally applicable to all field artillery units. This model is six feet long. The easel provides a means for displaying and demonstrating the graphical firing tables, graphical site table, or the military slide rule. It also provides a solid backing for any of the blackboards.
- (k) Graphic site table and firing table. The graphic site table and firing table provides instruction of personnel in the use of these two tables. These models are six feet long.
- (2) This kit appears on appropriate tables of allowances. A similar kit may be purchased from the Artillery School, Fort Sill, Oklahoma, through the Book Department, at a cost of approximately \$250.
- h. Tank communication trainer (fig. 108).
 - (1) This training device is constructed as

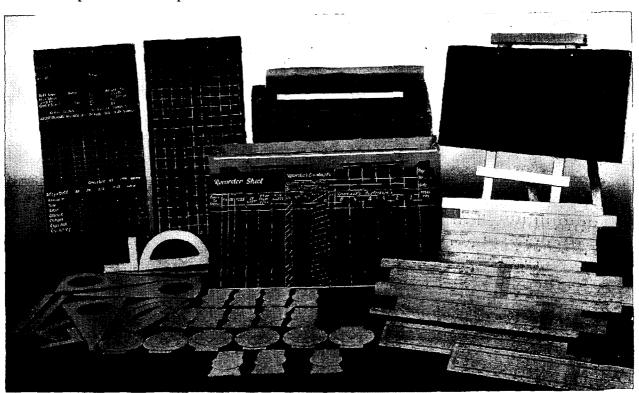


Figure 107. Gunnery training kit, M36.



Figure 108. Tank communication trainer.

an aid in tank communication instruction. Pipe ½-inch in diameter is used to build a simulated working model of the interior of a tank. The pipe is welded to conform to the general appearance of seat positions and frame.

(2) The intercommunication system and radio is added to the device. It is used

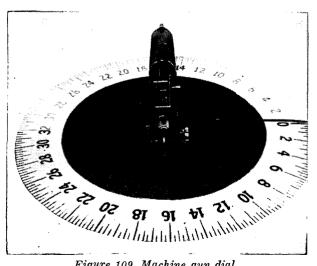


Figure 109. Machine gun dial.

indoors or outdoors, with 50 students for conference, and 5 for practical work. It can be constructed locally at any unit motor pool or shop, using five \(\frac{1}{4}\)- or \(\frac{3}{4}\)-ton truck seats, 80 feet of ½-inch pipe, 30 feet of 2-inch pipe, and four 4-inch casters.

i. Machine gun dial (fig. 109).

- (1) The training aid shown is an enlarged machine gun dial, 4 feet in diameter. A steel rod represents the standard index and is screwed into a specially drilled hole (ordnance project) in the cradle pintle block. The rod is stationary. The dial can be moved or kept stationary.
- (2) It can be used in the classroom or outdoors with a maximum of 200 students.
- (3) The dial can be made locally of masonite or other similar wall board.
- j. Driver's depth perception test (figs. 110 and 111).
 - (1) This test can be used as a training aid to teach safety rules and determination of approximate distances of

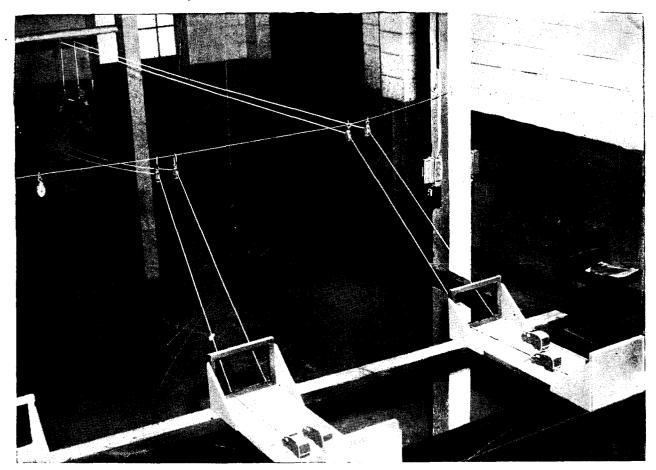
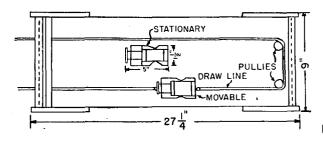


Figure 110. Driver's depth perception test.



DRIVER'S SCHOOL DEPTH PERCEPTION TEST

APPROX COST 15 TO 20 DOLLARS LOCALLY CONSTRUCTED

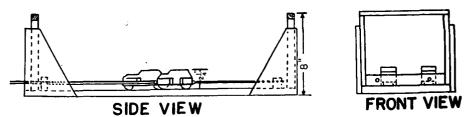


Figure 111. Schematic diagram of driver's depth perception test.

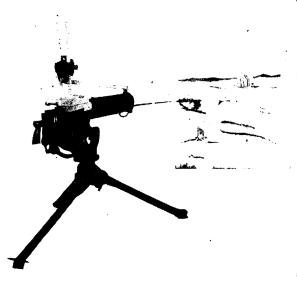


Figure 112. Auxiliary aiming point mock-up.

- vehicles approaching and passing one another.
- (2) By attempting to aline both miniature vehicle models correctly on the testing board, the potential driver can determine exactly how two approaching vehicles appear when abreast of each other, and how to judge, from the appearance, just when and at what distance he should observe certain safety measures.
- (3) This test, designed for indoor use, can be constructed locally from spare parts and salvage lumber. Pulleys and rope are used. One student operates the trainer.
- k. Auxiliary aiming point mock-up (fig. 112).
 - (1) This aid is employed in mock demontration of the auxiliary aiming point method of firing under conditions of poor visibility. The enlarged rear sight is 3½ times larger than the standard sight. A rod attached to the front and rear sight slide indicates the line of

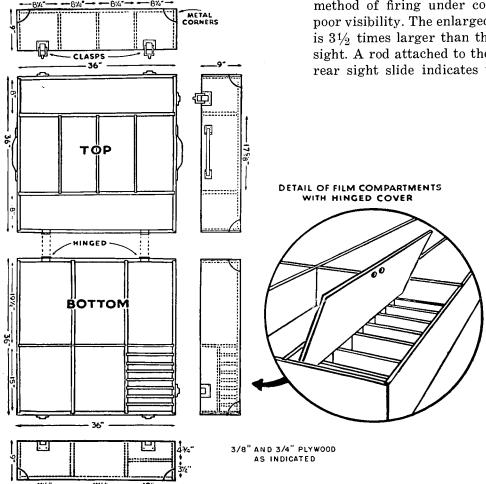


Figure 113. Training aid and publication carrying kit.

- aim, and extends 5 feet forward of the gun. A second rod, 5 feet long, protruding from the muzzle, indicates the trajectory.
- (2) It can be used in the classroom or outdoors for a maximum of 100 students. The target area can be changed periodically to represent different terrain and situations. Scrap masonite or plywood can be used and scenes painted on the surface.
- l. Training aid and publication carrying kit (fig. 113).
 - (1) This is a compact case for carrying training aids, projection equipment, and publications. This cabinet has space for manuals and other publications, training films and film strips, projectors, graphic portfolios, and a projection screen.
 - (2) Rabbet-joined edges provide protection against moisture. The training aid and publication carrying kit can be constructed inexpensively by any handy craftsman, following specifications in figure 113. Compartments may be changed to fit different combinations of training aids and publications.
- m. Antiaircraft machine gun trainer, M9 (figs. 114 and 115).
 - (1) An electrically controlled, pneumatic

- device, similar in dimensions to the caliber .50 water cooled antiaircraft machine gun. The trainer fires plastic pellets on a 1:30 scale range, simulating the time of flight of a caliber .50 bullet under actual firing conditions.
- (2) Each set includes two guns, two sound units which provide battle sounds and

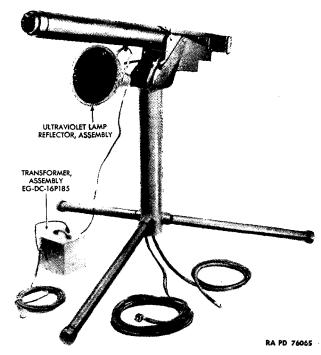


Figure 114. Antiaircraft machine gun trainer, M9.

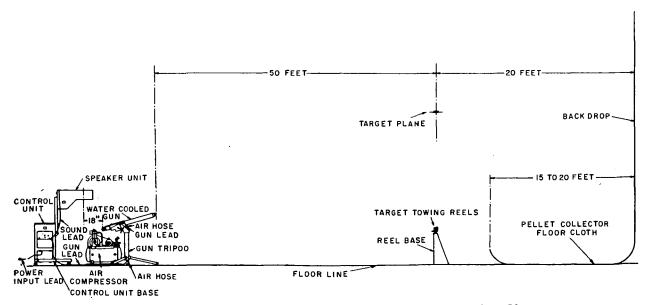


Figure 115. Schematic lay-out of antiaircraft machine gun trainer, M9.

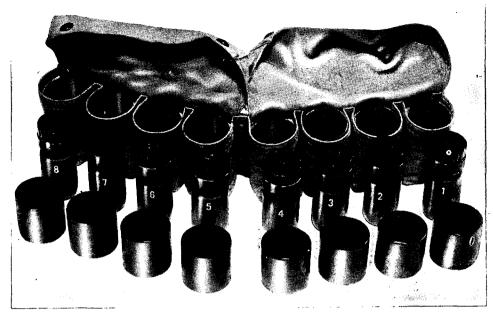


Figure 116. Gas identification set, M1.

simulate blast and recoil, a compressor, and a target system. (Sound units, compressor and target system not shown.) Complete data on this device are contained in TM 9-221 and TM 9-1221.

n. Gas identification sets (figs. 116 and 117). The gas identification sets are known as "sniff sets" and are used for the training of troops in the identification of various chemical agents. They can be procured through local Chemical Corps supply channels.



Figure 117. Gas identification set, M2.

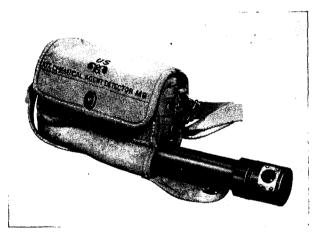


Figure 118. Kit, chemical agent detector, M9A1 (ready for carrying).

o. Kit, chemical agent detector, M9A1 (figs. 118 and 119). A set of materials, including detector tubes, reagents and air sampling pump used in the training of troops in the detection and identification of chemical agents. Units authorized this kit in tables of allowances may obtain it through Chemical Corps supply channels.

p. Kit, instruction, map reading (fig. 120). Full information for assembly and use of this kit may be obtained from TM 5-9990. Basis of issue is shown under appropriate tables of allowance.

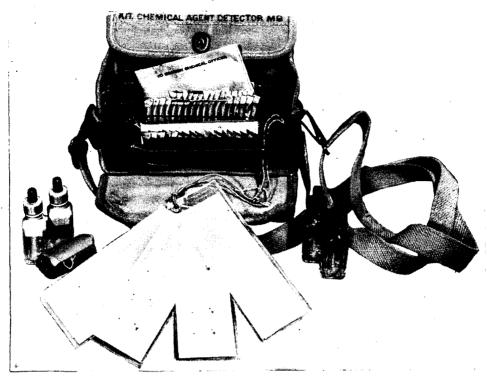


Figure 119. Kit, chemical agent detector, M9A1 (ready for contents).

q. Aggressor commander's kit (fig. 121). The kit shown in figure 121 is used by the delegated "Aggressor" commander to aid him in setting up and organizing an "Aggressor" unit. It includes the following items (the numbers corresponding to those in the picture):

- (1) Aggressor flag, white, 4 by 6 feet, with green equilateral triangle 2½ feet high in the center; used to identify Aggressor Commander's head-quarters or his vehicle.
- (2) FM 30-103, "Aggressor Army Order of Battle" (3 copies); reference and study manual.
- (3) FM 30-102 "Handbook on Aggressor Military Forces" (3 copies); reference and study manual.
- (4) FM 30-101, "The Maneuver Enemy" (5 copies); reference and study manual.

Note. FM 30-104, "Aggressor Army Representation, Operations and Equipment," will be included also.

(5) Aggressor documents used by the Aggressor forces for the testing and training of United States forces in

the correct processing of intelligence documents through the proper intelligence channels. Documents included are—

Pass.

Permanent pass.

Personal letter.

Sample page from notebook.

Sample page from diary.

Commendation.

Message.

Strength report.

Administration order.

Company roster form.

Casualty reports (tags).

Medical Corps collecting point tag.

Operation order.

Overlays (4 assorted).

- (6) Message form blanks used by the Aggressor forces in the same manner as the United States forces use the M 210-A Message Book.
- (7) Soldier's Identification Book, to be carried by Aggressor soldiers.

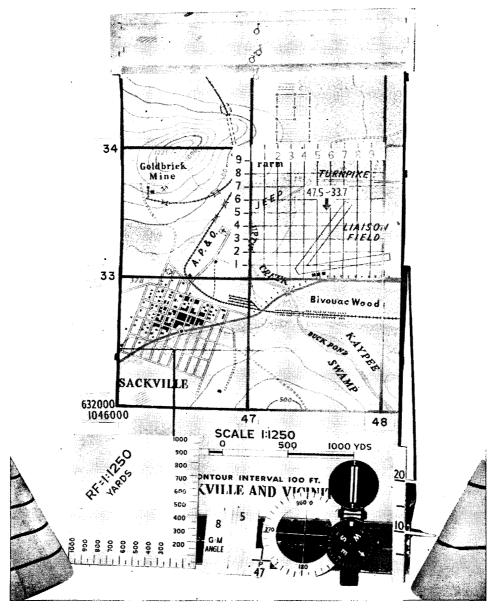


Figure 120. Kit, instruction, map reading.

- (8) Carrying case—a wooden case 5 by 12 by 18 inches (inside measurements) designed to hold all items of the kit for the purpose of storing and transporting.
- (9) Stamp pads and ink for use with rubber stamps.
- (10) Rubber stamp sets and rubber stamps. The rubber stamp sets are for marking Aggressor uniforms; the "secreto" stamp and "official seal" stamp are for marking documents.

The basis for issue for these items are one per division or one per separate unit of regimental strength or larger. Requisition for the Aggressor commander's kit should be forwarded to Commanding General, The Ground General School Center, Fort Riley, Kansas, Attn: Aggressor GHQ.

- $r.\ Smoke\ puff\ terrain\ board\ (figs.\ 122\ to\ 142)$.
 - (1) This type of training aid is used as a substitute for artillery service practice in teaching conduct of fire pro-



Figure 121. Aggressor commander's kit.

cedures. By using an aid of this type, a large number of students can obtain practice in conduct of fire without the expenditure of large quantities of service ammunition.

(2) The bill of materials, plans, and specifications shown in figures 122-142 are for a 14- by 14-foot terrain board.

Plans for the construction of a 6- by 6-foot portable and 3- by 3-foot terrain board can be procured, at a nominal cost, from the Book Store, The Artillery School, Fort Sill, Oklahoma. A 6- by 6-foot smoke puff terrain board is included in the gunnery training kit M36, shown in figure 107.

BILL OF MATERIALS

SADDLE 2	NO. REQ'D	CUT SHEET				
2	REGIO					
TRACK I				<u> </u>		
TRACK 1				2		
I	8		R.H.W.S.	3		
2 3" Butt Hinges 2 3/4" X 3-1/2" X 35" Yellow Pine 1 1-3/4" X 3-1/2" X 5'-3" " " " 1 1-3/8" X 5-1/8" X 3'-2" " " " 1 5/8" X 3-5/8" Dowel - Maple 1 #6 Drawer Pull 1 12 1" X 6 F.H.W.S. 2 3/4" X 1" X 16' Yellow Pine 2 3/4" X 1" X 14' " " " 1 2 25/32" X 3-5/8" X 67" " " " 1 2 1 3/8" X 1-1/2" X 7'-2" Plywood 1 1-1/2" X 3-1/4" X 7' White Pine 1 7/16" X 3-1/4" X 11-7/8" Plywood 5 2" Casters 2 CUT AND PLACE AS SHOWN IN PLANS 1 7/16" X 3-1/4" X 48-3/16" White Pine 3 3/4" X 5" X 5" Plywood 4 " " " " 2				η		
2 3" Butt Hinges 2 3/4" X 3-1/2" X 35" Yellow Pine 1 1-3/4" X 3-1/2" X 5'-3" " " " 1 1-3/8" X 5-1/8" X 3'-2" " " " 1 5/8" X 3-5/8" Dowel - Maple 1 #6 Drawer Pull 1 12 1" X 6 F.H.W.S. 2 3/4" X 1" X 16' Yellow Pine 2 3/4" X 1" X 14' " " " 1 2 25/32" X 3-5/8" X 67" " " " 1 2 1 3/8" X 1-1/2" X 7'-2" Plywood 1 1-1/2" X 3-1/4" X 7' White Pine 1 7/16" X 3-1/4" X 11-7/8" Plywood 5 2" Casters 2 CUT AND PLACE AS SHOWN IN PLANS 1 7/16" X 3-1/4" X 48-3/16" White Pine 3 3/4" X 5" X 5" Plywood 4 " " " " 2		1-1/2" X 11-1/2" X 12'	Yellow Pine	4		
2 3/4" X 3-1/2" X 35" Yellow Pine 1 1-3/4" X 3-1/2" X 5'—3" " " "				5		
		_	Butt Hinges	6		
1	2		Yellow Pine	7		
1 5/8" X 3-5/8" Dowel - Maple I 1 #6	ı	I-3/4" X 3-I/2" X 5'—3"	11 11	8		
#6 Drawer Pull	1		11 16	9		
12	1	5/8" X 3-5/8"	Dowel – Maple	10		
2 3/4" X 1" X 16' Yellow Pine I 2 3/4" X 1" X 14' " " " I 2 25/32" X 3-5/8" X 67" " " " I 2 " " X 96" " " " I I 3/8" X 1-1/2" X 7' - 2" Plywood I I 1-1/2" X 3-1/4" X 7' White Pine II I 7/16" X 3-1/4" X 11-7/8" Plywood I 5 2" Casters 2 CUT AND PLACE AS SHOWN IN PLANS I 7/16" X 3-1/4" X 48-3/16" White Pine 2 3 3/4" X 5" X 5" Plywood 2 4 " " " " 2	ı	#6 Drawer Pull		11		
2 3/4"X1"X14' " " "	12		F.H.W.S.	12		
2 25/32"X3-5/8"X67" " " "	2	3/4"XI"XI6'	Yellow Pine	13		
2 " X96" " " " I I 3/8"XI-I/2"X7'-2" Plywood I I I-I/2"X3-I/4"X7' White Pine I I 7/16"X3-I/4"XII-7/8" Plywood I 5 2" Casters 2 2 CUT AND PLACE AS SHOWN IN PLANS 2 I 7/16"X3-I/4"X48-3/16" White Pine 2 3 3/4"X5"X5" Plywood 2 4 " " " " " 2 " 2	2		11 11	14		
2 " X96" " " " I I 3/8"XI-I/2"X7'-2" Plywood I I I-I/2"X3-I/4"X7' White Pine I I 7/16"X3-I/4"XII-7/8" Plywood I 5 2" Casters 2 2 CUT AND PLACE AS SHOWN IN PLANS 2 I 7/16"X3-I/4"X48-3/16" White Pine 2 3 3/4"X5"X5" Plywood 2 4 " " " " " 2 " 2	2	25/32"X3-5/8"X 6 7"	in n	15		
I	2		11 11	16		
I	ı	3/8"XI-I/2"X7'-2"	Plywood	17		
5 2" Casters 2 2 CUT AND PLACE AS SHOWN IN PLANS 2 1 7/16" X3-1/4" X 48-3/16" White Pine 2 3 3/4" X5" X 5" Plywood 2 4 " " " " 2	ı	I-I/2" X 3-I/4" X 7'	White Pine	18		
5 2" Casters 2 2 CUT AND PLACE AS SHOWN IN PLANS 2 1 7/16" X3-1/4" X 48-3/16" White Pine 2 3 3/4" X5" X 5" Plywood 2 4 " " " " 2	ı	7/16" X 3-1/4" X 11-7/8"	Plywood	19		
7/16" X 3-1/4" X 48-3/16" White Pine 2 3 3/4" X 5" X 5" Plywood 2 4 " " " 2	5			20		
1 7/16" X 3-1/4" X 48-3/16" White Pine 2 3 3/4" X 5" X 5" Plywood 2 4 " " " " 2 2	2	CUT AND PLACE AS SHOWN IN	PLANS	21		
3 3/4"X5"X5" Plywood 2 4 " " " 2		7/16" X3-1/4" X 48-3/16"	White Pine	22		
4 " " 2	3			23		
	4	· · · · · · · · · · · · · · · · · · ·		24		
	20	1-3/4" X I O	F.H.W.S.	25		
				26		

Figure 122. Bill of materials for saddle and track.

SCREEN FRAME				
2	3-1/2"X3-1/2"X14'	Fir ·	27	
2	3-1/2" X 3-1/2" X 13'—9" "			
2	1/2" X 3/4" X 13' — 11"	Yellow Pine	29	
2	1/2" X 3/4" X 14'		30	
1	#14 or 16 —15 X 15 '	Wire Mesh	31	
12	I"XIO" X 23"	Yellow Pine	32	
1	1/4 X 4	Turnbuckle	33	
2	3/4 ROLLER	Awning Pulley	34	
4	1/4"	Screw Eye	35	
50 ft.	#6	Galvanized Wire	36	
2	2-1/4" X 3-1/4" X 6'—2-1/2"	Yellow Pine	37	
2	" " X5'—8-1/2"	u ii	38	
1	5/8" X I-1/4"	Dowel – Maple	39	
1	I" X5"	н н	40	
I	I-5/8" X 3-5/8" X 8"	White Pine	41	
6 sf.	1/4" Hail Screen			
4	Sponges			
5		Pipe Cleaner	44	
	BACKGROUND			
1	1/4" X 12" X 14'	Upson Board	45	
2	1/4" X 12" X 7"	11 11	46	
1	1/4" X 6" X 14'	u u	47	
2	1/4" X 6" X 7'	, II II	48	
1	3/4"XII-I/2"XI4'	White Pine	49	
2	3/4"XII-I/2"X7'	11 11	50	
1	3/4" X 2-1/2" X 9'	u b	51_	
_ 2	3/4" X 2 - 1/2" X 4'—5"	11 11	52	
32	1-3/4" X 10	F. H. W. S.	53	

Figure 123. Screen frame and background.

	PUFF B	ox	
1	I-1/2"X5"X9-1/2"	Yellow Pine	54
I	I-I/2"X7"X9-I/8"	n 11	55
4		Rubber Bulb	56
4	3/4"X 2-1/16"	Dowel—Plastic	57
2	1/2"X 1-3/4"	" Maple	58
2	I/2"X3"X9"	White Pine	59
28	I"X5	F.H.W.S.	60
2	I/2"X3"X3"	White Pine	61
1	1/2" X 5" X 8 - 5/16"	II II	62
NO. REQ'D	PUFF BOX COI	NTINUED	PIECE NO.
I	1/4"X12"	Welding Rod	63
ı	3/4" X 3/4" X 2 - 1/4	Iron Bar	64
2	5/16" IN. DIA.	Washers	65
2	I/2"XI-I/2"X 9-5/8"	White Pine	66
2	3/8" X 3/4" X 3-1/4"	" Maple	
2		Eye Hooks	68
	3/8"X9-5/I6"	· · · · · · · · · · · · · · · · · · ·	
1	I-3/4"XIO	R. H. W. S.	70
1		Washer	71
1	3/4"X2"X8-I/8	Plywood	72
2	1/2"X2"X 7"	Yellow Pine	73
2	3/4" X 6	R. H. W. S.`	74
l	1/2"X8-1/8"X24"	Yellow Pine	75
2	1/2"X1-1/2" X 24"	U O	76
2	1/2"X2"X9"	White Pine	77
	3/4" X 3/4" X 9 - 3/4"	11 11	78
8	IOUNCE CAP.	Vails	79
	3' 6 M M. O.D.	Glass Tubing	80
	9'	Rubber Hose	81

Figure 124. Puff box.

RANGE BEAM							
2	I-3/8"X7"X3' Yellow Pine						
ı	I-3/8" X 7" X I2'	11 11	83				
2 ·	3/16" X 6" X 3'	Upson Board	84				
I	3/16" X 6" X 12'	11 11	85				
2	3/4" X 2" X 3'	Yellow Pine	86				
4	I/I6" X 5/8" X 6"	"U" Strap	87				
2	1"X7	R.H.W.S.	88				
2	I-5/8"X3-1/2"X16"	Yellow Pine	89				
2	3"	Hinge	90				
2	3/4" X I-1/4" X 3'	White Pine	91				
	3/4" X I-I/4" X I2'	11 11	92				
4	6"	Strap Hinge	93				
Ι	I-3/4" X 3-5/8" X IO'	Yellow Pine	94				
8	I"X6	F. H.W. S.	95				
12	2" X I O	F. H. W. S.					
2	I/4" X 4"	Dowel-Maple ·	97				
	PILLOW BLOCK						
8	8 I-5/8" X I-3/4" X 3-1/2" Oa		98				
16	3" X I 2 R.H. W. S.		99				
	CARRIAGE						
4	4 3/4"X11-3/32"DIA. Plyw		100				
4	3/4" X 12-13/32" DIA.	l)	101				
i	4" X I" DIA.	Dowel-Bakelite	102				
I	4" X 4" X 4' — 4"	Fir	103				
2	4" X 4" X 4' —8"	ti .	104				
1	4" X 4" X 4' — 8 - 3/8"	11	105				
2	I-I/2" X 2-I/4" X 39"	Yellow Pine	106				
2	I-I/2" X 3-I/4" X 66"	11 11	107				
2	1-1/4" X 2-1/2" X 30"	II II	108				
2	1-1/4"X2-1/2"X33"	11 (1	109				
I	1/2"X4"	Dowel-Maple	110				
4	1/2" x 5 - 3/4" x 7"	White Pine	111				
2	3/4" x 3-5/8" x 7" " "		112				
1	4"x6"x25-1/4"	Fir	113				
ı	4" x 6" x 28 - 1/8"	11	114				
2	3/8"X#6	М. В.	115				

Figure 125. Range beam, pillow block, and carriage.

BILL OF MATERIAL

	·		
NO. REQ'D			
18	R.H.W.S. 3"X12		
I Gro.	F. H. W. S. 1-3/4" X 10		
4	HEAVY DUTY, 5" STRAP HINGES		
4	BROAD BUTT HINGES 3"		
50 ft.	#IO WIRE		
	3-1/2" TURNBUCKLE		
2	I" AWNING PULLEYS		
5	2" PLATE CASTERS, SWIVEL TYPE		
5 lbs.	ASSORTED NAILS AND TACKS		
l Gal.,	CLEAR VARNISH		
1/2 "	TURPENTINE		
1	1/2"X24" ROUND DOWEL STOCK, HARDWOOD		
. 1	1/4"X24" ROUND DOWEL STOCK, HARDWOOD		
l	I"XI8"ROUND DOWEL STOCK, HARDWOOD OR BAKELITE		
8	WIDE MOUTH GLASS BOTTLES I OZ CAP.		
. 8	RUBBER STOPPERS 2 HOLE # 6		
8	SOLID #6		
3 ft.	LIME GLASS TUBING 6 M.M. O.D.		
9 ft.			
4	RUBBER BULBS, PIPETTE LARGE 1-1/2"X 2-3/4"		
4	MEDIUM SIZE SPONGES		
<u> </u>	ASSORTED COLORS, SAWDUST		
IIb.	CASEIN GLUE		
5	4"X4"XI4' # I COMMON FIR		
2	4"X4"X 2' " " "		
L			

Figure 126. Material needed for construction of puff board.

1	4" x6"x 5' " " "				
	2" X12" X 14' " " "				
1	" " X 12' " " "				
5	1"X 12"X 16" " WHITE PINE				
<u> </u>	I"X 8" X 14' C-SELECT, YELLOW PINE				
2	I" X4" X H' " " " "				
4	2"X 4" X 12" T COMMON YELLOW PINE				
1	2 "X8 "X 18" " FIR				
1	2" X6" X 12" " YELLOW PINE				
I	2" X2" X 3' OAK OR MAPLE				
ı	3/4" X 2'X 4' PLYWOOD				
2	3/16" OR 1/4" X48" X84" UPSON BOARD				
	n n n n x72" n n				
256 SF	# 16 MESH SCREEN WIRE				
2	3/8'X 7" U.S.S. MACHINE HEAD BOLTS W/NUTS				
1	3/8 X 2 1/2"" " " " " "				
ı	LEAD ANCHORS FOR 3/8 BOLT. IF USED ON CONCRETE FLOOR				
6 S.F.	" MESH HAIL SCREEN				
ı	32" X /8" X /2" STRAP IRON				
	12" X 4" STEEL ROD				
6	SCREW EYES # 108				
	OURRED THRING				

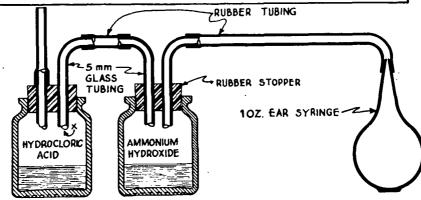


Figure 127. Material needed for construction of puff board.

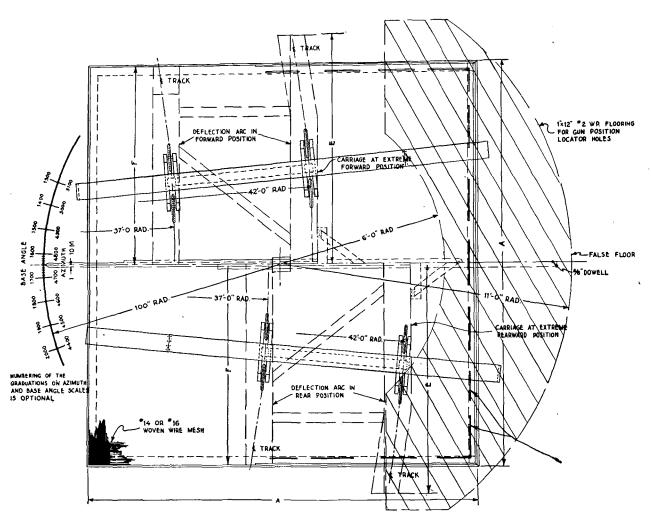


Figure 128. Floor plan of puff board, showing dimensions.

SCHEDULE OF KEY DIMENSIONS

SIZE OF TERRAIN	A	В	С	D	E	F
14' = 14'	14'-0"	8'-0"	12'-0"	3'-0"	8'-0"	7'-0"
12' * 12'	12'-0"	7'-0"	12'-0"	2'.0"	7'-0"	6'-172"
10' × 10	10'-0	6'- 0"	10'-0"	2'-0"	6'-0"	5'-3"

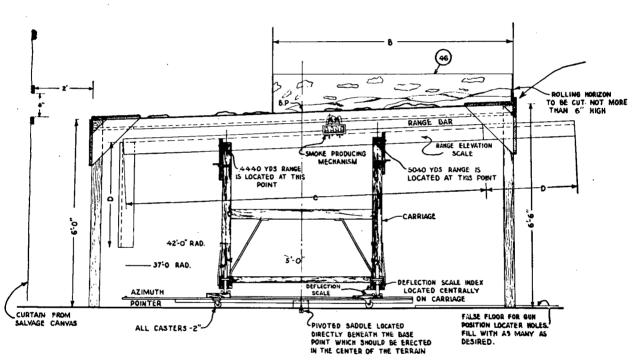


Figure 129. Specifications and dimensions of puff board—side view.

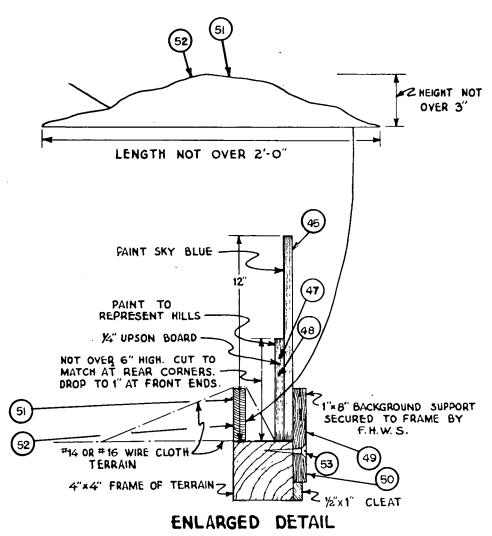


Figure 130. Specifications for joint and backboard of puff board.

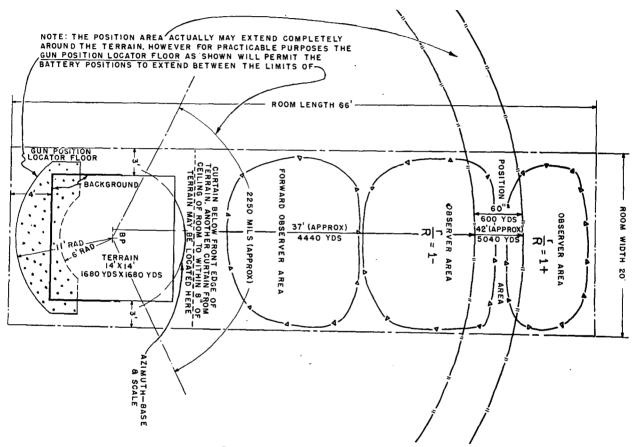


Figure 131. Top view of floor plan.

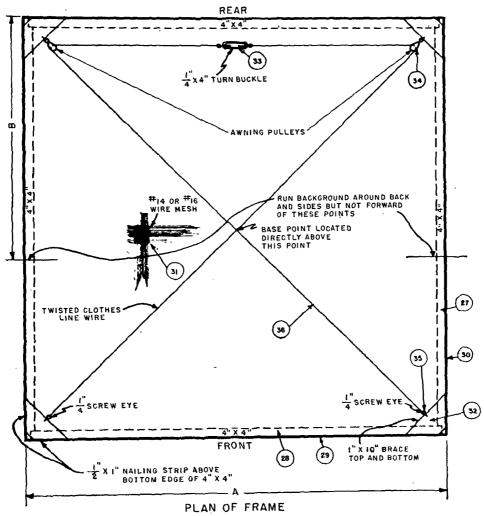
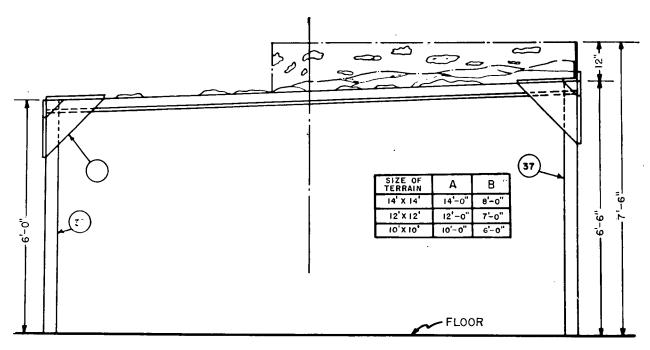


Figure 132. Plan of frame.



ELEVATION OF FRAME

Figure 133. Elevation of frame, showing dimensions.

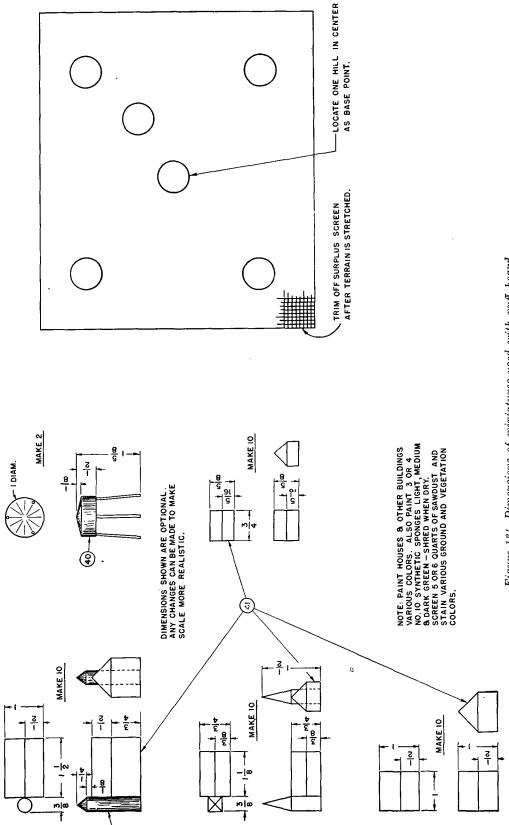


Figure 184. Dimensions of miniatures used with puff board.

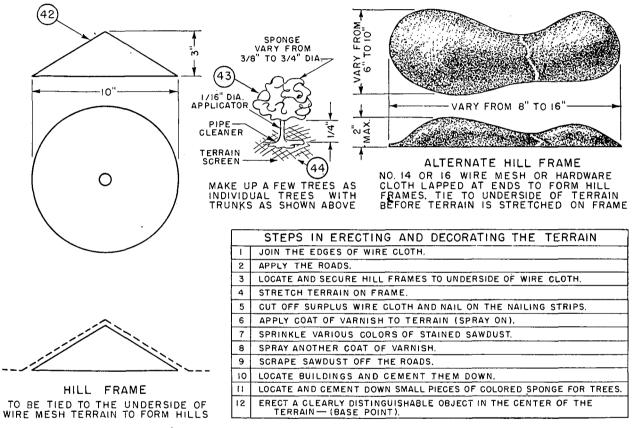


Figure 135. Plans for the terrain.

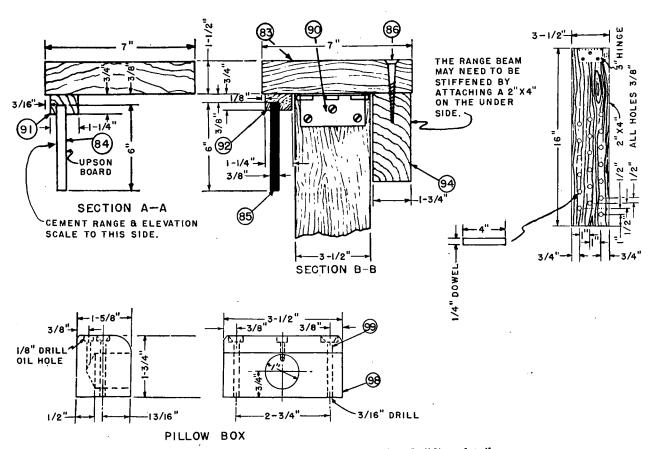


Figure 136. Close-up of hinge joint, showing building details.

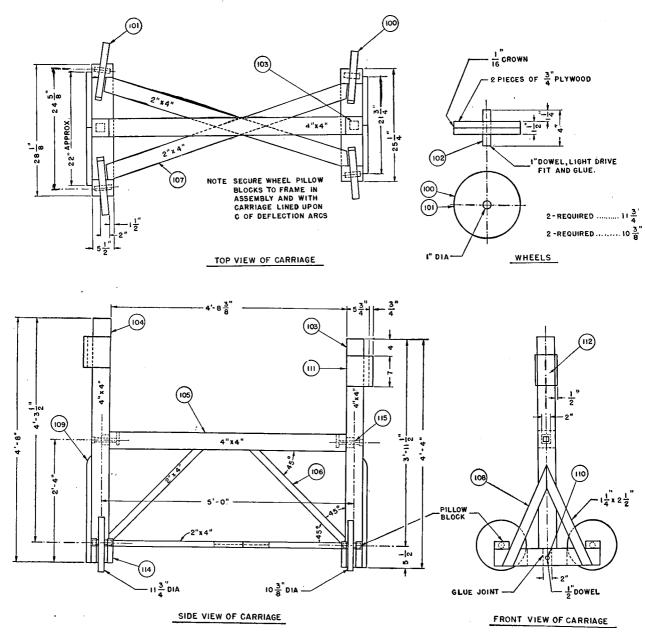


Figure 137. Plans for building carriage.

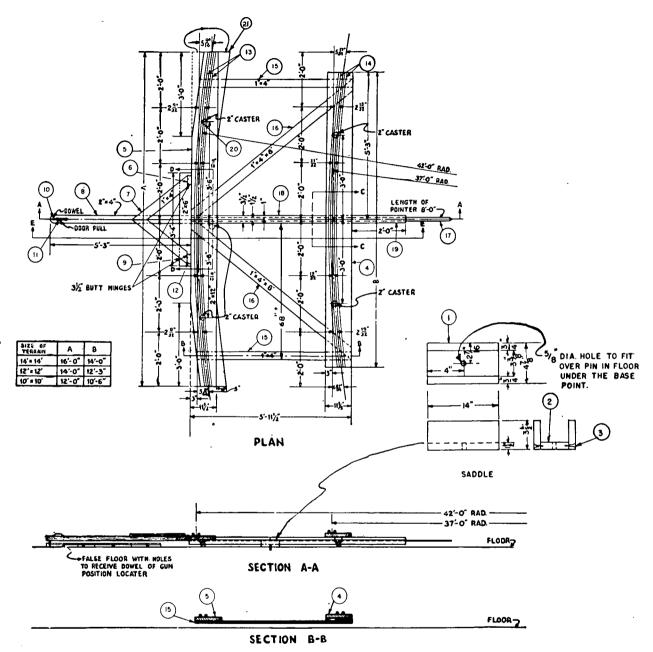


Figure 138. Construction of terrain base.

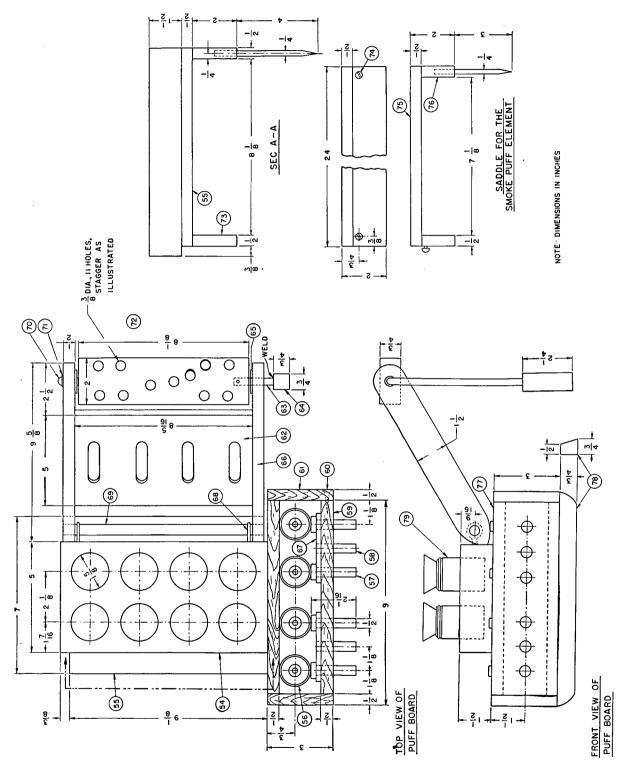


Figure 189. Additional view, side and front of puff board trainer.

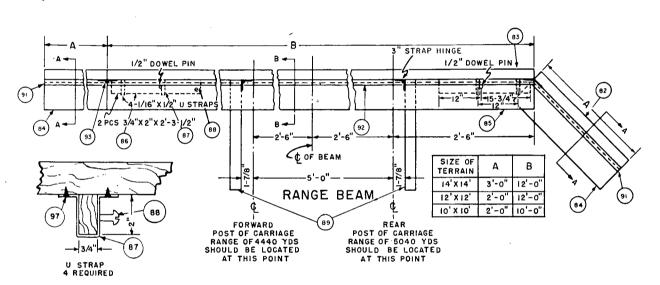


Figure 140. Size of terrain-side view.

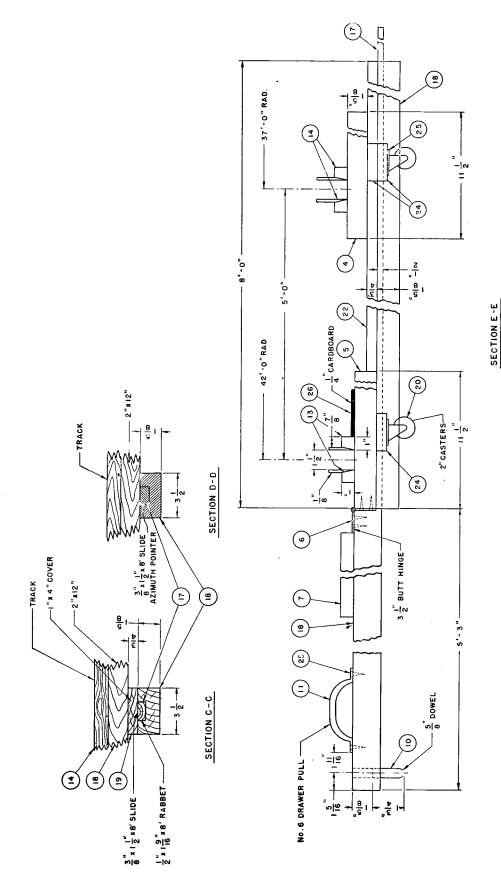
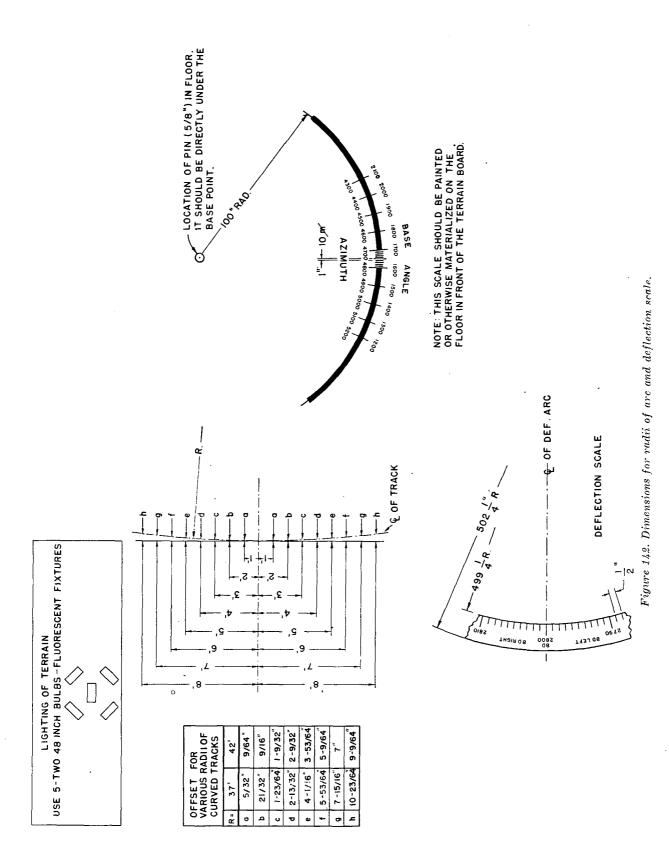


Figure 141. Section specifications for the puff board trainer.



Section VI. MINIATURES

25. GENERAL

a. Training aids constructed on a small scale are often helpful in adding realism to indoor training. Two-dimensional aids usually cannot give a realistic picture or representation of objects; therefore, the judicious use of miniatures can be a valuable asset in depicting the component parts of objects.

b. In this section are some miniature models used as training aids.

26. ILLUSTRATIONS AND INFORMATION

a. Gin pole, rigging model (fig. 143). This training aid is a miniature model of a rigging device, known as a gin pole, which is used in hoisting work. Constructed from ½-inch manila hemp or ordinary clothes line, a metal weight and small tackle blocks, this model is used to demonstrate proper procedures of rigging to groups of 30 men or less. For construction plans, see TM 5-225.

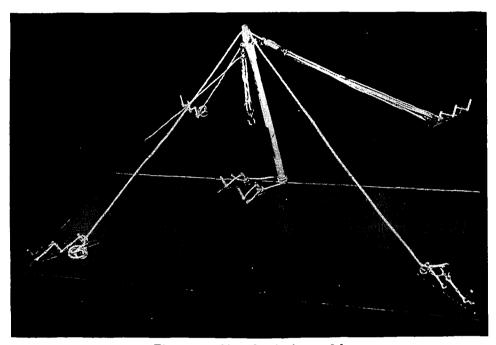


Figure 143. Gin pole, rigging model.

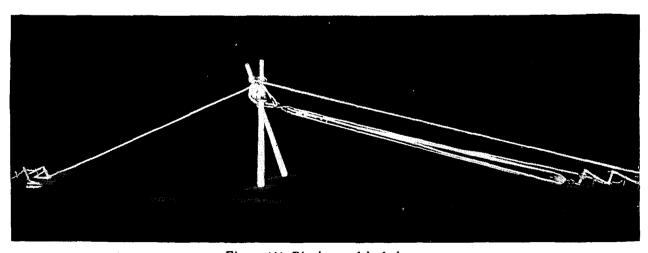


Figure 144. Rigging model of shears.

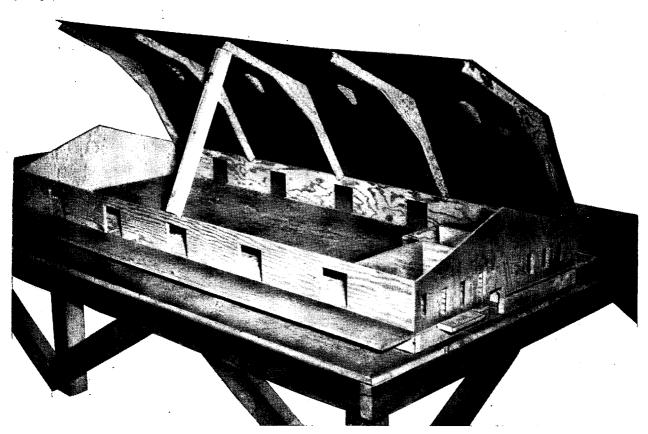


Figure 145. Warehouse model.

- b. Rigging model of shears (fig. 144). This training model is used to demonstrate the procedures employed in the erection of heavy machinery or other bulky objects. Materials needed are ¼-inch manila hemp or clothes line, 2 small snatch blocks, and lumber. See TM 5-225 for construction plans.
 - c. Warehouse model (fig. 145).
 - (1) This training aid is used to demonstrate the proper methods of storing supplies and equipment in warehouses. Models can be built to concur with current types of warehouses at the activities concerned, enabling the instructor to teach the procedures involved, using miniature models of local warehouses.
 - (2) This warehouse model was built with ½-inch plywood for the four sides and the beams. Masonite was used to construct the roof which is removable or can be attached with small hinges, allowing the roof to swing upward.

- (3) This model can be used indoors or outdoors with groups of 50 men or less.
- (4) Miniature storage pieces can be represented by wooden blocks of various dimensions.
- d. Field sanitation equipment (figs. 146 and 147). These miniature models, built to scale, can be used as training aids to show detailed construction of field sanitation equipment. The following items are shown in the illustrations: latrine box with pit, shower bath, baffle-type grease trap, incline plan incinerator, soakage pit, and soakage pit with baffle grease trap. The materials used in constructing these models include scrap lumber, pieces of glass, salvage screening and metal, nails, screws, bits of leather and cord.
 - e. Range target (fig. 148).
 - (1) This is a miniature movable target frame utilizing "A" and "D" 1,000-inch rifle targets. This training aid simulates the targets, frames, and stands which are used on standard

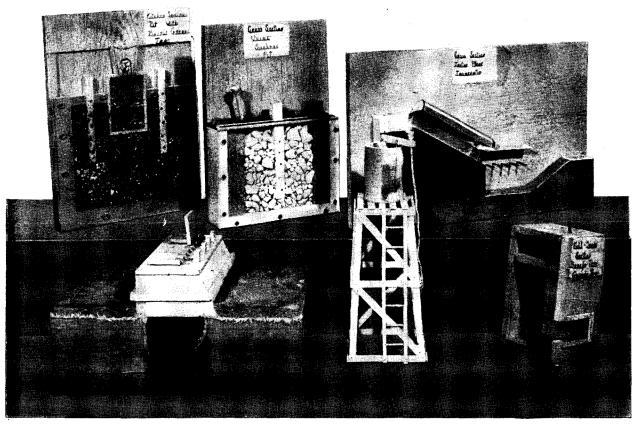


Figure 146. Angular view of miniature field sanitation equipment.

rifle ranges for practice and record firing. Targets are moved up and down by means of cords which are attached to each frame.

- (2) This aid is used to acquaint trainees with pit operations showing the marking and scoring of targets. This minimizes confusion and results in a substantial saving of time on the range. In addition, this device can be used in assisting trainees to develop proper timing for sustained firing.
- (3) It can be made from scrap lumber by a handy man, using the diagram shown in figure 148.

f. Rifle range (fig. 149).

(1) This training aid is a "range" built on top of a sturdy table, 4 feet wide and 5 feet long, with legs cross-braced to insure steadiness. The table top is a convenient height (40 inches) above the floor. The eight movable targets

are made to slide up and down in channels at the back of the range where they are pulled by strings attached to rings that extend through holes in the front end of the table. The red flags which indicate performance are controlled also from the front end of the table. As the photograph and diagram indicate, in the foreground of the range are the firing line, the ready line, and assembly area, on which is a realistic miniature tent made from a piece of khaki cloth or other material.

- (2) Training in rifle range discipline, before actual experience is acquired on the range, can be facilitated by knowledge gained through the use of miniatures of this nature.
- (3) This suggested training aid can be made by a craftsman from salvaged lumber, using the specifications shown in the diagram.

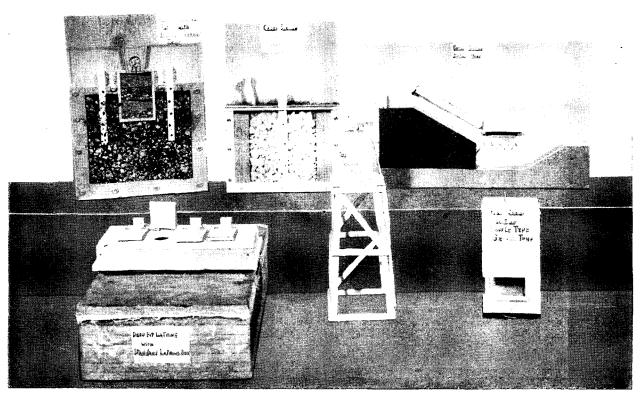


Figure 147. Front view of miniature field sanitation equipment.

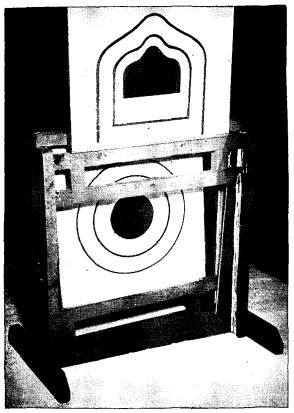


Figure 148. Miniature range target.

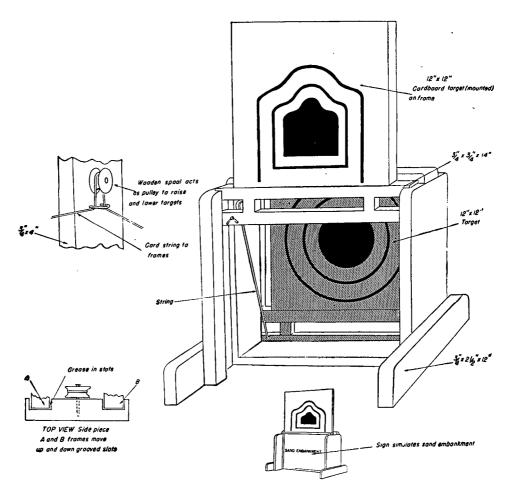


Figure 148. Miniature range target—continued.

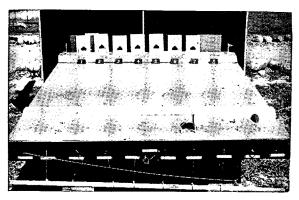


Figure 149. Rifle range (miniature).

MINIATURE RIFLE RANGE TOP VIEW

Figure 149. Rifle range (miniature)—continued.

Section VII. TERRAIN MODELS

27. GENERAL

- a. This section shows various types of terrain boards and sand tables and how they can be constructed.
- b. One method of preparing a terrain board or table is as follows:
 - (1) Secure a contour map of the area to be reproduced. If no map is available, or if the area is imaginary, a small map should be improvised.
 - (2) Determine the scale to be used and draw grid squares on the map.
 - (3) Draw corresponding grid squares to the desired scale on table top or base. It may be necessary to subdivide these grid squares to insure rigidity in the completed surface, in which event, corresponding subdivisions will have to be made on contour map.
 - (4) Determine elevation at each intersection of grids on contour map.
 - (5) Cut pegs to scale for elevation of each intersection of grids on contour map and install at corresponding point on wooden base.
 - (6) Stretch cheesecloth, dipped in thin wallpaper paste (or flour-and-water paste), or sized with varnish, over pegs, tacking the cloth to the lower pegs, and allow to dry.
 - (7) If paste is used, coat with shellac; if varnish is used, no shellac is necessary.
 - (8) Mix dry papier-mâché with water to about the consistency of custard and spread mixture over cloth with hands or trowel, shaping to suit surface of terrain desired.
 - (9) Trees and shrubbery may be made of sponges dipped in green ink or paint and buildings may be constructed out of cardboard, wallboard, plywood, or scrap lumber, suitably painted. Small trees may be made from lichen which has been cured by immersion in a mixture of glycerine and alcohol in equal parts and then colored with green ink or water colors. Shrubbery, trees, etc.,

- should be installed on terrain board while papier-mâché still is wet. Ingenuity should be used in obtaining other objects to be used to complete detail of terrain board. For example, miniature cars, trucks, and figures, can be obtained at small cost at novelty stores.
- (10) Alternate method of surfacing terrain board: Mix plaster of paris to a consistency of thick cream. Have ready, newspaper torn into piece 6 to 10 inches square. Into the plaster of paris mixture dip pieces of newspaper, one at a time, and apply to cloth foundation, overlapping each piece, and overlaying several pieces where extra height of irregular contours are desired. Shellac when dry and finish with oil paint. Only a small amount of plaster of paris should be mixed at one time, since this material sets very quickly.
- c. Frequently, terrain models are prepared from aerial photographs or they may be entirely hypothetical, with the terrain features especially created to fit the particular problem which the display is to illustrate.

28. ILLUSTRATIONS AND INFORMATION

- a. Sand table construction and accessories (figs. 150 and 151).
 - (1) These plans can be used for the construction of a portable sand table. The tray and stand are separate, allowing them to be moved easily. The tray holds approximately four bags of sand. The following is required to build the sand table:
 - 50 feet (running) 2- by 4-inch lumber
 - 17 feet (running) 1- by 5-inch lumber
 - 40 feet (running) 1- by 2-inch lumber
 - (2) The stand is constructed entirely of 2- by 4-inch lumber except for braces marked "A," which are 1 inch

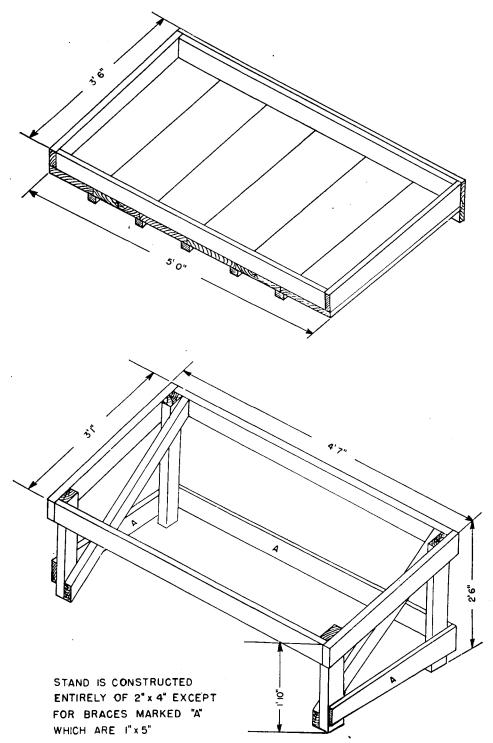


Figure 150. Sand table construction.

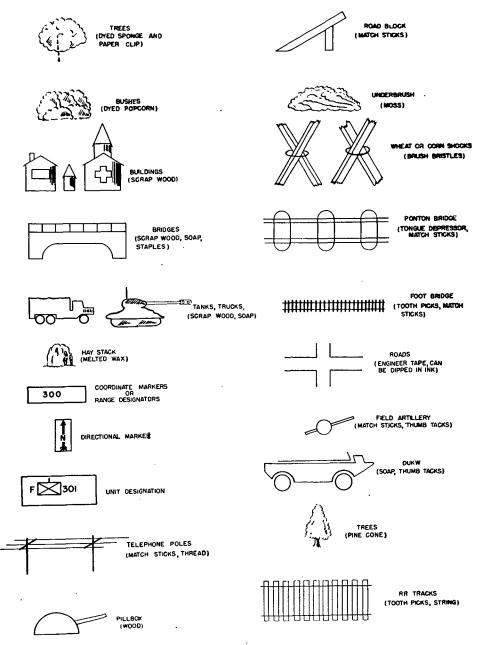


Figure 151. Sand table accessories.

by 5 inches. For suggested sand table accessories and their construction, see figure 151.

- b. Construction of laminated contour terrain model (figs. 152 and 153).
 - (1) Figures 152 and 153 illustrate the stages of development in the production of a terrain model using the horizontal layer method.
 - (2) The first step (fig. 152) is to construct a framework to the desired size of the

finished product and fasten a baseboard on top. This baseboard should be of lightweight but durable material, such as masonite or wallboard. Next, trace onto a piece of cardboard the contour lines from a map enlarged to the desired scale. To achieve this, the use of a balopticon projector would be a great value. After tracing on the cardboard, cut along each line. This leaves an island of cardboard for each contour line. When all islands are cut, place them in the correct position, and glue or nail each piece separately. When the top contour layer is in place, cover the entire surface with a thin coating of shellac to keep out moisture.

(3) Figure 153 shows the model after the contour layers have been covered with molding plaster or sand mixed with commercial glue. When the plaster or

sand-glue mixture is dry, the entire surface is covered with two coats of paint. Roads and streams are painted in. Basic vegetation, represented by pieces of dyed sponge or lichen, is glued in place. From then on, it is merely a matter of adding buildings, bridges, and any other miniatures desired, resulting in a finished terrain model presenting a realistic appearance.

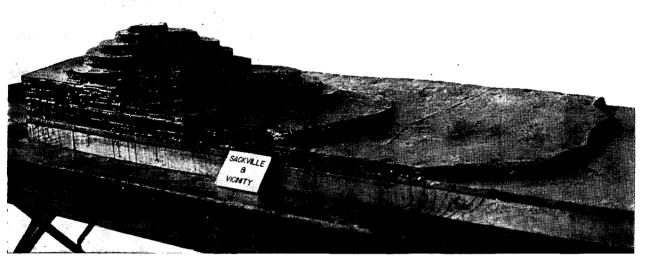


Figure 152. Framework of laminated contour terrain model.

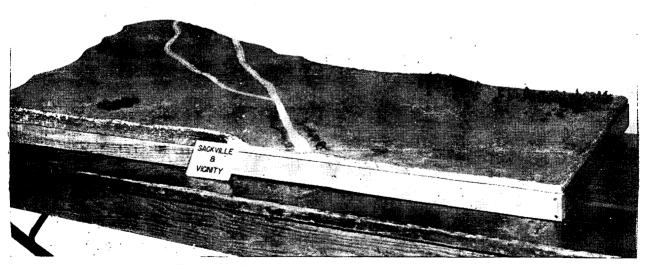


Figure 153. Framework covered with molding plaster.

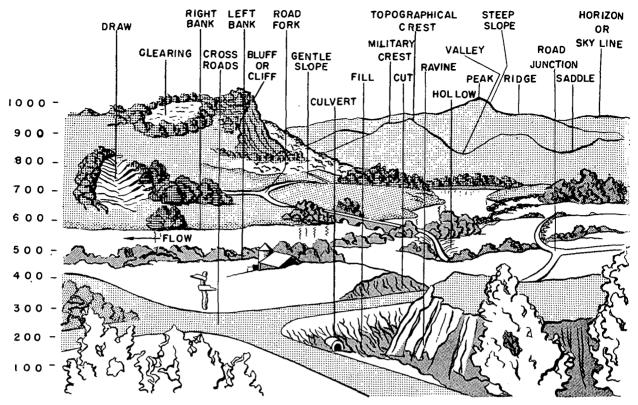


Figure 154. Topographical terms chart.

- c. Topographical terms chart (fig. 154). This suggested training aid is a 4- by 7-foot piece of \(^3\)\%-inch plywood with the topographical features and military terms painted on the panel. It is used in map reading instruction to acquaint the student with topographical terms. It can be used outdoors or in a classroom. It is designed for use with a group of 200 men or less. Approximate cost, \\$5 per chart. Examples of various other terrain and panoramic views may be obtained in FM 21-25 or FM 21-26.
 - d. Hasty terrain model (fig. 155).
 - (1) The ingenious use of an issue blanket, a piece of burlap, canvas, or other readily available material, can result in an excellent terrain model. Models can be based on maps, aerial photographs, or current information secured by direct observation of the terrain, or by patrols. They are lighter and set up more easily than sand tables, can be changed whenever necessary, and are capable of the greatest variety.
- (2) Figure 155 illustrates how an ordinary issue blanket can be utilized for this purpose. Miniature models of tanks, railroad tracks, houses, and woods can be made from scrap lumber. Designation and symbol cards representing units and activities can be drawn on small squares of cardboard and used over again.
- (3) The hasty terrain model, as depicted here, does not represent an actual tactical situation and is not meant to do so. It is used only to show how models and miniatures are adaptable to this particular type of training aid. Hills have been made by lumping material (such as sand, newspaper and dirt) under the blanket. Woods are represented by dyed pieces of sponge (see fig. 151). The line of departure shown is a piece of engineer tape. Ordinary rope can be used for this purpose. Railroad tracks are constructed from chicken wire.

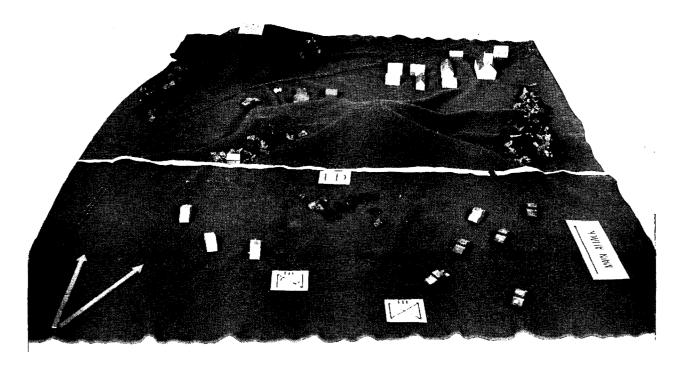


Figure 155. Hasty terrain model.

- (4) This model can be used to represent actual terrain for instruction of troops in battle formations, for briefing troops in the field on impending tactical problems, and for critiques.
- e. Tank gunnery training aids. The training aids shown in figures 156 through 164 are used in teaching conduct of fire to tank crews of armored units.
- f. Terrain board (fig. 156). The terrain board shown in figure 156 is constructed as follows:
 - (1) A painted 6- by 4-foot board is mounted *horizontally* about 3 feet above the floor.
 - (2) An aiming circle or binoculars are placed at the same height and 400 inches from the center of the board.
 - (3) The longitudinal center line of the board is determined and sketched in lightly.
 - (4) The aiming circle or binoculars are positioned so that the line of sight through the vertical center of the reticle is along the longitudinal line previously determined as in (3) above.
 - (5) Successive angles of 10 mils are meas-

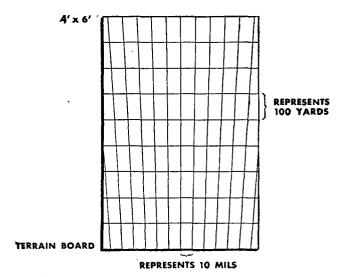


Figure 156. Terrain board, showing range and deflection lines.

- ured right and left from the center line, and deflection lines are sketched in.
- (6) Beginning at the front edge, parallel range lines are drawn across the board perpendicular to the center line. The distance between range lines is 8 inches.

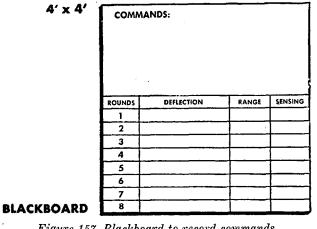


Figure 157. Blackboard to record commands and sensings.

- g. Blackboard (fig. 157). The blackboard is an additional piece of equipment used in conjunction with the terrain board. A piece of masonite board or plywood cut to the dimensions given in figure 157 is utilized for this purpose.
 - h. Accessories for terrain board (fig. 158).
 - (1) The HE and smoke spotter shown at the right in figure 158 is constructed by fastening two sheet metal semicircles, with a radius of three-quarters inch, to the ends of a 3-foot-long heavy iron rod. One semicircle is painted to

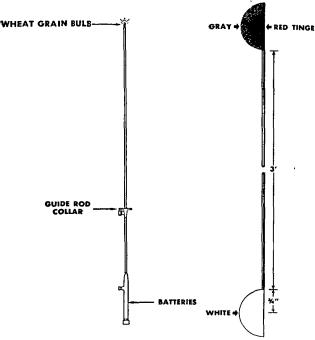


Figure 158. Accessories for terrain board.

- represent the burst of the smoke shell, the other end is painted to represent the burst of HE.
- (2) The shot pointer, shown at the left in figure 158, is fitted with a small red light which is activated by flashlight cells contained in the handle. The red light is used to represent the path of

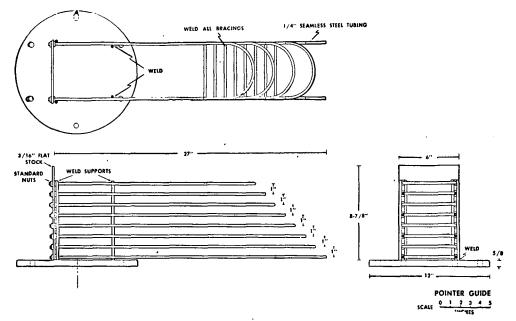


Figure 159. Details for construction of the pointer guide.

the tracer element in firing shot problems.

- i. Pointer guide (fig. 159).
 - (1) The pointer guide is used to hold the shot pointer at various elevations so that, when the pointer is moved, with the bulb lighted, it will show the path of a tracer shot.
 - (2) The distance between the guide rods is 1 inch. Each pair of alternate guide rods represents a vertical change of 5 mils. They are brought together at the open end for use in identification.
- j. Assembly of pointed guide. Figure 161 illustrates two views of the assembled terrain board, pointer guide, and pointer. Targets used

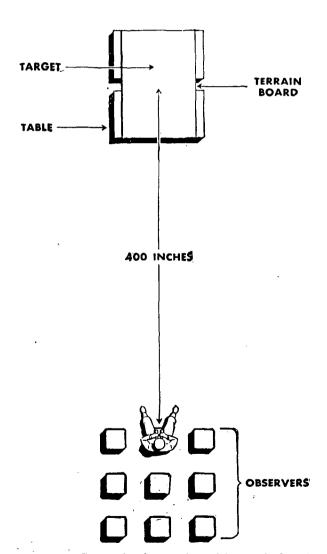
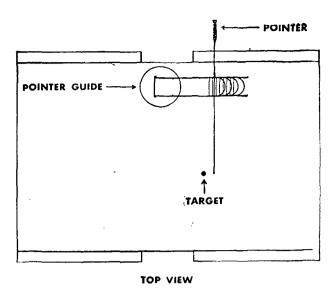


Figure 160. Set-up for instruction with terrain board.



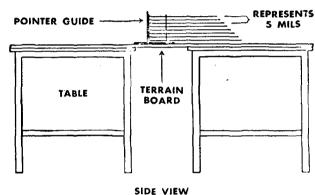


Figure 161. Assembly of pointer guide.

are made in miniature and should include enemy tanks, antitank guns, pillboxes, and fortified positions. The targets should be constructed to scale in order to give a correct representation at the range selected.

- k. Use and operation of terrain board (fig. 162). Instructions on the use and operation of the terrain board will be found in FM 23-100.
- l. Terrain fan (fig. 164). The terrain fan is not as elaborate as the terrain board. Further, the absence of the guide rails requires the instructor to demonstrate a thorough knowledge of trajectory. The simplicity of the terrain fan, however, permits it to be easily constructed on the ground or painted on a piece of plywood and moved from place to place, by using the dimensions shown in the illustration.

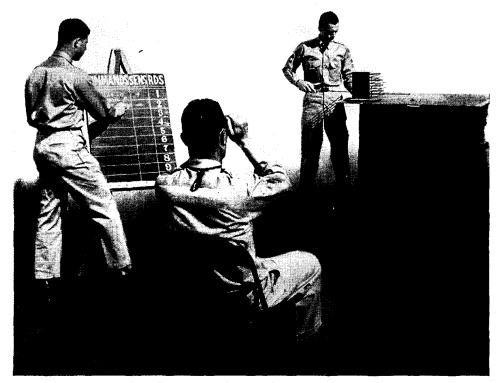


Figure 162. Terrain board in use.



Figure 163. Composite view of items required for gunnery training.

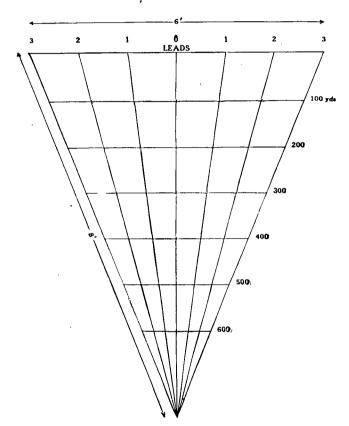


Figure 164. Terrain fan.

Section VIII. MISCELLANEOUS DEVICES

29. GENERAL

Many of the training aids shown in this section are devices developed and used locally by Army instructors in their courses of instruction. Relatively few of these have been standardized by the Department of the Army. Almost all of them have been made in training aid shops at training installations for use at the installation. Generally, devices are used as substitutes for actual objects in certain phases of training.

30. ILLUSTRATIONS AND INFORMATION

a. Radiation pattern models (fig. 165). These models are made of cardboard and are used to illustrate the radiation pattern of a half wave antenna at different heights above the ground and in a vertical or horizontal plane. The rod can be made of ½- by 30-inch wood or metal and represents the antenna. They can be used in the instruction of 30 or less students.

- b. Combat formation display board (fig. 166).
 - (1) This training aid display board consists of a 5- by 6-foot wooden frame covered with canvas or target cloth. Pegs fastened to the rear of the frame are used to stand the board upright. Eighteen men 8 inches high, cut from plywood, are used to show squad

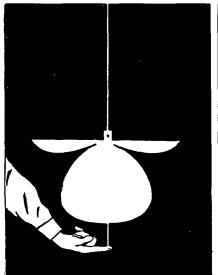
formations. They are painted and numbered according to their position in the squad:

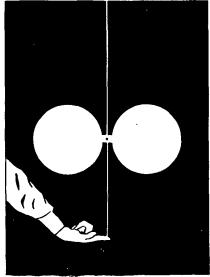
Scouts—white; numbers black. Squad leader—red; numbers white. Riflemen—blue; numbers white.

AR man and assistant—yellow; numbers black.

Assistant Squad Leader—green; numbers white.

- (2) Placques cut in the shape of squad formations are used to illustrate whole squads or platoons for larger unit formations. The men and formations are fastened to the board by means of small nails.
- (3) The cloth or canvas is painted black or olive drab to stiffen the cloth and to form a backround. It can be made locally at nominal cost.
- (4) The board is designed for use in the instruction of infantry combat formations to groups of 200 men or less.
- c. Sandpaper-backed movable indicators (fig. 167). Movable visual aids with sandpaper stapled on the back (rough side facing out) are placed on an ordinary Government issue blanket or felt cloth which is mounted on a frame. The frame is tilted slightly, permitting the indicators to stay in place without dropping.





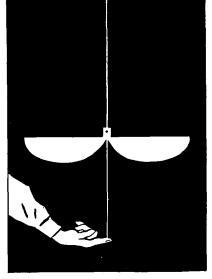


Figure 165. Radiation pattern models.

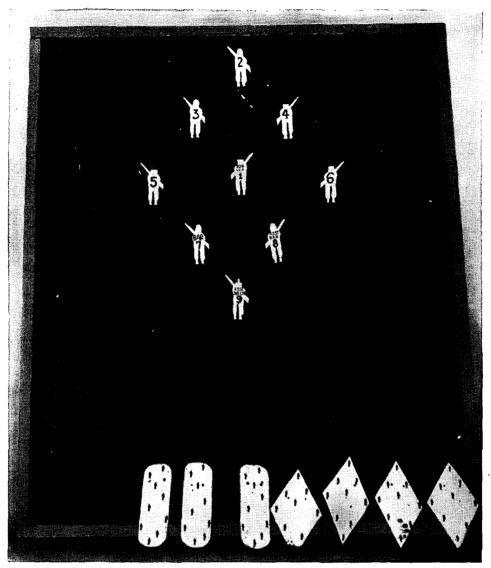


Figure 166. Combat formation display board.

This type aid enables the instructor to build charts, maps, drawings, diagrams, etc., in front of the students as he continues his lecture. Parts can be removed, interchanged or compared when necessary. Materials needed are scrap lumber, Government issue blanket or felt cloth, poster board, and sand paper (0 to 1½ gage, medium rough).

- d. Aerial photograph recognition factors (fig. 168).
 - (1) This training aid is used to show the six factors of recognition and is used in connection with instruction in aerial photograph reading.
 - (2) This aid is constructed in six panels,

- upon which various wooden objects are mounted. A movable light is suspended to one side of the board and, by movement of the light, shadows may be shortened or lengthened. Pegs are removable and are used to show outline break-up.
- (3) This aid may be constructed locally of scrap lumber.
- $e.\ Time\ and\ space\ march\ cards$ (figs. 171 and 172).
 - (1) In order to show graphically the length, organization, and composition of an organization on the march, time and space march cards may be used.

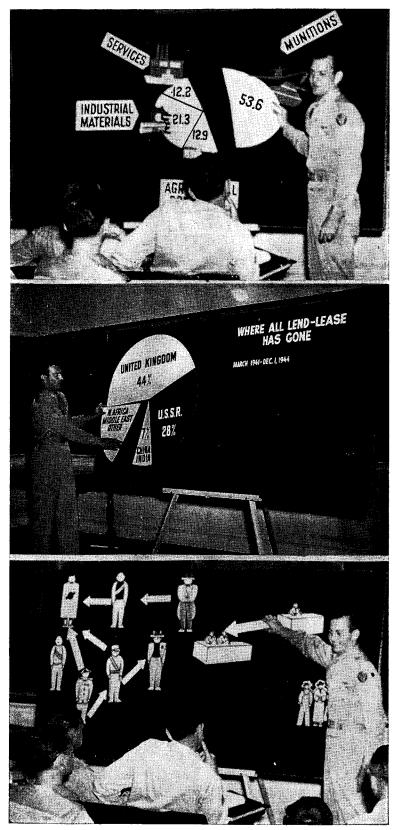


Figure 167. Sandpaper-backed movable indicators.

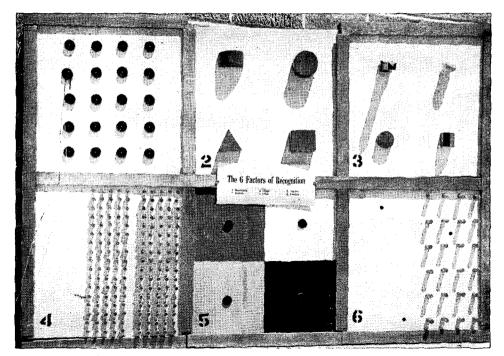


Figure 168. Aerial photograph recognition factors display.



Figure 169. Display panel showing air observation by eye (approximate cost, \$10.).

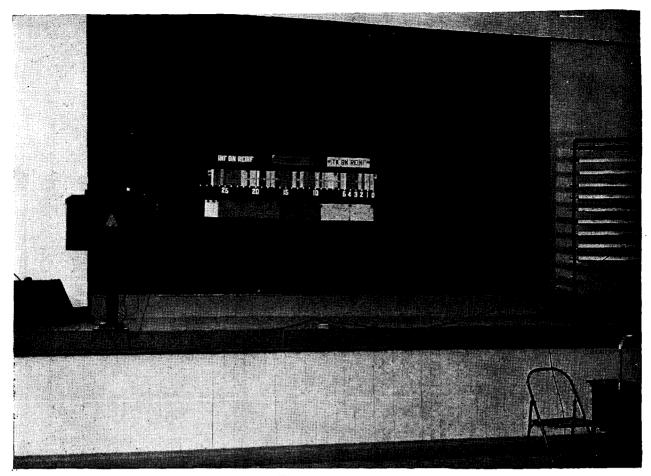


Figure 170. Time and space march cards.

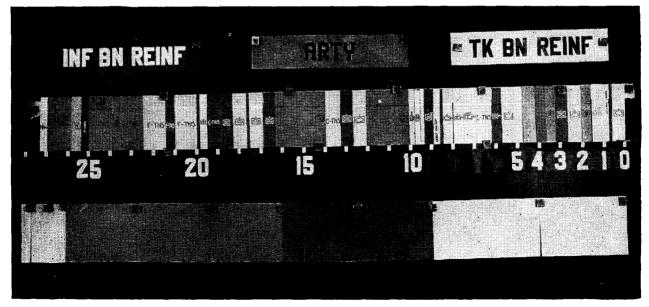


Figure 171. Close-up view of time and space march cards.

- (2) Each card represents a unit, or element of the unit, and is cut to scale so that, when placed on the mileage scale, it accurately represents the actual road space occupied by that unit.
- (3) The cards are painted different colors to represent units of the various arms and services. To further identify the cards, the unit symbol of the particular unit is placed on the front of the card. On the back of each card is typed the number of vehicles comprising the unit.
- (4) When these cards are placed side by side (fig. 171), they clearly illustrate the length, organization, and composition of an organization on the march.

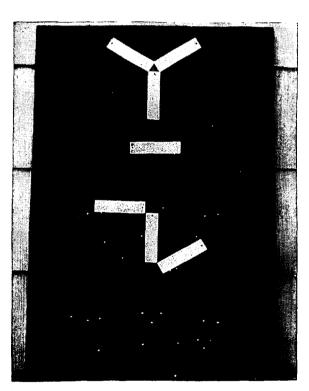


Figure 172. Panel board for ground-air communication training.

- f. Panel board for ground-air communication training (figs. 172 and 173).
 - (1) This is a simple training aid with which trainees can be given preliminary indoor instruction in the use of panels for ground-air communication.

- Any display used in CCBP 8, except special signs, can be set up with this training aid.
- (2) Each panel is a white card with a hole punched in one end. It will be noted that the screws on the backboard are placed so that, when each panel is in place, the hole is at the top.

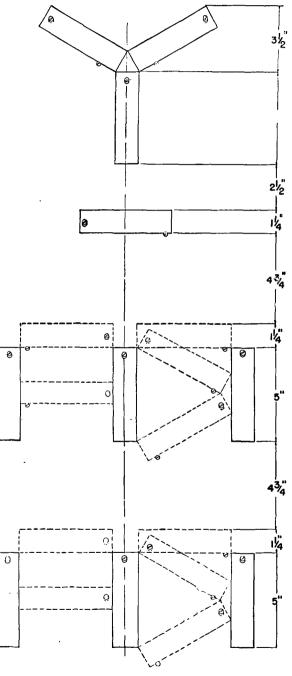
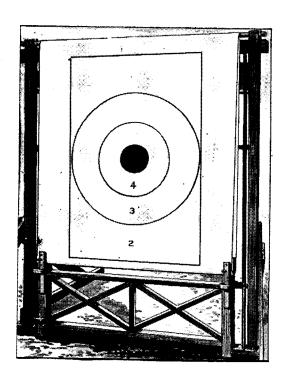


Figure 173. Construction diagram, panel board.

- (3) When a panel is set at an angle, it rests on a screw or brad. It is important that all holes be punched in the same spot on all the panels so that they will fit in all the positions. When holes have been punched in the cards, panels should be placed on the board in the various positions. Marks then should be made under each hole to insure the proper location of the screws. If the board is laid out correctly, all the numbers from 1 to 0 can be placed in each of the two base positions. The dotted lines (fig. 173) show the position of the panels in other numbered positions.
- (4) Any handyman can construct the CCBP 8 panel board, using scrap lumber, black paint, cardboard, and screws or brads.
- g. Roll target (fig. 174).
 - (1) This is a water-resistant target, painted on cloth, capable of being rolled up for carrying to the range and stretched on the wooden frame for practice firing. The target is fastened at the top to a round piece of wood, extending about six inches be-

- yond the width of the cloth target that fits into the slot in the frame. At the bottom the target is fixed to a slat that is held fast in grips tightened with lag screws.
- (2) This is a suggested aid for marksmanship training, particularly adaptable for use in inclement weather. It eliminates the trouble the paper targets cause when they get wet and peel off the target frame.
- (3) The frame is of simple construction, as the sketch and picture indicate. The target may be painted on ordinary target cloth that has been treated with a water-repellant solution.
- h. Artificial transmission line (fig. 175).
 - (1) This training aid is used to demonstrate certain electrical principles of a transmission line, such as characteristic impedance, reflection, standing waves, and effect of the terminating impedance. This training aid is 4 feet high and 8 feet long. The panel is made from pressed wood painted with blackboard paint. Across the top are mounted the elements of the artificial transmission line. The 100



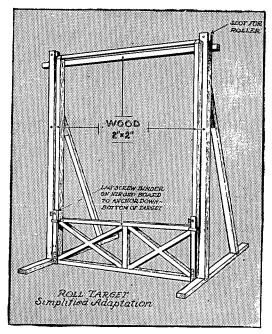


Figure 174. Roll target.

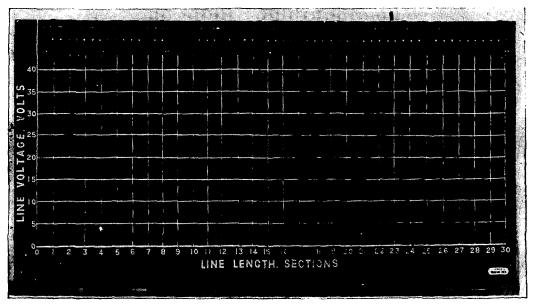


Figure 175. Artificial transmission line.

microhenry coils are soldered onto brass screws in the dowel. A lead from each screw is brought down to a brass nut held in place by a brass screw. Every other one of these nuts is tied to a common lead through a 5,000-micromicrofarad condenser. Thus, the line consists of "tee" sections with 200 microhenry series inductance with 5,000 micromicrofarads shunting capacity. The direct current resistance of each coil is approximately 70 ohms.

- (2) The board is made in two 4- by 4-foot sections. The bolts, wing nuts, and spacers shown on the bottom of the photograph are used to bolt the two sections together for storage. This is accomplished by putting one board right side up and the other upsidedown on top of the first. The complete board is 4 feet by 4 feet by 5 inches when arranged for storage. When in use, the two boards are held together by two loose pin hinges.
- (3) Materials used can be procured locally.
- i. Model polaris (fig. 176).
 - (1) This training aid is a wooden model. The big dipper, bit "M" and North Star are painted on a 2- by 4-foot piece of plywood.

- (2) It is used to show the student how to find north at night as part of the instruction in map reading. This aid can be used in a classroom or outdoors for groups of 200 men or smaller. Approximate cost, \$4 per model.
- j. Model watch and sun (fig. 177).
 - (1) This model is made from plywood and scrap lumber. The sun, hands, and a stick representing a shadow are movable and pivot at the center of the watch. It is used to show students how to find north in daytime as part of the instruction in map reading.
 - (2) Approximate cost, \$4 per model.
- k. Electric testing board (fig. 178).
 - (1) This training aid can be used to—
 - (a) Teach nomenclature of the parts of an internal combustion engine.
 - (b) Teach and test students on the appropriate steps to be taken in analyzing certain types of engine trouble.
 - (c) Assist individual students in learning the various parts of an internal combustion engine.
 - (2) The board is wired in such a manner that when one wire is clamped to a name in the middle of the board and the other wire touches the correct

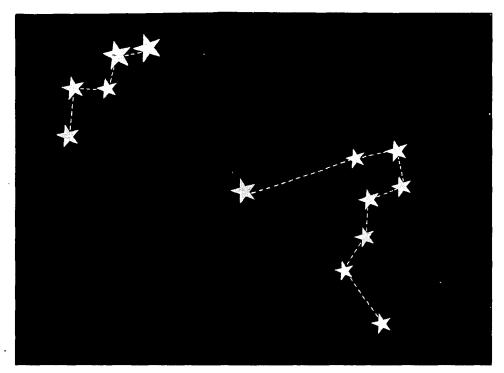


Figure 176. Model polaris.

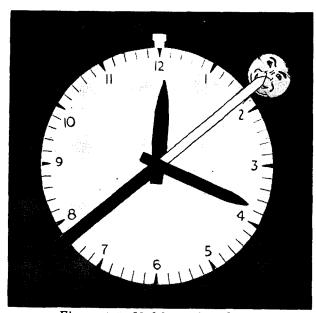


Figure 177. Model watch and sun.

part on the left, the "correct" sign at the top lights up and, simultaneously, the corresponding part in the diagram at the right lights up.

(3) The board can be made for approximately \$30 if the materials required

are not obtained from salvage, but it will cost less if such items as wire, lumber, and engine parts are obtained from salvage.

l. Compass training device (fig. 179).

- (1) This is a triplefold cardboard folder of shirt pocket size, 43% by 47% inches (folded), rounded corners, on which is mounted a cardboard replica of the lensatic compass.
- (2) The folder contains instructions and illustrations which cover azimuth determination by compass, by big dipper and North Star, and by watch and sun; map orientation by compass and by the two-point method. The parts of the replica compass are movable so that it can be used for instruction in exactly the same way the lensatic compass is used, except that cardboard compass has no magnetic attraction.
- (3) The compass training device is Department of the Army GTA 5-15, and may be obtained through normal Adjutant General publication channels.
- m. Sighting bar (figs. 180 and 181).

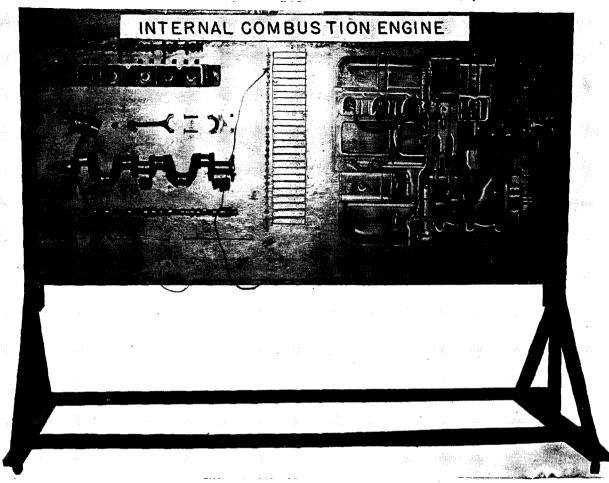


Figure 178. Electric testing board.

- (1) This device is useful for instruction in sighting exercises prior to actual firing of the rifle and carbine. The bar is a piece of scrap lumber upon which is mounted (permanently) a metal eyepiece and front sight. The rear sight and target, both removable, are made from scrap metal or cardboard. A hole must be bored or punched in the center of the rear sight.
- (2) By properly alining the eyepiece, rear sight, front sight, and target, correct sighting procedure can be demonstrated. One sighting bar for every four men is ample for the sighting exercises of preparatory marksmanship training. Plans for the construction of the sighting bar are shown in figure 181.
- (3) The plan illustrated in figure 181

shows the over-all length of the sighting bar to be 54 inches. If the sighting bar is made with an over-all length of 24 inches, by reducing the dimensions shown in figure 181, one man will be able to adjust his own sight picture.

(4) Construction details are as follows: Wooden bar—1" by 2" by 4'6".

Eyepiece—thin metal, 3" by 7"; hole 0.03" diameter.

Rear sight—thin metal or carboard 3" by 3"; hole in center 3/4" in diameter. Front sight—thin metal 1/2" by 3" bent

"L" shape.

Target—thin metal or carboard 3" by 3"; painted white; black bull's-eye ½" in diameter in center.

Slits—1" deep; may be lined with thin metal strips.



Figure 179. Cardboard replica compass.



Figure 180. Sighting bar.

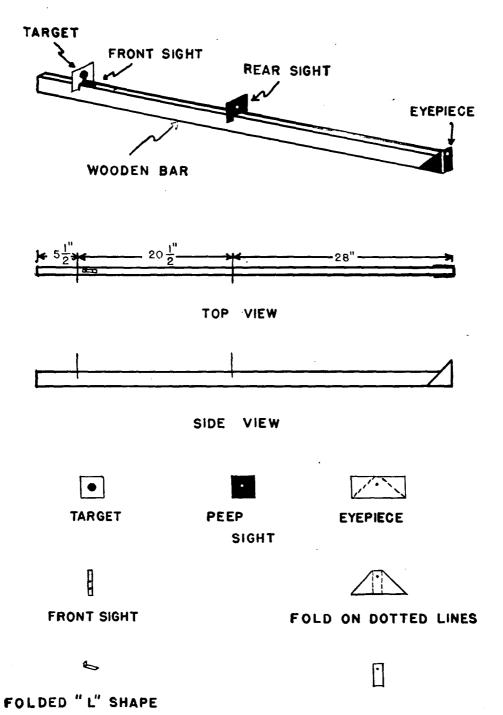


Figure 181. Construction of sighting bar.

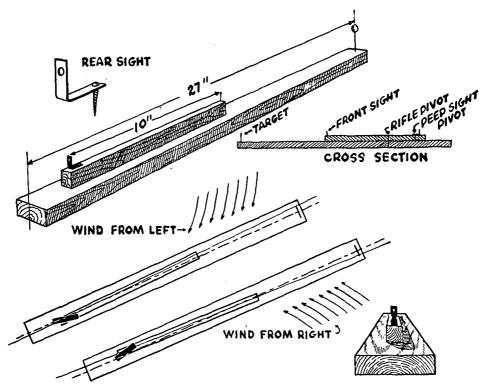


Figure 182. Windage correction device.

n. Windage correction device. (fig. 182).

- (1) This is an assembly of two boards with simple metal pieces to represent the sights of a rifle for use in marksmanship training. The bottom board represents the rifle range, and the single pivoted piece of wood on top represents the rifle with its movable rear sight. The instructor announces the wind velocity correction and the student makes the required shifts on the "gun."
- (2) The device may be used by an instructor to demonstrate the proper method of adjusting the sights of the rifle to correct for wind velocity, provided it is made three times the size of the one shown in figure 182. Either the large or small size device can be made very easily from salvaged materials.
- o. Model azimuth indicator (fig. 183). This model azimuth indicator can be made by reproducing the dials of an indicator, M19 (fig. 83 in FM 23-100), on hard paper stock. The cards can be made locally.

p. 24-hour clock dial (fig. 184). This is a cardboard or painted dial adaptable to the face of a clock. It may be made in two styles, with two sets of hour figures, as illustrated, by adding hours 13 to 24 inclusive; or with one complete set of hour figures, 1 to 24 inclusive. This device is used in training men to read time by the standard Army 24-hour clock system.

q. Shadowgraphs.

(1) Identification of military trucks, tanks, gun carriages, aircraft, etc., can be taught by means of shadowgraphs. Shadowgraphs can be produced by means of an improvised "shadow box." One method of improvising a "shadow box" is by placing a "tin can" spotlight (fig. 185), 8 to 10 feet behind a translucent screen, such as a bed sheet or a piece of tracing paper. The shadowgraph appears on the screen when a model is held between the screen and the light so that a shadow is cast on the screen. To obtain a sharp image, the model must be held as close as possible to the screen.

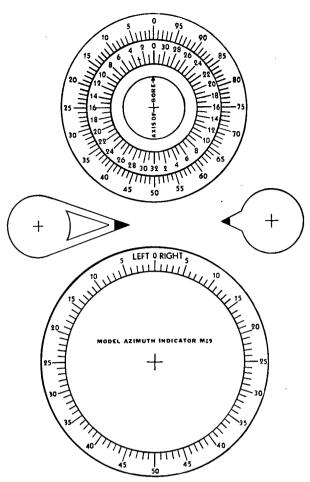


Figure 183. Model azimuth indicator, M19.

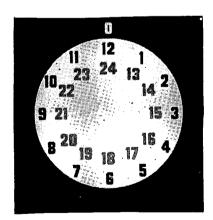


Figure 184. 24-hour clock dial.

(2) A No. 10 can cut vertically in half is used as a reflector for the "tin can" spotlight, and the box can be made from salvaged lumber.

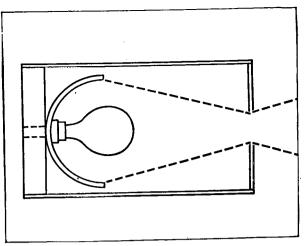


Figure 185. "Tin can" spotlight.

- r. Slide projector (fig. 186).
 - (1) Using any folding, miniature, or other camera with a hinged or removable back, and a good lens, it is possible to improvise a satisfactory slide projector without damaging the camera.
 - (2) In the illustration, full dimensions are not given, as some will depend upon the size and type of the camera used. The body of the projector is a box inclosing a 100-watt frosted lamp. For good ventilation, 1-inch holes must be drilled near the bottom of the box and masked to prevent light escape. Above the lamp is a chimney which may be constructed of two tin cans, one larger than the other, fixed concentrically with holes drilled near the bottom of the larger can.
 - (3) A hole is cut in the front of the box opposite the lamp filament. The camera is mounted on a table supported between two arms so that the camera back, if hinged, may drop between the arms. Grooved strips of wood are nailed above and below the opening so a slide changer may be constructed of three thin strips of wood or metal, as indicated, the inner strip cut-outs being 2 by 2 inches (the size of a slide) and the cut-outs in the outer strips being $1\frac{1}{2}$ by $1\frac{3}{4}$ inches. The slide changer must be positioned so that the slide, while being projected, will be as near as possible to the posi-

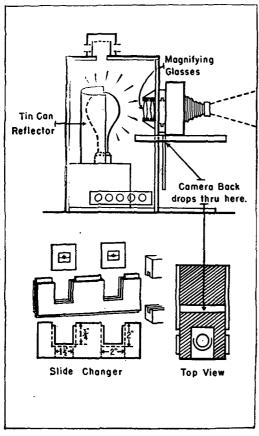


Figure 186. Improvised slide projector.

- tion the negative would occupy if the camera were loaded. Some experimentation may be necessary. Distribution and intensity of light may be greatly improved if one or, preferably, two condenser lens are fixed immediately behind the slide. Ordinary magnifying lens of 3-inches, or greater, diameter will serve this purpose.
- (4) The bulb should be 3 inches from the nearest condenser lens, or 3 inches from the slide, if no condensers are used. Half a tin can, placed behind the lamp as a reflector, will greatly increase the illumination.
- s. Sight trainer and target card (fig. 187).
 - (1) The sight trainer, in figure 187, is a small piece of transparent material upon which has been drawn a facsimile of the reticle of the straight telescope M53A1, and of the muzzle cross hairs. A small handle is attached to the sight trainer so that it may be moved freely over the face of the target card. Sight trainers can be made to represent any desired sight, such as panoramic or elbow telescopes.

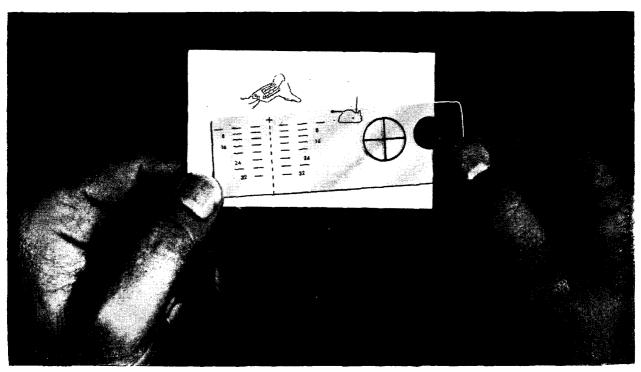


Figure 187. Sight trainer and target card,

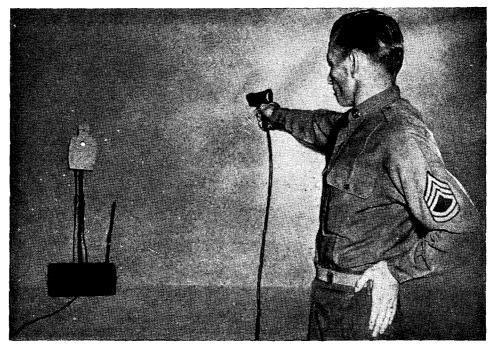


Figure 188. Ray-o-light pistol training device.

- (2) The target card is a panoramic sketch or picture of several different types of targets and terrain features to aid in identification of targets, mounted on a stiff backing and covered with a transparent material.
- (3) The sight trainer and target card may be used for the following purposes:
 - (a) To familiarize artillery and tank personnel with telescope reticles and the significance and use of those graduations.

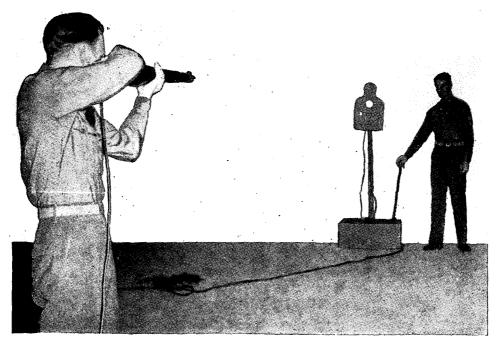


Figure 189. Ray-o-light rifle training device.

- (b) Preparatory gunnery training in direct laying.
- (c) To establish an understanding of the correct sight picture.
- (d) Preliminary instruction in bore sighting.
- (4) Procedures for the operation of this device are contained in FM 6-140. This is a suggested training aid and therefore must be made locally.
- t. Ray-o-light training devices (figs. 188 and 189). This type of device can be used indoors for rifle and pistol marksmanship training. The device is operated electrically so that a red light is turned on, at the bull's-eye, each time the bull's-eye is hit by the individual firing. (The equipment was purchased from the Phoebus Corp., 9 East Ohio Street, Chicago, Ill.) (The civilian sources and agencies referred to in this manual pertaining to the procurement of training aids does not constitute an indorsement by the Department of the Army.)
 - u. Rifle sighting device (figs. 190 and 191).
 - (1) This device is printed in black and green on cardboard $3\frac{1}{2}$ inches wide and 7 inches long. On one side is a cut-out circle representing the rear sight. Within this rear sight are a movable front sight and bull's-eye. On the reverse side are movable representations of the elevation and wind gages of the M1 and M1903 rifle.
 - (2) The sighting device is an aid to rifle marksmanship with the M1, M1903, and M1917 rifle and the carbine. The proper method of using this device can be found in FM 23-5, FM 23-6, FM 23-7, and FM 23-10.
 - (3) This is an approved Department of the Army training device and can be obtained through normal Ordnance

supply channels. The proper nomenclature, stock number, and basis of issue is: Device, sighting, M15; stock No. L001-7160903; one per soldier undergoing training with rifle.



Figure 190. Sighting device showing bull's-eye.



Figure 191. Elevation and wind gage of sighting device.

Section IX. TRAINING EQUIPMENT

31. GENERAL

This section illustrates various types of training equipment. Many of the items illustrated can be made locally; however, some are authorized for issue under appropriate tables of allowances.

32. ILLUSTRATIONS AND INFORMATION

- a. Lantern slides (fig. 192).
 - (1) Lantern slides made from photographs, using the photographic emulsion process, usually are made in photographic laboratories.
 - (2) Lantern slides, for immediate use, may be prepared very simply, first, by preparing a lay-out of the slides

- on a $3\frac{1}{2}$ by 4-inch piece of scrap paper, being sure to leave a $\frac{1}{2}$ -inch margin on all sides, then preparing the slide from the lay-out as follows:
- (a) Draw the figures on illustrations on a piece of glass or transparent acetate the size of the slide with any color of India ink.
- (b) Type words on a thin piece of transparent acetate or celluloid and assemble the slide as described in the step-by-step procedure given in (4) below.
- (3) Figure 192 illustrates the preparation of an improvised lantern slide, showing typed words only.

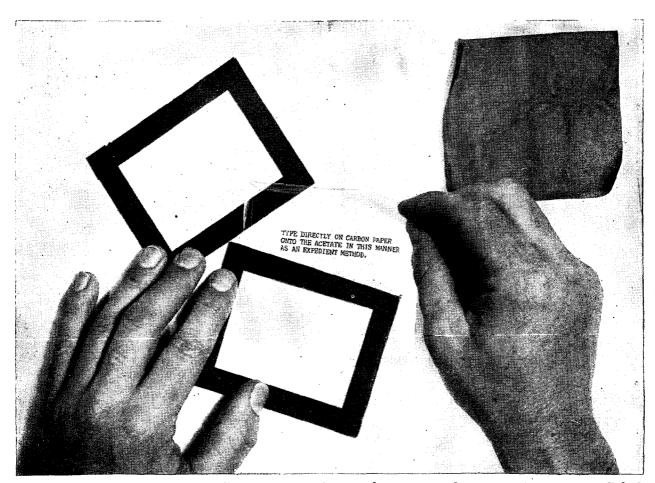


Figure 192. Construction of lantern slide, using typewritter, carbon paper, and transparent acetate or celluloid.

- (4) A step-by-step procedure and a list of materials required to prepare an improvised, "typed word," lantern slide follows:
 - (a) Fold the sheet of carbon paper in half and place the acetate in the center.
 - (b) Insert carbon and acetate in typewriter and adjust the machine for stencil position.
 - (c) Type material on acetate through the carbon. Using a ½-inch margin will allow about 13 single-spaced lines with about 33 spaces per line. (Do not crowd material on slide.)
 - (d) Remove acetate and place it between two pieces of cover glass $3\frac{1}{2}$ by 4 inches.
 - (e) Secure glass with binding tape.
 - (f) With slide in correct reading position, place a mark in the lower left-hand corner. This will assist in positioning the slide in the projector.
- (5) Materials required are—
 - (a) A 3½- by 4-inch sheet of plain cellophane or very thin acetate.
 - (b) A sheet of carbon paper.
 - (c) Two pieces of 3½- by 4-inch cover glass.
 - (d) Binding tape (scotch tape), 15 inches.
 - (e) Typewriter.
- b. Submachine gun rest and sighting disk. (fig. 193).
 - (1) The submachine gun rest and sighting

- disk shown in figure 193 were made from salvaged materials and an empty small arms ammunition box.
- (2) This equipment can be used in preliminary submachine gun marksmanship training as described in FM 23-41.
- c. Target frame for moving target range (figs. 194, 195, and 196). A sled of the type shown in figure 194 has proved to be the most satisfactory kind of target to represent a moving vehicle. It has the advantage of a low center of gravity, which prevents the target from upsetting when traversing rough ground or making changes in direction. The dimensions of the sled are 30 inches wide and 4 feet high; weight, about 45 pounds. It can be constructed from salvage lumber and target cloth.
 - d. Projection equipment (figs. 197 to 202).
 - (1) The projection equipment shown in figures 197, 198, and 199 is used to facilitate classroom instruction.
 - (2) The optical pointer (fig. 197) projects a small arrow-shaped indicator onto the screen to point out specific objects, giving them proper emphasis.
 - (3) The wall screen (fig. 198) is a permanent fixture especially adapted to the end wall of B-R-1 buildings. The screen is 8 by 10 feet, designed for use with the standard 16-mm projector with 3-inch lens. To construct the screen, all wall seams are filled with plaster, after which the surface is given two coats of calcimine. The border is painted with flat black paint.

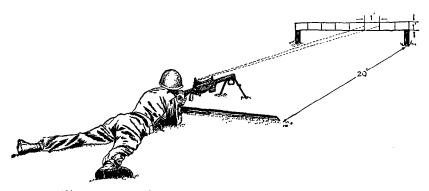
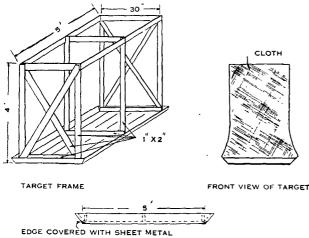
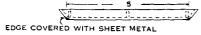


Figure 193. Submachine gun rest and sighting disk.





ELEVATION OF BASE

Figure 194. Target frame for moving target range.

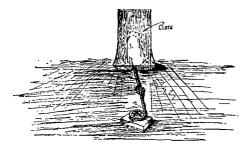
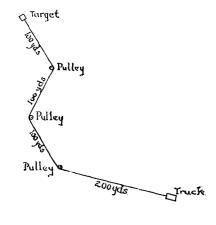


Figure 195. Sled target covered with target cloth; pulley and trip knot for effecting changes in direction.



* GUN

Figure 196. Manner of towing targets.

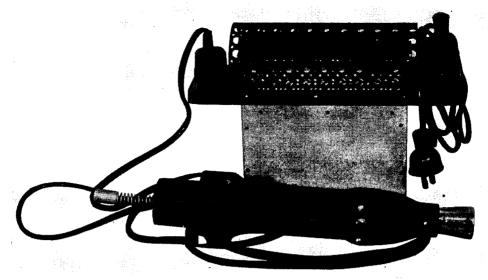
- (4) The slide projector (fig. 199) can be used not only to project slides on a screen in a dark room but also in the rear view daylight projection booth.
- (5) Opaque projector PH 132 (fig. 202) is used for projecting maps, charts, photographs, or diagrams direct from the printed page or sheet to the screen, and for projecting slides of various sizes.

e. Training aid stand (fig. 203).

- (1) This stand is designed and constructed as a special training aid to inject an element of surprise in a lecture. It is called the Boyd stand.
- (2) The uprights and crosspieces of the stand are built of 2- by 4-inch lumber and are bolted together solidly as shown in figure 205. Attached to the front upright by ordinary screen door spring hinges are ten 1- by 4-inch boards 30 inches long. These boards then are pulled back and held against the rear upright by hinged latches made of tin. Fishing line or strong twine is attached to each of the tin latches and arranged so that, when a line is pulled by an instructor standing at a distance from the stand, it will release one of the hinged boards, allowing it to swing forward in an arc, surprising and alerting the students and displaying a word or words, attached to the board, that the instructor wishes to impress upon the students.
- (3) The materials required to construct the stand are 28 feet of 2- by 4-inch lumber, 25 feet of 1- by 4-inch lumber. 6 carriage bolts one-half inch in diameter, 10 spring hinges, and 1 pound of sixpenny nails. These materials can be procured locally for approximately \$10.

f. Aggressor Army equipment (figs. 204 to 214).

> (1) Various types of equipment used by Aggressor forces are illustrated in figures 204 through 214. This equipment is tactically disposed so that United States information-gathering agencies



Rigure 197. Optical pointer.

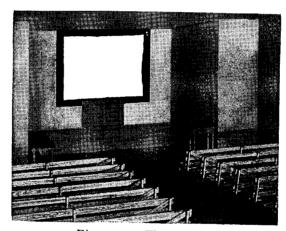


Figure 198. Wall screen.

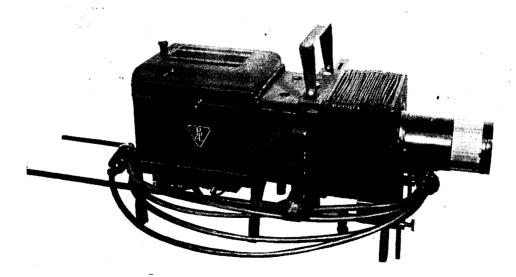


Figure 199. Slide projector for 31/4 by 4 inch slides.

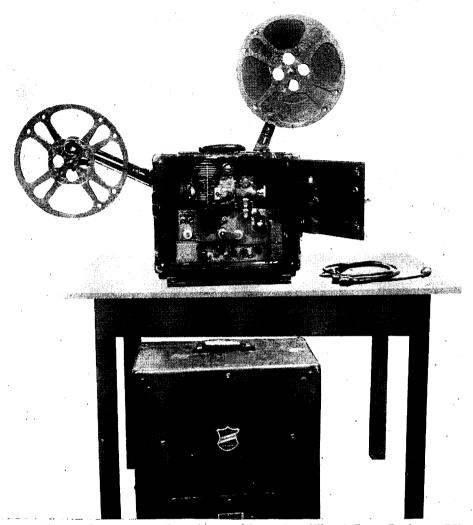


Figure 200. Standard 16-mm sound projector with speaker (Signal Corps Projector PH 131).

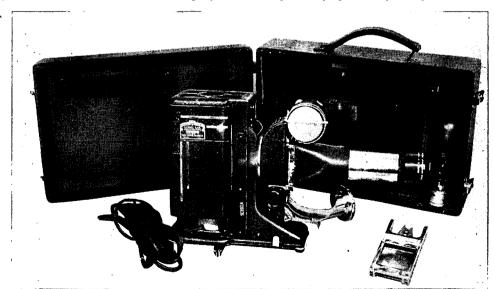


Figure 201. Film strip projector with slide adapter (Signal Corps Projector PH 222).

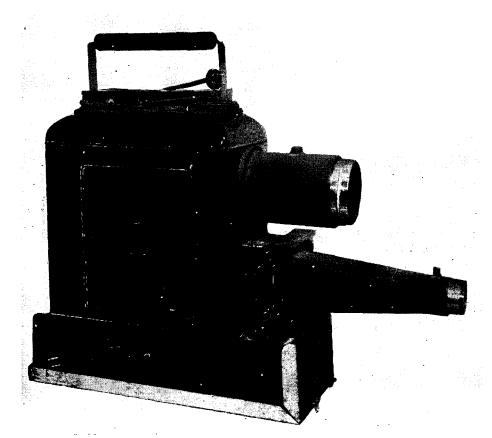


Figure 202. Opaque projector (Signal Corps Projector PH 132).

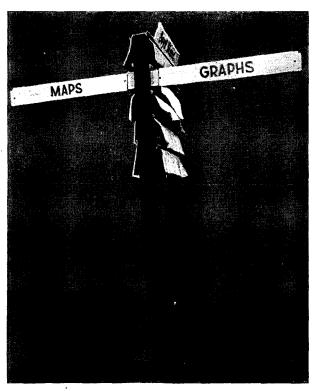


Figure 203. The Boyd stand.

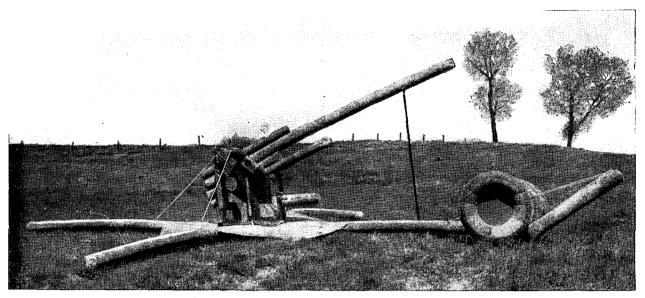


Figure 204. Pneumatic 90-mm antiaircraft gun.

- will be able to observe and report actual enemy positions and equipment.
- (2) The 90-mm antiaircraft gun shown in figure 204 is typical of the pneumatic equipment used to represent artillery pieces. Pneumatic equipment is lightweight and can be condensed into small packages when deflated, and may be emplaced rapidly. From a distance, it presents a highly realistic appearance. Aggressor Army uniforms and equipment can be obtained by forwarding a requisition, through normal command channels, to the ap-

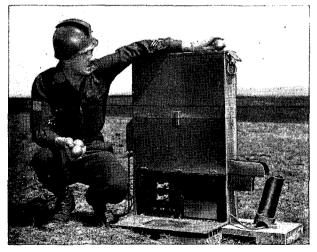


Figure 205. Antiaircraft sound and flash simulator.

- propriate army (ZI) or oversea commander.
- (3) The antiaircraft sound and flash simulator gives a realistic imitation of the 90-mm gun firing. Simulated artillery firing is controlled by use of the control panel shown in figure 208.
- g. Portable rope rack (figs. 215 and 216).
 - A portable rope rack provides facilities for knot-tying practice. Each section will accommodate four students.
 - (2) This piece of equipment can be constructed from scrap lumber and metal pipe by the unit carpenter. The plans and dimensions for building the rack are shown in figure 215.
- h. Public address set (figs. 217 and 218).
 - (1) The public address set AN/TIQ-2 (fig. 217) is authorized for training purposes in the table of allowances of those units or installations requiring this type of equipment. The set consists of an amplifier, turntable, 2 loud-speakers, 2 microphones, spare parts and record chest, and a large chest for the speakers, cords, and microphones. It is designed for use whenever amplification of the voice is necessary or whenever recordings require additional volume. For full details on its various uses, see TM 11-2586.



Figure 206. Aggressor Army equipment—pneumatic tank, M24.

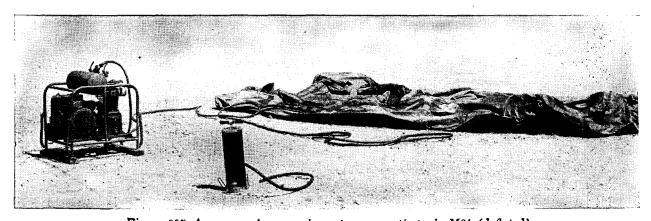


Figure 207. Aggressor Army equipment—pneumatic tank, M24 (deflated).



Figure 208. Aggressor Army control panel, artillery sound and flash simulator.

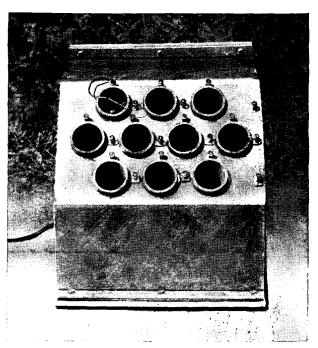


Figure 210. Front view, artillery sound and flash simulator.



Figure 209. Aggressor Army control panel in use.

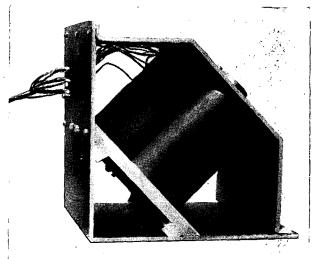


Figure 211. Side view, artillery sound and flash simulator.

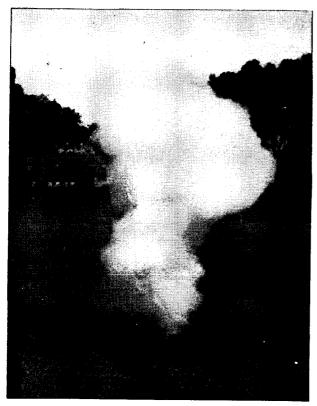


Figure 212. Simulator in action.

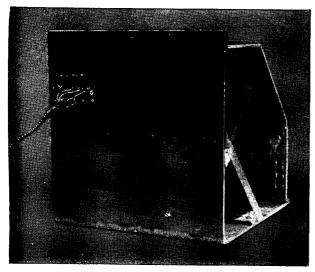


Figure 213. Rear view of simulator.

- (2) Figure 218 shows how the AN/TIQ-2 set can be used as a mobile public address system. The amplifier and turntable are inside the vehicle with the speakers mounted on the top.
- i. Folding easel.

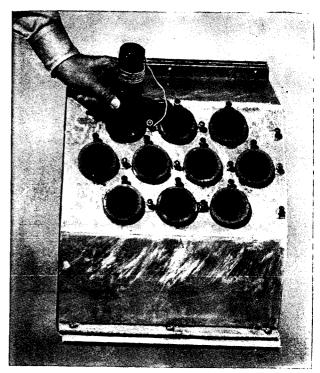


Figure 214. Loading simulator.

- (1) The folding easel, shown in figure 219, can be made by any person handy with tools. All of the instructions for building the easel are given in the illustration.
- (2) It should be remembered that graphic aids vary in size and easels should be constructed so that they will accommodate either the Department of the Army Graphic Portfolios which are upright, or the chart series on small arms which are horizontal.
- (3) If the folding easel illustrated is too elaborate, a simple "A" frame type easel can be easily made in the field.
- j. Enlarged rifle sight (figs. 220 to 222).
 - (1) The equipment illustrated in figures 220–222 can be used in preliminary rifle marksmanship training.
 - (2) The sight picture model (fig. 220) can be used with groups of 200 men or less to illustrate the correct sight picture. The model is mounted on a stand 72 inches high and 40 inches wide. The diameter of the bull's-eye is 8 inches and the width of the front sight is

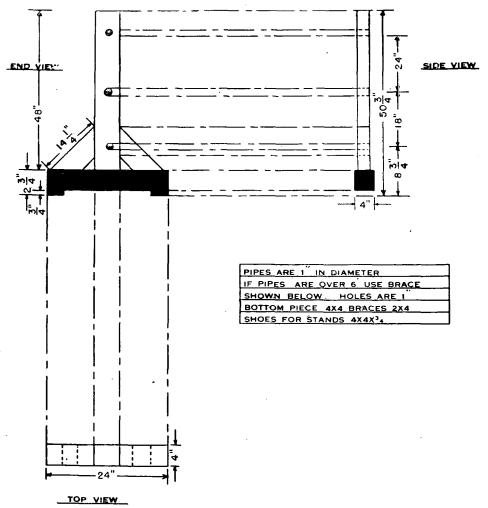


Figure 215. Diagram, portable rope rack.

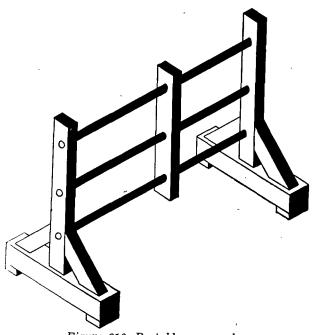


Figure 216. Portable rope rack.

- 16 inches. The bull's-eye and the front sight are movable.
- (3) The practice shot group target and rifle rest box can be used for individual practice in sighting and aiming as described in the appropriate field manual for the rifle being used in the training.

k. Score book holder (fig. 223). A very simple but effective device, this score book holder is 8 inches by 12 inches by 1 inch and is used to hold the pages of the individual score book at the firing point. It is suggested that one such holder be provided for each firer on the known distance range. It can be constructed easily of wood, two steel clips, and threepenny nails at an approximate cost of 5ϕ each. If steel clips or nails are not readily obtainable, rubber bands are an ideal substitute.

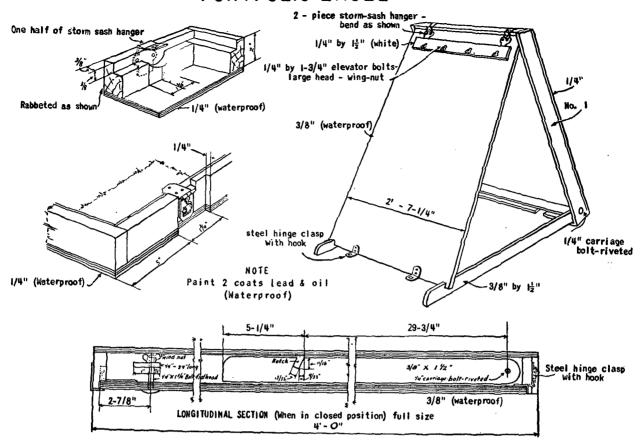


Figure 217. Public address set.



Figure 218. Mobile public address system.

PORTFOLIO EASEL



NOTE: Use any suitable material available.

Figure 219. Folding easel for displaying graphic training aids.

- l. Rear projection method (fig. 224).
 - (1) This is a suggested method for showing training films outdoors in daylight or in lighted rooms. The rear projection method can be utilized with any standard 16-mm film projector.
 - (2) The screen itself must be of some translucent material such as tracing cloth, tracing paper, ground glass, Kodaloid overlay sheets, sandblasted celluloid, or commercial equivalents. The mirror serves to decrease the total distance from the projector to the screen and to reflect the picture on the screen. The mirror, projector lens, and the back of the screen must be in the dark, and the front of the screen must be shielded from direct light by a shadow box.
- . (3) This method of showing films reduces the distance required for projection, and makes it possible for the instructor to supervise the students closely, and for the students to make notes while the film is being shown. The comfort and attentiveness of the student are increased because rear projection can be used in a well-ventilated room or outdoors. Since the entire assembly can be carried in a truck, trailer, or a portable booth, films may be shown in locations where ordinary projection methods would not be satisfactory.
- m. Daylight projector booth.
 - (1) Figure 225 is a schematic drawing of a daylight projection booth. A daylight projection booth is used to show slides, film strips, or training films in a lighted room,

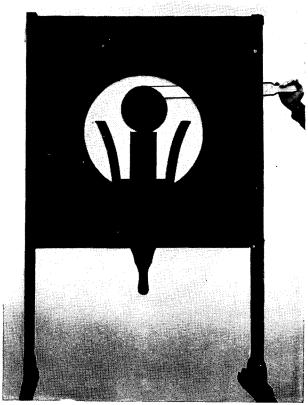


Figure 220. Sight picture model.

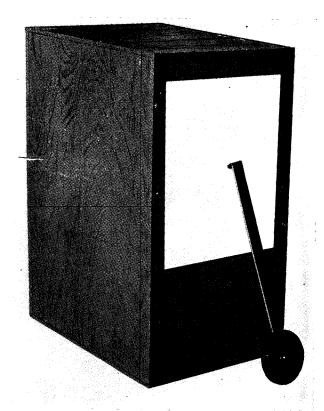


Figure 221. Practice shot group target.

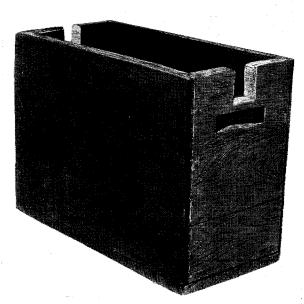


Figure 222. Rifle rest box.

(2) The screen can be made from an ordinary window glass that has been sandblasted on one side to produce a frosted effect.

n. Blackboard (fig. 226).

- (1) A blackboard of the type shown may be made of ordinary wallboard or other hard, smooth, nonwarping material, painted with several coats of flat black paint so that the pores are sealed completely. It can be used either indoors or outdoors.
- (2) The blackboard can be made easily from locally procured materials, by following the information contained in figure 226.

o. Display rack (fig. 227).

(1) The multiple display rack is a suggested training aid which can be used when several illustrations or diagrams are used in the same lecture. The entire display is hung on the wall at a convenient height for the lecturer and the shades are pulled down, one by one, as needed, in the course of instruction.

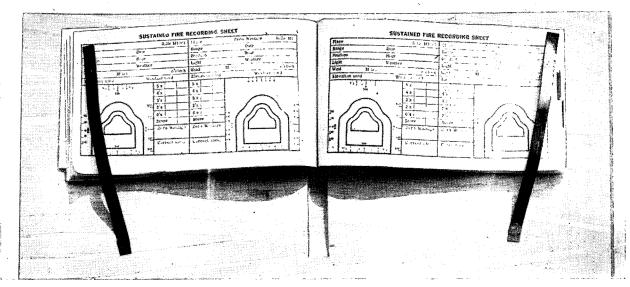


Figure 223. Score book holder.

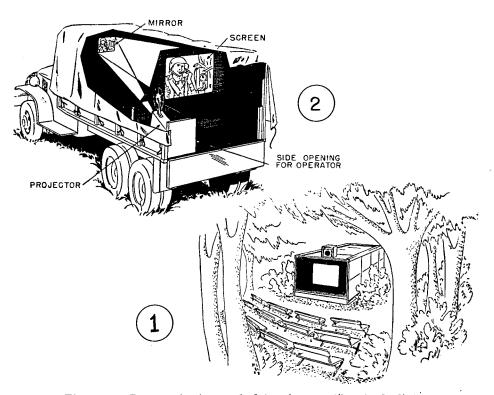
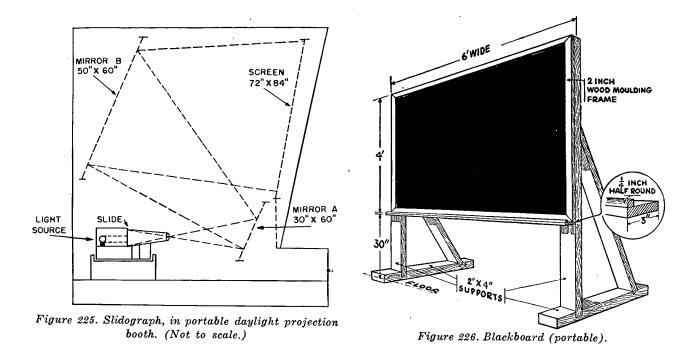


Figure 224. Rear projection method for showing films in daylight.



Slotted right wheel

Screw eye

6 window shode brackets (spacing is 60°)

Window shade

Crank (clockwise)

Figure 227. Multiple display rack.

- (2) This multiple shade display rack has a capacity of 6 to 12 charts. A crank handle at one end of the rack turns a circular disk on which are fastened regular window shades. Corresponding brackets are fastened to a second disk at the other end of the display.
- (3) This display rack can be constructed from locally procured materials, by following the information contained in figure 227.

p. Coach's paddle for rifle marksmanship (figs. 228 and 229). This training aid consists of a paddle 8 by 15 inches by $\frac{1}{4}$ inch with helpful reminders as to the duties and responsibilities of the coach painted in white on one side (fig. 228). The reverse side is divided into two sections; one is painted red with the letter "M" and the target number in white to request marking and the other section is green with the letter "D" and the target number in white to request discing (fig. 229). During firing on the rifle range, the paddle can be used to request the man in the pit to mark or disc his target. This is accomplished by the coach displaying either the red or green section of the paddle to the man in the pit, who marks or discs the target as requested. Using the paddle elminates the necessity of the coach calling the operator when discing or marking is desired, thereby reducing confusion and distraction on the firing

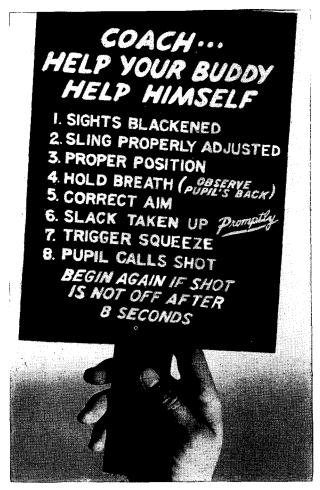


Figure 228. Coach's paddle for rifle marksmanship—front view.

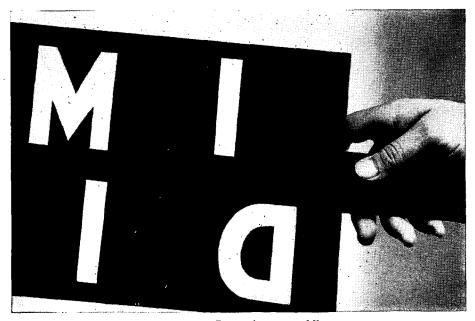


Figure 229. Rear view of paddle.

range. This aid can be produced locally, using plywood, masonite, or similar material. Lettering can be applied by stencil or silk screen process. Approximate cost of the paddle is 30ϕ .

- q. Moulages (fig. 230).
 - (1) This set of eight moulages simulating different types of war wounds is used in the teaching of first aid treatment to the wearer and to the student.
 - (2) These moulages are made of flesh-colored rubber masks and are strapped on the wearer's body in the appropriate place, presenting a realistic picture of a wound. This type enables the wearer to apply first aid treatment to himself as well as affording witnessing students a first-hand view of proper first aid methods.
- (3) This equipment can be used either outdoors or indoors with groups of 200 men or less. This approved Department of the Army training equipment can be obtained by those units authorized it in T/A 8-100. The proper nomenclature and stock number of this equipment is: Moulage, war wounds, set of eight demonstration masks, for training, stock No. 7-850-500, in the Army and Navy Catalog of Medical Material. Requisitions for this equipment will be submitted through normal medical supply channels.
- r. Designation bib (figs. 231 and 232).
 - (1) Bibs similar to that shown in figure 231 can be used to designate members of demonstration teams. Stu-

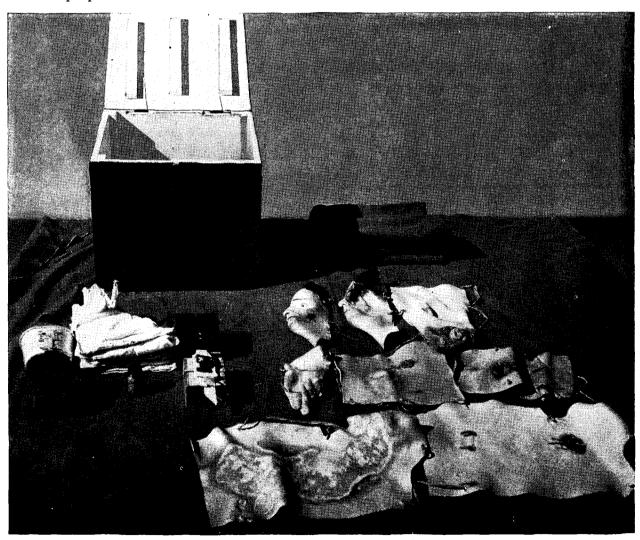


Figure 230. Set of war wounds moulage.

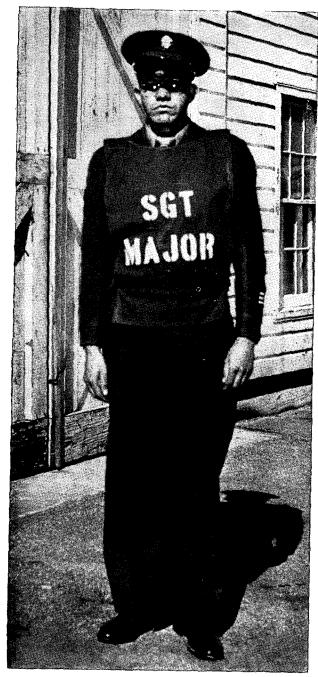


Figure 231. Designation bib.

dents observing demonstrations can be more easily taught the duties or action of each member of the team if designation bibs are worn by the demonstrators.

(2) Bibs can be made out of target cloth or salvaged canvas in accordance with the dimensions shown in figure 232.

Words to designate each member of the team are stenciled on the front and back of the bibs. The bibs can be made for approximately 30ϕ each.

s. Recorder-reproducer unit AN/GNQ-9 (fig. 233).

- (1) This is a portable sound recorder, record player, and public address system. It can be used for recording important conferences of critiques, for training voice radio operators, recording talks by guest speakers, as an aid in teaching methods of instruction by playing back an instructor's presentation of a subject, and for various other uses where voice recordings are needed for instructional purposes.
- (2) Two types of recorder-reproducers are shown in figure 233. To the left is shown turntable No. 1 with recording head and pick-up arm. In the center front is the amplifier with built-in speaker. To the left of the amplifier is shown a crystal-type microphone with desk-type mount. These three units comprise set AN/GNQ-9. At the right is turntable No. 2 taken from another set and used in conjunction with turntable No. 1 whenever a continuous recording in excess of 20 minutes is desired.

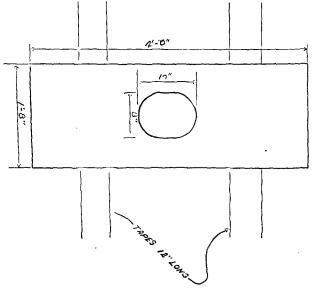


Figure 232. Designation bib dimensions.

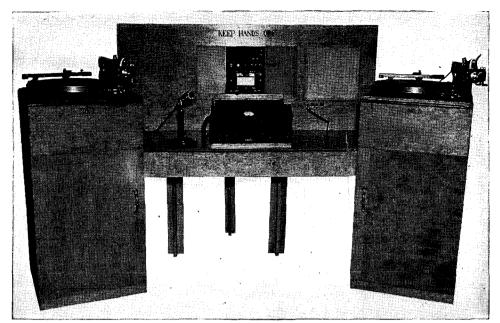


Figure 233. Recorder-reproducer AN/GNQ-9 and wire recorder RD11B/GNQ-1.

- (3) To the rear center is another type recorder-reproducer. This is wire recorder RD 11B/GNQ-1 with built-in speaker, capable of recording continuously for 1 hour.
- (4) The recorder-reproducers shown are displayed in a semipermanent set-up. However, each unit has its own carrying case for portable use.

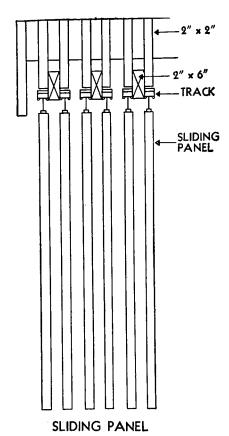
Section X. TRAINING FACILITIES

33. GENERAL

- a. Training facilities form an integral part of the training program and are necessary in order to achieve maximum efficiency in training.
- b. The illustrations shown in this section cover, in part, a small segment of the training facilities in use by Army personnel.
- c. Training facilities designed for use in physical training (such as strength, obstacle, and confidence courses) can be found in FM 21-20.

34. ILLUSTRATIONS AND INFORMATION

- a. Sliding display panels (fig. 234).
 - (1) Sliding display panels offer a permanent classroom facility which enables an instructor to display several visual aids in such a manner that only one is visible at any one time. A projection screen may be made a permanent part of one of the sliding panels so that training films and film strips can be presented with a minimum of preparation.
 - (2) The assembly illustrated consists of six panels approximately 12 by 8 feet



FOR DISPLAY OF VISUAL AIDS

Figure 234. Sliding display panel.

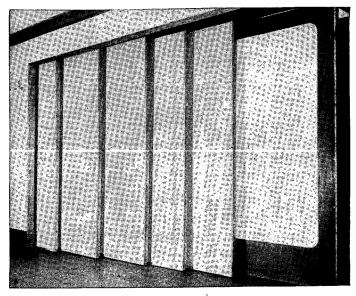


Figure 234. Sliding display panel-continued.

- in size. Each is surfaced with \(^3\gamma_1\)-inch wallboard. There is no floor track to hamper the sliding of these panels which are suspended from an overhead runway.
- (3) This training aid can be constructed by a handy man, using materials and facilities available at most installations.
- b. Target backstop for .22-caliber ammunition (fig. 235).
 - (1) The target backstop shown in figure 235 is designed for use on indoor rifle or pistol ranges for the firing of .22-caliber weapons. Targets are placed in front of the backstop in such a manner that all shots penetrating the target will be stopped by the backstop.
 - (2) This backstop is particularly suitable in armories, large rooms, and hallways and is designed so that penetration of the backstop with .22-caliber ammunition does not occur.
 - (3) Proper lighting of the target is important. The target should be brightly illuminated, without any shadows, while the firing point should be reasonably dull. Good results have been obtained by building a frame on the backstop, so that a reflector can be placed approximately 18 inches in front and 18 inches above the front edge of the backstop. The reflector should be placed at such an angle that the target area is brightly illuminated.
 - (4) The unit carpenter can construct the target backstop from salvaged lumber and No. 10 gage steel plates, by following the dimensions shown in figure 235.
 - c. Machine gun square (figs. 238 and 239).
 - The machine gun illustrated square contains 80 targets and can accommodate a class of company size.
 - (2) It is a compact arrangement for preliminary machine gun marksmanship training, providing maximum economy of space and effective control for outdoor instructions.

- (3) Working drawings and specifications of the machine gun square and the machine gun circle will be found in FM 23-55.
- d. Finger calibration court (fig. 240). This aid is designed specifically to teach personnel the use of fingers for lateral measurement. It is made of 2½-inch pipe 10 feet long and in 6 sections. A number of short vertical lines are drawn around the pipe at 1-foot intervals. At a distance of 20 feet from the pipe, a length of angle iron is laid out and used as a marker. The pipe sections are bolted at each flattened end to vertical pipes 51/2 feet above the ground (approximate average height of man). The pipe and angle iron can be procured from salvaged material; paint and bolts, from local supply. In setting up this court, it must be kept in mind that no distracting objects should appear in rear of the court. See FM 23-55.
- e. Machine gun calibration court (fig. 241). The machine gun can be calibrated on a court similar to the one shown in figure 241. This sketch shows the court in use. See C 2, FM 23-55.
- f. Miniature range for subcaliber tank fire adjustment (fig. 242). A flat or fairly flat piece of terrain covered with either short grass or sand is selected for this type range. Salvaged lumber or metal can be used to make the distance markers. Miniature roads, buildings, or objects can be used but are not necessary. Coaxial caliber .30 machine guns mounted on the tanks, using frangible ammunition, are used as the subcaliber weapon on this range. For detailed instructions in the operation and laying out of this range, see FM 23-100.
- g. Moving target range (fig. 243). Additional lay-outs of ranges for the firing of antitank and antipersonnel rifle grenades can be found in FM 23-30.
- h. Driving course (figs. 244 and 245). The wheeled vehicle driving course is designed to be used in precision driving instruction of motor vehicle drivers, as is the backing stall lay-out shown in figure 245. Detailed instructions for the proper use of the two facilities shown is contained in TM 21-300.
- i. Hand grenade course (figs. 246 and 247). A sketch of hand grenade assault course is shown in figure 247. Detailed information rela-

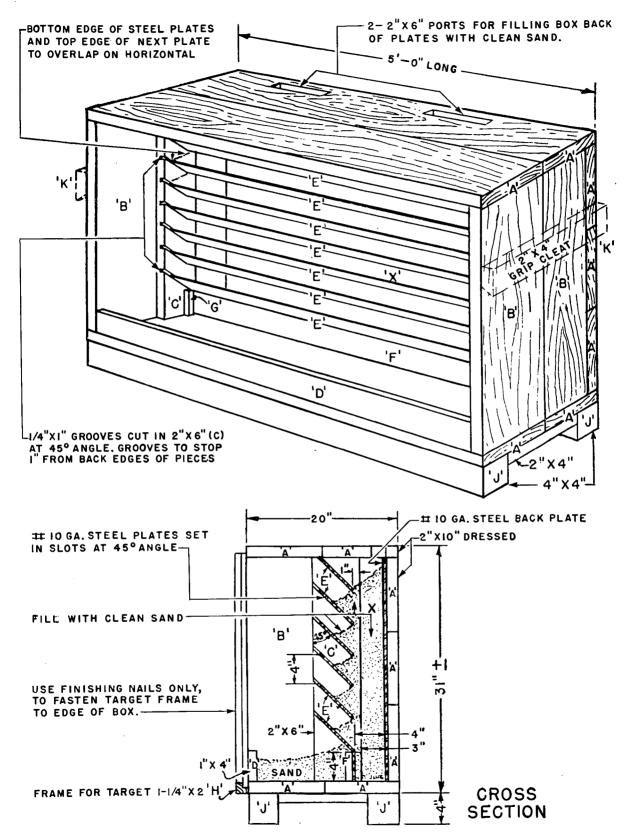
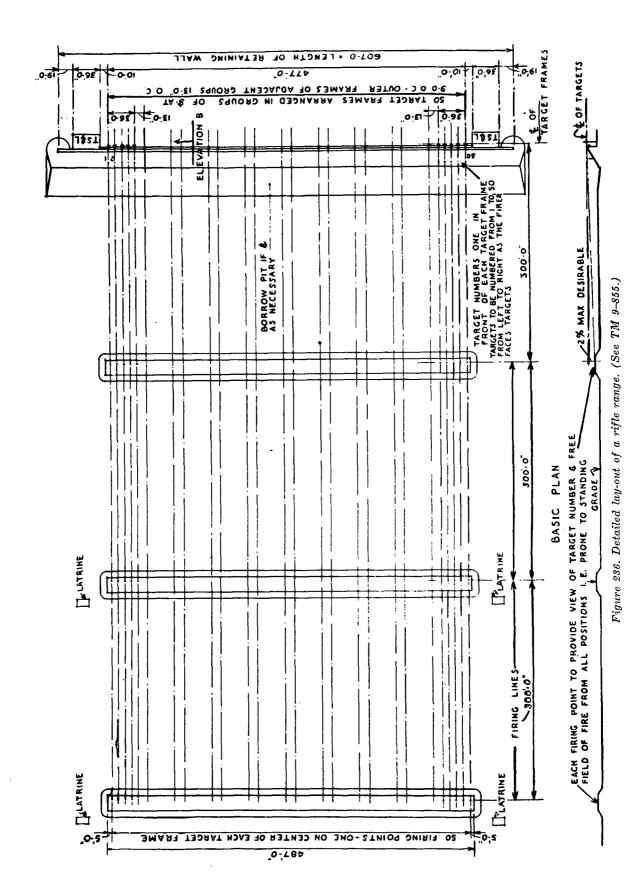
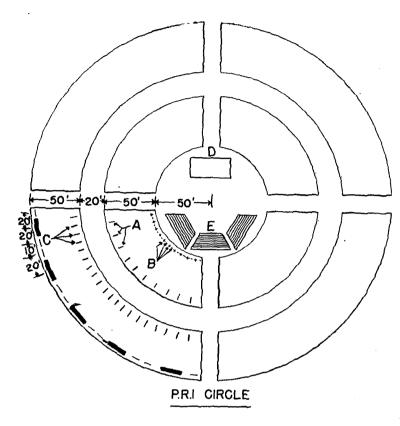


Figure 235. Dimensions and plans for target backstop.





LEGEND

A-TARGET NO. STAKES ARE 16'C.TO C.

B-DISAPPEARING TYPE-B AND STAKE TARGET ARE 3'-C.TO C.

C-TARGET NO. STAKES ARE 8'C. TO C.

D- INSTRUCTORS STAND

E-BLEACHERS

	IILL_	OF I	MATERIALS
		BLEAC	HERS
Quan	. Size	Length	Description
20	2"x 6	" 12'- O	
13	2"x 6	" 12'- 0	
8	2"x 6	1 12'-0	CROSS BRACING
25	2"x 4		SEATS
30	2"x 4'	' 16'-0' ' 12'-0	FOOT REST
10	2"x4	[12]-0	
. 125	2"x4'	8"	BRACE (SCRAP)
0.100		RUCTOF	RS STAND
Quan		Length	
6_	2"x 4"		
5	2"x 4"	16-0	HAND RAIL
8	2"x 4"	112-0	
3	2"x4"		STEPS SEAT BRACING
4	2"x 6"	12'-0"	UPRIGHTS
40	2" 4"	16'-0"	JOISTS
25	2"x 4"	116-(1	MUD SILLS
7_	12"x 6"	16'-0"	MUD SILLS
7	2"x 6"	16'-0"	FLOOR SILLS
	2"x 6"	12'-0"	CROSS BRACING
3	2"xl2"	112-01	STEP SUPPORT
[_12	STD.	4"x 4" 8"	METAL BRACE
2	1 < X D	8"	BRACE (SCRAP)
700linf	11"x 6"	16'-0"	FLOORING
0	Cina	TARGE	
·Quan.	Size	Length	
60	2"x 4"	16'-0"	FRAME
8	2"x 4" 1"x 6"	12'-0" 16'-0"	KNEE BRACING
50	1"x 6" 1"x 4"	16'-0"	SIDING (
50 25		16, 0,	SIDING (TOP)
25	l"x 1"	16'-0"	STRIP TARGET
45_	2"x 4"	6"	STOP (SCRAP)
3	1"x 2"	16'-0"	BRACING
30	1" v 6"	16'-0"	STAKE TARGET
15	1" x 6"	12'-0	NO TARGET
	STD.		SLIDING TARGET
		P.R	.1
Quơn.	Size	Length	Description
20 gal			WHITE PAINT
28gal			YELLOW PAINT
<u>85 gal.</u>			GREEN PAINT
5 gal.			BLACK PAINT
200lbs			NAILS
100lbs	10d.		NAILS-
100lbs	16 d.		NAILS
100lbs 3000	_8 d.		NAILS
2000fl	LA" DIA	~~ ~	SANDBAGS ROPE SASH CORD
-2761	17 DIM		NOIL SASH CORD

Figure 237. Practice rifle instruction circle and bill of materials.

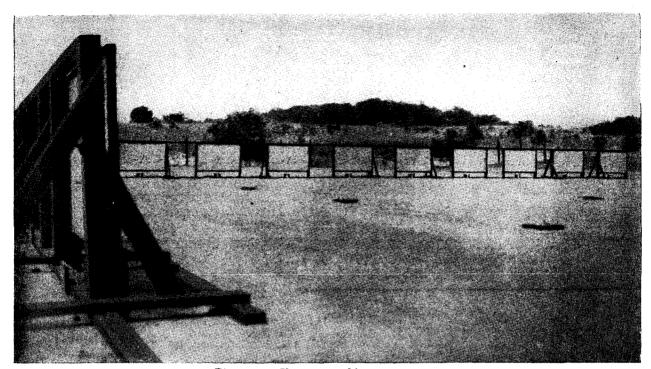


Figure 238. View of machine gun square.

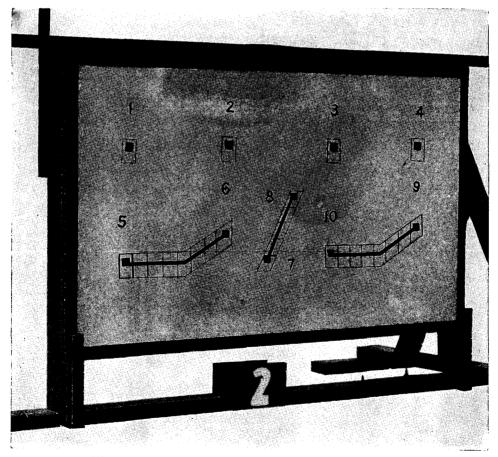


Figure 239. Close-up view of machine gun square target.

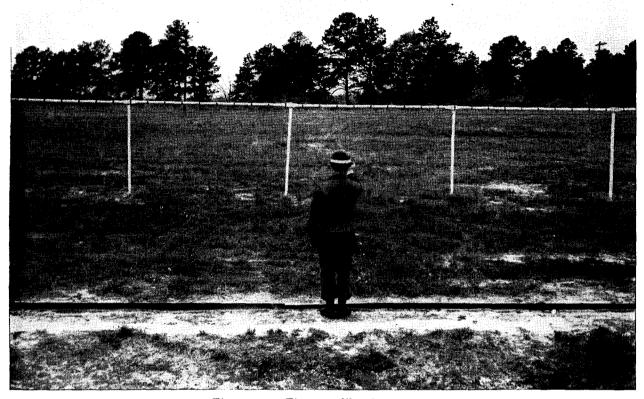


Figure 240. Finger calibration court.

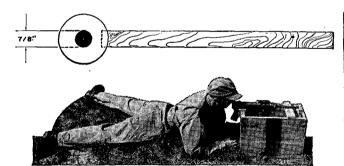


Figure 241. Machine gun calibration court.

tive to the location and operation of the assault course can be obtained from FM 23-30.

j. Landscape target panels (figs. 248 and 249). Landscape targets can be used in rifle marksmanship training on 1,000-inch ranges. A landscape target is a panoramic picture of a landscape drawn so that all or nearly all of the salient features are recognizable at a distance

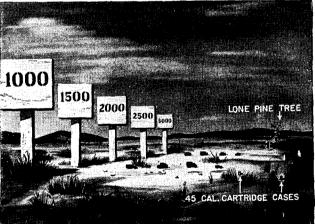
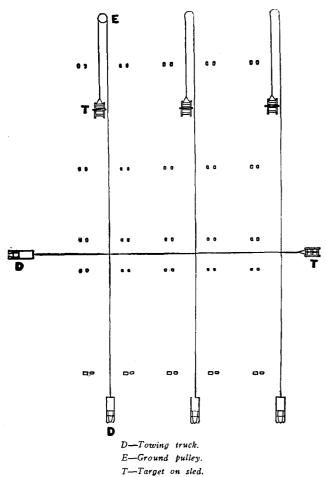


Figure 242. Panoramic view of miniature range for subcaliber tank fire adjustment.

of 1,000 inches. The standard target is the series "A" target of five sheets in black and white. The proper method of using this type of target is given in FM 23-5.



For firing at crossing targets, one target may be towed along the front of the entire firing point, each individual firing at the target in succession and observing the strike of his own grenade. For firing at approaching and receding targets, a target will be necessary for each two firing points.

Figure 243. Moving target range for firing practice antitank rifle grenades.

k. Rifle range. The rifle range shown in figure 250 depicts a typical lay-out for a 1,000-inch range. This type of range is used when time and personnel are limited. A range of this distance is used primarily in instruction practice, enabling the rifleman to learn all of the basic elements of marksmanship. In addition, subcaliber weapons also are used on this range. A complete working target (lower right of fig. 250) is placed within the range area and is used to teach personnel detailed in the pits the methods of operating the target, pasting, and discing. See FM 23-5 for instructions on 1,000-inch rifle range procedures.

l. Cargo aircraft mock-up (figs. 252 to 259).

- (1) This training facility is a full-size replica of the C-82 compartment of the cargo aircraft with a permanent ramp. It is valuable for use in practice and demonstration of methods of loading and unloading, lashing of cargo, appraisal of gross weight, and balancing of the load in the airplane.
- (2) Mock-ups of this type may follow the design of any aircraft; they may be extremely detailed or quite simple. Drawings with dimensions of the C-82 mock-up are shown in figures 253 through 259.
- m. Seating arena (figs. 260 and 261).
 - (1) The semicircular seating arena shown in figure 260 is especially useful whenever tactical map or terrain model exercises are being presented. The lay-out of the arena affords an uninterrupted view for each student and at the same time allows the instructor to face his audience while facing the map or terrain model.
 - (2) The seating capacity of the arena is approximately 75, with chairs and writing space for each student. The map, terrain model, or sand table used is of a portable nature, thereby increasing the over-all usefulness of the arena.
 - (3) Plans for the construction of the arena are shown in figure 261.
- n. Outdoor classrooms (fig. 262).
 - Outdoor classrooms are suggested as a warm weather alternative to conducting group instruction in stuffy indoor classrooms.
 - (2) Facilities designed to secure the maximum effectiveness of outdoor instruction can be improvised readily at most training installations.
 - (3) Things that must be considered to make outdoor instruction effective can be found in FM 21-5.
- o. Mortar range (figs. 264 and 265).
 - (1) The mortar range illustrated in figure 264 is ideal for teaching technique of firing mortars to personnel.

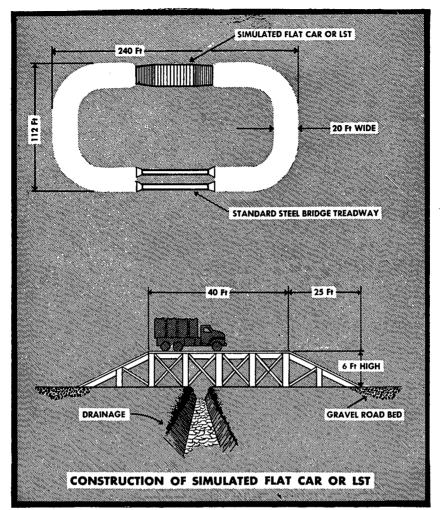


Figure 244. Wheeled vehicle driving course—precision driving.

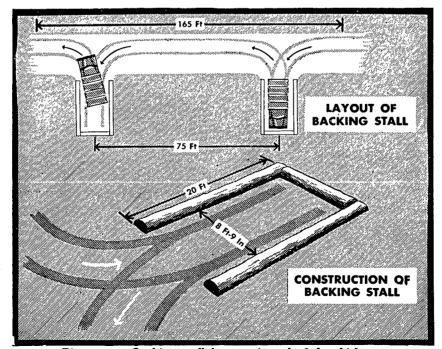


Figure 245. Backing stall lay-out for wheeled vehicles.

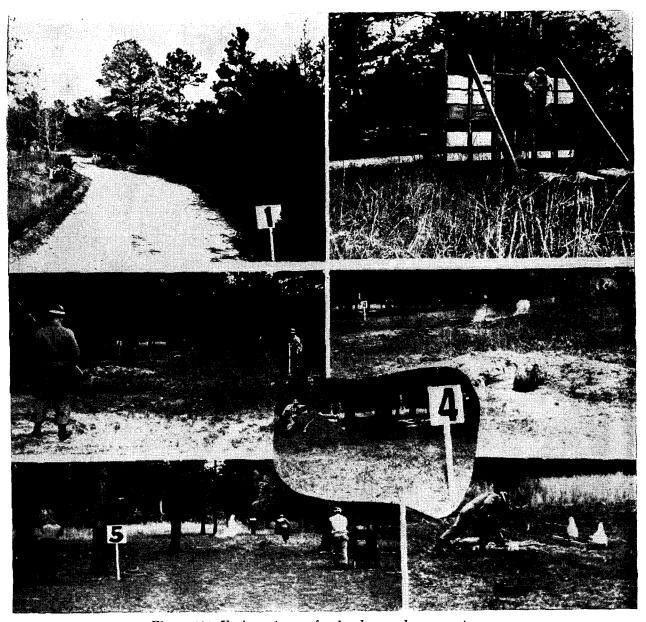


Figure 246. Various stages of a hand grenade course in use.

(2) All targets located on the range can be made of salvaged lumber or other available material. Procedures for observed mortar firing can be found in FM 23-85 or FM 23-90.

p. Field sanitary facilities. The proper location of sanitary facilities in the field is best

taught to personnel by a display similar to that shown in figure 266. Reference data on sanitary camp installations can be found in FM 21–10. Any lay-out for display of sanitary camp installations that complies with the provisions of FM 21–10, as to the location of each installation, is an effective training facility.

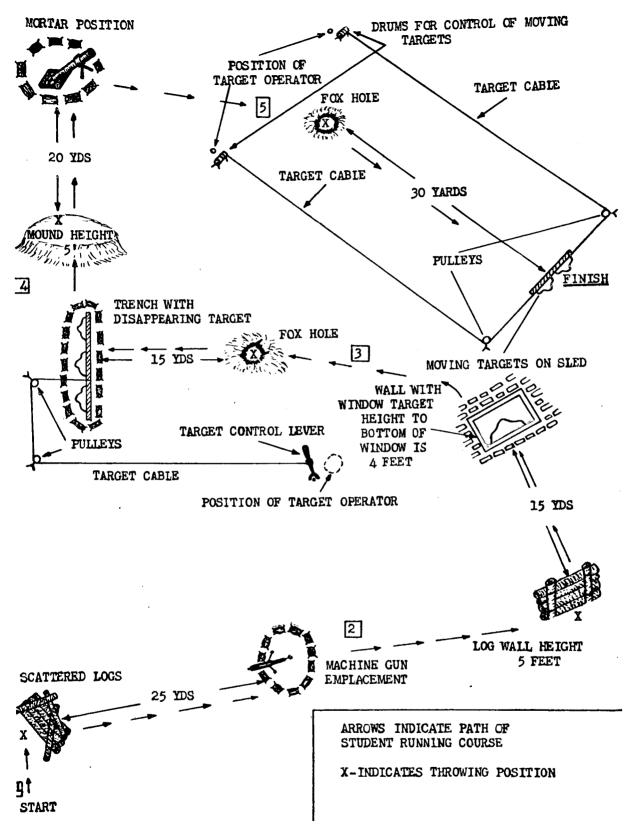


Figure 247. Sketch of a lay-out for a hand grenade assault course.



Figure 248. Arrangement for setting up landscape target panels.

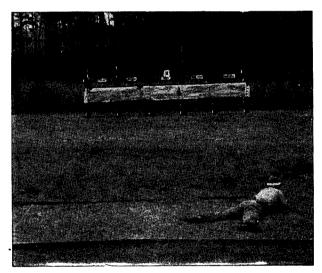


Figure 249. Landscape target in use.

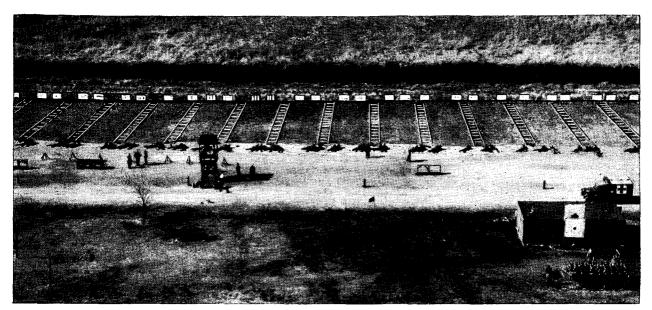


Figure 250. 1,000-inch rifle range.

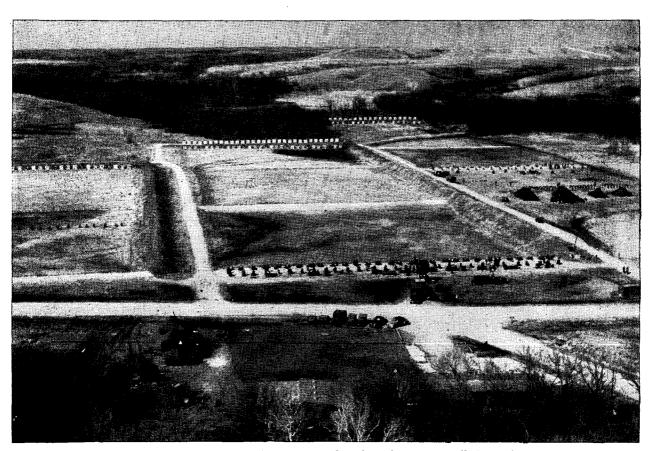


Figure 251. Air view of M1 rifle range, showing excellent location of storage facilities and buildings, instructor's platform, and vehicle parking space. (Detailed construction plans for this type range are shown in fig. 236.)

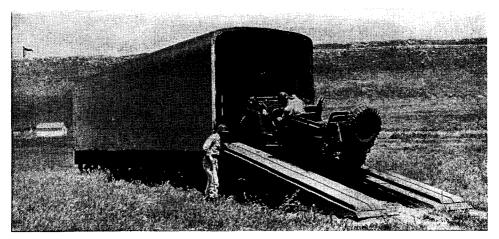
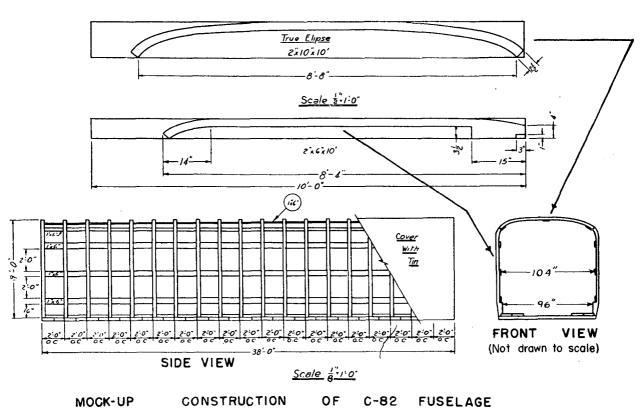


Figure 252. Cargo aircraft mock-up.



IP CONSTRUCTION OF C-82 FUSELAGE
Figure 253. Specifications for construction of C-82 mock-up fuselage.

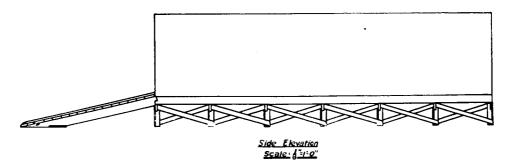
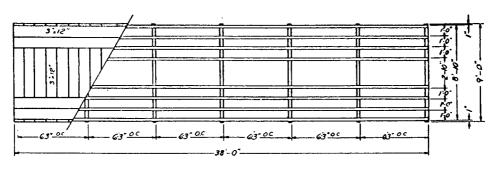
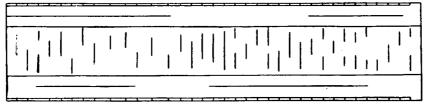


Figure 254. Side elevation of C-82 cargo aircraft mock-up.





Floor Plan Scole & 1-0"

Figure 255. Plans of top view, C-82 mock-up.

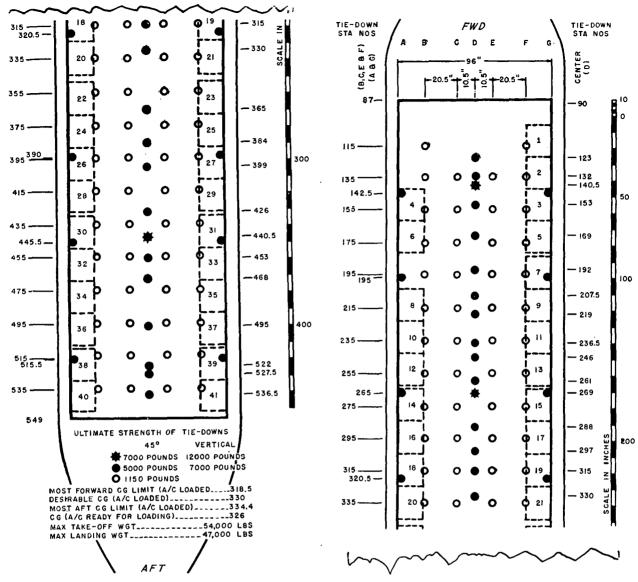


Figure 256. Loading diagram of rear half, interior of C-82 mock-up

Figure 257. Loading diagram of forward half, interior of C-82 mock-up.

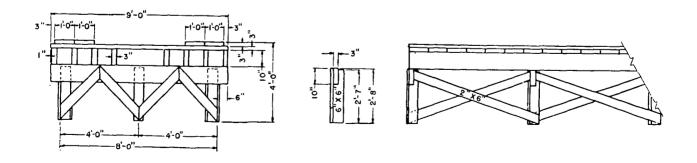


Figure 258. Working drawings, C-82 cargo aircraft platform.

SCALE 1/2": 1'-0"

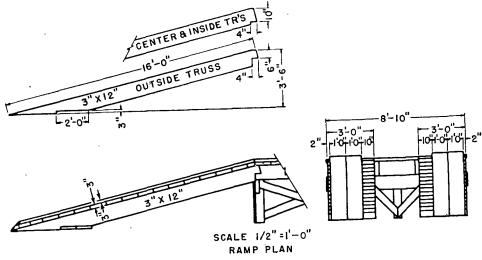


Figure 259. C-82 cargo aircraft mock-up ramp.

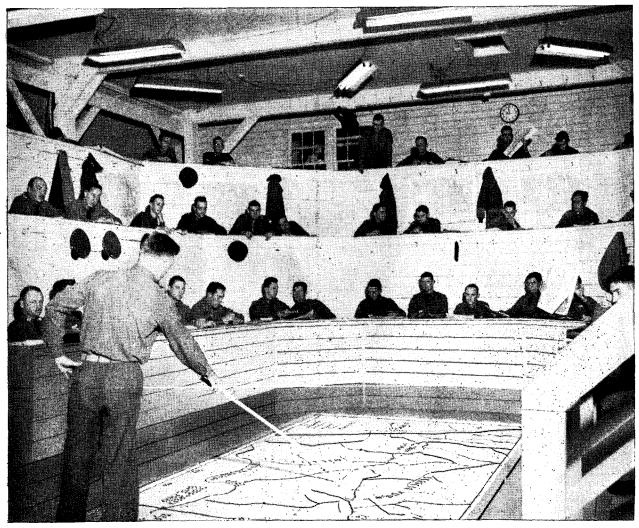


Figure 260. Seating arena.

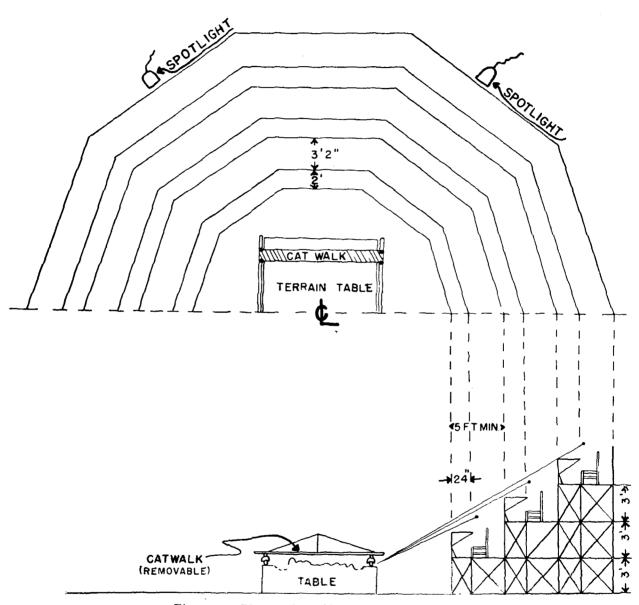


Figure 261. Plans and specifications for seating arena.



Figure 262. Outdoor classrooms.

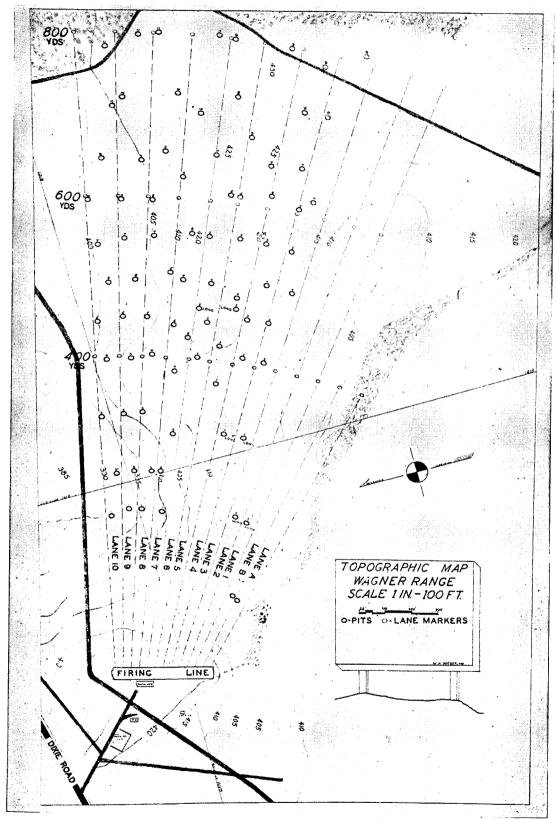


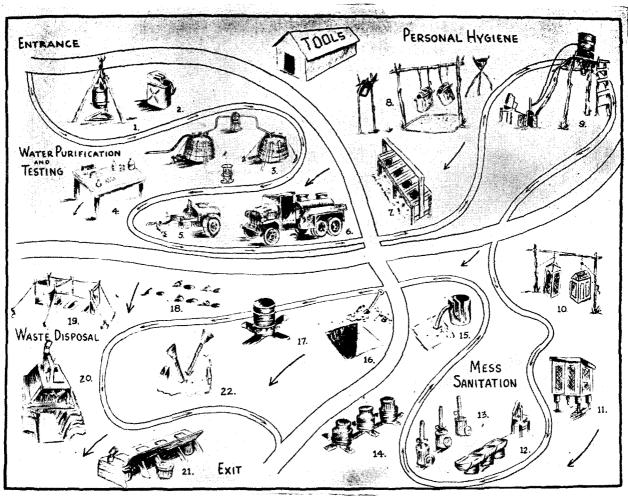
Figure 263. Topographic map showing the lay-out of a transition range.



Figure 264. Mortar range.



Figure 265. Position of mortar fire observer.



- 1. Lyster bag-36 gal.
- 2. Water can-5 gal.
- 3. Water point-two 3,000-gal. tanks with sand and diatomaceous filters and pumping unit
- 4. Water purification-canteen, water purification tablets, chlorine, calcium hypochlorite ampule, and orthotolidine testing kit with tablets
- 5. Trailer, water tank-250 gal.
- 6. Truck, 21/2-ton, water tank-700 gal.
- 7. Helmet rack, wash stand
- 8. Hand-washing devices
- 9. Improvised field shower
- 10. Food storage (suspended containers)

- Food storage (raised container)
- 12. Mess kit washing unit, "vapor (Carlise) type"
- 13. Mess kit washing unit, "immersion heaters"
 14. Mess kit washing unit. "fire trench with three containers"
- 15. Barrel (baffle principle) and soakage pit
- 16. Garbage pit
- 17. Incinerator-oil drum type on cross trench
- 18. Waste disposal-cat hole
- 19. Latrine-straddle trench type
- 20. Latrine-deep pit type
- 21. Latrine-bucket type
- 22. Urinal-pipe and funnel type with soakage pit

Figure 266. Display of field sanitary facilities. (Arrows indicate general terrain slope.)

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