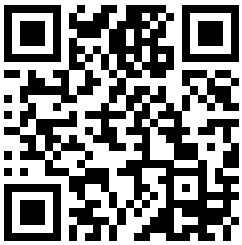

NAVSHIPS 250-624-9

MANUAL FOR

OVERHAUL, REPAIR AND HANDLING OF

U. S. NAVY
MECHANICAL, BOAT AND DECK CLOCKS
SETH THOMAS TYPE

WITH PARTS CATALOG

Contract NObs-47863

BUREAU OF SHIPS NAVY DEPARTMENT April 1953

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DEPARTMENT OF THE NAVY
BUREAU OF SHIPS
WASHINGTON 25, D. C.

1 April 1953

NAVSHIPS 250-624-9
U.S. NAVY CLOCKS—SETH THOMAS TYPE

This publication will be known as: "Manual for Overhaul, Repair, and Handling of U. S. Navy Mechanical, Boat and Deck Clocks, Seth Thomas Type, with Parts Catalog."

This manual, prepared with the assistance and cooperation of certain U. S. Navy repair facilities and Seth Thomas Clocks, Division of General Time Corporation, Thomaston, Connecticut, is promulgated for the information and guidance of all personnel in the Naval Establishment engaged in the servicing, repair, and testing of clocks.

This manual is available for public sale through the Superintendent of Documents, Washington 25, D. C.

H. N. Wallin,
Chief, Bureau of Ships

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Figure 2—Seth Thomas 8-1/2 Inch Type A Mechanical Clock in Phenolic Case

SECTION I

INTRODUCTION

PURPOSE AND PLAN OF REPAIR MANUALS FOR NAVIGATIONAL INSTRUMENTS

Each of these manuals on the repair of navigational instruments has several purposes:

1. To make an adequate record of know-how at the time the information was prepared.
2. To establish standard practice for the particular instrument.
3. To provide a manpower training tool for newcomers to the field, especially in cases of national emergency, when working forces must be expanded rapidly.
4. To form a foundation or base from which the quality of repair may be constantly improved, and the cost of repair reduced.

This standard repair practice manual will provide the groundwork for establishing standard allowable repair times by which performance may be judged.

Methods Employed

Prior to the preparation of this manual, an engineering survey of repair methods was conducted in Naval shipyards and in the plants of manufacturers. Consequently, the methods selected as standard repair practice are an integration of the best and most modern in Naval repair activities and those used by instrument manufacturers.

Methods Improvement

This handbook, as you see it, is by no means the final word. It is hoped that it will be subject to continuous change.

The Navy wishes each one working with navigational instrument repair to become "methods-conscious." It would like you to contribute ideas for further improvements to standard practice. Your suggestions should be cleared with your foreman and he will then submit them to the Beneficial Suggestions Committee. The Committee will forward each suggestion to the navigational instruments authority of the Bureau of Ships. There, it will be properly evaluated and, if adopted, you will be given credit and the appropriate portion of this manual will be changed.

Why is this opportunity being offered? Because everyone wants to do his or her share in improving methods and reducing repair costs. After this standard practice has first been put into effect, nobody but a person using it is in the best position to recommend improvement. You are the expert, so put your ideas to work. Take advantage of this chance to better your own position and, at the same time, increase the efficiency of instrument repair.

In this manual are included instructions for the maintenance, repair and overhaul of Seth Thomas Mechanical, Boat and Deck Clocks containing the Seth Thomas 5165 and 5160 series movements. Certain sections of this book give separate specific instructions relating to each of these series of movements, as is required in Disassembly Procedure, Reassembly Procedure and the Maintenance Parts Catalog. Other sections give instructions which are equally applicable to both series of movements, as is true in Parts Inspection, Repair and Cleaning; in Test, Adjustment and Final Inspection; and in Special Service Tools and Testing Devices.

U. S. Navy Mechanical Clocks made by Seth Thomas are manufactured in accordance with U. S. Navy Department Specification 18-C-11c. They consist basically of an eight-day movement enclosed in a black phenolic case with a hinged bezel of the same material. See Figs. 1 and 2 which show the two case sizes used.

Each type has a sweep second hand provided with a slip clutch for re-setting. All have black finished dials with non-luminous hands and figures, and all are wound and regulated through the dial. They are intended for general shipboard use other than for applications requiring Deck or Boat Clocks. The various type designations are listed in the tabulation which follows. See the parts lists in Section VII for the stock number of each type listed.

MECHANICAL CLOCK	DIAL		NET WEIGHT
Type	Hrs.	Dia. in Inches	Pounds (approx.)
A	24	6	3
A	24	8-1/2	5
B	12	6	3
B	12	8-1/2	5

Figure 3—Seth Thomas Deck Clock in Metal Case

Figure 4—Seth Thomas Deck Clock in Phenolic Case

Each Mechanical Clock dial is marked as follows:

SETH THOMAS
U. S. NAVY

(Serial Number)

Seth Thomas Boat and Deck Clocks (Mark I) are constructed in accordance with U. S. Navy Department Specifications 18-C-5d and 18-C-13. They consist basically of an eight-day movement enclosed in a metal or a black phenolic case. See Figs. 3 through 6. The case is dustproof, moisture-proof and equipped with a cushioned bulkhead mounting plate. Both types have a lusterless black 12-hour dial with luminous hands and dots over the numerals. Each has an eccentric second hand. The Boat and Deck Clocks are designed to be wound, set and regulated through a dust cover in back of the case. The two type designations are as follows:

CLOCK	DIAL		NET WEIGHT
Type	Hrs.	Dia. in Inches	Pounds (approx.)
Boat	12	3-1/2	4-1/4
Deck	12	6	7

Each Boat or Deck Clock is marked as follows:

MARK I (BOAT OR DECK) CLOCK
U. S. NAVY

N (Serial Number) (Year)

The allowance of Mechanical, Boat and Deck Clocks to the vessels and ships of the Navy are indicated on the ships' allowance lists.

Clock Movements

Seth Thomas clock movements are divided into two main groups. There are eight movements included in the 5160 series and six movements included in the 5165 series. These movements and their identifying characteristics will be described in Section II, "Description."

Preparation for Repair

Clocks awaiting overhaul should be sorted by model and type into lots of similar instruments to be processed through the different phases of repair work at one time—the larger the lots, the more efficient the repair operation.

At the clock repair activity, the regular predisassembly inspection accurately determines whether or not each clock is worth repairing. If it is decided that the clock is worth repairing, this inspection locates any defects in the movement (as far as this is possible before disassembly). As a part of the pre-disassembly inspection, a route ticket listing these defects is made out for each clock and accompanies the clock throughout the overhaul process. The purpose of the route ticket is to assure that these defects will be examined and corrected during the regular overhaul and repair process as described in this manual. Statistical data is also gathered as a result of this inspection.

Once it has been determined that a clock is worth repairing, all clocks go through the same overhaul procedure regardless of the nature of the repairs required. It is in the nature of timepieces that they should be completely overhauled and cleaned at intervals of from one to two years; therefore all clocks should be completely overhauled no matter what specific repair is required for any particular movement.

A general knowledge of Seth Thomas Clocks and the points which are of special importance in repair work may be obtained from the descriptive material in Section II. All repair personnel should be thoroughly familiar with the information contained in that section.

OUTLINE OF REPAIR PROCEDURE

The repair work itself is divided into six main classes of activity:

(1) Disassembly (Section III)
(2) Escapement Disassembly (Section III-A)
(3) Parts Inspection, Repair and Cleaning (Section IV)
(4) Escapement Operations (Section IV-A)
(5) Reassembly (Section V)
(6) Test, Adjustment and Final Inspection (Section VI)

Supplementing the preceding sections are the parts catalog in Section VII and the index of tools and testing devices in Section VIII. The material in Section II on "Performance Requirements" contains necessary information for all repair personnel.

A separate manual, the Bureau of Ships Navigational Instrument Control Manual, contains information on cleaning, lubrication and final repair inspection standards. Where reference is made to that volume, it will be called the "Control Manual." Such references will usually include a subject title from the Control Manual index. Use the index for all material pertinent to the particular references in the repair text.

The repair instructions in any of the major operation sections of this handbook may be carried out by one or more persons. For example, it will be noted that disassembly work is arranged to permit several persons to aid in taking

Figure 5—Seth Thomas Boat Clock in Metal Case

Figure 6—Seth Thomas Boat Clock in Phenolic Case

apart a single instrument, if desired. After the work covered in one section of the manual is finished, the clock (or its component parts) may be returned to the proper place in the Instrument Control Center.

The Instrument Control Center is the clearing house for all work and, also, acts to level off the flow of work through the repair facility. Its personnel receive and sort the instruments into lots for processing through the repair operations. All repair personnel draw their work (whole instruments or a parts tray containing a single instrument) from the Instrument Control Center and return it to the Center upon completion of the operations they perform. After final inspection, the completed instrument is returned to the Center for storage or shipment.

If the volume of work warrants—that is, if the lots are of sufficient size—work may flow directly from the operations of one section to the next without returning the clock parts tray to the Instrument Control Center. This decision is discretionary with the supervisor.

Disassembly

After the movement is removed from the case and the hands and dial are removed, all as per instructions given in this handbook, a pre-disassembly inspection is performed. This inspection determines whether or not the clock is worth repairing and, if so, what defects are found which warrant special attention during the regular overhaul process. These defects are noted on a route ticket which accompanies the clock through the entire overhaul process. All personnel who work on the instrument will sign the route ticket. Performance and usage data is collected by the inspector and this information will serve the Bureau of Ships as a guide for redesign and development.

After being given the pre-disassembly inspection, each movement to be overhauled is broken down, as per step-by-step instructions, and the parts put into their proper compartments in the cleaning trays. Special hand tools and fixtures are used to facilitate disassembly. When all disassembly operations are completed, the parts in their cleaning trays are returned to the Instrument Control Center.

Inspection and Repair

After the parts have been cleaned properly, they are inspected to determine which parts are defective and whether they should be repaired or scrapped. The general policy is to scrap defective movement parts and to perform certain restricted repair operations on the escapement parts. It is the intention that highly skilled watchmakers do not spend their time repairing parts which can be more economically replaced with new parts drawn from stock. Instead, these highly skilled men may better employ their talents by putting the escapement into proper adjustment. As a result of this policy, inspection and repair is broken up into "Movement Inspection and Replacement" (Section IV) and "Escapement Operations" (Section IV-A). Skilled watchmakers will concern themselves only with "Escapement Operations."

Reassembly

Following step-by-step instructions the clock is completely reassembled, oiled and adjusted. The overhauled escapement from "Escapement Operations" is also inserted. During the process of reassembly, several tests and adjustments must be made to assure a proper fit of the various train wheels and related parts. In addition, all of the pivots, with the exception of those already lubricated in the escapement operations, must be oiled. The clock is not put into its case until after it has been properly timed and tested as described in "Test, Adjustment and Final Inspection" (Section VI). The semi-completed clock is returned to the Instrument Control Center.

Test and Adjustment

The clocks are timed and tested to make them meet the standards prescribed by Navy Specifications. See "Performance Requirements," Section II. After each clock has met the test requirements, it is forwarded to an instrument inspector who gives it a final check. If it passes the final inspection, the inspector codes the clock in accordance with the "Coding" procedure described in the Control Manual. The instrument is then cleared through the Instrument Control Center and packaged for shipment or storage according to "Storage" or "Shipment" specifications in the Control Manual.

The repair procedure, as described in the foregoing outline, is intended to raise repair standards and to keep all clocks at the highest authorized performance and serviceability levels. The procedure also is designed to permit the planning of the flow of work and the utilization of the best in methods and techniques so as to lower repair costs.

PERSONNEL REQUIREMENTS

At the beginning of each repair section in this handbook, the required level of personnel skill is noted. This indicates the economic level of skill that is commensurate with the technicalities involved. The personnel skills that can be used successfully, without interim instruction, for each operation in the repair of Seth Thomas Mechanical, Boat and Deck Clocks are noted in Table I following.

TABLE I—CIVILIAN PERSONNEL SKILL REQUIREMENTS

SECTION	CIVILIAN PERSONNEL
Disassembly Procedure	
Pre-disassembly Inspection Operations	Watchmaker, Senior Grade

TABLE I (cont)

SECTION	CIVILIAN PERSONNEL
Disassembly Operations	Mechanical Instrument Assembler, Junior Grade
Movement Parts Inspection	Mechanical Instrument Assembler, Senior Grade
Escapement Inspection and Repair	Watchmaker, Junior Grade Watchmaker, Senior Grade (supervisor)
Reassembly Procedure	Mechanical Instrument Assembler, Senior Grade
Test, Adjustment and Final Inspection	Mechanical Instrument Assembler, Senior Grade

The foregoing list is a general guide. Where higher levels of skill are required or where lower levels can be used for a particular operation, the manual points out specifically the proper skill rating.

Under instruction, others may work at the class of operations indicated. In particular, the development of an escapement specialist rating will promote the economy of centralized escapement repair. An escapement specialist is a Mechanical Instrument Assembler, Senior Grade, who is specially trained in one particular phase of clock escapement operations. Some of these specialties are: Jewel inspection and replacement, balance wheel truing and poising, endshake and sideshake inspection and adjustment. After an escapement specialist has become proficient in all the different specialties, he should be capable of performing the duties of Watchmaker, Junior Grade, and should be so rated.

An outlined training path appears in the following tabulation, Table II.

TABLE II

TRAINING STEPS	CIVILIAN PERSONNEL ADVANCEMENT	
	From	To
Disassembly Operations	Mechanical Instrument Assembler, Trainee	Mechanical Instrument Assembler, Junior Grade
Movement Inspection and Replacement Operations	Mechanical Instrument Assembler, Junior Grade	Mechanical Instrument Assembler, Senior Grade
Reassembly Operations	Mechanical Instrument Assembler, Junior Grade	Mechanical Instrument Assembler, Senior Grade
Test and Adjustment Operations	Mechanical Instrument Assembler, Junior Grade	Mechanical Instrument Assembler, Senior Grade
Escapement Operations	Mechanical Instrument Assembler, Senior Grade	Escapement Repair Specialist
	Escapement Repair Specialist	Watchmaker, Junior Grade
	Watchmaker, Junior Grade	Watchmaker, Senior Grade

The training program should be in force continuously to provide a pool of "key" personnel as the basis for rapid expansion of clock repair staffs in times of national emergency.

All repair personnel, and especially trainees at the beginning of their training period, should study the information contained in Section II which follows immediately. This section describes, in simple terms, HOW a clock is constructed, HOW it works, WHAT performances requirements a clock must meet, WHY a clock must be overhauled regularly and WHAT to look out for in the overhaul and repair of clocks.

SECTION II

DESCRIPTION

This section provides information about the construction of Seth Thomas Mechanical, Boat and Deck Clocks and the requirements which a properly overhauled clock must be made to meet. It tells what you, as a repairman, should know about the purpose of each component in the clock. A good understanding of the construction and operation of a clock will help you do a better repair job.

In order to clarify the differences between the 14 various Seth Thomas movements, consider them divided into two main functional groups—(1) Mechanical Clock Movements and 2) Boat and Deck Clock Movements. Each of these functional groups is divided into the 5160 series ("old style") and 5165 series ("new style") movements, but this division is one based upon manufacturing variations and not functional variations. The various manufacturing variations will be considered later in this section, but first the functional differences between the movements will be described.

FUNCTIONAL DESCRIPTION OF MECHANICAL AND BOAT AND DECK CLOCK MOVEMENTS

General

Mechanical clock movements are characterized by a sweep second hand and provisions for winding and regulating through openings in the dial. Boat and Deck Clock movements have eccentric second hands and the operations of winding, regulating, setting and stopping the second hand take place through cutouts in a dust cover mounted on the back of the case.

Both types of movements contain all the components usually found in high grade clocks and watches. The front plate is the foundation of the movement. The other plates and bridges which support the moving parts are fastened to the front plate by pillars. There are three major groups of parts which work together to drive the clock hands and keep the correct time—the power assembly, the train and the escapement.

The power assembly contains the mainspring and all the parts necessary to wind it and allow it to run down in the proper direction. The train is a set of toothed wheels which transmit the power from the mainspring to the escapement. The escapement is the "brain" of the clock—it controls (through the train) the speed at which the mainspring unwinds, and it, therefore, controls the speed at which the hands are driven.

Plates and Bridges

The Mechanical Clock movement, of which the 5165 is a typical example, has three plates. As shown in Fig. 7, the train plate and the back plate are mounted off the front plate by means of pillars, and a center wheel bridge is mounted off the front plate by means of pillars. The train plate has provisions for mounting the escapement and contains pivot holes for the various train wheels. The back plate contains the upper pivot hole for the mainspring barrel. Due to the fact that this movement has a sweep second hand, a center wheel bridge is used to provide an upper pivot hole for the center wheel.

From Fig. 8, it will be noted that the Boat and Deck Clock movement does not contain a center wheel bridge since an eccentric second hand is used. This permits the upper pivots of all the various train wheels to be included in the

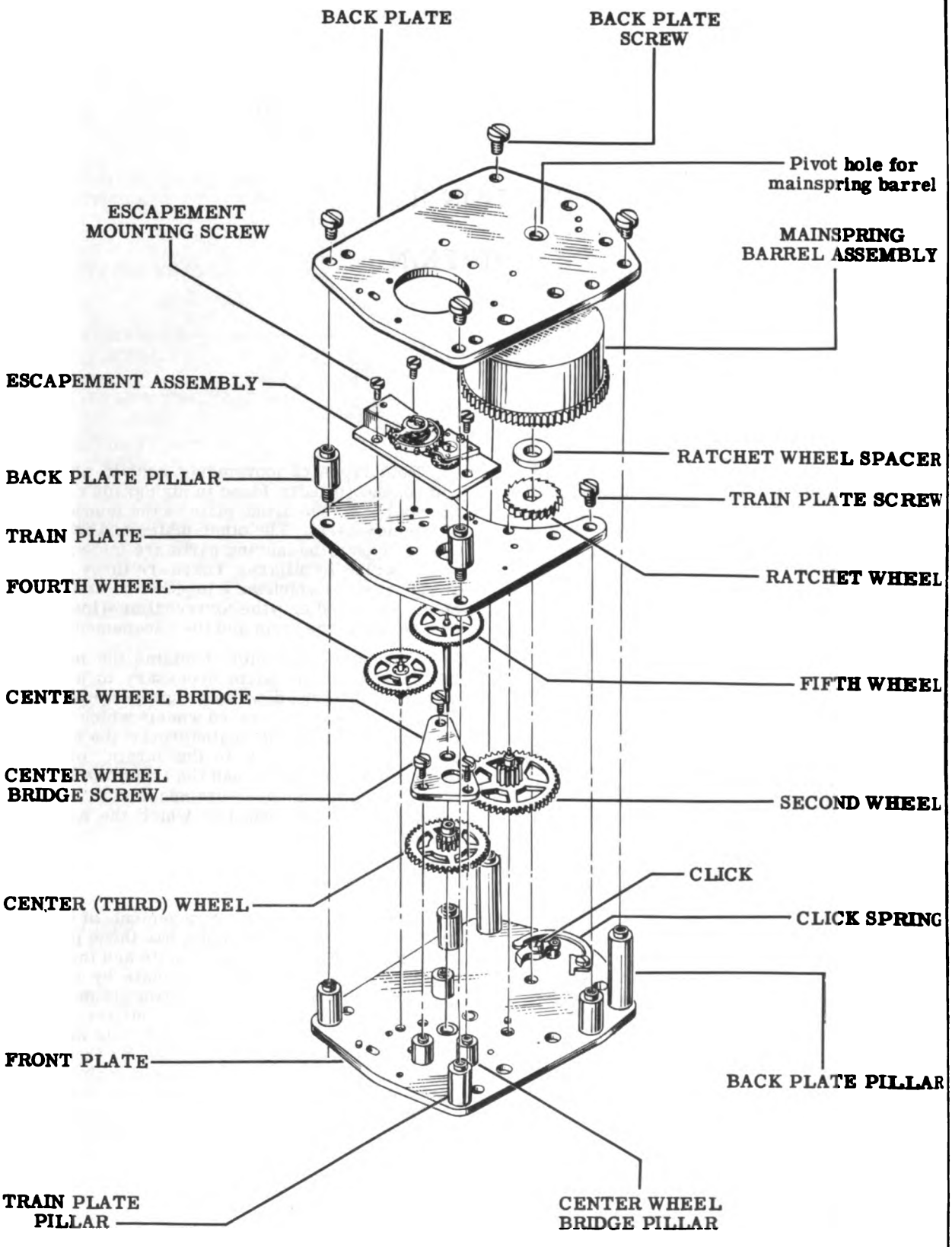

Figure 7—5165 Mechanical Clock Movement

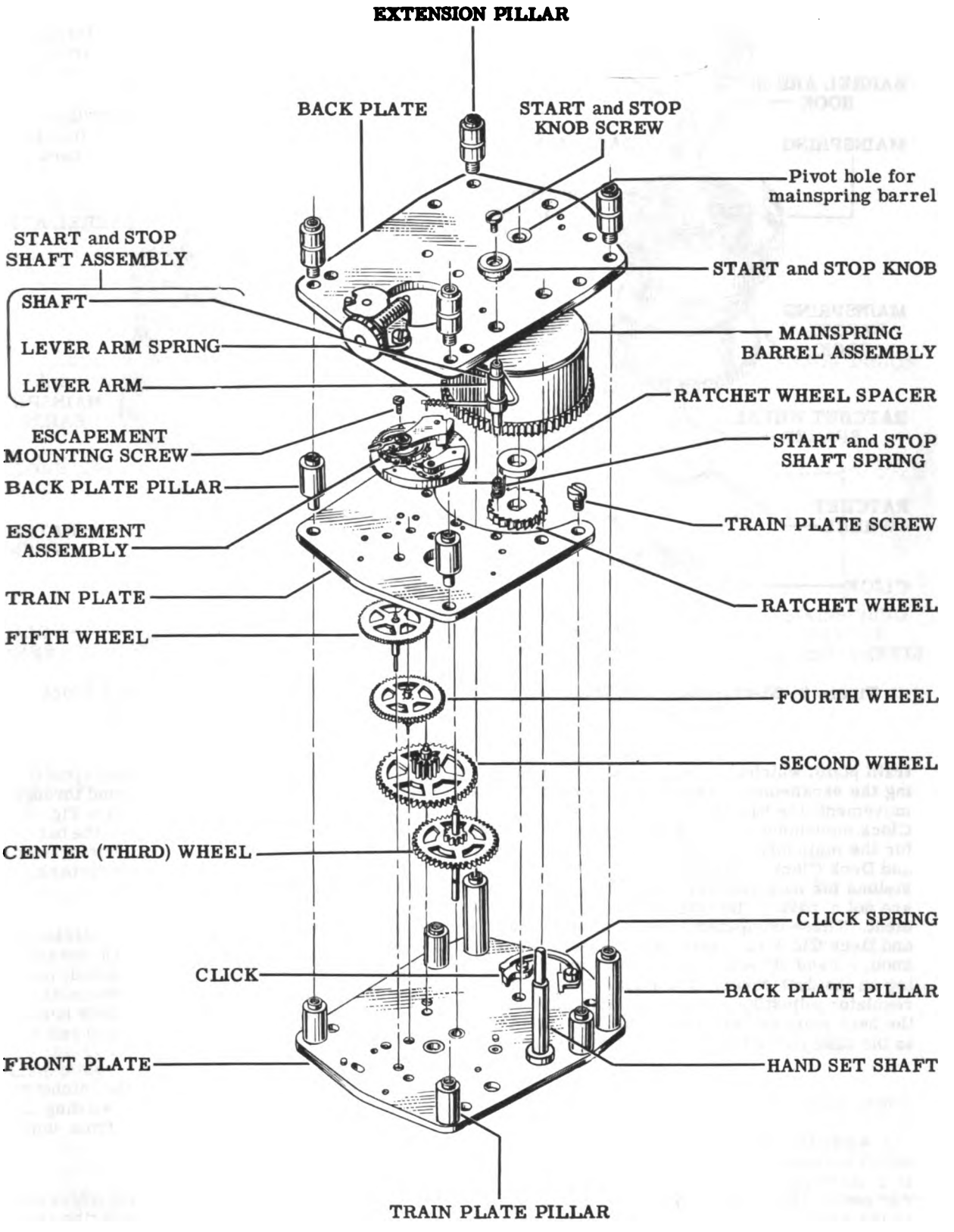

Figure 8—5189 Boat and Deck Clock Movement

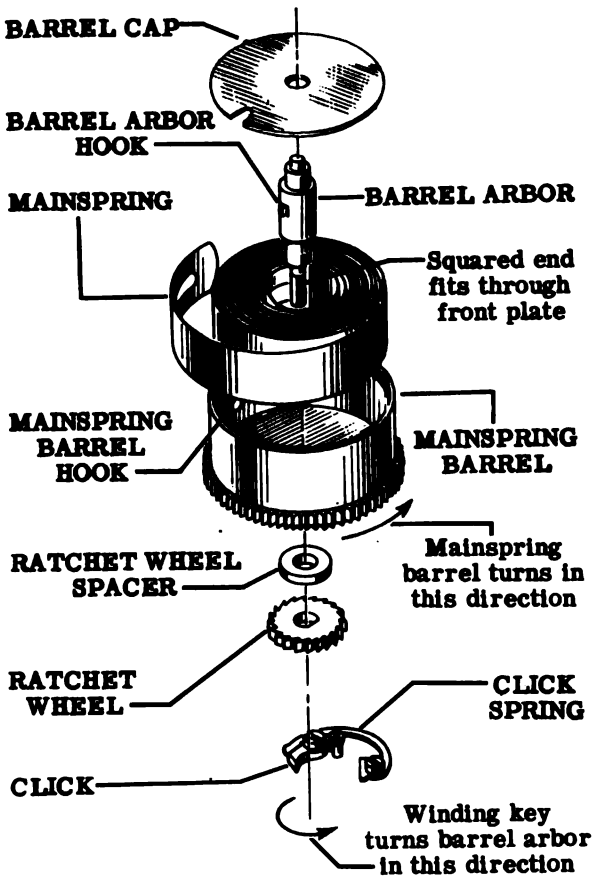

Figure 9—Mechanical Clock Mainspring Barrel

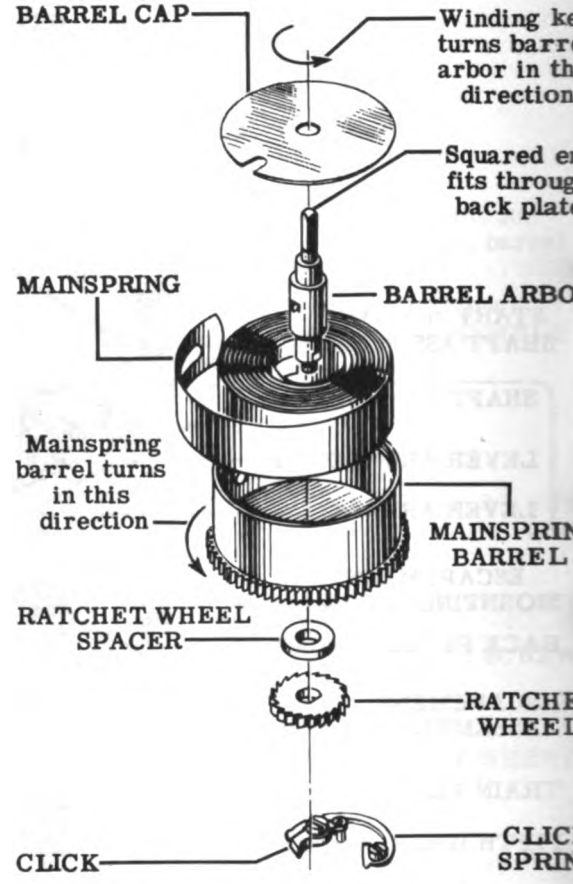

Figure 10—Boat and Deck Clock Mainspring Barrel

train plate, which also has provisions for mounting the escapement. Like the Mechanical Clock movement, the back plate of the Boat and Deck Clock movement contains an upper pivot hole for the mainspring barrel. In addition, the Boat and Deck Clock movement back plate has provisions for mounting certain components which are not a part of the Mechanical Clock movement. These components mounted on the Boat and Deck Clock back plate are a start and stop knob, a hand set shaft and four pillars for holding on the dust cover. The Boat and Deck Clock regulator adjusting components are mounted on the back plate rather than on the front plate as is the case in the Mechanical Clock movement.

Power Source

As in the case with conventional clock and watch movements, the mainspring is contained in a barrel, as shown in Figs. 9 and 10. The inner end of the mainspring is attached by a hook to the barrel arbor around which the mainspring is wound, and the outer end is attached by a hook to the inside of the barrel. In the Mechanical Clock movement, the barrel arbor is positioned so that the mainspring can be wound through the dial attached to the front plate. See Fig. 9. In the Boat and Deck Clock movement, the barrel arbor is turned around and the mainspring is wound through the dust cover attached to the back plate. See Fig. 10.

The mainspring is wound by placing a key over the squared end of the barrel arbor and turning the key clockwise. A ratchet wheel, mounted on the barrel arbor just behind the front plate, is engaged by a click which is held in position by a click spring. See Figs. 7, 8, 9 and 10.

The click locks the teeth of the ratchet wheel allowing the arbor to turn in the winding direction, but preventing the arbor from unwinding the mainspring.

The entire arrangement of the power assembly is so designed that the mainspring can unwind only by turning the barrel which is geared to the rest of the train.

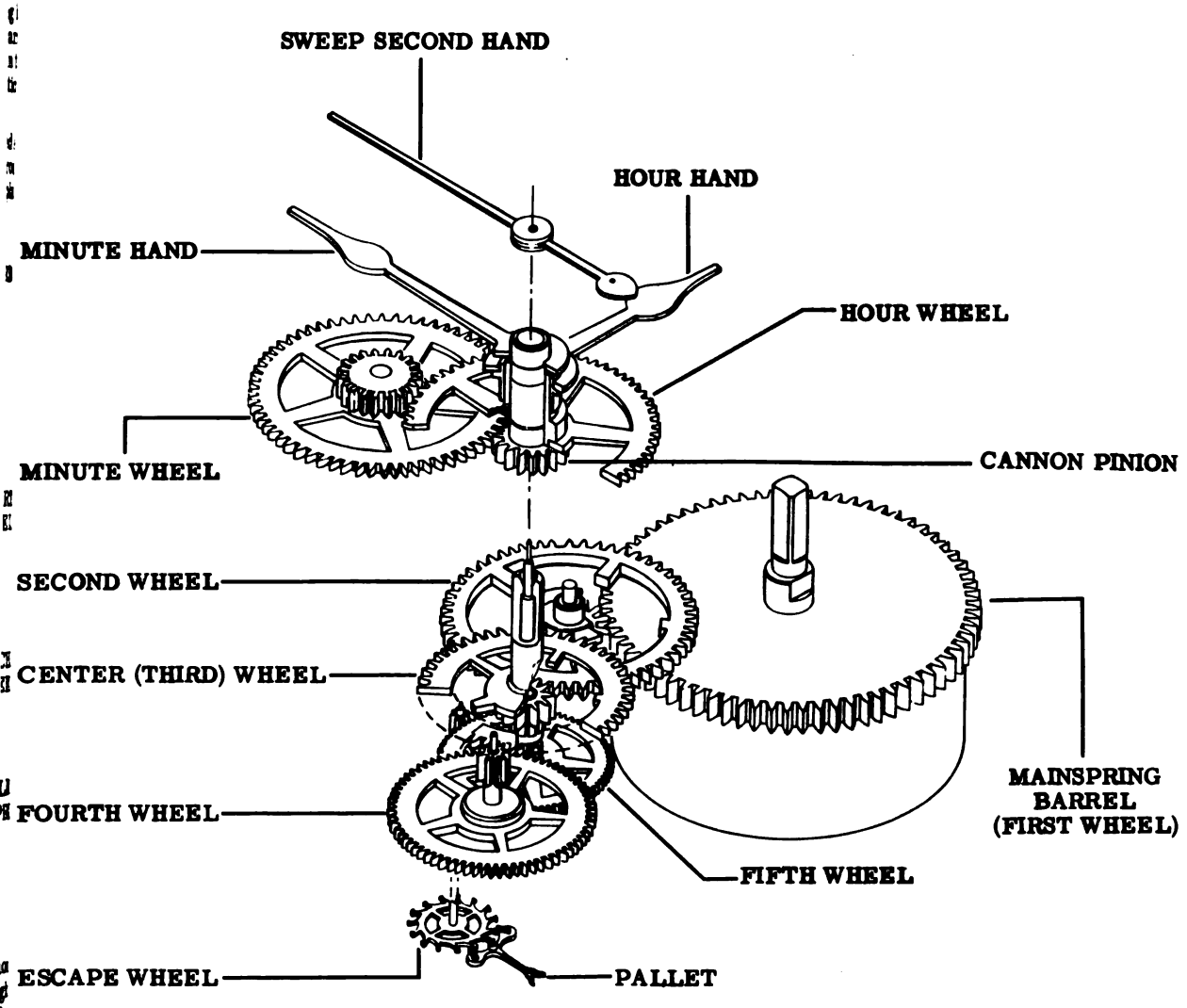

Figure 11—Mechanical Clock Train

The Train

The train shown in Figs. 11 and 12 consists of the teeth on the mainspring barrel and the second, third, fourth and fifth wheels. The power from the mainspring is delivered to the escapement through the wheels in the order mentioned. The center wheel has a long arbor which projects through the front plate, and mounts a cannon pinion.

NOTE

The wheel driven by the barrel is named the "second wheel" by the Seth Thomas Clock Company. In the parlance of certain other manufacturers, the wheel driven by the barrel is named the "intermediate wheel." Due to this varying terminology, a discrepancy will be noticed between the names of functionally similar wheels in clocks coming from different sources. In BuShips manuals, the original terms of the manufacturers concerned are preserved to avoid confusion when ordering various parts.

A minute hand is attached to the end of the cannon pinion. The cannon pinion drives a minute wheel which drives an hour wheel freely riding around the shaft of the cannon pinion. It is to the shaft of the hour wheel that the hour hand is attached. This combination of the cannon pinion, the minute wheel and the hour wheel is known as the dial train.

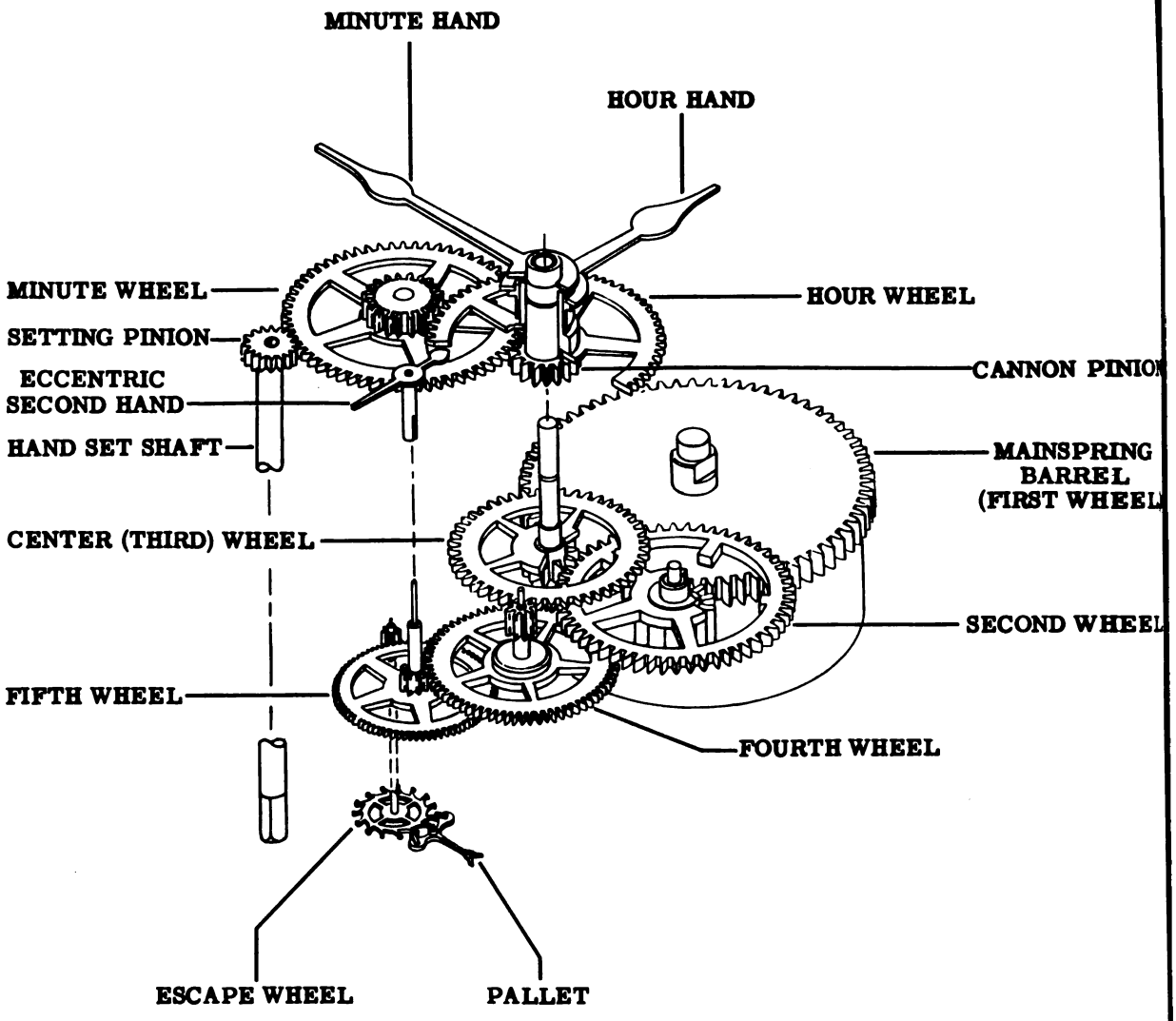

Figure 12—Boat and Deck Clock Train

In the Mechanical Clock movement (see Fig. 11), the fifth wheel has a long staff which projects down through the center wheel arbor. It is to the end of the fifth wheel staff that the sweep second hand is attached. In the case of the Boat and Deck Clock movement (see Fig. 12), the long staff of the fifth wheel projects through the front plate and the dial to receive the eccentric second hand.

Construction of the Escapement

There are three basic types of escapements used in Seth Thomas Mechanical, Boat and Deck Clocks—the R-20666, the R-20695 and the R-18565. All the escapements are completely detachable from the train plate and operate in a manner similar to the conventional watch escapement. Although the three basic types of escapements differ in appearance and in layout of the parts, the functioning of the corresponding parts is essentially identical. The differences between the various escapements will be described later in this section. For the purpose of a functional description, the R-20666 escapement will be analyzed. The R-20666 escapement is the latest type, and it is in most widespread use. The escapement consists of an escape wheel, a pallet and a balance assembly. See Fig. 13. An escapement plate forms the foundation for the entire escapement and it contains the lower jewel bearings for the pallet and the balance assembly. The lower jewel bearing of the escape wheel is mounted in the potance which projects through the bottom of the escapement plate. The upper jewel bearings of the escape wheel and the pallet

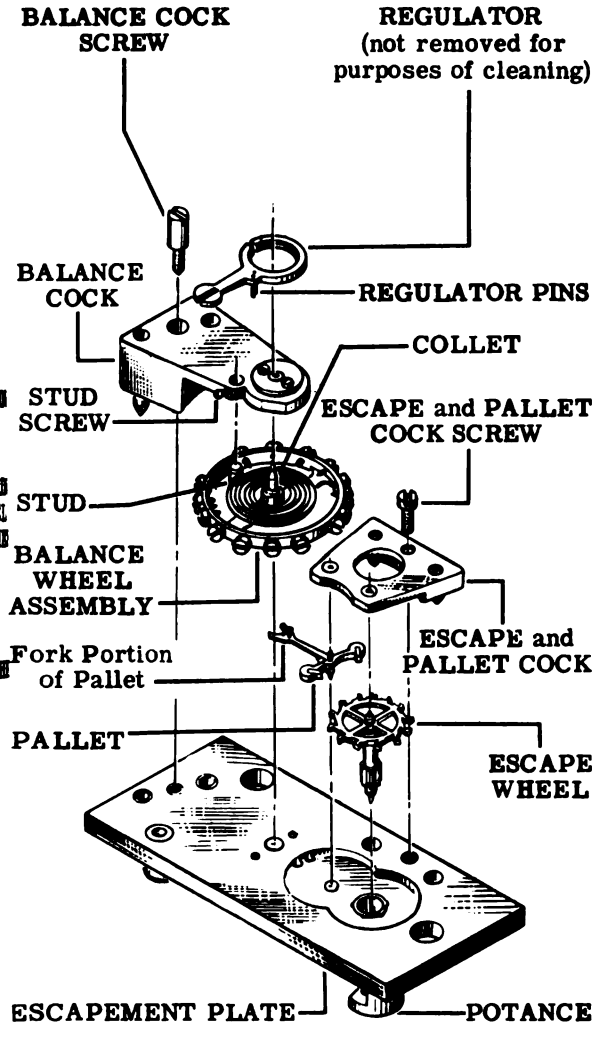

Figure 13—R-20666 Escapement

ire contained in an escape and pallet cock. The ipper jewel bearings of the balance assembly ire contained in the balance cock.

The purpose of the escapement is to control he unwinding of the mainspring so that the sec- nd, minute and hour hands will travel around he dial at proper speed. The escapement oper- tes in such a manner that each tooth of the es- ape wheel passes one of the locking jewels of he pallet at a regulated interval. As each es- ape wheel tooth goes by, it delivers an impulse o a pallet jewel and the impulse is transmitted hrough the pallet and delivered to the balance heel. The back-and-forth rotation of the balance heel moves the pallet and regulates the speed at hich the escape wheel teeth are released.

The balance wheel rotates first in one direc- on, and then the other, under the impulse which receives from the pallet. The rotation of the alance wheel is controlled by the hairspring.

The inner end of the hairspring is pinned to the collet fixed to the balance staff and the outer end is pinned to a stud which is held firmly in place on the balance cock by means of a stud screw. The balance wheel oscillations are controlled by the resistance of the hairspring (first it is wound and then unwound). The time required for each oscillation, therefore, depends upon the weight in the balance wheel rim and the tension of the hairspring. Due to the fact that the weight on the balance wheel rim is well counter-balanced by the hairspring tension, and due to the fact that the balance pivots are set in jewel bearings, very little impulse from the escape wheel through the pallet is required to keep up the oscillations.

On the balance staff, just under the balance wheel, is mounted a roller in which is set a jewel pin. It is this jewel pin which receives the impulse from the pallet fork, and it is the jewel pin which strikes the pallet fork to release each escape tooth.

Operation of the Escapement

The operation of the lever type escapement is well understood by all watch and clockmakers. Since only these persons will have reason to exercise judgment with respect to the escapement, no discussion of the theory of operation is necessary for the purpose of this manual. For other persons who wish to learn the principles of escapement operation, such information may be obtained from many sources.

Jeweling

There are eleven jewels in Seth Thomas Mechanical, Boat and Deck Clock escapements: One hole jewel and one cap jewel at each end of the balance staff, one hole jewel at each end of the escape wheel and pallet staffs, a balance roller jewel pin and two pallet jewels.

Special Devices

All the Seth Thomas Mechanical, Boat and Deck Clock movements contain a power source, a train, a dial train and an escapement as described in the previous paragraphs. In addition, the Boat and Deck Clock movements have two devices not included in a Mechanical Clock—a setting device and a start and stop mechanism.

The hand set shaft, included in Boat and Deck but not in Mechanical Clock movements, (refer to Fig. 8) has a squared end which projects through the back plate. The arbor extends right through the front plate where a setting pinion is attached to its end. The setting pinion engages the teeth of the minute wheel. When the squared end of the setting arbor is turned by the winding key, the setting pinion turns the minute wheel

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which turns both the cannon pinion and the hour wheel. This allows the minute hand and hour hand to be set in any desired position without actually touching them. See Fig. 12.

The start and stop mechanism, included in Boat and Deck but not in Mechanical Clock movements, (see Fig. 8) is a simple device consisting of a start and stop knob, a start and stop shaft (with a lever arm and lever arm spring) and a coiled start and stop shaft spring. When the start and stop knob is turned, the shaft turns against the resistance of the coiled shaft spring. The start and stop shaft lever arm turns until the lever arm spring touches the balance wheel, stopping its motion—thus effectively stopping the second hand in any desired position (usually 60). When the standard time signal matches the setting of the second hand, the start and stop knob is released. The coiled start and stop shaft spring turns the shaft back towards its original position, releasing the balance wheel and allowing the second hand to begin turning once more. The start and stop shaft continues to turn until the lever arm hits one of the back plate pillars, stopping the shaft in its place of rest.

IDENTIFICATION OF SETH THOMAS MOVEMENTS AND ESCAPEMENTS

For the purpose of ordering replacement parts and to understand properly the various overhaul procedures described in this manual, it is necessary to be able to identify rapidly the 14 movements and the three escapements used in Seth Thomas Mechanical, Boat and Deck Clocks.

All Seth Thomas movements have the model number stamped on the back plate. However, since different movement numbers are used to designate both minor and major variations and since a few alterations can change some movements from one type to another, it is necessary to have a means of identification other than the number stamped on the back plate. Since some movements differ only in the type of escapement employed, it is also necessary to be able to identify rapidly the various escapements. In order to simplify the whole job of identification, first the three basic types of escapements will be described, and then the 14 movement variations will be treated.

Escapement Identification

Although the three escapements differ somewhat in appearance, the function of the various parts is almost identical. Figs. 14, 15 and 16 show that the escapements can be readily identified by simple visual inspection.

The R-20666 escapement is the latest escapement manufactured by Seth Thomas for Mechanical, Boat and Deck Clocks. It is widely

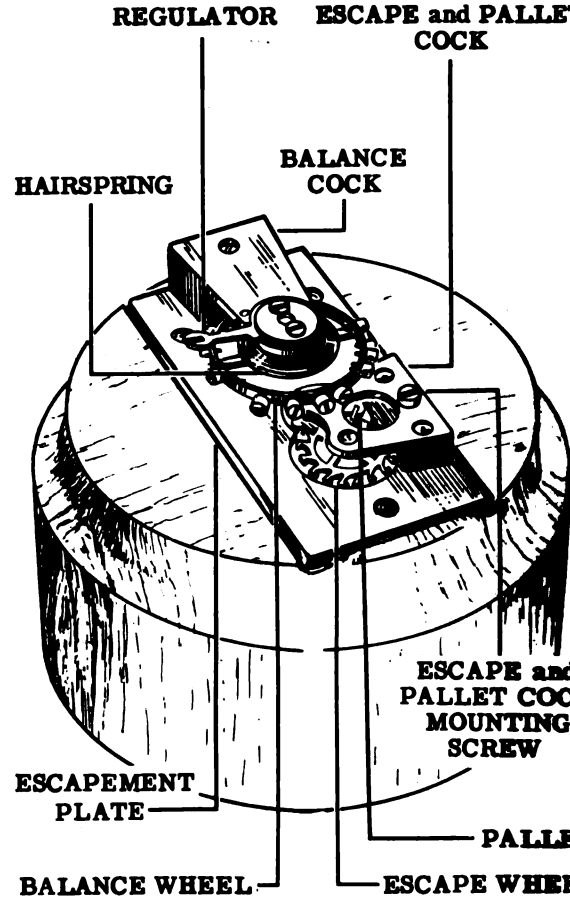

Figure 14—"New" Seth Thomas Escapement

known as the "New" Seth Thomas escapement, and is the one in the most widespread use in the movements being considered. This escapement is rapidly identified by the rectangular escapement plate and the shape of the escape and pallet cock which holds the upper pivots of the pallet and the escape wheel very close to the escape cock mounting screw. See Fig. 14. All parts of this escapement are readily replaceable without any special fitting or adjustments, since all the parts are manufactured to standard dimensions and held within close tolerances.

The R-18565 escapement is known as the "Old" Seth Thomas escapement and its manufacture was discontinued in 1945. This model is rapidly distinguished from the "New" escapement by the long escape cock which holds the upper pivot of the pallet at a long distance from the escape cock mounting screw. See Fig. 15. The various parts of this escapement were hand fitted and adjusted during manufacture, and replacement of the various components necessarily requires special fitting not needed in the case of the "New" escapement. Very early models of this escapement had "burnished-in" jewels.

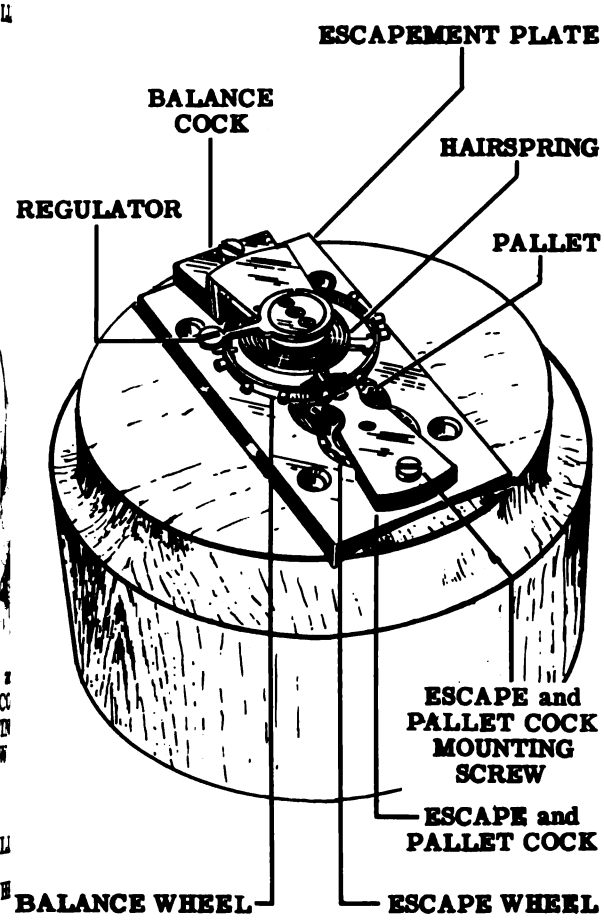

Figure 15—"Old" Seth Thomas Escapement

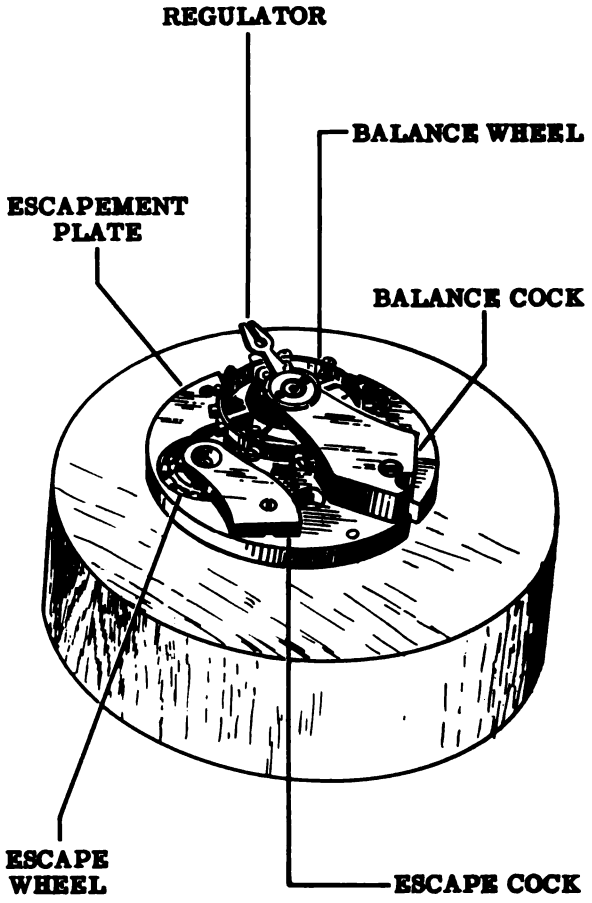

Figure 16—"Elgin" Escapement

The R-20695 escapement is also called the "Elgin" escapement and its manufacture was discontinued in 1945. This model is rapidly identified by the round shape of the escapement. See Fig. 16. Early models of this escapement had three mounting studs on the bottom of the escapement plate and the potance cutout left 180 degrees of the potance standing. These early models (before issue 5) are used in some "Old-Style" Seth Thomas movements. Later models of this escapement had two mounting studs on the bottom of the escapement plate and the potance cutout left 110 degrees of the potance standing. These later models (after issue 5) are used in some "New-Style" Seth Thomas movements.

Movement Identification

Seth Thomas Mechanical, Boat and Deck Clock movements may be distinguished on the basis of front-wind, front-regulate movements, and back-wind, back-regulate movements. They also may be distinguished as "Old-Style" and "New-Style" movements. New-Style movements are readily identified by the fact that the long sides of all the plates are wider apart at the point where the barrel fits into the movement than the width of either end. See Figs. 17 to 20. Old-Style movements are distinguishable by the fact that the long sides of all the plates are straight and parallel to each other. See Figs. 21 to 24. Running the fingers down the sides of any of the plates quickly determines whether the movement is "New-Style" or "Old-Style."

"New-Style" movements are characterized by having all parts completely interchangeable without any special fitting or adjustment. All parts are manufactured to standard dimensions and are held to close tolerances. Replacement of any of the components requires no special fitting or matching.

"Old-Style" movements are characterized by having the plates individually matched to each movement. This makes necessary a selective fitting of replacement parts if it becomes necessary to replace any of the plates.

The following Table III and the accompanying illustrations completely identify all the variations of both the Seth Thomas "New-Style" and "Old-Style" movements.

TABLE III

SEE FIG. NO.	MOVEMENT NO.	DESCRIPTION OR VARIATION
		NEW-STYLE MOVEMENTS
		Mechanical Clock Movements
14, 18, 20	5165	Basic model, front wind, 12-hr. dial, "New" Seth Thomas escapement.
14, 18, 20	5165-A	Same as 5165 except 24-hr. dial.
16, 18, 20	5169	Same as 5165 except "Elgin" escapement.
16, 18, 20	5169-A	Same as 5165 except 24-hr. dial and "Elgin" escapement.
		Boat and Deck Clock Movements
14, 17, 19	5188	Back wind, eccentric second hand, "New" Seth Thomas escapement.
16, 17 19	5189	Same as 5188 except "Elgin" escapement.
		OLD-STYLE MOVEMENTS
		Mechanical Clock Movements
15, 22, 24	5160	Basic model, front wind, 12-hr. dial, "Old" Seth Thomas escapement.
15, 22, 24	5161-A	Same as 5160 except 24-hr. dial.
15, 22, 24	5164	Same as 5160 except new click spring.
15, 22, 24	5164-A	Same as 5160 except new click spring, 24-hr. dial.
		Boat and Deck Clock Movements
15, 21, 23	5181	Back wind, eccentric second hand, "Old" Seth Thomas escapement.
15, 21, 23	5184	Same as 5181 except new click spring.
16, 21, 23	5186	Same as 5181 except new click spring, "Elgin" escapement.
15, 21, 23	5180	Same as 5181 except start-stop shaft has squared end instead of knob and barrel arbor has 0.137 "squared end instead of 0.125" squared end.

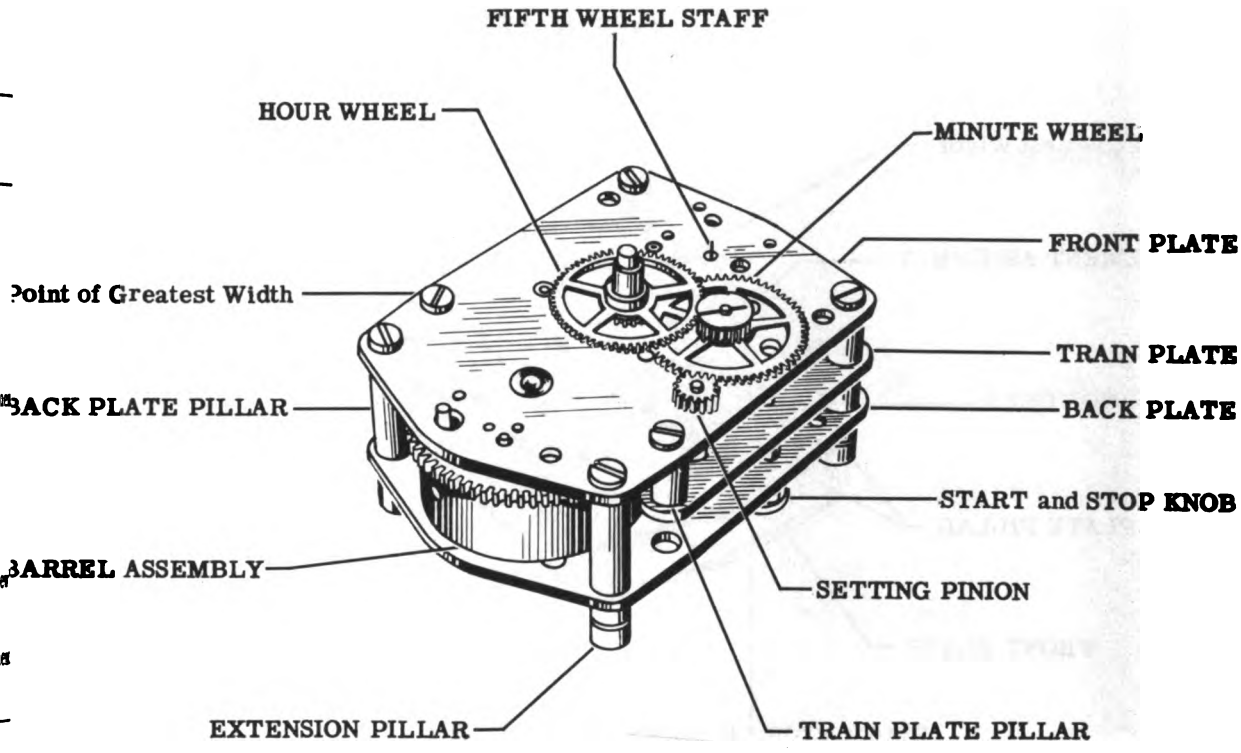

Figure 17—5188 Boat and Deck Clock Movement

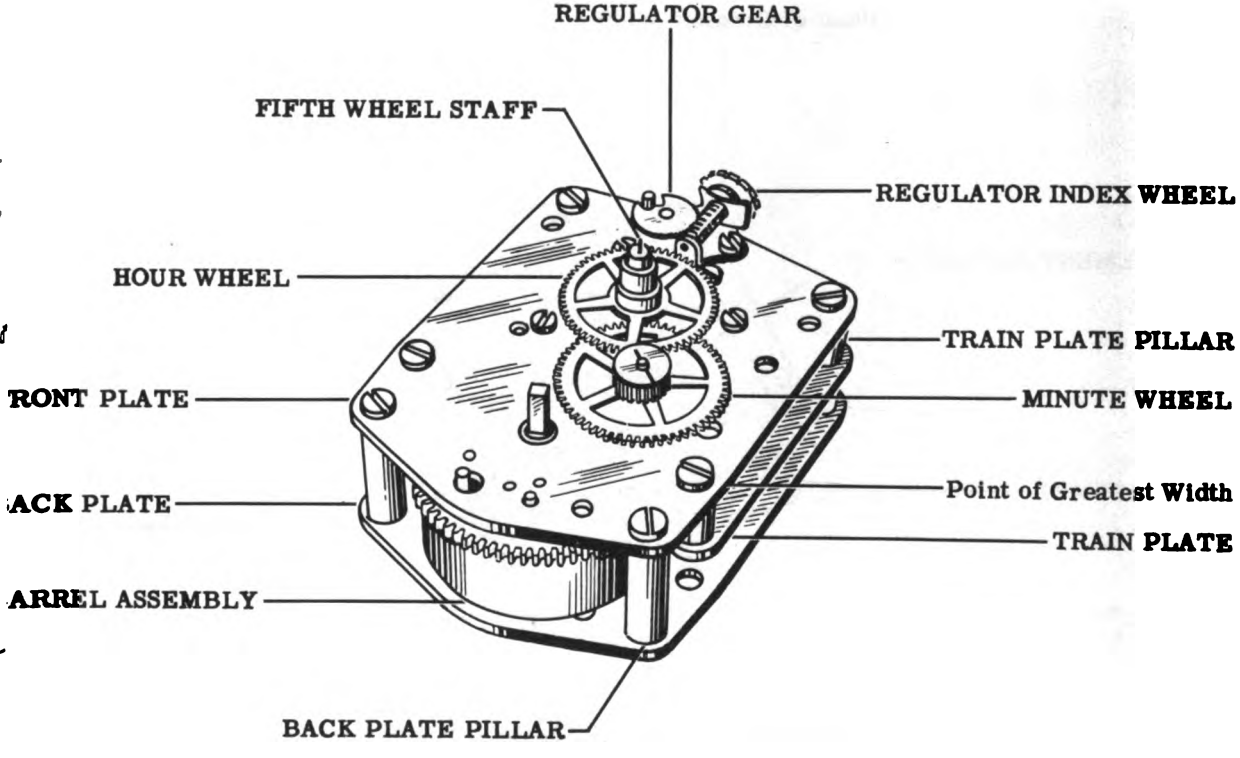

Figure 18—5165 Mechanical Clock Movement

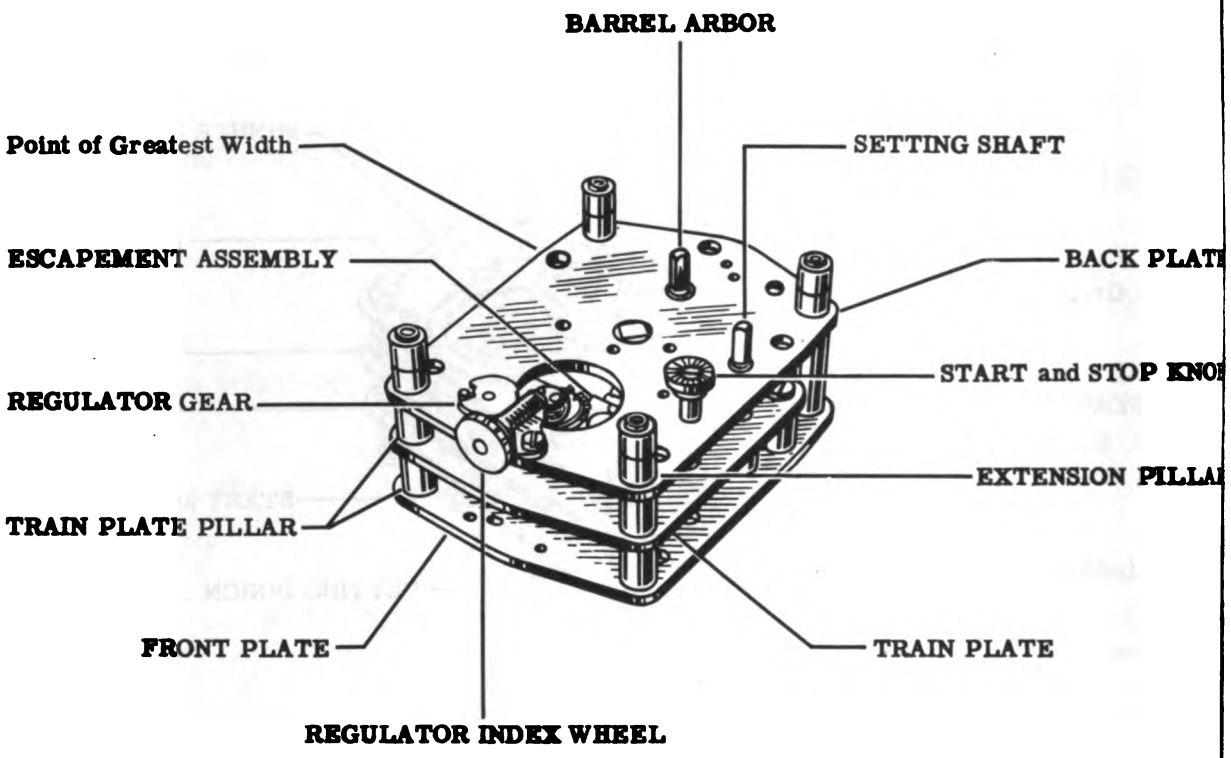

Figure 19—5188 Boat and Deck Clock Movement

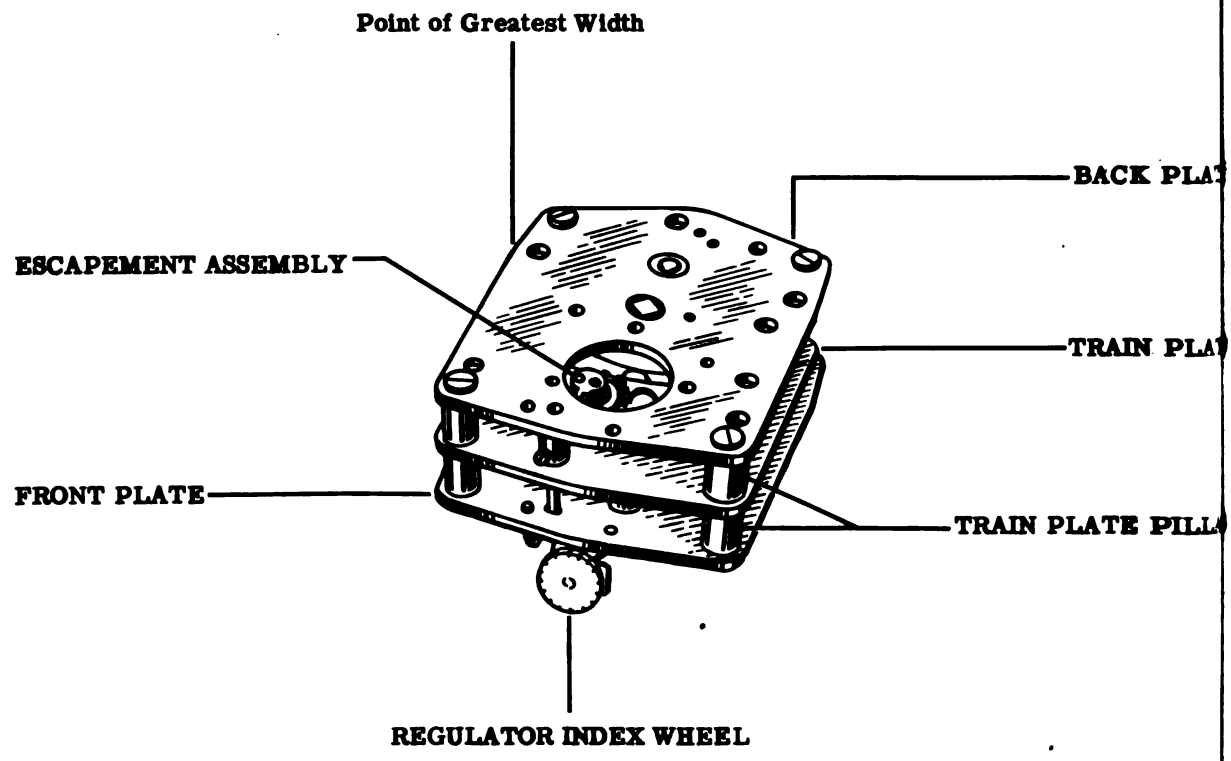

Figure 20—5165 Mechanical Clock Movement

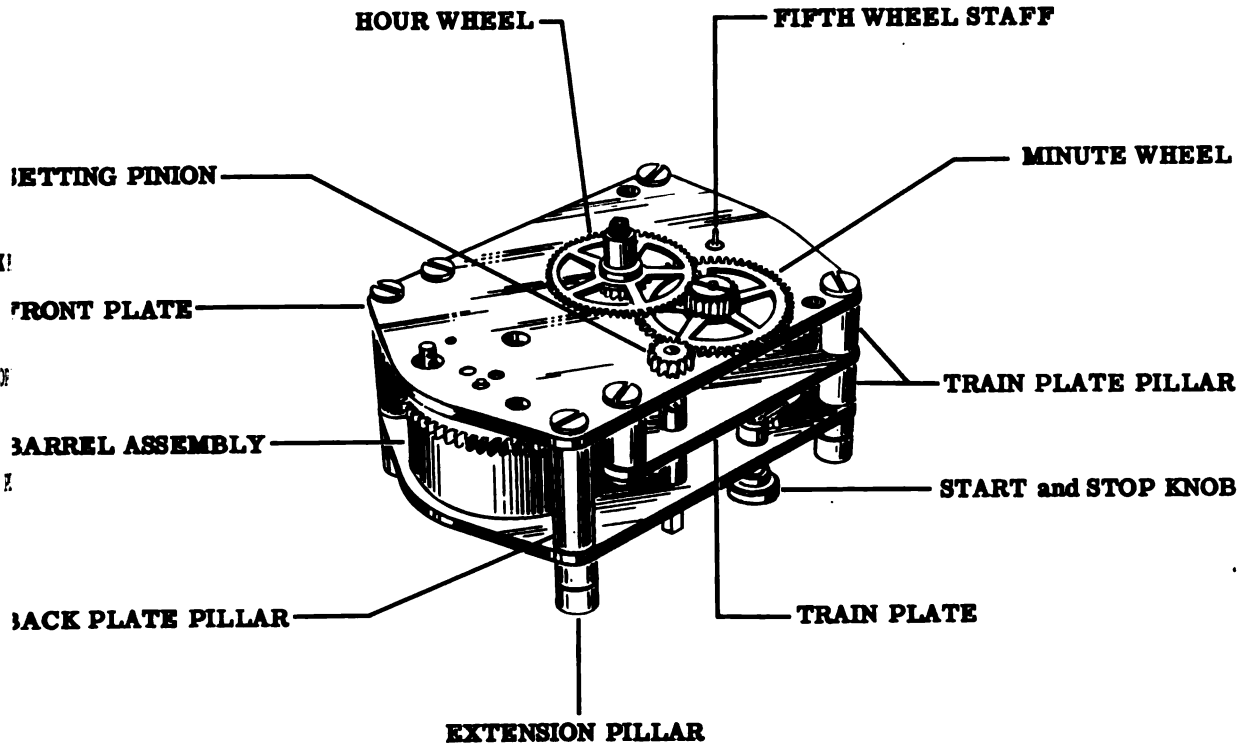

Figure 21—5181 Boat and Deck Clock Movement

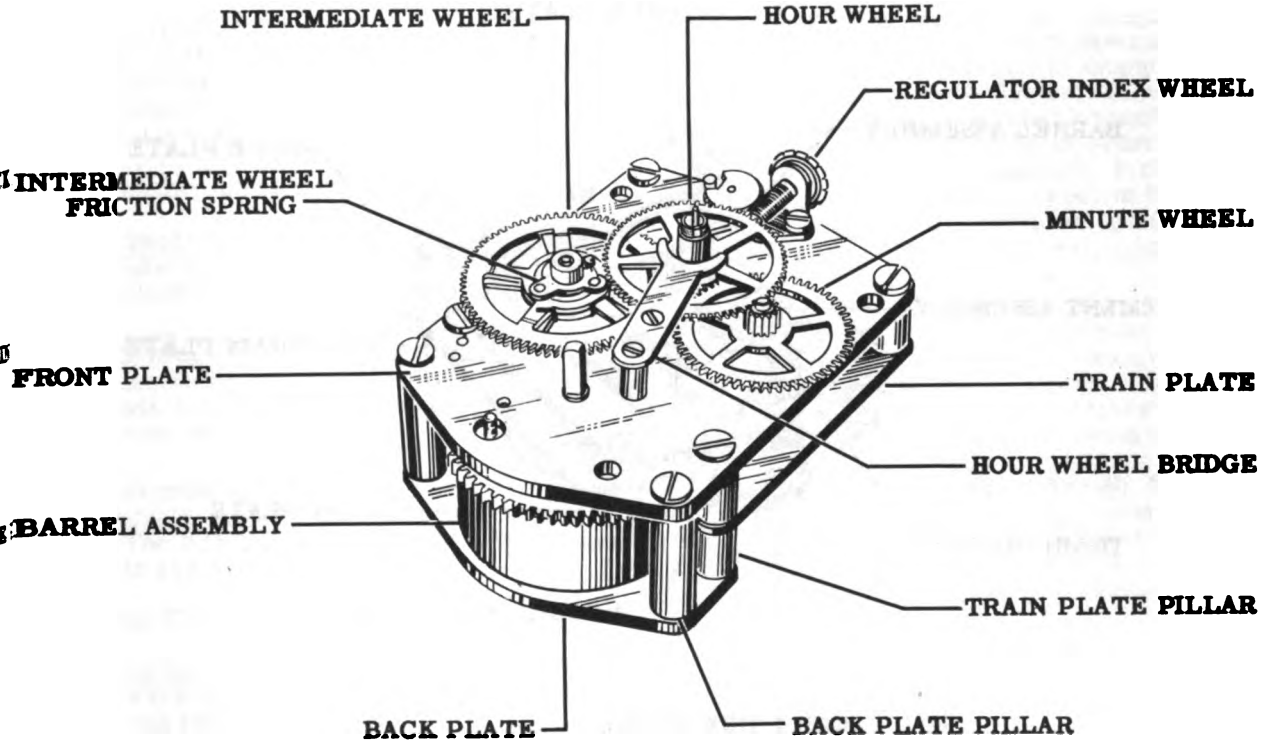

Figure 22—5160 Mechanical Clock Movement

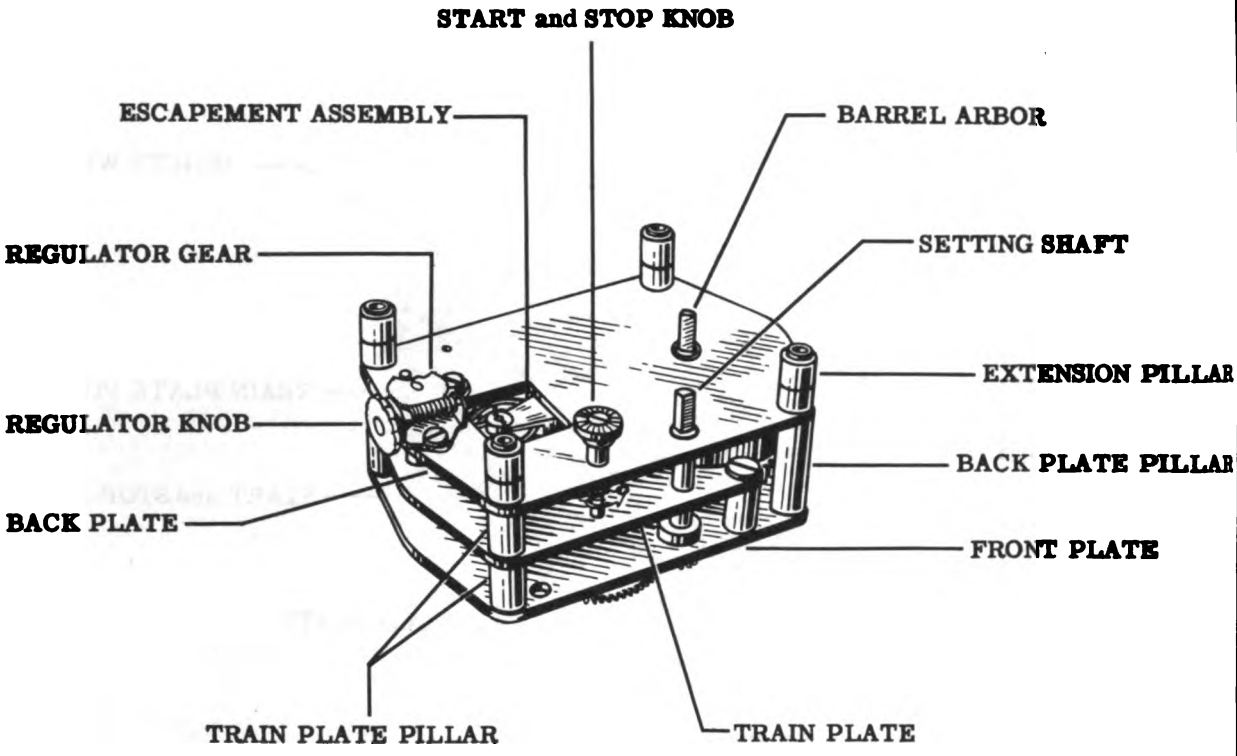

Figure 23—5181 Boat and Deck Clock Movement

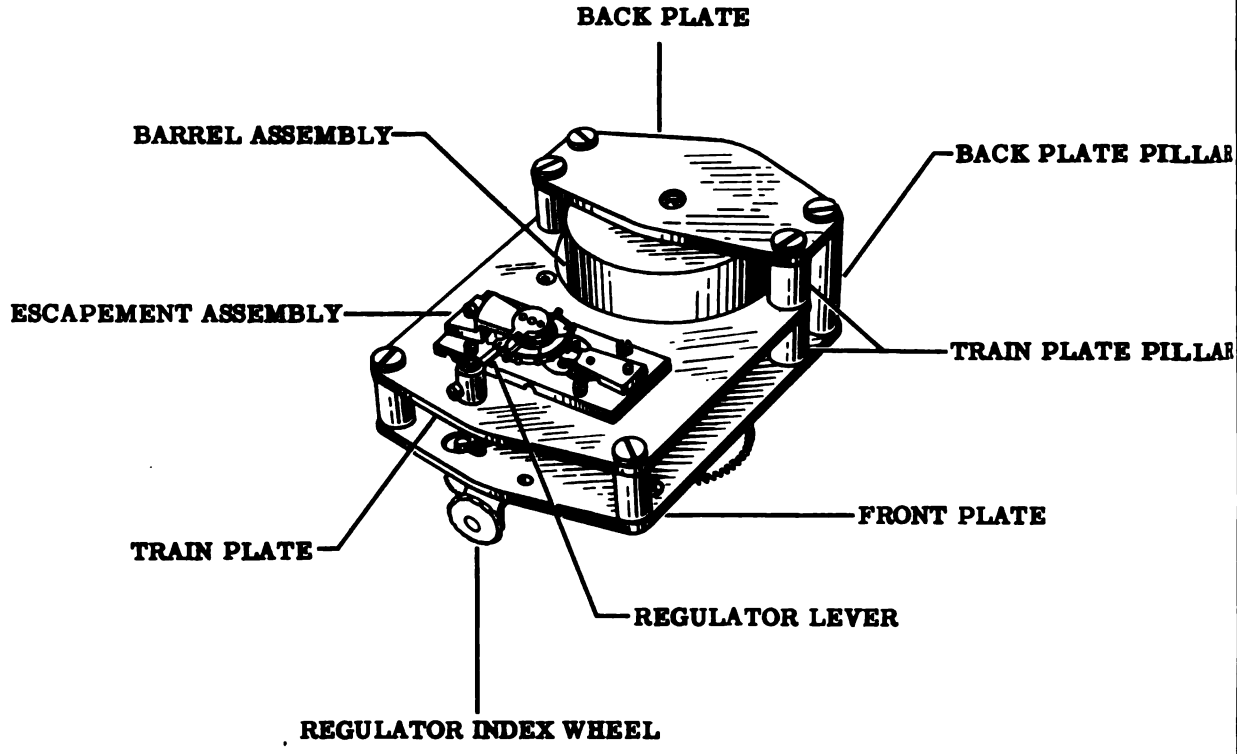

Figure 24—5160 Mechanical Clock Movement

PERFORMANCE REQUIREMENTS

When clocks come in for repair, every operator is expected to be extremely careful in performing his work on these instruments. Then, after each overhauled clock leaves the repair shop, it will do the job it was designed to do out in the Fleet.

The actual performance requirements for Mechanical, Boat and Deck Clocks are subject to variations. See Performance Requirements, as indexed in the Control Manual, for the complete and up-to-date specifications. The following requirements are traditional in Navy procurement as of the time this manual was first prepared.

1. Operating Standards

   A. Length of run—All clocks shall run at least 8 days on one winding.

   B. Timekeeping—The average weekly error shall be within ± 2 minutes for Mechanical Clocks, and ± 2 minutes 30 seconds for Boat and Deck Clocks. All daily errors shall be within ± 10 seconds for Mechanical Clocks, and ± 15 seconds for Boat and Deck Clocks, of the average daily error, for at least one week during the final test.

   C. Final Testing—Each clock shall undergo a final test of approximately four-weeks duration. During this final test, each clock shall meet the timekeeping requirements indicated in "B."

2. Assembly Adjustments

   A. Hand Clearance—The hands shall not interfere with each other or rub on the glass or dial at any time.

   B. Setting—The hands shall be set either manually or by setting mechanism without injuring the escapement or movement in any way.

3. Workmanship

   The workmanship shall be first class in every respect.

4. Final Case Inspection

   A. Cases—The cases shall be free from warpage, chips, blisters, burrs, ridges, and unsightly finishes.

   B. Glasses—The glasses shall be clear, free from blemishes and securely locked and sealed to the bezel to exclude dust and moisture under usual variations in temperature.

   C. Stamping—Before packing, each clock shall be rubber stamped on the back, at the bottom, with the date and repair activity code.

In order to meet these requirements, there are certain essentials to be borne in mind. The overhaul procedure is normally broken down into disassembly, cleaning, escapement overhaul, reassembly, and test and adjustment. Unless each procedure is carried out in the recommended manner, there is no guarantee that the clock will continue to operate properly once it is returned to the Fleet. The requirements necessary for continued proper operation are brought together here in order to call to your attention how important your particular job is in the entire overhaul procedure. When you read the following paragraphs, you will see how your job ties in with all the other jobs that go into overhauling a clock and putting it into first class condition.

The Reason for Overhaul

A clock must be completely overhauled whenever it receives physical damage, whenever it will not run, whenever it shows a tendency to stop or whenever it fails to keep good time. These symptoms indicate that there is something mechanically wrong within the clock and that the condition must be corrected in order to prevent further damage. In addition, a clock must be completely overhauled every one to two years, whether or not it is in apparent perfect working condition.

Nobody would operate an automobile without keeping the crankcase filled with oil and without having the oil changed periodically. The balance wheel within a clock turns many times more than the engine in any automobile. It swings 300 times each minute, day in and day out, month in and month out and year in and year out. The other wheels also must continue in operation all this time without stopping. It should be obvious that unless any damage is repaired, dirt removed and oil renewed, a tremendous amount of wear can take place.

Proper Disassembly

Once the pre-disassembly inspection is complete, the entire purpose of disassembly is to

break down the movement to an extent sufficient that it can be properly cleaned and inspected. If the disassembly instructions are not carefully carried out, it is quite possible that damage will result to the parts. This will cause additional expense for replacement parts and, in addition, will cause extra difficulties in the inspection department.

If the movement is not broken down to the recommended degree, the result will be improper cleaning and incomplete inspection. On the other hand, if the movement is broken down further than recommended, unnecessary work will fall upon the cleaning, inspection and reassembly departments. From this, it is obvious that proper and careful disassembly is a very important part of clock overhaul.

Cleanliness

Clocks must be clean to assure continued accuracy. Whenever dust enters the movement or whenever oil dries, causing the pivots to become gummy, the result is wear and lack of power in the train. This causes the movement to show an erratic gain and loss of time which cannot be corrected by the regulator. The condition becomes worse and worse until the movement stops functioning.

In addition, a clock movement must be perfectly clean before it can be properly oiled. The slightest film or deposit causes oil to spread, leaving dry the pivot where its presence is essential and, very likely, causing difficulty elsewhere. Thus, satisfactory service after overhaul is entirely dependent upon the care and attention given to cleaning.

Careful Inspection

The purpose of movement inspection is to cause replacement of any worn or damaged parts with perfect new ones. It is the responsibility of the inspector to check each cleaned part to see that it is functionally perfect. If a worn or defective part were to pass the inspector, it would eventually cause trouble when put into a movement with other perfect parts. The net result of careless inspection is to cancel all of the careful work that is put into the overhaul of a clock and require that the clock be put through another overhaul in a short time. Proper inspection will assure that all reassembly, test and adjustment work will be done with functionally perfect parts and that the clock will have a good chance to complete its scheduled service period without developing any defects.

Proper Escapement Repair and Adjustment

The inspection, repair, reassembly, oiling and adjustment of the escapement are critical points in the overhaul procedure. Since the escapement is the "brain" of the clock, only persons who are skilled in the applicable portions of the watchmaker's trade should attempt to do any work on it. From the brief description of escapement construction and operation, it should be clear that considerable knowledge and manual dexterity are needed to perform the necessary repairs and adjustments that are normally required. Without a properly repaired and adjusted escapement, there would be no point in all of the careful work done by the other operators. Any qualified watchmaker fully understands, without further explanation, just how much this work determines the final accuracy and performance of the overhauled clock.

Careful Reassembly

The purpose of reassembly is to make up a clock movement from clean and mechanically perfect parts and from the fully adjusted escapement passed by the watchmaker. During the process of reassembly, all the train wheels will have to be tested for proper fit in their pivot holes. All train wheels must have sufficient endshake and sideshake to assure that the pivots will not bind in their pivot holes, and yet the endshake and sideshake must not be so great as to cause a sloppy fit which would result in excessive wear, erratic operation and possible slipping of the interlocking teeth. The reassembly operator will be responsible for certain tests and adjustments which will keep the endshakes and sideshakes within tolerances of a few thousandths of an inch. To perform these operations properly requires a certain sensitivity of touch and knowledge of how to handle the necessary tools.

In addition, the reassembly operator has the responsibility of properly oiling all of the various pivots not included in the escapement. This requires a reasonable amount of knowledge and skill—too little oil causes excessive wear and too much oil causes a rapid gumming-up of the movement. The reassembly operation is the next to the last process in the overhaul of the clock and its importance in the successful overhaul process is self-evident.

Careful Timing Operations

A properly overhauled Seth Thomas movement may be put on a timing machine and adjusted so that it will show neither a gain nor a loss of time on the timing machine. When so adjusted and wound each week, a Seth Thomas movement

n test will easily meet the "Timekeeping" requirements listed under "Performance Requirements—1.B." included earlier in this section.

It is the job of the timing-machine operator perform the necessary adjustments to the iming screws on the balance wheel to bring the lock to perfect time. These adjustments also equire that whatever is done to one timing crew be done in exactly the same manner to the pposite timing screw. Whenever adjustments n weight are made on other balance screws, it s again important that the same adjustment be erformed on the opposite screw.

If symmetry of weight distribution on the alance wheel is not kept perfect, the result will e an erratic gain or loss of time and failure of he clock to pass its performance test. The iming operator should realize that his is the ast operation in the overhaul procedure and hat it is his responsibility to see that the work f all the other operators is not in vain. If the erfect poise of the balance wheel is lost, the scapement unit will have to be returned to the watchmaker for repoising before the clock will be able to pass its performance test.

Conclusion for Performance Requirements

It should be clear to each person involved in the clock overhaul process that he is a member of a team and that all the other members depend upon him to do his work properly. When proper coordination takes place, clocks in all stages of damage and wear will flow smoothly through the overhaul process and will come out in perfect working condition. Read the instructions as given in the remainder of this manual, understand what you have to do, do your job well and you will have the satisfaction of being an efficient member of the team.

Having familiarized yourself with the "Functional Description," "Identification of Seth Thomas Movements and Escapements" and "Performance Requirements," you are now ready to proceed with the actual disassembly operations, Section III.

SECTION III

DISASSEMBLY PROCEDURE

Skill Levels: Disassembly Operations—Mechanical Instrument Assembler, Junior Grade

Pre-disassembly Inspection Operations—Watchmaker, Senior Grade

This section contains instructions covering the recommended procedure for disassembling Seth Thomas Mechanical, Boat and Deck Clocks. The reason for disassembly, as described, is to permit proper cleaning and inspection for purposes of overhaul and repair. Seth Thomas Clocks have proved rugged and dependable in the service of the U. S. Navy, but it must be stressed that they may easily be damaged in the hands of those unskilled in the care of fine clocks. For this reason all disassembly operations should be performed only by qualified personnel and by following only the described procedures.

Because of certain differences between the various Seth Thomas movements and escapements, the description of the disassembly procedure is divided into several parts, as follows:

1. Pre-disassembly Inspection Operations.
2. Preliminary Disassembly Operations.
3. Movement Disassembly Operations.
   - A. Disassembly of 5165 Series Mechanical Clocks and all Boat and Deck Clocks.
   - B. Disassembly of 5160 Series Mechanical Clocks.

   The disassembly of R-20666, R-20695 and R-18565 Escapements is described in Section III-A.

Observe that in the arrangement of this section "Pre-disassembly Inspection Operations" is treated before the preliminary disassembly operations which must precede it. This is done in order that the disassembly procedure shall be presented to disassembly personnel as a continuous process without being interrupted by material which is directed only to a Watchmaker, Senior Grade.

Pre-disassembly Inspection

A pre-disassembly inspection is provided in the text. This inspection is to be performed after the movement has been removed from the case and after the hands and dial have been removed from the movement. The purpose of this inspection is to determine whether the movement is worth overhauling and to locate the troubles within the movement. Location of specific troubles is for the purpose of assuring that they will be found and remedied during subsequent inspection and reassembly. All clocks worth overhauling are to go through the entire overhaul process as described in this instruction book. The pre-disassembly inspection provides a double check that any existing trouble will be remedied. It also affords opportunity to record statistics of component performance which are valuable for design and development purposes.

As a part of the pre-disassembly inspection a route ticket, listing these defects, is made out for each clock and accompanies the clock throughout the overhaul process. The purpose of the route ticket is to assure that these defects will be examined and corrected during the regular overhaul and repair process as described in this manual.

Before beginning the actual work of disassembly, turn to Section VII, "Maintenance Parts Catalog," and study the group assembly part lists and the associated exploded views to familiarize yourself with the names, appearance and relative positions of all the assemblies and parts. Also, read Section II, "Description," if you have not already done so, to learn the functions of the various components of the clock. The knowledge of this information will give you an appreciation of the disassembly procedure and make your job easier.

Disassembly Inspection

During disassembly there is no inspection procedure particularly recommended for the purposes of repair. Aside from setting aside parts obviously damaged, such inspection may best be reserved until after cleaning and, therefore, it is described in Section IV "Parts Inspection, Repair and Cleaning."

Tools

Most of the tools required are those included in every watchmaker's kit. They are mentioned in the text when necessary. Where special service tools are needed, or tools are employed for purposes which are not immediately obvious, they are explicitly designated by number in the text. Also, they are further identified in Section VIII of this book, "Special Service Tools and Testing Devices."

NOTE

The description of the pre-disassembly inspection operations which follows is directed only to Watchmakers, Senior Grade. All other personnel may skip this portion of the text and go on to the description of "Preliminary Disassembly Operations."

PRE-DISASSEMBLY INSPECTION OPERATIONS

Skill Level: Watchmaker, Senior Grade

The Need for Pre-disassembly Inspection Operations

Before a clock is put through the overhaul process, valuable information can be gained as to just what is wrong with it. Every clock that comes in for overhaul has been carefully adjusted by the manufacturer and by any Navy repair shop to which it has been previously sent for overhaul. Therefore, special repairs and adjustments will be usually required only when the clock has met with some accident.

The first inspection is made after the removal of the movement from the case and after the removal of the hands and dial but before the movement is disassembled. Such an inspection can locate some types of defects much more rapidly than an inspection of the cleaned parts after disassembly.

All clocks coming in for overhaul must go through the entire process of Disassembly, Cleaning, Inspection, etc. as described in this manual. The findings of the pre-disassembly inspection are intended to assist the overhaul process as described and they should not eliminate any of the standard procedures.

For purposes of the first inspection, clocks coming in for overhaul may be divided into three classes:

1. Clocks that are in operating order and are sent in for a routine cleaning, oiling and regulation. These clocks can go right through the overhaul process and generally the only repairs will be to replace any worn parts.

2. Clocks that are not in operating order but have not met with any accident. These clocks will have functional disorders such as gummed oil, excessive wear or mechanical failure. By locating the trouble before disassembly, it will be assured that this fault will be corrected during the process of cleaning, inspection and reassembly.

3. Clocks that have met with an accident. Clocks of this type will require a double check after cleaning because the damage may easily be more extensive than is immediately visible. A report of this nature will assure that the inspection and reassembly operations will correct the trouble.

The person performing the first inspection should be thoroughly acquainted with the "Clock Movement Assembly Adjustment Standards" and "Clock Escapement Assembly Adjustment Standards" indicated in the index of the Control Manual. He should also be thoroughly acquainted with all phases of the overhaul process as described in this manual. It is the duty of the pre-disassembly inspector to fill out the route ticket which will accompany each clock and each escapement. This will assure that any such defects will be located and corrected as described in Sections IV and IV-A of this manual and that further checks and adjustments will be made as described in Section V.

The persons doing the various inspection and reassembly operations will initial the route ticket for each movement and escapement to indicate that they have done their part in correcting the original trouble.

Pre-disassembly Inspection Operations

The first inspection will take place after the movement has been removed from the case and after the hands and dials have been removed.

The procedure for the pre-disassembly inspection is as follows:

1. Check the general condition of the movement with regard to corrosion, oil gumming and any obvious physical damage.
2. Make all the checks listed under "Clock Movement Final Inspection Operations" as listed in Section V of this manual.
3. From the results of the inspection, determine whether the clock will be overhauled, or surveyed and salvaged. The "Survey and Salvage Standards" as set forth in the Control Manual is the basis for this decision. Indicate the disposition on the route ticket. If the instrument is to be surveyed, also indicate on the route ticket the salvaging to be performed. Serviceable parts should be turned in to the Instrument Control Center for stock as available replacements.
4. On the route ticket for the movement, indicate any recommendations for replacement during parts inspection or readjustment during movement reassembly. On the route ticket, enter the specific parts or fits to be checked.
5. On the route ticket for the escapement, indicate any recommendations for replacement, repair or readjustment during "Escapement Operations" as described in Section IV-A. On the route ticket, enter the specific parts or fits to be checked.
6. On the route ticket, indicate the appearance standards that shall be met by the overhauled clock—see "Appearance Standards" as indexed in the Control Manual.
7. Place the route tickets in the parts tray for delivery to the movement disassembler.

The inspected clock with its route ticket, on which you have recorded all defects to be checked, or on which you have entered directions to survey and salvage, should be returned to the Instrument Control Center.

PRELIMINARY DISASSEMBLY OPERATIONS

Skill Level: Mechanical Instrument Assembler, Junior Grade

The purpose of the preliminary disassembly operations is to remove the movement from the case and to remove the hands and dial components from the movement. These operations permit the movement to be inspected so that the pre-disassembly inspection previously described may be carried out.

Preliminary Disassembly Operations—All Mechanical Clocks

1. With the fingers, loosen the case knob (see Fig. 25) on the side of the bezel until the bezel can be swung open. The bezel need not be removed—it should just be turned completely out of the way of the dial.
2. Unscrew the three reflector mounting screws (see Fig. 25) which hold the reflector onto the dial and which hold the dialed movement in the case.
3. Place a winding key or a mainspring let down key (Tool No. 5A) through the dial winding hole and over the squared end of the barrel arbor. See Fig. 25. With a tilting and lifting motion of the key, lift up on edge of the dial so that it can be grasped with the fingers.
4. Lift the dialed movement out of the case and rest it, dial side up, on the movement work block, Tool No. 1B for 5165 series or Tool No. 1C for 5160 series Mechanical Clocks.

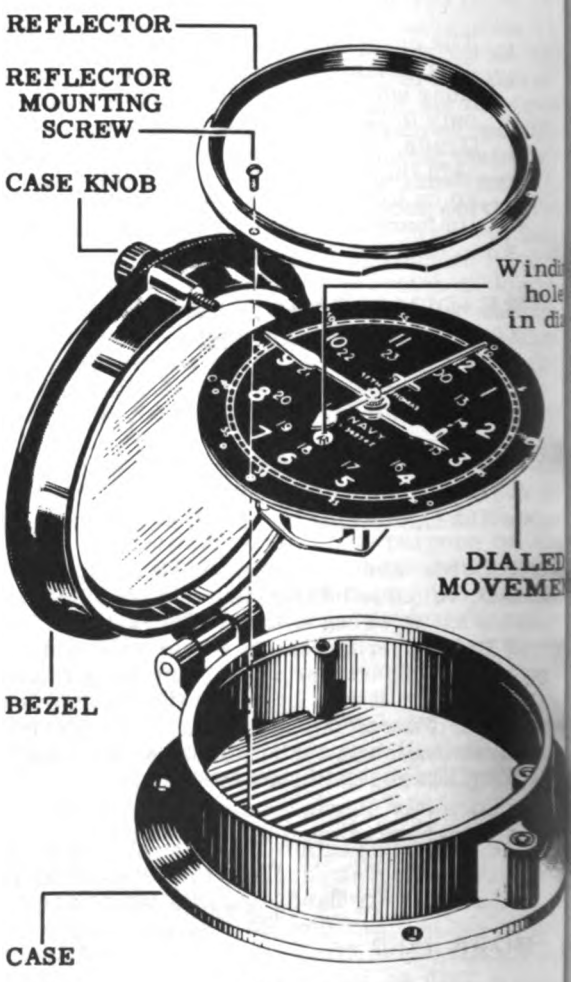

Figure 25

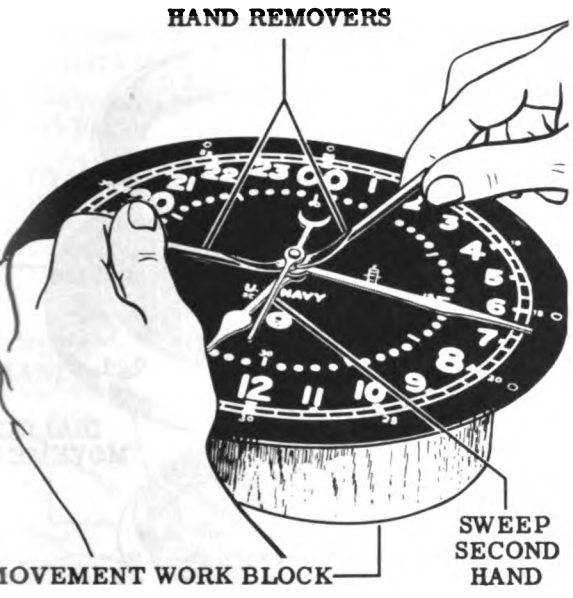

Figure 26

6. Using the hand removers with felt pads (Tool No. 2A), remove the sweep second hand as shown in Fig. 26. The purpose of the felt pads on the heels of the hand removers is to put a cushion between the bearing surface of the hand removers and the dial to prevent the dial from being scratched.

7. Remove the hand nut with the hand nut pliers (Tool No. 3A) as shown in Fig. 27. Tool No. 3A has a hard rubber insert to enable the round hand nut to be turned without slipping. Remove the minute and hour hands with the hand removers with felt pads, Tool No. 2A.

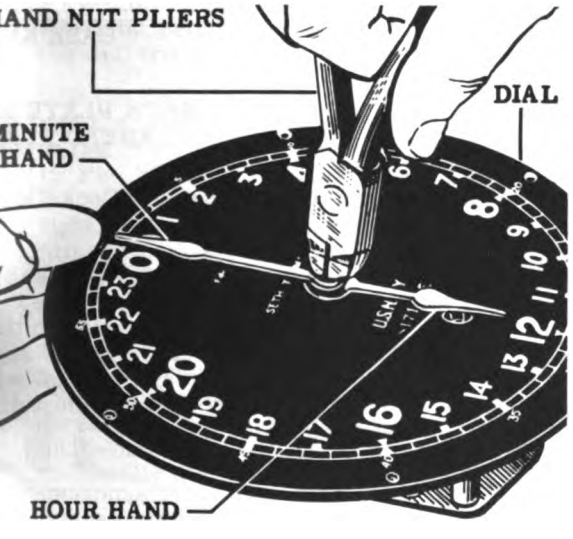

Figure 27

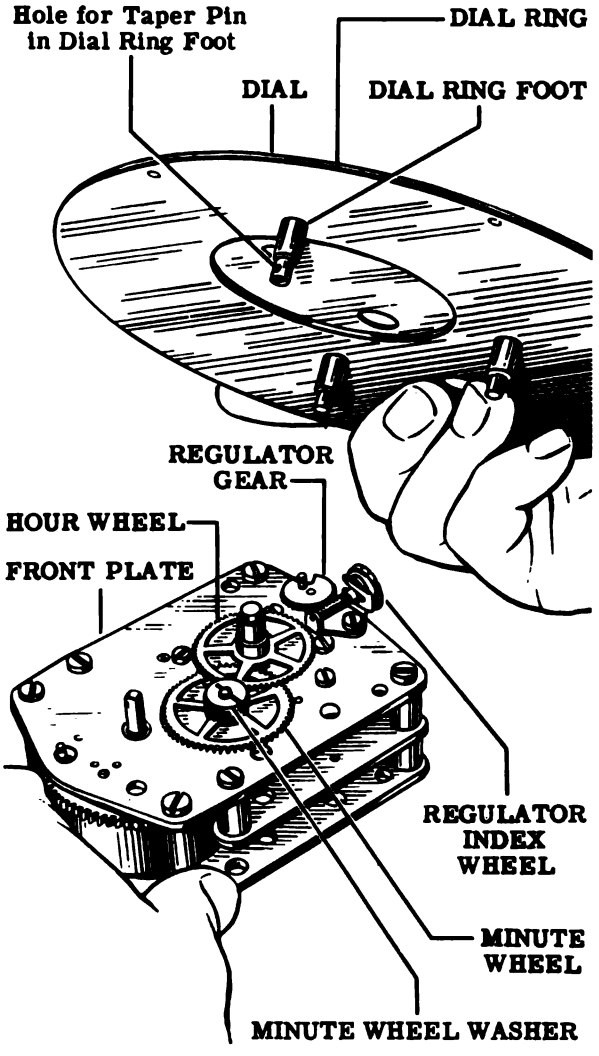

Figure 28

7. Tilt the dial and movement so that you can see the three dial foot taper pins holding the dial ring feet to the front plate of the movement. See Fig. 28. With a pair of pliers, pull out the three taper pins. If the pins are very tight, they can be loosened by turning the pliers so that the pin is turned about its axis while being pulled out.

8. Lift off the dial with the attached dial ring as shown in Fig. 28. For purposes of repair the dial may be separated from the dial ring by removing the three dial screws (see Fig. 136)—otherwise the two parts are not ordinarily disassembled.

9. Place the case, the dial, the hands and the movement in the parts tray for delivery to the pre-disassembly inspector.

**Preliminary Disassembly Operations—
All Boat and Deck Clocks**

1. With the fingers, loosen the case knob on the side of the case (see Figs. 29 and 30) until the case is free to swing away from the back plate.

2. Work will be facilitated by separating the case from the back plate and bulkhead plate. This can be done by pulling out the hinge pin (see Fig. 29), or by unscrewing the hinge pins (see Fig. 30).

3. Place the case on the work bench, dial down. Remove the three dust cover case mounting screws which hold the dialed movement and the dust cover inside the case. See Figs. 29 and 30.

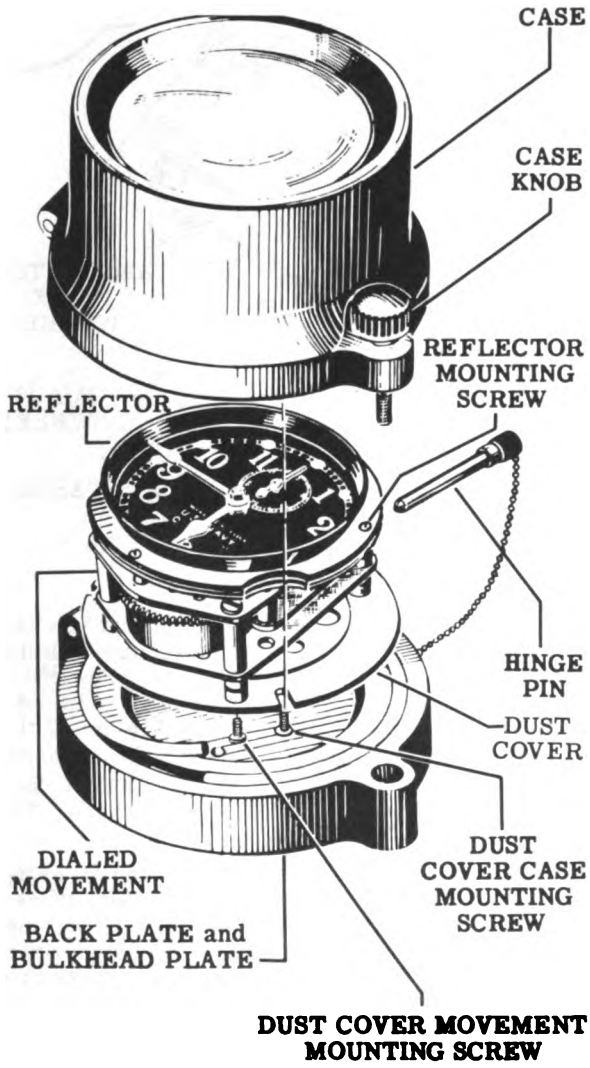

Figure 29—Phenolic Case Boat and Deck Clock

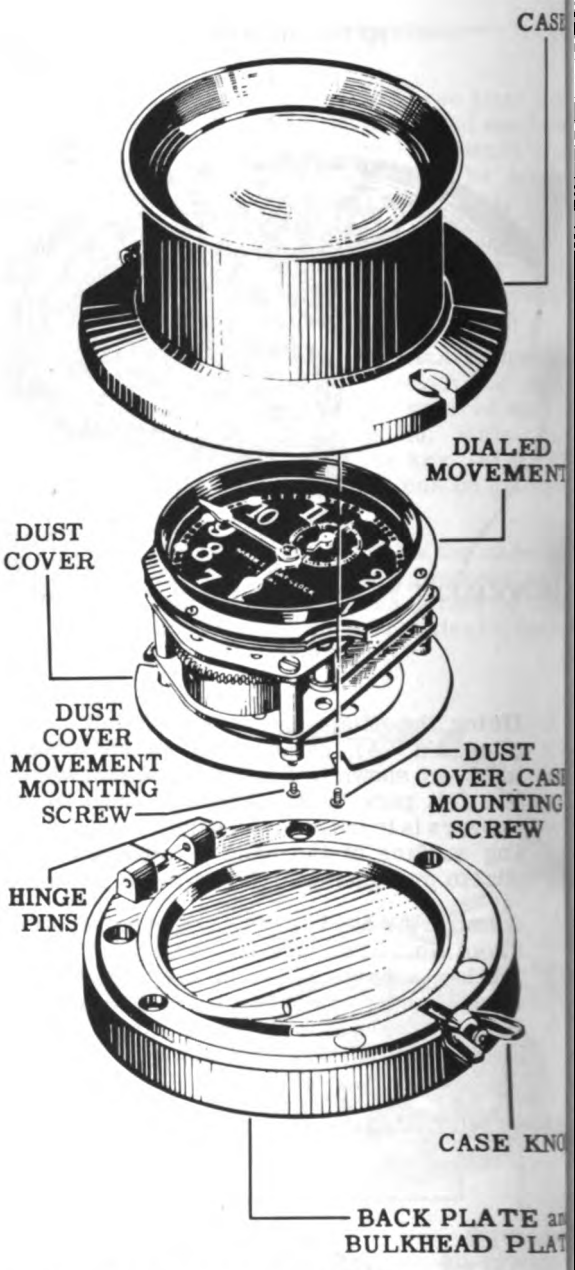

Figure 30—Metal Case Boat and Deck Clock

4. In order to remove the dialed movement from the case, place one hand over the dust cover. Turn the entire case over so that the dialed movement and dust cover is supported by one hand. Lift the case off with the free hand and place the movement dial down on the work bench.

5. Remove the four dust cover movement mounting screws which hold the dust cover to the back plate of the movement and lift off the dust cover. See Figs. 29 and 30.

6. Turn the dialed movement over so that it is dial side up and stands on the four extension pillars in the position shown in Fig. 31.

7. Remove the hand nut with the hand nut socket wrench (Tool No. 4A) as shown in Fig. 31.

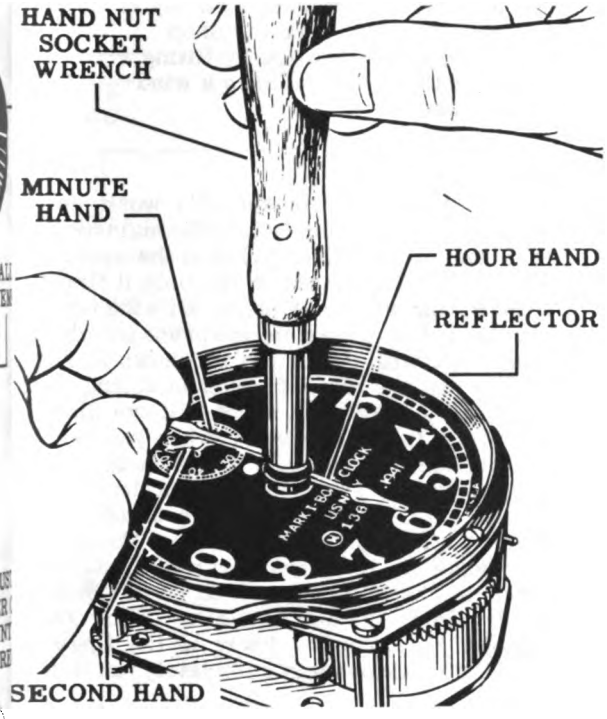

Figure 31

8. Using the hand removers with felt pads (Tool No. 2A), remove the minute and hour hands as shown in Fig. 32. Remove the second hand. The purpose of the felt pads on the heels of the hand removers is to put a cushion between the bearing surface of the hand removers and the dial to prevent the dial from being scratched.

9. Tilt the dial and movement so that you can see the taper pins holding the dial ring feet to the front plate of the movement. Refer to Fig. 33. With a pair of pliers, pull out the three taper pins. If the pins are very tight, they can be loosened by turning the pliers so that the pin is turned about its axis while being pulled out.

10. Lift off the dial with the attached dial ring and reflector as shown in Fig. 33. For purposes of repair, the dial may be separated from the dial ring by removing the three reflector screws (see Figs. 137 and 138)—otherwise the three parts are not ordinarily disassembled.

11. Place the case, the dial, the hands and the movement in the parts tray for delivery to the pre-disassembly inspector.

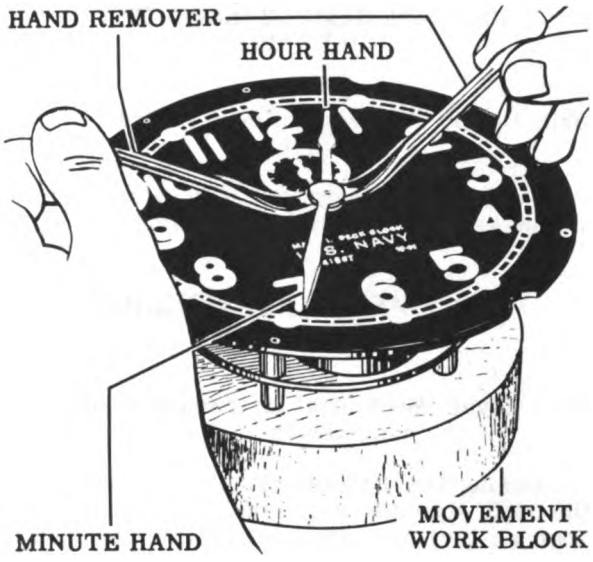

Figure 32

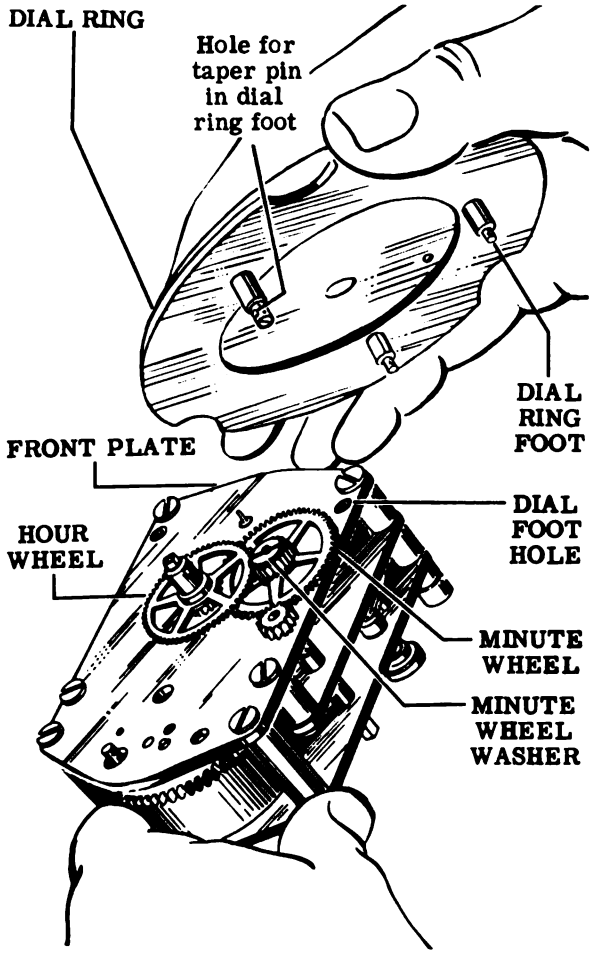

Figure 33

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PRE-DISASSEMBLY INSPECTION OPERATIONS

Skill Level: Watchmaker, Senior Grade

Perform the inspection previously described in this section under the above heading.

MOVEMENT DISASSEMBLY OPERATIONS

Skill Level: Mechanical Instrument Assembler, Junior Grade

During the disassembly of the movement, the parts should be put in the cleaning trays as soon as they are taken out of the movement. The arrangement of the parts in the cleaning trays is shown in "Cleaning"—see the Control Manual index.

Two basic differences exist in the 5165 Series Movements—the Mechanical Clock Movements and the Boat and Deck Clock Movements.

In the Mechanical Clock Movements, the 5165 is typical—the variations being for 24-hour dial arrangement (5165-A) and an Elgin escapement (5169). The 5169-A movement has both a 24-hour dial arrangement and an Elgin escapement.

In the Boat and Deck Clock Movements, the 5188 is typical. Variations in appearance are minor and are completely discussed in Section II, "Description."

In the disassembly instructions for the 5165 Series, the 5165 will be given complete treatment, and suitable notes will be included when a modification must be made in the procedure to cover the various Boat and Deck Clock Movements.

Since 5160 Series Mechanical Clock movements are quite different, they will be treated later in this Section under "Disassembly of the 5160 Series Mechanical Clocks."

DISASSEMBLY OF 5165 SERIES MECHANICAL CLOCKS AND ALL BOAT AND DECK CLOCKS

CAUTION

In Operation 1 use only a letdown key with no projecting wings (similar to Tool No. 5A, which is indexed in Section VIII). Use of a winding key may result in serious injury to the fingers if they should slip while holding the key against the force of the mainspring. If a letdown key is not available, have the shop make up one for you by fitting a smooth round handle to a winding key.

1. Before doing any disassembly work, let down the mainspring. Place the mainspring letdown key (Tool No. 5A) over the squared end of the barrel arbor and hold it firmly with the fingers of one hand. With the other hand, hold the movement and press the click stud aside with the thumb, as shown in Fig. 34, so that the ratchet wheel is disengaged from the click. The click will not disengage from the ratchet wheel when you press on the stud. To do this you must turn the winding key a very small amount (less than 1/8 of a turn) in a clockwise direction. When you do this, you will feel the click disengage from the ratchet wheel and the force of the mainspring will be felt in the hand holding the letdown key. Allow the letdown key to spin slowly in the fingers until the mainspring is completely run down.

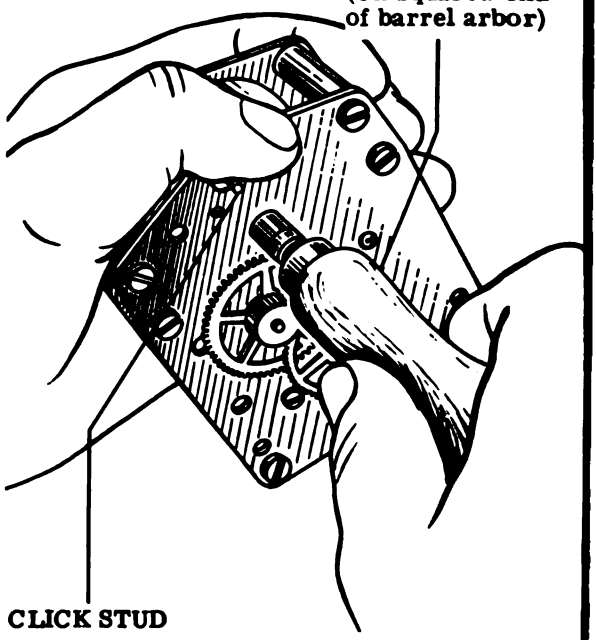

Figure 34

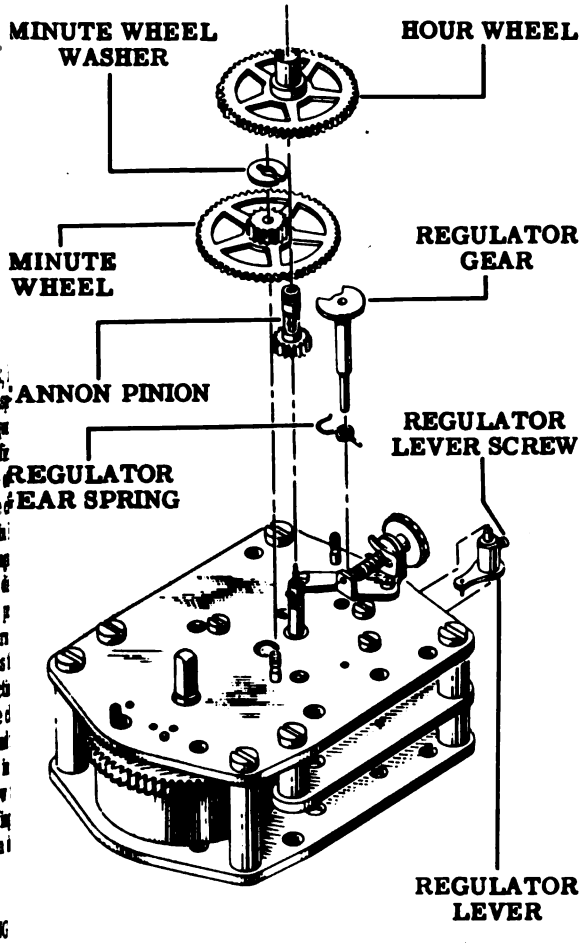

Figure 35—5165 Mechanical Clock Movement

2. Place the movement dial side up on the movement work block, Tool No. 1B. Remove the minute wheel washer by spreading its slot with a screwdriver. Lift off the hour wheel and the minute wheel. See Fig. 35.

   A. If there is any damage in the hand-set shaft components in Boat and Deck Clock Movements, these parts should be removed at this time. For purposes of cleaning, they may be left in position attached to the front plate. In order to remove the hand-set shaft and collet, loosen the collet screw and pull out the hand-set shaft and pinion through the front plate. Remove the collet. See Fig. 36.

3. Using the hand removers with felt pads (Tool No. 2A), as shown in Fig. 37, pry off the cannon pinion.

4. If there is any damage to the regulator gear, this part should be removed at this

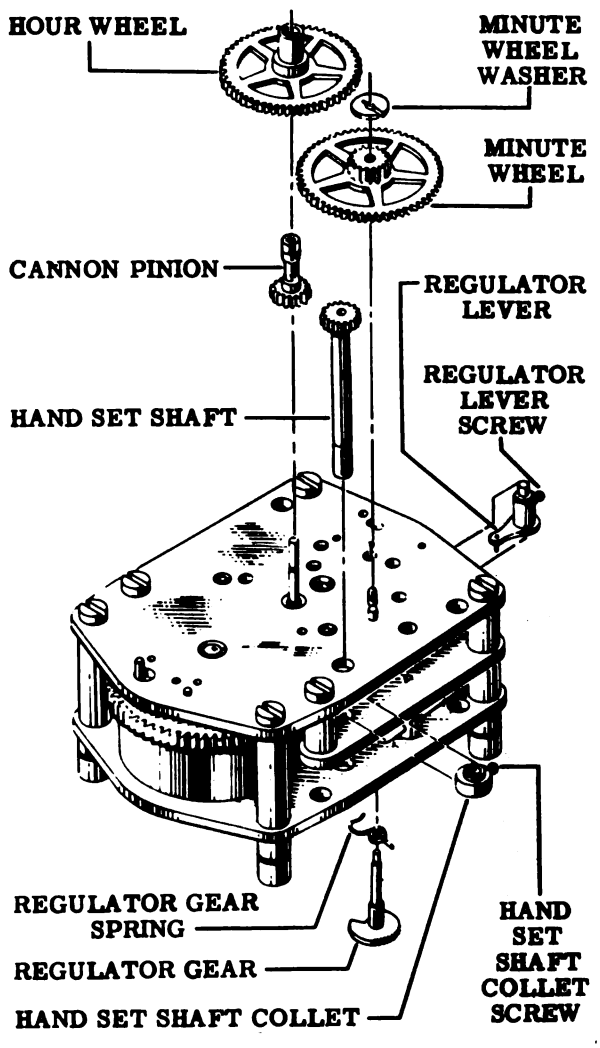

Figure 36—5189 Boat and Deck Clock Movement

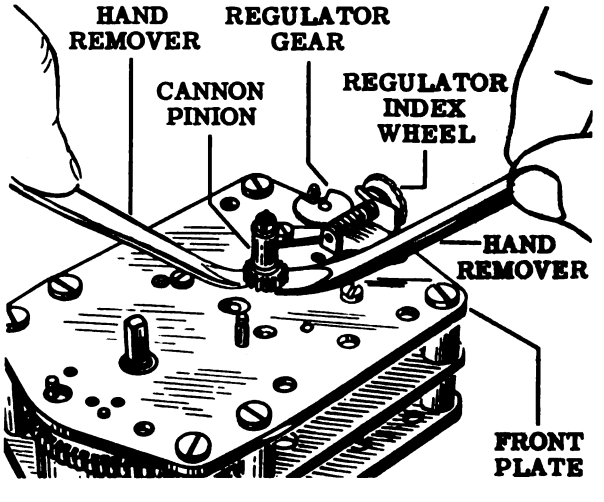

Figure 37

time. However, for ordinary cleaning purposes, these parts may be left mounted in position. To remove the regulator gear, loosen the regulator lever screw (see Fig. 35), pull out the regulator gear along with the regulator gear spring. See Fig. 36. Remove the now loose regulator lever from between the back plate and the train plate.

NOTE

In the Mechanical Clock movements, the regulator gear and regulator gear spring pull out from the dial side. In the Boat and Deck Clocks, the regulator shaft components pull out from the train side.

5. Turn the movement over so that it is train side up (back plate up) on the movement work block (Tool No. 1B) and in the position shown in Fig. 38.

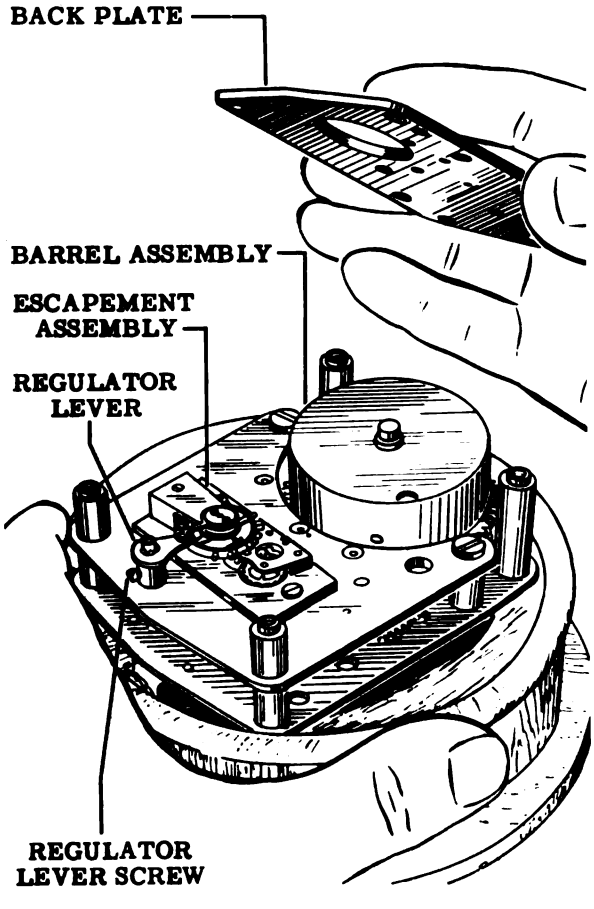

Figure 38

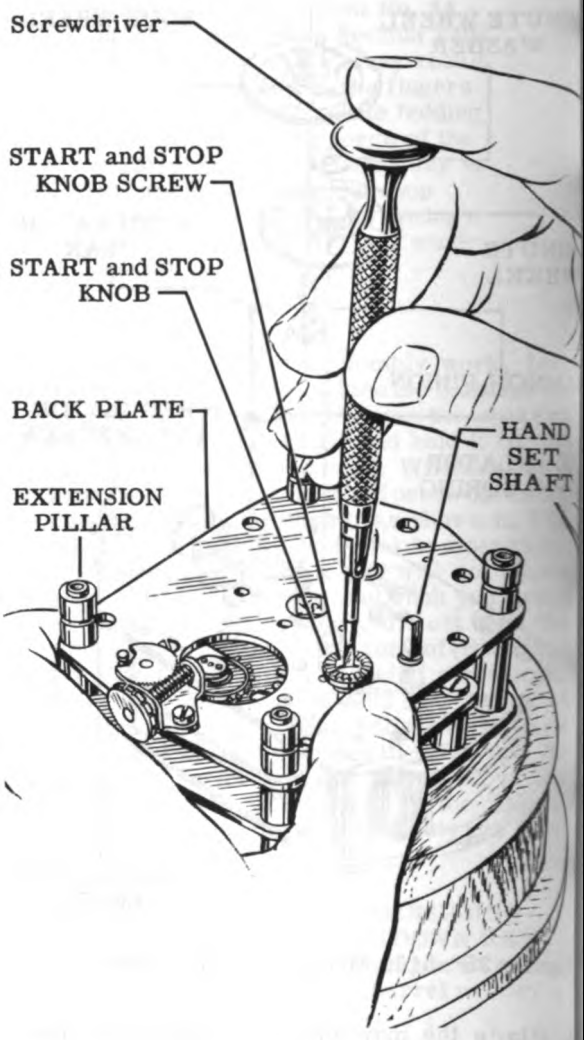

Figure 39

NOTE

Operation No. 6 is for Boat and Deck Clock movements only.

6. Unscrew the start and stop knob screw a remove the start and stop knob. See Fig.

7. Unscrew the four back plate screws and re move the back plate as shown in Fig. 3 (Also see Fig. 41.)

   A. In Boat and Deck Clock movements, re move the four extension pillars with t pillar pliers, Tool No. 6A. Lift off t back plate as shown in Fig. 40. Th start and stop shaft assembly may fa out as soon as the back plate is re moved—if it does not, remove it. Re fer to Fig. 42.

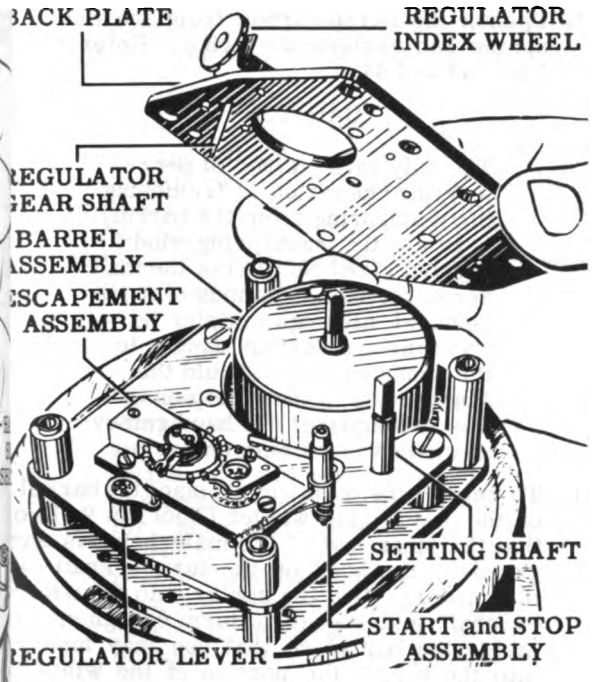

Figure 40

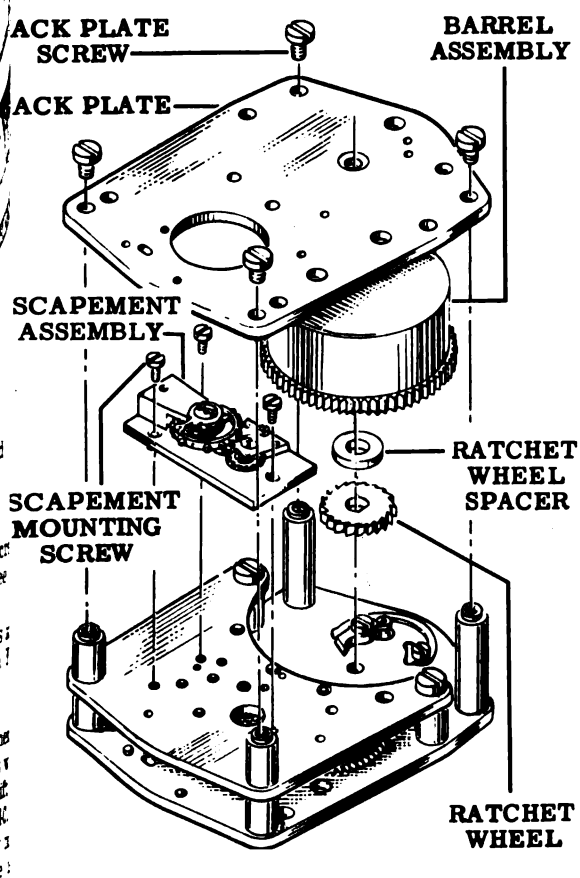

Figure 41—5165 Mechanical Clock Movement

8. Lift out the mainspring barrel along with the ratchetwheel and ratchet wheel spacer. See Figs. 41 and 42.

NOTE

Mainspring barrels may be set aside for separate disassembly or they may be disassembled at this time—as suits the facilities of the repair activity. Barrel disassembly is described here (Operations 9 through 11) for purposes of continuity.

CAUTION

Do not use a steel-headed hammer in Operation 9—it will deform the end of the barrel arbor.

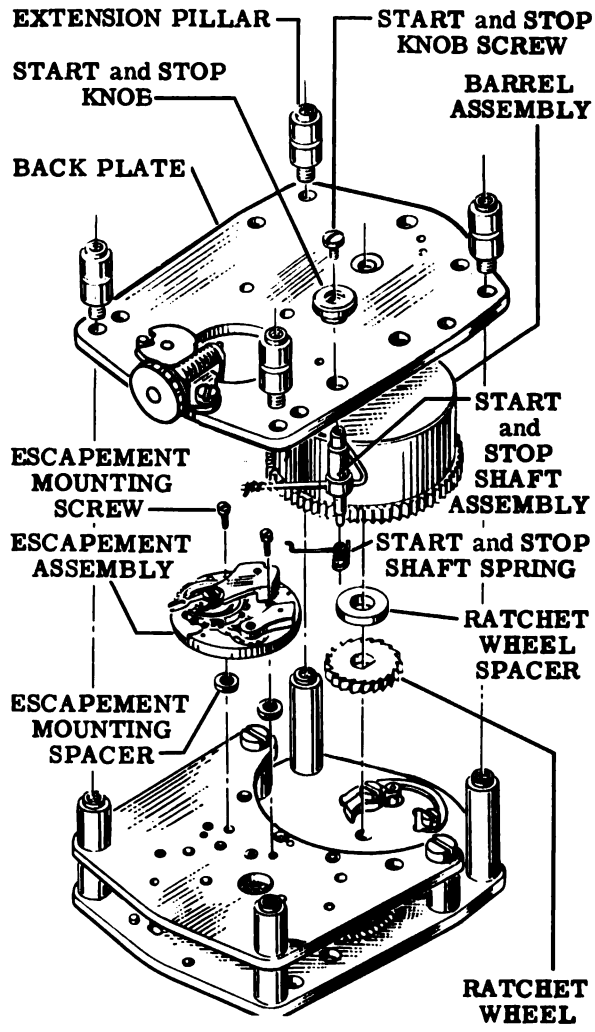

Figure 42—5189 Boat and Deck Clock Movement

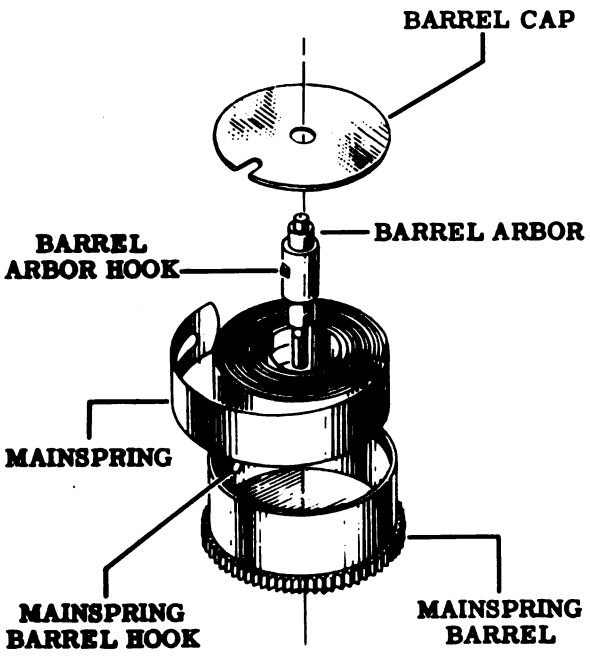

Figure 43—Mechanical Clock—Barrel Assembly

9. To remove the barrel cap, hold the barrel tightly in one hand and smartly strike the end of the barrel arbor farthest from the cap with a plastic- or a wood-headed hammer. The shoulder of the arbor will transmit this blow directly to the inside of the cap and force it out. See Figs. 43 and 44.

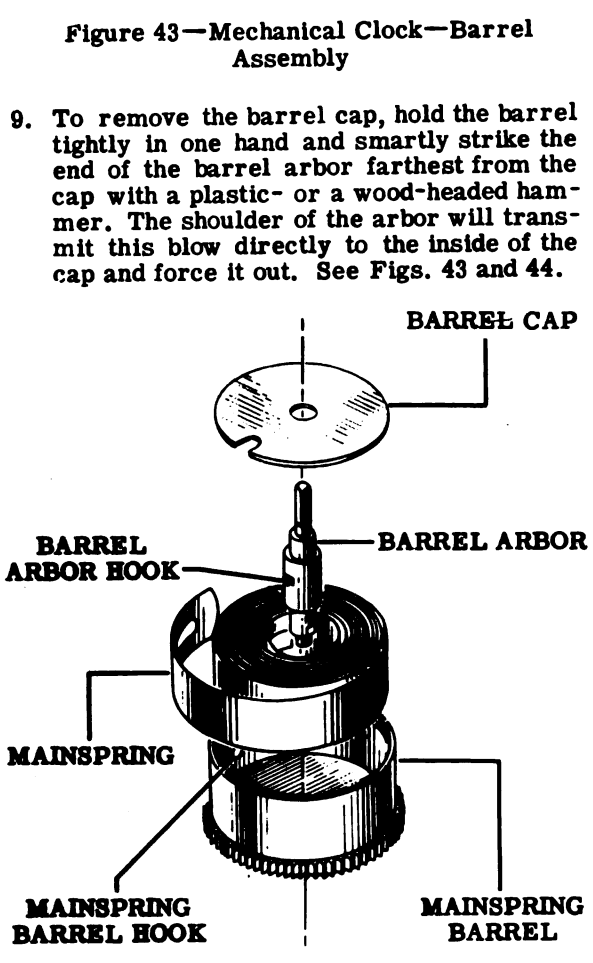

Figure 44—Boat and Deck Clock—Barrel Assembly

10. Unhook the barrel arbor from the mainspring and remove the arbor. Refer to Figs. 43 and 44.

CAUTION

The only safe method of performing Operation 11 (removing the mainspring from the barrel) is to use the mainspring winding tool (Tool No. 9A) in the manner described. Methods of hand removal, although simpler, always involve serious danger to the hands and face should the fingers slip in their grip on the oily mainspring. No hand removal method is recommended.

11. To remove the mainspring, place the barrel on the mainspring winder (Tool No. 9A) so that the inner end of the mainspring is engaged by the hook on the turning shaft of the winder. Wind the spring onto the winder shaft just enough to form enough space inside the barrel so that you may insert into the barrel the portion of the winder which holds the outer turn of the mainspring. When the mainspring is securely held by the winder, turn the barrel back and forth to disengage the outer end of the mainspring from the barrel hook. Pull off the barrel, leaving the mainspring on the winder. Hold the winding handle firmly and release the click preventing the mainspring from unwinding. Slowly turn the handle so as to unwind the mainspring. Pull on the outer end of the mainspring while unwinding so as to draw it out of the winder.

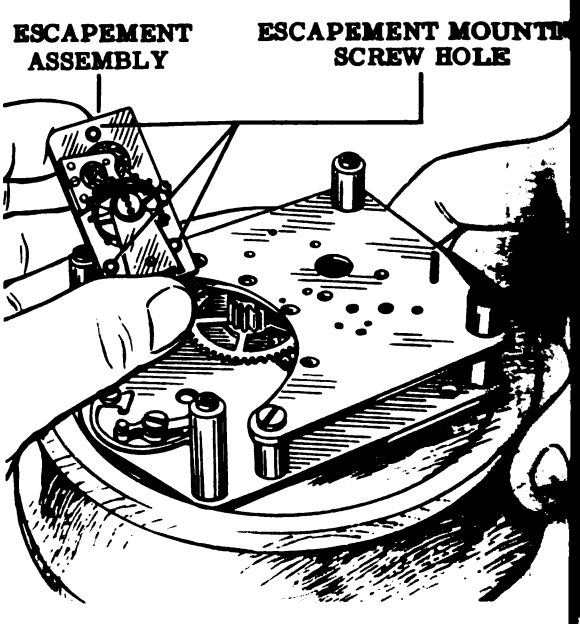

Figure 45

Discard the mainspring, since a new one will be used upon reassembly.

2. If the regulator lever was not removed in Operation 4, loosen the regulator lever screw and lift off the regulator. Unscrew the escapement mounting screw and lift off the escapement as a complete unit as shown in Fig. 45. Also refer to Figs. 41 and 42. Set the escapement aside, for separate disassembly.

NOTE

Disassembly of the escapement is simple enough to be performed by any Instrument Assembler, Junior Grade, who has seen the process demonstrated by a skilled operator. More manual dexterity is required than is the case with the rest of the movement, but it has been well demonstrated that escapement disassembly may be efficiently carried out by this skill.

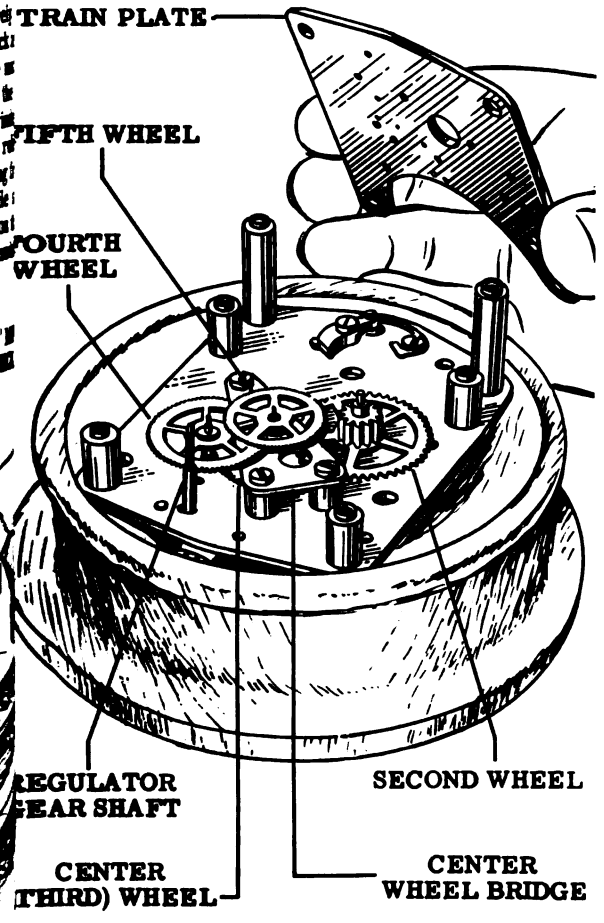

Figure 46

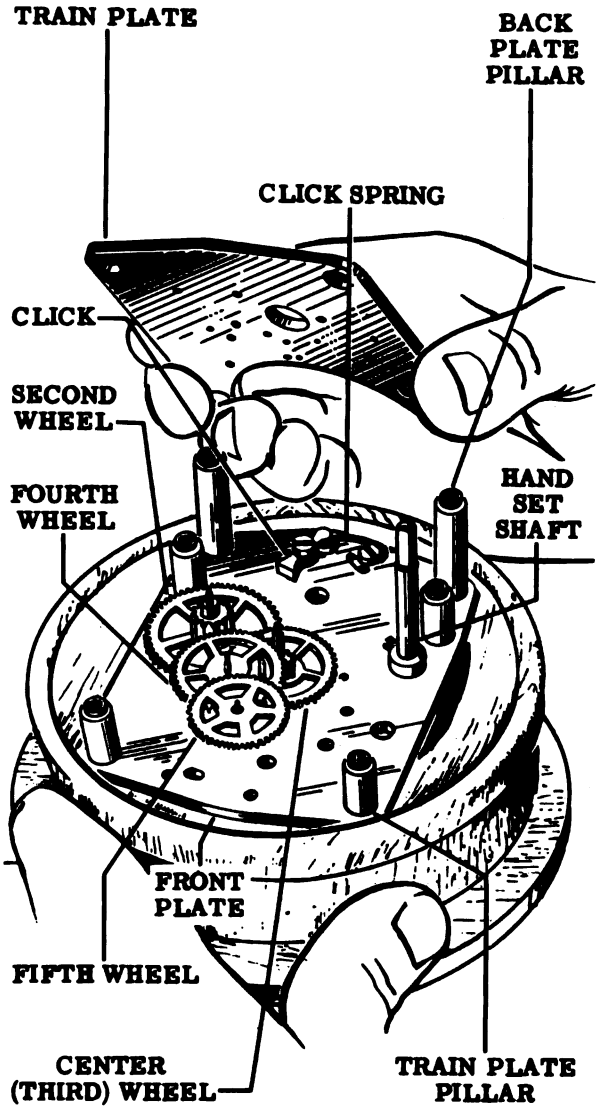

Figure 47

Since there are three major types of escapements used in Seth Thomas Movements and since escapement disassembly may be carried out by a person other than the one disassembling the main movement, the procedure is described under "Escapement Disassembly," Section III-A.

13. Unscrew the two train plate screws. Unscrew the two back plate pillars with the pillar pliers (Tool No. 6A) and remove the train plate as shown in Fig. 46.

A. Fig. 47 shows lifting off the train plate for Boat and Deck Clocks.

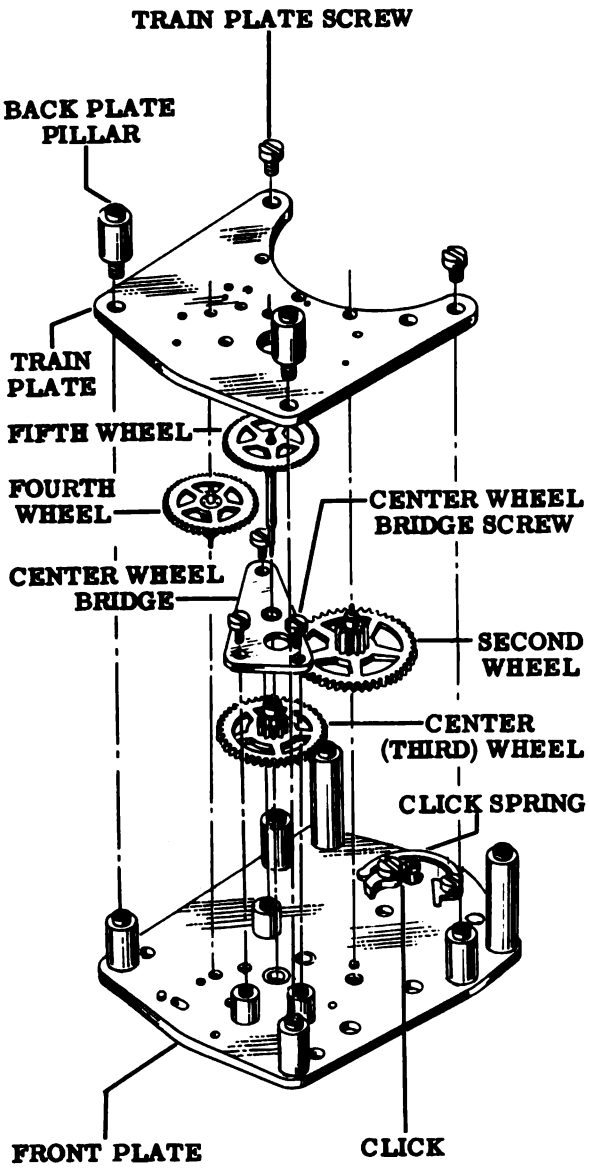

Figure 48—5165 Mechanical Clock Movement

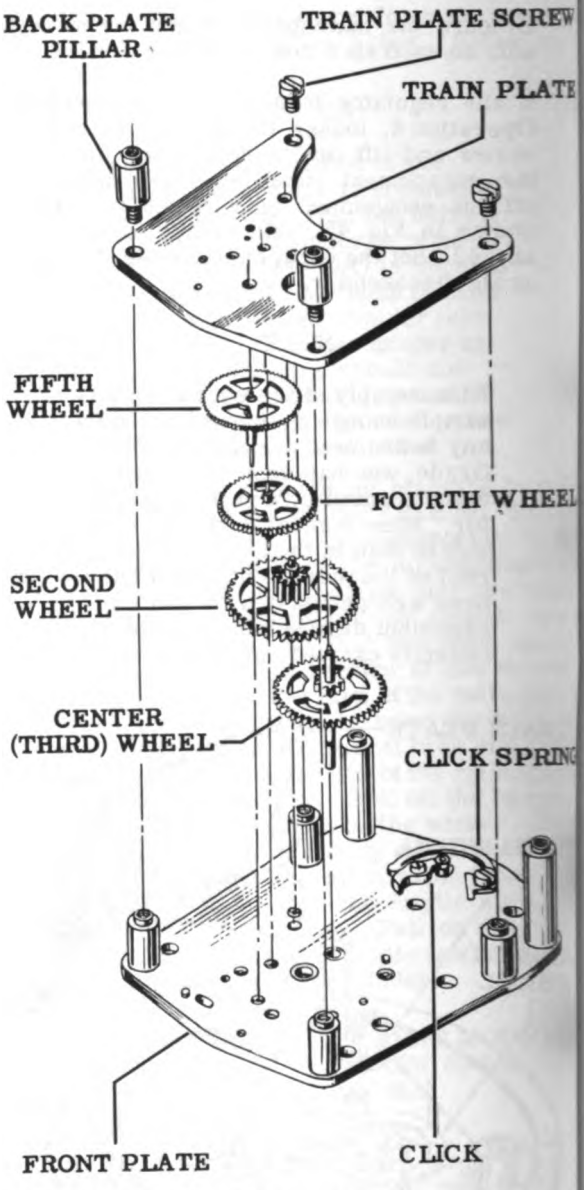

Figure 49—5189 Boat and Deck Clock Movement

14. Lift out the fifth, the fourth and the second wheels. See Fig. 48.

    A. In Boat and Deck Clock Movements also take out the center wheel. See Fig. 49.

15. Unscrew the three center wheel bridge screws, as shown in Fig. 50, and remove the center wheel bridge.

    A. There is no center wheel bridge on the Boat and Deck Clock Movements—proceed with Operation 16.

16. Remove the center (third) wheel. See Fig. 5

17. For purposes of cleaning, no further disassembly is required. The various pillars attached to the front plate need not be disassembled. The click and click spring also remain unless there is obvious need for them to be replaced.

All parts of the movement with the exception of the escapement should now be in the cleaning trays. After the escapement is disassembled and placed in its individual cleaning tray, return the trays to the Instrument Control Center

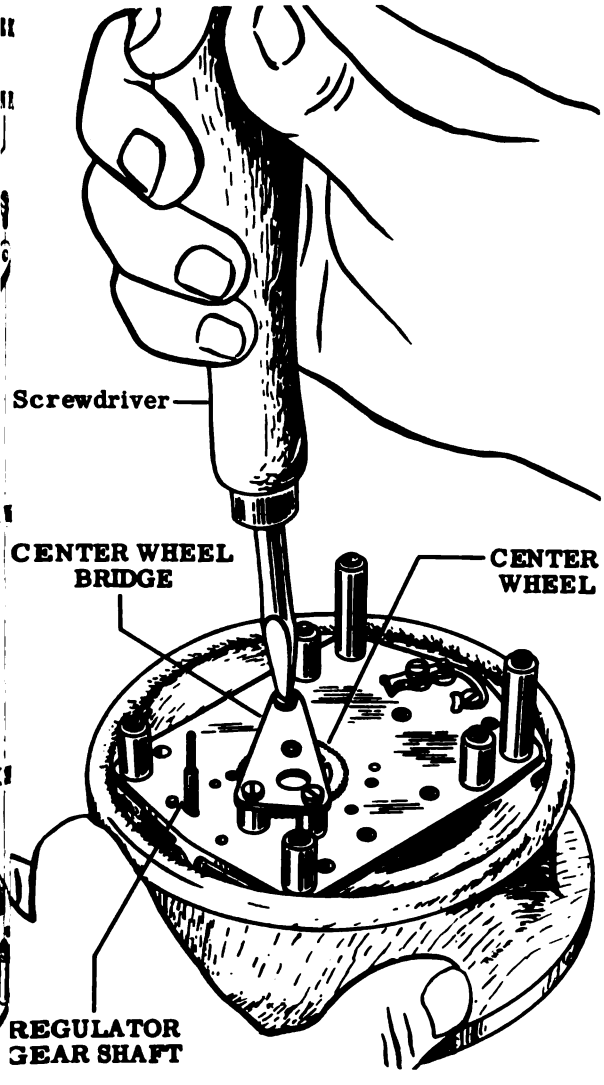

Figure 50

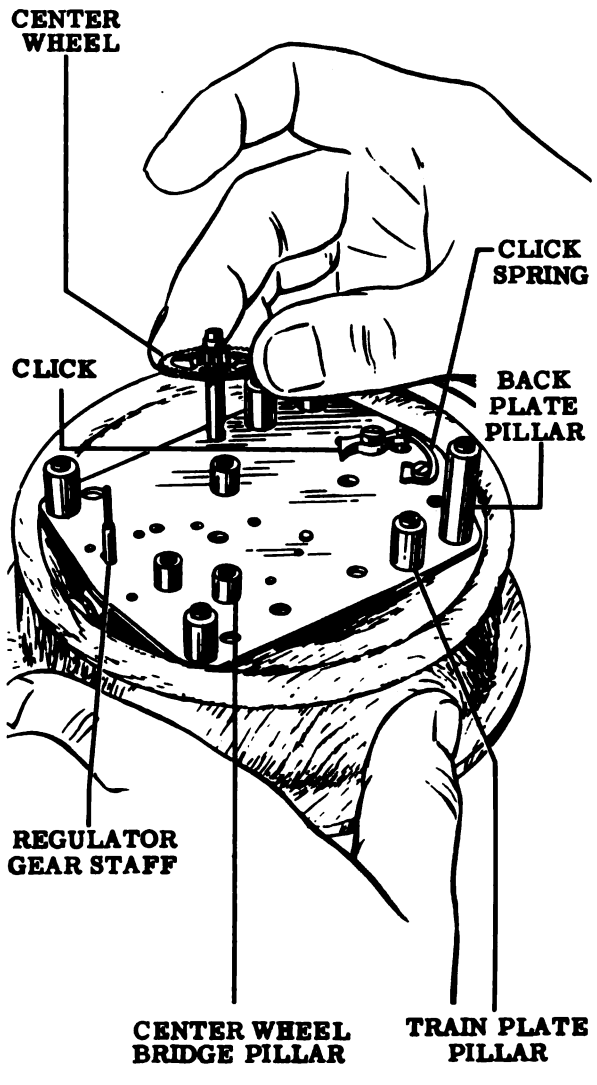

Figure 51

DISASSEMBLY OF THE 5160 SERIES MECHANICAL CLOCKS (5160, 5161-A, 5164, 5164-A)

CAUTION

In Operation 1 use only a letdown key with no projecting wings (similar to Tool No. 5A, which is indexed in Section VIII). Use of a winding key may result in serious injury to the fingers if they should slip while holding the key against the force of the mainspring. If a letdown key is not available, have the shop make up one for you by fitting a smooth round handle to a winding key.

1. **Before doing any disassembly work, let down the mainspring. Place the mainspring letdown key (Tool No. 5A) over the squared end of the barrel arbor and hold it firmly with the fingers of one hand. With the other hand hold the movement and press the click stud aside with the thumb as shown in Fig. 52, so that the ratchet wheel is disengaged from the click. The click will not disengage from the ratchet wheel when you press on the stud. To do this you must turn the winding key a very small amount (less than 1/8 of a turn) in a clockwise direction. When you do this you will feel the click disengage from the ratchet wheel and the force of the mainspring will be felt in the hand holding the letdown key. Allow the letdown key to spin slowly in the fingers until the mainspring is completely run down.**

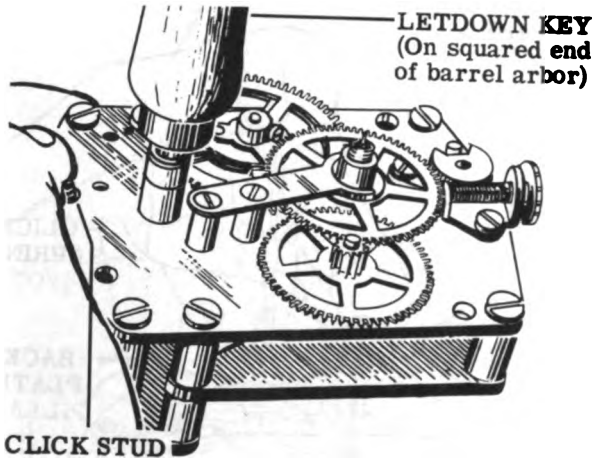

Figure 52

2. Place the movement dial side up on the movement work block, Tool No. 1C. Remove the minute wheel washer by spreading the slot with a screwdriver. Unscrew the two screws holding down the hour wheel bridge and lift off the hour wheel bridge as as shown in Fig. 53. Remove the two hour wheel bridge collars.

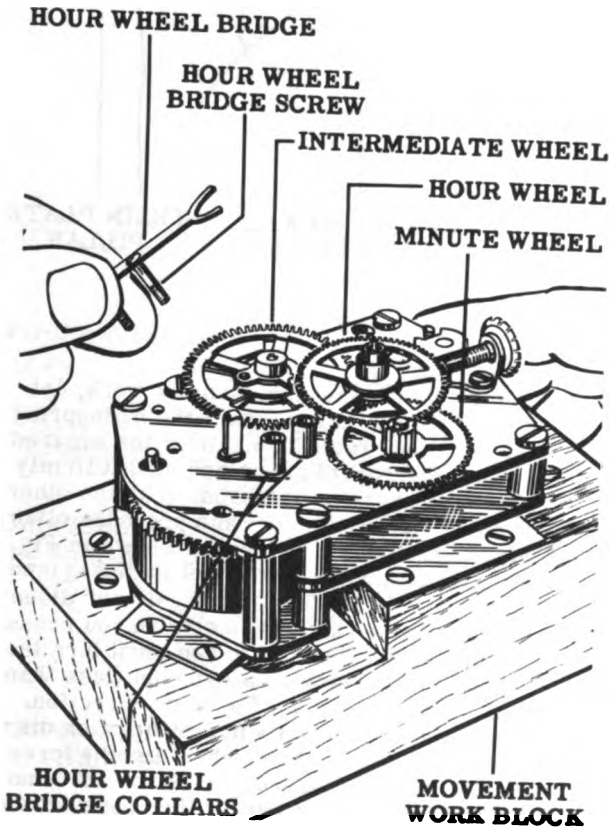

Figure 53

3. Lift off the hour wheel and the minute whee

4. Loosen the friction spring screw and lift o the friction spring. Lift off the intermedia wheel with its spring. See Figs. 53 and 5

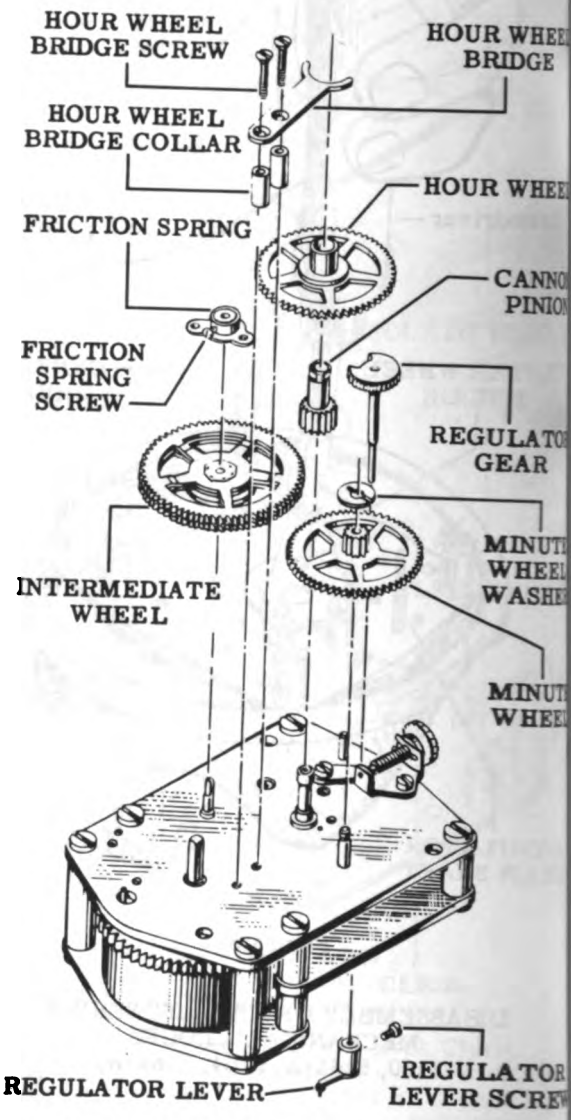

Figure 54—5160 Mechanical Clock Movement

5. Using the hand removers with felt pads (Tool No. 2A), pry off the cannon pinion a shown in Fig. 55.

6. Turn the movement so that it is train sid up on the work block. Unscrew the four back plate screws as shown in Fig. 56 an lift off the back plate.

7. Lift out the mainspring barrel along wit ratchet wheel and ratchet wheel spacer. See Fig. 57.

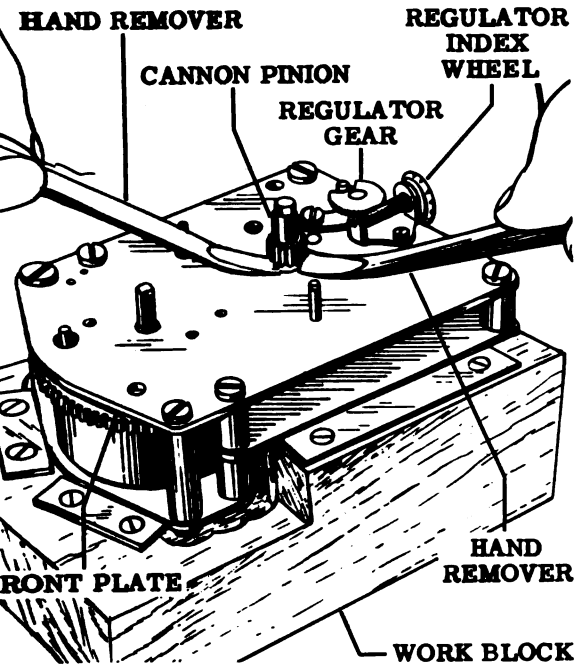

Figure 55

NOTE

Mainspring barrels may be set aside for separate disassembly or they may be disassembled at this time—as suits the facilities of the repair activity. Barrel disassembly is described here (Operations 8 through 10) for purposes of continuity.

CAUTION

Do not use a steel-headed hammer in Operation 8—it will deform the end of the barrel arbor.

8. To remove the barrel cap, hold the barrel tightly in one hand and strongly hit the squared end of the barrel arbor with a plastic- or wood-headed hammer. The shoulder of the arbor will transmit this force directly to the inside of the cap and force it out. See Fig. 57.

9. Unhook the barrel arbor from the mainspring and remove the arbor. See Fig. 57.

CAUTION

The only safe method of performing Operation 10 (removing the mainspring from the barrel)

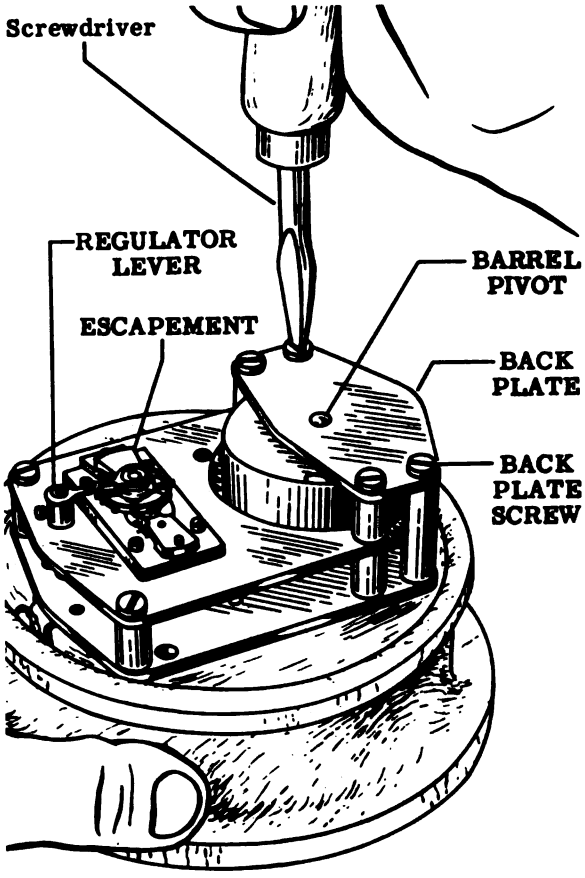

Figure 56

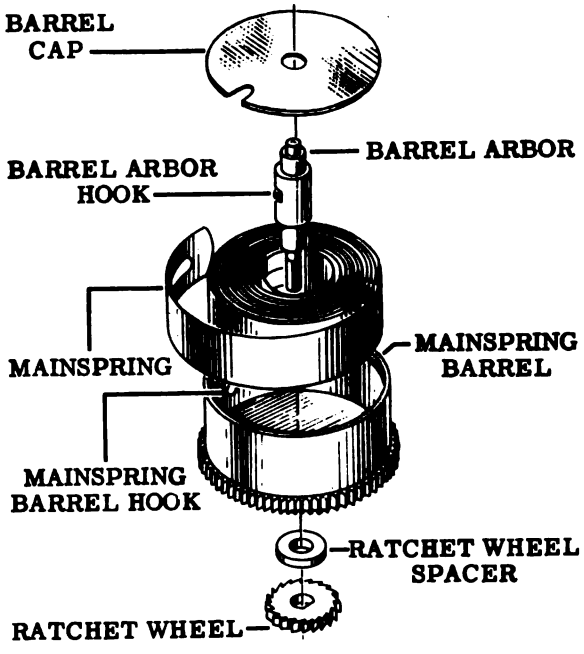

Figure 57

is to use the mainspring winding tool (Tool No. 9A) in the manner described. Methods of hand removal, although simpler, always involve serious danger to the hands and face should the fingers slip in their grip on the oily mainspring. No hand removal method is recommended.

10. To remove the mainspring, place the barrel on the mainspring winder (Tool No. 9A) so that the inner end of the mainspring is engaged by the hook on the turning shaft of the winder. Wind the spring onto the winder shaft just enough to form enough space inside the barrel so that you may insert into the barrel the portion of the winder which holds the outer turn of the mainspring. When the mainspring is securely held by the winder, turn the barrel back and forth to disengage the outer end of the mainspring from the barrel hook. Pull off the barrel, leaving the mainspring on the winder. Hold the winding handle firmly and release the click preventing the mainspring from unwinding. Slowly turn the handle so as to unwind the mainspring. Pull on the outer end of the mainspring while unwinding so as to draw it out of the winder.

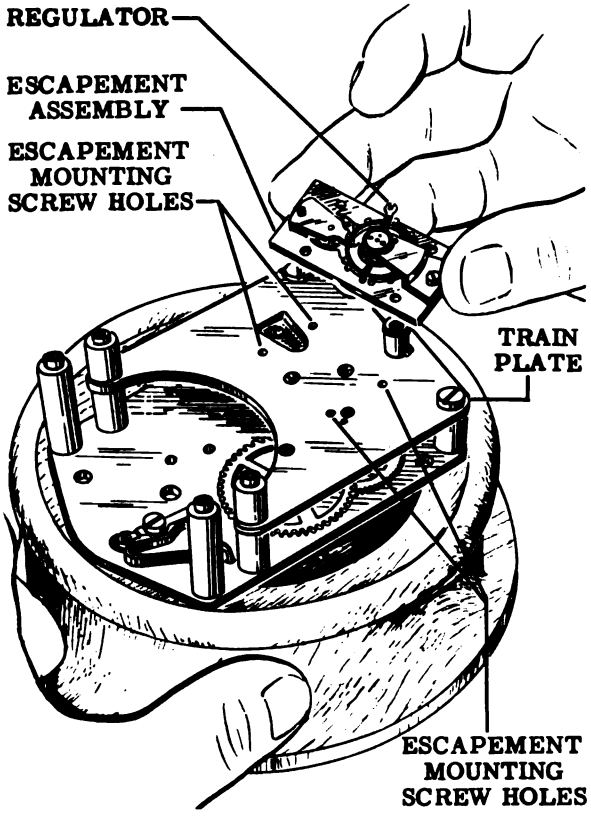

Figure 58

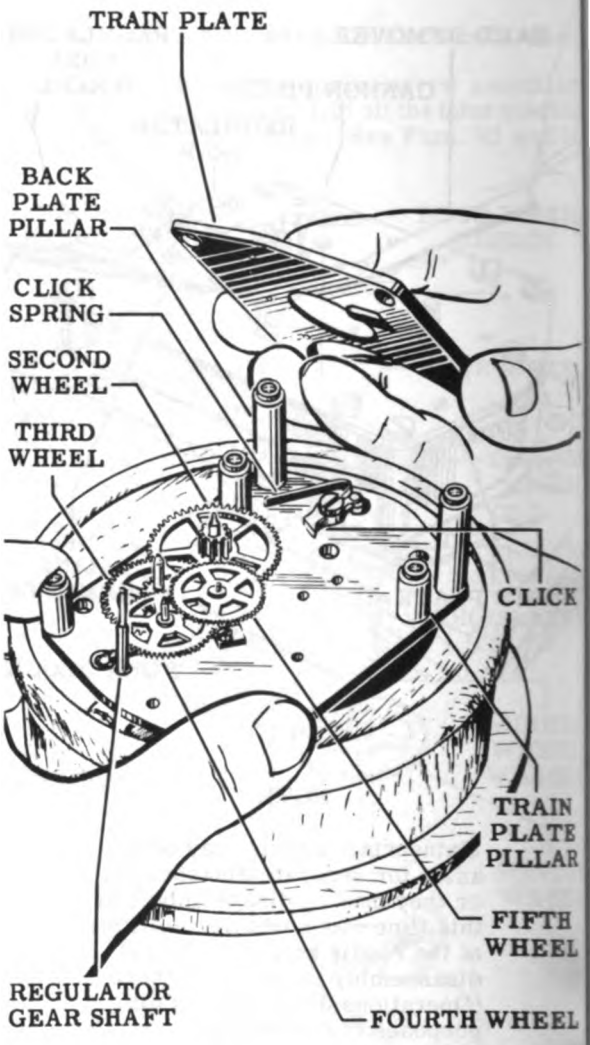

Figure 59

Discard the mainspring since a new one will be used upon reassembly.

11. Turn the movement on its side with the regulating mechanism toward you. Loosen the regulator lever screw. If the regulator gear is damaged, pull out the regulator gear through the front plate and slide the regulator lever out from under the regulator. Refer to Figs. 54 and 55.

    If the regulator gear is not damaged, allow it to remain in position and only remove the regulator lever.

12. Turn the movement so that it is train side up on the movement work block. Unscrew the four escapement mounting screws and lift off the escapement as a complete unit as shown in Fig. 58. Set the escapement aside for separate disassembly.

NOTE

Disassembly of the escapement is simple enough to be performed by any Instrument Assembler, Junior Grade, who has seen the process demonstrated by a skilled operator. More manual dexterity is required than is the case with the rest of the movement, but it has been well demonstrated that escapement disassembly may be efficiently carried out by this skill level.

Since the escapement disassembly may be carried out by a person other than the one disassembling the main movement, the procedure is described under "Escapement Disassembly," Section III-A.

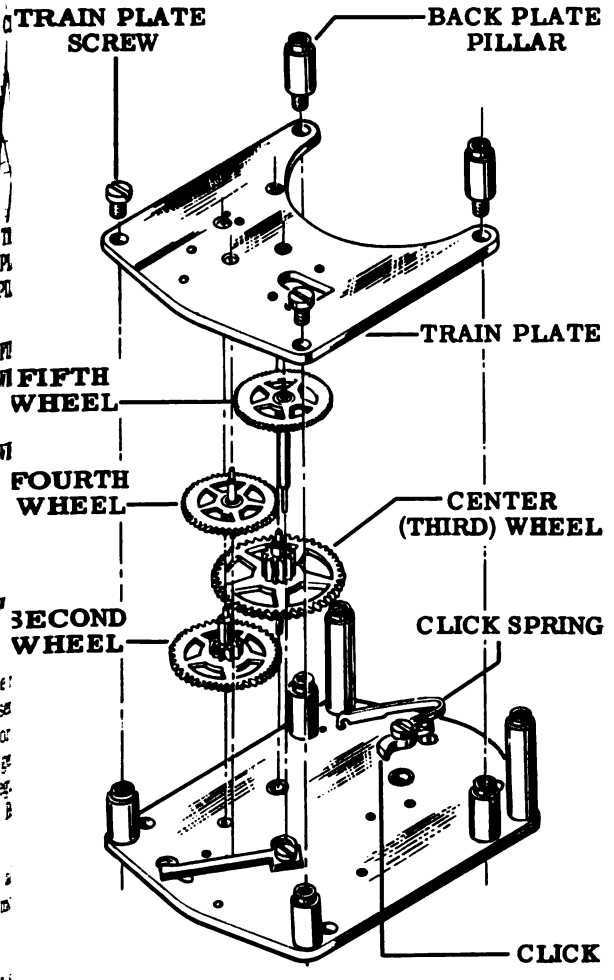

Figure 60—5160 Mechanical Clock Movement

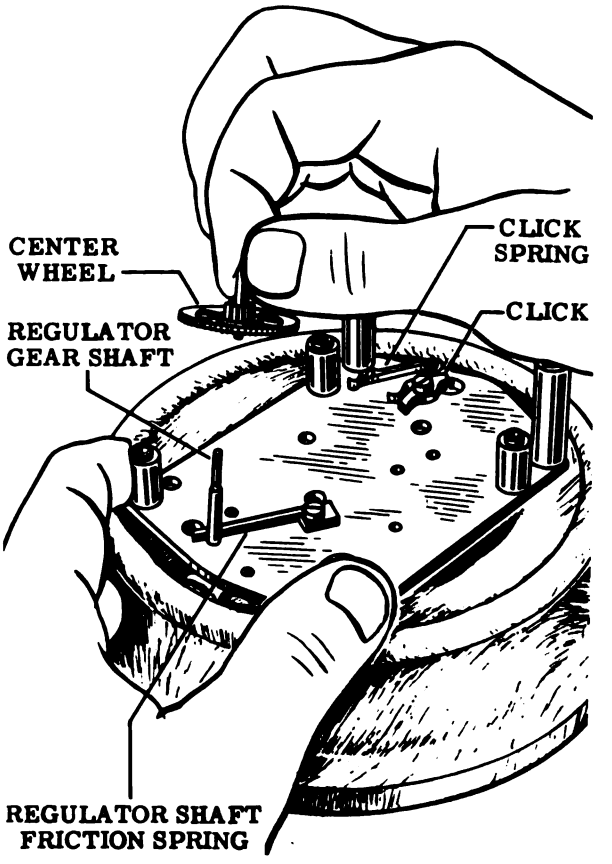

Figure 61

13. Unscrew the two train plate screws. Unscrew the two back plate pillars with the pillar pliers (Tool No. 6A) and remove the train plate as shown in Fig. 59.

14. Lift out the fifth, the fourth, the second and the third wheels. See Figs. 60 and 61.

15. For purposes of cleaning, no further disassembly is required. The various pillars attached to the front plate need not be disassembled. The click, click spring and regulator gear remain attached unless there is obvious need for them to be replaced. See Fig. 61.

All parts of the movement with the exception of the escapement should now be in the cleaning trays. After the escapement is disassembled and placed in its individual cleaning tray, return the trays to the Instrument Control Center.

SECTION III-A

ESCAPEMENT DISASSEMBLY

Skill Level: Mechanical Instrument Assembler, Junior Grade

Although the three escapements used in Seth Thomas Mechanical, Boat and Deck Clocks differ somewhat in appearance, they are very similar in the function of their parts. For this reason, the disassembly of all three escapements is treated simultaneously. Since the R-20666 escapement is the one in most widespread use, its disassembly is described. The disassembly of the R-20695 and the R-18565 escapements are adequately illustrated by means of exploded views, and appropriate notes are included in the text to call attention to any difference in the disassembly of these escapements from the R-20666.

The following operations may readily be performed by any Mechanical Instrument Assembler, Junior Grade, after one or two demonstrations of the manual techniques involved.

1. Place the escapement upon the escapement work block (Tool No. 7B for Seth Thomas Escapements and Tool No. 7C for Elgin Escapements). The potance should be placed down in the work block hole so that the escapement lies level as shown in Figs. 62, 63 and 64.

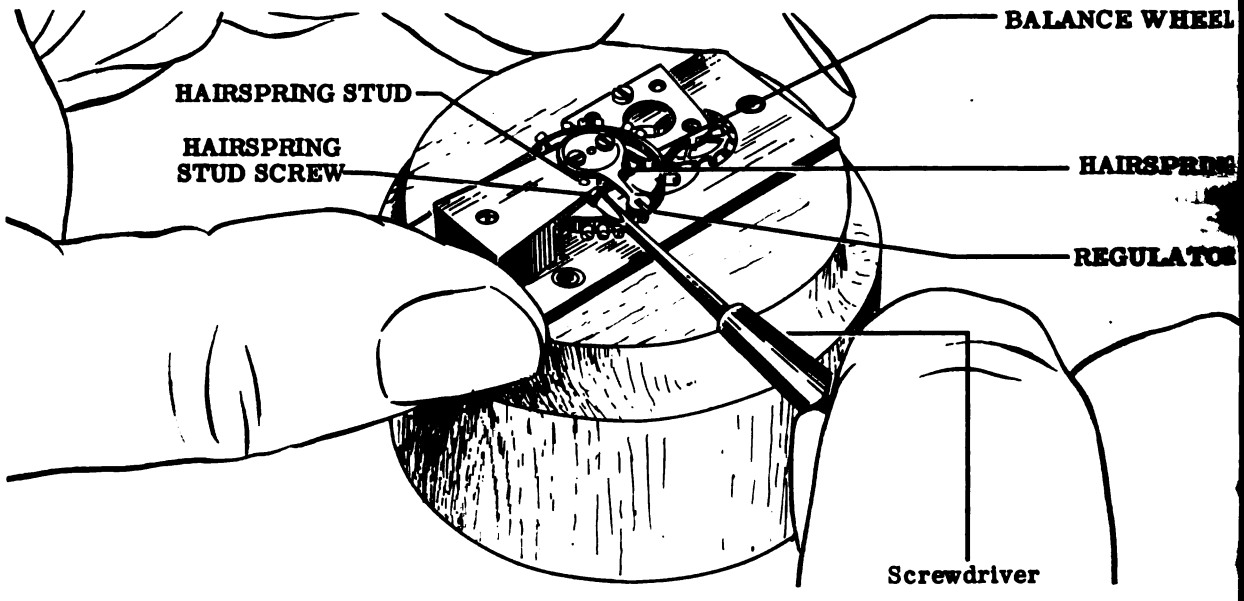

Figure 62—"New" Seth Thomas Escapement (R—20666)

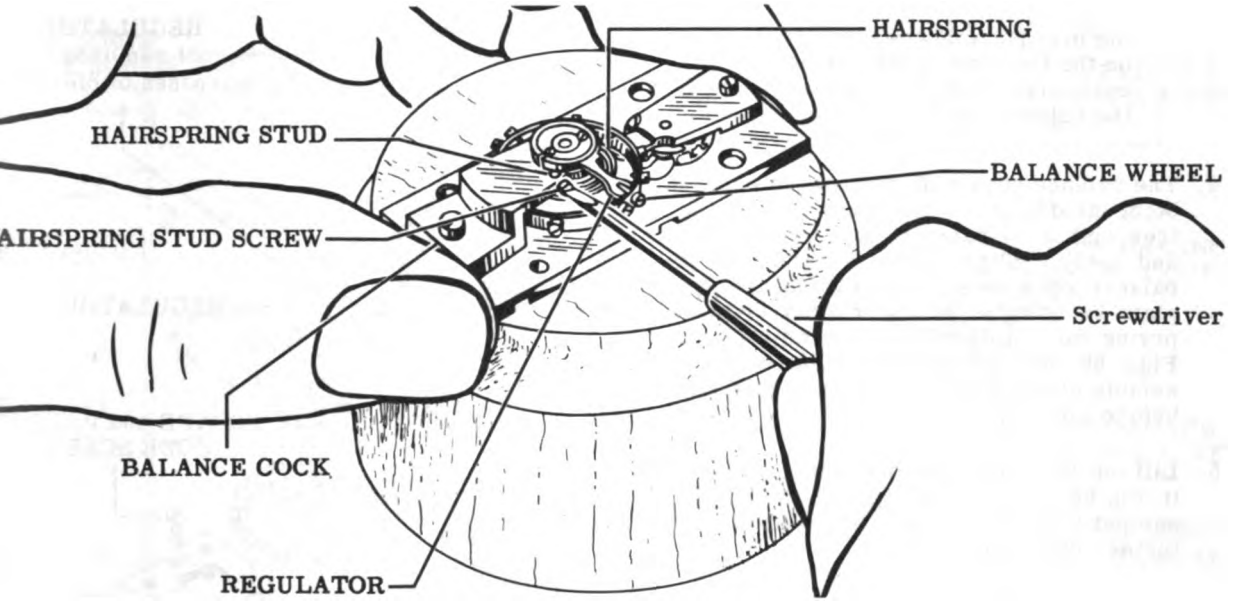

Figure 63—"Old" Seth Thomas Escapement (R—18565)

Loosen the hairspring stud screw several turns, as shown in Figs. 62, 63 and 64, to release the hairspring stud from its hole on the balance cock. With a very small screwdriver, push the hairspring stud down out of its hole in the balance cock. Retighten the stud screw into the balance cock.

Unscrew the balance cock screw.

CAUTION

In Operation 4 (removing the balance cock) be sure to lift the free end of the balance cock with tweezers while prying the base loose from the escapement plate. If the free end of the balance cock is not lifted, the pry-

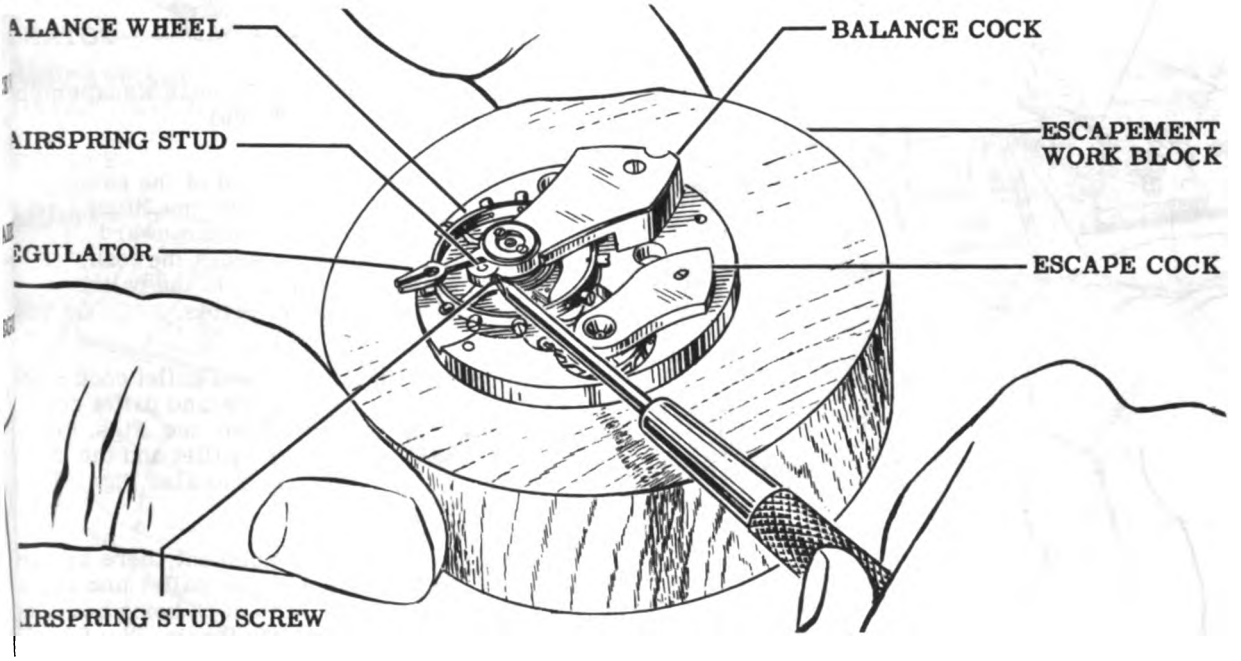

Figure 64—Elgin Escapement (R—20695)

ing may put a downward force on the free end of the balance cock—resulting in damage to the balance staff pivots.

4. The balance cock will remain in position, being held by its steady pins. Grasp the free end of the balance cock with tweezers and apply a slight upward force. Pry the balance cock loose from the escapement plate by using a small screwdriver in the prying hole. Lift off the balance cock. See Figs. 65, 66, 67 and 68. No further disassembly of the balance cock is to take place before cleaning.

5. Lift out the entire balance wheel as shown in Fig 69, and also in Figs. 66, 67 and 68, and put it in the cleaning tray without any further disassembly.

CAUTION

In Operation 6 (removing the escape and pallet cock) the free end of the escape and pallet cock must be lifted with tweezers while prying the base loose from the escapement

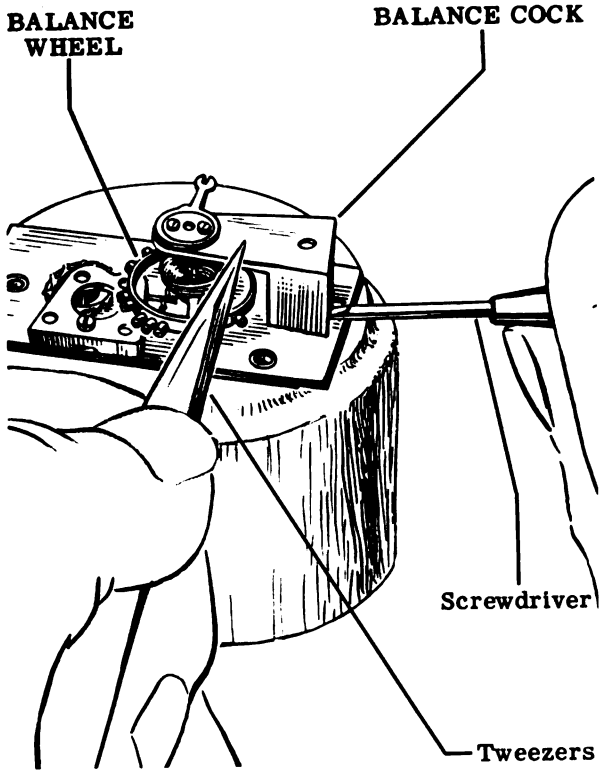

Figure 65

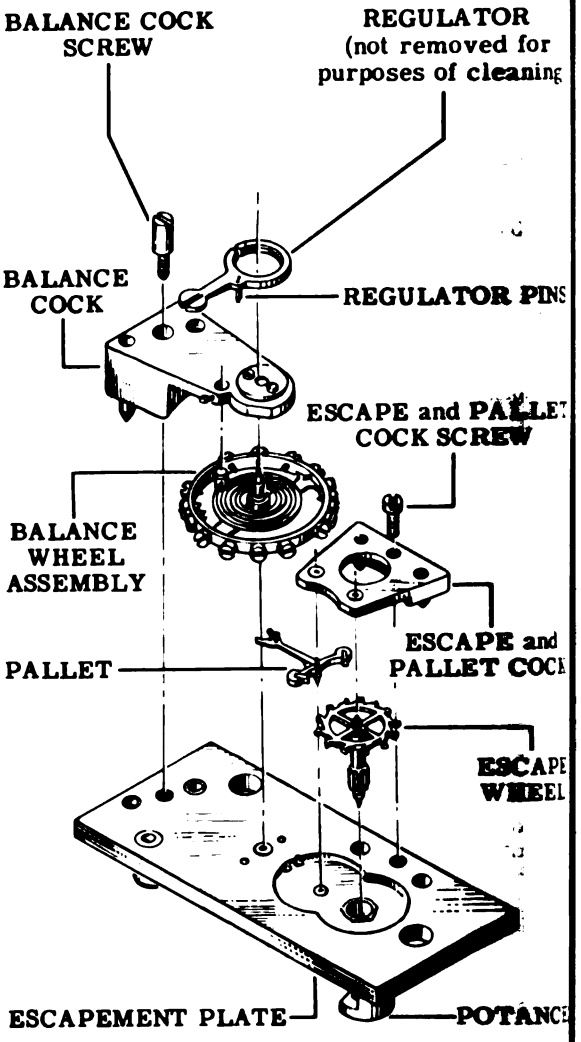

Figure 66—"New" Seth Thomas Escapement (R—20666)

plate. If the free end of the escape and pallet cock is not lifted, the prying may put a downward force on the free end of the cock, resulting in damage to the pallet and escape wheel pivots.

6. Unscrew the escape and pallet cock scre and remove the escape and pallet cock a shown in Fig. 70. Also see Figs. 66, 6 and 68. Lift out the pallet and the esca wheel. See Fig. 71, and also Figs. 66, 6 and 68.

   A. In the Elgin escapement, there are se arate cocks for the pallet and the e cape wheel—each cock being held do by one screw. Refer to Fig. 68. U screw the pallet cock screw, remove escape cock and lift out the escape whe

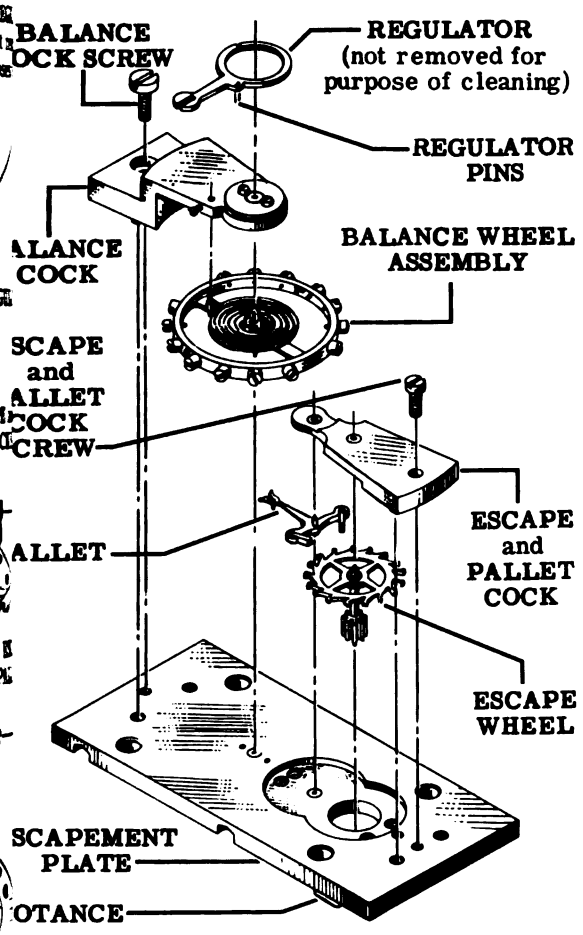

Figure 67—"Old" Seth Thomas Escapement
(R—18565)

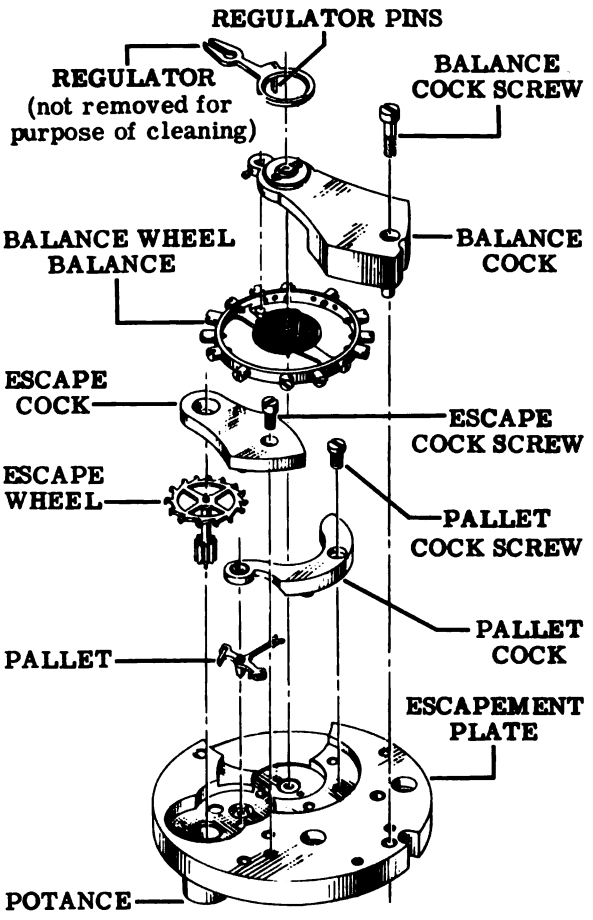

Figure 68—Elgin Escapement
(R—20695)

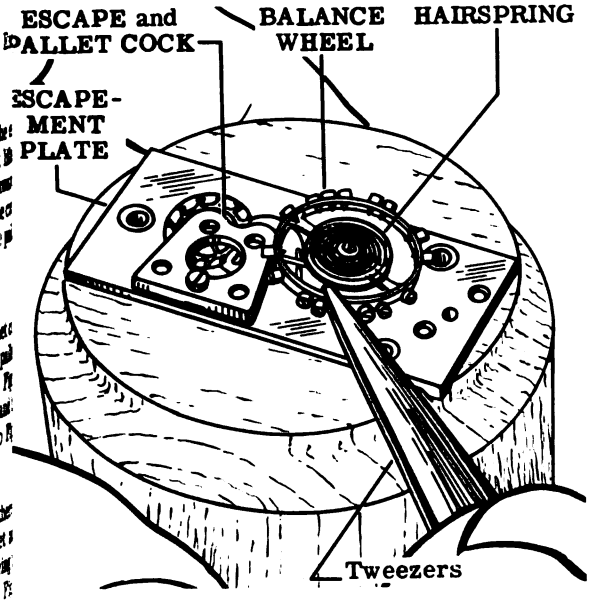

Figure 69

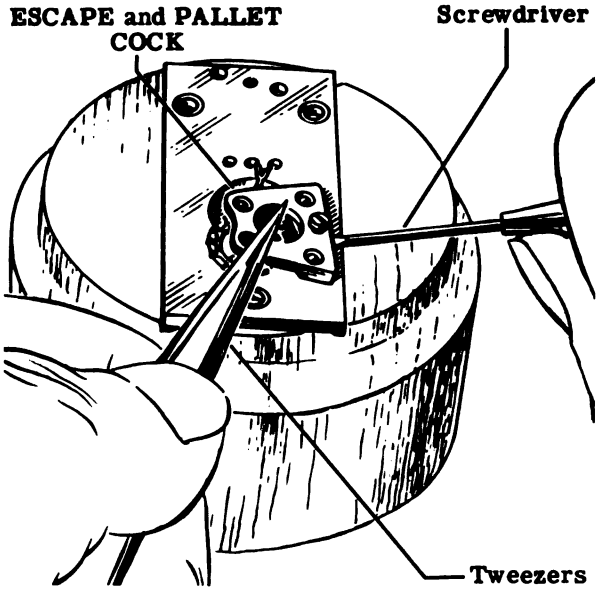

Figure 70

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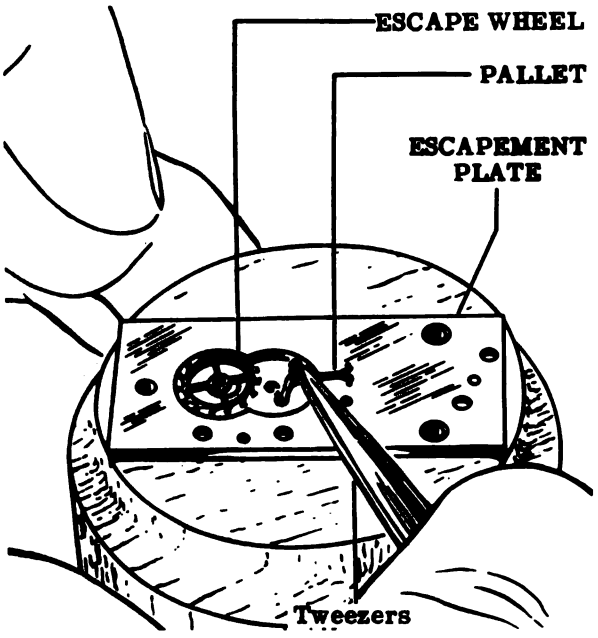

Figure 71

The disassembly of the escapement is now complete, as far as required for the purposes of cleaning. The escapement parts should all be in the escapement cleaning tray. Place the escapement cleaning tray into the parts tray and return to the Instrument Control Center. From there the disassembled escapement will be cleaned and then turned over to watchmakers for reassembly and adjustment. As has been pointed out previously, if the volume of escapement repair is sufficient, centralized repair of escapements can be established. This arrangement would allow a competent mechanical instrument assembler the opportunity of learning this specialty of escapement reassembly. Development of skills and knowledge along this path would allow the mechanical instrument assembler to graduate into the watch repair field.

At this point, a Seth Thomas movement, including the escapement, would have been disassembled. The next series of operations to be performed, are those described in Section IV, "Parts Inspection, Repair and Cleaning."

SECTION IV

PARTS INSPECTION, REPAIR AND CLEANING

Skill Levels: Cleaning Operations—Cleaner

Inspection Operations—Mechanical Instrument Assembler, Senior Grade

The purpose of the procedures included within this section is to prepare a complete set of clean and serviceable parts that will reassemble easily and efficiently. The pre-disassembly inspection determined what parts were defective and what particular fits were not within tolerance —as much as this was possible before disassembly. These functional defects were noted on the route ticket, and all parts listed or parts concerned in any defective fits listed on the route ticket must be double-checked for defects. Remember that the defects noted on the route ticket are to be checked in addition to the inspection procedures in this section.

The economy of clock overhaul is largely determined by the skill and efficiency of the inspector. Time and money invested in the reassembly of a clock will be wasted if a defective part is included. A defective part which has passed inspection will either cause a clock to fail in passing its performance test or, which is still more undesirable, it will cause a clock to have an early breakdown when it is placed in service in the Fleet. The responsibility is yours —learn your job and apply yourself to it.

Inspection Standards

Seth Thomas Mechanical, Boat and Deck Clocks were designed and manufactured on the basis of interchangeable parts, and every part can be replaced without causing any special problems of fitting or matching. Repairs are expensive and tend to destroy the standard dimensions of a part. Do not perform any repairs that involve machining. This is to be the policy with all parts—including those in the escapement. Replace all parts which have functional defects or structural weakness—not merely for the sake of appearance. Refinishing of the clock case and bezel is the only true repair which is permissible. Further discussion of this policy will be included in the specific inspection instructions which are set forth later in this section.

Performance and Usage Data

The Navigational Instruments Section of the Bureau of Ships needs to be informed as to how various clock parts are holding up in service. It is only with complete recorded facts that design improvements can be made to bring about desirable changes. Therefore, from time to time, you will be requested to report on certain conditions of performance; this is a very important function of inspection, so don't pass it off lightly. In addition, since you are the "eyes and ears" of the Bureau of Ships, you should take it upon yourself to bring attention to certain of your own observations which you consider important. Remember that the Navy is one of the largest individual users of clocks in the world and, as a result, you will gather a tremendous amount of information on the performance of all clock parts. It is only from the experience data you supply that the Bureau can be kept up to date on developments in the field. Your efforts in this connection will be very much appreciated.

CLEANING OPERATIONS

Skill Level: Cleaner

Clean all parts—case, dial, movement and escapement parts. The standard techniques and materials to be used are fully described in "Cleaning Clock Parts" as referenced in the index of the Control Manual. No instructions are given here.

NOTE

Parts that are obviously defective need not be cleaned. They should be replaced with new parts in the cleaning baskets so that clean new parts will be available for reassembly.

INSPECTION OPERATIONS

Skill Level: Mechanical Instrument Assembler, Senior Grade

The exploded view and parts lists in the Maintenance Parts Catalog (Section VII) will provide a means for identifying parts and obtaining stock numbers for requisitioning replacements. The parts lists also indicate those parts which should be replaced as a subassembly and not individually.

NOTE

All inspection and repair work on the escapement other than preliminary disassembly and cleaning is to be done only by Watchmakers, Junior Grade, under the supervision of a Watchmaker, Senior Grade. For this reason, inspection and repair is divided into two parts: One part for the case, dial and movement less the escapement (Section IV) and one part for the escapement operations alone (Section IV-A).

Inspection of the Case, Dial and Movement—Less Escapement

After the disassembled parts are perfectly cleaned, the parts tray will be delivered to the inspector—less the escapement parts which will go to the Escapement Repair Group. The check list which follows tells you the defects for which you should look. Worn, damaged or badly corroded parts are to be replaced. The check list mentions particular checks that are required, although various other reasons may be found for replacing a part. It should be noted that no repairs should be attempted other than those indicated. The basic reason for this that it is usually more economical to replace a defective part with a new one rather than to repair it. Repairs are expensive and often cause a changing of the dimensions of parts which results in complications during reassembly.

CAUTION

The parts you receive will be clean—keep them that way. Keep handling to a minimum and use tweezers whenever possible. Fingerprints hold dust, promote corrosion and interfere with proper oiling. Pivots and bushings are specially critical points—never touch them with the fingers.

NOTE

Because case, dial and hand inspection and refinishing may involve the use of paints and buffing equipment, it is recommended that these operations be performed by a different inspector and away from the movement inspection position. Such procedure will minimize the likelihood of dirtying the movement parts.

INSPECTION CHECK LIST

Before proceeding to make any of the checks on the following list, first refer to the "route ticket" accompanying the clock parts. This route ticket may bear notations which are to be considered in addition to the check list which follows. As you carry on in accord with each notation, initial it to indicate that the work has been done. The appearance standards called for in these instructions are essentially for "like new" final appearance. Refer to the route ticket to check whether any other appearance standards are specifically called for.

Case and Dial Components

1. Check cases and bezels for cracks, breaks, chips, warpage or damaged hinge lugs which prevent proper closing of the case or permit the entry of dust or moisture. If any such condition exists, the part must be replaced with a new one.

2. Check cases, bezels, back plates and bulkhead plates for superficial scratches, chips and damage to the finish. These defects are not a cause for replacement unless they cannot be removed and seriously affect the appearance of the clock.

   Scarred hinge pins and case knobs may be replaced. Finish damage may be removed by careful use of a very fine wire wheel or sandpaper, followed by buffing to a polish that will match the rest of the case. Where the black finish has worn off metal inserts which are used for hinging and locking the case, the exposed portion should be wire-brushed clean and carefully touched up with matching paint—see "Paints" as referred to in the index of the Control Manual.

3. In the case of Mechanical Clocks, inspect the glass set into the bezel and temporarily remove the locking wire in order to inspect the waterproof cement seal of the glass to the bezel. If the glass is broken, cracked

or badly scratched, it should be replaced with a new one and resealed to the bezel with waterproof cement—see "Waterproofing" as indexed in the Control Manual. If the waterproof seal is not in perfect condition, the glass should be resealed to the bezel with waterproof cement.

4. In the case of Boat and Deck Clocks, the permoseal crystal is not replaceable—the entire case must be replaced. Carefully inspect the permoseal crystal for any breaks or cracks which might permit the entry of dust or moisture. If such a condition exists, the case must be replaced. Do not replace the case because of superficial scratches on the crystal. Only scratches which prevent proper reading of the dial would warrant replacement in such case.

5. Inspect cork and rubber gaskets used to seal the case and rubber discs used for shock mounting. Check these parts for cracks, breaks and brittleness that indicate that the material is aged and dried out. If this condition is found, replace the part with a new one.

6. Inspect the dial and dial ring for any deformity or breakage. In these cases, replace the defective part. See that the numerals and markings on the dial are bright and clear. Superficial dial scratches are not to be the cause for replacement. Minor chips in the numerals and other dial markings may be retouched with matching paint. See "Paints" in the index of the Control Manual. However, do not attempt any refinishing which involves more than a few minor scratches or chips—in that event, replace the dial with a new one.

7. Check the hour, minute and second hands for bending, cracks or other physical deformities. If these are noted, replace the hand with a new one. If the finish of any of the hands is chipped or flaked, replace it with a new part.

8. Recheck the route ticket as it applies to the case, dial and hand inspection to make sure you have initialed and attended to each of the recommendations.

After the inspection and repair work is complete on the case components, the dial, and the hands, place the parts in the parts tray for delivery to the movement inspector.

CAUTION

Replacement parts procured from stock should be clean and in sealed containers. If the parts are not sealed or if preserving material has been put on them, have the parts cleaned before placing them in with the movement being inspected.

Movement Inspection

1. Check the pivots of all the train wheels. If the pivots are worn, scored, bent or broken, replace with a new wheel.

2. Check the teeth of all the train wheels and their pinions. If the teeth appear corroded, bent, worn or broken, replace with a new wheel.

3. Check each staff and the fit of each wheel on its staff. Replace any wheel which has a bent staff or which has loosened in its fastening to the staff.

4. Check the teeth on the barrel, the ratchet wheel, the cannon pinion, the minute wheel and the hour wheel. Also check the teeth on the regulator gear and the threads on the regulator index wheel worm screw. In the case of the Boat and Deck Clocks movement, check the hand set shaft pinion teeth. If any teeth or threads show any corrosion, bending, wear or breakage, replace the part.

5. Check barrel hook for looseness. If hook is loose, be especially careful in checking for bent teeth. If a bent tooth is found, replace the entire barrel. If hook is loose but no teeth are bent, the hook may be tightened by peening over the rivet.

6. In the case of the Boat and Deck Clocks movement, check the start and stop shaft spring and lever arm spring for any corrosion, deformity or breakage. If such is found, replace the spring with a new one.

7. Check each plate and bridge for any bending, cracks or corrosion which would affect the fit of any of the movement parts. Any of these conditions required replacement with a new plate or bridge.

8. In regard to all other miscellaneous pillars, screws, arbors, etc., the rule is as follows: If any part has corrosion, wear, bending or breakage which interferes with its function in the movement, it must be replaced.

When the case, dial, and movement parts have gone through inspection, they should be put back in the parts tray.

9. Recheck the route ticket to see that all the recommendations referring to movement inspection have been initialed to indicate that the work has been done. Return the parts tray to the Instrument Control Center.

SECTION IV-A

ESCAPEMENT OPERATIONS PROCEDURE

Skill Levels: **All Escapement Operations Except Matching—Watchmaker, Junior Grade**

Escapement Matching Operations, Bench Inspection Operations and Supervision—Watchmaker, Senior Grade

The larger part of the operations described in this section are intended for Junior Grade Watchmakers who are under the supervision of a Senior Grade Watchmaker. When the skill of a Senior Watchmaker is required for certain critical adjustments, special note will be made.

As mentioned in Section I, Mechanical Instrument Assemblers, Senior Grade, may be trained to do work as "Escapement Specialists." It has been demonstrated in commercial practice that these Escapement Specialists can readily be trained to perform efficiently any one of such specialized jobs as jewel inspection and replacement, balance wheel truing and poising, balance wheel repairs, hairspring repairs, endshake and sideshake adjustment, etc. Utilization of this specialist rating can be used to expedite the establishment of centralized escapement overhaul and repair.

The escapement repairs described in this section apply equally to all escapements used on Seth Thomas Clocks. When any variation in the procedure is required because of physical differences between the various escapements, special attention will be called to these procedure variations. In spite of the fact that escapement overhaul is essentially the same for all three escapements, it should be expected that the R-18565 ("Old Style" Seth Thomas) will require much more care in adjustment than either the R-20666 ("New Style" Seth Thomas) or the R-20695 (Elgin) escapements. The reason for this is that the R-18565 escapement had its components specially matched and fitted together while the two other escapements are manufactured to standard dimensions and closely held tolerances.

Since the escapement operations of inspection, repair, oiling, reassembly and adjustment are all normally and necessarily done by a Senior Grade Watchmaker or by persons under his immediate supervision, they are all included in this section. For that reason, the entire sequence is described as it would normally be performed on a flow-line basis. The number of persons required in such a flow line depends basically upon the number of escapements to be overhauled and therefore, the subdivision of the overhaul process is left to the discretion of the supervisor.

Escapement operations begin when the cleaned escapement parts are delivered to the watchmaker along with the inspection report. Escapement operations end when the escapement is completely overhauled and ready for insertion into the main movement.

Descriptions of proper oiling techniques and materials are included in "Timepiece Lubrication" as referenced in the Control Manual index. It is to this heading that reference is made when the "Control Manual" is mentioned in connection with escapement lubrication.

Repairs to parts, and any adjustments for ich specific instructions are not given in this :t, are accomplished by the same methods :h which the watchmaker is thoroughly accus-ned by his work on other timepieces. In all ses, the basic tools of the watchmaker will be ind to be completely adequate for escapement erations, although a few special fixtures are commended for convenience.

NOTE

Certain adjustment and repair operations—which are standard procedures requiring special explanation or involving more than one or two operations—are described under "Special Timepiece Repair and Adjustment Operations" (see the Control Manual index).

This plan is followed in order to avoid breaking up the text in this section, which describes the normal sequence of events. When "Special Operations are mentioned, locate the operation in "Special Timepiece Repair Operations" in the Control Manual index.

spection Standards

Seth Thomas escapements R-20666 and 20695 were designed and manufactured for e parts to be interchangeable, and every part n be replaced without causing any special pro-ems of fitting or matching. Repairs are ex-nsive and tend to destroy the standard dimen-ons of a part. Do not perform any repairs that volve machining. The intent is that the watch-aker devote his skills to making the necessary sts and adjustments indicated in this section d shall not spend any time correcting badly nt hairsprings, repairing scored or bent piv-s and other repairs which are best corrected replacement.

It should be again noted that the above is t necessarily true for the R-18565 escapement. ith this type it may be necessary to individually any new replacement parts to the other com-nents of the escapement. Since there were a mber of slightly different balance wheels used th this escapement, great care should be taken nen replacing any of the balance or hairspring mponents in order to avoid using the wrong placement part—always refer to Parts Cata-g Section VII.

Any questions you have on what you should repair, and what you should replace, are answered in this section and in the parts list. The exploded views of the escapements and their parts lists in the Maintenance Parts Catalog (Section VII) will provide a means for identifying parts and obtaining stock numbers for requisitioning replacements. The parts lists also indicate which parts are not recommended for replacement—in which case the part should be replaced by the next higher assembly.

Performance and Usage Data

The Navigational Instruments Section of the Bureau of Ships needs to be informed as to how various escapement parts are holding up in service. It is only with complete recorded facts that design improvements can be made intelligently. Keep a daily record of the number of escapements handled. On this record, keep columns for parts replaced and parts requiring unreasonably difficult adjustment. Identify each part by name and part number. Keep a comment column for noting exactly what was wrong with each part. You can expect to be requested to report on this from time to time. The keeping of repair, replacement and adjustment records is a very important part of your job as a watchmaker, so don't pass it off lightly. In addition, since you are the "eyes and ears" of the Bureau of Ships, you should take it upon yourself to bring attention to any special problems that you consider important. Since the Navy is one of the largest individual users of clocks in the world, you will have the opportunity of gathering a tremendous amount of information on performance which will be very useful to the Navigational Instruments Section of the Bureau of Ships.

ESCAPEMENT OPERATIONS

Skill Levels: Operations 1 through 25 and 30 through 40—Watchmaker, Junior Grade

Operations 26 through 29 plus supervision of Junior Grade—Watchmaker, Senior Grade

Before proceeding with the escapement operations, first refer to the route ticket accompanying the escapement parts. This route ticket will make recommendations which are to be considered in addition to the procedure which is outlined in the following paragraphs. As each recommendation is followed, initial it to show that the work has been done.

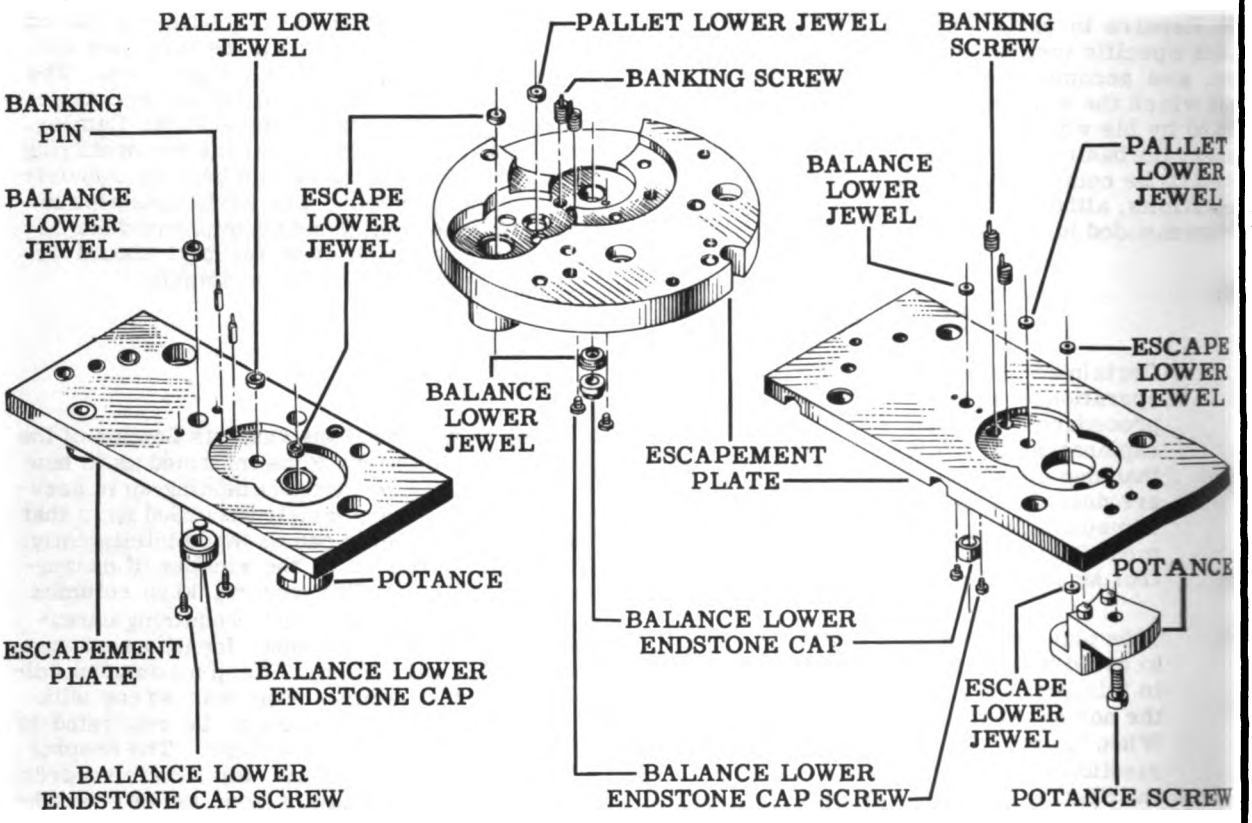

Figure 72—Escapements
"New" Seth Thomas (R—20666) Elgin (R—18565) "Old" Seth Thomas (R—20695)

1. From the escapement plate assembly, unscrew the two balance lower endstone cap screws and remove the balance lower endstone cap. See Fig. 72.

2. Clean off the endstone with a buff stick (see "Timepiece Cleaning" in the Control Manual to check the recommended techniques) and examine it for pits, chips, cracks or breakage. If the endstone is defective, it should be replaced as described in "Special Operations." See the Control Manual index.

3. Clean off the escapement plate with a buff stick dampened with the cleaner specified in "Timepiece Cleaning" in the Control Manual.

4. Peg out the balance lower, escape lower and pallet lower jewels from both sides with clean, soft pegwood. See "Timepiece Cleaning" in the Control Manual to check the recommended techniques. Blow out the holes with an air blast. Check the hole jewels for chips, cracks, breakage or possible wear. Chipped or worn hole jewels will usually be noticeably out of round. If any of the hole jewels are defective, they should be replaced as described in "Special Operations." See the Control Manual.

5. Check the banking pins with the tweezers to see that they are not loose. If solid type pins are loose, remove, close the hole with a bell-ended punch and replace. Escapement with screw type banking pins should have the screws slot spread to tighten the pins

6. Replace the balance lower endstone cap and lubricate—see "Timepiece Lubrication" as referenced in the Control Manual index.

7. Place the escapement plate on the work block (Tool No. 7B for Seth Thomas Escapements and Tool No. 7C for Elgin Escapements) so that the potance projects down into the hole permitting the escapement plate to lie flat.

8. Examine the escape wheel with a high-powered eyeglass, checking for bent or scored pivots and worn escape teeth. If any defect is noted, discard the escape wheel and replace with a new one. Place the escape wheel in its position on the escapement plate so that its pinion projects down int the potance. See Figs. 73, 74 and 75.

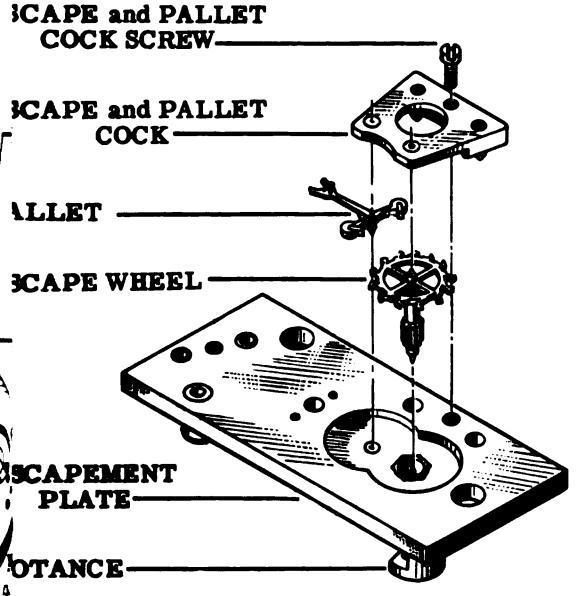

Figure 73—"New" Seth Thomas Escapement

9. Examine the pallet for chipped, loose or out-of-line stones. Check the pallet pivots for scoring or bending. Check the guard pin for proper fit and alignment. Loose or chipped stones may be re-set or replaced by the use of pallet warmers and thread

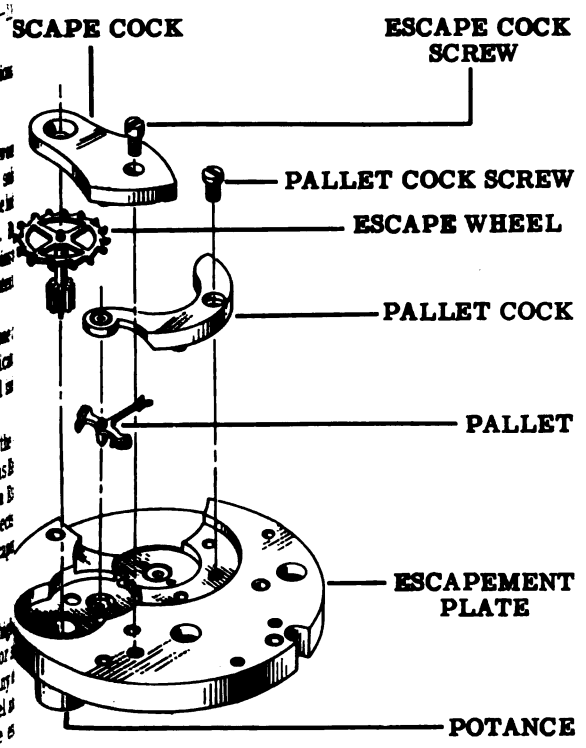

Figure 74—Elgin Escapement

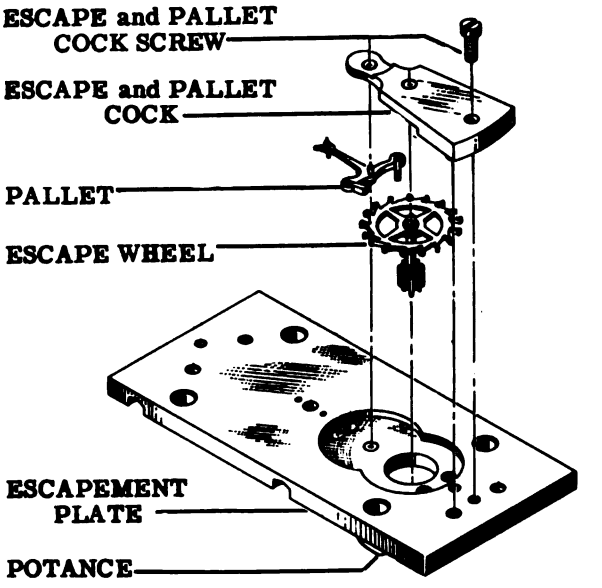

Figure 75—"Old" Seth Thomas Escapement

shellac. Defective pivots should be corrected by driving out the pallet arbor and replacing it with a new one.

10. No other repairs to the pallet are recommended. If they are required, the entire pallet assembly should be replaced. Place the pallet in its position on the escape plate. See Fig. 76 and also Figs. 73, 74 and 75.

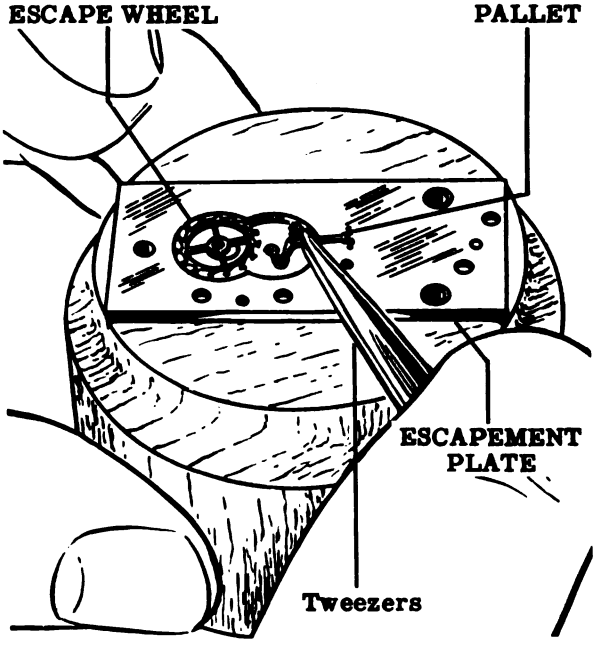

Figure 76

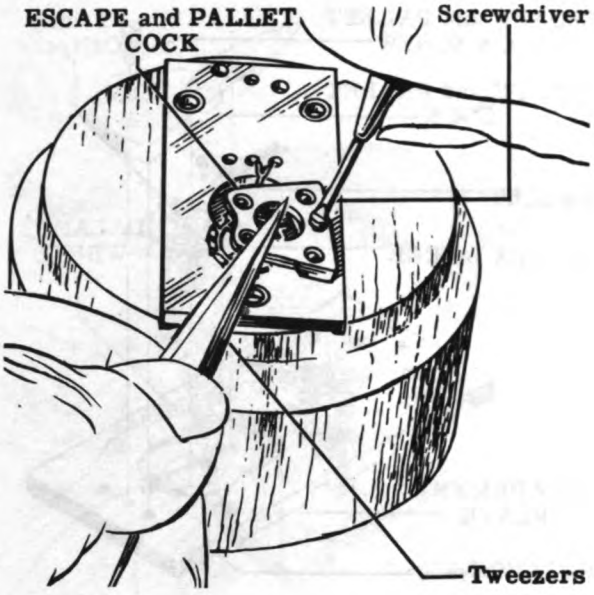

Figure 77

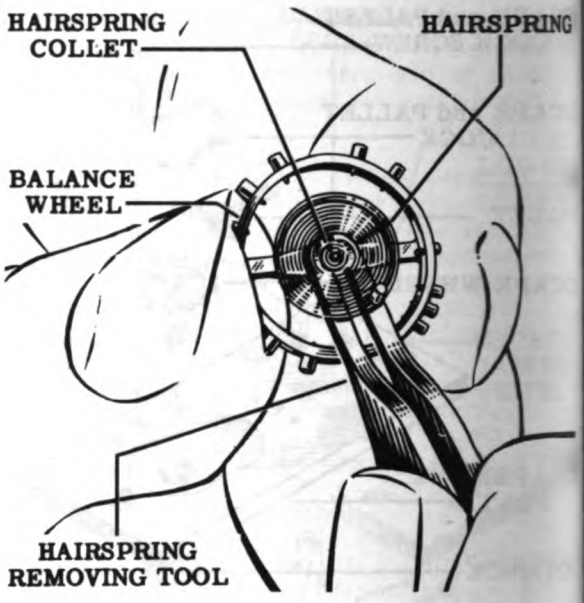

Figure 78

11. Mount the escape and pallet cock onto the escapement plate with its single screw. See Fig. 77 and also Figs. 73 and 75.

    A. There are separate pallet and escape cocks on the Elgin escapement, each being held in position by its own mounting screw. See Fig. 74.

12. Check the sideshake and endshake on the escape wheel and the pallet. Refer to "Clock Escapement Assembly Adjustment Standards"—see the Control Manual index. In the event that any sideshake or endshake adjustments are necessary on either the escape wheel or the pallet, first see "Special Operations" in the Control Manual.

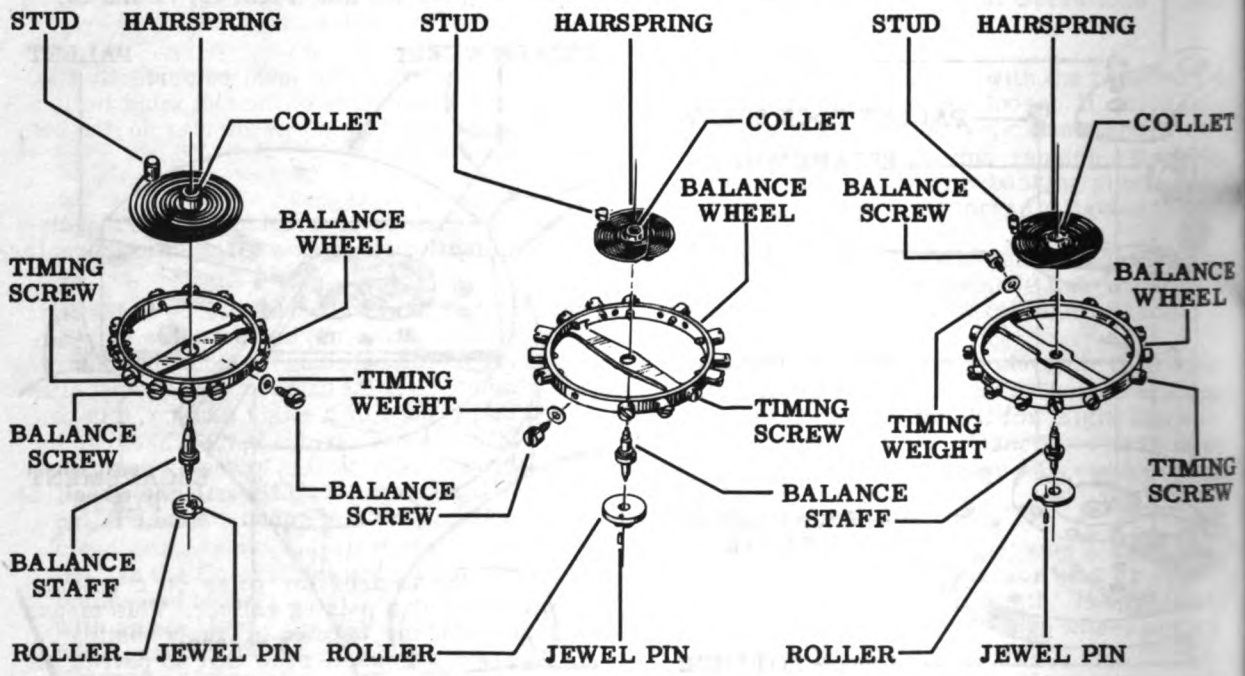

Figure 79—Escapements

"New" Seth Thomas (R—20666) Elgin (R—18565) "Old" Seth Thomas (R—20695)

13. Remove the hairspring assembly from the balance by using the special tool (Tool No. 21A) to pry under and pull off the collet. For details see "Special Operations." See Figs. 78 and 79.

14. Check the jewel pin on the balance roller for cracks, chips, breakage, tightness and proper alignment. Check the roller for tightness on the balance staff. If the roller is loose, remove it as shown in Fig. 80 with a regular commercial roller removing tool and replace it. It is not recommended that the roller hole be closed and reamed out for a tight fit since there is extremely little tolerance for eccentricity.

15. Check the balance pivots for scoring or bending out of line. If this condition exists, replace the balance staff as described in "Special Operations." See the Control Manual index. Do not attempt to repair a damaged pivot. Replace the balance staff.

16. Check the tightness of the balance screws and the timing screws. If a screw is damaged or worn, try a new screw. If the threads are stripped in the balance wheel, replace the entire balance wheel.

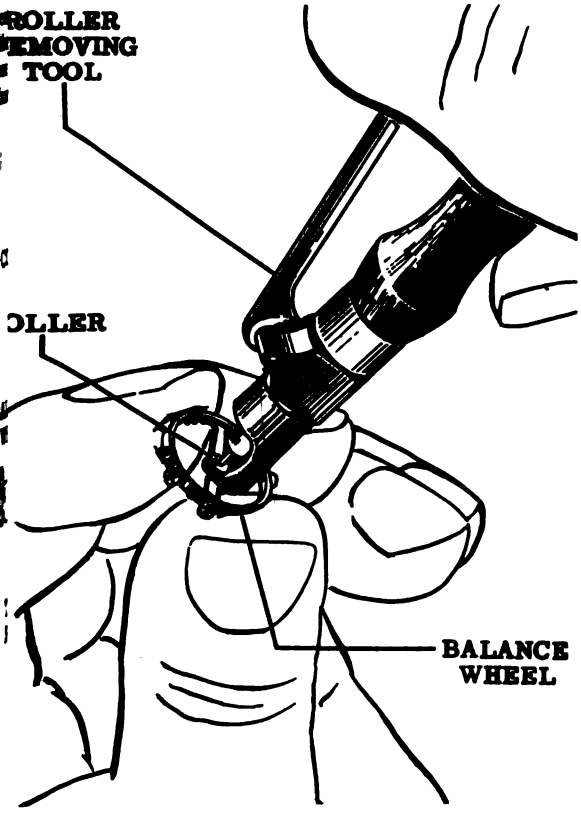

Figure 80

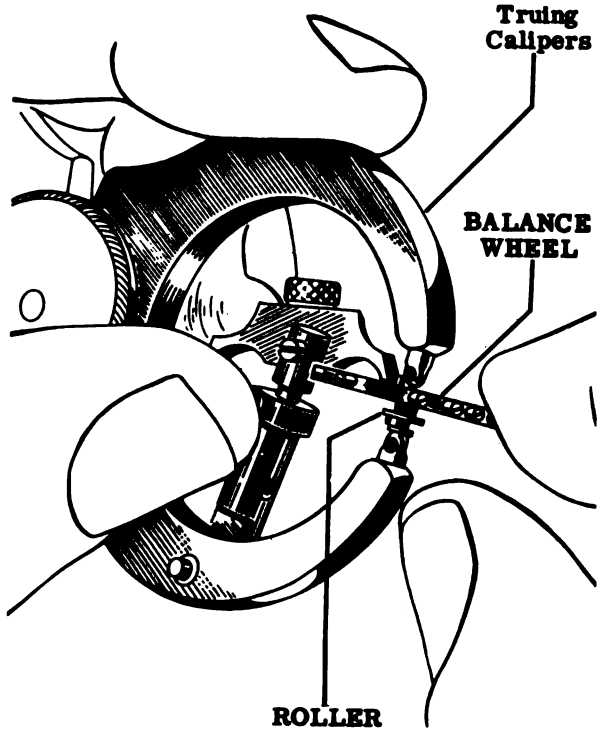

Figure 81

17. Using a truing caliper, as shown in Fig. 81, check to see that the balance wheel is true in the flat, and true in the round. This means that:

A. The balance rim must be perfectly flat and all portions of the rim must lie in a plane which is perpendicular to the balance staff.

B. The balance rim must form a perfect circle with the balance staff at the exact center.

If the balance wheel is not true in the flat, this condition may be corrected by bending one or both balance arms the required amount. If the balance wheel is not true in the round by a slight amount, this condition is not serious if the wheel can be brought into perfect poise as described in Operation 18. If the balance wheel is noticeably out of round, replace it.

18. Check the balance for poise on a poising stand or with a poising caliper. This means that, when the balance is freely resting on its pivots, it should show that no part of its rim is heavier than any other part. If any screw is apparently heavier than the opposite screw, carefully cut out the slot of the

heavy screw with a saw or file or undercut the screwhead with an undercutter as shown in Fig. 82.

19. If weight must be added to the balance wheel, use a washer under the light balance screw. Radical change in the weight of any of the balance screws is to be avoided since afterwards it may not be possible to bring the balance to proper time with the timing screws.

20. Check the shape of the hairspring. Minor corrections in shape may be made by bending with a pair of fine tweezers. Do not attempt to repair major distortions of the hairspring—replace the entire hairspring assembly with a new one.

    If for any reason it becomes necessary to remove or replace a stud or to place a stud on an unstudded hairspring and collet, it will be necessary to rough time the hairspring and balance wheel before the stud is finally pinned in place. See "Rough Timing" in the Control Manual.

21. Do not replace the hairspring assembly on the balance wheel. This will be done in Operation 31 after the process of matching the escapement (Operations 26 through 29).

22. Remove the balance upper endstone cap from the balance cock by unscrewing the two cap screws. See Fig 83. Peg out the balance upper jewel and check it for cracks, breakage or possible wear. Check the endstone. Replace the endstone cap and mount it in position with its two screws. Press the regulator into position.

23. Place the balance wheel in position (without the hairspring) and mount the balance cock with the balance cock screw.

24. Check the sideshake and endshake of the balance staff. Refer to the standards listed in "Clock Escapement Assembly Adjustment Standards" as listed in the index of the Control Manual. To make any adjustments, refer to "Special Operations." See the Control Manual index.

25. Check the position of the roller jewel pin. It should be perpendicular to the roller and centered in the crescent of the safety roller. In no position should the bottom of the jewel pin rub against anything.

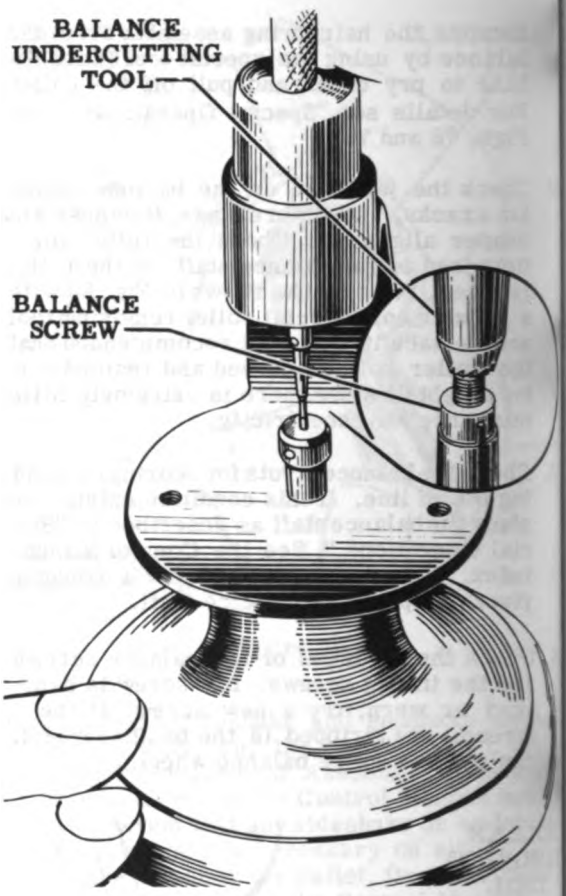

Figure 82

NOTE

The following operations (Operations 26 through 29) involve checking and adjusting the matching of the various components of the escapement to each other.

These checks and adjustments call for the knowledge and skill of a Watchmaker, Senior Grade and should be made only by fully qualified personnel. Since these adjustments are very well understood by skilled watchmakers and since they are performed in a manner similar to that employed with any high grade watch, only a brief outline is presented here.

It is recommended that these adjustments be made with the escapement mounted on a movement in order to provide a power source although some skilled craftsman may very well make them without a power source.

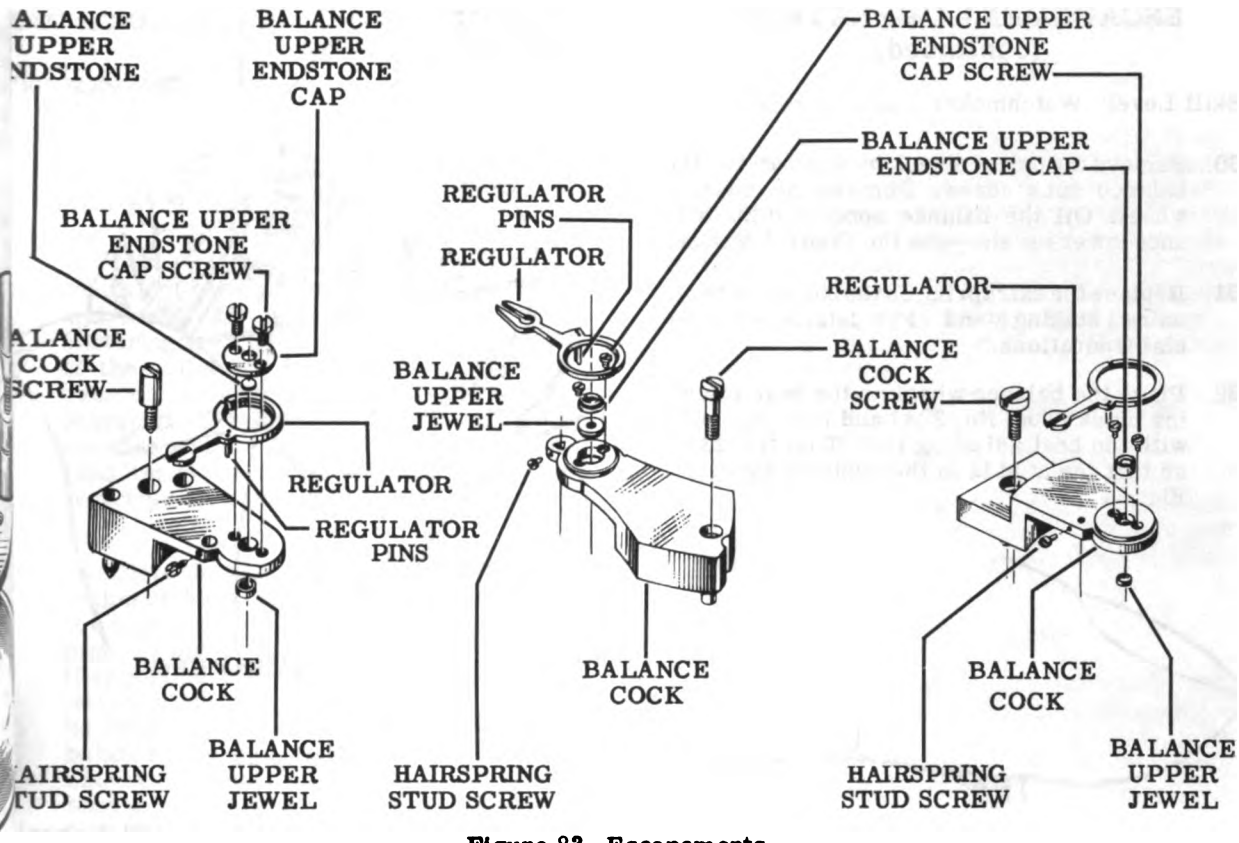

Figure 83—Escapements

"New" Seth Thomas (R—20666) Elgin (R—18565) "Old" Seth Thomas (R—20695)

MATCHING THE ESCAPEMENT

ill Level: Watchmaker, Senior Grade

3. Before making any checks or adjustments, examine the operation of the escapement. Read the route ticket for the escapement to see what notations appear there. The predisassembly inspector may have some recommendations concerning escapement banking and matching adjustments. Every escapement has been carefully banked and matched by the factory and by any previous repair activity, so readjustment is necessary only when the escapement has met with an accident or careless handling. Give consideration to these points before adjusting the escapement as outlined in Operations 27, 28 and 29.

. Remove the balance cock and the balance wheel. Carefully move the pallet fork back and forth between the banking pins. Observe the action of the pallet stones in relation to the escape wheel teeth. Check the "lock," the "drop" and the positioning of the banking pins. Make any adjustments in the banking pins necessary to make the fork "Banked to the Drop."

28. Put the balance (without the hairspring) in position and mount the balance cock with its screw. With the finger, roll the balance wheel back and forth through an arc which enables the roller jewel pin to engage the slot in the pallet. In this manner, move the pallet from side to side so that the escape wheel is allowed to turn. Observe the operation of the escapement.

29. Check and adjust if necessary: (a) "Lock," (b) "Drop," (c) "Jewel Pin Shake" and (d) "Guard Pin Shake." Readjust the banking pins to allow the proper amount of "Slide."

Specifications for these adjustments will be found in "Clock Escapement Adjustment Standards" as referenced in the Control Manual index. Remember that these standards are only for the purpose of guidance and that it is the responsibility of the operator to put the escapement in its best running condition. When the adjustments are completed, remove the escapement from the movement.

NOTE

The following operations may be performed by Watchmaker, Junior Grade.

ESCAPEMENT OPERATIONS (continued)

Skill Level: Watchmaker, Junior Grade

30. Remove the balance cock by unscrewing the balance cock screw. Remove the balance wheel. Oil the balance upper and the balance lower jewels—see the Control Manual.

31. Replace the hairspring on the balance wheel, using a staking stand. For details see "Special Operations."

32. Place the balance wheel on the beat adjusting block (Tool No. 22A) and turn the collet with the beat adjusting tool (Tool No. 23A) so that the stud is in the position shown in Fig. 84.

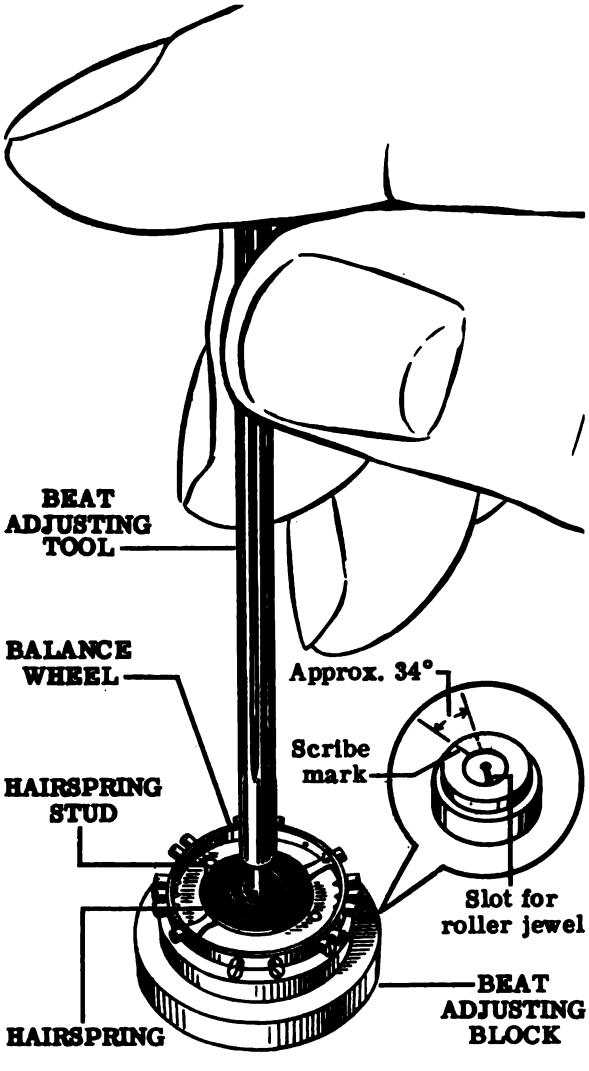

Figure 84

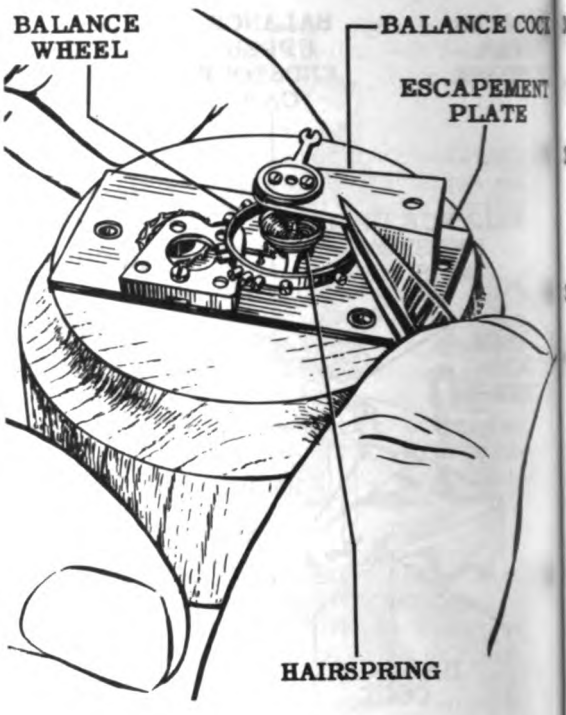

Figure 85

A. For Elgin escapements the collet should be turned so that the stud is directly above the left balance arm when the roller jewel is facing towards you.

33. Since the hairspring stud fits securely into the balance cock, it is recommended that the stud be fastened into the balance cock before it is mounted on the escapement plate. Turn the balance cock and the balance wheel upside down, insert the stud and tighten the stud screw. Pick up the balance cock with the attached balance wheel as shown in Fig. 85, and place them in position on the escapement plate. Slip the hairspring in between the regulator pins. Mount the balance cock with the balance cock screw.

34. Check to see that the escapement is in beat. This means that the collet should be in such a position that the balance roller jewel pin is on the center line of the pallet when the balance is at rest. In other words, there should be a straight line from the center of the pallet pivot through the pallet center line, through the roller jewel pin and to the center of the balance pivot when there is no tension on the hairspring.

35. Make any necessary adjustments by moving the hairspring collet on the balance staff by means of the beat tool as described in Operation 32.

6. Oil the escape wheel, the pallet hole jewels and the pallet stones. See the Control Manual.

7. Check the condition of the regulator pins on the regulator. If they are badly bent or broken, replace the regulator.

8. Check the hairspring to see that it is level and centered. Corrections in level and centering are made by bending the first turn of the collet end of the hairspring. The overcoil should be made parallel to the hairspring by bending the hairspring between the stud and the point where the regulator pins reach their closest point to the stud (extreme slow position).

9. Oscillate the balance wheel and observe the action of the hairspring between the regulator pins to check the circling. The regulator pins should be closed just enough so that they just barely touch the hairspring in all positions, slow or fast, and the touch should be equal on both regulator pins. When the balance wheel is at rest, the hairspring should not touch either regulator pin and should be centered between the regulator pins in all positions of the regulator. Correct the shape of the hairspring, if necessary.

10. Recheck the route ticket to see that all the recommendations pertaining to escapement operations have been initialed to indicate that the work has been done. Pass the escapement on to the bench inspector.

BENCH INSPECTION OPERATIONS

Skill Level: Watchmaker, Senior Grade

The purpose of the bench inspection is to assure that a mechanically perfect escapement is ready for installation into the movement for final adjustment and testing. It is the job of the bench inspector to locate any defects and have them corrected before the escapement is mounted on to the movement. Defective escapements cause clocks to fail in passing their final performance test or, much worse, cause an early failure in the Fleet.

1. Check to see that all screws are tight.
2. Check for clearance of all parts.
3. Check all endshakes and sideshakes listed in "Clock Escapement Assembly Adjustment Standards" as listed in the Control Manual index.
4. Check for oil on all bearings.
5. Place the escapement on a movement, and check the overall operation of the escapement with special regard to the lock, slide, drop, etc. adjustments listed in the Control Manual index.
6. Inspect the escapement for cleanliness.
7. Check the route ticket to see that all the recommendations with regard to the escapement have been carried out.
8. Place the escapement in its container and attach the route ticket. Return the container to the Instrument Control Center.

SECTION V

REASSEMBLY PROCEDURE

Skill Levels: Movement Reassembly, Dialing and Casing Operations—Mechanical Instrument Assembler, Senior Grade

Bench Inspection Operations—Watchmaker, Senior Grade

This section contains instructions covering the recommended procedure for reassembling Seth Thomas Mechanical, Boat and Deck Clocks. All parts used in reassembly have been previously cleaned, inspected and repaired or replaced, and the result of reassembly, for all practical purposes, will be equivalent to a brand new movement.

Seth Thomas parts have proved rugged and dependable in the service of the U. S. Navy, but it must be stressed that they may be easily damaged in the hands of those unskilled in the care of fine clocks. For this reason, all reassembly operations are to be performed only by qualified personnel and only by following the procedure described in the text.

Because of certain differences between the various Seth Thomas movements, the description of the reassembly procedure will be divided into several parts as follows:

a. Reassembly of 5165 Series Mechanical Clocks and all Boat and Deck Clocks.

b. Reassembly of 5160 Series Mechanical Clocks.

c. Replacement of all Mechanical Clocks into their cases.

d. Replacement of all Boat and Deck Clocks into their cases.

Most of the tools required are those included in every watchmaker's repair kit and are mentioned in the text as they are required. Where special service tools are needed, or tools are employed for purposes which are not immediately obvious, they are explicitly designated by number in the text. They are further identified in Section VIII of this book, "Special Service Tools and Testing Devices."

Endshakes and Sideshakes

During reassembly, it will be necessary to check the endshake and sideshake of various pivots. The tolerances permissible are listed in "Clock Movement Assembly Adjustment Standards" which is the heading that appears in the Control Manual. Procedures for correcting these endshakes and sideshakes, to bring them to within the required limits, are described in "Special Timepiece Repair and Adjustment Operations" as indexed in the Control Manual. It is to these two headings that reference is made in this text when the "Control Manual" is mentioned in regard to endshakes and sideshakes.

Lubrication

The points to be lubricated are mentioned in the text, but specific instructions as to oiling techniques, precautions and the type of oil to be used are included in "Timepiece Lubrication" as referenced in the Control Manual index. It is to this heading that reference is made when the "Control Manual" is mentioned in regard to lubrication.

MOVEMENT REASSEMBLY OPERATIONS

Skill Level: Mechanical Instrument Assembler, Senior Grade

REASSEMBLY OF 5165 SERIES MECHANICAL CLOCK AND ALL BOAT AND DECK CLOCK MOVEMENTS

Before proceeding with the movement reassembly operations, first refer to the route ticket accompanying the movement parts. The route ticket will make recommendations concerning movement reassembly which are to

:onsidered in addition to the procedures out-ined in the following paragraphs. As each ecommendation is followed, initial it to indi-:ate that the work has been done.

1. Place the front plate on the work block (Tool No. 1B) with the pillars facing up. Already mounted on the front plate should be the pillars, the click, the click spring, the regulator bracket, the regulator index wheel and the regulator gear. Replace any of these parts that are missing. See Fig. 86.

   A. There will be no regulator gear on the front plate of Boat and Deck Clock movements—it attaches to the back plate.

2. Check to see that all parts are tight on the front plate. Check to see that the click turns freely without binding. Check the click spring for sufficient pressure on the click to insure a positive engagement between the click and the barrel ratchet wheel. If necessary, the end of the click spring may be bent slightly to increase the force on the click.

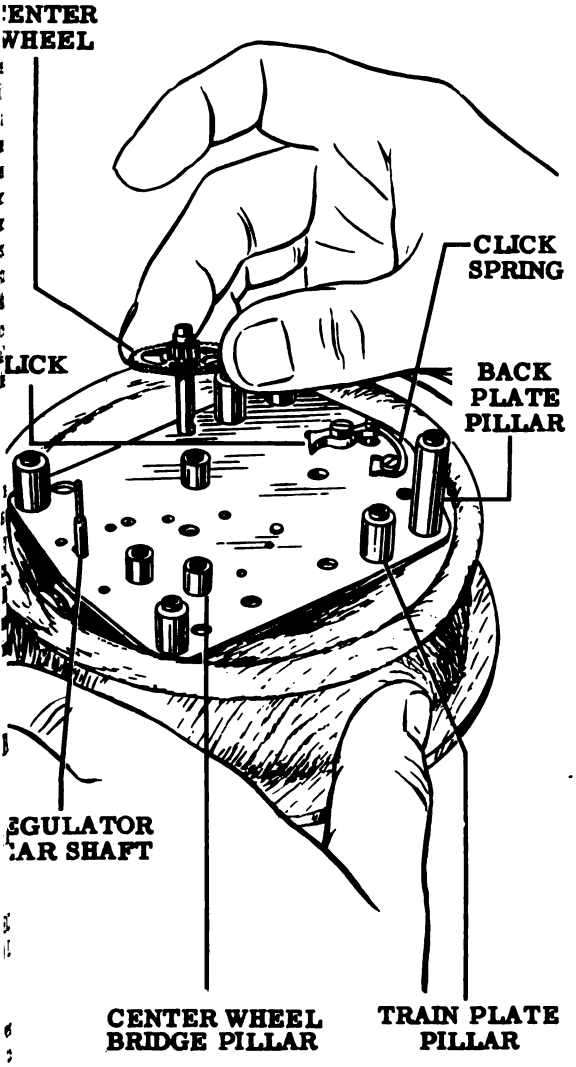

Figure 86

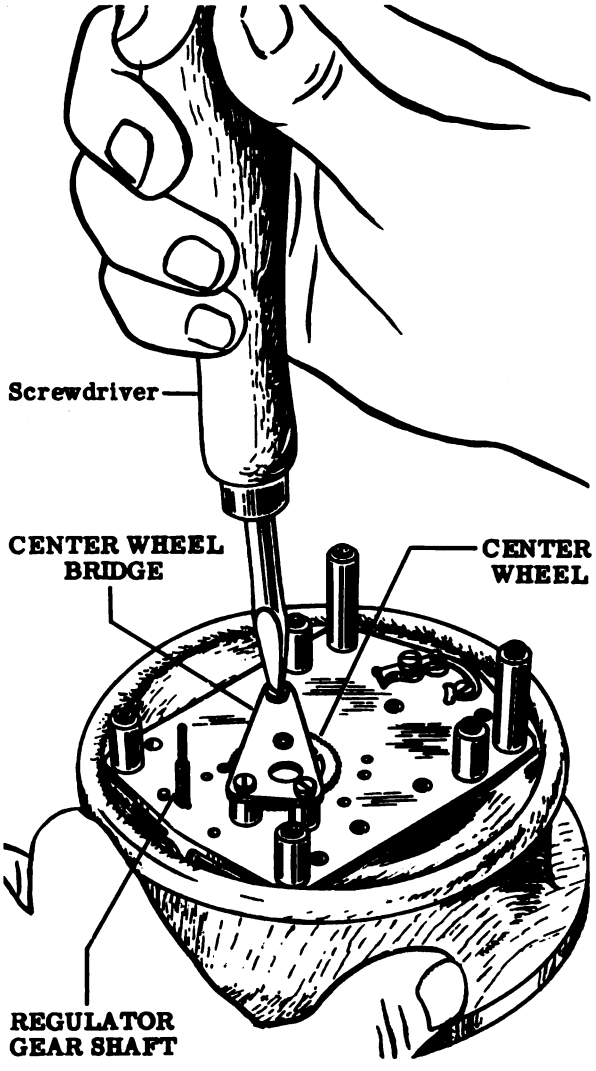

Figure 87

3. Place the center wheel in its position as shown in Fig. 86 on the front plate. Put on the center wheel bridge as shown in Fig. 87 and fasten it down with the three screws, using the special collar (Tool No. 13A) on the end of an automatic screwdriver to speed up the work and to prevent scratching of the bridge.

   Check the endshake and sideshake of the center wheel against the standards listed in "Clock Movement Assembly Adjustment Standards" as indicated in the index of

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the Control Manual. If any adjustments are necessary, refer to the procedures given in "Special Timepiece Repair and Adjustment Operations" as indicated in the Control Manual index.

Oil the bridge hole. See Fig. 88 and "Timepiece Lubrication" in the Control Manual.

A. In Boat and Deck Clock movements, there is no center wheel bridge—put the center wheel in position.

4. Place the second, fourth and fifth wheels in position. See Figs. 89 and 90.

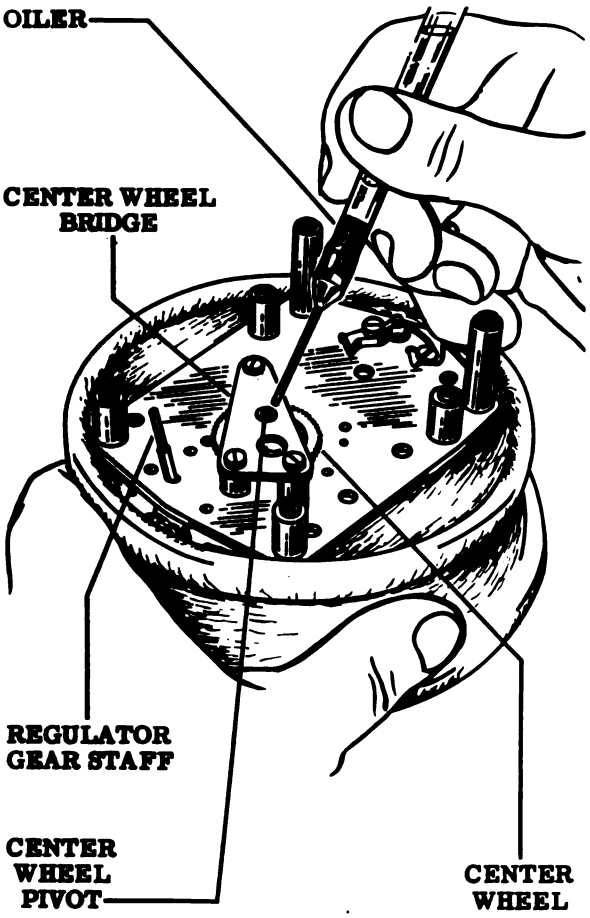


Figure 88

5. Put on the train plate as shown in Fig. 89 and fasten it down with two train plate screws and the two back plate pillars. Use only the special pillar pliers (Tool No. 6A) to tighten the back plate pillars. Use the special collar (Tool No. 13A) on the end of an automatic screwdriver for putting in the screws.

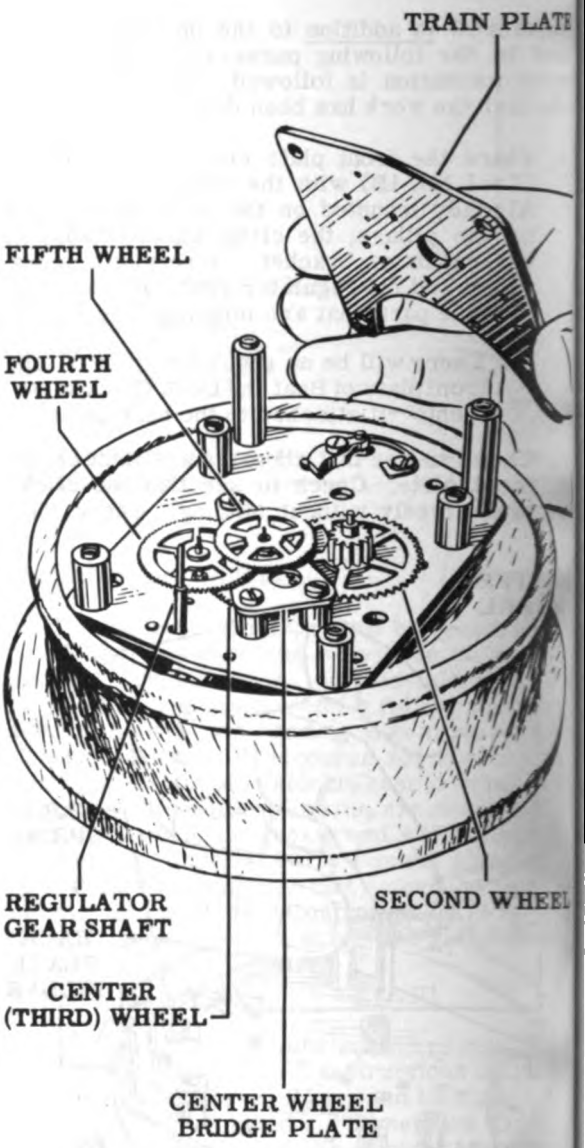


Figure 89—Mechanical Clock Movement

A. Replacing the train plate for Boat and Deck Clock movements is shown in Fig. 9

6. Check the freedom of the train by turning the second wheel to see that none of the wheels bind.

7. Check the endshake and sideshake of each of the train wheels against the standards listed in "Clock Movement Assembly Adjustment Standards" as indexed in the Control Manual. For corrective measures see "Special Timepiece Repair and Adjustment Operations." See the Control Manual index. Fig. 91 shows testing the endshake of the fifth wheel.

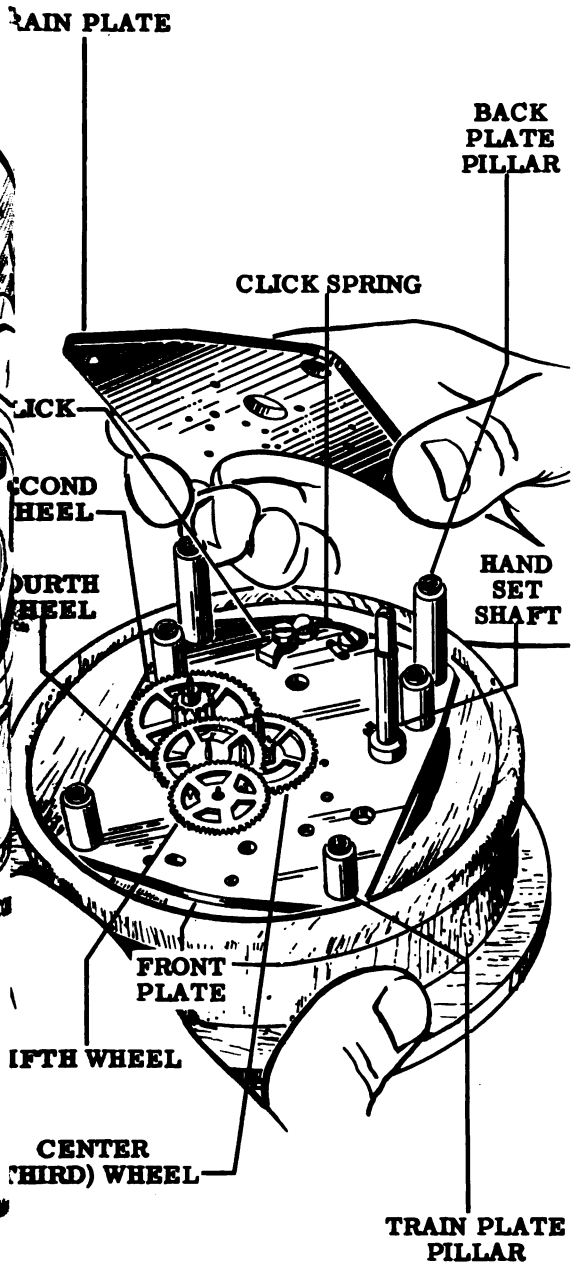


Figure 90—Boat and Deck Clock Movement

. Oil the upper pivots of the train wheels. See Fig. 92, and "Timepiece Lubrication" as referenced in the Control Manual index.

A. The train plate oiling points for Boat and Deck Clocks are shown in Fig. 93.

. Place the escapement in position on the train plate. Carefully mesh the escape pinion with the teeth of the fifth wheel and fasten down the escapement with its mounting screws.

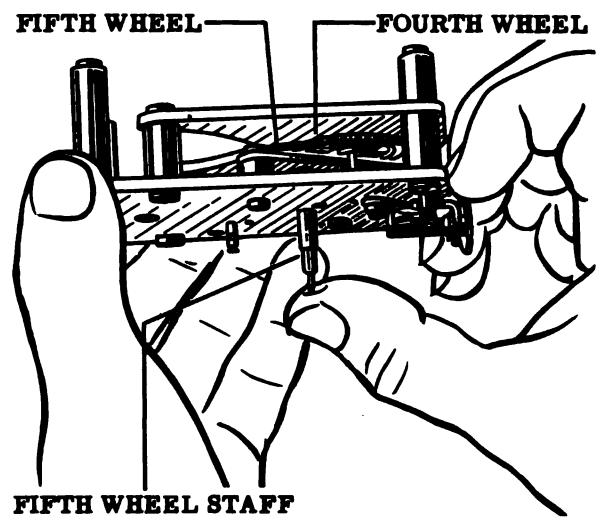


Figure 91

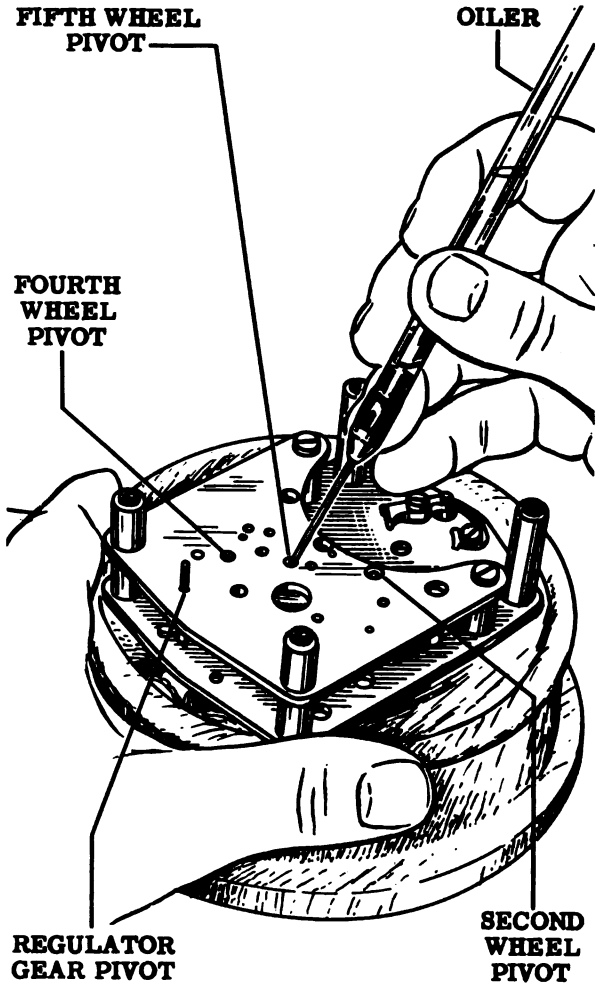


Figure 92—Mechanical Clock Movement

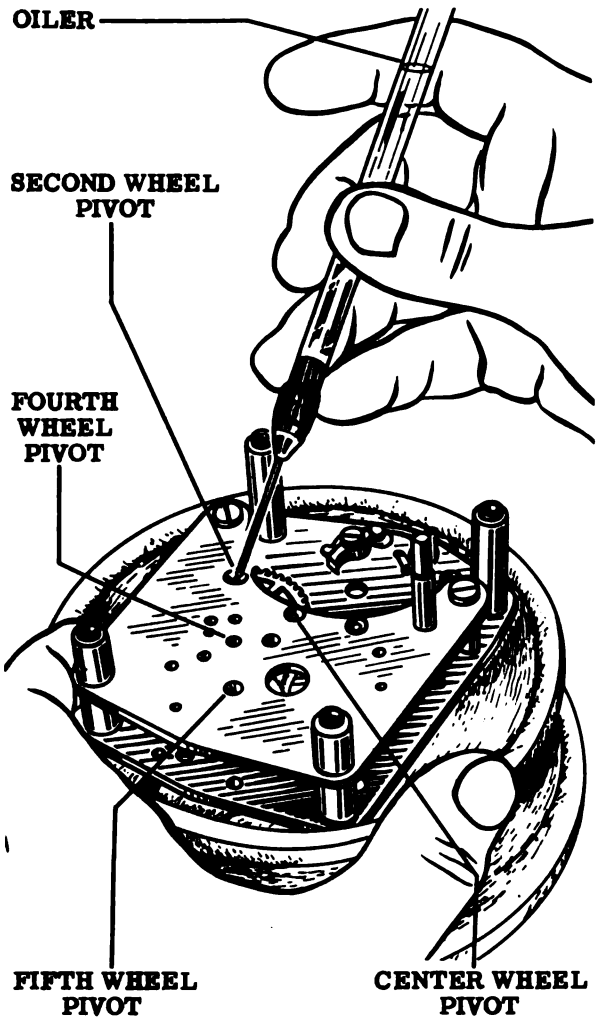


Figure 93—Boat and Deck Clock Movement

NOTE

Operations 10 through 14 are not necessarily performed at this time. Mainspring barrels may be assembled by a person other than the movement assemblers and at any time before Operation 15.

10. **Get a new mainspring. Shape the inside end so that it will match the shape of the barrel arbor for about one-half turn around the arbor. Use the special mainspring end shaping pliers, Tool No. 8A. With the same pliers, put a slight bend in the extreme outside end of the mainspring so that it will engage the hook on the inside of the barrel.**

11. **Wind the mainspring into the barrel using the special mainspring winder, Tool No. 9A. Oil the mainspring. See the Control Manual.**

12. Place the mainspring barrel on the barrel cap staking block, Tool No. 12A. Insert the barrel arbor—tapping it lightly with a plastic- or wood-headed hammer if necessary. Turn the arbor so that it engages the inner end of the mainspring. Put on the barrel cover and stake it in position in three places with the special staking tool, Tool No. 11A. See Figs. 94, 95 and 96.

NOTE

In mechanical clock movements, the squared end of the barrel arbor goes through the toothed end

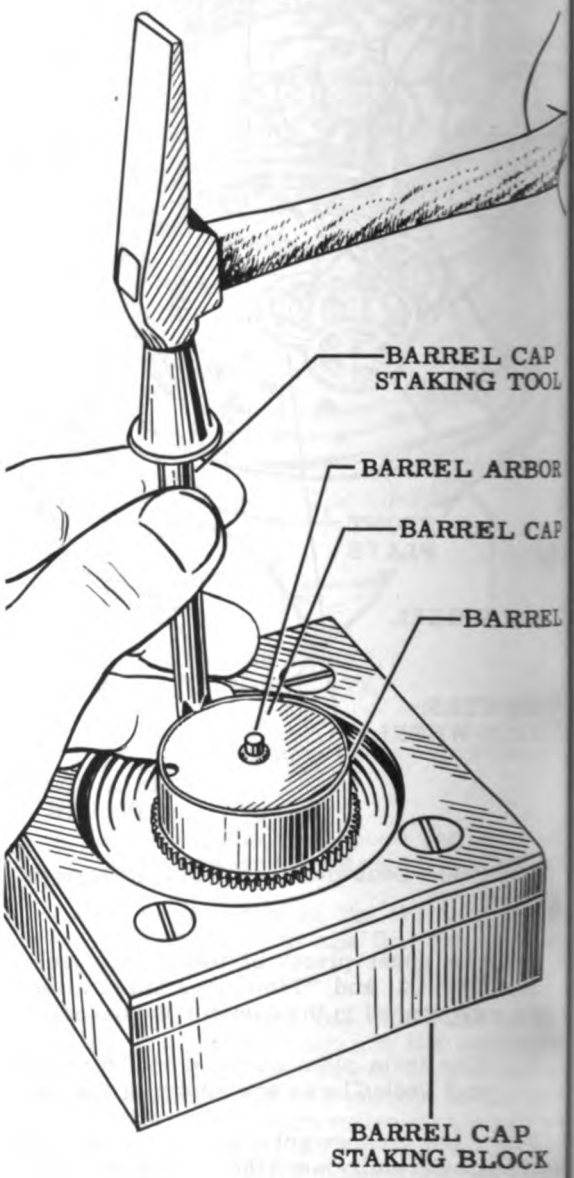


Figure 94

of the barrel. In Boat and Deck Clock movements, the squared end of the barrel arbor goes through the cap end of the barrel.

13. Check the endshake and sideshake of the barrel arbor against the standards listed in the Control Manual.

14. Turn the barrel arbor several times to see that the barrel hook and the arbor hook engage the mainspring inside the arbor. Oil both mainspring arbor bearings. See the Control Manual.

15. Place the ratchet wheel spacer and the ratchetwheel on the barrelarbor. See Figs. 95 and 96. Mount the barrel into its hole in the front plate. Check to see that the click properly engages the ratchet wheel.

16. Properly position the regulator lever on the regulator shaft so that it engages the escapement regulator as shown in Fig. 97. Tighten the regulator lever screw. Final adjustment of the regulator is described in Operation 19.

A. In Boat and Deck Clock movements, the regulator lever is not put in position until Operation 19.

NOTE

Operation 17 applies only to Boat and Deck Clock movements.

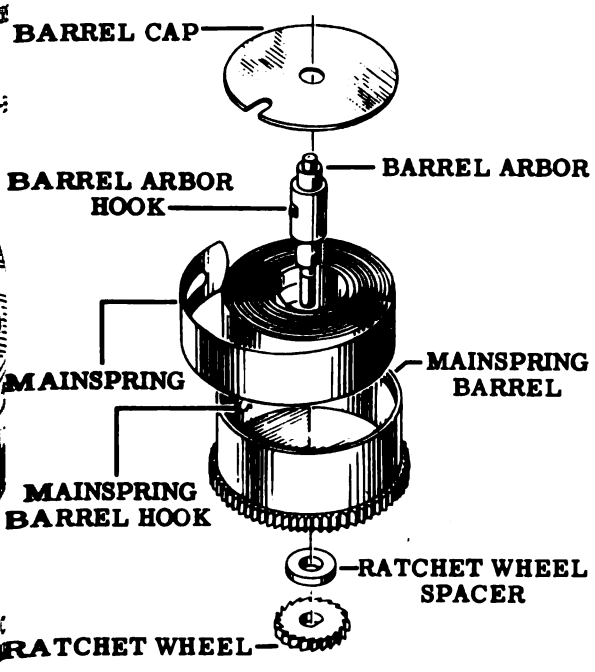


Figure 95—Mechanical Clock Barrel

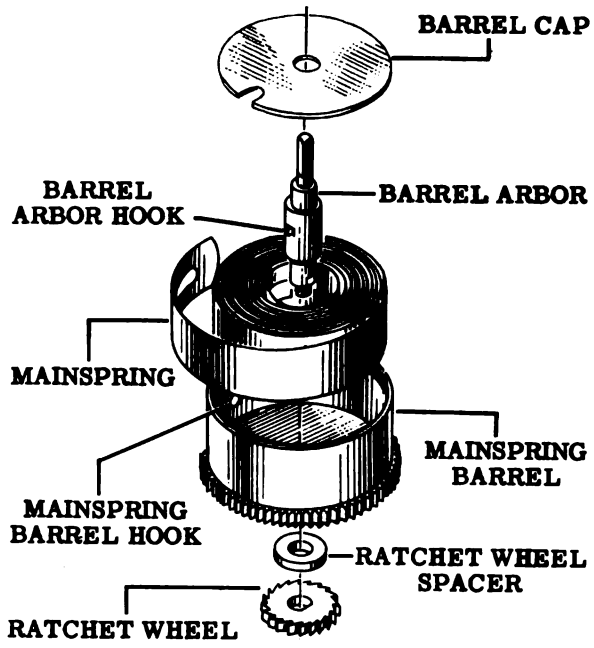


Figure 96—Boat and Deck Clock Barrel

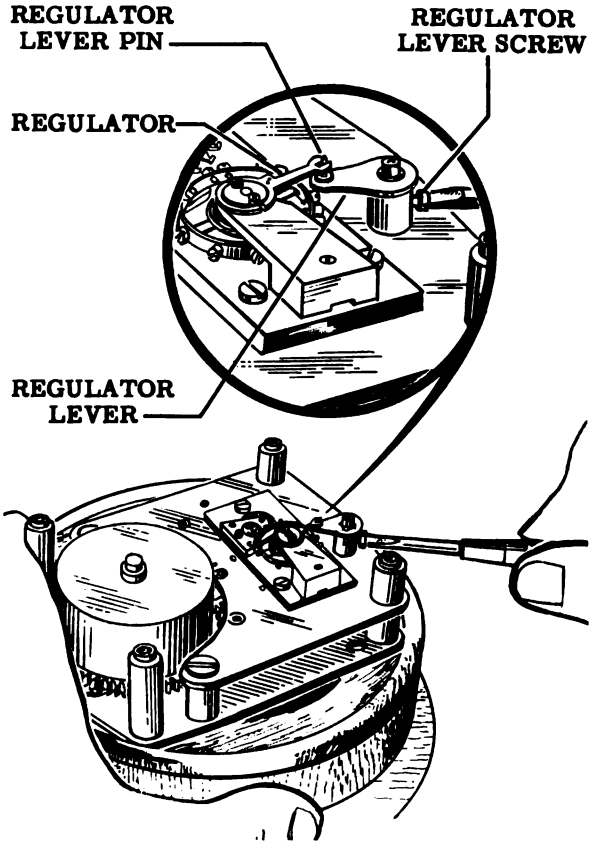


Figure 97

17. Check to see that all components of the start and stop assembly are in their proper positions on the start and stop shaft. Place the start and stop shaft in position on the train plate and make any necessary adjustments to put it in proper operating condition. See Fig. 98.

    The start and stop shaft may have to be held in position while the back plate is being put on so as to keep it in the proper position.

    For old style Boat and Deck Clock movements, also check to see that the regulator gear shaft spring is mounted to the underside of the back plate. Slip the regulator lever over the regulator gear shaft coming through the back plate.

18. Put the back plate in position as shown in Figs. 98 and 99 and fasten it down with the four back plate screws. Use the special collar (Tool No. 13A) on the end of an automatic screwdriver.

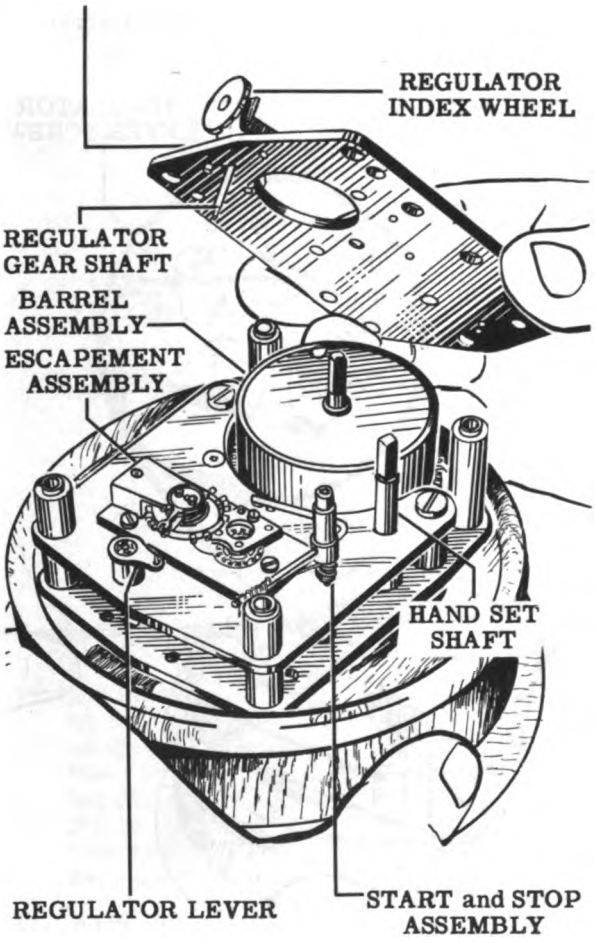


Figure 98—Boat and Deck Clock Movement

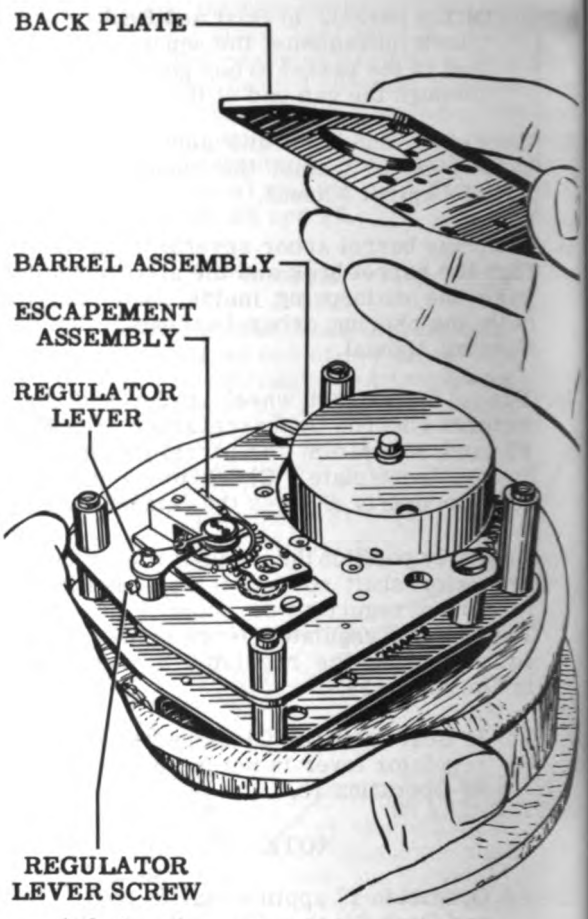


Figure 99—Mechanical Clock Movement

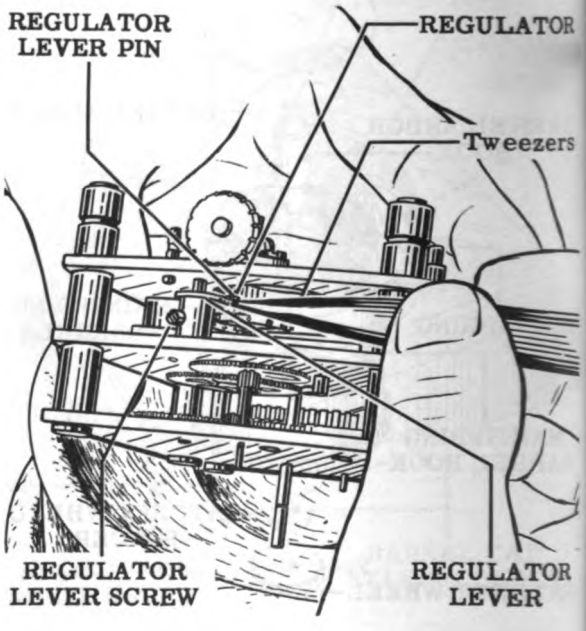
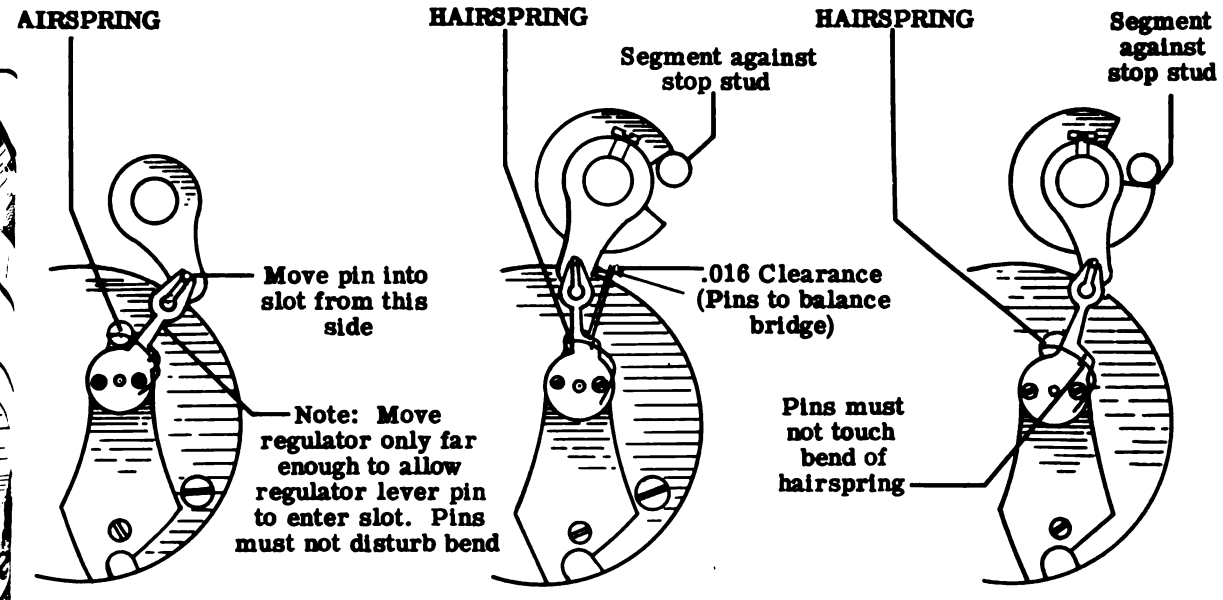


Figure 100—Boat and Deck Clock Movement

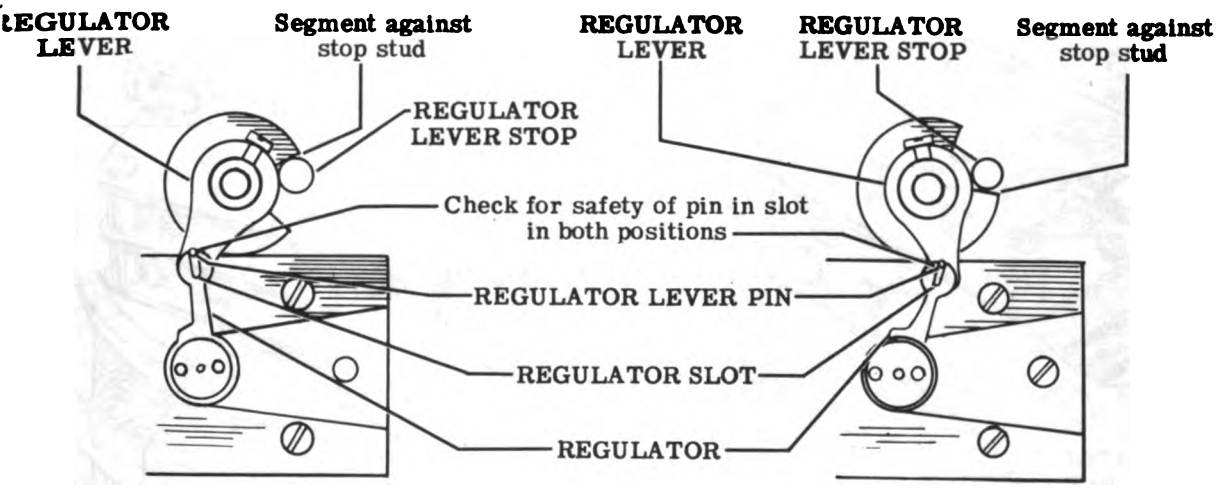


Proper Adjustment of Regulator Lever for Extremes of Travel Elgin Escapements

Figure 101

A. In Boat and Deck Clock movements, the back plate is fastened down with the four extension pillars. See Fig. 100. Tighten these pillars only with the special pillar pliers, Tool No. 6A. Adjust the regulator lever so that it engages the escapement regulator as shown in Figs. 100, 101 and 102. Tighten the regulator lever screw.

19. Check the adjustment of the regulator mechanism. Turn the regulator worm wheel as far as it will go in either direction, checking to see that the regulator lever pin is always engaged by the slot in the regulator. If the regulator lever pin becomes disengaged from the regulator slot in any position, re-set the adjustment so as to correct this condition.



Proper Adjustment of Regulator Lever for Extremes of Travel Seth Thomas Escapements

Figure 102

20. Oil the upper barrel pivot in the back plate. See Figs. 103 and 104 and the Control Manual.

21. Put the start and stop knob on the end of the start and stop shaft and fasten it down with its screw. There is no start and stop knob on 5180 movements—the shaft end is squared to fit the winding key.

22. Turn the movement over so that it is dial side up on the work block. Oil the lower pivots of the barrel, the second, third and fourth wheels and the fifth wheel pivot in the third wheel shaft. See Fig. 105 and the Control Manual.

    A. In Boat and Deck Clock movements, also oil the lower pivot of the fifth wheel. See Fig. 106.

23. Adjust the friction of the cannon pinion by crushing it with pliers over the special friction adjusting tool (Tool No. 18A) as shown in Fig. 108. Push on the cannon pinion with the special pusher, Tool No. 19A.

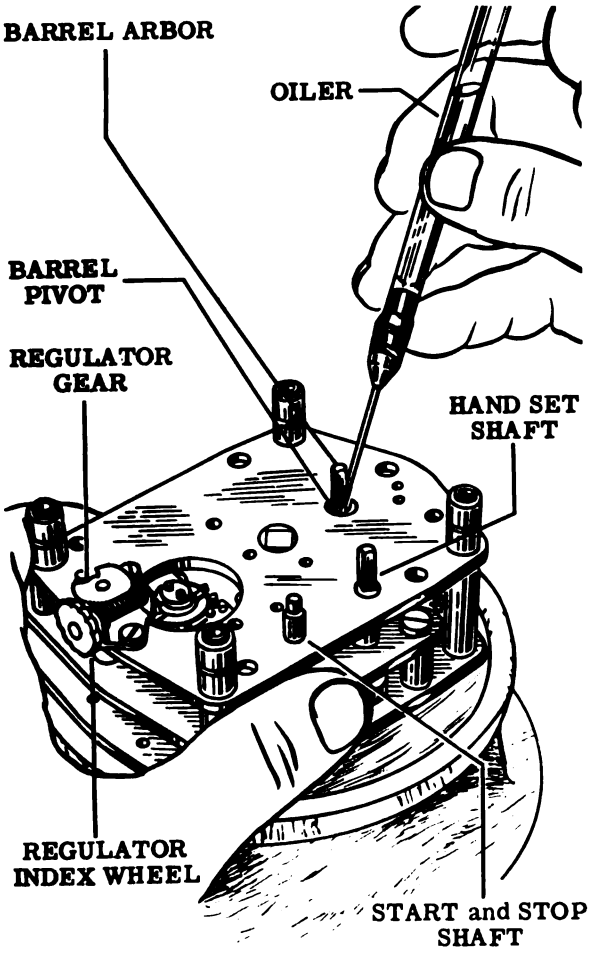


Figure 103—Boat and Deck Clock Movement

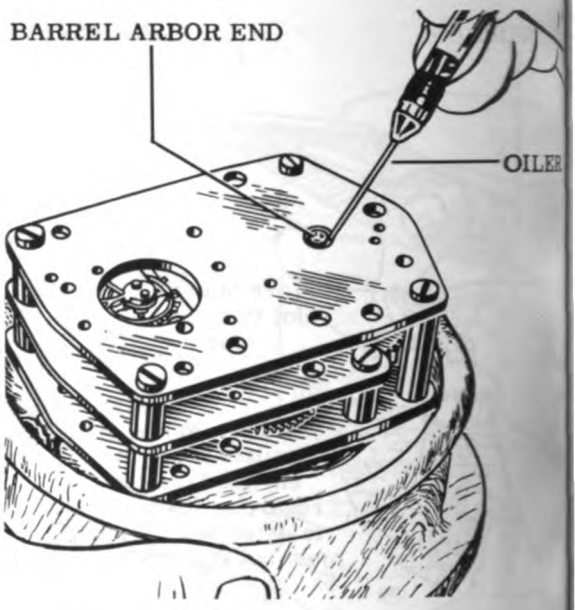


Figure 104—Mechanical Clock Movement

24. Put on the minute wheel and hour wheel. Slip the split minute wheel washer over the groove in the end of the minute wheel stud and clamp it tight with pliers. Refer to Figs. 107 and 109.

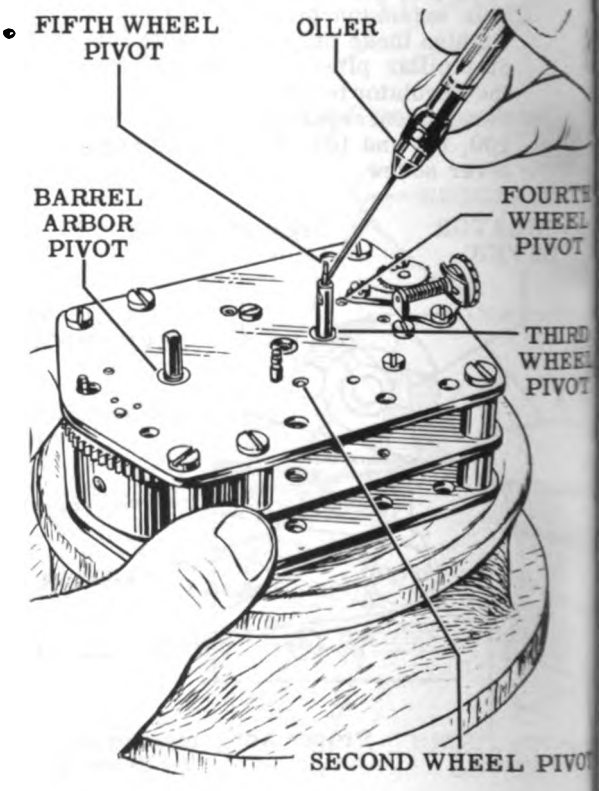


Figure 105—Mechanical Clock Movement

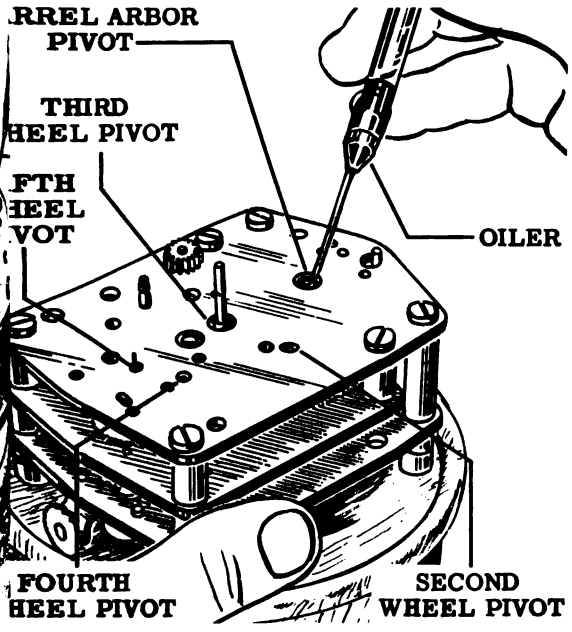


Figure 106—Boat and Deck Clock Movement

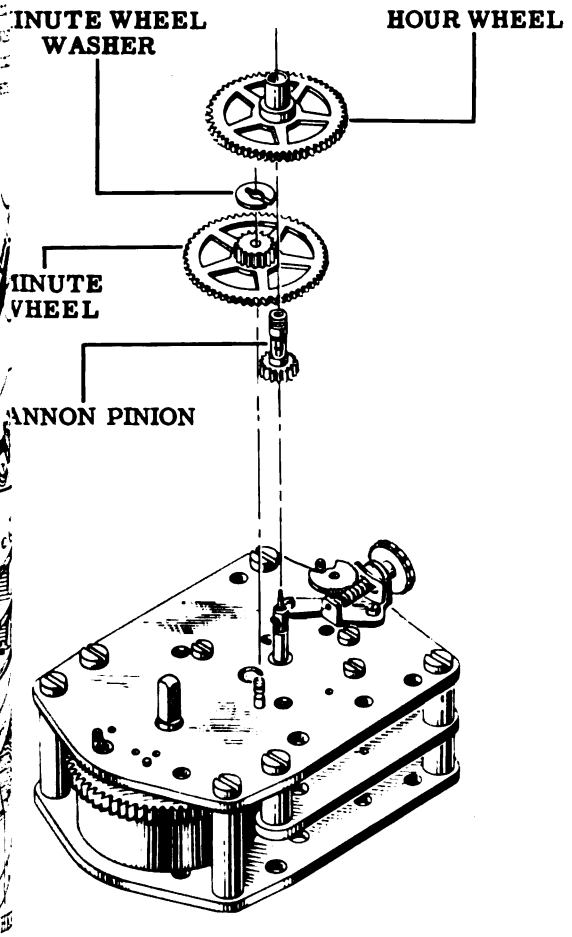


Figure 107—Mechanical Clock Movement

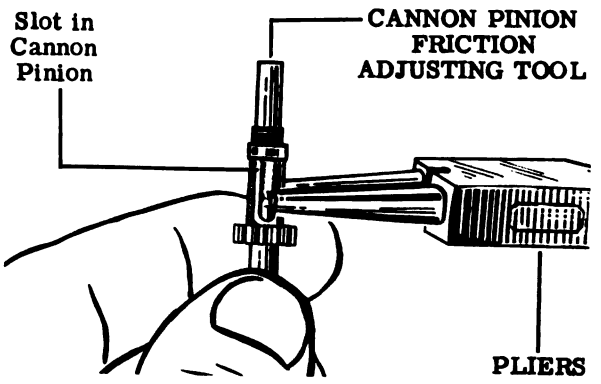


Figure 108

25. Recheck the route ticket to see that all the recommendations pertaining to clock movement assembly have been initialed to indicate that the work has been done.

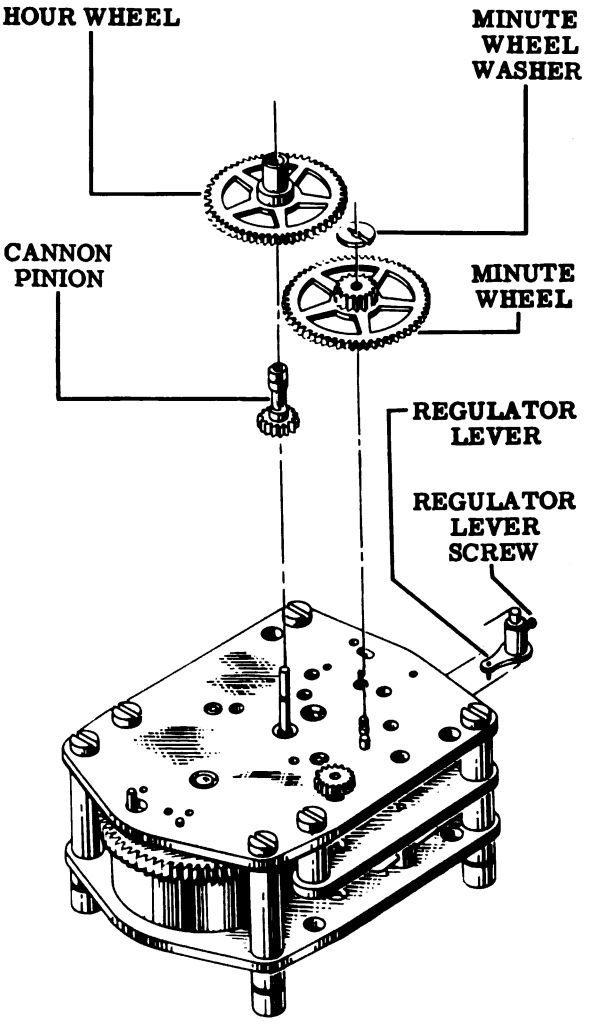


Figure 109—Boat and Deck Clock Movement

BENCH INSPECTION OPERATIONS

Skill Level: Watchmaker, Senior Grade

The purpose of the bench inspection is to assure that a mechanically perfect movement with a mechanically perfect escapement is ready for dialing, timing and performance testing. It is the job of the bench inspector to locate any defects and have them corrected before dialing, timing and performance testing. Defective movements cause clocks to fail in passing the performance test or, much worse, cause an early failure in the Fleet.

1. Check to see that all screws are tight.
2. Check for clearance of all parts.
3. Check all endshakes and sideshakes listed in "Clock Movement Assembly Adjustment Standards" as referenced in the Control Manual index.
4. Check for oil on all bearings.
5. Check for freedom of click.
6. Check for sufficient tension on click spring.
7. Check the operation of the regulating mechanism through its entire path by turning the regulating wheel in both directions from stop to stop. There should be no backlash and no play of the regulator shaft in its slot. The regulator must not disengage from the regulator lever pin in any part of the cycle.
8. Check for clearance between the cannon pinion and the front plate.
9. With the mainspring full wound, the motion of the balance wheel should be at least 1-1/2 turns. With the mainspring wound 3-1/2 turns, the motion of the balance wheel should be at least 1-1/4 turns.
10. On Boat and Deck Clocks, check the operation of the mechanism for stopping and starting the balance wheel.
11. On Boat and Deck Clocks, check the operation of the hand setting mechanism.
12. Inspect the movement for cleanliness.
13. Check the route ticket to see that all the recommendations entered by the pre-disassembly inspector have been carried out.
14. Pass the checked movement on for dialing.

DIALING OPERATIONS

Skill Level: Mechanical Instrument Assembler, Senior Grade

5165 Series Mechanical Clocks and All Boat and Deck Clocks

1. Place the dial in position with the dial feet projecting through the holes in the front plate. Put the dial foot taper pins through the holes in the dial feet behind the front plate. See Fig. 110. Push the taper pins into their holes with a pair of pliers so that the dial is firmly attached to the movement.

   A. See Fig. 111 for replacing the dial on Boat and Deck Clock movements.

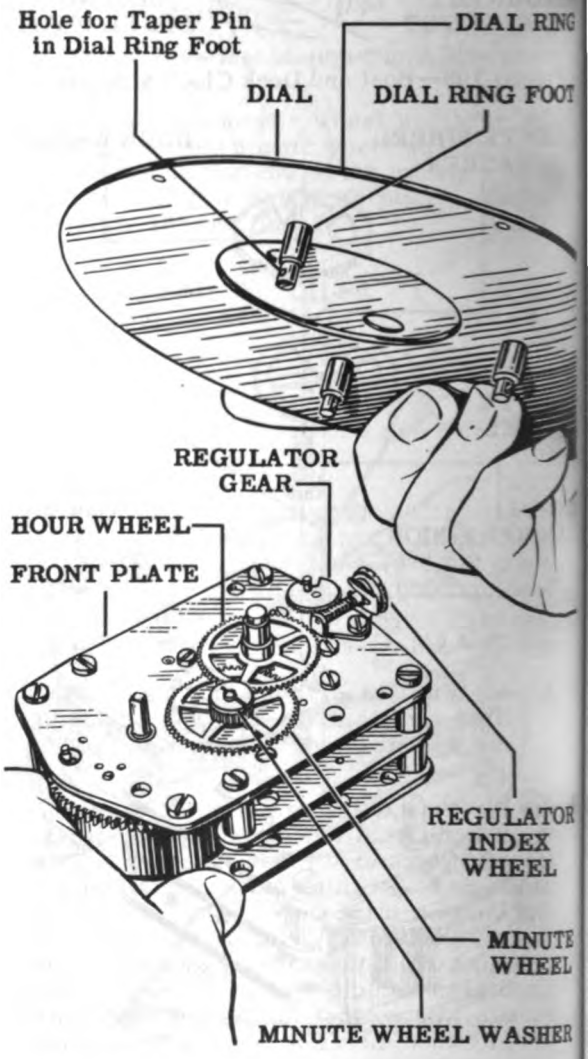
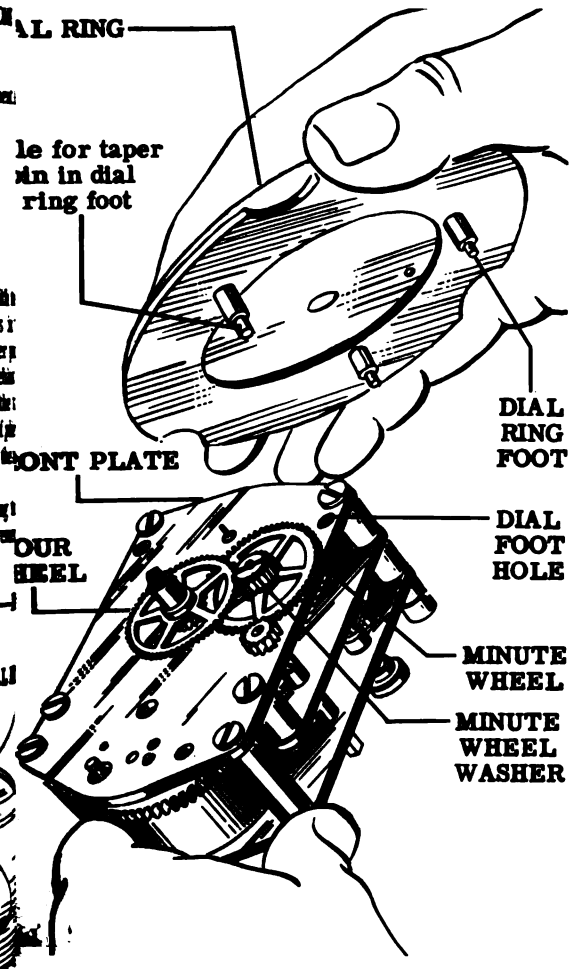


Figure 110—Mechanical Clock Movement



igure 111—Boat and Deck Clock Movement

Press on the hour and minute hands with the hand pushing tool, Tool No. 20A. Fasten down the hour and minute hands with the hand nut and using the special pliers with the hard rubber inserts (Tool No. 3A) as shown in Fig. 112. Press on the second hand.

A. See Fig. 113 for replacing the hands on Boat and Deck Clock movements with the special socket wrench, Tool No. 4A.

Set the clock to the correct time by moving the minute hand clockwise with the index finger. Check to see that the sweep second hand can be set either clockwise or counter-clockwise with the finger. This is done by rapidly, but gently, moving the end of the second hand in 10-second jumps all around the dial in both directions. There should be enough slip so that the second hand can be set in either direction without any damage to the escapement. If there is any sign that the second hand does not slip freely, use a

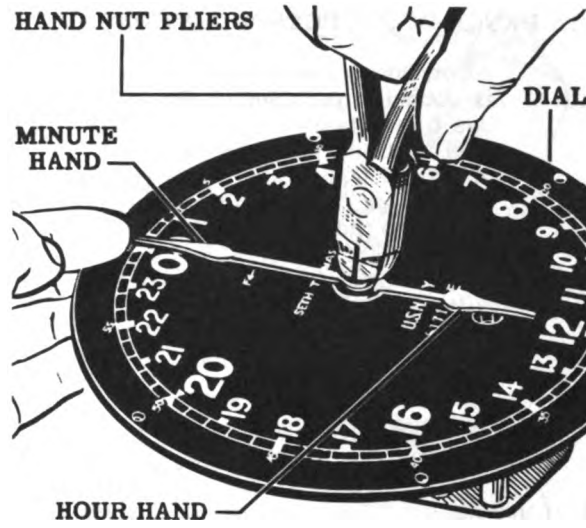


Figure 112—Mechanical Clock

new second hand. None of the hands should interfere with the operation of any of the others and the movement should resume its normal operation once setting is completed.

A. For Boat and Deck Clock movements, perform the setting operations by means of the setting arbor and the second hand start and stop knob.

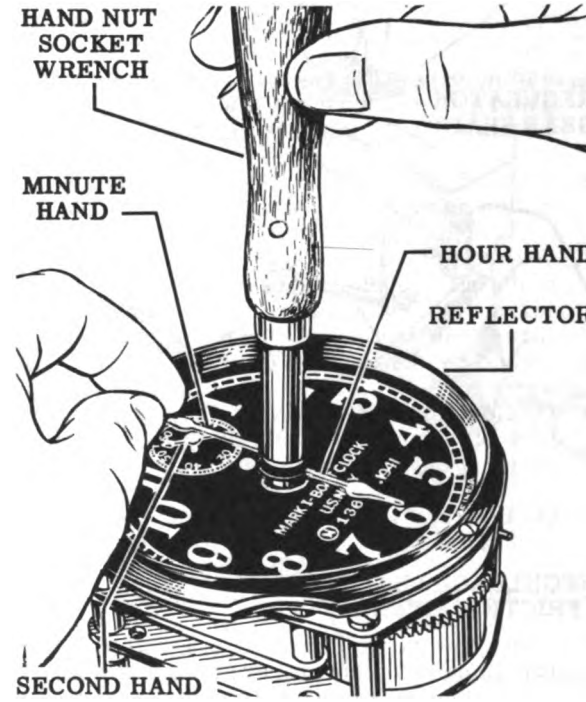


Figure 113—Boat and Deck Clock

NOTE

After Operation 3, the movement is normally put through the various timing tests described in the next section "Test, Adjustment and Final Inspection." The final steps of placing the dialed movement into the case are included at the end of this section for purposes of maintaining the continuity of the reassembly operations. See "Casing Operations" at the end of this section.

REASSEMBLY OF 5160 SERIES MECHANICAL CLOCK MOVEMENTS

Before proceeding with the movement reassembly operations, first refer to the route ticket accompanying the movement parts. This route ticket will make recommendations concerning movement reassembly which will be considered in addition to the procedures in the following paragraphs. As each recommendation is followed, initial it to indicate that the work has been done.

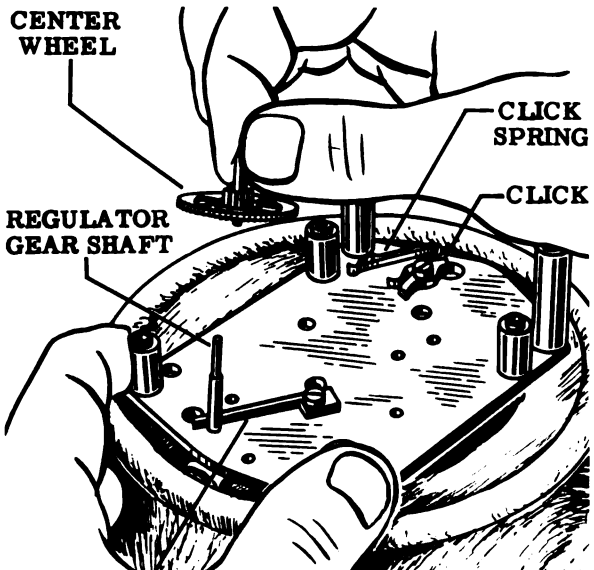


Figure 114

1. Place the front plate on the work block (Tool No. 1C) with the pillars facing up. Already mounted on the front plate should be the pillars, the click, the click spring, the regulator bracket and index wheel, the regulator spring and the regulator gear. Replace any of these parts that are missing. Refer to Fig. 114.

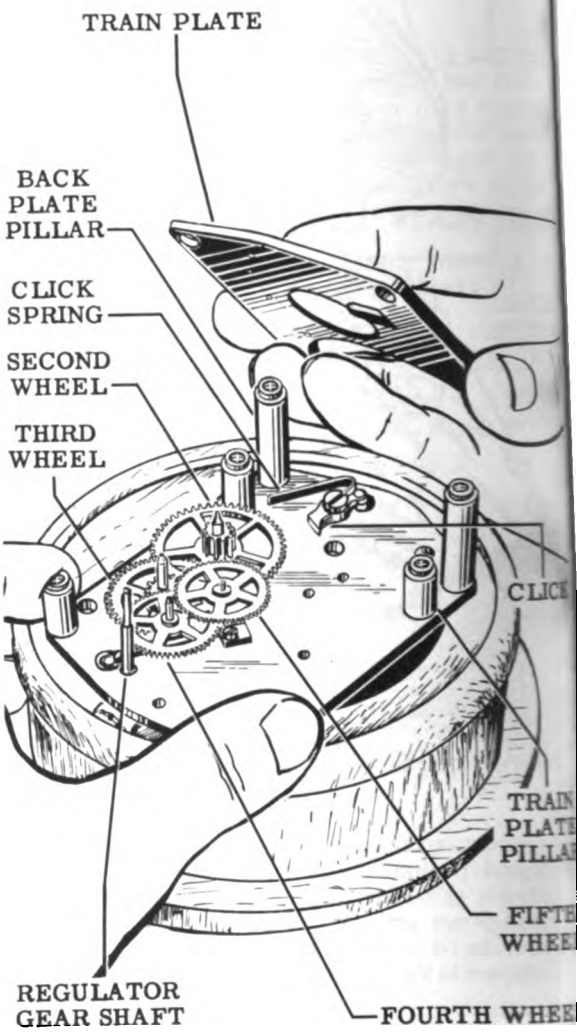


Figure 115

2. Check to see that all parts are tight on the front plate. Check to see that the click turns freely without binding. Check the click spring for sufficient pressure on the click to insure a positive engagement between the click and the barrel ratchet wheel. If necessary, the click spring may be bent slightly to increase the force on the click.

3. Place the third, second, fourth and fifth wheels in the positions shown in Fig. 115.

. Put on the train plate as shown in Fig. 115 and fasten it down with the two train plate screws and the two back plate pillars. Use the special pillar pliers (Tool No. 6A) to tighten the back plate pillars. Use the special collar (Tool No. 13A) on the end of an automatic screwdriver to put on the screws. This prevents scratching the plate and speeds up the work.

. Check the freedom of the train by turning the second wheel to see that none of the wheels bind.

. Check the endshake and sideshake of each of the train wheels. Fig. 116 shows checking the endshake of the fifth wheel. See "Clock Movement Assembly Adjustment Standards" as indicated in the index of the Control Manual. For corrective measures, see "Special Timepiece Repair and Adjustment Operations" as indicated in the Control Manual index.

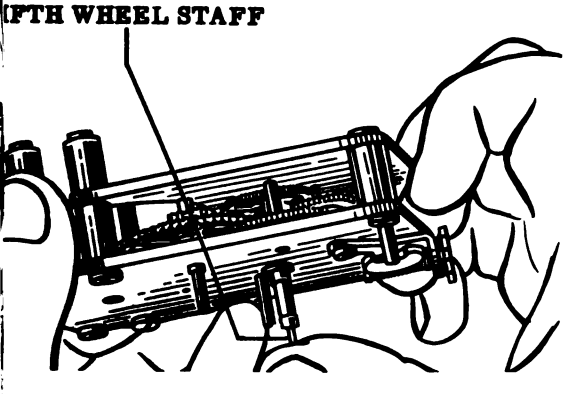


Figure 116

. Place the movement on the work block, train side up. Oil the upper pivots of the second, third, fourth and fifth wheels as shown in Fig. 117. See "Timepiece Lubrication" in the Control Manual.

. Put the escapement in position. Fasten down the escapement with its four mounting screws. Set the regulator lever so that it engages the escapement regulator in the position shown in Fig. 118.

NOTE

Operations 9 through 13 are not necessarily done at this time. Mainspring barrels may be assembled by a person other than the movement assembler and at any time before Operation 12.

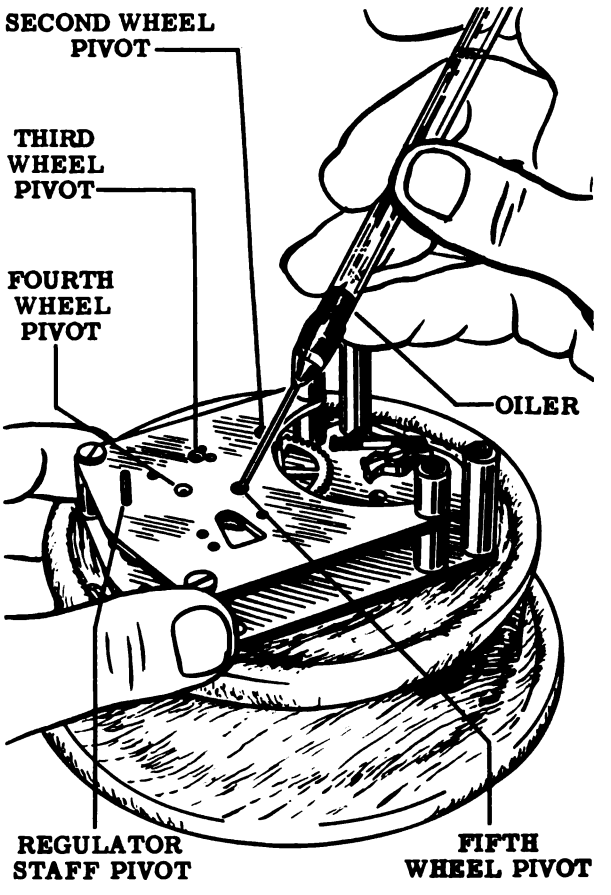


Figure 117

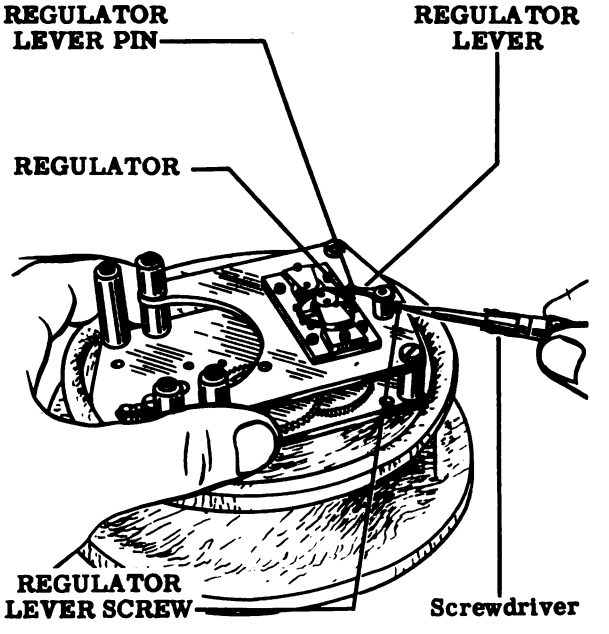


Figure 118

9. Get a new mainspring. Shape the inside end so that it will match the shape of the barrel arbor for about one-half turn around the arbor. Use the special mainspring shaping pliers, Tool No. 8A.

   With the same pliers, put a slight bend in the extreme outside end of the mainspring so that it will engage the hook on the inside of the barrel.

10. Wind the mainspring into the barrel, using the special mainspring winder, Tool No. 9A. Oil the mainspring. See "Timepiece Lubrication" as indicated in the index of the Control Manual.

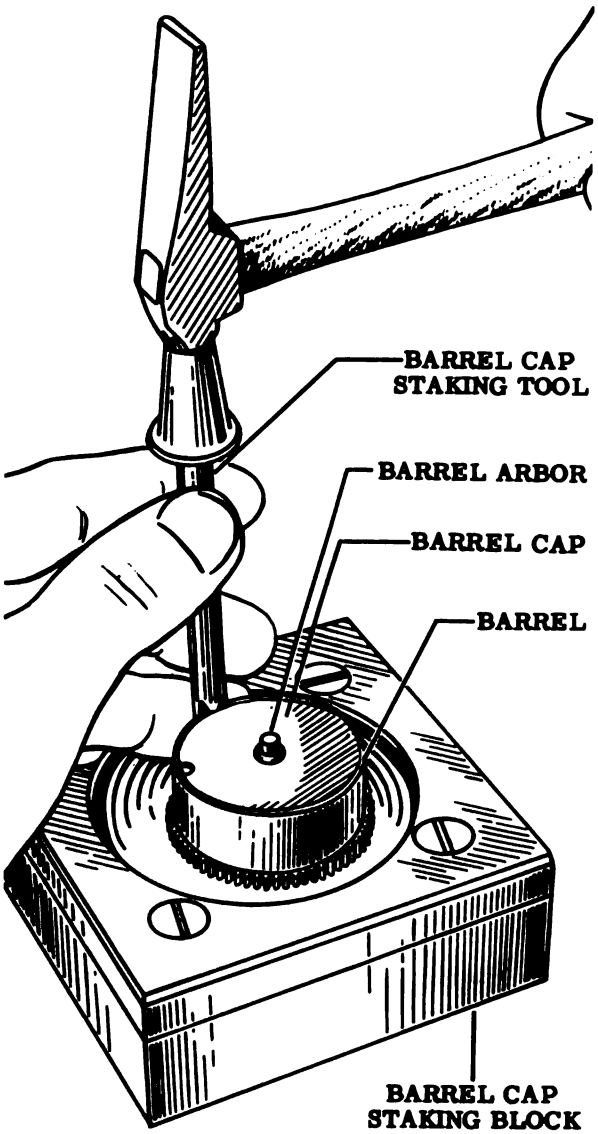


Figure 119

11. Place the mainspring barrel on the barrel cap staking block, Tool No. 12A. Insert the barrel arbor—tapping it lightly with a plastic- or wood-headed hammer if necessary. Turn the arbor so that it engages the inner end of the mainspring.

12. Put on the barrel cover and stake it in position in three places with the special staking tool, Tool No. 11A. See Figs. 119 and 120.

13. Check the endshake and sideshake of the barrel arbor. Refer to the Control Manual for standards and corrective measures.

14. Turn the barrel arbor several times to see that the barrel hook and the arbor hook engage the mainspring. Oil both mainspring bearings. See the Control Manual.

15. Place the ratchet wheel spacer and the ratchet wheel on the barrel arbor. See Fig. 120. Mount the barrel into its hole on the front plate. Check to see that the click properly engages the ratchet wheel.

16. Put the back plate in position and [illegible] down with the four back plate screws shown in Fig. 121.

17. Oil the barrel upper pivot as shown in Fig. 122. See the Control Manual.

18. Check the adjustment of the regulator mechanism. Turn the regulator index wheel [illegible]

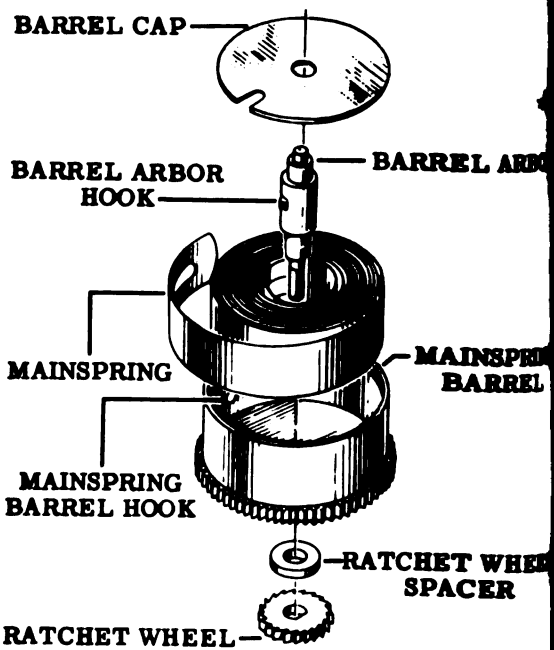


Figure 120

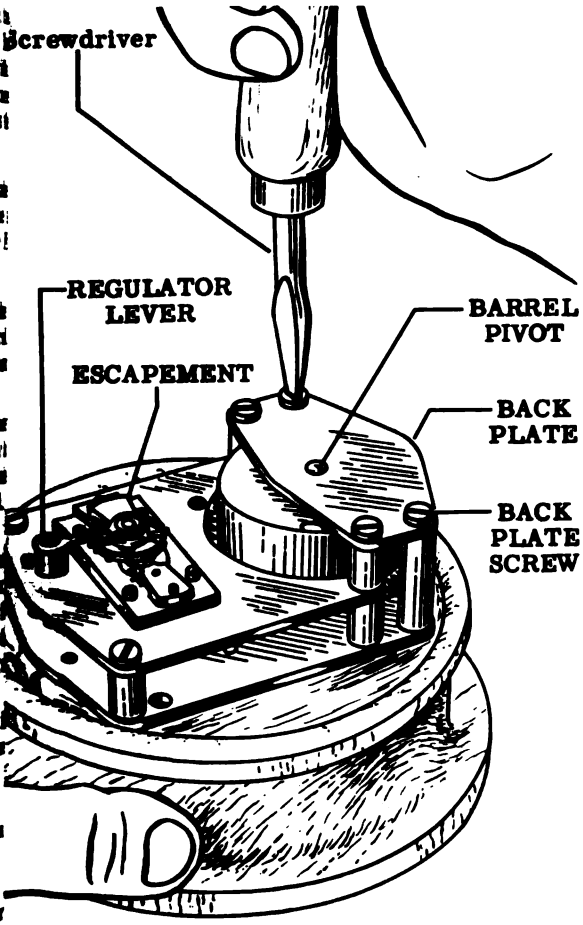


Figure 121

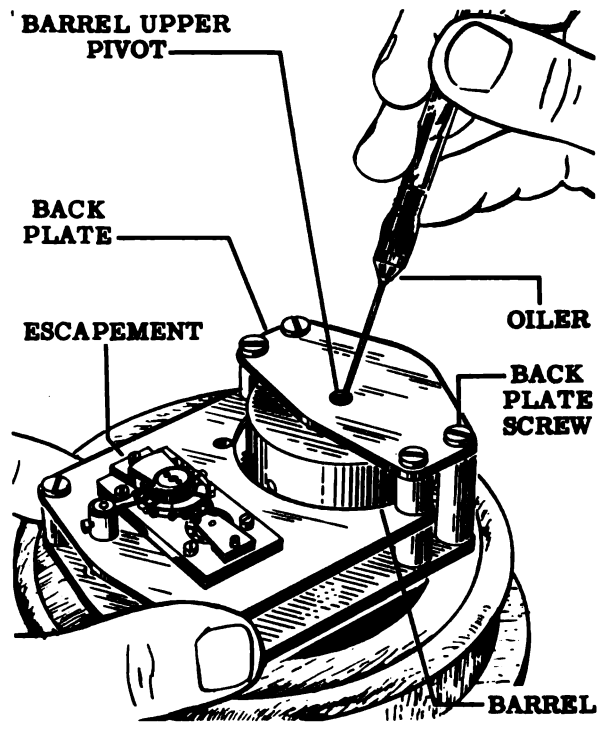
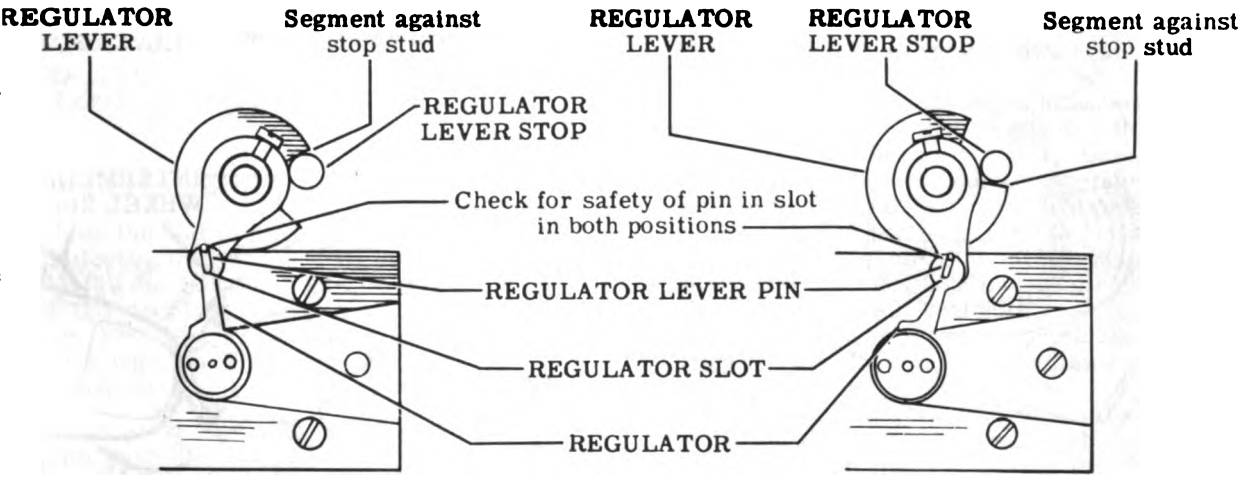


Figure 122

far as it will go in either direction, checking to see that the regulator lever pin is always engaged by the slot in the regulator. Refer to Fig. 123. If the regulator lever pin becomes disengaged from the regulator slot in any position, re-set the adjustment so as to correct this condition.



Proper Adjustment of Regulator Lever for Extremes of Travel
Seth Thomas Escapements

Figure 123

19. Turn the movement over so that it is dial side up on the work block. Oil the lower pivots of the barrel arbor and the second, third, fourth and fifth wheels as shown in Fig. 124. See "Timepiece Lubrication" as referenced in the Control Manual index.

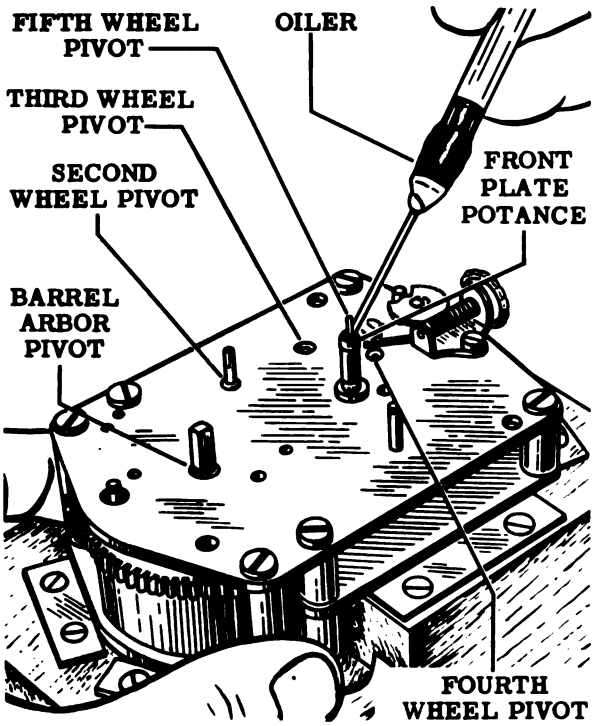


Figure 124

20. Slip the cannon pinion over the front plate potance. Put on the minute wheel. Refer to Fig. 125 for the proper position of the parts.

21. Place the intermediate wheel in position so that it engages the cannon pinion. The two elements of the intermediate wheel should be rotated three teeth in opposite directions, as shown in Fig. 126, before engaging the cannon pinion—the spring action of the two elements of the intermediate wheel acts to eliminate backlash. Fasten the intermediate wheel in position by placing the intermediate wheel friction spring over it and tightening the friction spring screw. Refer to Fig. 125.

22. Place the hour wheel and hour wheel bridge in position as shown in Fig. 127. Tighten the two-hour wheel bridge screws.

23. Recheck the route ticket to see that all the recommendations pertaining to clock movement assembly have been initialed to indicate that the work has been done. Pass the movement on to the Bench Inspector.

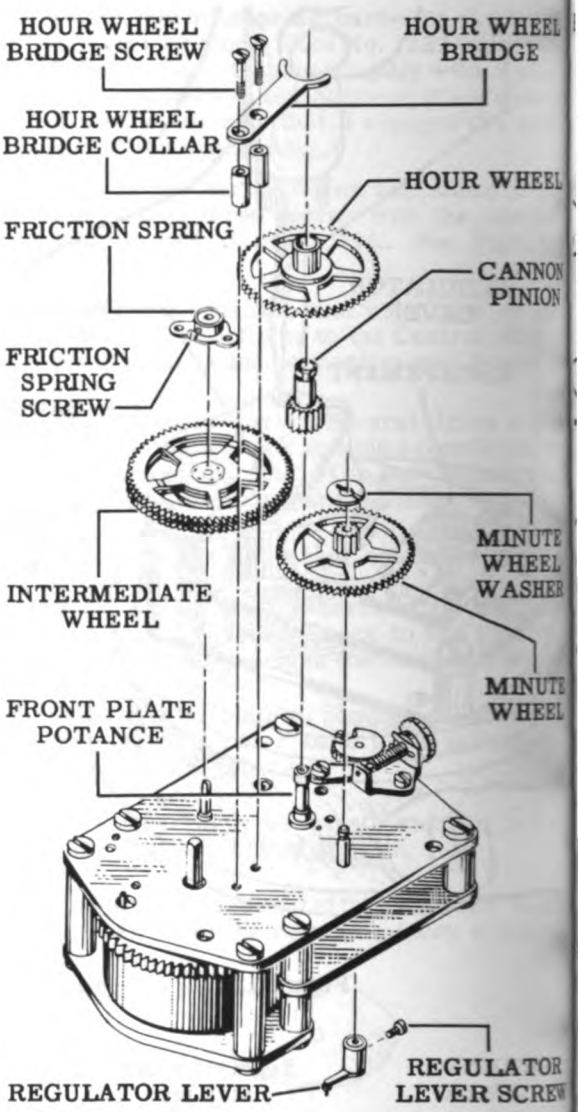


Figure 125

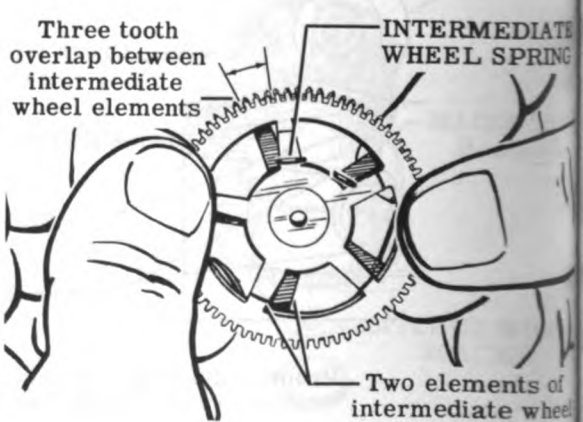


Figure 126

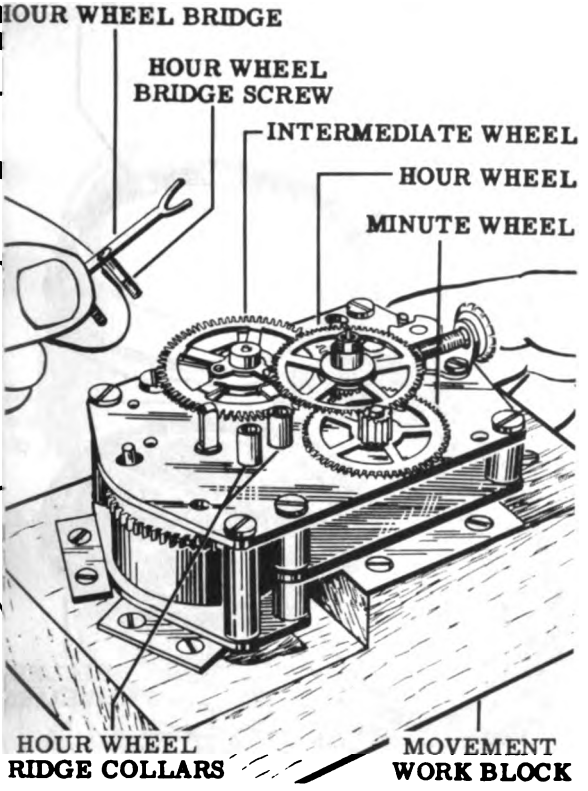


Figure 127

BENCH INSPECTION OPERATIONS

:ill Level: Watchmaker, Senior Grade

Perform the operations listed previously in is section under the same heading.

DIALING OPERATIONS

:ill Level: Mechanical Instrument Assembler, Senior Grade

60 Series Mechanical Clocks

Place the dial in position with the dial feet projecting through the holes in the front plate. Put the dial foot taper pins through the holes in the dial feet behind the front plate. See Fig. 128. Push the taper pins into their holes with a pair of pliers so that the dial is firmly attached to the movement.

Press on the hour and minute hands with the hand pushing tool, Tool No. 20A. Fasten down the hour and the minute hands with the hand nut by using the special pliers, Tool No. 3A. Refer to Fig. 129. Press on the second hand.

Set the clock to the correct time by moving the minute hand clockwise with the index finger. Check to see that the sweep second hand can be set either clockwise or counter-clockwise with the finger. This is done by rapidly, but gently, moving the end of the

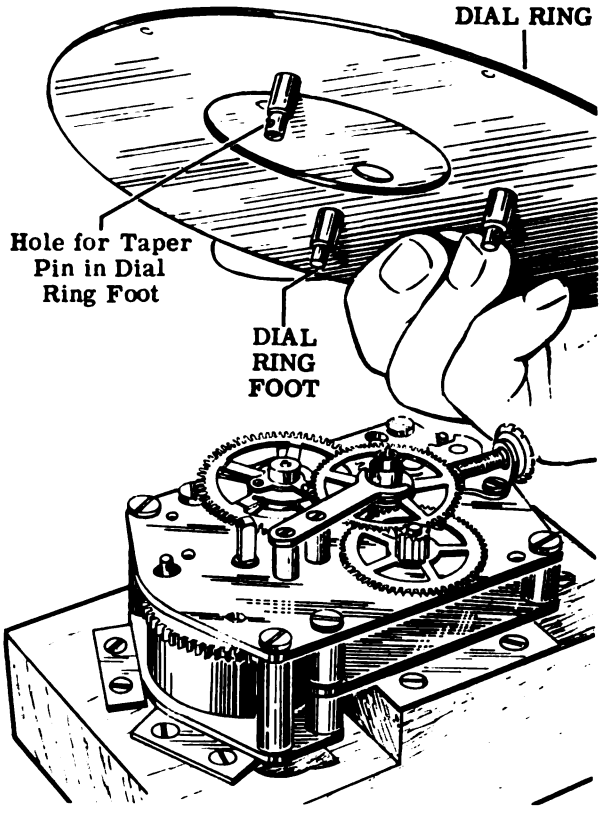


Figure 128

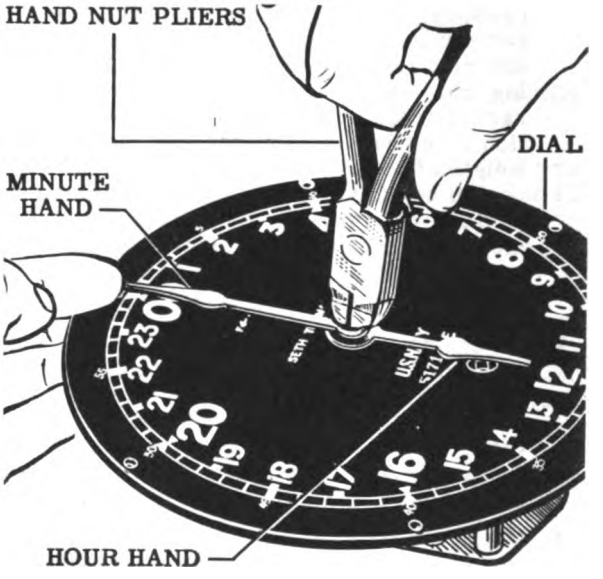


Figure 129

second hand in 10-second jumps all around the dial in both directions. There should be enough slip so that the second hand can be set in either direction without any damage to the escapement. If there is any sign that the second hand does not slip freely, use a new second hand. None of the hands should interfere with the operation of any of the others and the movement should resume its normal operation once setting is completed.

NOTE

After Operation 3, the movement is normally put through the various timing tests described in the next section "Test, Adjustment and Final Inspection." The final steps of placing the dialed movement into the case are included in the following paragraphs for purposes of maintaining the continuity of the reassembly operations.

Operations 1 through 3 are for Mechanical Clocks only.

Operations 4 through 7 are for Boat and Deck Clocks only.

CASING OPERATIONS

Skill Level: Mechanical Instrument Assembler, Senior Grade

Mechanical Clocks Only

1. To put the dialed movement back into the case, refer to Fig. 130 for the proper positions of the parts involved. Place a winding key or a letdown key through the dial winding hole and over the squared end of the barrel arbor. With a tilting and lifting motion of the hand holding the key, most of the weight of the dialed movement can be supported by the key. With the other hand supporting the rim of the dial, place the dialed movement back into the case. Turn the dial so that the three dial mounting holes line up with the three mounting holes in the case rim.

2. Place the reflector ring in position on the dial so that the three holes around the reflector rim line up with the three holes around the outside of the dial. Screw down the reflector to the dial with the three reflector screws which also hold the dialed movement in the case.

3. Swing the bezel into position so that it covers up the dial and encloses the entire dialed movement inside the case. Tighten the case knob on the side of the bezel, sealing the case.

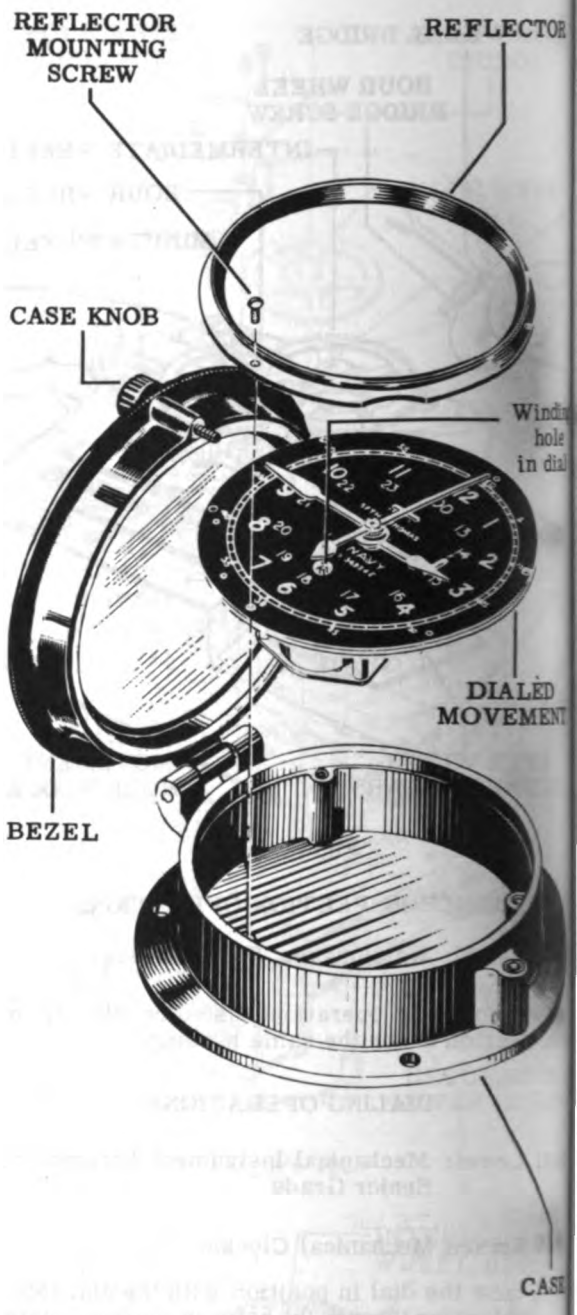


Figure 130

Boat and Deck Clocks Only

4. Refer to Fig. 131 (phenolic case) and Fig. 132 (metal case) for the relative positions of all parts involved in Operations 1 through 4. Turn the dialed movement over in the work ring and position it so that no weight is placed on the hands. Fasten on the dust cover with the four dust cover movement mounting screws.

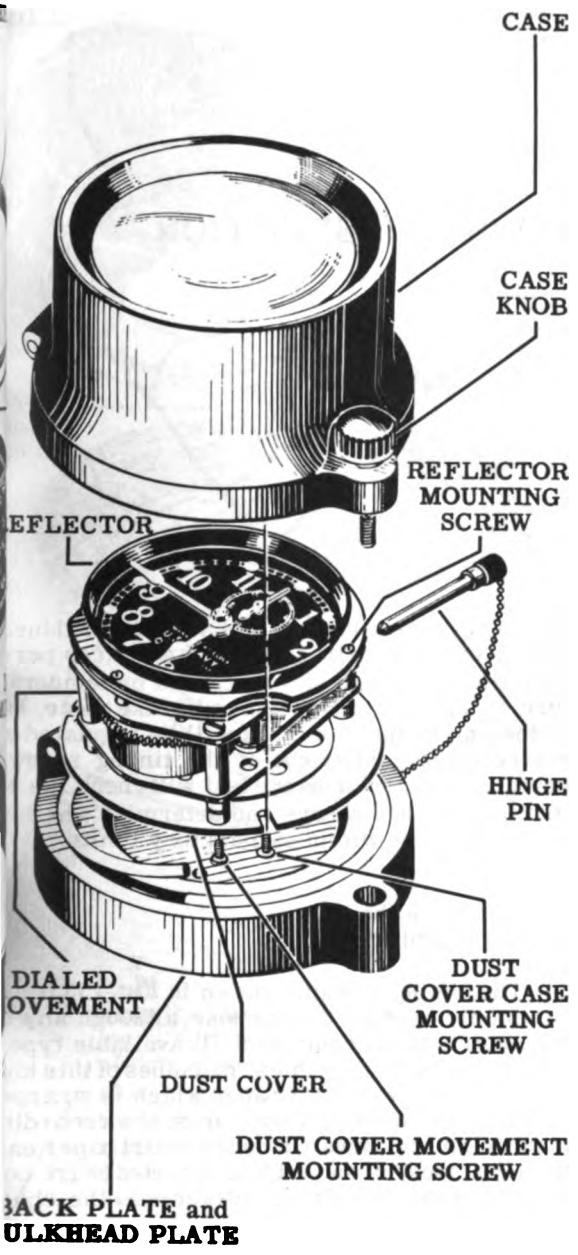


Figure 131

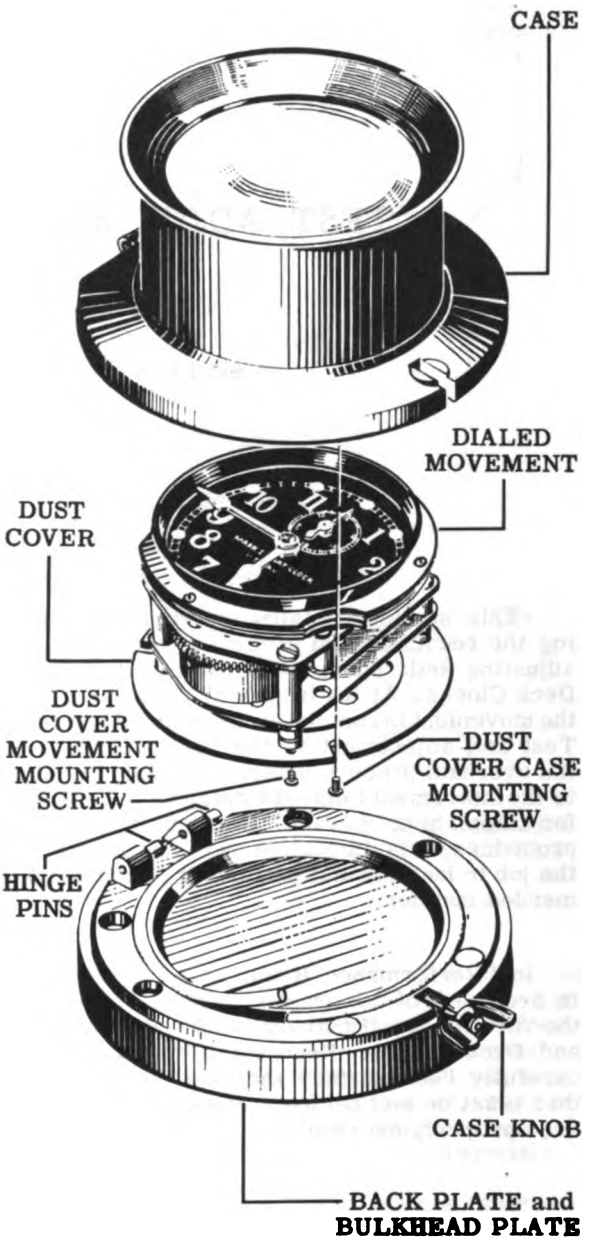


Figure 132

Hold the movement dial side up in one hand and put the case over it with the other hand. Turn over the case and movement so that the dust cover is up. Turn the dust cover so that its three mounting holes line up with the three mounting holes in the case. Fasten the movement into the case by screwing in the three dust cover case mounting screws through the dust cover.

6. Place the case and movement in position on the case back plate so that the hinges interlock. Once the hinges are interlocked, slip in the hinge pin which holds the case and lock plate together.

7. Tighten the case knob on the side of the case so that the case and case back plate are firmly fastened together.

SECTION VI

TEST, ADJUSTMENT AND FINAL INSPECTION

Skill Level: Mechanical Instrument Assembler, Senior Grade

This section contains instructions covering the recommended procedure for testing and adjusting Seth Thomas Mechanical, Boat and Deck Clocks. At the beginning of this procedure the movement is completely assembled and dialed. Test and adjustment is the last procedure in the overhaul process before returning the clock to the Instrument Control Center to be packaged for shipment or storage. Because it is the last procedure, it is important that you understand the job to be done and perform it in the recommended manner.

In "Performance Requirements," included in Section II of this manual, there are included the various specifications for Mechanical, Boat and Deck Clocks. Read these requirements carefully because they indicate the standards that must be met before a clock can be considered properly overhauled.

Test and adjustment, as described in this section, consists in first regulating the clock by use of a timing machine and, second, in putting the regulated clock through a performance test. The overall purpose of test and adjustment is to assure that Mechanical, Boat and Deck Clocks will give satisfactory performance in the Fleet both as to accuracy and freedom of mechanical defects.

TIMING OPERATIONS

Skill Level: Mechanical Instrument Assembler, Senior Grade

The purpose of the timing operations is to adjust the balance wheel timing screws so as to secure a perfect rate on the timing machine. This does not mean that the clock will keep perfect time, because errors caused by temperature change and isocronism will take place, but it does mean that the clock will be regulated as perfectly as adjustment of the timing screws permit. The performance test will check the effect of the other errors and determine whether or not they are within satisfactory limits.

Regulating on the Timing Machines

The timing machine shown in Fig. 133 is commonly used for the purpose, although any of the many similar commercially available types may be employed. Timing machines of this kind have a calibrated chart paper which is wrapped around a drum. As a drum turns, the recording mechanism produces a dot on the chart paper each time the clock "ticks." The completed chart consists of a sequence of these dots across the chart.

The usual timing machine of this type requires about 30 seconds to show the time deviation which would occur in a 24-hour run. Chart recordings which slope upward from left to right indicate a gaining rate, and recordings which slope downward from left to right indicate a losing rate. The chart paper is marked with ruled lines which indicate the number of seconds gained or lost in a 24-hour period.

NOTE

There are commercially available continuous tape timing machines which make a vertical row of dots on the paper tape

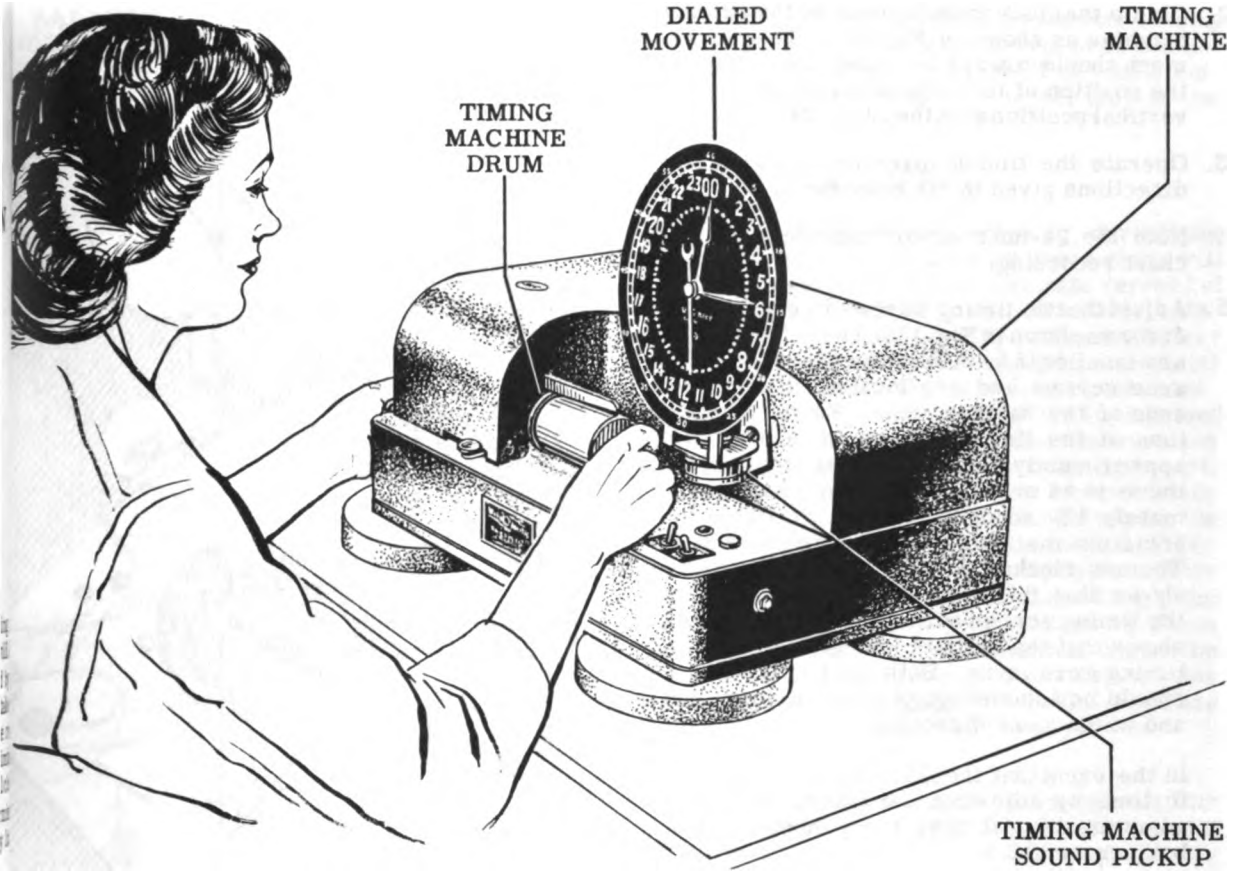


Figure 133

when the clock is neither gaining nor losing time. If the row of dots slopes to the left, the clock is running slow; and if the row of dots slopes to the right, the clock is running fast. A convenient angle measuring device mounted over the tape permits reading the error directly in seconds per day.

The clock is held in place in the timing machine by a spring clamp. Underneath the clamp is a sensitive pickup which detects the impulse from the escapement. This impulse, after being amplified within the timing machine, drives a stylus that prints the impulse on the chart paper. A perfectly adjusted escapement in the clock will produce only one line on the chart paper. However, some clock movements may produce records consisting of a double line of dots and still be acceptable. It is not the purpose of this handbook to enter into a discussion of diagnosis of clock defects by means of a timing machine—first, because such information is usually furnished along with the timing machine, and, second, because diagnosis should never be attempted by inexperienced personnel. The purpose of the timing operations described in this section is only to adjust the rate of the clock—if unusual chart recordings appear, the movement should be sent to the escapement repair activity for diagnosis.

Since Mechanical, Boat and Deck Clocks are intended to be used mounted in a vertical position with the 12 (or 24) mark straight up, they must be held in this position—the position of normal operation—while the timing machine is operating. Since the clamp on a timing machine is usually designed to hold a watch movement, a special spring clamp (Tool No. 26A) has been designed to hold dialed Mechanical, Boat and Deck Clocks in the proper upright position. This special clamp is held in place by the regular pickup clamp furnished with the timing machine and, once it is mounted, it need not be moved.

Timing Procedure

1. Set the regulator to the exact center position between "F" and "S."

2. Clamp the clock movement on to the timing machine as shown in Fig. 133. The movement should always be timed and tested in the position of its normal operation—in a vertical position with the 12 (or 24) mark up.

3. Operate the timing machine following the directions given by its manufacturer.

4. Note the 24-hour error indicated on the chart recording.

5. Adjust the two timing screws to correct the error as shown in Fig. 134. These two screws are smaller in head size than the other balance screws and are located close to the ends of the balance arms. Each complete turn of the timing screws is equivalent to approximately 60 seconds per day, so that there is an overall adjustment of approximately 120 seconds per day available by adjusting the timing screws in these Seth Thomas clocks. If the chart recording shows that the clock is gaining time, turn the timing screws out; and, if the recording shows that the clock is losing time, turn the timing screws in. Both timing screws should be adjusted exactly the same amount and in the same direction.

   In the event that the clock cannot be brought to time by adjusting the timing screws, adjustments will have to be made to the balance weight.

CAUTION

In Operation 6 (adjusting the weight of the balance screws), it is very important to perform each detail very carefully. Any change to one balance screw must be made in exactly the same manner to the opposite balance screw. Failure to take sufficient care will result in completely ruining the poise of the balance wheel, resulting in excessive work by the Escapement Repair Activity in order to correct its poise.

If it is necessary to perform Operation 6, do it and then perform Operation 7. Once the clock has been brought to perfect time, send the movement back to the Escapement Repair Activity for checking and adjusting the poise of the balance wheel. Then go through the entire Timing Procedure once more.

6. In the event that the clock is losing time, remove any two opposite balance screws, file out the slots (or undercut the screw heads as shown in Fig. 135) by exactly the same amount and replace the balance screws. In the event that the clock is gaining time, add equal weight timing washers to two opposite balance screws.

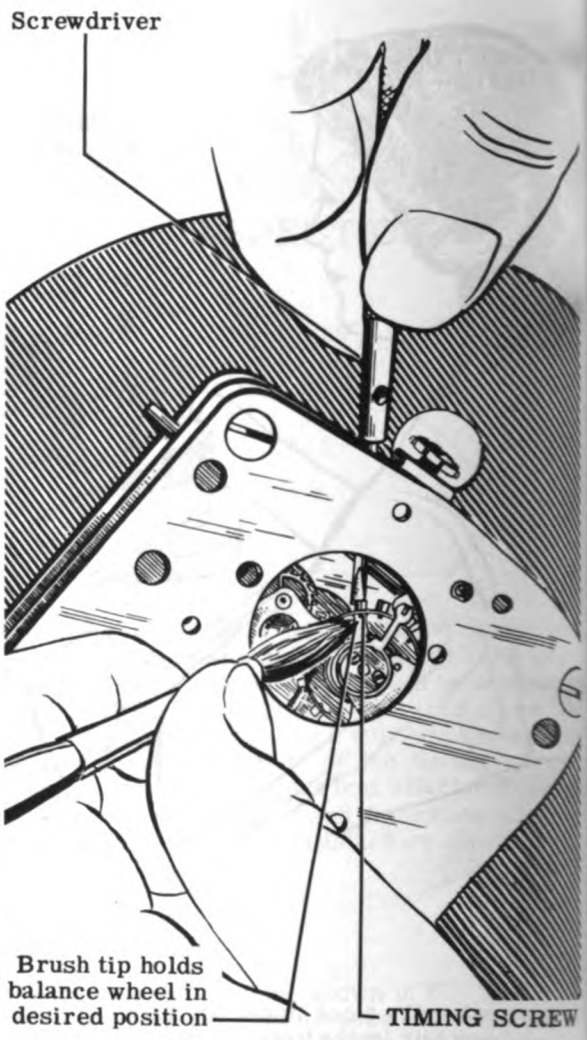


Figure 134

7. After the adjustments in Operations 5 and 6 are complete, place the clock in the timing machine and adjust the timing screws until the chart recording shows neither a gain nor a loss of time. This is not particularly difficult to do and requires only moderate skill in making time adjustments on the timing screws. If any adjustment was made to the weight of the balance screws, send the movement back to the Escapement Repair Activity for checking and adjusting the poise of the balance wheel. Then go through the entire timing procedure once more.

   After the clock movement is brought to perfect time, it is ready for the performance test.

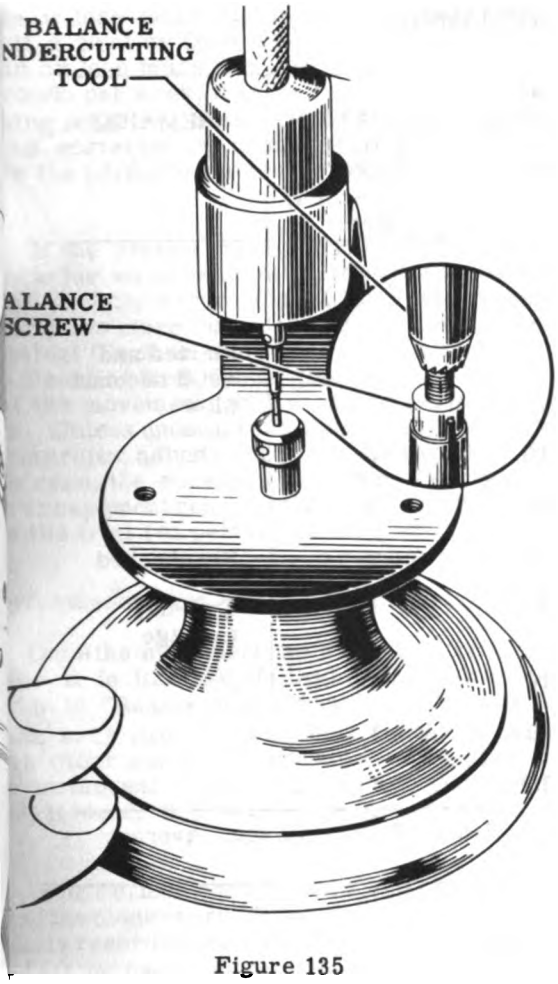


Figure 135

PERFORMANCE TESTING

dll Level: Mechanical Instrument Assembler, Senior Grade

The purpose of the performance test is to ove that no mechanical defects appear in the ock movement, to make sure that the escape- ent adjustments were properly performed and check the accuracy of the timing screw ad- stment. During the performance test, the ock is wound every 168 hours (7 days) and aintained at ordinary room temperature (68 to degrees F). The clock must be tested in a rtical position with the 12 or 24 mark on the al straight up—thus simulating normal opera- ng conditions. In order to determine whether not the accuracy is up to standard, daily com- risons must be made between the clock dial ading and a master time source. The master ne source may be a radio signal or a stand- d-frequency operated comparing clock. It is, erefore, very simple to arrive at the dial er- r factor, which is the difference between the exact time and that indicated on the clock being tested. It is not necessary for one to be a highly experienced timer because it is sufficient for all comparisons to be correct only to the nearest second.

Determining the Daily Rate

As mentioned in the foregoing, during the course of the performance test each clock will be wound every 168 hours and rate (error) of each clock determined daily. The daily rate (daily error) is discovered by noting the difference between the dial errors of successive dial readings. If these dial errors are recorded daily, the rate is indicated by the time gained or lost per day. In the event that observations are unavoidably made more than one day apart, the rate should be reduced to a 24-hour basis by dividing the difference in dial errors by the number of days involved. This method of determining the daily rate can easily be understood from the sample "Performance Chart" included here. In the "Remarks" column as shown on the chart, any unusual conditions should be noted so that these may be taken into account when determining whether or not the clock has passed its performance test. See page 84.

The daily rate or error is not the only important concern in determining the timekeeping abilities of a clock. A clock that gains exactly 15 seconds per day is an excellent timekeeper, because this type of error can easily be corrected by slightly slowing down the clock with the regulator. On the other hand, a clock gaining 5 seconds one day and losing 5 seconds the next day is not nearly as good as the first clock, because an erratic gain and loss cannot be corrected by means of the regulator. In order to take this factor into account, the daily rate (error) must be compared with the weekly error divided by 7 and a limit must be placed upon the allowable difference between the two. A study of the sample "Performance Chart" will make this clear.

Performance Requirement Summary

The overall weekly dial error (last entry in col. 2 minus the first entry in col. 2) must be no more than 2 minutes for Mechanical Clocks and no more than 2 minutes 30 seconds for Boat and Deck Clocks during any of the 3 weeks of the Performance Test.

For at least one of the three weeks of the Performance Test, no deviation of daily error in col. 5 must be more than ± 10 seconds for Mechanical Clocks and more than ± 15 seconds for Boat and Deck Clocks.

PERFORMANCE CHART (SAMPLE)

1 DATE	2 DIAL ERROR + = Fast - = Slow Min.	Sec.	3 DAILY RATE (Daily Error) Sec.	4 AVERAGE (Daily Error) Sec.	5 DEVIATION OF DAILY ERROR (col 3-col 4) Sec.	REMARKS
July 1951						
13	-0	03				Started and set 3 seconds slow
14	-0	10	-7	-10	+3	
15	-0	18	-8	-10	+2	
16	x	x	x	x	x	Not checked
17	-0	37	* -10	-10	0	*Two-day average
18	-0	49	-12	-10	-2	
19	-1	1	-12	-10	-2	
20	-1	15	-14	-10	-4	

Weekly error July 14-20 = 1 min 15 sec -03 sec = 1 min 12 sec = 72 sec. Average daily error = 10-2/7 sec = 10 sec.

THE PERFORMANCE TEST

Skill Level: Mechanical Instrument Assembler, Senior Grade

The overall performance test is made up of a series of individual tests which will determine whether or not the clock meets all parts of the specifications.

Testing Conditions

The testing conditions are prescribed as follows:

1. Temperature—The room temperature of the testing area shall be maintained between 68 degrees F and 72 degrees F at all times during testing.
2. Each overhauled clock shall pass the trial run and performance test before it can be released for use.
3. The requirements for the trial run and performance test shall be as described in the remainder of this section.

Trial Run

A trial run is to be made of each uncased movement—this test to last exactly eight days (192 hours). The movement is to be fully wound at the beginning of the trial run and a performance record kept. The purpose of this particular portion of the test is to bring to light any mechanical defects which may exist, to determine that the clock will run at least eight days and to get information on whether or not the clock has a good chance to pass its performance test.

If the clock stops, determine whether it is due to the hands, the movement, or failure of the escapement. See that the hands are not interfering with each other. Check the endshakes and sideshakes in the train to see that there is no binding—correct any binding located. If the cause is not in the movement, but in the escapement, return the escapement to the escapement repair activity. After the condition is corrected another trial run is required.

From the Performance Chart for the trial run you can get a good idea whether or not the clock has a good chance to pass its performance test. If a mechanical clock shows that it will

ain or lose more than two minutes per week, r if a Boat or Deck Clock shows that it will ain or lose more than two minutes and thirty econds per week, it is to be sent back to the ming machine. Smaller gains or losses are) be corrected by means of the regulator be-)re the performance test is begun.

If the overall gain or loss is within limits, heck for an erratic rate. If any of the devia- ons of daily errors (col. 5 of Performance 'hart) are more than ± 10 seconds for the Me- hanical Clock or more than ± 15 seconds for ie Boat and Deck Clock, there is poor chance iat the movement will pass the performance est. Unless unusual conditions exist, the trouble s improper adjustment of the escapement. In iis case, the escapement is to be sent back to ie escapement repair activity for readjustment, nd the trial run performed over again.

'erformance Test

Once the movement has passed its Trial Run, lace it in its case, following the instructions iven in "Reassembly Procedure," Section V. lake sure that the hands do not interfere with ach other due to the pressure of the glass or ie permoseal crystal. Rectify any such condi- on, if found. Set the clock to the correct time.

The Performance Test shall last three weeks Vind the clock every 168 hours (7 days) and keep daily record on the Performance Chart. Once he test has begun, neither the timing screws nor he regulator shall be adjusted without beginning he test over again. The performance require- ients are as follows:

Requirement No. 1. Each weekly dial error hall be within ± 2 minutes for the Mechanical 'lock and ± 2 minutes 30 seconds for the Boat r Deck Clock.

Requirement No. 2. During 1 week of the -week test the average daily error shall be de- ermined by dividing the weekly error by 7. All aily errors shall be within ± 10 seconds (Me- hanical Clock) or ± 15 seconds (Boat or Deck lock) of the average so obtained.

Even though the performance requirements do not require this, it is important to keep a daily record on the Performance Chart—otherwise much time may be wasted. If the first week of the test shows that the clock is not meeting Requirements No. 1 and No. 2, there is no point in carrying out the balance of the test.

If the gain or loss is within 30 seconds of Requirement No. 1, correct the condition with the regulator and begin the test over again. If the gain or loss exceeds 30 seconds more than Requirement No. 1, send the clock back to the timing machine and begin the test over again. If the deviations of any of the daily errors (col. 5 on Performance Chart) are more than 1 or 2 seconds away from those listed in Requirement No. 2, it is unlikely that the clock will meet Requirement No. 2. In this case, send the escapement back to the escapement repair activity for readjustment and begin the test over again. Remember that any trouble of this nature, once the performance test has begun, is due to faulty interpretation of the Performance Chart during the Trial Run. The Trial Run is an important means of saving your time on the Performance Test.

By the end of the second week of the performance check, the clock should be well within Requirements No. 1 and No. 2. If it is, you can be sure that the clock will pass the test. If is not, determine whether the cause is due to unusual conditions, such as failure to wind at proper intervals, excessive variations in room temperature, etc. In these cases, allow the test to continue but correct the condition causing it. If the cause is within the clock itself, you will have to decide whether the errors are of such a nature that Requirement No. 2 will be met during the third week or whether it will be more economical (as in the case of an erratic rate) to have the escapement readjusted.

Final Approval

Once the clock has passed the three-week Performance Test, it is in suitable condition to be issued for use in the Fleet. Return the clock to the Instrument Control Center, from which it may be drawn by the navigational instrument inspector for a complete inspection before packaging for shipment or storage. See the "Navigational Instrument Inspector's Final Inspection Standards and Procedure" in the Control Manual.

SECTION VII

MAINTENANCE PARTS CATALOG

INTRODUCTION

As a supplement to the repair sections of this manual for Seth Thomas Mechanical, Boat and Deck Clocks, the Maintenance Parts Catalog is included to provide a convenient source of stock numbers and complete identification for all maintenance parts and other components. Maintenance parts are under the cognizance of the Ship Parts Control Center, Mechanicsburg, Penna.

The Maintenance Parts Catalog consists of a Group Assembly Parts List detailing all main assemblies, subassemblies, component parts and attaching parts, and a series of exploded views illustrating the Group Assembly Parts List. These are described in the paragraphs which follow.

Group Assembly Parts List

The Group Assembly Parts List, together with its exploded views, lists and illustrates the complete disassembly of Seth Thomas Mechanical, Boat and Deck Clocks. This breakdown covers, in logical sequence, all operations in the disassembly procedure from the taking of the dialed movement out of its case, to the removal of the components from the front plate, including some operations not ordinarily performed in clock overhaul. The arrangement provides an unabridged and methodical listing of maintenance parts and, in addition, serves as a reliable supplement to the sections on Disassembly, Section III, and Reassembly, Section V. Small distinctions of design and construction become glaring visual differences when reference is made to the exploded views.

In the Group Assembly Parts List, the "Part Name" column is indented to indicate the relationship of each component part to its next higher assembly. The attaching parts for each assembly are listed directly following that assembly, before the assembly is broken down. The part names were derived from the terms which are traditional among watch and clock makers, and these names are essentially functional and descriptive in origin. When ordering parts, refer to the Catalog of Navy Material, No. 28001, for the standard stock names; these standard stock names must be used on all requisitions.

Some component parts have a symbol with the footnote, "Not recommended for stocking." This note is added for one of two reasons. One reason may be that the manufacturer recommends the purchase of some parts as assemblies rather than component parts, because assembling the parts may require special equipment not ordinarily found at repair stations. The other reason is that experience may show it is more economical to order a new assembly rather than to do a good job of replacing one of the components of that particular assembly.

Footnote references in the Parts List appear on the pages which list the particular referenced parts.

Those manufacturer's part and drawing numbers which are followed by a "-10(Z)," "-11(Z)," "-12(Z)," or higher numbers followed by (Z) are identified in that manner for two reasons:

a. Certain assemblies, subassemblies and parts had no manufacturer's part and drawing numbers at the time of publication of this manual. When part and drawing numbers are assigned, changes will be issued to this manual.

b. Certain assemblies, subassemblies and parts which, as such, are not procured as maintenance parts by the Ships Parts Control Center have been assigned numbers for purposes of inventory control, cost analysis, work control and handling of salvage. These assigned numbers will serve for purposes of identification at the repair facility, the Instrument Control Center and the navigational instrument control section of the Bureau of Ships.

Fig. & Index Number	SPCC Number	Seth Thomas Part and Drawing Number	Part Name	Units Per Assembly M 60 Type A 24 Hr.	M 60 Type B 12 Hr.	M 85 Type A 24 Hr.	M 85 Type B 12 Hr.
	*G18-C-1141		U.S. Navy Mechanical Clock—6" Size, Type A (24 hr.)	1			
	*G18-C-1143		U.S. Navy Mechanical Clock—6" Size, Type B (12 hr.)		1		
	*G18-C-1142		U.S. Navy Mechanical Clock—8-1/2" Size, Type A (24 hr.)			1	
	*G18-C-1144		U.S. Navy Mechanical Clock—8-1/2" Size, Type B (12 hr.)				1
136-1		R-18629-12	Key—Winding	1	1	1	1
	H18-TSK-10043	†R-20377-A	Case and Bezel Assembly, 7-11/16" O.D.	1	1		
	H18-TSK-10044	†R-30190-A	Case and Bezel Assembly, 10-5/8" O.D.			1	1
136-2		†R-20376-111(Z)	Bezel Assembly, 7-11/16" O.D.	1	1		
136-2		†R-30187-111(Z)	Bezel Assembly, 10-3/16" O.D.			1	1
136-3		R-20376	Bezel, 7-11/16" O.D.	1	1		
136-3		R-30187	Bezel, 10-3/16" O.D.			1	1
136-4	H18-TSK-10194	R-50205	Ring—Horse shoe	1	1	1	1
136-5		R-19997	Washer	1	1	1	1
136-6		R-50179	Washer—Case knob	1	1	1	1
136-7		R-50182	Knob—Case, complete with shaft	1	1	1	1
136-8		R-9051	Glass—Bezel, 5.812" O.D.	1	1		
136-8		R-14717	Glass—Bezel, 8.315" O.D.			1	1
136-9		R-20376-11(Z)	Wire—Glass, 0.062" dia., spring brass	1	1		

This is a stock number identified in the General Stores Section of the Catalog of Navy Material.

† Not recommended for stocking.

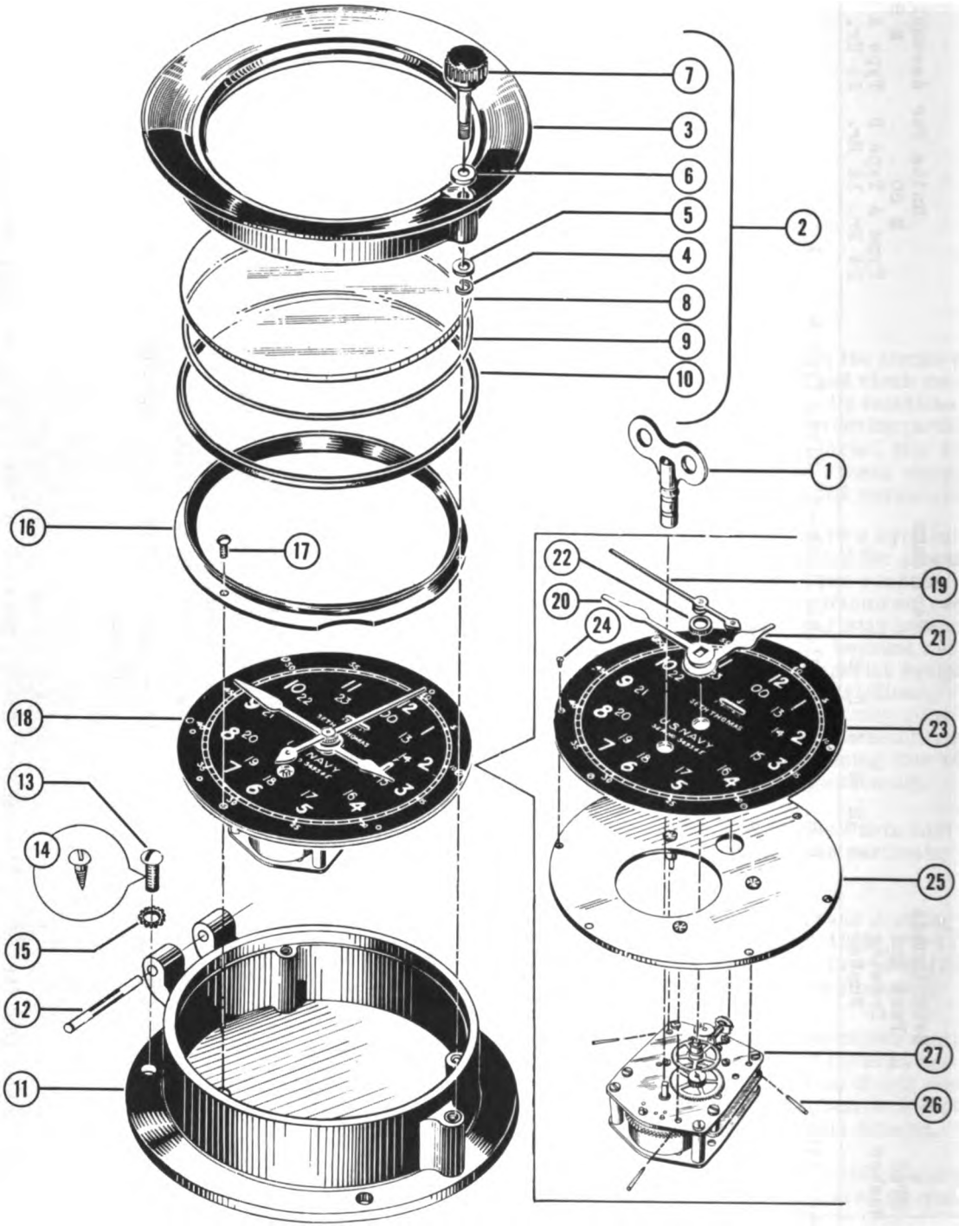


Figure 136—U.S. Navy Mechanical Clock

Fig. & Index Number	SPCC Number	Seth Thomas Part and Drawing Number	Part Name	Units Per Assembly M 60 Type A 24 Hr.	M 60 Type B 12 Hr.	M 85 Type A 24 Hr.	M 85 Type B 12 Hr.
136-9		R-20376-12(Z)	Wire—Glass, 0.090" dia., spring brass			1	1
136-10		R-16304	Gasket—Cork, 6.300" O.D.	1	1		
136-10		R-16234	Gasket—Cork, 8.805" O.D.			1	1
136-11		R-20375	Case—Mechanical clock, complete with inserts, 7-5/8" O.D.	1	1		
136-11		R-30186	Case—Mechanical clock, complete with inserts, 10-5/8" O.D.			1	1
136-12		R-16235	Pin—Hinge	1	1	1	1
136-13		R-50494-34	Screw—Case flange, rd. hd. machine	3	3	3	3
136-14		*R-66176-6	Screw—Case flange, rd. hd. wood	3	3	3	3
136-15	H18-TSK-10220	R-50025	Washer—Lock, external teeth	3	3	3	3
136-16		R-10398-6	Reflector, 6" O.D.	1	1		
136-16	H18-TSK-10110	R-20008-6	Reflector, 8-1/2" O.D.			1	1
136-17	H18-TSK-10186	R-50131-7	Screw—Reflector	3	3	3	3
136-18		†R-5165-11(Z)	Movement Assembly—Dialed 6" Size, 24 hr. dial	1			
136-18		†R-5165-12(Z)	Movement Assembly—Dialed 6" Size, 12 hr. dial		1		
136-18		†R-5165-13(Z)	Movement Assembly—Dialed 8-1/2" Size, 24 hr. dial			1	
136-18		†R-5165-14(Z)	Movement Assembly—Dialed 8-1/2" Size, 12 hr. dial				1
136-19	H18-TSK-10094	R-16192-24	Hand—Sweep second, complete with socket and washer (use with 5165 movement)	1	1	1	1

* Alternate with R-50494-34.

† Not recommended for stocking.

SETH THOMAS MECHANICAL CLOCK
GROUP ASSEMBLY PARTS LIST

Fig. & Index Number	SPCC Number	Seth Thomas Part and Drawing Number	Part Name	Units Per Assembly M 60 Type A 24 Hr.	M 60 Type B 12 Hr.	M 85 Type A 24 Hr.	M 85 Type B 12 Hr.
136-19	H18-TSK-10093	R-50636-28	Hand—Sweep second, complete with socket and washer (use with 5169 movement)	1	1	1	1
136-20	H18-TSK-10089	R-16196-19	Hand—Minute, complete with socket, 2-5/8" long (approx.)	1	1		
136-20	H18-TSK-10090	R-50191-19	Hand—Minute, complete with socket, 3-11/16" long (approx.)			1	1
136-21	H18-TSK-10085	R-16198-19	Hand—Hour, complete with socket, 1-7/8" long (approx.)	1	1		
136-21	H18-TSK-10086	R-50193-19	Hand—Hour, complete with socket, 2-1/2" long (approx.)			1	1
136-22	H18-TSK-10126	*R-15459-19	Nut—Hand	1	1	1	1
136-23	H18-TSK-10057	R-16218	Dial, 6" O.D., 12 hr., regulator slot marked "S-F"		1		
136-23	H18-TSK-10104	†R16218-11(Z)	Dial, 6" O.D., 12 hr., regulator slot marked "F-S"		AR		
136-23	H18-TSK-10059	R-16287	Dial, 6" O.D., 24 hr., regulator slot marked "S-F"	1			
136-23	H18-TSK-10176	†R-16287-11(Z)	Dial, 6" O.D., 24 hr., regulator slot marked "F-S"	AR			
136-23	H18-TSK-10063	R-20374	Dial, 8-1/2" O.D., 24 hr., regulator slot marked "S-F"			1	

* Hand nut, Part No. R-15459-19 (round nut), is to be replaced with a hexagonal type nut as soon as present stocks are exhausted.

Fig. & Index Number	SPCC Number	Seth Thomas Part and Drawing Number	Part Name	Units Per Assembly M 60 Type A 24 Hr.	M 60 Type B 12 Hr.	M 85 Type A 24 Hr.	M 85 Type B 12 Hr.
136-23	H18-TSK-10187	*R-20374-11(Z)	Dial, 8-1/2" O.D., 24 hr., regulator slot marked "F-S"			AR	
136-23	H18-TSK-10061	R-20372	Dial, 8-1/2" O.D., 12 hr., regulator slot marked "S-F"				1
136-23	H18-TSK-10180	*R-20372-11(Z)	Dial, 8-1/2" O.D., 12 hr., regulator slot marked "F-S"				AR
136-24	H18-TSK-10171	R-4645-7	Screw—Dial	3	3	3	3
136-25	H18-TSK-10121	R-16215	Ring—Dial, complete with feet, 6" O.D. (approx.)	1	1		
136-25	H18-TSK-10122	R-20371	Ring—Dial, complete with feet, 8-1/2" O.D.			1	1
		†R-16216	Foot—Dial ring	3	3	3	3
136-26	H18-TSK-10148	R-2269	Pin—Dial foot	3	3	3	3
136-27		†5165	Movement Assembly—Mechanical Clock, "new" style, 12 hr. dial, "new" Seth Thomas escapement		1		1
136-27		†5165-A	Movement Assembly—Mechanical Clock, "new" style, 24 hr. dial, "new" Seth Thomas escapement	1		1	
136-27		†5169	Movement Assembly—Mechanical Clock, "new" style, 12 hr. dial, Elgin escapement		1		1

* Use dials marked "S-F" with Seth Thomas escapements. Use dials marked "F-S" with Elgin escapements.

† Not recommended for stocking.

SETH THOMAS MECHANICAL CLOCK
GROUP ASSEMBLY PARTS LIST

Fig. & Index Number	SPCC Number	Seth Thomas Part and Drawing Number	Part Name	Units Per Assembly M 60 Type A 24 Hr.	Units Per Assembly M 60 Type B 12 Hr.	Units Per Assembly M 85 Type A 24 Hr.	Units Per Assembly M 85 Type B 12 Hr.
136-27		*5169-A	Movement Assembly—Mechanical Clock, "new" style, 24 hr. dial, Elgin escapement	1		1	
136-27		*5160	Movement Assembly—Mechanical Clock, "old" style, 12 hr. dial, "old" Seth Thomas escapement		1		1
136-27		*5161-A	Movement Assembly—Mechanical Clock, "old" style, 24 hr. dial, "old" Seth Thomas escapement	1		1	
136-27		*5164	Movement Assembly—Mechanical Clock, "old" style, 12 hr. dial, "old" Seth Thomas escapement, "old" style click spring		1		1
136-27		*5164-A	Movement Assembly—Mechanical Clock, "old" style, 24 hr. dial, "old" Seth Thomas escapement, "old" style click spring	1		1	

* Not recommended for stocking.

Fig. & Index Number	SPCC Number	Seth Thomas Part and Dwg. Number	Part Name 1 2 3 4 5 6 7	Units Per Assy. Plastic B 4	Units Per Assy. Plastic D 6
	*G18-C-992		U.S. Navy Boat Clock—4", phenolic case	1	
	*G18-C-1048-100		U.S. Navy Deck Clock—6", phenolic case		1
137-1	H18-TSK-10170	R-18629-20	Key—Winding	1	1
137-2	H18-TSK-10046	R-20683	Case Assembly—Deck Clock, phenolic, complete with permoseal crystal and inserts		1
137-2	H18-TSK-10045	R-19973	Case Assembly—Boat Clock, phenolic, complete with permoseal crystal and inserts	1	
137-3	H18-TSK-10184	R-50178	Knob—Case	1	1
137-4		R-50179	Washer—Case knob	1	1
137-5		R-19997	Washer	1	1
137-6	H18-TSK-10194	R-50205	Ring—Horse shoe	1	1
137-7	H18-TSK-10120	†R-50135	Cover Assembly—Dust (with Elgin escapements only)		1
137-7	H18-TSK-10119	†R-19999	Cover Assembly—Dust (with Seth Thomas escapements only)		1
137-7	H18-TSK-10117	†R-50132	Cover Assembly—Dust (with Elgin escapements only)	1	
137-7	H18-TSK-10116	†R-19969	Cover Assembly—Dust (with Seth Thomas escapements only)	1	
137-8		R-18367-3	Screw—Dust cover case mounting	3	3
137-9		R-18380	Screw—Dust cover movement mounting	4	4
137-10		§R-5165-15(Z)	Movement Assembly—Dialed, 4" B4 Boat Clock	1	
137-10		§R-5165-16(Z)	Movement Assembly—Dialed, 6" D6 Deck Clock		1
137-11	H18-TSK-10091	R-18434	Hand—Second, complete with hub		1
137-11	H18-TSK-10092	R-18410	Hand—Second, complete with hub	1	

* This is a stock number identified in the General Stores Section of the Catalog of Navy Material.

† Use Dust Cover Assemblies with regulator slots marked "S-F" with Seth Thomas escapements. Use Dust Cover Assemblies with regulator slots marked "F-S" with Elgin escapements.

§ Not recommended for stocking.

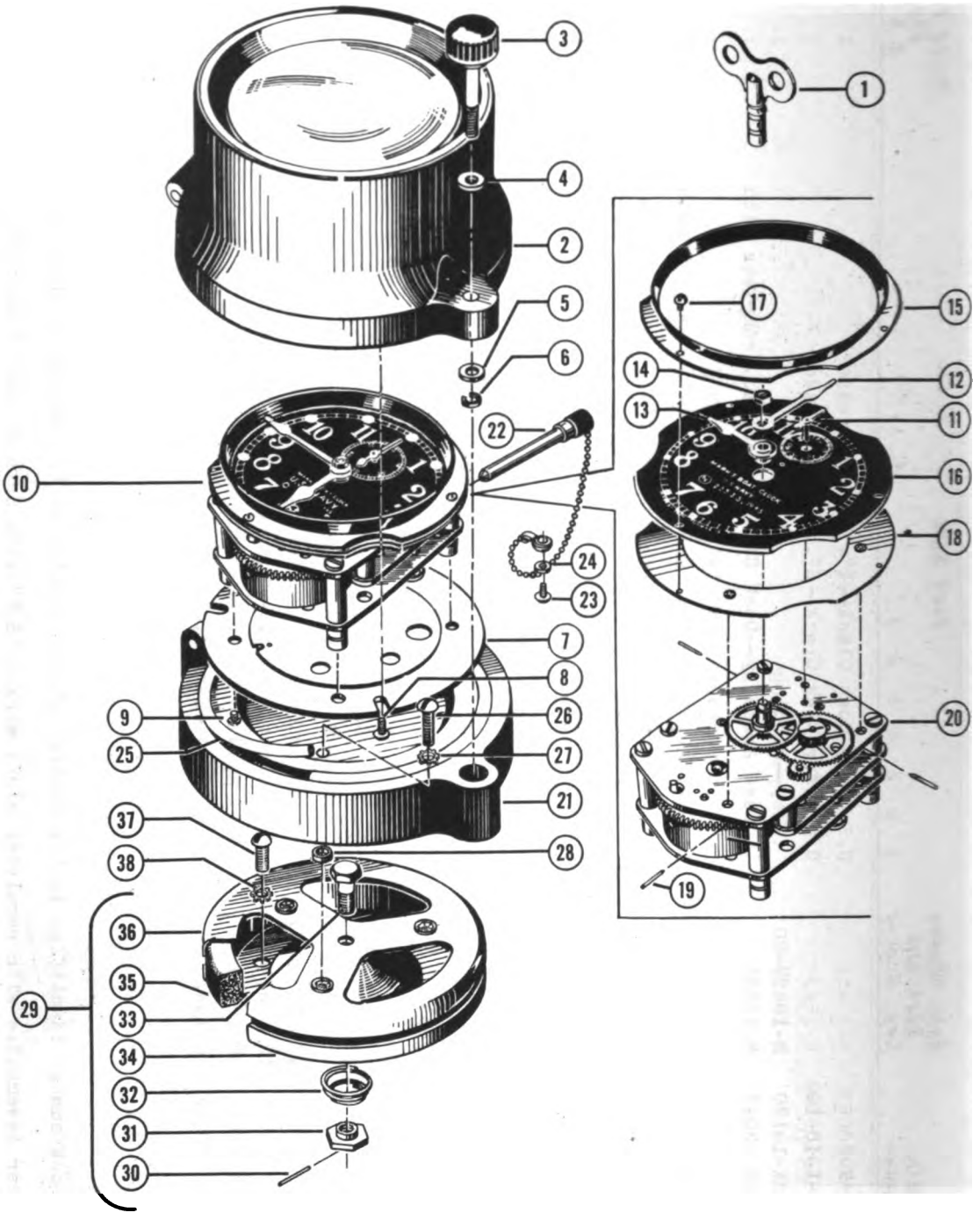


Figure 137—U.S. Navy Boat and Deck Clock—Phenolic Case

Fig. & Index Number	SPCC Number	Seth Thomas Part and Dwg. Number	Part Name 1 2 3 4 5 6 7	Units Per Assy. Plastic B 4	Plastic D 6
137-12	H18-TSK-10087	R-18451	Hand—Minute		1
137-12	H18-TSK-10088	R-18407	Hand—Minute	1	
137-13	H18-TSK-10083	R-18452	Hand—Hour		1
137-13	H18-TSK-10084	R-18406	Hand—Hour	1	
137-14	H18-TSK-10125	R-18382	Nut—Hand	1	1
137-15	H18-TSK-10111	R-18375	Ring—Reflector		1
137-15	H18-TSK-10172	R-18386-6	Ring—Reflector	1	
137-16	H18-TSK-10056	R-18374	Dial, 6" O.D.		1
137-16	H18-TSK-10065	R-18387	Dial, 3-13/16" O.D. (approx.)	1	
137-17		R-18379	Screw—Dial and reflector mounting	3	3
137-18	H18-TSK-10123	R-18372	Ring—Dial, complete with feet, 6" O.D.		1
137-18	H18-TSK-10124	R-18403	Ring—Dial, complete with feet, 3-13/16" O.D. (approx.)	1	
137-19	H18-TSK-10148	R-2269	Pin—Taper, dial ring	3	3
137-20		*5188	Movement Assembly—Boat and Deck Clock, "new" style, "new" Seth Thomas escapement	1	1
137-20		*5189	Movement Assembly—Boat and Deck Clock, "new" style, Elgin escapement	1	1
137-20		*5180	Movement Assembly—Boat and Deck Clock, "old" style, "old" Seth Thomas escapement, "old" click spring, no start and stop knob	1	1
137-20		*5181	Movement Assembly—Boat and Deck Clock, "old" style, "old" Seth Thomas escapement, "old" click spring	1	1

* Not recommended for stocking.

SETH THOMAS BOAT AND DECK CLOCK
GROUP ASSEMBLY PARTS LIST

Fig. & Index Number	SPCC Number	Seth Thomas Part and Dwg. Number	Part Name	Units Per Assy. Plastic B 4	Plastic D 6
137-20		*5184	Movement Assembly—Boat and Deck Clock, "old" style, "old" Seth Thomas escapement, "new" click spring	1	1
137-20		*5186	Movement Assembly—Boat and Deck Clock, "old" style, Elgin escapement, "new" click spring	1	1
	H18-TSK-10223	R-20694	Bulkhead Unit Assembly		1
	H18-TSK-10019	R-20688	Bulkhead Unit Assembly	1	
137-21	H18-TSK-10017	R-33036	Plate—Bulkhead back, complete with inserts		1
137-21		R-20680	Plate—Bulkhead back, complete with inserts	1	
137-22	H18-TSK-10150	R-50039	Pin Assembly—Hinge, complete with chain and knob		1
137-23		R-18412	Screw—Chain mounting	1	1
137-24		R-11612	Washer—Lock	1	1
137-22	H18-TSK-10149	R-19958	Pin Assembly—Hinge, with chain	1	
137-23		R-18412	Screw—Chain mounting	1	1
137-24		R-11612	Washer—Lock	1	1
137-25	H18-TSK-10071	R-18368	Gasket—Rubber, (cut to length AR)	1	1
137-26		R-50024	Screw—Bulkhead back plate mounting		4

SETH THOMAS BOAT AND DECK CLOCK
GROUP ASSEMBLY PARTS LIST

Fig. & Index Number	SPCC Number	Seth Thomas Part and Dwg. Number	Part Name	Units Per Assy. Plastic B 4	Units Per Assy. Plastic D 6
137-27	H18-TSK-10220	R-50025	Washer—Lock, external teetn		4
137-28	H18-TSK-10072	R-50051	Washer—Rubber		4
137-26		R-19970	Screw—Bulkhead back plate mounting	3	
137-27	H18-TSK-10219	R-50026	Washer—Lock, external teeth	3	
137-28	H18-TSK-10073	R-19975	Washer—Rubber	3	
137-29	H18-TSK-10113	R-20689	Cushion Assembly—Bulkhead		1
137-29	H18-TSK-10114	R-19974	Cushion Assembly—Bulkhead	1	
137-30		R-50133	Pin—Compression stud	1	1
137-31		R-19956	Nut—Compression stud	1	1
137-32	H18-TSK-10206	R-50048	Spring—Compression stud	1	1
137-33		R-50050	Screw—Compression		1
137-33		R-19955	Screw—Compression	1	
137-34		R-20692	Plate—Mounting		1
137-34		R-19953	Plate—Mounting	1	
137-35		R-20693	Ring—Rubber cushion		1
137-35		R-19987	Ring—Rubber cushion	1	
137-36		R-20690	Plate—Cushion, complete with bushings		1
137-36		R-19952	Plate—Cushion, complete with bushings	1	
137-37		R-50024	Screw—Clock mounting, 1/4"—20 x 1/2" rd. hd.	3	3
137-38	H18-TSK-10220	R-50025	Washer—Lock, external teeth	3	3

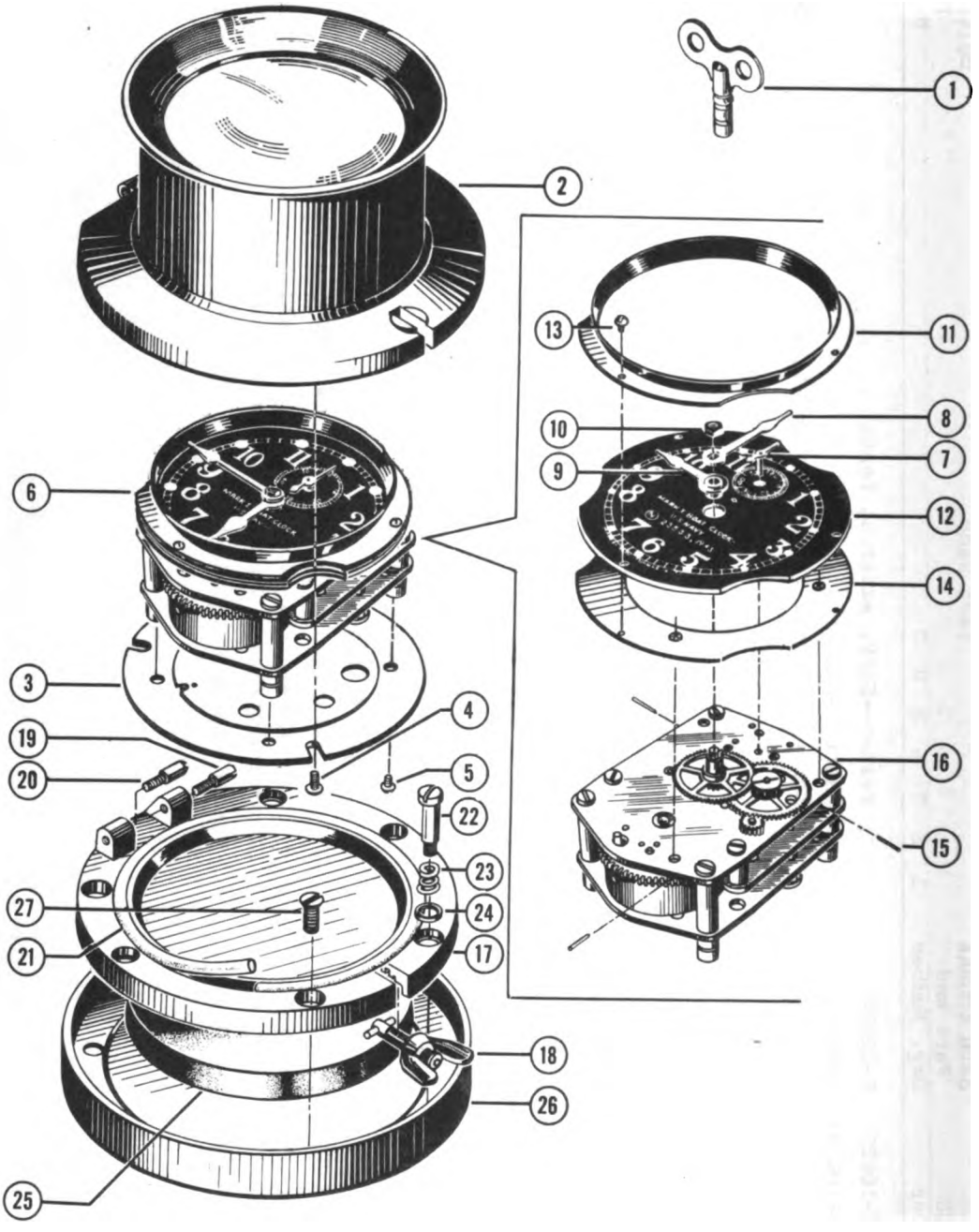


Figure 138—U.S. Navy Boat and Deck Clock—Metal Case

Fig. & Index Number	SPCC Number	Seth Thomas Part and Dwg. Number	Part Name 1 2 3 4 5 6 7	Units Per Assy. Metal B 4	Units Per Assy. Metal D 6
	*G18-C-981		U.S. Navy Boat Clock—4", Cast brass case, chromium plated	1	
	*G18-C-1046		U.S. Navy Deck Clock—6", Cast bronze case, chromium plated		1
138-1	H18-TSK-10170	R-18629-20	Key—Winding	1	1
138-2	H18-TSK-10047	R-18423	Case Assembly—Deck Clock, cast bronze complete with permoseal crystal and inserts		1
138-2	H18-TSK-10048	R-19202	Case Assembly—Boat Clock, cast brass complete with permoseal crystal and inserts	1	
138-3	H18-TSK-10118	R-19599	Cover Assembly—Dust		1
138-3	H18-TSK-10115	R-19603	Cover Assembly—Dust	1	
138-4		R-18367-3	Screw—Dust cover case mounting	3	3
138-5		R-18390	Screw—Dust cover movement mounting	4	4
138-6		†R-5165-15(Z)	Movement Assembly—Dialed, 4" B4 Boat Clock	1	
138-6		†R-5165-16(Z)	Movement Assembly—Dialed, 6" D6 Deck Clock		1
138-7	H18-TSK-10091	R-18434	Hand—Second, complete with hub		1
138-7	H18-TSK-10092	R-18410	Hand—Second, complete with hub	1	
138-8	H18-TSK-10087	R-18451	Hand—Minute		1
138-8	H18-TSK-10088	R-18407	Hand—Minute	1	
138-9	H18-TSK-10083	R-18452	Hand—Hour		1
138-9	H18-TSK-10084	R-18406	Hand—Hour	1	
138-10	H18-TSK-10125	R-18382	Nut—Hand	1	1
138-11	H18-TSK-10111	R-18375	Ring—Reflector		1
138-11	H18-TSK-10107	R-18386-5	Ring—Reflector	1	

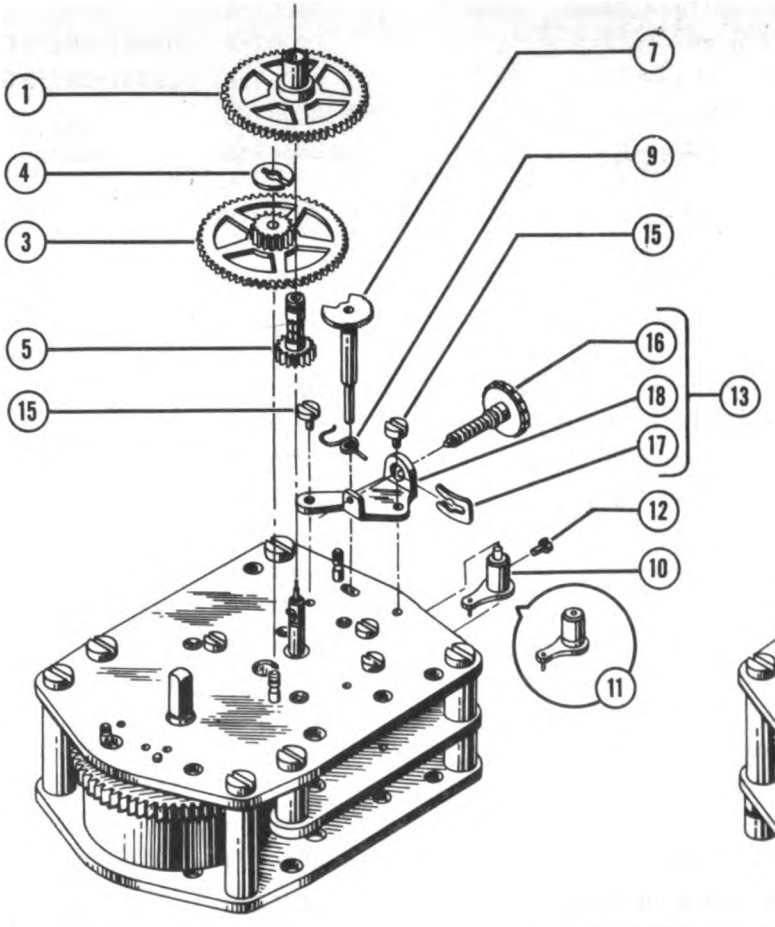
* This is a stock number identified in the General Stores Section of the Catalog of Navy Material.

† Not recommended for stocking.

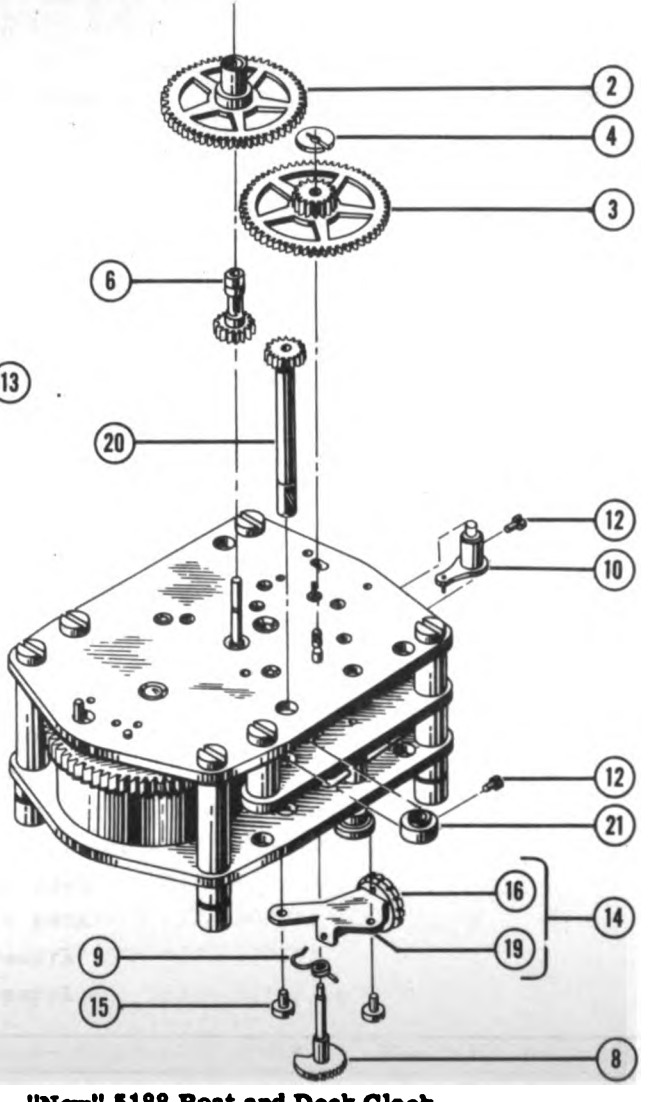
SETH THOMAS BOAT AND DECK CLOCK
GROUP ASSEMBLY PARTS LIST

Fig. & Index Number	SPCC Number	Seth Thomas Part and Dwg. Number	Part Name 1 2 3 4 5 6 7	Units Per Assy. Metal B 4	Units Per Assy. Metal D 6
138-12	H18-TSK-10056	R-18374	Dial, 6" O.D.		1
138-12	H18-TSK-10065	R-18387	Dial, 3-13/16" O.D. (approx.)	1	
138-13		R-18379	Screw—Dial and reflector mounting	3	3
138-14	H18-TSK-10123	R-18372	Ring—Dial, complete with feet, 6" O.D.		1
138-14	H18-TSK-10124	R-18403	Ring—Dial, complete with feet, 3-13/16" O.D. (approx.)	1	
138-15	H18-TSK-10148	R-2269	Pin—Taper, dial ring	3	3
138-16		*5188	Movement Assembly—Boat and Deck Clock, "new" style, "new" Seth Thomas escapement	1	1
138-16		*5189	Movement Assembly—Boat and Deck Clock, "new" style, Elgin escapement	1	1
138-16		*5180	Movement Assembly—Boat and Deck Clock, "old" style, "old" Seth Thomas escapement, "old" click spring, no start and stop knob	1	1
138-16		*5181	Movement Assembly—Boat and Deck Clock, "old" style, "old" Seth Thomas escapement, "old" click spring	1	1
138-16		*5184	Movement Assembly—Boat and Deck Clock, "old" style, "old" Seth Thomas escapement, "new" click spring	1	1
138-16		*5186	Movement Assembly—Boat and Deck Clock, "old" style, Elgin escapement, "new" click spring	1	1

Fig. & Index Number	SPCC Number	Seth Thomas Part and Dwg. Number	Part Name	Units Per Assy. Plastic B 4	Plastic D 6
	H18-TSK-10218	R-18738	Bulkhead Unit Assembly		1
	H18-TSK-10018	R-19168	Bulkhead Unit Assembly	1	
138-17	H18-TSK-10016	R-30294	Plate—Bulkhead back		1
138-17		R-30277	Plate—Bulkhead back	1	
138-18	H18-TSK-10127	R-18355	Screw Assembly—Case lock	1	1
138-19	H18-TSK-10214	R-18424	Pin—Hinge, upper		1
138-20	H18-TSK-10211	R-18425	Pin—Hinge, lower		1
138-19	H18-TSK-10215	R-19204	Pin—Hinge, upper	1	
138-20	H18-TSK-10212	R-19205	Pin—Hinge, lower	1	
138-21	H18-TSK-10071	R-18368	Gasket—Rubber (cut to length AR)	1	1
138-22	H18-TSK-10154	R-18356	Screw—Back plate compression	3	3
138-23	H18-TSK-10197	R-18364	Spring—Back plate compression	3	3
138-24	H18-TSK-10217	R-18360	Washer—Compression screw	3	3
138-25	H18-TSK-10054	R-18901	Disc—Rubber		1
138-25	H18-TSK-10055	R-19203	Disc—Rubber	1	
138-26	H18-TSK-10020	R-30274	Plate—Bulkhead		1
138-26		R-20534	Plate—Bulkhead	1	
138-27		R-50024-11(Z)	Screw—Clock mounting, 1/4"—20 x 1/2" ft. hd. mach.	3	3



"New" 5165 Mechanical Clock



"New" 5188 Boat and Deck Clock

Fig. & Index Number	SPCC Number	Seth Thomas Part and Dwg. Number	Part Name	Units Per Assembly 5165	5165 A	5169	5169 A	5188	5189
136-27			Movement Assembly—Mechanical Clock	Ref.	Ref.	Ref.	Ref.		
137-20 138-16			Movement Assembly—Boat and Deck Clock					Ref.	Ref.
139-1	H18-TSK-10165	R-18695	Wheel—Hour, complete with socket	1		1			
139-1	H18-TSK-10166	R-50324	Wheel—Hour, complete with socket		1		1		
139-2	H18-TSK-10112	R-18542	Wheel—Hour, complete with socket					1	1
139-3	H18-TSK-10097	R-50601	Wheel—Minute, complete with pinion	1		1		1	1
139-3	H18-TSK-10101	R-50599	Wheel—Minute, complete with pinion		1		1		
139-4	H18-TSK-10193	R-50265	Washer—Minute wheel	1	1	1	1	1	1
139-5	H18-TSK-10076	R-18690	Pinion—Cannon	1	1	1	1		
139-6	H18-TSK-10074	R-18546	Pinion—Cannon					1	1
139-7	H18-TSK-10078	R-50658	Gear—Regulator, complete with shaft	1	1	1	1		
139-8	H18-TSK-10079	R-50659	Gear—Regulator, complete with shaft					1	1
139-9	H18-TSK-10204	R-50229	Spring—Regulator gear	1	1	1	1	1	1
139-10	H18-TSK-10010	R-50217	Lever—Regulator, complete with hub and pin	1	1			1	1
139-11	H18-TSK-10011	R-50216	Lever—Regulator, complete with hub and pin			1	1		
139-12		R-13394	Screw—Regulator lever	1	1	1	1	1	1
139-13	H18-TSK-10038	R-16212	Bracket Assembly—Regulator	1	1	1	1		
139-14	H18-TSK-10039	R-18540	Bracket Assembly—Regulator					1	1
139-15		R-50970	Screw—Regulator bracket	2	2	2	2	2	2
139-16		R-16203	Wheel—Regulator index, complete with worm screw	1	1	1	1	1	1
139-17		R-50288	Spring—Regulator index wheel friction	1	1	1	1	1	1
139-18		R-50223	Bracket—Regulator	1	1	1	1		
139-19		R-18539	Bracket—Regulator					1	1
139-20	H18-TSK-10077	R-18545	Shaft—Hand set, complete with pinion					1	1
139-21	H18-TSK-10049	R-18537	Collet—Hand set shaft					1	1
139-12		R-13394	Screw—Hand set shaft collet					1	1

SETH THOMAS "NEW STYLE" 5165 SERIES CLOCK MOVEMENT
GROUP ASSEMBLY PARTS LIST

Fig. & Index Number	SPCC Number	Seth Thomas Part and Dwg. Number	Part Name	Units Per Assembly 5165	5165 A	5169	5169 A	5188	5189
140-1	H18-TSK-10066	R-19597	Knob—Stop and start shaft					1	1
140-2		R-78079	Screw—Stop and start knob					1	1
140-3		R-20709	Plate—Back	1	1	1	1	1	1
140-4	H18-TSK-10189	R-18531	Screw—Back plate pillar	4	4	4	4		
140-5	H18-TSK-10132	R-18566	Pillar—Extension					4	4
140-6	H18-TSK-10192	R-50232	Shaft—Stop and start, complete with lever arm and spring					1	1
140-7	H18-TSK-10105	R-50231	Spring—Start and stop lever arm, blank					1	1
140-8	H18-TSK-10205	R-18568	Spring—Stop and start shaft					1	1
140-9		*R-84136-11(Z)	Barrel Assembly—Mainspring	1	1	1	1		
140-10		*R-84136-12(Z)	Barrel Assembly—Mainspring					1	1
140-11	H18-TSK-10042	R-18723	Cap—Barrel, complete with hub	1	1	1	1	1	1
140-12	H18-TSK-10004	R-18724	Arbor—Barrel, complete with hook	1	1	1	1		
140-13	H18-TSK-10005	R-18731	Arbor—Barrel, complete with hook					1	1
140-14	H18-TSK-10200	R-50321	Mainspring—Clock	1	1	1	1		
140-15	H18-TSK-10199	R-18567	Mainspring—Clock					1	1
140-16	H18-TSK-10015	R-50203	Barrel—Mainspring, complete with hook	1	1	1	1	1	1
140-17	H18-TSK-10167	R-16177	Wheel—Ratchet	1	1	1	1	1	1
140-18	H18-TSK-10196	R-16178	Spacer—Ratchet wheel	1	1	1	1	1	1
140-19	H18-TSK-10069	R-20666	Escapement Assembly—"New" Seth Thomas Clock (see Fig. 145 for breakdown)	1	1			1	
140-20	H18-TSK-10173	R-19746	Screw—Seth Thomas escapement mounting	3	3			3	
140-21		R-20695	Escapement Assembly—Elgin Clock (see Fig. 146 for breakdown)			1	1		1
140-22		R-50214	Spacer—Elgin escapement mounting			2	2		2
140-23		R-50238	Screw—Elgin escapement mounting			2	2		2

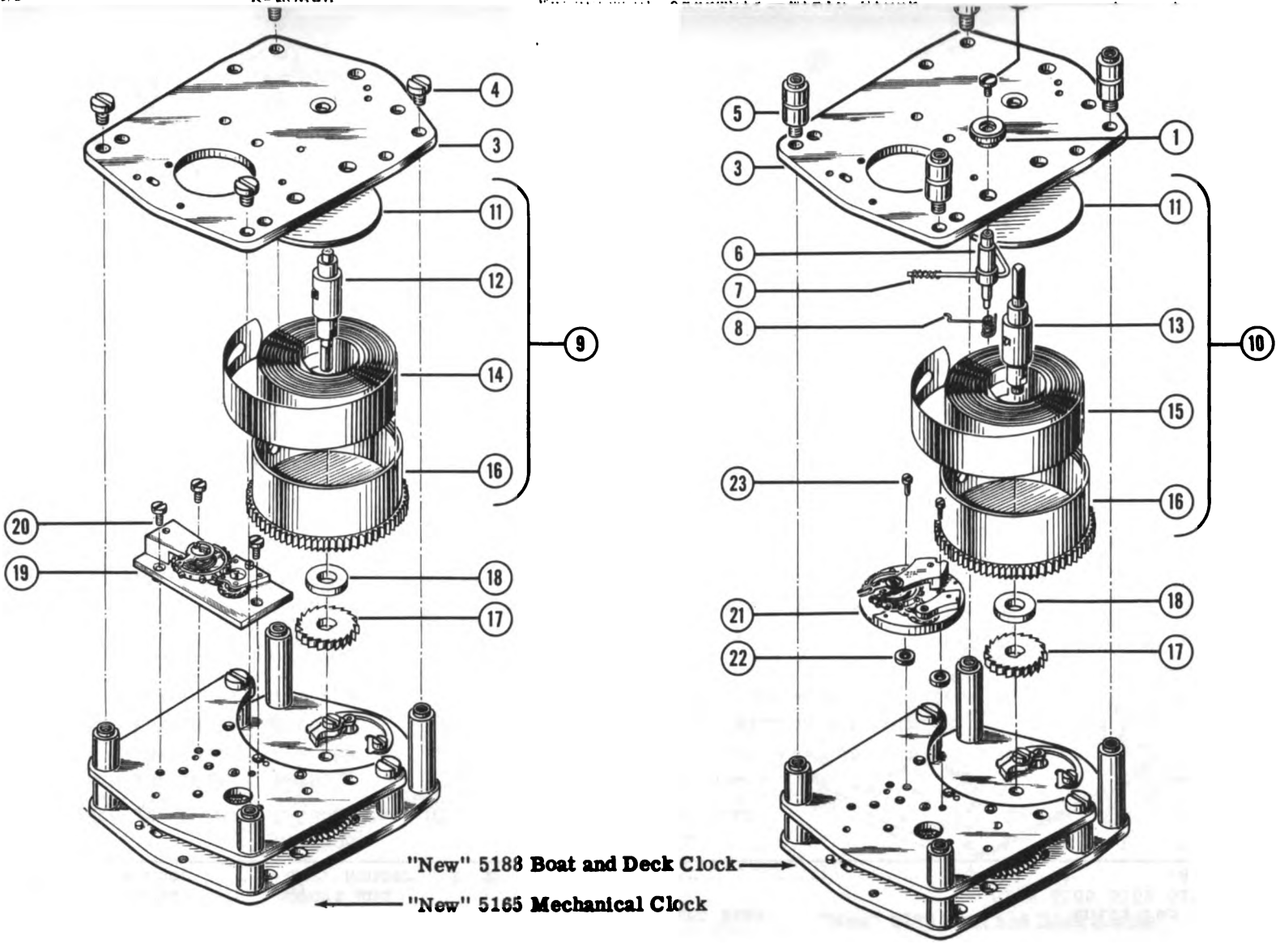
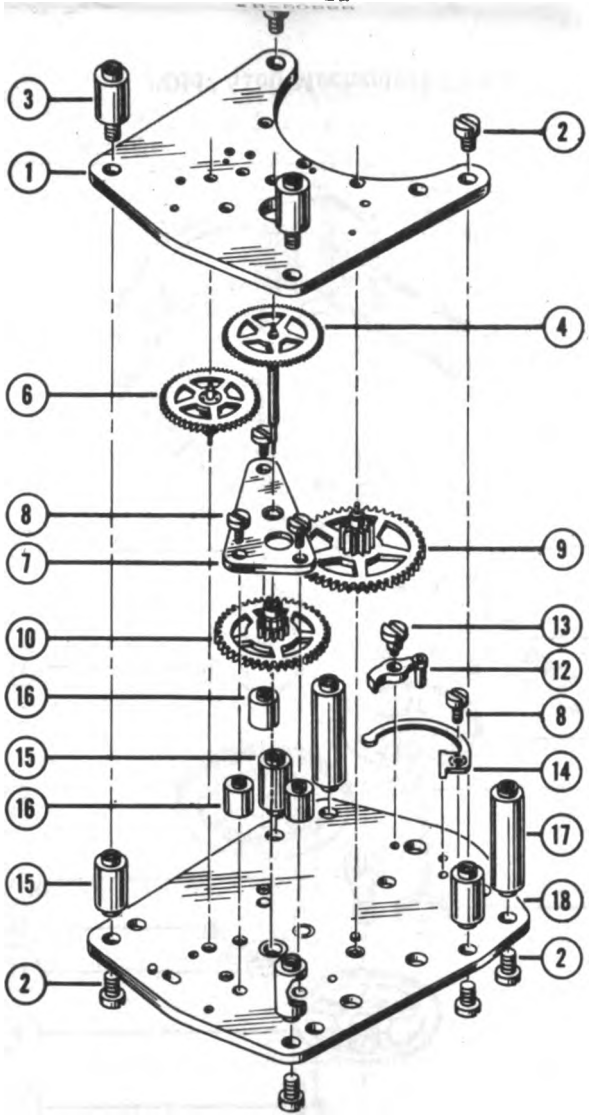


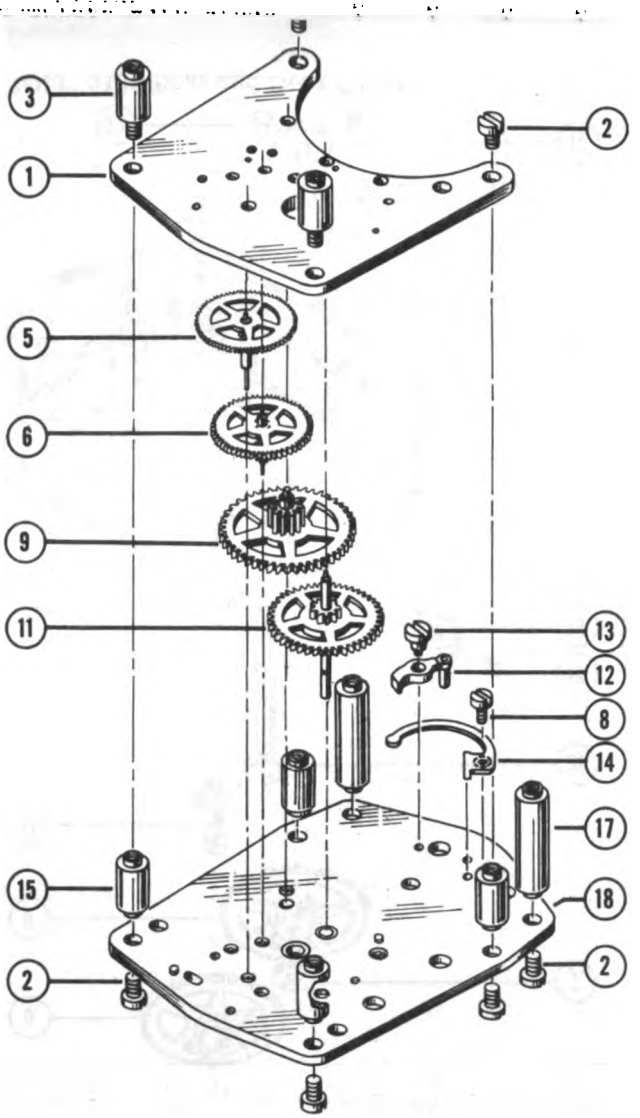
Figure 140—Comparative Views—Back Plate and Mainspring Barrel Disassembly

SETH THOMAS "NEW STYLE" 5165 SERIES CLOCK MOVEMENT
GROUP ASSEMBLY PARTS LIST

Fig. & Index Number	SPCC Number	Seth Thomas Part and Dwg. Number	Part Name 1 2 3 4 5 6 7	Units Per Assembly 5165	5165 A	5169	5169 A	5188	5189
141-1		R-20706	Plate—Train	1	1	1	1	1	1
141-2	H18-TSK-10189	R-18531	Screw—Train plate	2	2	2	2	2	2
141-3	H18-TSK-10142	R-18534	Pillar—Back plate	2	2	2	2	2	2
141-4	H18-TSK-10231	R-18689	Wheel—Fifth, complete with pinion	1	1	1	1		
141-5	H18-TSK-10025	R-50268	Wheel—Fifth, complete with pinion					1	1
141-6	H18-TSK-10234	R-50269	Wheel—Fourth, complete with pinion and hub	1	1	1	1	1	1
141-7		R-18683	Bridge—Center wheel	1	1	1	1		
141-8		R-50970	Screw—Center wheel bridge	3	3	3	3		
141-9	H18-TSK-10229	R-18562	Wheel—Second, complete with pinion	1	1	1	1	1	1
141-10	H18-TSK-10225	R-18699	Wheel—Center (third), complete with pinion	1	1	1	1		
141-11	H18-TSK-10224	R-18630	Wheel—Center (third), complete with arbor and pinion					1	1
141-12	H18-TSK-10131	R-16281	Click, complete with stud	1	1	1	1	1	1
141-13	H18-TSK-10169	R-16201	Screw—Click	1	1	1	1	1	1
141-14	H18-TSK-10201	R-19743	Spring—Click	1	1	1	1	1	1
141-8		R-50970	Screw—Click spring	1	1	1	1	1	1
141-15	H18-TSK-10144	R-18532	Pillar—Train plate	4	4	4	4	4	4
141-2	H18-TSK-10189	R-18531	Screw—Train pillar	4	4	4	4	4	4
141-16	H18-TSK-10141	R-18684	Pillar—Center wheel bridge	3	3	3	3		
141-8		R-50970	Screw—Center wheel bridge pillar	3	3	3	3		
141-17	H18-TSK-10143	R-18533	Pillar—Back plate	2	2	2	2	2	2
141-2	H18-TSK-10189	R-18531	Screw—Back plate pillar	2	2	2	2	2	2
141-18		R-20710	Plate—Front, complete with studs	1	1	1	1	1	1
		*R-50228	Stud—Minute wheel	1	1	1	1	1	1
		*R-50229	Stud—Regulator stop	1	1	1	1	1	1

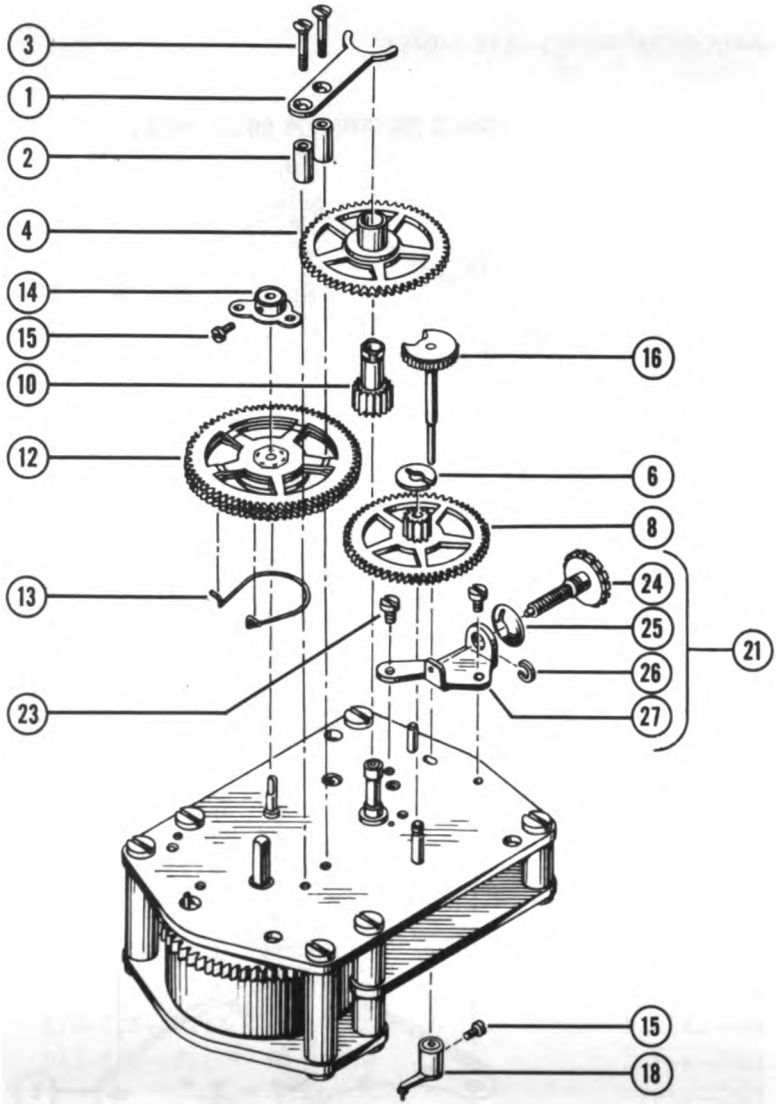


"New" 5165 Mechanical Clock

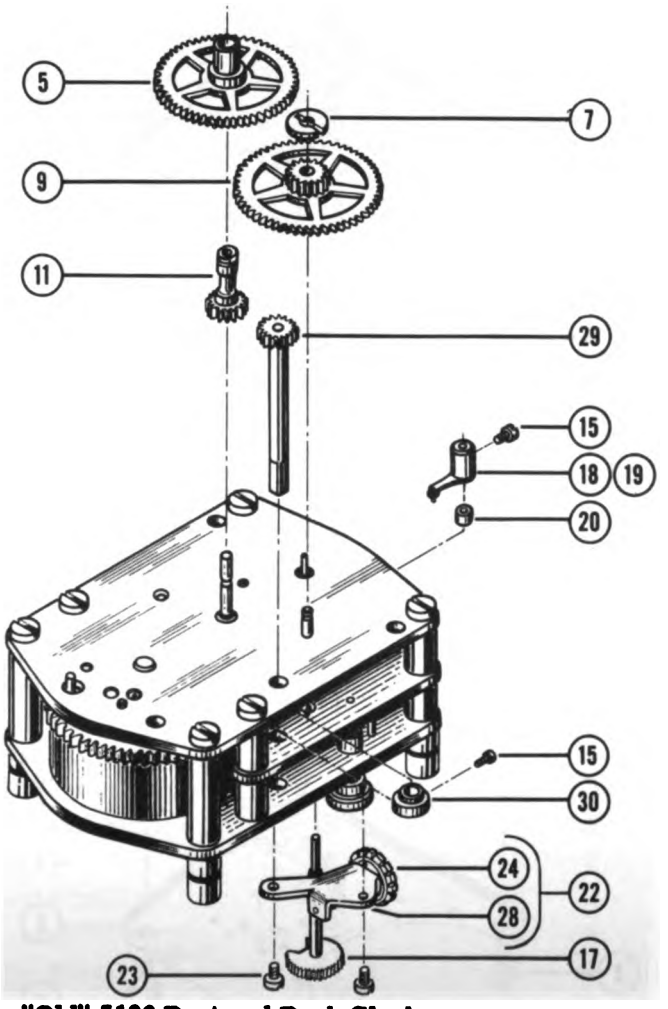


"New" 5188 Boat and Deck Clock

Figure 141—Comparative Views—Train Plate Disassembly



"Old" 5160 Mechanical Clock



"Old" 5186 Boat and Deck Clock

Figure 142—Comparative Views—Dial Side Disassembly

GROUP ASSEMBLY PARTS LIST

Fig. & Index Number	SPCC Number	Seth Thomas Part and Dwg. Number	Part Name	Units Per Assembly 5160	5161 A	5164	5164 A	5180	5181	5184	5186
136-27			Movement Assembly—Mechanical Clock	Ref.	Ref.	Ref.	Ref.				
137-20 138-16			Movement Assembly—Boat and Deck Clock					Ref.	Ref.	Ref.	Ref.
142-1		R-16222	Bridge—Hour wheel	1	1	1	1				
142-2	H18-TSK-10040	R-16223	Collar—Hour wheel bridge	2	2	2	2				
142-3		R-16221	Screw—Hour wheel bridge	2	2	2	2				
142-4	H18-TSK-10221	R-16187	Wheel—Hour, complete with socket	1		1					
142-4	H18-TSK-10236	R-16342	Wheel—Hour, complete with socket		1		1				
142-5	H18-TSK-10112	R-18542	Wheel—Hour, complete with socket					1	1	1	1
142-6		*R-15057	Washer—Minute wheel	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.
142-7	H18-TSK-10193	R-50265	Washer—Minute wheel	1	1	1	1	1	1	1	1
142-8	H18-TSK-10064	R-16194	Wheel—Minute, complete with pinion	1		1					
142-8	H18-TSK-10067	R-16341	Wheel—Minute, complete with pinion		1		1				
142-9	H18-TSK-10062	R-18549	Wheel—Minute, complete with pinion					1	1	1	1

* Minute wheel washer, Part No. R-15057, is now being replaced by minute wheel washer, Part No. R-50265. See also Fig. 139-4.

SETH THOMAS "OLD STYLE" 5160 SERIES CLOCK MOVEMENT
GROUP ASSEMBLY PARTS LIST

Fig. & Index Number	SPCC Number	Seth Thomas Part and Dwg. Number	Part Name	Units Per Assembly							
				5160	5161 A	5164	5164 A	5180	5181	5184	5186
142-10	H18-TSK-10075	R-16188	Pinion—Cannon	1	1	1	1				
142-11		R-18546	Pinion—Cannon					1	1	1	1
142-12	H18-TSK-10060	R-16183	Wheel and Hub—Intermediate	1	1	1	1				
142-13		R-16182	Spring—Intermediate wheel	1	1	1	1				
142-14	H18-TSK-10198	R-16170	Spring—Friction, complete with hub	1	1	1	1				
142-15		R-13394	Screw—Friction spring	1	1	1	1				
142-16		*R-16200	Gear—Regulator, complete with shaft	1	1	1	1				
142-17		†R-18536	Gear—Regulator, complete with shaft					1	1	1	1
142-18	H18-TSK-10008	R-16214	Lever—Regulator, complete with hub and pin	1	1	1	1	1	1	1	
142-19	H18-TSK-10009	§R-50126	Lever—Regulator, complete with hub and pin								1
142-15		R-13394	Screw—Regulator lever hub	1	1	1	1	1	1	1	1
142-20		R-18538	Spacer—Regulator lever					1	1	1	
142-21	H18-TSK-10038	R-16212	Bracket Assembly—Regulator	1	1	1	1				

* Replace regulator gear, Part No. R-16200, with regulator gear, Part No. R-50658, when stock is exhausted. See Fig. 139-7.

† Replace regulator gear, Part No. R-18536, with regulator gear, Part No. R-50659, when stock is exhausted. See Fig. 139-8.

§ Replace regulator lever, Part No. R-50216, with regulator lever, Part No. R-50217, when stock is exhausted. See Fig. 139-9.

Fig. & Index Number	SPCC Number	Seth Thomas Part and Dwg. Number	Part Name 1 2 3 4 5 6 7	Units Per Assembly 5160	5161 A	5164	5164 A	5180	5181	5184	5186
142-22	H18-TSK-10039	R-18540	Bracket Assembly—Regulator					1	1	1	1
142-23	H18-TSK-10191	R-16175-1	Screw—Regulator bracket	2	2	2	2	2	2	2	2
142-24		R-16203	Wheel—Regulator index, complete with worm screw	1	1	1	1	1	1	1	1
142-25		*R-16213	Spring—Regulator index wheel friction	1	1	1	1	1	1	1	1
142-26		*R-15192	Ring—Horseshoe lock	1	1	1	1	1	1	1	1
142-27		R-50223	Bracket—Regulator	1	1	1	1				
142-28		R-18539	Bracket—Regulator					1	1	1	1
142-29	H18-TSK-10077	R-18545	Shaft—Hand set, complete with pinion					1	1	1	1
142-30	H18-TSK-10049	R-18537	Collet—Hand set shaft					1	1	1	1
142-15		R-13394	Screw—Hand set shaft collet					1	1	1	1

* Replace both regulator index wheel friction spring, Part No. R-16213, and horseshoe lock ring, Part No. R-15192, with Part No. R-50288 when stock is exhausted. See Fig. 139-17.

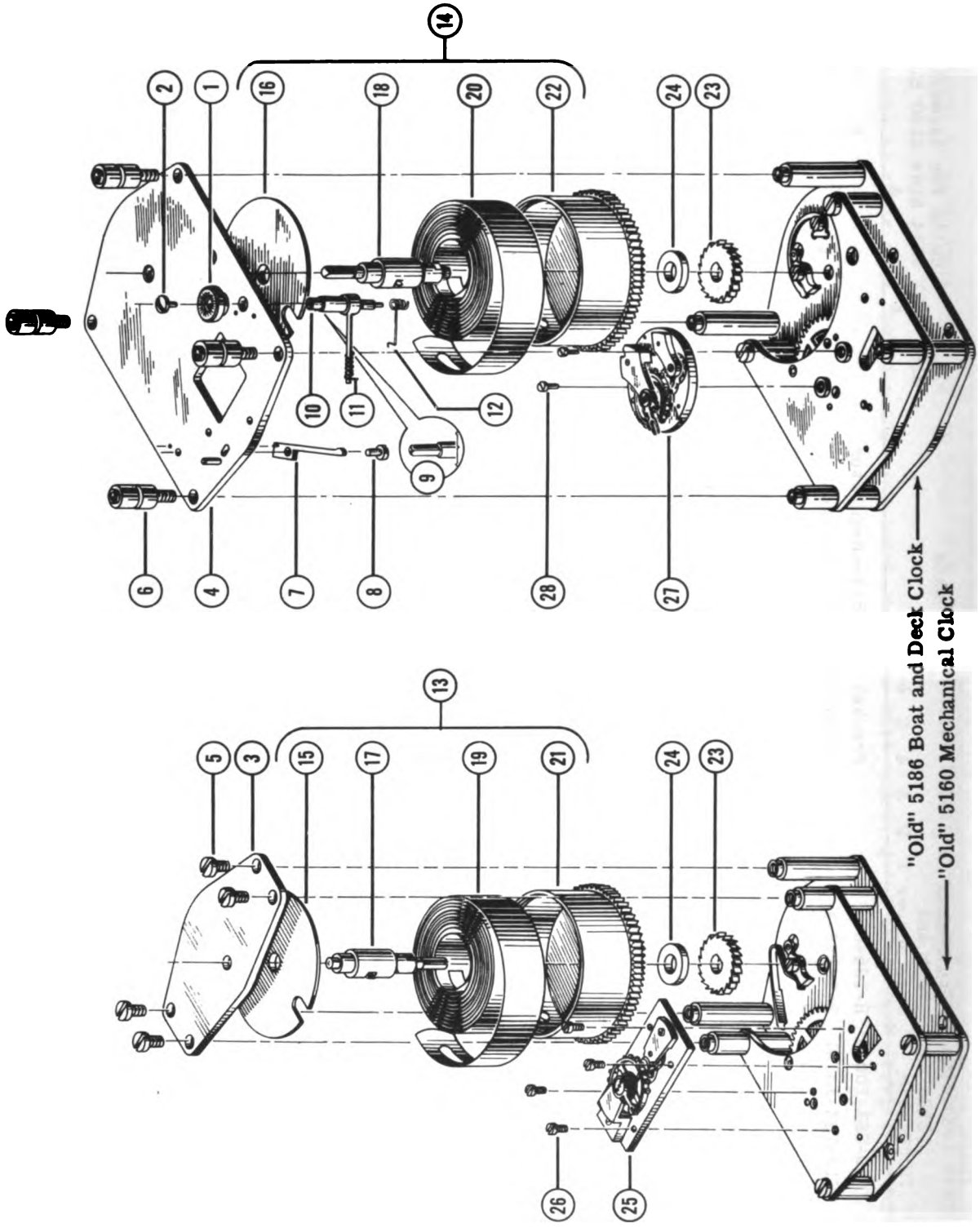


Figure 143—Comparative Views—Back Plate and Mainspring Barrel Disassembly

GROUP ASSEMBLY PARTS LIST

Fig. & Index Number	SPCC Number	Seth Thomas Part and Dwg. Number	Part Name	Units Per Assembly 5160	5161 A	5164	5164 A	5180	5181	5184	5186
143-1	H18-TSK-10066	R-19597	Knob—Stop and start						1	1	1
143-2	H18-TSK-10175	R-12058-3	Screw—Stop and start knob						1	1	1
143-3	H18-TSK-10134	R-30185	Plate—Back	1	1	1	1				
143-4		R-30281-A	Plate—Back, complete with pins and regulator stud					1			
143-4	H18-TSK-10133	R-30281-B	Plate—Back, complete with pins and regulator stud						1		
143-4	H18-TSK-10135	R-30281-C	Plate—Back, complete with pins and regulator stud							1	
143-4		R-30281-D	Plate—Back, complete with pins and regulator stud								1
		*R-16202	Stud—Regulator					1	1	1	1
		*R-18587	Pin—Stop and start					2	2	2	2
143-5	H18-TSK-10189	R-18531	Screw—Back plate pillar	4	4	4	4				
143-6	H18-TSK-10132	R-18566	Pillar—Extension					4	4	4	4
143-7	H18-TSK-10203	R-16217	Spring—Regulator shaft friction, complete with pin.					1	1	1	1
143-8	H18-TSK-10191	R-16175-1	Screw—Regulator spring					1	1	1	1
143-9		R-18569	Shaft—Start and stop, complete with lever arm and spring					1			
143-10		R-19601	Shaft—Start and stop, complete with lever arm and spring						1	1	1
143-11	H18-TSK-10105	R-50231	Spring—Start and stop lever, blank					1	1	1	1
143-12	H18-TSK-10205	R-18568	Spring—Stop and start shaft					1	1	1	1

* Not recommended for stocking.

SETH THOMAS "OLD STYLE" 5160 SERIES CLOCK MOVEMENT
GROUP ASSEMBLY PARTS LIST

Fig. & Index Number	SPCC Number	Seth Thomas Part and Dwg. Number 1 2 3 4 5 6 7	Part Name	Units Per Assembly 5160	5161 A	5164	5164 A	5180	5181	5184	5186
143-13		*†R-16163-11(Z)	Barrel Assembly—Mainspring	1	1	1	1				
143-14		*†R-18564-11(Z)	Barrel Assembly—Mainspring					1			
143-14		*†R-18730-11(Z)	Barrel Assembly—Mainspring						1	1	1
143-15	H18-TSK-10041	R-16166	Cap—Barrel, complete with hub	1	1	1	1	1			
143-16	H18-TSK-10042	R-18723	Cap—Barrel, complete with hub						1	1	1
143-17		R-16176	Arbor—Barrel, complete with hook	1	1	1	1				
143-18		R-18543	Arbor—Barrel, complete with hook					1			
143-18	H18-TSK-10005	R-18731	Arbor—Barrel, complete with hook						1	1	1
143-19		R-16180	Mainspring—Clock	1	1	1	1				
143-20	H18-TSK-10199	R-18567	Mainspring—Clock					1	1	1	1
143-21	H18-TSK-10114	R-16163	Barrel—Mainspring, complete with hook	1	1	1	1				
143-22		R-18564	Barrel—Mainspring, complete with hook					1			
143-22		R-18730	Barrel—Mainspring, complete with hook						1	1	1

* "Old" style Barrel Assemblies, Part Nos. R-18564-11(Z) and R-18730-11(Z), for back wind movements may be replaced in their entirety by the Barrel Assembly, Part No. R-84136-12(Z), used in "New" style back wind movements. See Fig. 140-10.

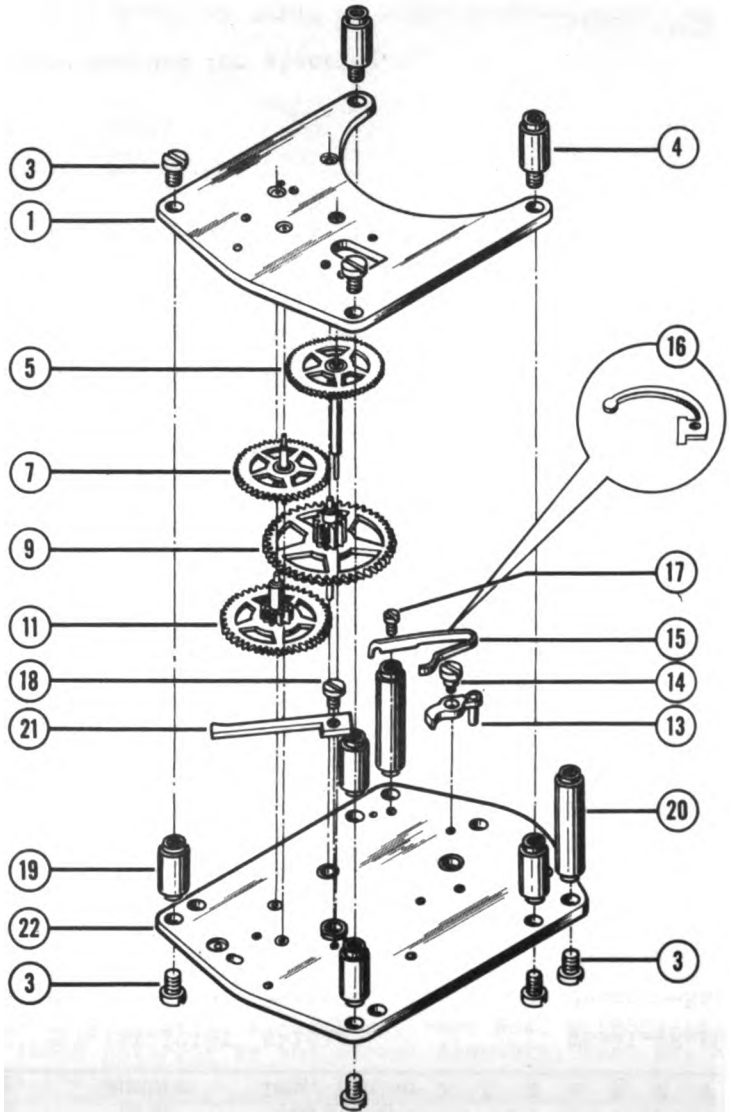
"Old" style Barrel Assemblies, Part No. R-16163-11(Z), for front wind movements may be replaced in their entirety by the Barrel Assembly, Part No. R-84136-11(Z), used in "New" style front wind movements. See Fig. 140-9.

† Not recommended for stocking.

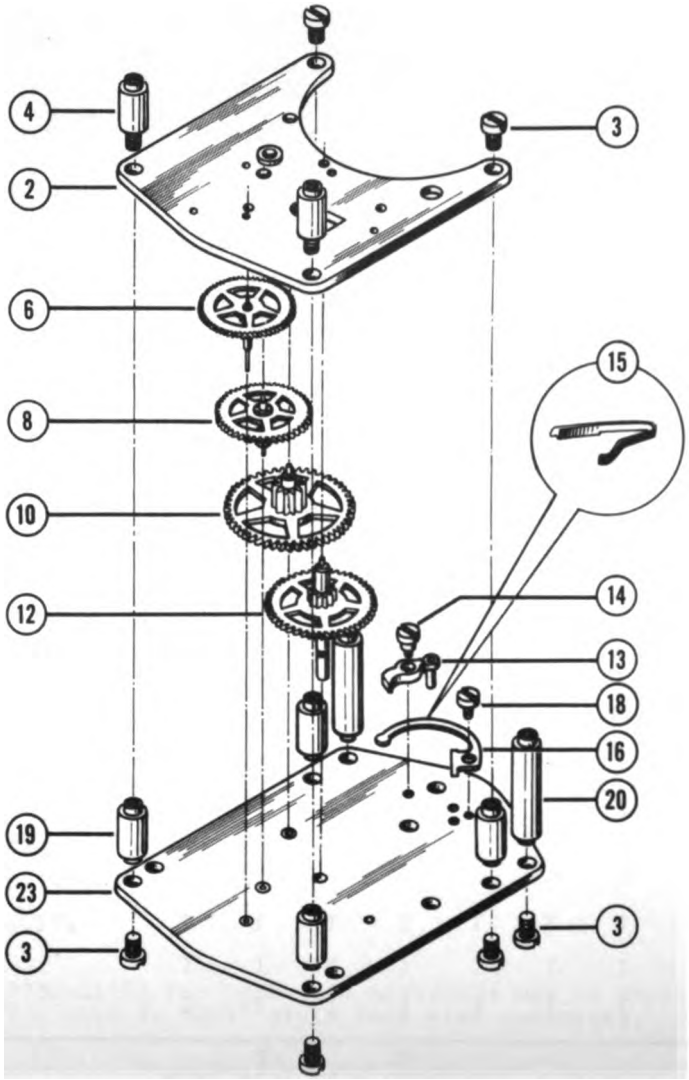
Fig. & Index Number	SPCC Number	Seth Thomas Part and Dwg. Number	Part Name	Units Per Assembly 5160	5161 A	5164	5164 A	5180	5181	5184	5186
143-23	H18-TSK-10167	R-16177	Wheel—Ratchet	1	1	1	1	1	1	1	1
143-24	H18-TSK-10196	R-16178	Spacer—Ratchet wheel	1	1	1	1	1	1	1	1
143-25	H18-TSK-10068	*R-18565	Escapement Assembly—"Old" Seth Thomas Clock (see Fig. 147 for breakdown)	1	1	1	1	1	1	1	
143-26		R-17443	Screw—Escapement plate	4	4	4	4	4	4	4	
143-27	H18-TSK-10070	R-20695-101	Escapement Assembly—Elgin Clock (see Fig. 146 for breakdown)								1
143-28	H18-TSK-10174	R-50066	Screw—Escapement plate								2
144-1	H18-TSK-10136	R-30184	Plate—Train	1	1	1	1				
144-2	H18-TSK-10138	R-30280	Plate—Train					1	1	1	
144-2	H18-TSK-10137	R-33038	Plate—Train, complete with Elgin escapement spacer bushings								1
		†*R-50137	Bushing—Elgin escapement spacer								2
144-3	H18-TSK-10189	R-18531	Screw—Train plate	2	2	2	2	2	2	2	2
144-4	H18-TSK-10142	R-18534	Pillar—Back plate	2	2	2	2	2	2	2	2
144-5	H18-TSK-10233	R-50295	Wheel—Fifth, complete with pinion	1	1	1	1				
144-6	H18-TSK-10232	R-18559	Wheel—Fifth, complete with pinion					1	1	1	1

* Not recommended for stocking.

† For replacement of "Old" Seth Thomas escapements with "New" Seth Thomas escapement, see Section II.



"Old" 5160 Mechanical Clock



"Old" 5186 Boat and Deck Clock

Figure 144—Train Plate Disassembly

Fig. & Index Number	SPCC Number	Seth Thomas Part and Dwg. Number 1 2 3 4 5 6 7	Part Name	Units Per Assembly 5160	5161 A	5164	5164 A	5180	5181	5184	5186
144-7	H18-TSK-10058	R-4741	Wheel—Fourth, complete with pinion	1	1	1	1				
144-8		R-18553	Wheel—Fourth, complete with pinion					1	1	1	1
144-9	H18-TSK-10230	R-16167	Wheel—Second, complete with pinion	1	1	1	1				
144-10	H18-TSK-10229	R-18562	Wheel—Second, complete with pinion					1	1	1	1
144-11	H18-TSK-10235	R-16184	Wheel—Center (third), complete with arbor and pinion	1	1	1	1				
144-12		R-18557	Wheel—Center (third), complete with arbor and pinion					1			
144-12	H18-TSK-10224	R-18630	Wheel—Center (third), complete with arbor and pinion						1	1	1
144-13	H18-TSK-10131	R-16281	Click, complete with stud	1	1	1	1	1	1	1	1
144-14	H18-TSK-10169	R-16201	Screw—Click	1	1	1	1	1	1	1	1
144-15	H18-TSK-10202	R-16266	Spring—Click	1	1			1	1		
144-16	H18-TSK-10201	R-19743	Spring—Click			1	1			1	1
144-17	H18-TSK-10168	R-17357	Screw—Click spring	1	1			1	1		
144-18	H18-TSK-10191	R-16175	Screw—Click spring			1	1			1	1
144-19	H18-TSK-10144	R-18532	Pillar—Train plate	4	4	4	4	4	4	4	4
144-3	H18-TSK-10189	R-18531	Screw—Train plate pillar	4	4	4	4	4	4	4	4
144-20	H18-TSK-10143	R-18533	Pillar—Back plate	2	2	2	2	2	2	2	2
144-3	H18-TSK-10189	R-18531	Screw—Back plate pillar	2	2	2	2	2	2	2	2

SETH THOMAS "OLD STYLE" 5160 SERIES CLOCK MOVEMENT GROUP ASSEMBLY PARTS LIST

Fig. & Index Number	SPCC Number	Seth Thomas Part and Dwg. Number	Part Name	Units Per Assembly 5160	5161 A	5164	5164 A	5180	5181	5184	5186
144-21	H18-TSK-10203	R-16217	Spring—Regulator shaft friction, complete with pin	1	1	1	1				
144-18	H18-TSK-10191	R-16175-1	Screw—Regulator spring	1	1	1	1				
144-22		R-33025	Plate—Front, complete with potance and studs			1	1				
144-22	H18-TSK-10140	R-30183	Plate—Front, complete with potance and studs	1	1						
		*R-16189	Potance	1	1	1	1				
		*R-16195	Stud—Minute wheel	1	1	1	1				
		*R-16202	Stud—Regulator stop	1	1	1	1				
144-23	H18-TSK-10139	R-33014	Plate—Front, complete with stud							1	1
144-23		R-30293	Plate—Front, complete with stud						1		
144-23		R-30279	Plate—Front, complete with stud					1			
		*R-18563	Stud—Minute wheel					1	1	1	1

* Not recommended for stocking.

GROUP ASSEMBLY PARTS LIST

Fig. & Index Number	SPCC Number	Seth Thomas Part and Dwg. Number	Part Name 1 2 3 4 5 6 7	Units Per Assy.
140-19	H18-TSK-10069	R-20666	Escapement Assembly—"New" Seth Thomas Clock	Ref.
145-1		R-51047	Cap—Balance upper endstone, complete with endstone	1
145-2	H18-TSK-10183	R-19747	Screw—Balance upper endstone cap	2
145-3	H18-TSK-10095	*R-18500	Endstone—Balance upper	1
145-4	H18-TSK-10002	R-19619	Regulator, complete with pins	1
		*R-16379	Pin—Regulator	2
145-5	H18-TSK-10037	R-20654	Cock—Balance, complete with jewel and steady pins	1
145-6	H18-TSK-10156	R-19764	Screw—Balance cock	1
145-7	H18-TSK-10022	R-18499	Jewel—Balance hole, upper	1
145-8	H18-TSK-10179	R-19749	Screw—Hairspring stud	1
145-9	H18-TSK-10026	R-19750	Balance and Hairspring Assembly	1
145-10		R-19034-11(Z)	Hairspring Assembly, complete with collet and stud (Elgin)	1
	H18-TSK-10080	R-19034	Hairspring, complete with collet	1
		*R-19628	Stud—Hairspring	1
		*R-16379	Pin—Hairspring stud	1
145-11	H18-TSK-10152	R-19629	Roller, complete with jewel pin	1
145-12	H18-TSK-10103	R-19631	Pin—Jewel	1
145-13	H18-TSK-10208	R-19621	Staff—Balance	1
145-14	H18-TSK-10159	*R-50277	Wheel—Balance, complete with balance screws and timing screws	1
145-15	H18-TSK-10222	R-18745-1	Washer—Timing, No. 1, 0.001" ± 0.00025" thick	AR
145-15	H18-TSK-10051	R-18745-2	Washer—Timing, No. 2, 0.002" ± 0.00025" thick	AR
145-15	H18-TSK-10052	R-18745-3	Washer—Timing, No. 3, 0.003" ± 0.00025" thick	AR

* Not recommended for stocking.

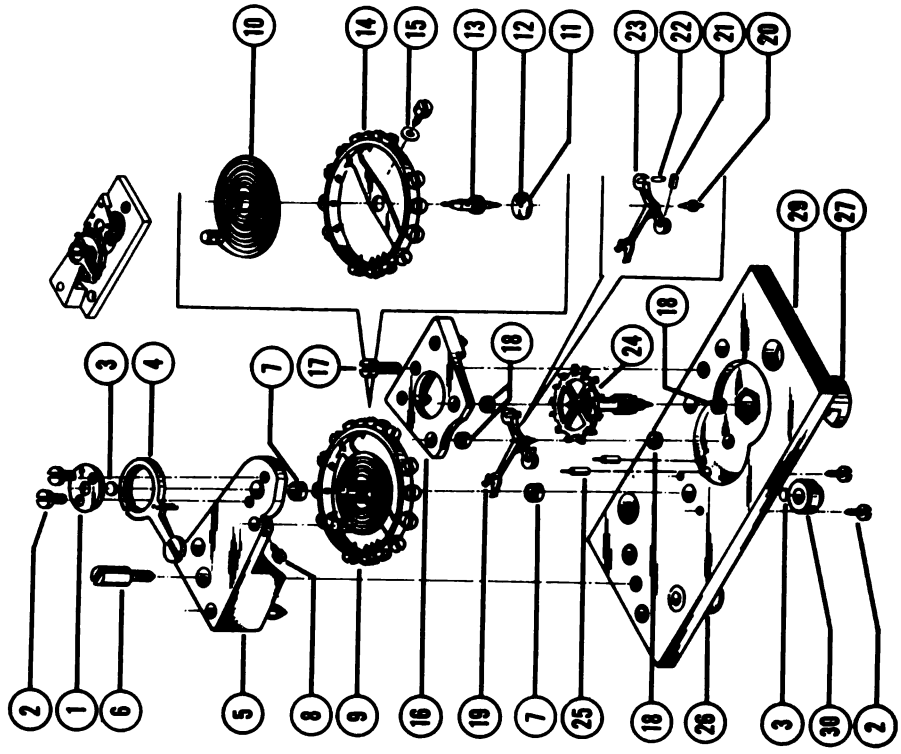


Figure 145—"New" Seth Thomas Escapement

GROUP ASSEMBLY PARTS LIST

Fig. & Index Number	SPCC Number	Seth Thomas Part and Dwg. Number	Part Name	Units Per Assy.
145-15	H18-TSK-10053	R-18745-4	Washer—Timing, No. 4, 0.004" ± 0.00025" thick	AR
145-15	H18-TSK-10082	R-18745-5	Washer—Timing, No. 5, 0.005" ± 0.00025" thick	AR
145-16	H18-TSK-10033	R-20655	Cock—Escape and pallet, complete with jewels and steady pins	1
145-17	H18-TSK-10163	R-19748	Screw—Escape and pallet cock	1
145-18	H18-TSK-10023	R-18501	Jewel—Escape and pallet, upper	2
145-19	H18-TSK-10129	R-19617	Pallet Assembly, complete	1
145-20	H18-TSK-10050	R-20656	Arbor—Pallet	1
145-21	H18-TSK-10098	R-19615	Stone—Pallet receiving (right)	1
145-22		R-50975	Stone—Pallet discharging (left)	1
145-23		*R-20659	Pallet, complete with guard pin	1
145-24	H18-TSK-10227	R-19627	Wheel—Escape, complete with pinion	1
		*R-20651	Plate Assembly—Escapement	1
145-25	H18-TSK-10145	R-19608	Pin—Banking	2
145-18	H18-TSK-10023	R-18501	Jewel—Pallet, lower	1
145-7	H18-TSK-10022	R-18499	Jewel—Balance hole, lower	1
145-26		*R-19607	Bushing—Escape plate	3
145-27		*R-19606	Potance—Escape pinion	1
145-18	H18-TSK-10023	R-18501	Jewel—Escape, lower	1
145-29		*R-33013	Plate—Escapement	1
145-30		R-51048	Cap—Balance lower endstone, complete with endstone	1
145-2	H18-TSK-10183	R-19747	Screw—Balance lower endstone cap	2
145-3	H18-TSK-10095	*R-18500	Endstone—Balance lower	1

* Not recommended for stocking.

SETH THOMAS CLOCK MOVEMENT—ELGIN ESCAPEMENT
GROUP ASSEMBLY PARTS LIST

Fig. & Index Number	SPCC Number	Seth Thomas Part and Dwg. Number	Part Name	Units Per Assy.
140-21 143-27	H18-TSK-10070	R-20695-101	Escapement Assembly—Elgin Clock	Ref.
146-1	H18-TSK-10216	R-20695-137	Regulator, complete with pins	1
		*R-20695-138	Pin—Regulator	2
146-2		*R-20695-111	Cock Assembly—Balance, complete	1
146-3	H18-TSK-10157	R-20695-140	Screw—Balance cock	1
146-4		R-20695-112	Cap—Balance upper endstone, complete with endstone	1
146-5	H18-TSK-10182	R-20695-114	Screw—Balance upper endstone cap	2
146-6		R-20695-113	Setting—Balance upper jewel, complete with jewel	1
146-7	H18-TSK-10178	R-20695-115	Screw—Hairspring stud	1
146-8	H18-TSK-10035	*R-20695-11	Cock—Balance, complete with steady pins	1
146-9	H18-TSK-10012	R-20695-102	Balance and Hairspring Assembly	1
146-10	H18-TSK-10081	R-20695-104	Hairspring Assembly, complete with collet and stud	1
146-11	H18-TSK-10153	R-20695-106	Roller, complete with jewel pin	1
146-12	H18-TSK-10102	R-20695-108	Pin—Jewel	1
146-13	H18-TSK-10209	R-20695-110	Staff—Balance	1
146-14		*R-20695-102-10(Z)	Wheel—Balance, complete with balance screws and timing washers	1
	H18-TSK-10158	*R-20695-147	Screw—Balance	10
146-15	H18-TSK-10222	R-18745-1	Washer—Timing, No. 1, 0.001" ± 0.00025" thick	AR
146-15	H18-TSK-10051	R-18745-2	Washer—Timing, No. 2, 0.002" ± 0.00025" thick	AR
146-15	H18-TSK-10052	R-18745-3	Washer—Timing, No. 3, 0.003" ± 0.00025" thick	AR
146-15	H18-TSK-10053	R-18745-4	Washer—Timing, No. 4, 0.004" ± 0.00025" thick	AR
146-15	H18-TSK-10082	R-18745-5	Washer—Timing, No. 5, 0.005" ± 0.00025" thick	AR

* Not recommended for stocking.

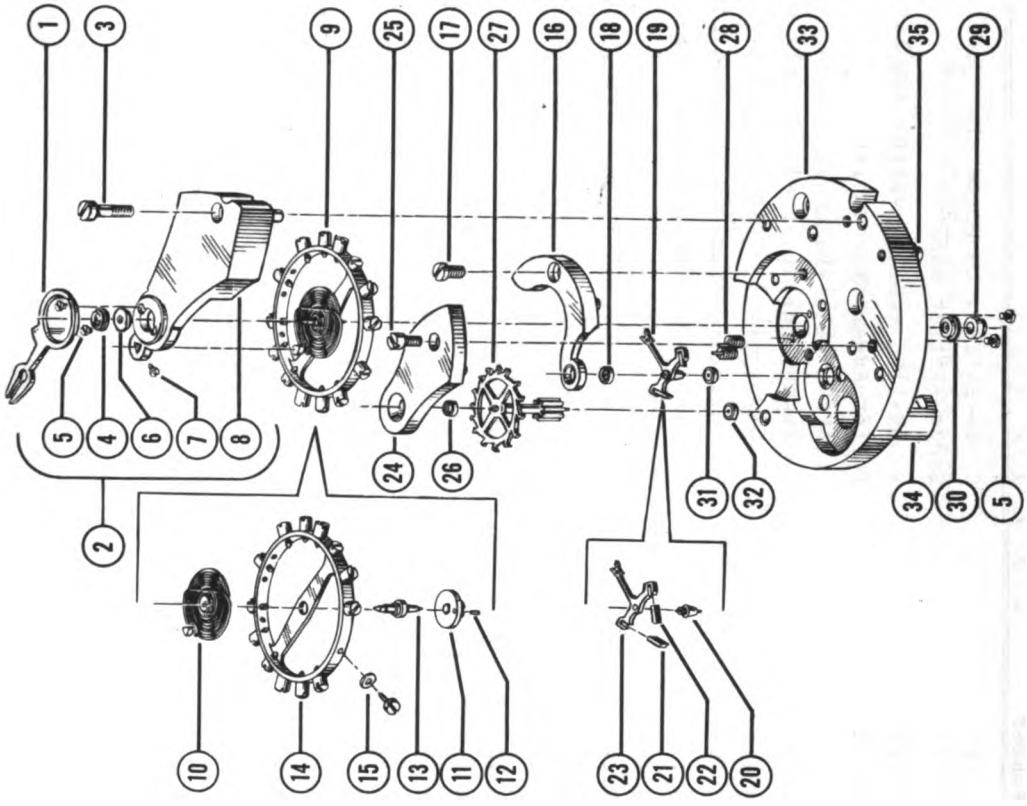


Figure 146—Elgin Escapement

SETH THOMAS CLOCK MOVEMENT—ELGIN ESCAPEMENT
GROUP ASSEMBLY PARTS LIST

Fig. & Index Number	SPCC Number	Seth Thomas Part and Dwg. Number	Part Name 1 2 3 4 5 6 7	Units Per Assy.
146-16		R-20695-146	Cock—Pallet, complete with jewel and steady pins	1
146-17	H18-TSK-10188	R-20695-142	Screw—Pallet cock	1
146-18		R-20695-145	Setting—Pallet upper, complete with jewel	1
146-19	H18-TSK-10130	R-20695-118	Pallet Assembly, complete	1
146-20	H18-TSK-10007	R-20695-119	Arbor—Pallet	1
146-21	H18-TSK-10099	R-20695-123	Stone—Pallet receiving (right)	1
146-22	H18-TSK-10100	R-20695-124	Stone—Pallet discharging (left)	1
146-23		R-20695-120	Pallet, complete with guard pin	1
146-24	H18-TSK-10034	R-20695-116	Cock—Escape, complete with jewel and steady pins	1
146-25	H18-TSK-10162	R-20695-141	Screw—Escape cock	1
146-26		R-20695-117	Setting—Escape upper, complete with jewel	1
146-27	H18-TSK-10228	R-20695-125	Wheel—Escape, complete with pinion	1
		*R-20695-128-10(Z)	Plate Assembly—Escapement	1
146-28	H18-TSK-10000	R-20695-134	Screw—Banking	2
146-29	H18-TSK-10024	R-20695-129	Cap—Balance lower endstone, complete with endstone	1
146-5	H18-TSK-10182	R-20695-114	Screw—Balance lower endstone cap	2
146-30	H18-TSK-10021	R-20695-131	Setting—Balance lower hole jewel, complete with jewel	1
146-31	H18-TSK-10096	R-20695-130	Setting—Pallet lower, complete with jewel	1
146-32		R-20695-112	Setting—Escape lower, complete with jewel	1
146-33		*R-20695-128	Plate—Escapement, complete with potance and steady pins	1
146-34		*R-20695-135	Potance	1
146-35		*R-20695-132	Pin—Steady	2

* Not recommended for stocking

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Fig. & Index Number	SPCC Number	Seth Thomas Part and Dwg. Number	Part Name 1 2 3 4 5 6 7	Units Per Assy.
143-25	H18-TSK-10068	R-18565	Escapement Assembly—"Old" Seth Thomas Clock	Ref.
147-1	H18-TSK-10003	R-16324	Regulator, complete with pins	1
		*R-16379	Pin—Regulator	2
147-2		*R-10122-A	Cock Assembly—Balance	1
147-3	H18-TSK-10155	R-5155	Screw—Balance cock	1
147-4		R-50037	Cap—Balance upper endstone, complete with endstone	1
147-5		R-14297	Screw—Balance upper endstone cap	2
147-6	H18-TSK-10022	R-18499	Jewel—Balance hole, upper	1
147-7	H18-TSK-10095	*R-18500	Endstone—Balance upper	1
147-8	H18-TSK-10177	R-14291	Screw—Hairspring stud	1
147-9	H18-TSK-10036	R-10122	Cock—Balance, complete with steady pins	1
147-10	H18-TSK-10013	R-19053	Balance and Hairspring Assembly	1
147-11		R-19034-11(Z)	Hairspring Assembly, complete with collet and stud	1
	H18-TSK-10080	†R-19034	Hairspring, complete with collet	1
		†R-50154	Hairspring, complete with collet	1
		*R-5501	Stud—Hairspring	1
		*R-16379	Pin—Hairspring stud	1
147-12	H18-TSK-10151	W-2220	Roller, complete with jewel pin	1
147-13		W-50	Pin—Jewel	1
147-14	H18-TSK-10207	R-10059	Staff—Balance	1
147-15		*R-19033	Wheel—Balance, complete with screws	1
	H18-TSK-10160	R-19894	Screw—Balance	10
147-16	H18-TSK-10222	R-18745-1	Washer—Timing, No. 1, 0.001" ± 0.00025" thick	AR

* Not recommended for stocking.

† Hairspring, Part Nos. R-19034 and R-50154, are completely interchangeable.

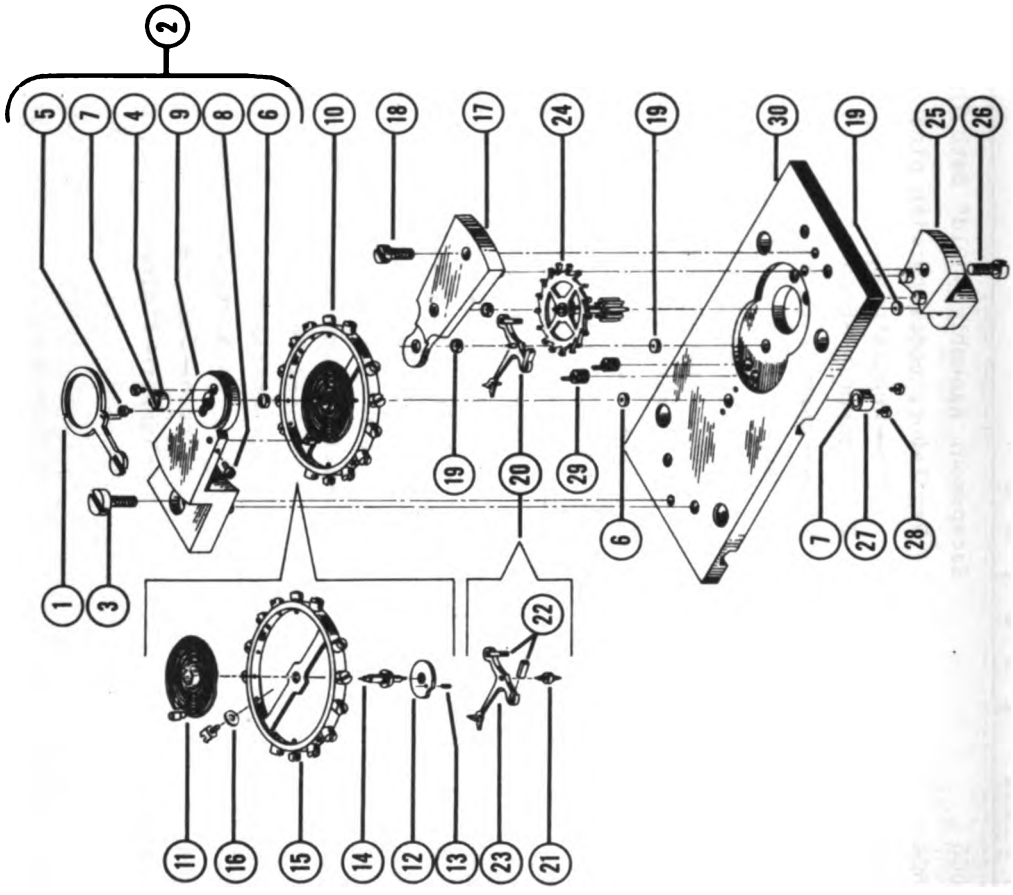

Figure 147—"Old" Seth Thomas Escapement

GROUP ASSEMBLY PARTS LIST

Fig. & Index Number	SPCC Number	Seth Thomas Part and Dwg. Number	Part Name	Units Per Assy.
147-16	H18-TSK-10051	R-18745-2	Washer—Timing, No. 2, 0.002" ± 0.00025" thick	AR
147-16	H18-TSK-10052	R-18745-3	Washer—Timing, No. 3, 0.003" ± 0.00025" thick	AR
147-16	H18-TSK-10053	R-18745-4	Washer—Timing, No. 4, 0.004" ± 0.00025" thick	AR
147-16	H18-TSK-10082	R-18745-5	Washer—Timing, No. 5, 0.005" ± 0.00025" thick	AR
147-17	H18-TSK-10032	R-6068-A	Cock—Escape and pallet, complete with jewels and steady pins	1
147-18	H18-TSK-10161	R-14289	Screw—Escape cock	1
147-19	H18-TSK-10023	R-18501	Jewel—Escape and pallet, upper	2
147-20	H18-TSK-10128	W-724	Pallet Assembly, complete	1
147-21	H18-TSK-10006	W-681	Arbor—Pallet	1
147-22		R-10892	Stone—Receiving and discharging	2
147-23		*W-734	Pallet, complete with guard pin	1
147-24	H18-TSK-10226	R-17376	Wheel—Escape, complete with pinion	1
147-25	H18-TSK-10031	*R-3665-A	Potance—Escape pinion, complete with jewel and steady pins	1
147-26	H18-TSK-10161	R-14289	Screw—Potance	1
147-19	H18-TSK-10023	R-18501	Jewel—Escape, lower	1
		*R-19435	Plate Assembly—Escapement	1
147-27		R-50038	Cap—Balance lower endstone, complete with endstone	1
147-28	H18-TSK-10181	R-14292	Screw—Balance lower endstone cap	2
147-7	H18-TSK-10095	*R-18500	Endstone—Balance lower	1
147-6	H18-TSK-10022	R-18499	Jewel—Balance hole, lower	1
147-19	H18-TSK-10023	R-18501	Jewel—Pallet, lower	1
147-29	H18-TSK-10001	R-4743	Screw—Banking	2
147-30		*R-33045	Plate—Escapement, complete with steady pins	1
		*W-1882	Pin—Steady	2

* Not recommended for stocking.

SECTION VIII

SPECIAL SERVICE TOOLS AND TESTING DEVICES

INTRODUCTION

The standard practice for the repair of Seth Thomas clocks, as set forth in this manual, is an integration of the best and latest methods employed by both instrument manufacturers and Naval repair facilities. This section catalogs the special service tools, fixtures and test apparatus which were selected to:

a. Implement standard practice.

b. Reduce skill levels to that of the personnel ratings indicated.

c. Prevent damage to parts during repair operations.

You are in an excellent position to use the benefits of your experience, in actually doing the work, toward improving the existing tools. The Beneficial Suggestion Program in shipyards was devised to encourage new ideas by rewarding those who make acceptable suggestions. Enlisted personnel aboard repair ships are also invited to submit their suggestions.

Become methods-conscious and constantly analyze your job and the tools you are using. See what improvements you can suggest. If you get an idea that requires time and material to develop, ask your supervisor for permission to work on it. Clear all suggestions through your supervisor and Beneficial Suggestion Committee for transmittal to the navigational instrument authority of the Bureau of Ships.

Any effort by you on behalf of the Navy will be appreciated. If your suggestions are accepted, future revisions of the Special Service Tool List will include your suggested tool for the benefit of all repair facilities.

Hand tools and test fixtures that can be readily fabricated in a small machine shop are illustrated by isometric drawings. Where such tools appear in the tool list, they are referenced to the illustrations.

The tools and testing devices are listed numerically in the Special Service Tool List by their tool numbers. The name assigned to each tool was selected on a functional basis to suggest the use of the tool.

As we have indicated, the special service tools and test apparatus recommended for use in repairing a Seth Thomas clock are intended to increase the efficiency of the repair work; they should save time, reduce costs, help prevent damage to parts and make your job easier. However, these tools are hardly the last word; there is always room for improvement of existing tools and for new tools.

COMBINED SPECIAL TOOL AND FIXTURE LIST

FOR U.S. NAVY MECHANICAL, BOAT AND DECK CLOCKS

(CHELSEA AND SETH THOMAS TYPES)

Fig. & Index No.	Tool Type	Tool No.	Tool Name	Where Used
148-1	1		Block—Movement work	
		1A		Chelsea 12E and 17E
		1B		Seth Thomas Boat and Deck Clocks, 5165 Mechanical Clocks
		1C		Seth Thomas 5160 Mechanical Clocks

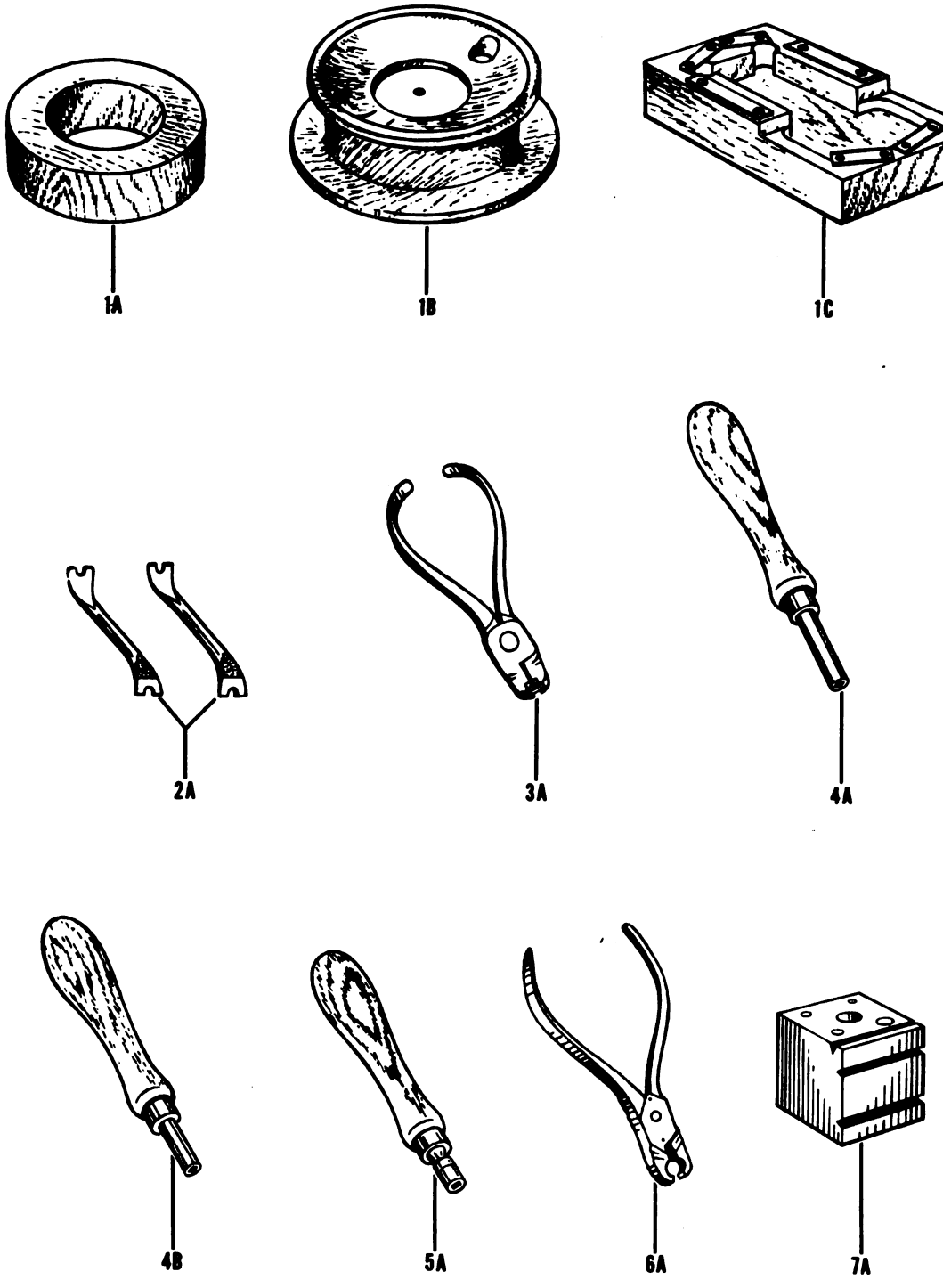

Figure 148—Special Tools and Fixtures

COMBINED SPECIAL TOOL AND FIXTURE LIST

FOR U.S. NAVY MECHANICAL, BOAT AND DECK CLOCKS

(CHELSEA AND SETH THOMAS TYPES)

Fig. & Index No.	Tool Type	Tool No.	Tool Name	Where Used
148-2	2		Remover—Hand (also called "lifters") (with felt heel pad)	
		2A		Chelsea and Seth Thomas Mechanical, Boat and Deck Clocks
148-3	3		*Pliers—Hand nut, round (with hard rubber insert)	
		3A		Seth Thomas Mechanical Clocks
148-4	4		Wrench—Socket, hand nut, hex	
		4A		Seth Thomas Boat and Deck Clocks. Large hex. nuts
		4B		Seth Thomas Boat and Deck Clocks. Small hex. nuts
148-5	5		Key—Mainspring letdown	
		5A		Chelsea and Seth Thomas Mechanical, Boat and Deck Clocks
148-6	6		Pliers—Pillar	
		6A		Chelsea and Seth Thomas Mechanical, Boat and Deck Clocks
148-7	7		Block—Escapement work	
		7A		Chelsea escapements
149-7		7B		Seth Thomas escapements
		7C		Elgin escapement
149-8	8		Pliers—Mainspring end shaping	
		8A		Chelsea and Seth Thomas Mechanical, Boat and Deck Clocks
149-9	9		Winder—Mainspring	
		9A		Chelsea and Seth Thomas barrels
149-10	10		Press—Barrel cap	
		10A		Chelsea barrels
149-11	11		Tool—Barrel cap staking	
		11A		Seth Thomas barrels
149-12	12		Block—Barrel cap staking	
		12A		Seth Thomas barrels

* The pliers for the round hand nut are to be replaced with a hexagonal socket wrench as soon as the round hand nut is replaced with a hexagonal hand nut.

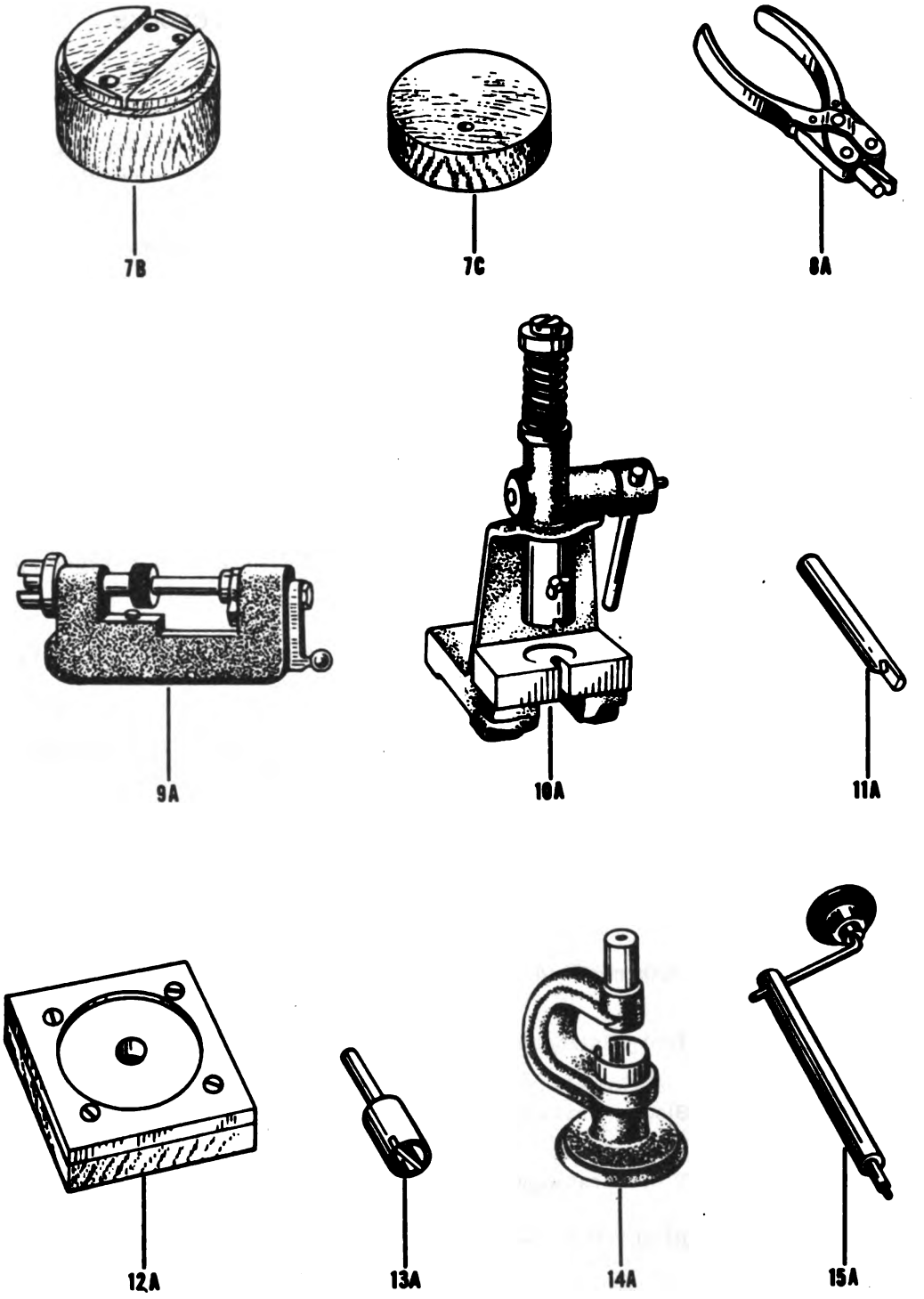

Figure 149—Special Tools and Fixtures

COMBINED SPECIAL TOOL AND FIXTURE LIST

FOR U.S. NAVY MECHANICAL, BOAT AND DECK CLOCKS

(CHELSEA AND SETH THOMAS TYPES)

Fig. & Index No.	Tool Type	Tool No.	Tool Name	Where Used
149-13	13		Collar—Automatic screwdriver tip	
		13A		All pillar screws
149-14	14		Stand—Milling and broaching tool	
		14A		Endshaking and sideshaking all movement pivots
149-15	15		Holder—Milling and broaching tool	
		15A		Endshaking and sideshaking all movement pivots
150-16	16		Tool—Milling, assorted sizes	
		16A		Endshaking all movement pivots
150-17	17		Tool—Broaching, assorted sizes	
		17A		Sideshaking all movement pivots
150-18	18		Tool—Cannon pinion friction adjusting	
		18A		Seth Thomas large diameter cannon pinion
		18B		Seth Thomas small diameter cannon pinion
150-19	19		Pusher—Cannon pinion	
		19A		Large diameter cannon pinions
		19B		Small diameter cannon pinions
150-20	20		Pusher—Hand	
		20A		All hands
150-21	21		Tool—Hairspring removing	
		21A		All hairsprings
150-22	22		Block—Beat adjusting	
		22A		All balance wheels
150-23	23		Tool—Beat adjusting	
		23A		All balance wheels
150-24	24		Block—Balance cock bumping	
		24A		All balance cocks
150-25	25		Tool—Balance cock bumping	
		25A		All balance cocks
150-26	26		Clamp—Movement to timing machine	
		26A		All movements

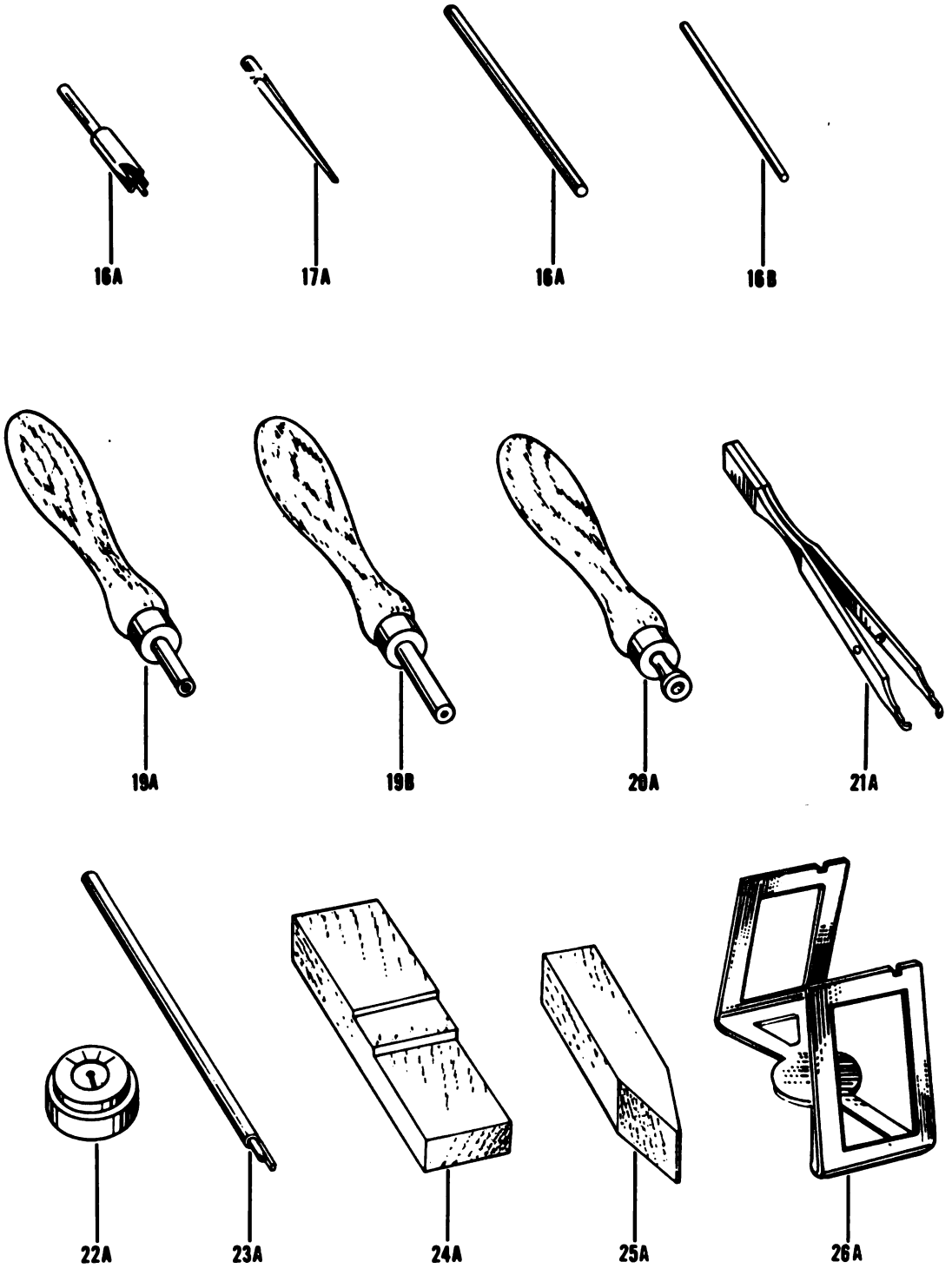

Figure 150—Special Tools and Fixtures

PAGE FOR NOTES

SECTION IX

SETH THOMAS CLOCKS SERVICE BULLETINS

INTRODUCTION

This section is provided for the manual as a place to incorporate the various Seth Thomas service bulletins as they are issued by the Bureau of Ships. It is contemplated that such bulletins will be the medium by which navigational instrument repair facilities are informed of changes and developments in the overhaul and repair procedures of these instruments. Hence, it is important that all such information peculiar to the repair of Seth Thomas clocks be placed immediately in this section of the manual. Changes affecting general navigational instrument standard repair procedures and techniques, inspection standards, etc. will be issued as supplementary service bulletins to the Bureau of Ships Navigational Instrument Control Manual.

All repair personnel should appreciate the importance of keeping up to date on all such changes. Good work can come only from well-informed personnel who are experienced in performing their duties.

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