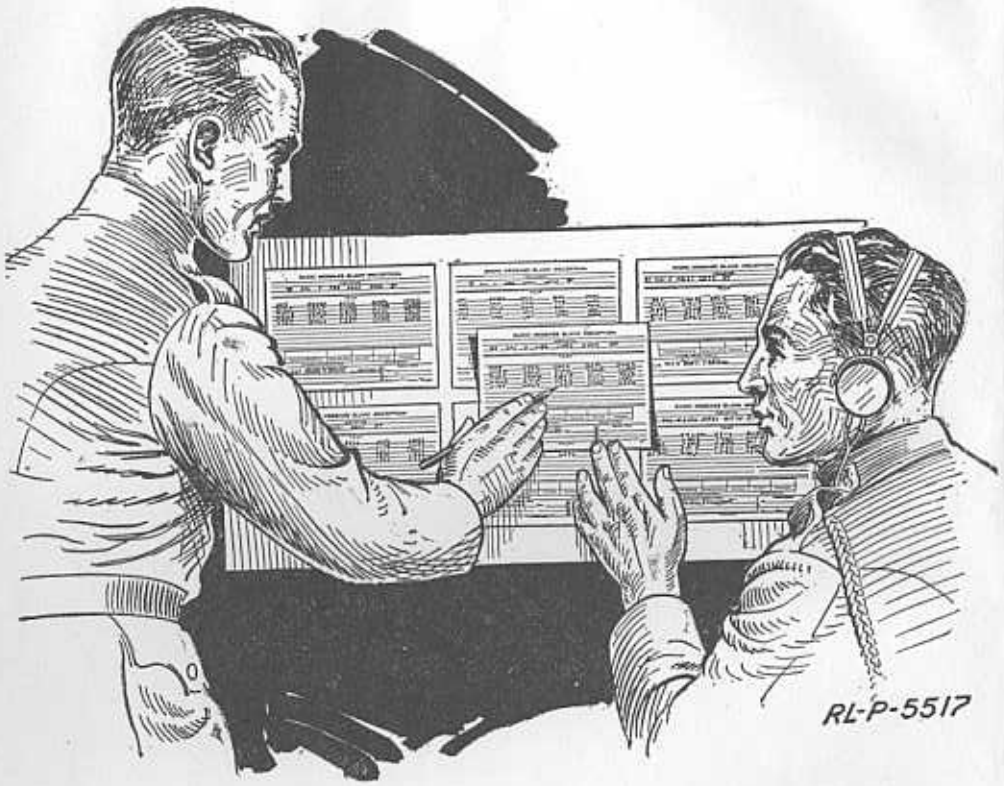

Neat and legible printing is of great importance in the duties of an efficient radio operator. As a means of determining progress in lettering the student's copy is compared with a standard printing scale at frequent intervals. This standard scale consists of six printed charts which range from "excellent" (upper left-hand chart in illustration) to "poor" (lower right). The instructor is shown here pointing out to the student the quality of the individual letters as compared with the standard scale.

UNITED STATES ARMY

TRAINING MANUAL No. 26

RADIO OPERATOR

STUDENTS MANUAL

FOR ALL ARMS

Part II. CODE PRACTICE

VOLUME 1

PREPARED UNDER THE DIRECTION OF
THE CHIEF SIGNAL OFFICER

1925

WASHINGTON
GOVERNMENT PRINTING OFFICE
1925

CERTIFICATE: By direction of the Secretary of War, the matter contained herein is published as administrative information and is required for the proper transaction of the public business.

WAR DEPARTMENT,
WASHINGTON, *February 2, 1925.*

Manuals for training in the Army are to be prepared and revised from time to time by the branches of the service concerned, and when approved, published by The Adjutant General of the Army in pamphlet form in a series of training manuals.

In accordance with this plan there has been prepared by the Signal Corps a series of pamphlets relating to signal communication specialists.

The pamphlets in this series are titled as follows:

Training Manual No. 20—Basic Signal Communication, Students Manual.

Training Manual No. 21—Basic Signal Communication, Instructors Guide.

Training Manual No. 26—Radio Operator, Students Manual.
- Part I, Radio Sets.
- Part II, Volume I, Code Practice.
- Part II, Volume II, Tactical Radio Procedure.

Training Manual No. 27—Radio Operator, Instructors Guide.
- Part I, Radio Sets.
- Part II, Volume I, Code Practice.
- Part II, Volume II, Tactical Radio Procedure.

This pamphlet is published for the information and guidance of all concerned.

BY ORDER OF THE SECRETARY OF WAR:

J. L. HINES,
Major General,
Chief of Staff.

OFFICIAL:
ROBERT C. DAVIS,
Major General,
The Adjutant General.

PREFACE

The Radio Operator, Code Practice Instructors Guide, contains an analysis of the methods of giving instruction to Radio Operators in code practice. As much importance is placed on the transmitting ability of an operator as there is on his receiving speed.

The development of instructional methods has progressed considerably since the time the operator was merely required to learn the code and then listen to press until he was able to receive at a required rate of speed. By experience it was found that an operator could more readily and accurately acquire the necessary receiving skill by listening to the characters as they were sent by an expert operator. The student then learned only the sound of the letter. Later it was found that very often an excellent receiving operator was an extremely poor transmitter so that in order to permit the student to see the relation between the components of a properly made letter or numeral, a tape recording machine was used. Thus the student was able by the aid of visual comparison, to note the difference in the way his characters were formed and the way in which characters made by the instructor were formed. Still another method was found to be of service and a decided improvement over anything previously attempted, this was the use of the phonograph or Ediphone. This method eliminates the need for requiring an expert instructor to send for hours at a time while the class has little or no supervision. It permits the instructor to confine his entire attention to supervising the class, and also permits large numbers of students to practice receiving from a record made by an expert operator.

This manual gives the instructor the choice of these three methods of instruction; that is, the instruction without the use of any auxiliary instruments, the use of the undulator or tape recording machine, and the use of the Ediphone. It is evident that for the best instruction a combination of all three of these methods is the most desirable.

The requirements which this Guide must fulfill are:

a. It must analyze the steps in training radio operators in code practice so that officers in time of war can quickly train such men for duty with combat units in the field.

b. It must provide directions for the students to follow these steps, and such directions for the instructors as will permit him to train efficient operators in a minimum time.

c. It must provide tests so that instructors can determine the progress of their students, and when the course is completed to determine their proficiency, so that the term "radio operator" shall come to mean, just as "expert rifleman" means, a soldier who can do certain things in a certain time with a given degree of accuracy.

d. It must provide a method of instruction for the peace-time Army Regular, National Guard, and Reserve, and also for the R. O. T. C. and C. M. T. C., which requires no change of any kind for the training of these specialists in the larger Army which a national emergency may demand.

Notification of errors and suggestions for improvement of this manual should be addressed to the Chief Signal Officer of the Army.

RADIO OPERATOR

STUDENTS MANUAL FOR ALL ARMS

CONTENTS

INDEX OF ILLUSTRATIONS

UNIT OPERATIONS

RADIO OPERATOR

STUDENTS MANUAL FOR ALL ARMS

CODE PRACTICE

UNIT OPERATIONS

Equipment.

1. Paper, pencils, and an assigned position at the code practice tables.

Information.

The purpose of Unit Operations Nos. 1–6 is to teach the student the phonetic names of the different letters and numerals, to show how they are printed, and to familiarize him with their sound when sent in the International Morse Code. These three things are taught simultaneously for a group of 6 characters, thus making 6 groups or Unit Operations to be studied in order to teach all 36 characters.

The student is required to print in capital letters all copy that he makes. This is done to insure legibility, and thus prevent errors. The system of printing to be used together with the phonetic name of each character is given in Fig. 1. In this figure the light arrows surrounding the characters indicate the direction of each stroke in forming the character. The heavy dot represents the beginning of the stroke while the point of the arrow shows its end. The numbers on the arrows tell the order in which the strokes are made; number one being made first, then number two. The grouping of the characters in Fig. 1 is the same as the order in which they are studied in the first six Unit Operations.

The Unit Operations and the characters studied in each are as follows:

Unit Operation No.	Characters
1	D, H, S, 9, X, Z
2	6, O, Y, L, J, 2
3	7, Ø, 3, 4, K, 5
4	W, E, S, M, A, U
5	V, R, F, 1, T, I
6	B, N, G, Q, C, P

Fig. 2 is a photograph of the "Printing Scale." As will be seen, six sample messages are shown, No. 1 being printed practically perfect while No. 6 is, to a large extent, illegible. Nos. 2, 3, 4, and 5 lie between the best and poorest and are arranged in their order of merit. The use of this scale is to furnish a definite check on the quality of the student's printing. This check is obtained in the following manner: The student's copy is placed on the printing scale and compared to the different samples until the one is found which it most nearly resembles. The number of this sample denotes the

quality of the student's printing. If the only comparison which can be made is that the student's copy lies between two samples its quality is then denoted by the number of the lower grade sample, plus (for example, 4+). This is explained here in order that the student may at any time grade his own printing if he so desires.

The code practice of the student on each of the first six Unit Operations is divided into two parts. Part one is to teach the sound of the characters being studied while part two is to give practice in the reception and printing of these characters (and any previously studied) when sent at the rate of approximately 25 words per minute.

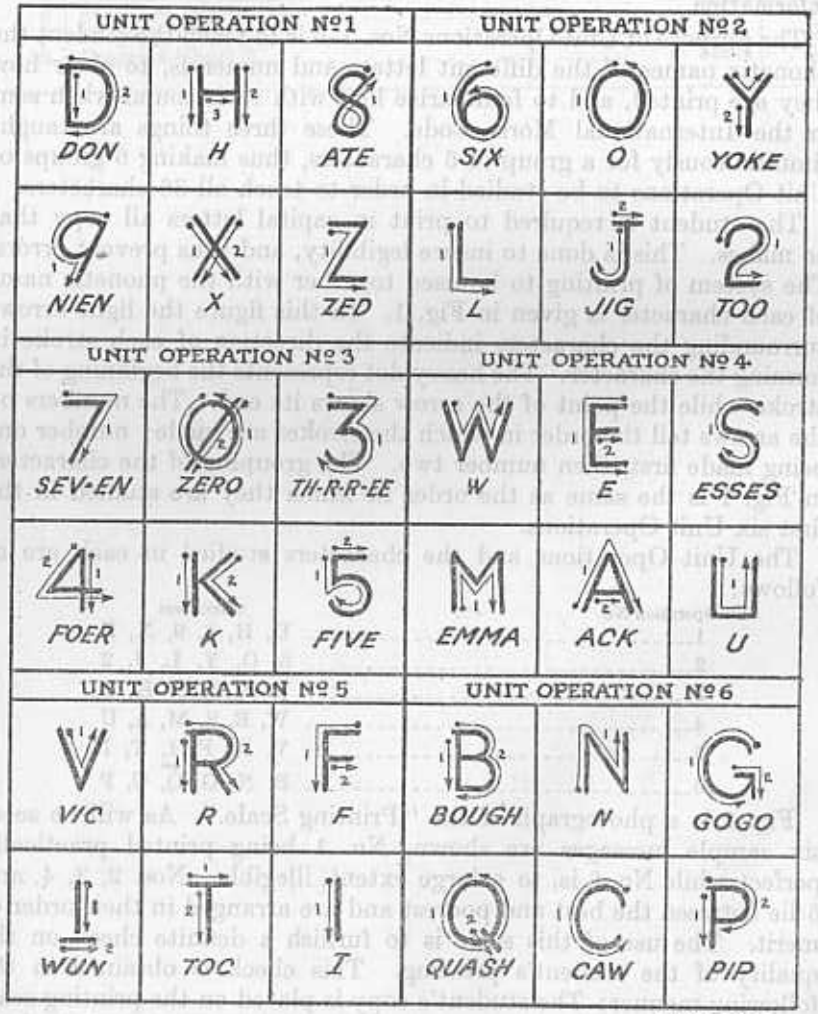

Fig. 1.—Printing alphabet showing how letters and numerals should be formed and the sequence in making the various strokes

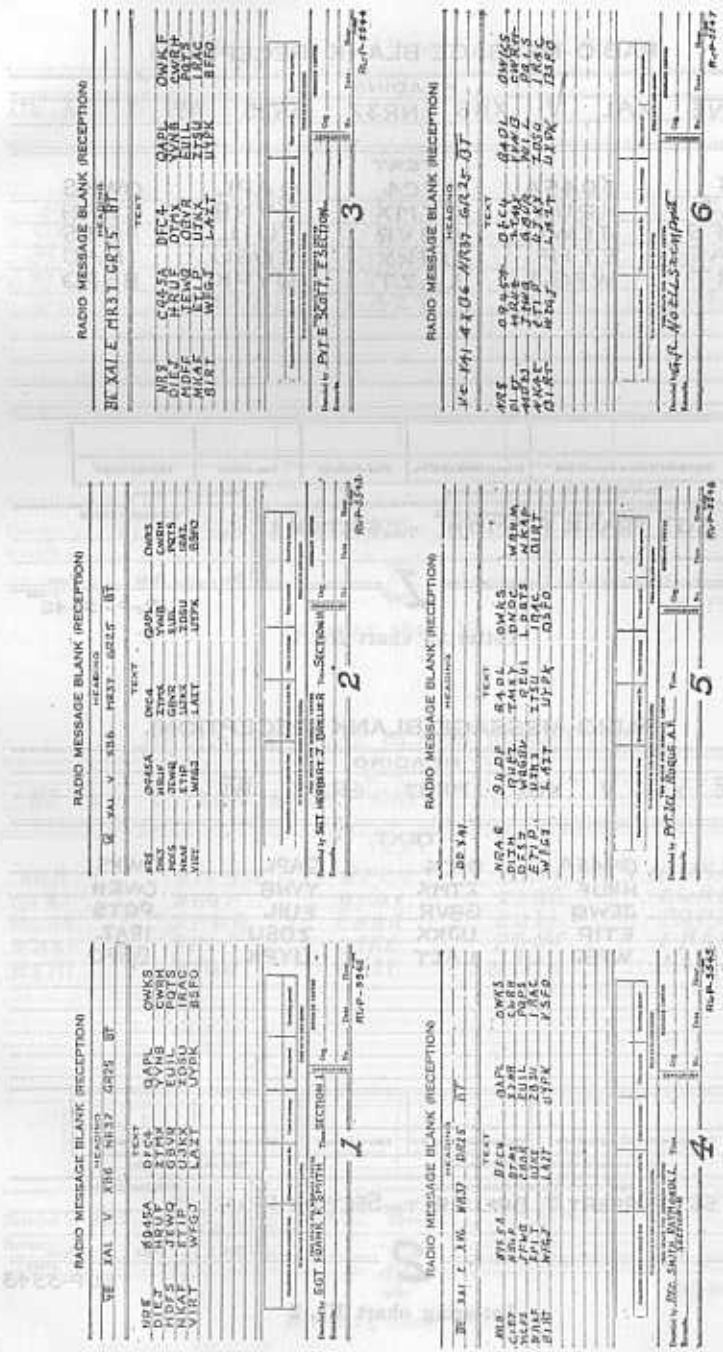

Fig. 2.—Printing scale

RADIO MESSAGE BLANK (RECEPTION)

HEADING

VE XAL V XB6 NR37 GR25 BT

TEXT

NR8	Ø945A	DFC4	QAPL	OWKS
DIEJ	HRUF	ZTMX	YVNB	CWRH
MDFS	JEWQ	GBVR	EUIL	PQTS
NKAF	ETIP	UJKX	ZDSU	IRAC
VIRT	WFGJ	LAZT	UYPK	BSFO

Organization of station originally from | Message center serial No. | Class of message | Time received | Receiving operator

To be inserted by radio operator from the heading — Filled out by radio operator

THIS SPACE FOR MESSAGE CENTER

Decoded by SGT FRANK F. SMITH Time SECTION 1

Remarks

REGISTERED

MESSAGE CENTER

Org.

No. Date Hour

1

RL-P-5542

Lettering chart No. 1

RADIO MESSAGE BLANK (RECEPTION)

HEADING

VE XAL V XB6 MR37 GR25 BT

TEXT

NR8	Ø945A	DFC4	QAPL	OWKS
DIEJ	HRUF	ZTMX	YVNB	CWRH
MDFS	JEWQ	GBVR	EUIL	PQTS
NKAF	ETIP	UJKX	ZDSU	IRAZ
VIRT	WFGJ	LAZT	UYPK	BSFO

Organization of station originally from | Message center serial No. | Class of message | Time received | Receiving operator

To be inserted by radio operator from the heading — Filed out by radio operator

THIS SPACE FOR MESSAGE CENTER

Decoded by SGT HERBERT J. BRELIER Time SECTION H

Remarks

REGISTERED

MESSAGE CENTER

Org.

No. Date Hour

2

RL-P-5543

Lettering chart No. 2

RADIO MESSAGE BLANK (RECEPTION)

HEADING

BE XAI E MR37 GRT5 BT

TEXT

NR8	C945A	DFC4	QAPL	OWKF
DIEJ	HRUF	DTMX	YVNB	CWRH
MDFF	JEWQ	OBVR	EUIL	PQTS
MKAF	ETIP	UJKX	ZTSU	IRAC
BIRT	WFGJ	LAZT	UYPK	BFFO

Organization of station originally from | Message center serial No. | Class of message | Time received | Receiving operator

To be inserted by radio operator from the heading — Filed out by radio operator

THIS SPACE FOR MESSAGE CENTER

Decoded by PVT E SCOTT, E SECTION Time

Remarks

REGISTERED

MESSAGE CENTER

Org.

No. Date Hour

3

RL-P-5544

Lettering chart No. 3

RADIO MESSAGE BLANK (RECEPTION,

HEADING

BE XAI C XV6 NR37 DR25 BT

TEXT

NRH	Ø945A	BFC4	QAPL	OWKS
GIET	HRUF	BTMX	X2NB	CWRH
MCFS	JFWQ	CBBR	EUIL	PQPS
NKAF	EPIT	UJKX	ZBSU	I RAC
BIRT	WFGJ	LAZT	UYPK	VSFO

Organization of station originally from | Message center serial No. | Class of message | Time received | Receiving operator

To be inserted by radio operator from the heading — Filed out by radio operator

THIS SPACE FOR MESSAGE CENTER

Decoded by PFC. SMITH, RAYMONDL. Time

SECTION-H

Remarks

REGISTERED

MESSAGE CENTER

Org.

No. Date Hour

4

RL-P-5545

Lettering chart No. 4

107446°—25——2

RADIO MESSAGE BLANK (RECEPTION)

HEADING

BE XAI

TEXT

NRAQ	94DF	Q4DL	OWKS	
DIJH	RUEZ	TMXY	DNDC	WRHM
DFSJ	WQGBV	REUI	LDQTS	NKAF
ETIP	UIKX	ZTSU	IRAC	BIRT
WFGJ	LAZT	UYPK	BSFO	

Organization of station originally from | Message center serial No. | Class of message | Time received | Receiving operator

To be inserted by radio operator from the heading | Filled out by radio operator

THIS SPACE FOR MESSAGE CENTER

Decoded by PVT. ICL. ROQUE A.F. Time

Remarks

5

REGISTERED

MESSAGE CENTER

Org.

No. Date Hour

RL-P-5546

Lettering chart No. 5

RADIO MESSAGE BLANK (RECEPTION)

HEADING

VE VAI AXB6 NR37 GR25 BT

TEXT

NR8	09454	DEC4	Q4DL	OWKS
DI EJ	HRUE	ZTMX	YYNB	CWRH
MDEJ	JZWQ	GBUR	7UIL	PQIS
NKAZ	ETIP	UJKX	ZOSU	IRAC
BIRT	WZQJ	LAZ4	UXPK	BSFO

Organization of station originally from | Message center serial No. | Class of message | Time received | Receiving operator

To be inserted by radio operator from the heading | Filled out by radio operator

THIS SPACE FOR MESSAGE CENTER

Decoded by G.R. NOZLLS ZCMPUT

Remarks

6

REGISTERED

MESSAGE CENTER

Org.

No. Date Hour

R-P-5547

Lettering chart No. 6

Directions.

The following directions apply equally to any one of Unit Operations Nos. 1 to 6 and will be repeated for each operation as it is studied.

1. Pay close attention to the instructor as he explains the method of printing the six characters being studied and, when told to do so, practice printing the characters. Note the phonetic name of each character.

2. When the instructor reads the characters and tells you to print them as they are read, use a sharp pencil and print carefully and accurately on the ruled copy paper, taking care to have your printing evenly spaced on each line.

3. Take your assigned position at the code tables and put on the headset, adjusting it until it is comfortable and the receivers fit closely over the ears. Each character being studied will be sent several times in the International Morse Code. For example: The six characters shown at the top of page 2 constitute Unit Operation No. 1. Each character will be sent six times and then the unit operation will be repeated several times. Listen carefully to the sound of each character as it is made and repeat its name to yourself. When this has continued for some time, the instructor will direct the students to print each character as it is sent. Using the ruled copy paper furnished and a sharp pencil, print each character every time it is certain that the character has been correctly heard.

4. On the completion of par. 3 above, the student should be able to recognize by sound, and print any of the six characters studied. The next step is to be able to recognize and print them (and others which may have been previously studied) when they are sent one after another in fairly rapid succession. In order that the student may do this, the characters will be sent at the rate of 25 per minute. Reception of this transmission should be printed on the ruled copy paper furnished, with the usual care regarding neatness, accuracy, etc. If any character is not recognized at once, do not stop and try to puzzle out which one it is, as to do so will mean the loss of several succeeding ones; leave a space and go ahead. Always place your name and date on all copy you make and turn it in to the instructor at the end of each period.

5. By means of certain tests which will be given, the instructor will determine when a student may progress to the next Unit Operation. Special directions for these tests will be given by the instructor.

RECEIVING PRACTICE IN TWO-CHARACTER CODE GROUPS SENT AT A RATE OF FIVE TO SEVEN WORDS PER MINUTE

Equipment.

Paper, pencils, and assigned positions at the code practice tables.

Information.

On completing Unit Operation No. 6 the student is proficient on receiving all characters when sent at the rate of 25 per minute. The purpose of this Unit Operation is to give the student his first training in the copying of code groups. The simplest possible group will be used; that is, one composed of 2 characters. The student has noted that in all previous Unit Operations each character is sent very fast (about 20 words per minute) and that the slow speed used was obtained by leaving long intervals between characters. In this Unit Operation the same basic idea is carried out in the sending of groups. That is to say, each group is sent quite fast and the slower speed in words per minute obtained by leaving long intervals between groups.

The student will be given practice on groups composed of both letters and numerals but in no case will any one group contain both a letter and a numeral. Numeral groups will be mixed in random order among the letter groups of the transmission.

The transmission on which the students receive practice in this Unit Operation will be at the rate of 5 words per minute at the beginning of the operation. Since a word is taken as 5 characters, 25 characters per minute will be sent. These 25 characters are divided into 2 character groups so that the student will actually receive approximately 12 groups per minute. In copying these groups the student should listen to the entire group, recognize each of the characters composing it, and then, when the transmission of the group has been completed, print the 2 characters recognized during the interval before the next group is sent. As the Unit Operation is studied the speed is increased to 7 words per minute.

In printing his reception in this Unit Operation, the student should be careful to print the same number of groups on each line and to have the groups on a line placed directly under those on the line above.

Directions.

Specific directions for the student will be issued by the instructor. In general, the only directions needed by the student are given by the instructor from time to time.

RECEIVING PRACTICE ON THREE-CHARACTER CODE GROUPS SENT AT THE RATE OF 7 TO 9 WORDS PER MINUTE—PRELIMINARY SENDING PRACTICE

Equipment.

1. Paper, pencils, and assigned positions at the code practice tables.

2. A small brass or iron washer about one-half inch in diameter and one-sixteenth inch thick (a penny will do).

Information.

On completing Unit Operation No. 7 the student is rated as a 7-word receiving operator. This Unit Operation has two purposes. First, to make the student a nine-word receiving operator and second, to start the student's instruction in sending and make him a five-word sending operator.

The telegraph key used in sending is shown in Fig. 3, RL–P–1784 and 1785, which also shows the correct method of holding and operating it. Ability to send will depend to a very great extent on the student acquiring the proper movement of his wrist and hand in operating the key. This movement can be best described in conjunction with Fig. 3, RL–P–1784 and 1785. On this figure several arrows appear. Their explanation is as follows: When the key is closed, the hand executes a forward and downward rocking motion. The wrist moves upward. On opening the key, these two movements are reversed, the hand rocking backward and upward and the wrist moving downward. The importance of operating the key in this manner can not be overemphasized and the student should make every effort to acquire this motion exactly as illustrated. It is important that the back of the hand and wrist be kept horizontal and not tilted.

In order to properly operate the telegraph key, it must be adjusted in a certain manner. Correct adjustment of the key is obtained as follows:

a. Adjust the two trunnion screws which form the pivot of the key lever. See that the lever moves freely up and down and with a very slight amount of side play. In adjusting these screws, be sure that the upper contact of the key, which is mounted on the key lever, is kept directly over the lower contact mounted on the base of the key. When the correct adjustment of the trunnion screws has been obtained, lock them by means of the locking nut on each screw.

b. Unlock the screws on the back end of the key lever and adjust it until the knob of the key moves up and down approximately one-sixteenth of an inch when the key is operating. Lock the screw in this adjustment.

c. Unlock the screw which passes through the key lever just in rear of the key contact and adjust it until the amount of pressure required to close the key is comfortable to the operator using the key. The exact adjustment of this knob will vary with different operators and must be determined by the operator to suit himself.

The student will be required to execute all sending practice given in this Unit Operation with a small washer or penny balanced on the back of his wrist where the wrist joins the hand. The purpose of this is to prevent the hand being turned to either side while the key is being operated. If during the operation of the key the washer falls off, the student should stop sending and replace the washer.

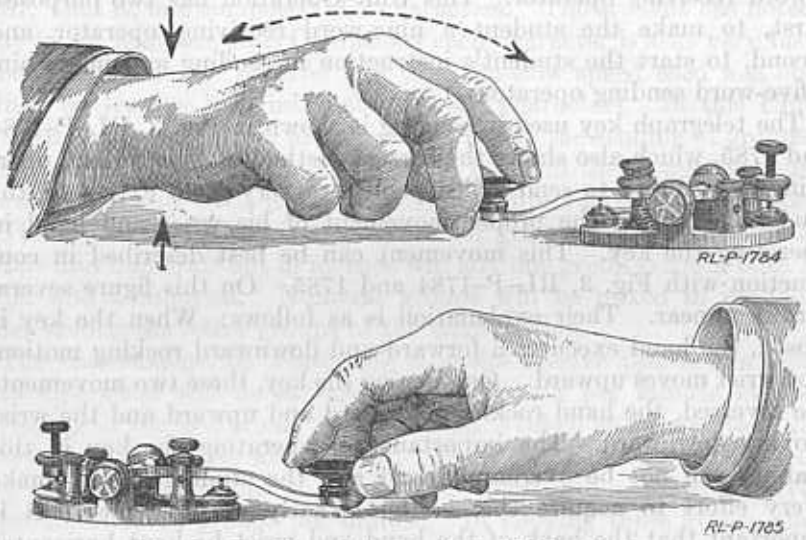

Fig. 3.—Position of the hand in holding the key

All receiving practice on this Unit Operation will consist of three-character groups, some groups being composed of letters and others of numerals. These groups will be sent at the rate of from seven to nine words per minute. Practice on these groups will be given along the same lines as the receiving practice of previous Unit Operations.

Directions.

1. *Receiving practice.*—Any directions needed by the student for the carrying out of the receiving practice required in this Unit Operation will be given by the instructor as needed.

2. *Sending practice.*—Approximately one-third of the total time devoted to the Unit Operation will be used for sending practice. Specific directions for the carrying out of the sending practice will be given by the instructor as needed.

PRACTICE IN TRANSMISSION AND RECEPTION AT 12 AND 15 WORDS PER MINUTE

Equipment.

Paper, pencils, and assigned positions at the code practice tables.

Information.

On completing Unit Operation No. 8 the student is rated as a 9-word receiving operator and a 5-word sending operator. These two Unit Operations have two purposes. Unit Operation No. 9 endeavors to make the student a 12-word receiving operator and a 12-word sending operator. Unit Operation No. 10 endeavors to make the student a 15-word receiving operator and a 15-word sending operator.

Students must observe the exact method of holding and operating the telegraph key as previously instructed in Unit Operation No. 8 for transmitting.

All the student's practice in Unit Operation No. 9 will consist of 4-character groups, some groups being composed of letters and others of numerals. These groups will be sent at the rate of from 9 to 12 words per minute. Practice will be given along the same lines as the receiving practice in previous Unit Operations.

Directions.

1. *Receiving practice.*—Any directions needed by the student for the carrying out of the receiving practice required in Unit Operations Nos. 9 and 10 will be given by the instructor as needed.

2. *Sending practice.*—Approximately one-third of the total time devoted to Unit Operations 9 and 10 will be used for sending practice. Specific directions for the carrying out of the sending practice will be given by the instructor as needed.

PRACTICE IN TRANSMISSION AND RECEPTION AT 18 AND 20 WORDS PER MINUTE

Equipment.

Paper, pencils, and assigned positions at the code practice tables.

Information.

On completing Unit Operation No. 10, the student is rated as a 15-word receiving operator. Unit Operation No. 11 endeavors to make the student an 18-word receiving operator and an 18-word sending operator. Unit Operation No. 12 endeavors to make the student a 20-word receiving operator and a 20-word sending operator.

The same care in sending, the adjustment of the key and lettering, applies to these Unit Operations as in previous ones.

All the student's practice in these Unit Operations will consist of 5 and 6 character groups and 6-numeral groups. These groups will be sent at the rate of from 15 to 18 words per minute in Unit Operation 11 and from 18 to 20 words per minute in Unit Operation No. 12. Practice in receiving these groups will be along the same lines as the receiving practice in previous unit operations.

Directions.

1. *Receiving practice.*—Any directions needed by the student for carrying out the receiving practice required in Unit Operations Nos. 11 and 12 will be given by the instructor as needed.

2. *Sending practice.*—Approximately one-third of the total time devoted to Unit Operations 11 and 12 will be used for sending practice. Specific directions for the carrying out of the sending practice will be given by the instructor as needed.

LETTERING CHARTS

It is of great importance for a radio operator to print characters neatly and legibly. A great number of the messages sent to the message center by a radio operator are in many cases valueless, due to illegible printing. In order to overcome this difficulty, the student is given a thorough course in lettering.

It is evident that if an instructor were to grade the efforts of a student in lettering the mark would be unfair in most cases. This is due to the fact that one instructor would grade a student's paper according to his own ideas of standard printing, while another instructor, who had totally different ideas, might give a considerably lower mark. With this handicap in view a means was devised whereupon the error in the judgment of the instructor is reduced to a minimum.

On page 13 is shown a table containing six lettering charts. If carefully noticed, it will be seen that these charts range from excellent (beginning at the upper left and extending across the top) to poor (at the lower right). These charts were selected from a total number of about 200. The process of selecting the charts was somewhat as follows:

A number of officers and instructors were chosen to select by comparison, out of the 200 charts, 6 which ranged from the best to the poorest. The number of officers and instructors selecting these papers was approximately 25. By averaging their selections the 6 standard charts in the table on page 13 were finally selected as standards. At the bottom of each chart is a number which constitutes its rating compared with the remaining charts.

In order to aid the instructor and to save him the work of producing a new lettering table, large full-page illustrations of each chart in the table shown on page 13 may be found on pages 14 to 16 consecutively. Each of these pages should be cut from the manual and mounted on a heavy bristol board so as to form a complete table similar to the one shown on page 13.

The instructor should collect the papers of the students at the end of at least one of the periods during the daily session. With the standard lettering table in front of him he should take one paper at a time and compare it with the standard.

In these comparisons the best results are obtained in the following manner:

1. Glancing at the student's paper, note the general appearance of the printing as a whole. Look at the standard table and select a chart which has the same general appearance of the student's paper.

107446°—25——3

2. Hold the student's paper beneath the standard chart selected and compare at random a few of the individual characters. If the student's characters are slightly better than those in the standard chart compare the paper with the next higher chart. If the student's characters are not as good as those in the original chart selected, compare the paper with the next lower chart. The student's paper is finally scored according to the score appearing at the bottom of the chart which has been selected as bearing the greatest similarity to the student's paper. This score should be inserted on a daily grade sheet and kept for reference purposes. The instructor should observe very closely the progress of the students in lettering as shown by these daily scores. If there are any students who continually perform poorly in lettering, they should be given individual attention and required to practice outside of the regular hours.

RADIO CODE PRACTICE EQUIPMENT

The code practice equipment described in the following pages, is designed to provide individual keys and headsets for the students, arranged in such a manner that interconnections may be made between the various student positions and between the student positions and the Ediphone, both for receiving and sending practice.

In order to accomplish these interconnections, it is necessary to have a switchboard. A source of tone for operating the headsets is also required.

A type of switchboard and a source of tone well adapted to this work are shown in the upper right hand corner of Fig. 4, which represents the complete circuit arrangement of the Ediphone, the switchboard and the table wiring.

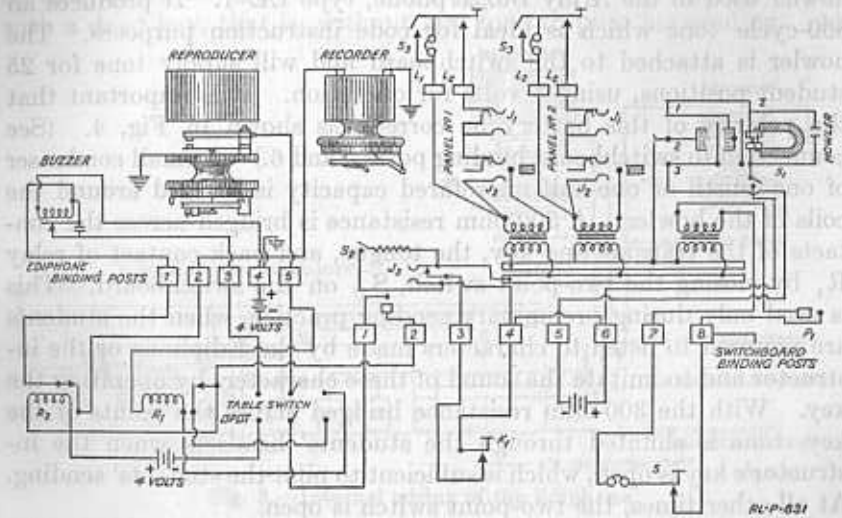

Fig. 4.—Complete table wiring and connections to Ediphone and switchboard

The switchboard is made up of panels from the Signal Corps Monocord Telephone Switchboard. These panels are rewired so as to make a suitable radio code practice switchboard, each panel being a separate unit which may be removed from the switchboard without disturbing the other units. Each unit is provided with a transformer, which is made from the electromagnet of the switchboard drop. The two coils of the magnet are cut apart, one coil being used as a primary and the other as a secondary. Both coils are shielded with a single covering of copper. This arrangement makes a one-to-one iron core transformer, each winding having a resistance of 100 ohms. The primary windings of all the transformers are connected in parallel, care being taken to not reverse the polarities. This is accom-

plished without wiring or soldering by bringing the tone supply from the howler to two brass bus bars in the switchboard. The primary terminals of each transformer are connected permanently to brass pieces which rest against the bus bars when the units are screwed into the switchboard. Any panel may be removed from the switchboard by removing two screws and without disturbing the wiring. The switchboard may be made with any desired number of units. An extra panel, J_3, is provided for Ediphone operation. An extra transformer is included in the switchboard for connection to the instructor's set. This set consists of a key and a head set connected to a cord and plug which may be inserted in jack J_1 of any unit for purposes of class supervision. The howler, which supplies the tone to all of the paralleled transformer primaries, is identical with the howler used in the Army Buzzerphone, type EE–1. It produces an 800-cycle tone which is ideal for code instruction purposes. The howler is attached to the switchboard and will supply tone for 25 student positions, using 4 volts for operation. It is important that the polarity of this battery be correct, as shown in Fig. 4. (See connection to switchboard binding posts 5 and 6.) A small condenser of one-fourth or one-half microfared capacity is bridged around the coils of the howler. A 300-ohm resistance is bridged across the contacts of the transmitting key, the tongue, and back contact of relay R_1 by closing the two-point switch, S_2, on the switchboard. This is used only during preliminary sending practice, when the students are required to listen to characters made by the Ediphone or the instructor and to imitate the sound of these characters by operating the key. With the 300-ohm resistance bridged across the points of the key, tone is shunted through the students' headsets when the instructor's key is open, which is sufficient to pilot the students' sending. At all other times, the two-point switch is open.

Each student set consists of a key, a telephone head set (70-ohm) and a two-point switch, S_3. The switch is used to place a short circuit around the student's head set when he is making a record This is for the purpose of cutting the resistance of the head set out of the circuit.

Each student position is connected to L_1 and L_2 of a panel in the switchboard, as shown in Fig. 4. From L_2 the circuit passes through jacks J_1 and J_2. From J_2 the circuit is completed by placing the cord plug P in J_2. The circuit then passes from J_2 through the cord and the transformer secondary to L_1.

The howler operates continuously during receiving practice, the tone passing through the primaries of all transformers in parallel and being controlled by the instructor's key or by the tongue and back contact of relay R_1. If it is desired to have the students practice operating in nets, two or more positions can be connected in series by means of the cords attached to each panel. For example, to connect student sets Nos. 1 and 2, place the plug of panel 1 in J_2 of panel 2 and the plug of panel 2 in J_2 of panel 1. To connect student sets 1, 2, and 3, place the plug of panel 1 in J_2 of panel 2, the plug of panel 2 in J_2 of panel 3, and the plug of panel 3 in J_2 of panel 1. In this way, any number of positions may be connected. J_1 is provided for the purpose of supervision by the instructor. By inserting the plug P_1 of his set in J_1 of any panel, he can listen in or operate with his key.

When it is desired to have a student make a record of his sending, the table cord plug is inserted in J_2, the table switch is thrown to the left and key K_1 is closed. The student then closes his switch S_3 and commences to send. During this time the student sends with a dead key, that is, without any tone to pilot his sending. At the same time, the other students can engage in sending or net practice without interference. When through sending, the table switch is thrown to the right, the student's switch S_3 is opened and the record is reproduced for the student to observe or copy.

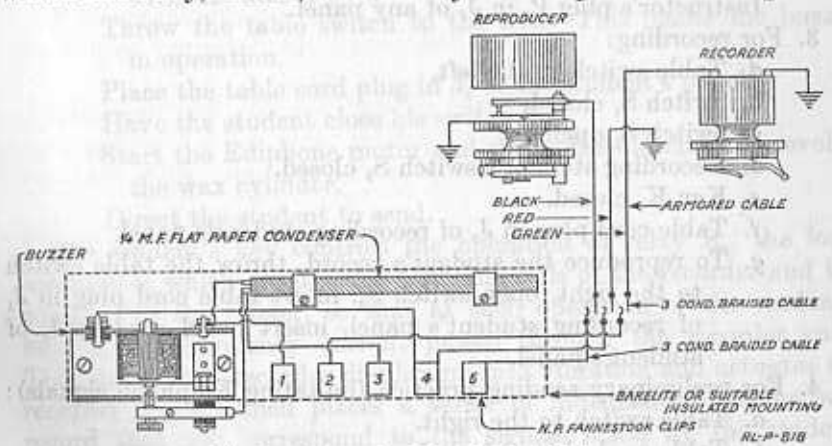

Fig. 5.—Internal wiring of the Ediphone

Figure 4 shows the wiring of the instructor's table and its connection to the Ediphone and to the switchboard. Three 4-volt batteries are required. A storage battery is recommended. The polarities should be as shown in Fig. 4. The relays R_1 and R_2 should have a resistance of 100 or 150 ohms. Relay R_1 is operated by the Ediphone reproducer during receiving practice, the back contact and the tongue of the relay acting as a key in the tone circuit. Relay R_2 is operated by the student's key when making a record. Its tongue and front contact act as a key in the recorder circuit. The

table switch is a double-pole, double-throw switch. This is thrown to the right for receiving practice and when the students are practicing sending individually. It is thrown to the left for recording.

SUMMARY OF SWITCHBOARD AND SWITCH CONNECTIONS TO BE OBSERVED

1. For receiving practice and for individual sending practice:
   - *a.* Table switch to the right.
   - *b.* Table cord plug in Jack J_3.
   - *c.* Switch S_1 closed.
   - *d.* Switch S_2 open.
   - *e.* Students' switches S_3 open.
   - *f.* Key K_1 open.
   - *g.* Panel plugs in J_2 of own panels.
2. For supervising students:
   Instructor's plug P_1 in J_1 of any panel.
3. For recording:
   - *a.* Table switch to the left.
   - *b.* Switch S_1 closed.
   - *c.* Switch S_2 open.
   - *d.* Recording student's switch S_3 closed.
   - *e.* Key K_1 closed.
   - *f.* Table cord plug in J_2 of recording student's panel.
   - *g.* To reproduce the student's record, throw the table switch to the right, open switch S_3, insert table cord plug in J_1 of recording student's panel, insert panel cord in J_2 of student's panel.
4. For preliminary sending practice (imitating Ediphone signals):
   - *a.* Table switch to the right.
   - *b.* Table cord plug in jack J_3.
   - *c.* Switch S_1 closed.
   - *d.* Switch S_2 closed.
   - *e.* Switches S_3 open.
   - *f.* Key K_1 open.
   - *g.* Panel plugs in J_2 or own panels.
5. For net practice:
   - *a.* Table switch to the right.
   - *b.* Table cord plug idle.
   - *c.* Key K_1 closed.
   - *d.* Panel plug of panel 1 in J_2 of panel 2.
   - *e.* Panel plug of panel 2 in J_2 of panel 3.
   - *f.* Panel plug of panel 3 in J_2 of panel 1, etc.

NOTE.—Several nets may be operated simultaneously if desired, or nets may be operated while a student is making a record.

OPERATION AND ADJUSTMENT OF THE EDIPHONE

The Signal Corps Special Ediphone consists of an Ediphone dictating machine equipped with a special recorder, a special reproducer, a buzzer, and a condenser.

The recorder and reproducer are mounted on a swivel arm in such a manner that either may be placed in position for operation by pivoting the arm to the right or left.

The buzzer is mounted on the back of the machine, together with the condenser, which is bridged across the buzzer contacts to prevent sparking.

The method of operation of the Ediphone is as follows:

To make a record of the student's sending:

Place a blank wax record on the Ediphone.

Pivot the arm to the right, placing the recorder in contact with the wax record.

Throw the table switch to the left. This places the buzzer in operation.

Place the table cord plug in J_2 of the student's panel.

Have the student close his switch S_3.

Start the Ediphone motor and throw the clutch in to revolve the wax cylinder.

Direct the student to send.

The student's key controls the operation of relay R_2, the local contacts of which are in series with the coils of the recorder and the contacts of the buzzer, so that at each operation of the student's key, a high-frequency current passes through the recorder coils. This throws the recorder diaphragm into vibration and actuates the recorder stylus which places a series of indentations on the wax record that will correspond to the signals made by the student.

To reproduce these signals:

Pivot the arm to the left, placing the reproducer in contact with the wax record at the point where the signals begin.

Throw the table switch to the right.

Place the table cord plug in J_1 and the panel cord plug in J_2 of the student's panel.

Have the student open his switch S_3.

Start the Ediphone as before.

As the reproducer stylus passes over the indentations on the wax record, it throws the reproducer reed into vibration. This vibration corresponds to the frequency of the buzzer with which the signal was made and is high enough to introduce considerable resistance to the flow of current through the contacts on the reed and the inertia bar directly above it. As these contacts are in series with a battery and the coils of relay R_1, the result is a stoppage in

the flow of current through relay R_1. The local contacts of relay R_1 are arranged to close, when the armature opens, and as these local contacts are in series with the student's set through the table cord, the tone passing through his secondary transformer circuit will be interrupted in consonance with the signals impressed on the wax record.

For receiving practice, permanent records are used. These are reproduced as directed, for wax records, except that the table cord plug is placed in jack J_2.

For preliminary sending practice the arrangements are the same as for receiving practice, except that switch S_2 is closed.

Closing switch S_2 places a 300-ohm shunt around the local contacts of relay R_1 so that, when these contacts are open, there is still a weak tone passing through the students' head sets.

Preliminary sending practice is conducted as follows:

One of the A records is sent from the Ediphone.

The students listen to the sounds of the characters as they are sent and, between characters, they attempt to imitate them on the key.

The tone which is shunted through the 300-ohm resistance is sufficient to pilot the students' sending and not loud enough to interfere with the sound of the character when made by the Ediphone.

This practice is continued with all of the A and B records, until the students can make the characters properly.

The buzzer has only one adjustment It should be adjusted to give a clear tone by manipulating the contact screw. When adjusted properly, it will not spark at the contacts.

The howler is attached to the switchboard. It is placed in operation by closing switch S_1 and normally furnishes current to all of the transformer primary windings in parallel.

The various grounds shown in Figs. 4 and 5 indicate connections to the frame of the Ediphone. No actual connection to the earth is required.

The reproducer requires no adjustment and should not be taken apart.

The recorder consists of a telephone receiver whose diaphragm, when thrown into vibration, actuates a stylus through the medium of an air column. Ordinarily, it needs no adjustment and should not be taken apart or the cover removed unless it fails to operate. In case its adjustment has been altered in this way, it may be readjusted by screwing the receiver in or out until the buzzer signals make a suitable record.

The polarity of the batteries should be as shown in Fig. 4.

Relays R_1 and R_2 are ordinary telegraph relays of 100 or 150 ohms resistance and operate well on from 30 to 50 milliamperes of current.

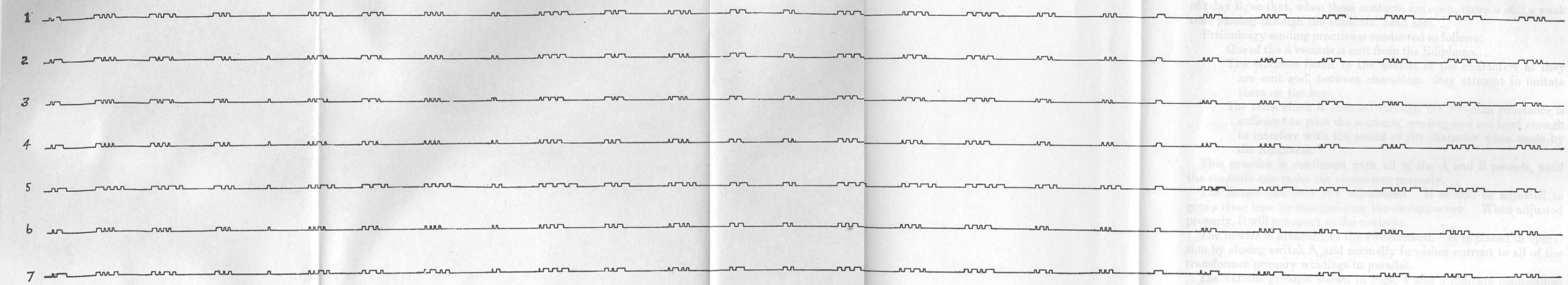

Fig. 6.—Standard tape scale

RL-P-5590

STANDARD TAPE SCALE AND ITS USE

In giving the transmitting tests to the students by means of an undulator it is necessary to use a method for correcting tapes somewhat similar to that used in correcting the lettering tests. Fig. 6 shows a table of standard tape records which were chosen in much the same manner as the lettering charts. A large number of students, instructors, and officers were required to transmit the alphabet with no particular attention paid to speed. Another group of officers and instructors were chosen to select from these tapes a series of 20 which were to be used as standards. An average of these selections made produced a standard table of 7 tape records.

After giving a test according to the directions given in the Instructors Guide of each Unit Operation the instructor is ready to score these tapes. This method of scoring is as follows:

1. Select one of the student's tapes and hold it near the standard tapes shown in Fig. 6. Locate one of the standard tapes which as a whole resembles the student's tape.

2. Glance slowly through the student's tape and notice whether or not the dashes and dots are of uniform length. If they are of uniform length, compare their lengths with the dots and dashes on the standard tape. If the student's tape compares well with the standard tape in this respect, score the paper according to the mark given at the left of the standard tape. If the student's tape does not compare well as far as the individual character is concerned and seems to be poorer than the standard tape in this respect, drop to the next lower standard tape and repeat the process of comparing individual characters. Proceed in this manner until a standard tape is found which compares well with the student's tape in all respects.

MEASURING THE PROGRESS OF STUDENTS IN RECEPTION

In order that the student may see what progress he is making in comparison to other members in the class as well as men in previous classes, the following charts are furnished. Chart 1 shows the progress made by members of a class during a previous school term. The location of the white block indicates at what rate of receiving speed the student began. His progress is marked by the shaded blocks. The white line on the extreme right indicates the 100 per cent speed required of a receiving operator, that of 22 words per minute. Chart 2 shows the progress of a class in receiving speed at the end of the twentieth week of instruction. It will be noted that some of the men started in as low as zero word operators and at the end of the twentieth week were rated as 10-word operators, while others started as 6-word operators, and progressed as high as 22 words per minute. The tests used to measure this progress are found in this manual. Similar charts should be prepared to show the progress of students in transmission.

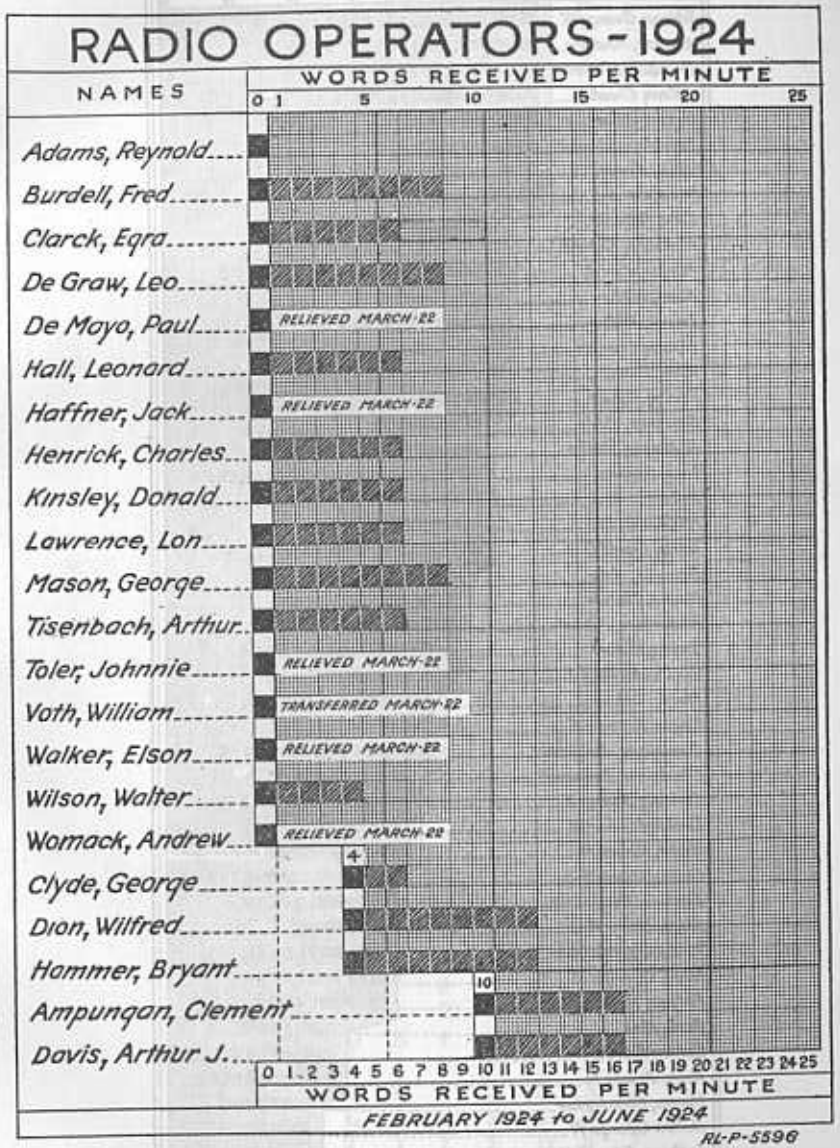

Fig. 7.—Progress chart 1

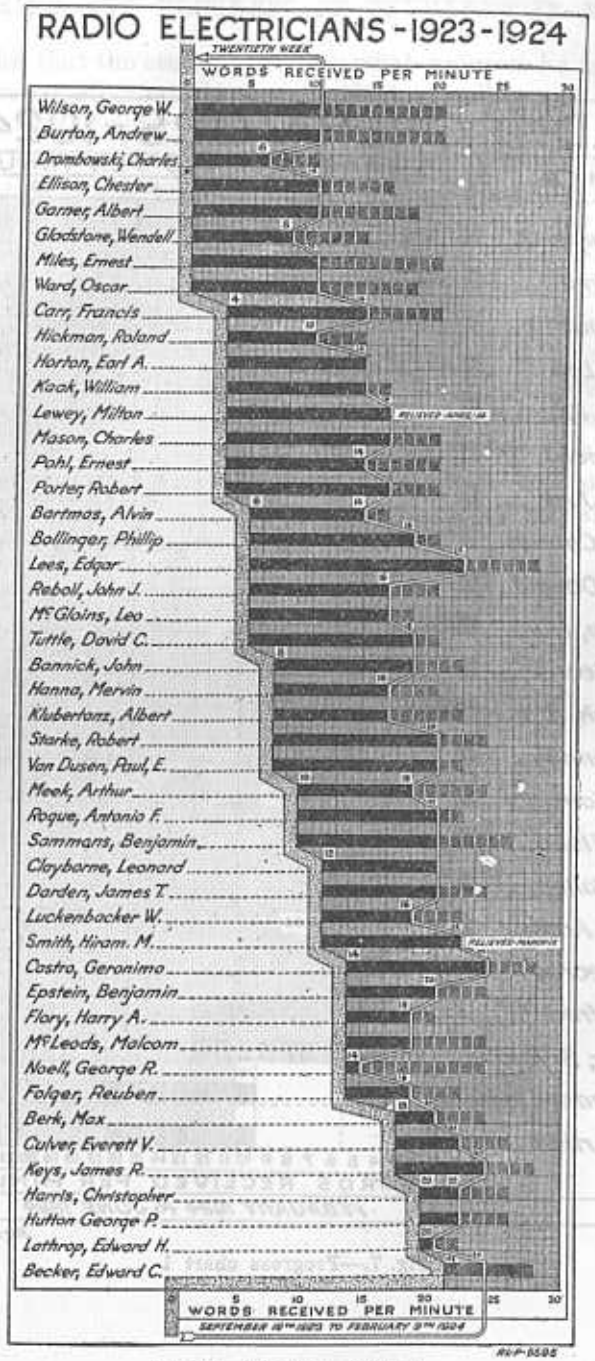

Fig. 8.—Progress chart 2

TABLE NO. 1-B

Record NO. 1-B—150 Characters

D	H	9	X	8	Z	H	D	8	9
Z	X	H	9	X	Z	D	8	H	9
D	8	X	Z	H	9	X	Z	8	D
8	9	Z	D	X	D	Z	8	X	9
D	X	8	9	Z	Z	9	X	D	8
Z	D	X	8	9	D	X	Z	8	9
X	H	D	Z	8	9	D	X	Z	8
D	X	Z	8	9	X	Z	D	9	8
8	9	H	D	Z	D	9	8	X	Z
H	D	X	Z	8	9	Z	X	Z	D
D	X	Z	9	8	Z	X	9	8	X
Z	D	X	H	9	8	D	Z	X	D
9	H	8	9	D	X	9	8	9	X
H	D	Z	9	8	H	8	9	X	D
Z	H	8	D	X	Z	9	H	8	Z

TABLE NO. 2-B

Record NO. 2-B—150 Characters

6	O	Y	L	J	2	Z	D	H	X
9	L	J	8	2	D	L	9	J	L
Z	8	9	O	6	Y	J	L	Y	Z
D	6	8	9	L	X	O	9	8	Y
L	X	6	J	Z	L	Z	9	8	L
2	O	8	9	Y	X	L	D	H	6
2	O	8	D	Z	Y	L	J	O	6
9	2	Y	D	J	X	Y	D	X	6
O	D	H	Z	O	6	J	Y	2	9
L	Y	X	Z	9	8	6	O	9	9
X	Y	X	O	6	8	Z	X	6	O
L	J	2	D	H	J	2	O	L	J
D	8	Z	6	8	J	Y	Z	8	H
D	J	Z	X	Y	D	H	2	Y	2
J	2	2	X	6	L	9	Y	8	J

TABLE NO. 3-B

RECORD NO. 3-B—150 Characters

J	L	Y	O	6	D	H	8	9	X
K	5	2	7	Z	K	J	6	9	8
X	Y	L	3	7	Ø	3	5	O	6
K	L	H	9	8	X	Z	K	J	6
7	3	4	D	K	4	6	J	Y	Z
7	Ø	4	L	J	5	9	Y	3	D
7	3	O	L	D	8	5	9	K	Y
L	5	O	L	D	7	3	4	Ø	2
Z	5	7	2	Y	7	Z	D	5	7
3	O	7	3	4	K	4	7	8	9
6	2	J	Ø	4	6	X	J	2	4
3	Z	9	8	2	Y	3	4	O	H
4	3	D	4	O	2	7	Z	4	7
3	8	X	O	3	7	4	Ø	X	Ø
3	4	X	H	7	K	Y	8	3	Z

TABLE NO. 4-B

RECORD NO. 4-B—150 Characters

W	M	A	4	U	X	3	8	9	5
Z	7	4	O	6	J	U	5	M	E
S	W	A	U	W	3	5	X	E	H
D	8	9	W	E	S	X	7	M	A
4	K	9	Y	W	S	M	3	4	7
J	L	6	U	K	A	O	Y	ø	3
E	W	A	ø	9	5	4	7	L	M
4	Z	ø	E	U	K	S	S	E	7
4	6	O	8	K	7	X	Z	3	4
Y	O	2	8	5	ø	A	M	W	E
U	M	W	A	Y	J	X	3	7	S
3	Z	L	4	3	7	3	E	W	8
D	W	E	S	4	2	H	2	K	J
6	L	D	2	3	7	S	3	7	E
S	M	D	A	M	A	U	ø	Z	S

TABLE NO. 5-B

RECORD NO. 5-B—150 Characters

6	Z	S	V	T	U	R	F	I	1
H	A	9	W	D	M	S	4	L	ø
E	O	8	R	E	K	2	V	6	T
S	3	A	D	Y	X	4	I	7	F
A	3	U	1	E	W	9	M	R	T
1	S	5	A	F	V	T	F	3	M
K	7	R	1	E	U	4	T	J	W
3	V	I	A	R	Y	1	V	R	7
4	W	F	I	3	M	J	E	1	R
V	F	7	W	R	1	R	F	V	I
U	R	U	R	7	ø	L	F	X	1
M	Z	4	V	2	O	5	8	S	2
H	6	O	Y	1	L	S	I	3	T
J	7	D	ø	9	X	4	K	5	W
E	S	M	A	U	R	F	V	F	X

TABLE NO. 6-B

RECORD NO. 6-B—150 Characters

C	P	Q	N	G	B	V	4	F	P
W	G	B	C	Q	M	A	7	R	E
1	T	P	R	3	G	S	U	C	I
Q	F	B	E	B	G	F	C	Q	R
1	V	P	N	Q	C	P	R	7	S
U	I	B	T	G	B	V	3	G	P
Q	C	F	R	N	Q	1	Y	Q	C
G	P	R	W	B	N	A	P	R	E
4	B	Q	C	G	I	7	J	2	V
C	P	R	B	Q	1	ø	K	F	P
C	T	6	B	O	M	U	S	Q	Z
9	D	V	X	M	A	C	5	G	W
S	Y	6	B	3	L	1	N	P	4
T	2	J	7	V	O	ø	4	X	S
D	I	B	L	H	9	Z	Q	C	P

RECORD NO. 7—150 Characters

TABLE NO. 7-A

5 to 7 words per minute

YB	ST	BL	ø3	87	CY	HS	FA	YQ	62	71	NU	WC	53	67	18	XV	VJ		
IL	RD	84	71	UX	OM	25	68	71	ø5	ZG	QP	FL	IA	61	ø8	HX	BJ		
RX	UI	EL	OG	FX	14	24	EC	YT	IX	QW	82	ø3	FK	RI	HV	NA	28		
UQ	TE	LC	DS	84	14	95	37	KI	DG	LB	MA	DC	9ø	16	93	TH	25		
HW	ø2	TD	FA	MG	64	ø9	KU	DS	EH	AB	39	12	RZ	IQ	VL	KY	94		

TABLE NO. 7-B

EM	ZI	3ø	46	28	SR	23	71	TA	DY	HL	KX	CV	71	54	69	IV	WG		
83	76	JO	PF	YG	13	84	QL	HP	AV	MO	21	86	IB	LO	FG	75	43		
IB	65	LO	43	FG	27	XW	AC	TM	44	38	75	SU	XR	9ø	RJ	34	ZM		
EF	TS	ZJ	86	WR	NB	KW	57	43	ø9	IC	UX	21	IB	LO	FG	75	42		
41	EJ	UT	NR	57	ø6	GN	IP	XK	IH	3S	ø4	AX	JR	21	UR	QK	LF		
RX	US	EP	QU	25	69	DK	HB	MX	JR	OL	57	MX	JR	OL					

TABLE NO. 7-C

NT	CA	29	31	WX	GF	YV	NA	JT	92	13	58	XB	GU	OR	CH	73	96		
WX	GF	DC	UO	BD	92	AK	83	IC	JY	QG	SL	74	OR	CH	BK	LD	65		
13	YB	UL	OQ	SR	ø4	BR	UA	CB	NR	ZY	2ø	48	71	53	UJ	PD	EN		
LZ	IB	EH	TD	FY	7ø	VN	JW	SN	42	59	CA	13	7ø	OK	RU	LX	9S		
35	62	PJ	DF	LA	JP	UF	TI	KG	37	69	NY	HV	SZ	DE	RN	BX	16		
RX	JI	EB	WX	91	56	ø8	RG	LQ	UM	AX	86	35	2ø						

TABLE NO. 7-D

41	CJ	UT	57	NR	OL	ø6	29	SC	BP	HK	QV	38	ø4	XJ	WF	21	65
73	YZ	IG	BZ	ND	64	ø9	71	QD	CS	HT	71	65	HT	AX	JR	ø3	87
62	GW	VC	BQ	XU	93	26	MB	71	ø5	AT	RS	IZ	ø5	52	RS	IZ	6ø
IZ	ME	NK	81	94	YV	NA	25	68	14	7ø	DC	UO	BD	AK	2ø	18	36
GJ	HE	RF	DW	PN	46	IK	MQ	ZO	TU	15	96	34	YX	LA	JP	UF	TI
HW	RU	ø3	57	EX	OQ	SJ	BY	21	65	73	ø8	TD	FA	64			

TABLE NO. 7-E

HW	RU	EX	89	IQ	SJ	15	RY	TD	FA	MG	NP	KL	24	WI	RZ	CV	YB
ST	BL	FJ	HY	GO	QA	ZD	ø3	YW	KM	XR	CU	75	61	EI	MP	CY	HS
73	CM	29	MI	87	XB	VJ	IL	RD	TX	PB	72	93	PS	2ø	37	95	LT
WQ	SN	AD	91	36	JU	AX	ZE	63	29	57	HJ	SB	CW	PM	DQ	HS	MZ
ZT	MU	DJ	CL	71	65	84	BP	KF	IX	AT	YN	39	12	57	UH	WA	YK
ET	RU	WZ	36	QK	42	34	AB	IV	85	JX	TB	UX	58	5ø			

RECORD NO. 8—240 Characters

TABLE NO. 8-A

7 to 9 words per minute

QCA	WND	BVM	YEF	298	81ø	KZB	LXO	TSP	263	754	IHR	JGU	UYB	RGM	ø24	UYB
RGM	CHA	LFG	TWQ	IFJ	BVO	824	39ø	976	253	4ø5	XZS	ENK	PLO	RND	MAB	257
GIZ	YTU	82ø	385	491	UJC	FWK	285	VQK	HPE	CSR	891	743	JXA	DZW	IOF	925
NVY	128	EFL	SCD	QKG	ø85	839	RUP	MTH	HKP	WOR	DJV	GMI	ANS	824	39ø	468
YCQ	TEX	UZB	135	986	ELD	JYQ	NXE	9ø5	837	GSI	MBL					

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TABLE NO. 8-B

924	385	175	FOE	QHJ	SPM	GIW	AUR	173	49ø	675	NHR	QMS	FOB	PAV	937	483
GBW	AKI	TCN	GZP	SML	BVU	OWE	HJG	FRJ	928	3ø1	589	317	VUO	WEH	GJF	RJD
JER	XBI	386	KGP	TWV	KSH	UGM	QOY	183	592	YRA	BCL	NJV	285	376	UXD	BCO
NOV	KSO	GHR	UYG	QMV	PJW	TZL	YFC	JNV	238	140	586	718	HCQ	LFS	MYR	UXZ
ø62	582	174	98ø	ONG	LYX	RKV	STI	QWF	DCT	ZEH	UIE	PUR	JMP	28ø	496	587

TABLE NO. 8-C

LFP	JER	GBW	KHX	NOV	415	ø62	ICU	QYT	SMB	38ø	421	TSM	WRC	983	684	VYB
LFP	JER	GBW	LHX	NVO	ZDH	AIC	415	769	293	JKH	TXH	NYS	ODQ	71ø	552	HGE
ø37	819	494	YFX	ZWM	PGU	IAT	543	679	OHJ	479	DFZ	ONL	BVD	351	786	441
839	674	RWG	OWZ	DGQ	126	INQ	KVN	936	FNC	117	RJT	LCF	814	765	TDF	KSZ
RGD	UCD	QUT	841	967	6ø1	XUN	DST	GLO	DUT	HGO	982	436	758	LGY	JWX	HUD

TABLE NO. 8-D

TCQ	289	3ø1	538	CRK	TVJ	CYS	GRH	UDM	FLE	578	293	TRW	WZQ	KAB	IVJ	XPB
829	ø15	893	XQU	NEK	ZIM	RTS	BYA	HLK	CVQ	GJO	983	582	571	JOP	FGY	QIH
PZV	MOB	KEF	TSZ	JWR	NDK	WIC	UXM	892	357	4ø6	IBL	OFG	925	391	XWA	ACT
MSU	XRJ	ZMV	925	386	754	HDY	QPE	VPY	OCI	BRI	KIN	HDS	ABE	UBM	TWX	142
ZJD	LKV	357	9ø7	865	SIF	QUA	NYH	CRO	UGB	89ø	185	XPW	EZM	YTJ	284	3ø4

TABLE NO. 8-E

KAD	WEM	TEZ	NVR	XHT	OUD	12ø	394	857	6ø1	CDL	LSG	QYJ	CIK	238	475	692
138	UIJ	BWF	TEM	TXZ	QVA	894	375	172	ø35	ZQV	ANY	HSL	DVI	183	4ø5	865
OCR	GYH	135	975	OCR	GWH	RSL	UBY	248	3ø4	861	FTE	ZNV	MJA	KCD	PIX	ø35
QOB	EPO	983	ø47	SWV	BAC	SDR	NRQ	825	376	JHZ	CIL	TKM	GUX	892	ø31	FOE
QJH	SPM	GIV	783	496	OUJ	AUR	BLX	KVT	DYZ	ø21	385	RNB	CNH	RQM	SFO	374

RECORD NO. 9—300 Characters

TABLE NO. 9-A

9 to 12 words per minute

1591	7Ø19	ARGM	KQVX	NANG	TKYQ	2281	YKHB	PUJP
ITLC	SZQS	EFWV	HOUW	GONH	ORAX	MVGN	9356	44ØØ
HMWP	XKBQ	DSZC	IEDD	EZLL	1355	6789	XUBW	3629
VYAO	FFOO	HVUS	QWAE	TNYR	LPLJ	RXJV	KITL	4771
5395	MAAD	NKEC	PQQU	CWGG	1864	HQRX	IDDO	1109
7Ø12	BTMH	LFGM	JSZY	2154	6745	UTWI	YOEU	FOFB
VLSO	AXEC	NKRY	PVJH	9930	Ø683	XRVS	IQLX	AJDM
5832	KACW	QZUH	WGGN	QPXD	DTOA	2642	TIHV	FYMK
SCYV	PLWZ	QIRY						

TABLE NO. 9-B

AOWP	QTVM	2642	17Ø4	NWRY	ULPH	JGZJ	716Ø	9Ø83
447Ø	XICU	JQGC	KEWH	SZFQ	MRNT	5261	TJYU	1387
9936	ECXV	FOCK	WWHY	ZFYA	5189	1Ø63	OGUS	JIIB
LXBQ	XPVH	QNAI	PSDB	2779	GHIC	Ø652	RWVG	4134
9981	DMMQ	IDZV	EUHV	ZJQE	2896	5477	RYTA	JTUX
CFVK	OOKL	426Ø	Ø335	WRYZ	FDAP	5Ø49	GRST	LKBX
XEQF	PUNZ	NNIQ	6478	2782	SHBA	HSCO	1691	WXGA
MGQM	DIVD	Ø886	7997	BOPT	VELJ	JIDV	XZJN	6214
RFUQ	IYFU	LKDH	CBHD	124Ø	9153	SRGA	XGYP	XGYP
876Ø	4974	AMVW	PZOK	EXQC	BSDL	22Ø5	BNNE	TGWP

TABLE NO. 9-C

KBLJ	OJOQ	QZRD	1676	8559	NHXT	BLFH	JMZG	2432
934Ø	YCCY	ZIIA	TEWV	5981	LFAD	AVCM	629Ø	WSRH
DFPZ	VCQO	FBMI	KWSF	3852	4168	IEES	TLFB	Ø773
2141	686Ø	FYAG	JXWK	UPOY	CYAC	WHRG	9Ø23	SRBM
5379	4175	OTNH	ZDZL	YJRX	FHTJ	LSKG	WMEG	Ø351
NUPD	QUFU	VKIB	SILX	UCEW	2Ø77	9452	PBDT	6926
8Ø49	7665	AGIE	WKMS	CYCY	ACAM	RGCI	5796	BMMQ
NHCB	ALKY	WXRO	TZRU	SGBJ	3Ø22	41Ø2	QREH	8315
PDCA	FUIC	IBVE	9Ø94	5527	LJXD	EMBT	6832	OUTX
VVKS	QBZD	11Ø0	TIMC	WAYQ	SJFZ	LHKN	7634	4118

TABLE NO. 9-D

CUGA	DHCD	WAVF	2536	XEON	YZXF	2581	3947	BWXJ
YBUL	SHRW	GXIP	BCKA	2584	9191	XZUS	VNVN	3489
6719	Ø505	FZST	EFPC	LBCV	9184	IXWD	YGXF	UCQK
BRPF	OHEA	2581	3837	CYDK	UNGJ	MYKS	6411	LZAV
FQCI	4693	WCMX	1313	JMTY	PLEK	9830	NYR	VTFZ
JQXL	HRDN	7963	6187	SQVH	ILWB	UKJY	6781	9234
JDSC	8256	8110	IAXE	KZJC	LDFG	9128	UYKG	KPUD
SHZJ	7391	AGLX	GEHT	PSDB	AYMO	8431	KJVG	INQU
2435	4657	MKQR	ETPN	ZTYC	8975	UJEF	WNGU	XNHF
2406	DEPL	XDSM	CUMS	DBIG	5154	9832	KSIF	JCAY

TABLE NO. 9-E

ZGQP	FLIA	1347	6892	BJTW	SYMC	3725	DURE	VKIL
3951	BDSA	YTFG	UWWR	2145	0583	ZYUL	TIDG	8376
KSWQ	ELDQ	9346	RZVL	MBWQ	KUDS	4612	7153	OMCK
1593	3541	DGRN	LIRY	JNPW	EGZW	4678	CSVK	LBTH
IMHT	4678	5312	HDUG	CQXI	KTDF	HTME	4666	7846
3521	AFTG	NBBD	HTEM	8342	8181	FDKT	SADC	KPIZ
9835	LIQP	EFHM	8321	0456	WRTJ	MRKV	WRTP	4581
CJUT	NROL	8537	BPHK	QVXJ	3712	YXIG	7389	0909
1517	QDCS	HTMP	AXJR	9137	LFEY	VNGO	5178	ZDWI
4965	RXUS	EPQY	KDBH	BMUX	5319	9384	XUMB	ATRS

RECORD NO. 10—390 Characters

TABLE NO. 10-A

12 to 15 words per minute

52069	JJMBA	ZEHUI	24718	75483	WFDCP	SVTIQ	LYXRK	EDONG
08762	13594	68201	ITGTB	YRUXZ	34195	62940	VKWAZ	FYCJN
ACYBD	41678	56900	TRYHS	ZCZCD	48489	PKJDE	45178	EHFTU
32456	10100	71029	62651	ADTRY	JGOJK	85097	34781	NCEFR
45376	49186	13487	PMMSE	AHERT	GDGUE	VAREM	45361	68908
NFJGR	BJRIM	IQXVC	UXYHM	68908	16547	26799	NFTHY	23987
ADOLF	PJERG	68908	91654	72799	LFPVI	JGEHR	GKBWI	95214
03589	17365	75873	GIWKD	KRXQH	ZWLGD	72834	98170	34425
86514	70311	60862	73158	58023	NSVXO			

TABLE NO. 10-B

78234	ONHDU	89510	GCQXW	KJHSD	FGDKT	67342	KIVNG	54101
BXCMK	45783	ASXLR	14536	DSHJK	ERTYH	KISEO	23489	WERQK
LKISD	QAZED	EDCRF	23459	PLMKI	UJNHY	45101	87432	TGBHY
32469	16712	EDCRF	QWERT	ASDFG	ZXCVB	93697	PAMYL	14759
98563	QPALZ	WOEIR	SLDKT	35796	ZMXLS	96281	ECHGI	53410
SRZEP	11001	BLOAW	78900	72843	XPHTN	QMZQA	43650	GDTBJ
TGBER	68903	ASXNZ	53470	SEKCL	BXSER	UHSOP	27946	YHSXN
67593	RZUIE	23152	LOGFX	71023	VKZYZ	78783	NTQIV	HJASB
68476	60216	63589	RZULE	IXCQN	64187	BUPLA	LYCON	57328
RIBLO	ZXUYN	UCPCH	23645	81098	IQLTD	16743	23110	ENAFU

TABLE NO. 10-C

ORCBU	LCYJY	CYBYQ	83272	42559	YVDQH	QAYOB	WYYPQ	34937
59168	YFAQY	76735	MBYXK	RYCCQ	95017	YCKQY	95017	CQWYZ
18423	XMCRE	PCLYY	27292	CCLYY	OPYYX	60669	IUGXR	11301
JCCDY	47888	78576	CYYYQ	28990	32284	YLPZR	QOZQJ	WZQYL
DQXTF	SDEFT	QTEQD	45678	QFQQG	KQQHL	23458	10178	93400
94112	ZQPSL	80766	QERQX	YCQZC	51073	UQZCL	64510	VZTXF
05321	YIUZM	YMZZO	79407	HZZCF	JZDFF	83534	YMVQG	61755
QBZZQ	27449	TZQLF	SQOOL	10263	49512	REWTG	38030	WERTH
ZBTFB	49512	TFSYS	96127	QJFLY	QDILI	04383	YLLQH	53940
93694	TFSYS	80671	QDILI	61246	SHLLA	QXBLD	26068	ZCLFG

TABLE NO. 10-D

DZQIL	CEPKO	68638	12771	89200	UTZFX	OFGMR	76170	BBNSC
18925	09481	DRCFF	AUTLW	KAIQN	ICKON	CBFHH	20436	98754
BRCFF	AUTLW	KAIQN	69295	21887	ICKON	CBFHH	JNVXA	66518
55673	14003	YRHAT	QYIWG	98763	QZIWG	GYQXK	55673	ASKCB
14002	SDCJJ	LTWIM	TQYUA	HENHB	87836	52568	XOGAP	RFXBN
VVOMZ	NKBJS	ASULT	ELEGE	56041	07925	99754	GASHT	23811
TWZNF	MIROP	EGESC	78076	32491	WMPZL	YPFTB	96109	64838
01622	73584	BSLCK	UHJDN	LJTFD	YGVWH	67293	59591	BJAQZ
OHKIX	QEDTJ	34901	07233	SDMSA	RJZVI	HRXKF	80374	42260
AEDRF	MKEIL	DSRTY	34561	64002	MGSXC	87110	IOSEH	MDHET

TABLE NO. 10-E

61246	QALOI	WSKIE	78166	RFVTK	GHTUI	44433	VBGHT	57916
CLFDS	39852	ASEDR	GHTYU	00744	84586	PXJWI	77452	EJZNS
ZMUFI	FFSAH	42967	91878	ZOFFS	55624	46401	CFFNH	23210
73333	32596	FFSAH	QPDFQ	8566Ø	ZQFLK	LFLDH	94715	OLUES
XHFGD	TUULQ	08854	61327	HSBDU	46580	59936	SPDUP	84043
06171	59576	TUULQ	TSWKU	42808	SSRUU	SEUUC	18799	MIUSJ
59576	MSCSU	95408	71337	SHIUB	63193	HOUDI	AKDYZ	MHVXD
HHNDD	10929	HLDDM	77210	SSTDU	OPODU	08651	VHEAD	53084
SSTDU	NVDHB	82182	HQDUB	VHVOH	45535	QZUHF	96213	HOHXF
80474	24687	ASDFG	HJKLO	39050	POIUY	QWERT	ZXCVB	58808

RECORD NO. 11—480 Characters

TABLE NO. 11-A

15 to 18 words per minute

SQMNE	OCRYL	HITED	WJQFX	GKWZU	PVJBD	AIBLM	AWMZI	IOJGD
BSJHT	MPWCV	IQTNA	YZIUZ	RKDXF	GOLEA	BKDHE	SJDHE	NJUIK
LUKGJ	POINS	QJHZF	MQWRX	YTCEV	DBATR	GXHEP	WDMNE	NHYGF
TRGXA	OISPE	YUHEC	NQXCE	AWMZI	CUTSH	LVOPF	KRPLM	AIBLE
WICLG	KVSDX	NYTFN	UHRGL	PEZAD	QUWGM	KMTHL	KJSTR	DJYXO
DMENH	RPLMA	IBLMB	HESIF	QWCOX	UYGTV	SLDHE	JJUHN	AKIOD
EYJBS	SMVGA	DKLAF	XPWNR	BLFHE	SHDNE	BHAGT	VFDIK	MXBCV
SLDIH	TRGXA	OISPE	YUHFR	KVJLZ	NQBCN	KDWDV	OPFLS	JVJDH
JVBXZ	EOMBP	XTDRL	ICWUN	SHCCQ	YASLF	DXRKV	QUCPM	HNSWO
SHDUJ	ASDFG	HJKLP	OIUYT	REWQA	ZXCVP	NMKJH	VFRED	XSWQA
CKEOH	DLQYI	GSOTQ	AFNML	RVWJX	BPGAN			

TABLE NO. 11-B

DOQJS	WICLG	KVSDX	NYTFN	UHRGL	PEXAS	SHDUW	YBJSH	SJYYH
EIYBF	JPHXT	WURZL	AODXV	KGMCV	QSNVP	SHDYE	SIDUJ	QOAHN
SYLHB	FNGQC	EXMWT	ZIOGJ	JASKD	SHQDN	QCXIF	GBKRA	JSVDD
PZOXC	IVUBY	NTMRE	QMWEN	ALKJU	NHYTA	SIJHN	BGTAD	VFREQ
DQHOE	JDYVM	DYEHS	QRLTB	AYGSE	OOLGY	VKSAW	XSRBY	LPURS
BTTAI	FOJSV	MAJAB	BYLHV	PQKNZ	SPAHW	GVECD	BPNMU	PLSOW
BIDTX	DQEHY	SKNIM	ASHHN	TIXER	XLONQ	VPNMY	QJOLP	UMNPB
CDEVH	FETSS	JIDHS	CJUHA	NHYTG	SODKM	NYAKS	CNHYA	SGCBQ
BIDTZ	DQEHY	SKNIM	ASYHN	TIXER	OQQKL	IVHWE	UNHSW	NHYAD
PYYJT	QGPIB	GBUPV	OVVNG	YEBPV	EBTFI	YTQFA	JCHZA	NHYUJ
RJIPV	BZSNO	EYHZU	FCXMG	WJAIL	WDKXJ	DNICY	LORVS	SDJHF
BGTTE	BAUVD	SLDKF	WCEIR	NHAGS	AOSUD	QHYTG	NHSIA	NGCSA

TABLE NO. 11-C

DQHOE	JKYVM	DYEHS	QRLTB	AYGSE	IATTB	SRUPL	YBRSX	WASLD
OOLGY	QXPYJ	BOWBO	RQGTL	RLKGJ	FZZMY	JEGHB	XATEX	KTTRH
JMGXH	KMDNB	WHAPS	ZNKQP	VHLYB	BAJAM	VSJOF	IUNME	SKDHF
CWJIV	OKUWC	ULPXN	VBOIW	NQVRP	LRKEG	MJDGM	CVCGG	DLISC
GVECD	BPNMU	PLOJQ	YMNPV	QNOLX	KCRUK	PWOKJ	MNSDT	OKISD
SRCXA	TFUED	ASHNT	IXERZ	DRFDA	FZIWN	YOWKL	RERPS	SHDYE
ASBBQ	FYZCE	LWNEB	KJADE	LAWBN	ZJVIH	ARGZH	YFJFU	FKSHW
LTIQX	CHFOR	GIWCR	VTECF	VONUC	UMKYF	NJHDK	ISHDE	LKJUQ
EAXIY	EOODX	SHDUJ	MNAIS	NEHCG	SOIDJ	NHAIK	BQVUK	NHYAL
QWERT	IOPTU	QPHYT	BGFSA	ERGVD	CEKIO	NBEDA	VCTRU	NGFSI
DIGFY	PSYFG	XTOSU	MGSOT	GLTLI	VMKXS	HAGDY	OSNFZ	BSXWI
PMXFS	OJDEZ	IKCTB	GBJMS	QXULQ	PAHSD	VLJDA	UHWAV	RQNYS

TABLE NO. 11-D

ASBBQ	FYZCE	LWNEB	KJADE	IAWBN	SJPWX	LWBKF	USHDE	NHYUJ
EBTFI	JZAOP	YTQFA	PZDKO	MPAVQ	LRKEG	MJDGM	CVDGM	SNDHU
WGBTH	PYAPI	VHQHA	EDZWY	EFXTR	ODKMS	NHUKA	NMJAU	NYDAW
SOLEQ	KPVJB	GJOXR	OQECH	JEGHB	NHUSJ	MUIKA	NGHQY	BTDSA
GVECD	BPNMS	DHFYR	NUOKJ	ASSDF	GHJKL	OMINH	BGTRF	VRDSA
NAHSJ	BHAGS	QIWUE	AYGSE	KSHGG	FDSWE	VCXZA	HGFRT	NBHGT
IUYTR	JHGTR	VCFDE	BGTUJ	NHIKO	VFDSA	CRTEW	XTVEF	CVFRE
OMUNY	BTVRE	CFRED	VCREW	CDEWS	VFRED	CDESA	BGTRF	VFDSW
MJUIK	NHYTG	VRESA	CXZWE	VRYIO	MURFS	VFOIH	NHDSA	BAGST
ASEDF	JHYGF	HJIWS	AHSTG	BGAYS	DHWGE	CNHGA	SBGTX	BGAFS
FLHGQ	WAMIK	BUPZA	SYVRO	LYCTN	DJSND	OEKCH	DLSKD	UZLYF
KDWSL	CVOGI	MXKWD	FPQYN	RJXTJ	EZHBU	YVPWO	LSUDH	OQIAH

TABLE NO. 11-E

DOQJW	LOCLG	GKVSD	XNYTF	NUHRT	LPEZA	QOEHZ	UWVOZ	IQLXP
PNGMA	FDTYB	JXHLP	GANJK	ERFCD	FOZZU	CKWXM	IYIVB	CGYHP
HLPGA	NJKSN	HBTRY	ZXGJS	HLPGA	NJKMS	HBTRY	ZXGJS	BNTOM
IOGJS	VJLZM	ZUBCK	EOELD	VKLDS	WUVHE	ALSOD	ONSHQ	EHSND
OGYHP	MIECU	RXTSR	TRCSA	OISPE	YUHRF	KVSJL	SIAMP	SHDYS
ASKFL	VPHNS	WUCYD	DUVOE	PWSAD	XLOMW	BVPUE	VPOBY	DHSTD
AXEPS	HRUDS	LCHAM	HURDY	RJSHE	BVWHO	DXGHL	JQRQZ	OYAAM
FDKYK	ZXBKB	AYCKQ	RJLHG	XKWLT	AJGWM	DGIUY	BVWOL	GHSKB
BJTTE	TQDCS	SHDUY	PSEXE	UUNHY	PUETS	GRYCD	AWHYD	KHGSR
FIEAW	MTCKJ	XRVDH	ZYOPQ	LUXOW	MXJDU	AWHUY	NOQRE	UYSVL
VKWLT	AJWGM	XCPUZ	HYEON	SZBVP	IJRXJ	DMTCY	LORDY	ORVYS
SZXAP	KIMAW	QHWHF	GOYAL	JBUAT	NZDHG	LOFGT	NTUZD	FZURS

RECORD NO. 12—540 Characters

TABLE NO. 12-A

18 to 20 words per minute

DKOAN	LKJPW	VPQES	UIZXJ	MBCHG	TRYSW	TKVUD	NOXUE	RCMFT	HAIGD
PQGZV	ABEQU	WGMKN	THLXJ	STRBJ	YXOIF	ZCMWO	XPFCM	UJTGY	KLWSG
KQIZR	BAHED	XRKVQ	UCPMH	NSWOF	TLBIE	ADGJY	LYSQT	HDLVL	PMKOC
HEVTX	GRAIB	ZFWER	CTKLP	COHNR	NYIXF	SBVDZ	QWUAJ	NEHST	RYQZG
YQXGJ	SBNIN	NQWKE	OFESY	LHVGN	GQCEX	MWTZI	OGJAK	RVPJG	HYNUJ
DPKHY	KQQEQ	OGIVX	AZZTG	NVRXJ	LABGS	KBARB	JEHAN	PQEII	WUDBN
VWXZQ	FGRFW	QMKWW	EKVEK	SNQRD	UTUGL	IHCTV	ZLPKA	XXMLU	HHGPC
MSNCP	VTSOO	CRWHF	HDOZE	GJFRS	TYTNY	RXLYL	YOBIH	SIIXV	WFEFG
TZASN	KCDBG	VMGVQ	UWJDC	DOYZE	NXLQX	OPYWM	XFSUW	UCQAT	EMTJZ
HYUGL	RUHNI	CJDEO	MTLHG	JGVSJ	BYLTA	ZKNRK	HLPYR	AVMQV	ISKZP
XIFBP	KLCJD	WVQCH	FUMNS	VXDAG	KLIPO	BRXEY	TZCQU		

TABLE NO. 12-B

LEGCN	FUFPS	PKWFF	JXZEL	EJOMN	GGMDG	BTTKL	WXUQC	KHNLY	HNVOH
XYEEO	NSUYE	OOIFF	VDAZI	ZQJXJ	DZNWZ	GLDNR	AVQPP	IIYUA	CJRGV
UGWIP	QHGAG	YCOTT	ACBUR	MWLWR	VADSD	MTIBV	WZXKR	ZKUEH	PFCGM
YJYDJ	GPTMU	QIMHP	OTQPA	IRWLI	TKAAK	RPJQT	XZVVI	KERIS	AFGCX
BVTWB	EDBFT	CCGXF	UZZYT	LGOZY	VMNDK	GSIBV	QQBXM	MNVFQ	XOKCL
BLSQC	YGEOF	SYHZY	SYHZY	OJRIN	HJUHN	RXNGD	WHRXZ	IVEUD	WXCNF
JXIGL	DQNHL	YSDAY	XCXYC	FZJGW	URMXT	COGCB	QABPI	KLCIM	BJASI
RGWJK	PTPUK	FPLKV	OBNQE	EDEFS	AEBSP	LENVE	ASDRE	ASLKE	ZXCVM
NVVQH	EUBRT	VDZFT	MNJER	REPJV	HXAOS	BLKAS	QJYZU	OLNGQ	LUFVM
DCDBG	GQUMY	ASOIJ	SQSYQ	YFWNX	UTECL	REMWH	WMHRB	OGXLD	IMCXN
GATIW	UXIAC	PPWZS	SOLEE	JHRKE	QXQCL	BBKLU	KHPDY	GDURK	YHFGT
OHOMQ	VTZJH	IPSRY	ASVOB	MDDEQ	UBLQG	TATUA	YYRPP	ZMGZC	XOJUE

TABLE NO. 12-C

KLTPD	BJLBP	OOFAT	JQYGE	QRJWM	ZDXKS	RBUOC	UQKYY	NXGAA	HTYCH
BFVRC	LHMGI	JZSBN	MGRMQ	YCONG	CYTHB	ZAZZK	INDLY	ASEDR	ECKFJ
OLAKS	ERCVB	QWEIU	AKSZX	NCFGH	QASOD	ZIXEU	AMSDN	QPOWE	THNFG
PQIFT	THEKS	AZQKT	ASLKE	QOWIE	ALSKE	ZIXER	UFGTE	EGFHT	HQALS
QPWOX	RFVGT	QPWZX	EOBFK	QIZSK	ENFEK	EOQEP	SHDRZ	AGTFH	EGASL
EKSHA	QLZXJ	TKEQO	QWZXM	EYQAL	QNZAD	JASGQ	ZBSKT	QOEVB	AKWIX
OTDWK	UAXVL	KSLJG	QBAUO	ZDIMB	TIDIR	MCLZX	WAQTE	YQTAY	SJGXT
FZUIZ	IHOFC	KNBBQ	NLJPU	XSRKM	QICLF	UXWCV	JGSHN	OPEHO	ZDFFH
NYMUY	KCZMU	LEONG	NIGSL	GREVK	WBQXX	HRRDR	ROGAZ	WYSGT	XWZJS
YLWWV	BXGYF	WOVKY	EMVIZ	SZBBW	PNKHP	QGIJE	GSJUS	IVMIH	ASKQW
KBOJQ	ZRUNH	BLJMY	CZITE	LPAVW	SDFUP	LJOQR	DBQXT	FHZGC	YANWV
ADCMR	HPZQO	BIWFE	TLFYJ	XUKGY	VMSRO	TZDYJ	FHLKW	MNUQC	VXEIU

TABLE NO. 12-D

BZRIB	QAZWS	EDCRF	VTGBY	TGBYH	UJMKI	OLPIY	QPWOE	ASLKD	ASZXN
LWQPO	ZMNDF	ERTHY	QPWOZ	XIRTU	KERTU	ASJHD	ERIOQ	KJQWE	EDRFT
ZFKBN	SXXGR	HQLTO	FUCNL	MLXUS	MTWVC	KSWJB	VOVXP	YCPDH	BDAZK
TGIBQ	AEZHV	JVSDX	WPJIJ	DTEOW	DTECW	SNPRF	EJZKY	QIOEZ	CRGGI
ROKVG	JBQHB	UHBTZ	NNIGD	PGJZQ	OOHMD	IHDSN	FARAS	LTCRH	ZMAPT
QAZWS	EDCRF	TGBYH	UJMIK	OLPIK	QPWOE	ALSKD	ASKDJ	ZXNRY	ASJQU
ALSKD	QPWOE	WEUTE	EFGTY	ZXEIT	QOCIE	SNEHT	JSHRT	AWERZ	ANSDH
TGSEA	QPWOZ	EORIF	ZKXLS	RFASK	ZXEWI	ASKCX	ZXNDH	SASHA	JAQEC
PBAGW	KOYAC	RGBMH	NZLRX	TJSGE	QPDFU	IBLXE	WERTY	DPTEM	SCYAH
CINQG	BKYRO	ZUBJR	HGAIC	VEJDB	TOUVK	OUVKQ	ZTMWY	SFLKN	XQUJY
FXMPO	ZNKLB	GWHRW	TAVSB	DICAQ	JZHNL	SIXGM	KBFUP	PDYCI	EIRBO
YWDXY	DXYLA	IDLQT	GUOBJ	RCWSH	VPNKE	FMZOH	EQRQS	WVNYU	MIZTA

TABLE NO. 12-E

FIEAW	MTCKF	RSFGH	ZPYOW	LUBXO	MSJGD	DJLVA	WHUYM	QRPMX
FVZLE	CRIMF	MTRMG	MSIKZ	RDCEG	WZJOB	AUBQO	CJEFH	HSYGT
DXGHL	XQURD	TGCYA	TBKBX	NKYKD	LAVOM	BKGOH	ROGLB	XUPXA
TTRLA	IDYIL	HZGWR	SAXOR	SNDHE	ALSKD	MYHST	SHWGI	XMDAG
XMDIG	BCLSW	BWKDQ	DHGGR	BWGUX	MEYNG	MSIDY	SHDGB	SNHTG
SALDA	FGHJH	QBWOE	RITUY	ZMXXC	DNBAQ	XSWED	WFRBV	GTYHN
MJUIK	LOPNA	XICUH	NAJSW	BUGRF	AKJUW	SHDRF	RHYSD	NHYTR
BERTG	BHYUJ	MNVUC	AFXUW	WDEFR	TBGYM	MEUDA	CEDSA	DFGHT
MBIOH	WRART	SVBHU	OHJYR	UINNH	DXANF	UCAJE	WXEDH	UEXDN
PBSLN	KKDSD	RNXIN	OGEDG	VDURJ	KSGTV	HBGKQ	BNGNV	MJAIK
AMCEB	LUWKR	WDHUR	XXYBZ	YTPKW	ZYRPM	FAHND	MAIKD	MKALJ
JKOYM	HXMPH	FJCYG	DMJIG	ZKDNQ	PWJHB	SCVAC	TCUCT	MAIKJ
VIQYP	UQAUL	AGZOY	ZYTKA	XRNDU	FUCIQ	FDLEA	XKORK	NAJHQ
ZLNDW	NZRED	CDBFF						

RECORD NO. 13—450 Characters

TABLE NO. 13-A

13 to 18 words per minute

482703	447351	681285	953764	976014
325043	322667	941258	009876	221723
586374	765882	630445	200927	113828
421603	418076	009932	394891	385542
908125	567890	751026	633605	418078
221726	447356	812896	976014	511689
741397	641420	292956	604821	077664
331486	043321	625433	618095	943552
191955	146810	024689	558876	139421
998834	641423	896445	028788	251336
418072	334257	105890	123682	311586
292990	625174	334094	385549	435587
421601	394895	785517	433406	385549
589932	268776	251150	813991	970568
407853	327443	122140	401847	859001

TABLE NO. 13-B

220056	154389	637890	387654	198723
516340	354679	415133	516890	890454
416901	364235	914238	283749	053247
511306	578320	353196	314320	124589
433161	074236	676990	873114	195678
238991	873114	466840	282869	566981
341005	697652	876450	668893	075634
944562	372654	913224	108618	904552
324816	900236	759125	180471	162894
491355	883095	036958	983547	601658
180356	615670	503190	594361	036417
447798	179568	801876	238983	795689
421148	377036	958018	062389	835479
601652	942117	208298	941351	594364
062387	601652	483779	201365	725806
311568	483779	016754	966217	574891
861894	237269	224103	197501	460391
133246	314706	491364	334175	983542
942115	036958	765432	102345	983543
942118	309683	110039	413264	795684

TABLE NO. 13-C

201357	298543	398260	189432	025349
267890	123456	546782	415234	202633
302615	315123	625789	718155	198765
313456	343536	149056	146143	103910
205281	264125	122514	572230	281421
300517	117143	292856	146198	956437
123449	334924	211220	105674	450216
171575	415874	374590	213789	197845
211953	910687	264253	038981	086801
752536	411418	615945	386251	250450
473242	517643	934279	681944	131417
216890	314987	092341	364280	218409
170268	692680	954236	146141	664152
963651	384672	086934	456234	987654
243546	273625	079685	135790	123490
324538	210054	385420	554431	216439
338802	390321	513894	216895	246357
210435	514327	110165	398246	165893
415161	158738	035177	855946	176643
367241	394032	165432	854234	056772

TABLE NO. 13-D

902456	874569	036784	235478	323580
387543	137895	237854	143789	167351
342673	315634	701690	017532	178940
212789	302061	162465	103964	152326
393847	483902	389601	389465	490264
797016	103589	219754	876453	038574
134069	263894	432567	139842	389043
203948	161687	865320	394672	384905
265349	263279	394725	387548	274358
216789	423678	540234	283946	423864
126738	321567	117854	456732	871073
648912	918756	265743	101125	246358
203852	267893	342563	173450	356789
304562	293564	756890	353657	025789
402156	284753	246855	536720	210457
253674	654379	215378	217935	623940
314567	394026	303678	267389	313784
369534	394937	394726	315789	789345
134631	212356	035789	284321	567853
217890	213785	105789	290361	351960

TABLE NO. 13-E

897643	743928	468590	236419	342568
907654	234567	937829	425363	743568
304857	293948	243581	893745	298347
362591	395746	178249	293641	273954
789234	345267	992385	998345	293948
654321	456734	921374	821967	367999
638165	276435	137629	398954	911234
654566	237891	785684	196759	892134
352189	983654	678961	287345	192345
294735	342678	123478	293742	924681
273546	987654	213989	252438	293691
312468	374239	123459	242921	234687
293694	432168	238639	211953	987654
321145	537293	212936	294567	382947
313256	218954	213899	912345	314158
317899	513699	267845	123987	357948
229142	843919	976391	534275	756948
345697	448199	315078	275685	384752
543278	594837	319389	299453	297899
432123	415678	574839	287643	936792

SIGNAL COMMUNICATION TRAINING MANUALS

Corrected to February, 1925

No.

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21. Basic Signal Communication—Instructors Guide.
22. Telephone Switchboard Operator—Students Manual.
23. Telephone Switchboard Operator—Instructors Guide.
24. Message Center Specialist—Students Manual.
25. Message Center Specialist—Instructors Guide.
26. Radio Operator—Students Manual.
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