THE

SERVICE MANUAL

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Hermle

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Hermle

CONTENTS

CHAPTER I

GENERAL INFORMATION

Hermle

PART A

Introduction

Franz Hermle & Sohn have produced clock movements for over 70 years in the Federal Republic of Germany. The company was originally founded in 1922 by Franz Hermle as a manufacturing facility for clock components and movements. During the occupation of Germany following World War II most of the original production equipment was dismantled and removed from the Hermle Factory. By the 1950's the company was able to procure new equipment and resume full scale production. Since that time Hermle has become a leading contender on a global scale in the clockmaking industry.

In 1977 Hermle saw a need to open a plant in the United States of America. Amherst, Virginia was selected as the home for this modern manufacturing facility. This new plant has become one of the most efficient clockmaking plants in the industry. The plant in Amherst uses the name Hermle Black Forest Clocks to distinguish itself from the parent company.

Hermle clock movements have been designed with the clockmaker who will service them in mind. In all probability they are among the easiest movements in the world to service. Once the basic principles of operation set forth in this manual are understood, this knowledge can easily be transferred from one movement to another. The ready availability of parts and replacement movements offers a wide range of options to clockmakers servicing Hermle products and to the customers they serve.

Some of the factors that cause Hermle movements to lend themselves to being easily serviced, replaced, repaired or restored lie in the very rational way that every movement has been designed:

1. All Hermle movements operate on the same principles.

2. Different models with variations in escapements, striking, chiming mechanisms and special features are all placed on basic movements that can be counted on to operate in the same manner as other Hermle movements do.

3. A rational system has been used to categorize Hermle movements into groups. Once the principles of operation have been mastered for one movement, the variations can be identified and dealt with quite easily. These groupings make it easy to order parts and replacement movements when they are required.

4. Hermle repair parts and replacement movements are readily available through supply houses supporting the clockmaking trade. These are identified in spare parts lists published by the factory. The use of these lists in conjunction with this service manual makes it extremely easy to procure the material necessary to provide top quality service to the customer.

This service manual is a continuing effort on the part of Franz Hermle & Sohn and Hermle Black Forest Clocks to assist those individuals who service their clock movements all over the world.

Hermle

PART B

Service, Repair, Restore or Replace

Service

The clockmaker is often called on to deliver a new clock and put it in operation. In other instances he may be asked to locate the cause of a minor malfunction and correct it. The latter can occur both on new clocks that have just been put into operation as well as those that have been working for several years. If extensive disassembly and correction of wear problems is not required and the problem can be solved by placing a component back in its correct position or by lubricating it, these are considered as routine actions and rarely require that the movement be removed from the customer's home to accomplish them. Except as a matter of convenience, it is rarely necessary to remove a clock and take it to the shop to perform routine service functions.

Repair

Repair is generally accepted as meaning that the movement has a worn or broken component that requires attention before the clock can be expected to render reliable service. This may involve extensive disassembly of the movement to gain access to the part needing attention. In other instances repairs can be performed on components outside the plates in an expedient manner. Essentially then, a repair is accomplished to solve one or more specific problems, may or may not involve a considerable amount of time, and may or may not require the complete disassembly of the movement. If the movement does require disassembly, a proper cleaning should be considered as it will improve the reliability of the movement and is in the best interests of both the customer and the clockmaker.

Restoration

Some customers may prefer to keep the original movement intact for sentimental reasons even after the time involved and the labor costs have been explained to them. Restoration is normally meant to include complete disassembly of the movement and giving detailed attention to all of the component parts that are likely to have been affected by wear, oxidation or other factors that would affect its reliability. Specifically then, a properly restored Hermle movement should have the appearance and reliability of a new one. As every component must be removed and disassembled completely, a proper cleaning must always be a part of the restoration process.

Replacement

During the course of performing a service or repair operation it may be discovered that the whole movement is so badly worn or damaged that it is in the customer's best interest to replace it entirely. Replacing a movement in a modern clock with one of the same specifications is an entirely acceptable procedure and should not be confused with the undesirable act of destroying an antique clock by substituting an improper movement. One advantage to replacing the movement is that the cost of labor and the cost of the movement can be computed quickly and accurately in most cases.

Hermle

Section 1

Servicing Hermle Movements

Servicing of the movement is normally carried out without disassembly. The movement will usually have to be removed from the case to perform the services outlined in this section.

Timekeeping Problems

When a relatively new clock refuses to run:

Check the clock to identify any obstructions such as the pendulum contacting the case.

Check for indirect causes of friction such as the pendulum leader binding in the crutch.

Check for friction caused by gummy oil or drying of the lubricants in the time train, especially in the escapement area.

If the movement is found to be dry of lubrication remove the gummy oil residues with a sharpened piece of pegwood so the train is free.
Lubricate the movement using the procedures outlined in the lubrication section.

Check the stability of the clock. Floor clocks are likely to stop if they are sitting on a soft carpet. To cure this problem a stable platform can be constructed under the clock or it can be secured to the wall.

Check the beat and insure the automatic beat adjusting mechanism is in good operating order.

Check for wear which might warrant the repair, restoration or replacement of the movement.

Servicing Chiming and Striking Failures

As in the time train, friction or obstructions are the major causes of chiming and striking failures.

Check for obvious obstructions to the hammers to include the position of the shutoff device.

Check to insure cables and chains are not binding or caught.

Check the lubricant in the chiming or striking trains. If it has dried out, remove the residues with a sharpened piece of pegwood and lubricate in accordance with the guidelines in the lubrication section.

If the movement is capable of chiming, but fails to strike, check for excessive friction in the striking train or in the linkage to the striking hammers.

Section 2

Repair of Hermle Movements

A movement requiring repair usually has excessive wear, may have a component that requires replacement; or might have a condition that must be corrected before the clock can be expected to operate reliably.

Unless a repair is being accomplished on an easily accessible component, the movement will usually have to be removed from the case.

In most instances repairs accomplished outside the movement plates can be done without removing the clock from the customer's home. If work must be accomplished between the plates, it is best to accomplish this in a shop environment and to perform a complete cleaning while the movement is disassembled.

Repairs to the time train

Damage to the self adjusting beat setting mechanism is best accomplished by replacing the complete assembly.

As in servicing, the greatest cause of repair problems will center around the pivot holes and the sliding surfaces.

If the movement has to be completely disassembled it is advisable to service the center shaft assembly. Slip the clip off and clean the old residues away. If the disassembled clock is to be cleaned, leave this assembly apart until all of the components have been dried, lubricated and are ready for reassembly.

Check chains and cables to insure they are capable of operating correctly. If a chain has been overstressed and the links have opened these must be closed and brought back to their normal shape. Consider replacing the complete chain or cable if it has been damaged.

Damage to the escapement signals that it is best to remove the unit and replace the damaged parts in an environment where a suitable test run can be conducted and the required adjustments can be accomplished.

Chime and Strike Repairs

In a dusty environment it is possible for the star wheel to cut into the lifting tab that activates the chime hammer. Replacing this assembly is the most expedient means of solving this problem. Minor repairs can be accomplished by smoothing the face of the tab with a file to insure the star wheel teeth cannot get caught in the groove.

Damaged lifting surfaces on the chime drum are best dealt with by replacing the complete assembly, as are damaged hammers and levers.

Section 3

Restoring Hermle Movements

Restoration is normally understood to mean that the movement is going to be completely disassembled, a complete cleaning is to be accomplished and all problems caused by wear or damage are to be corrected.

Every component that is not riveted or permanently joined should be removed during the restoration process. This allows the cleaning solutions to reach every surface of each component part. Once every part of the movement has been cleaned, a meticulous inspection must be made of each component. Look for signs of wear and fractures that might cause problems in

the future. Reject any part that does not appear capable of providing reliable service and replace it with a new one.

Return worn pivots to a round and smooth condition. If it appears that nickel plating has broken away from the pivots on older movements, it is best to replace the wheel assembly. Bush each pivot hole that has any possibility of harboring nickel residues.

Inspect each pivot hole for wear. If metal has worn away from the plate or the pivot shows signs of wear, it is best to bush the hole. Detailed instructions on how to accomplish this operation are contained in Chapter VII.

Smooth all wear tracks out of each sliding surface. If grooves have been cut in lifting surfaces it is best to replace the component or restore the metal that has been worn away in a repectable manner.

The movement should then be reassembled, lubricated in accordance with the instructions in Chapter IV, and test run for a reasonable amount of time. At the end of the restoration process the movement should have a respectable cosmetic appearance and should be capable of performing all of its functions in a reliable manner.

Section 4

Replacing Hermle Movements

The repair technician can recommend the option of replacing a Hermle movement with full confidence. Hermle can supply an exact replacement or an improved model with the same or better capabilities than the original in almost every instance. There are several advantages to replacing a worn or damaged movement.

When mechanical movements operate over a number of years it is unusual for wear to concentrate itself in only one or two locations. There are always the obvious wear points such as pivot holes in locations receiving a great deal of stress or shock. There are tracks that form in sliding surfaces and in the pallets. The cumulative combination of this wear is often difficult to deal with economically. This is especially true when a movement must be disassembled several times to correct problems that are not immediately obvious and do not become apparent until after the clock fails to work reliably during a test run.

Many customers and competent technicians share a reluctance to replace a clock movement. This reluctance may stem from a well founded belief that this practice is wrong and should not be engaged in. Without a doubt, it is not a good practice to change movements in antique clocks or in special timepieces that will lose their value if they are altered. However, changing the movement in a modern production line clock does not have a negative effect on its value. Conversely, if a clock of this nature has been put in good running order its value will probably be much higher. A hundred years from now this may not be the situation with the same clock.

When the cost of a replacement movement and the amount of time it will take to install it is known, a very accurate estimate can be given to the customer. Unless the customer is intent on keeping the clock in its original condition for sentimental reasons it is best to recommend the replacement of a worn modern movement rather than engaging in restoring it. It is usually in the best interest of both parties to do so.

Hermle

CHAPTER II

MECHANICAL MOVEMENTS

Hermle

PART A

Hermle Movements

Hermle clock movements are straightforward in their design and construction. Once the basic functions of one or two movements have been mastered, the others can be understood quite readily. This section provides a very basic outline to assist the technician in his understanding of Hermle Mechanical movements and how they operate. More specific information on timing and adjustments will be presented later in this manual.

One of the most practical features of all Hermle movements is that almost all of the adjustments can be made outside the plates. This makes it extremely easy to adjust the chime and strike trains so they can start with adequate vigor and stop with all of their components coming to rest in the correct position.

Hermle produces several types of mechanical movements. These are spring driven, weight driven and some are even powered by quartz motors. The spring driven movements can be subdivided into those that use balance wheels or pendulums. The weight driven movements can be further classified as those that use chains or cables as a means of transmitting power to the train wheels.

The service technician will also encounter several different types of striking systems on Hermle movements. Some of these systems produce a single stroke on the hour, others count the hours with a series of single strokes, still others use special patterns such as a bim-bam or ships bell striking system. All of these striking systems are based on the same principles and are easy to understand.

Hermle chiming mechanisms are also easy to understand. Once the basic principles of a movement with a Westminster chime system has been mastered, it is very easy to make the transition to the models that have a triple chime capability. Information on how to service and adjust the special features on these movements can be found in the appropriate sections of this manual

Section 1

Understanding Mechanical Movements

Single Train Movements

Movements with only one train are very easy to understand and because of their simple construction most malfunctions can be identified immediately. Franz Hermle & Sohn makes several models of single train movements. These will be encountered in wall, shelf and bracket clocks.

As in most mechanical movements, the power is stored in the spring barrel or on a drum pulled downward by a suspended weight. When the spring, cable or chain is wound and restrained by

the ratchet mechanism, the wheel attached to the barrel or greatwheel moves forward and causes the next wheel in the train to rotate in the opposite direction.

The power is transmitted to each pinion by the preceding wheel. The center wheel pinion has been bored to allow the center shaft to pass through it. The friction to carry the hands forward and allow them to be set is provided by a clutch mechanism located on the center wheel. The final wheel in the train is the escape wheel. The timekeeping rate of the clock is governed by the gear ratio of the train and the action of the pallets on the teeth of the escape wheel. Considerable attention is given to these matters in the chapter that addresses this type of technical information.

Two Train Movements

The understanding of the functioning of the mechanisms discussed above can be transferred to any Hermle movement. The functions of the single train describes the action of the time train in a multiple train movement. In spring wound or weight driven movements these functions will always be the same. Some Hermle movements have special features in the time train such as second hand mechanisms that are mounted on special bridges. These do not alter the basic functions of the time train, although damaged or worn parts in these assemblies will affect the reliability of the clock movement.

The function of the second train in a Hermle movement will be to perform a striking operation. Striking will usually occur twice an hour. The appropriate numbers of strokes will be executed on a bell or gong to announce the time indicated by the hands on the dial. Every half hour will be announced with a single stroke.

Many movements have bim-bam or double strike features that provide a delayed stroke on two gongs producing a different tone. Mechanically, these striking mechanisms work exactly like a system using a single hammer. The only difference is that the second hammer in the bim-bam system is raised and released a fraction of a second later by the same lifting mechanism.

The striking train, like the time train is powered by a spring, cable or chain driven mechanism that causes the first wheel in the train to rotate. The wheel carrying the lifting mechanism for the hammers is usually placed in the early stages of the striking train as there is more power available there. Most Hermle striking trains have several intermediate wheels, each of which deliver more speed, but less power the farther they are located from the great wheel. The last component in the striking train will be the fly. Its function is to govern the speed of the striking train so it delivers a controlled and even tempo that is pleasing to the ear.

The striking train is normally held immobile by a locking device. As the minute hand approaches the 12 o'clock position on the dial, a cam mounted on the centershaft lifts the device locking the striking train out of the way and releases the rack. At the same time a warning device moves into place and restrains the striking train until the exact time it is to be released. When the minute hand reaches the 12 o'clock position, the lever in contact with the cam on the centershaft is released and the striking train is allowed to operate just long enough to accomplish the correct hour count. In the case of the half hour, the train will be allowed to run only long enough to accomplish a single strike or one bim-bam cycle each time the minute hand arrives at the six o'clock position on the dial.

The mechanism that determines how many strokes the striking train hammer(s) will make is a fixture called the rack. The tail of the rack comes in contact with a step on a 12 faced cam which is mounted on the hour hand tube. The lower steps on the cam allow the rack to drop farther down, causing a need for more teeth to be dealt with before the striking train shuts itself off. Each tooth on the rack is picked up by a pin set on the edge of a kidney shaped disk called a gathering

pallet. As each tooth is picked up, the rack is restrained so it cannot fall back down. When there are no more teeth left to support the shutoff device it falls into place. This occurs just as the last hammer stroke is delivered.

One exception to the above description of two train movements is the ships bell clock. The action of the striking train is exactly the same as any two train movement, but a special cam system is utilized to produce the appropriate number of strokes on the bell to announce each hour and half hour. This cycle is repeated three times during a 24 hours period.

Three Train Movements

The third train in all Hermle movements executes a chiming function. The train is allowed to operate just long enough to execute a measure, or combination of measures of music to identify a specific quarter hour. The chiming can be executed on bells, gongs or tubes. Even though several different hammer mounting configurations are used on Hermle movements, they all operate in the same manner. The only exception to this is the Flagship model which uses a unique tubular bell striking system.

As with time and strike trains, the chime train is powered by a spring coiled in a barrel, by a weight attached to a cable wound on a drum or by a chain that engages a sprocket attached to a wheel. As the spring power or weight moves the first wheel in the train, more power is found in the wheels closest to the power source so the hammer lifting devices are located in this area. Control cams and locking disks are mounted on arbors driven by wheels that are located in the middle of the train. As with the striking train, the last component is the fly which governs the speed and tempo of the chiming mechanism.

The chiming train is activated in much the same manner as the striking train is in a two train movement. A lever is lifted by a cam with four lobes mounted on the centershaft arbor. This lifting action starts the process of unlocking the train. At the same time a warning device moves into place to restrain the train until the exact time when it is to start operating. At exactly the moment when the minute hand reaches the appropriate time on the dial, the tail of the lever drops off the cam on the center shaft and the chiming train is allowed to run just long enough to execute the appropriate measure(s) of music to identify the current quarter hour. The amount of time the train is allowed to run is governed by a control cam with raised sections of specific lengths that hold the shutoff lever hook free of the locking device until the exact moment the train is to be shut off.

Towards the end of the chiming of the fourth quarter a pin in the lever connecting the chiming and striking trains travels over the highest spot on the control cam. This action unlocks the striking train. At the same time a flag on the lever rises into place to restrain the striking train, placing it in the warning mode. At exactly the moment when the last note of music announcing the fourth quarter has been sounded, the chiming train will shut off and lock. During this process the lever connecting the two trains drops. This action allows the warning flag to drop down and the striking train begins to operate. The striking cycle on a clock with three trains is executed exactly as was described above for a clock with two trains. The only difference is the manner in which the striking train is placed in the warning mode and in the way it is released to start striking. The striking trains in both types of clocks count the appropriate number of hammer strokes and shut themselves off using identical methods.

Using this very basic description of how Hermle movements operate as a framework, the more technical aspects of timing each of these events to occur at the correct time can be addressed in greater detail. More information on how to adjust the warning, the amount of time the striking and chiming trains will operate and how to shut them off at exactly the right time will be covered in

subsequent sections of this chapter. Special features such as automatic chime correction mechanisms, night shutoff devices and melody selection controls will be addressed in other sections of this manual.

Section 2

Hermle Spring Driven Movements

Hermle produces a considerable number of spring driven movements. These range from simple movements with one train to triple chime movements with multiple trains.

In recent years Hermle has initiated several improvements in the mainsprings used in their clock movements. Modern Hermle mainsprings are made of an improved unbreakable material. This material is comparable to that used in the mainsprings found in fine watches. Clockmakers installing these new mainsprings can expect them to last longer and provide better service.

Hermle spring driven movements have several features that make them very attractive from a service standpoint. They are easy to uncase, disassemble and clean. Because almost all of the adjustments can be made from outside the plates, they are among the easiest movements in the world to reassemble.

Unlike weight driven models, these movements are powered by a mainspring. The mainspring is contained in a barrel which can be removed as a unit. This in itself is another feature that makes Hermle movements easy to work on as the mainspring is always kept under control as long as it is confined to the barrel.

A wide range of escapements are available on Hermle spring driven movements. These range from dead beat escapements that drive pendulums to specialized pin pallet escapements that operate balance wheels. It is not unusual to find some unused pivot holes in the plates of these movements. These pivot holes are used for different types of wheels for other escapement configurations.

The procedures for maintaining spring driven movements are just a little bit different than those required for weight driven units. As the mainsprings exert a tremendous amount of force against the train wheels there is always the opportunity for a winding accident to occur. Regardless of what service is being performed on a movement, it is essential to check the condition of the rachets and clicks each time the movement is removed from its case.

Customers who are not familiar with spring driven movements must be instructed to wind them slowly and let the clock seat itself completely before releasing pressure on the key. They must also be instructed, and sometimes shown, how to wind the clock completely so it can run the full eight day winding cycle. This is especially important when dealing with senior citizens as they often have difficulty judging when the mainspring has been fully wound.

Another item that must be checked on spring driven movements is the condition of the bearing surfaces between the winding arbor, the spring barrel and the cover. If these have been allowed to run without lubrication for extended periods of time there is a possibility that wear will have

occurred in these areas. The most economical course of action is to replace the complete spring barrel assembly when this problem is discovered.

Section 3

Hermle Weight Driven Movements

Hermle manufactures a wide range of movements that employ weights to provide the motive power for the time, strike and chiming functions. Although these movements may appear to be fairly simple compared to spring driven units, there are several things that need to be considered when working with weight driven movements; especially if they have been in the hands of an unskilled clockmaker.

The correct amount of weight must be used on each train. The correct weight for each function on Hermle weight driven movements is presented in the chapter covering technical information of this nature. These tables will prove to be very helpful in those cases when any doubt exists concerning whether or not the correct weights are on the movement under examination. It is quite common to find clocks that have been purchased from second hand dealers with weights that are not original to the clock and the first step is to determine for sure if this may be the reason it refuses to operate correctly.

The weight should be sufficiently heavy to operate its train and still have some reserve to overcome the friction of drying oil and ordinary wear that is sure to take place in any mechanical movement. A favorite technique of unskilled clockmakers is to add more weight than necessary to force the movement to operate even though it is well overdue for a complete restoration service. Another of their favorite tricks is to substitute a lead insert where an iron filler was used originally. These practices only tend to accelerate the wear process and are even likely to cause damage to the wheel teeth, ratchet mechanisms, chains or cables.

The techniques mentioned above should be avoided by the professional service technician and priority should be given to restoring the movement so it is capable of operating with the weight that was designed to drive it. If it is discovered that the movement has been operated with an improper amount of weight, every component in the train should be carefully examined for damage before proceeding with a restoration service. It is well worthwhile to replace the wheels in the lower end of the train if any wear appears on the teeth or pinions.

Hermle movements employ both chains and cables. From a motive power standpoint both produce equally good results. The chain driven movements are the simplest to service. It is a simple matter to slip the chains off the sprockets to remove and replace them.

Cable driven movements require a bit more attention to detail. If the movement is equipped with plastic cable guards these should always be put back in place when the movement is reassembled. These devices will save an untold amount of time and frustration in transporting and reinstalling the movement in the case, so their presence is extremely beneficial. If an uninformed clockmaker has removed the cable guards, it is well worthwhile to order a replacement set before reassembling the movement. Details on positioning the cable drum and setting the stopworks appear in other sections of this manual.

Hermle

Chain links tend to separate in the hands of owners who have a tendency to force things beyond their limits. It is a good practice to close links that are beginning to open immediately upon their discovery as they will surely cause problems later on. Likewise, cables must be checked periodically to insure they have not suffered damage or are fraying. The presence of one or two broken strands or a kink are indicators that the cable should be replaced without delay. It is a worthwhile investment to carry at least one new replacement cable in the spare parts kit when making service calls.

Another commonly overlooked item that must be carried out each time every weight driven clock is serviced is the tightening of the weight shell cap fixtures. The weight shell is held together by a threaded device that secures the caps in place. The end caps of the weight shell are held on by a decorative nut and a cap screw in the shape of a hook or an eye. As the weights are raised over a period of time these components may come unscrewed. The result is most unpleasant and upsetting to the clock owner. It is imperative that the tightness of these components be checked on every service, no matter how minor. It is a good practice to accomplish this service immediately upon opening the door of the clock case to insure it is not overlooked.

Hermle

PART B

Chime and Strike Adjustments

It is important that a mechanical movement be able to start with adequate vigor and sustain itself throughout the striking or chiming cycle with an even tempo. Perhaps even more important is the precision with which the movement shuts itself off when the cycle has been completed.

A logical starting point in adjusting chiming and striking trains is to obtain a clear understanding of what the movement is to accomplish and how it is to accomplish it. It is not enough that the wheels in chiming or striking train simply turn and lift hammers. The movement must start correctly, it must run correctly, must lift the hammers in the proper sequence and must shut itself off correctly.

A clock movement with a striking train must start its striking cycle as the minute hand reaches the 12 o'clock or 6 o'clock position on the dial. The striking train must start with adequate vigor and sustain itself at an even tempo. It must then execute the correct number of strokes in a reliable manner. When the last stroke has been executed the striking train should come to rest with the hammer(s) in the proper position.

The movement in a chiming clock must start and stop in the same manner, but will begin to operate each time the minute hand reaches a quarter hour indicator on the dial. A train in good running order will have adequate vigor to establish the proper tempo before the first hammer drops. It should be capable of maintaining an even tempo throughout the chiming cycle. When the last stroke has been executed each hammer should come to rest in the proper position.

Section 1

Adjusting Striking Train Shut Off

A very general outline of how the striking train was activated and shut off was presented earlier in this manual. This section will cover how to apply the proper adjustments to insure the movement is capable of striking the correct number of hours and that the train stops reliably in the correct position.

The number of hours that are struck are determined by a cam attached to the tube that carries the hour hand. This cam is often referred to as the snail because of its shape. This shape is determined by the twelve steps cut at different levels around its outside surface. As each hour advances, the next lower step will come under the rack tail.

The tail of the rack landing on the appropriate step of the snail determines how many hours will be struck. The rack tail is attached to the rack, which has several teeth cut in its face. Each time the rack tail engages a lower step on the snail a greater number of teeth must be dealt with

before the striking train can shut itself off. Several coordinated functions must occur before this sequence can be repeated in a reliable manner.

The rack tail must be positioned so it can not miss the snail. The end of the tail should extend past the face of the snail about one millimeter. Irregular striking patterns can often be traced to the failure of the rack tail to engage the step on the snail in a reliable manner. If it slips behind the snail an excessive number of hours will be sounded. If the rack cannot drop completely an erratic striking pattern may result.

The striking and shutoff functions are very closely integrated in most modern clocks made by mass production methods. If none of the parts are worn or damaged it is a practical approach to give the priority to making the necessary adjustments that cause the striking train to shut itself off properly. Once this has been accomplished the hour counting mechanism will usually function correctly because the parts requiring special attention have already been placed in their proper positions.

Striking trains in Hermle movements are shut off by a tab attached to a lever. While the train is in the act of striking this lever is supported by the surface of the rack with the teeth cut in it. While there are rack teeth available, this lever is held clear of the locking mechanism that shuts off the train. When all of the rack teeth have been collected by the gathering pallet the lever is allowed to drop into place. On some movements it grasps a notch in the gathering pallet, in others it interferes with a pin mounted on the wheel that drives the fly. When the train comes to rest this pin must be correctly positioned to execute the warning function for the next striking cycle.

It is not quite enough to simply synchronize the events outlined above so they occur at the same time. As the wheel that drives the fly travels at a high rate of speed a certain amount of time must be allowed for the tab that will arrest it to fall completely into place. A practical means of compensating for this is to hold the wheel that drives the fly about one half turn away from the locking position with a finger. Then, assemble the shutoff lever and gathering pallet in their proper rest positions. If locking occurs too late the gathering pallet can be rotated slightly to adjust the arrival time of the locking lever. When locking occurs, the device that lifts the hammer(s) should come to rest midway between the teeth of the starwheel.

If the above relationship does not exist the appropriate adjustments must be made. If necessary, the plates can be opened just enough to dislodge a pivot so the correct relationship can be established to insure the starwheel stops in the proper position. Because it is difficult to determine exactly how much change has occurred in the relationship between the starwheel and the wheel that drives the fly this adjustment may have to be repeated several times. Once these wheels have been synchronized, the shutoff action can be tested by applying finger pressure to one of the larger wheels in the train. A positive, reliable shutoff action should occur just as the final hammer stroke is released by the starwheel.

With the parts of the striking train having been put in place to accomplish the actions described above, the movement should be capable of striking and shutting itself off, but not of counting the hours correctly. The pin on the gathering pallet should engage the rack teeth, extending about 1/3 the depth of the space between each tooth. When the striking train comes to rest, the pin should be clear of the rack so it can drop freely the next time it is released. This position should be established after the final adjustments to shut the movement off have been established.

Turn the center shaft with the minute hand so the lever that rides on the cam attached to the center shaft has just fallen off the highest lobe. Install the snail so the rack tail is centered on the lowest step. The striking train should execute 12 strokes and shut off sharply. Turn the center shaft a complete revolution and check the 1 o'clock step on the snail. Select several hour posi-

tions at random to confirm that the correct number of strokes are being delivered. In most instances the rack tail should rest at about the midpoint on the step of the snail. If the relationship between the end of the rack tail and the step is not correct, the minute wheel can be disengaged and the snail rotated the desired amount in either direction. Replace the minute wheel and recheck the relationship between the rack tail and the step on the snail. The train should be capable of counting the hours correctly and shutting itself off in a reliable manner. When this has been confirmed the gathering pallet should be seated on its arbor with a thin walled hollow punch that will not distort the pin.

Section 2

Adjusting The Chiming Train Shut Off

A general outline of how the chiming train operates was presented earlier in this manual. This section will cover some of the detailed adjustments that must be made to insure the chiming train is capable of starting and stopping reliably. Only topics concerning the chime train will be addressed here. The automatic chime correcting feature is covered in a later section of this manual. Likewise, details concerning adjustments to establish the proper hammer lifting sequence are covered in a separate section.

In clock movements manufactured by mass production methods the chime train will usually function correctly if it has been assembled in such a manner that it can shut itself off properly. Although the chime train often has far more moving parts than the striking train does, it is not as difficult to adjust so it is capable of stopping at exactly the correct place after the last note of each quarter. As there is no star wheel to contend with, all adjustments can be made by rotating the cams and disks that control the chiming, warning and shutoff functions.

When the pin following the control cam approaches the lowest point in a notch between quarters, several things start to happen. The lever that the pin is affixed to will drop. A hook at about the midpoint of the lever engages a pin on the locking disk, interfering with the forward motion of the wheels in the train.

The wheel that drives the fly in the chime train is not arrested as it is in the striking train. Therefore it must be positioned so it parks about one half turn away from where the warning flag will meet it. This is important as this provides just enough rotation for the train to move clear of its locking devices when it goes into the warning mode. This adjustment can be made by holding the wheel that drives the fly in the desired position and then installing the control cam and locking disk on their arbors. If the wheel that drives the fly does not park in the desired position, minor adjustments can be made by rotating the locking disk on its arbor. The pin that rides on the edge of the control cam should come to rest at the lowest point of the notch following the first quarter when this relationship has been established.

Once the relationship between the locking disk, the control cam and the wheel that drives the fly has been established, the set screws can be tightened just enough to hold the locking disk and control cam in place. Test the locking action of the train by applying finger pressure to one of the large wheels and moving it forward. The train should shut off with a sharp click. If the hook jumps or is kicked out of the way before it can lock, the relationship between the wheel that drives the fly, the locking disk or the control cam is not correct. Continue to adjust the locking disk and control cam as outlined above until the movement shuts off reliably.

As the cam affixed to the center shaft lifts the lever that initiates the chiming action, several events start to unfold. The lever has a hook cut in it that rests just forward of the pin on the locking disk. As the lever and its hook are raised, the locking disk is allowed to rotate forward just a small amount. This action is sufficient to prevent the hook from arresting the pin on the locking disk when the cam on the center shaft releases the lever. This forward movement of the wheels during the warning mode will allow the train to start itself without relocking when the lever drops off the cam on the center shaft.

The set screws in the locking disk can be tightened in place when the movement has demonstrated a consistent ability to lock and warn correctly. The set screws can be tightened down on the control cam and a final check made of the shut off and warning functions. Once it has been determined that these functions can be executed correctly, the components on the back of the movement can be adjusted. Instructions covering these adjustments can be found in a subsequent section.

Section 3

Adjusting The Chime Sequence

Before adjustments can be made to the chiming and striking trains several things must be accomplished. Each train must be capable of sustaining itself with adequate vigor throughout a complete winding cycle. Each train must be capable of shutting itself off so all of its components come to rest in the proper position. Once this has been accomplished the technician can proceed to adjust the mechanisms that lift and drop the chime hammers.

As with the timing of the chiming and striking trains, the best place to start making these adjustments is to obtain an understanding of what a movement in good condition should be capable of accomplishing.

In adjusting both chiming and striking trains it is important to understand what happens each time a cycle is initiated. As the train moves into the warning mode all of the wheels advance a slight amount. When this action has been completed, the lifting device for the first hammer should still be located a reasonable distance from the hammer tail or lifting lever tab. This free running space allows the train to establish the correct tempo and accelerate to full speed before it lifts the first hammer.

Once the correct chiming sequence has been established, the technician can turn his attention to establishing exactly where the movement must start and end its cycle. One of the most reliable means of doing this is to adjust the components of the striking or chiming train so the movement locks immediately after the last hammer stroke of the cycle has been executed. Carefully accomplished, this should allow the train a maximum amount of run before a hammer has to be lifted at the beginning of the next cycle.

Obvious indicators that a movement is not properly adjusted are:

- Sluggish starting at the beginning of a cycle
- Unfinished chime melodies when the train shuts off
- Hammers remaining in the air at the end of a cycle

When a movement has been completely disassembled for cleaning, repair or restoration work

the relationship between the pin barrel and the hammers is destroyed. More importantly, the relationship between the cam that controls the amount of time the movement runs and the pin barrel will be disturbed. Many clockmakers are reluctant to take this assembly apart because they are not sure they can reestablish the relationship between all of the components in the chiming and striking trains.

It is not all that difficult and there are some common sense things that have to be accomplished before moving directly into reestablishing the chiming sequence. Assuming that the movement has just been repaired or restored and that it has been cleaned, reassembled, and lubricated, the components of the chiming train can be put in place. Time the chiming train so it stops correctly and reliably. The instructions on how to accomplish this are covered in the preceding section.

Triple chime clocks are no more difficult to synchronize than those with only one melody. As the Westminster melody is the easiest to recognize and deal with, many clockmakers prefer to use it initially to synchronize a triple chime movement. A practical approach is to use the Hermle Westminster Chime Sequence diagram to start the procedure and then make the final adjustments on the other melodies using the appropriate diagram. The procedure is basically the same if one of the more complicated melodies is selected for the initial set up.

On the Westminster diagram the hammer sequence is from right to left. The first note will be lifted on the right or on the most outboard position and the last one will be the most inboard. Remove all of the burrs from the shaft that supports the large wheel that drives the pin barrel. When this has been accomplished, place the wheel on the shaft, but do not tighten the screws that retain it in place. With the gears meshed, gently turn the large wheel so it causes the pin barrel to rotate and lift the hammers. Identify the pin pattern that produces the down scale run for the first quarter.

The pin barrel and the control mechanism that shut off the train must be synchronized so everything comes to an abrupt stop immediately after the last note of a quarter has sounded. This is not only to render a pleasing sound sequence, but it allows the maximum amount of free running time before the movement must lift the first hammer when it starts to announce the next quarter. Recheck to insure that the pin on the shut off lever is resting at the bottom of the notch at the end of the first quarter. With the large drive wheel on the back of the movement, move the drum until the hammer producing the last note of the first quarter just drops off. Gently tighten one of the screws to temporarily secure the wheel in place. With finger pressure, move the train wheels so the pin barrel lifts the hammers and check the hammer sequence. Note particularly that there is a sharp locking action when the last hammer stroke has fallen at the end of each quarter. If the movement has more than one melody, confirm the positioning of the control cam and the drive wheel by rechecking the drop off of the hammer on the last note of each quarter on the other selections.

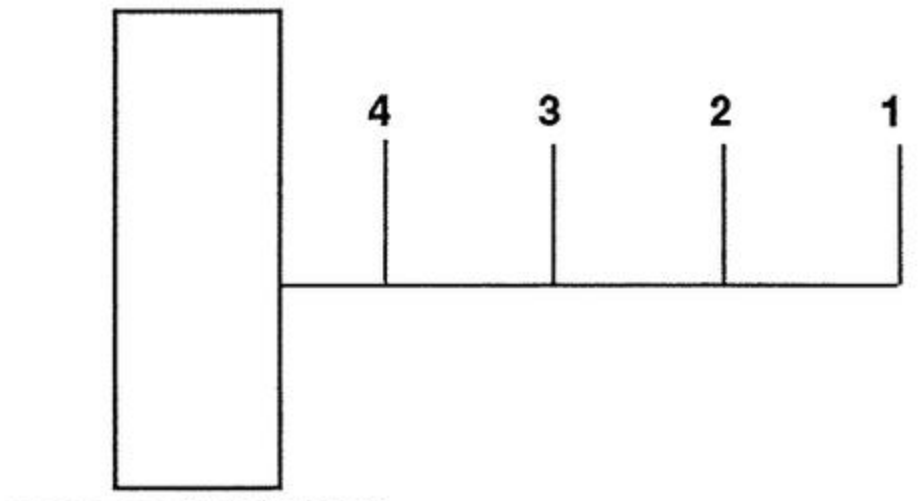
With the initial adjustments having been made using finger pressure, operate the movement under its own power. Some slight adjustments may have to be made after several cycles, especially on movements with more than one melody. When it is clear that all of the components are in their correct positions, tighten the screws to secure the cam and drive wheels to their shafts. If further adjustments are required, the cam and drive wheel should be removed completely and the burrs removed to prevent the screw from finding its way back to its original position.

Hermle

HERMLE WESTMINSTER CHIME SEQUENCES

The following is a guideline for checking the chime sequence on Hermle movements.

The hammers are numbered starting with number one being the outermost hammer (see diagram).



movement side view

WESTMINSTER

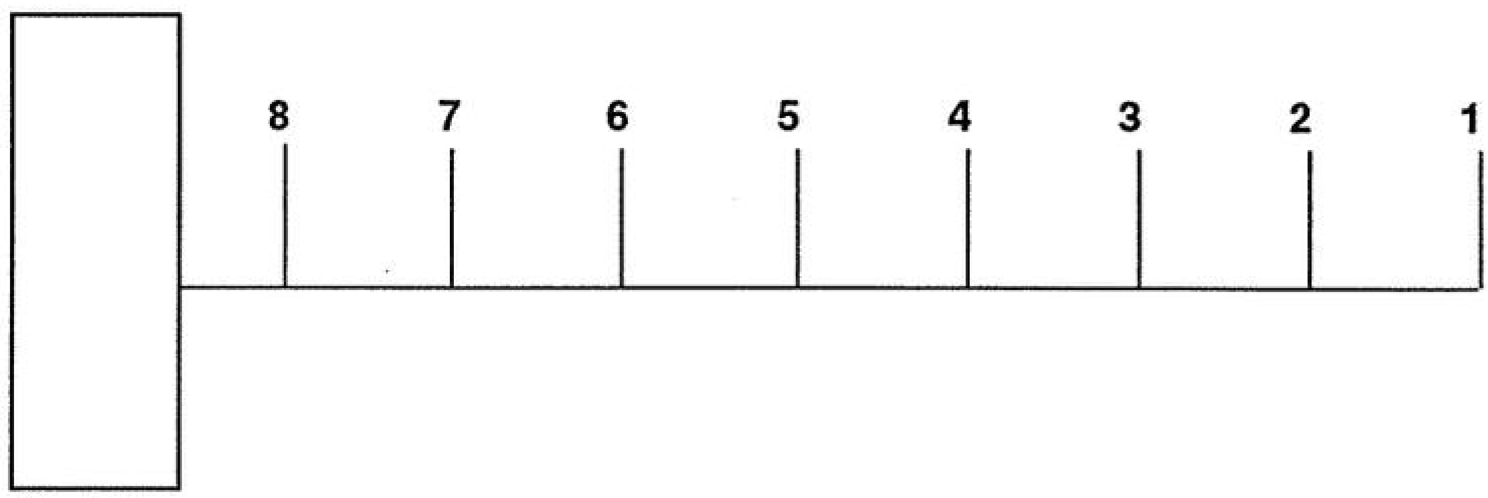
1/4 HOUR	1	2	3	4											
1/2 HOUR	3	1	2	4	3	2	1	3							
3/4 HOUR	1	3	2	4	4	2	1	3	1	2	3	4			
HOUR	3	1	2	4	3	2	1	3	1	3	2	4	4	2	1	3

Hermle

HERMLE TRIPLE CHIME SEQUENCES

The following is a guideline for checking the chime sequence on Hermle movements.

The hammers are numbered starting with number one being the outermost hammer (see diagram).



movement side view

WESTMINSTER

1/4 HOUR	3 4 5 3			
1/2 HOUR	5 3 4 3	5 4 3 5		
3/4 HOUR	3 5 4 3	3 4 3 5	3 4 5 3	
HOUR	5 3 4 2	5 4 3 5	3 5 4 3	3 4 3 5

WHITTINGTON

1/4 HOUR	1 2 3 4 5 6 7 8			
1/2 HOUR	1 7 6 5 2 4 3 8	4 5 6 3 7 2 1 8		
3/4 HOUR	2 1 6 5 7 4 3 8	4 2 6 1 5 7 8 3	1 2 3 4 5 6 7 8	
HOUR	1 7 6 5 2 4 3 8	4 5 6 3 7 2 1 8	2 1 6 5 7 4 3 8	4 2 6 1 5 7 3 8

ST. MICHAEL

1/4 HOUR	1 2 3 4 5 6 7 8			
1/2 HOUR	1 3 5 7 2 4 8 3	7 6 5 3 4 2 1 8		
3/4 HOUR	1 3 7 5 3 4 6 8	7 5 3 1 2 4 8 3	1 2 3 4 5 6 7 8	
HOUR	1 3 5 7 2 4 6 8	7 6 5 3 4 2 1 8	1 2 7 5 3 4 6 8	7 5 3 1 2 4 8 3

Hermle

Section 4

Chime Shifting Mechanisms

By simply shifting a lever any of three melodies can be selected on a Hermle triple chime movement. Because so much is accomplished by this mechanism, many clockmakers tend to shy away from disassembling it. Actually, the chime shifting mechanism is one of the simplest components to adjust if one understands the principles of operation and proceeds in a logical sequence.

The chime shifting mechanism is a simple ramp device that moves the pin barrel to the correct position to execute the melody selected. This action aligns the pins in the barrel with the hammers so each will be lifted in the correct sequence. Properly adjusted, the melody executed should match the title on the dial.

Setting the chime shifting mechanism is best done with a familiar melody. Westminster lends itself to doing the initial adjustments as there are clearly defined patterns that can be seen and heard in each measure of music. In setting up the Westminster chime on any movement, it is easiest to identify the down scale run of the first quarter. With this measure having been identified, the cam and locking device on the front plate can be synchronized with the pin barrel. Insure that the train shuts itself off immediately after the last hammer for the measure falls. The screws should be tightened lightly in place at this stage as additional adjustments will probably be necessary.

Once the clock movement is capable of executing the Westminster melody correctly; the others can be checked. Shift the selector to each of the other positions and observe the relation of the pins in the barrel to the hammer tails. Ideally, the pins for the melody selected should be centered on the hammer tail lifting surface. Minor adjustments can be made by loosening the screw on the collar that determines the position of the pin barrel. When all of the melodies can be executed with the pins properly engaging the hammer tails in the correct sequence the lateral adjustments can be considered complete. A final check should be made to insure that none of the unused pins are passing dangerously close to any of the hammer tails.

With the lateral adjustments complete, a final check must be made to insure no hammers are left in the air at the end of a measure. It is not uncommon to find that minor adjustments will have to be made to insure each of the hammers drops off at the end of the eight note melodies. Once this adjustment has been completed a final test run of each cycle should be carried out.

The shifting device must be capable of moving freely when the chime train is at rest. There should be no dragging of pins on hammer tails as the pin barrel is shifted at each quarter. It is not unusual to find that minor adjustments need to be made at this point. When the lever is moved, the barrel must be completely free to travel its complete length through all three melodies without interference any place along its path.

Most adjustments on the chime mechanism can be carried out with the movement on the bench. The pattern in which the hammers fall can be observed and the appropriate adjustments applied to achieve the desired results. The final test should be made with the movement in the clock case with the rods or gongs in place.

It is a worthwhile investment to purchase a set of rods to use on the test stand if this type of work is done on a regular basis. The final adjustments can be made in the shop before the movement is returned to the customer's home and placed in the case. It is much easier to make these adjustments while one has unrestricted access to the movement.

Hermle

Section 5

The Chime Auto Correction System

The automatic chime correction system installed on Hermle movements is probably one of the most practical in the world. It is easy to understand and it is simple to adjust.

The chiming system on Hermle clocks is activated by a four lobe cam affixed to the center shaft. A close examination of this cam will reveal that three lobes are the same height and that one is taller. The cam is designed this way so there is a distinct difference between the hour lobe and the three quarter lobes that precede it. The tallest of these cam lobes plays an active part in the operation of the automatic chime correction system.

The principles the auto correct system operates on are quite simple. When each quarter of the chime melody is aligned in its correct sequence, the train will allow itself to be unlocked by the shorter lobes on the cam affixed to the centershaft. When the correct sequence is interrupted, a locking device shaped like a hook falls into place and arrests a pin mounted on the locking disk. This disk is located on the wheel arbor that follows the cam that governs the amount of time the chime train is allowed to run as it identifies the appropriate quarter. Behind this cam is a small drum with a notch that allows the locking hook to drop down immediately after the music for the third quarter has been completed. Once this locking device is in place it will only respond to the tallest lobe on the cam on the center shaft, allowing the others to pass by without any action.

The tallest lobe on the cam on the centershaft will lift the locking device out of the way at the appropriate time to reestablish the correct chiming sequence. This occurs when the minute hand indicates the hour on the dial. Once the correct number of measures of music have been released to identify the hour, the chime train will resume its normal operating pattern. Thereafter, the train will allow itself to be unlocked by the appropriate cam lobe on the centershaft.

This system operates very reliably. The main causes for its failure are inadvertent adjustments made by well intentioned people who do not understand it, and gummy lubricants. If the levers in the chiming and striking system cannot operate freely, the auto correct will not be able to lock and unlock reliably. As the shaft supporting these levers encounters very little rotating action, it is best to leave it without lubrication. The collar that holds the shaft in place behind the front plate must have enough sideshake to allow the lever assembly to drop quickly. Quite often gummy lubricants will interfere with the freedom of these components.

As is the case with any system operating on the principle of a hook engaging a pin, the condition of each component and the proper adjustment of the assembly are important. When the pin has been arrested by the hook very little friction should be encountered when lifting it. Check for wear or rough surfaces on the pin or hook if this is not the case. Polish both components if they do not slide smoothly against each other.

Adjustment of the locking device on the auto correction system is not difficult. The auto correction system operates on the same cam that shuts off the chime train at the end of each quarter. When the proper adjustments have been made to shut the train off in the correct position the chime auto correction system components will operate as they are supposed to after they have been put in place.

Hermle

Section 6

Hammer Adjustments

The sound of a bell, gong or tube can be affected by the manner in which the hammer strikes it. Hermle movements are constructed in a manner that allows the hammers to be adjusted quickly and easily.

The "correct" blow to a bell, rod or tube consists of more than simply allowing the hammer to come in contact and make a noise. To impart a pleasing tone the bell, rod or tube must be struck with a sharp blow and then it must be allowed to vibrate freely without contacting the hammer.

Before bending the hammers the complete chiming and striking system should be examined. The damper system or rebound mechanism that brings the hammers to a gentle rest should be operating effectively. A light coating of grease should be in place between the hammer tail and the damper or rebound mechanism. When it is clear that this mechanism is allowing the hammer to come to rest reliably in the same position each time, the hammer itself can be adjusted.

It is not enough to simply bend each hammer so it contacts the bell, rod or gong. The hammer must be able to strike a sharp blow when its tail has been lifted as high as it will go by the lifting device and allowed to fall off. Once the hammer has struck the gong it should come to rest a suitable distance away from it. Thereafter, there should be no contact between the hammer and the gong until the next time it is lifted and released.

If the hammer does not travel far enough forward to make contact with the gong, the arm should be bent just enough to allow the head to make contact and fall away. The arm must be over-stressed enough to actually make an adjustment that will remain in place after the hammers have operated for a respectable amount of time.

If the hammer is not capable of coming to rest a respectable distance from the gong, it will "chatter" and make an unpleasant sound. The arm of the hammer must be bent back away from the gong to relieve this situation.

The parking position of the chime hammers can be changed by adjusting the downstop or re-bound mechanism. On chiming movements, rotating the cam forward or backwards will raise or lower the hammers. On striking movements, the damper or rebound mechanism can be bent to regulate where the hammer will come to rest. These mechanisms should always have a light coat of grease between the components that slide against each other.

Hermle

PART C

Timekeeping Adjustments

A mechanical movement must be in good running order before it can be expected to deliver acceptable timekeeping service. Excessive friction from any source can have an adverse effect on the timekeeping ability of a clock movement. Therefore, every wheel bearing must be in good condition and every lever that is lifted by the time train must operate as freely as possible. All of the components that are placed in motion by the time train must be in good running order including the escapement components, the auto beat setting mechanism, the crutch and the pendulum assembly.

If a clock is to be expected to deliver precision timekeeping performance, the escapement and every component between the escape wheel and the regulating nut on the pendulum bob must have a minimum of free play. Components that are designed to allow forward and backward movement of the pendulum leader should be able to slide freely, but should not have excessive space between the parts. Rotating parts should move freely, but should not have excessive wear in their pivot holes.

Wear is an enemy of precision timekeeping. If the escape wheel and the pallet arbor have the least amount of wear, the clock movement cannot be expected to run with the maximum vigor. If the crutch yoke has been allowed to operate without grease for an extended period of time excessive wear can take place in this area. The slot should be restored to its original configuration and closed so there is a minimum amount of free travel between it and the pendulum leader.

Once the movement and all of the components that affect its timekeeping ability have been determined to be in good order, the technician can proceed to regulate it. All Hermle mechanical movements lend themselves to being regulated with electronic timing instruments. The results of these adjustments can be seen immediately. Electronic instruments can save a tremendous amount of time when this work is being accomplished in the repair shop. Moreover, most portable timing instruments being marketed today provide excellent results when they are used to adjust clocks in the customer's home.

Section 1

Floor and Wall Clock Escapements

Hermle escapements can be expected to deliver several years of reliable service without attention. If the escapement is kept free of dust and abrasive materials, these mechanisms will run for a considerable amount of time without showing any signs of wear. Most problems with escapements present themselves when accidental damage occurs to the movement or when an unwary person leaves it incorrectly adjusted.

By their nature, escapements must have an adequate supply of clean oil to operate properly. As the teeth and pallets slide against each other, degraded performance can be expected if the escape-

ment is run in a dry condition. Each face or sliding surface of the pallets should be given a drop of clock oil. The clock should be operated until the escape wheel has made approximately a quarter turn and then the oiling process should be repeated. The escapement can be considered as being correctly lubricated when the tip of each tooth visibly glistens with a thin, uniform coating of oil. Once the teeth have been lubricated, a drop of oil should be put on each of the escape wheel and pallet arbor pivots.

Traditionally, the relationship between the teeth and the pallets is accomplished with two adjustments. The first is the adjustment of the entry pallet. This is accomplished by moving the bridge that supports the pallet arbor closer to the escape wheel or by backing it away. The second adjustment is accomplished by increasing or decreasing the span of the pallets. This adjustment will influence the relationship between the teeth of the escape wheel and the pallet that will receive the impulse on the inside face.

Hermle floor clock pallets are made from a solid piece of metal to precision specifications. The outside drop can be adjusted by moving the bridge or adjusting tab that supports the pallet arbor. No adjustments should be attempted to alter the span between the pallets. Complete pallet arbor and crutch assemblies are readily available from supply houses selling Hermle parts and it is better to replace these assemblies than attempt to apply adjustments to them.

The escapement is considered to be properly adjusted when an equal drop occurs between the escape wheel teeth as they are in the process of being received by the entry and exit pallets. The drop, or amount of space an escape wheel tooth travels without being in contact with the pallets, can be observed from the back of the movement. The clock will operate with more vigor when the amount of drop has been reduced to a minimum in the escapement. After this adjustment has been accomplished, the clock can be put in beat.

The care with which the above adjustments are made will affect the vigor with which the clock runs. A poorly adjusted escapement will result in a marginal pendulum swing, unreliable performance and an uneven sounding tick. It is best to make these adjustments based on one's own observations rather than relying on marks placed on the escapement parts by a previous clockmaker.

Placing a Hermle floor clock in beat is easily accomplished with the automatic beat setting mechanism. When this adjustment has been applied the pallets will stay in contact with the escape wheel for an equal amount of time. Putting the clock beat differs from the previous adjustment in that it does not influence the amount of free travel the escape wheel has before the tooth lands on either of the receiving pallets. Each time a floor clock has been wound or the case has been opened, it is advisable to swing the pendulum enough to allow the automatic beat setting mechanism to function so the pallets can settle into their proper position.

Section 2

Auto Beat Setting Mechanisms

Automatic beat setting mechanisms are installed on Hermle pendulum movements. The purpose of this mechanism is to provide a means for the clock to put itself in beat each time the pendulum is put in motion. Over the years there has been a tremendous amount of confusion concerning automatic beat setting mechanisms and it is not unusual to receive a movement on which this mecha-

nism has been disabled. These attempts range from mutilation of the parts to the application of glue between the moving components.

Automatic beat setting mechanisms are installed on Hermle movements for a good reason - the customer can understand how to operate it. In most cases it is impossible for the customer to understand how to adjust a beat setting mechanism that is held by friction or must be bent. Moreover, very few customers are willing to pay for repeated service calls just to have an unstable clock put back in beat.

The spring tension on Hermle automatic beat mechanisms is set with precision instruments at the factory. Left alone and properly handled, they will work indefinitely without any maintenance. It must be clearly understood by both the customer and the service technician that:

- Auto beat mechanisms should never be oiled
- No attempts should be made to increase the spring tension on auto beat mechanisms
- Because they contain plastic components the auto beat mechanism should never be placed in cleaning solutions of any kind

The customer can usually understand how to operate the self beat setting mechanism. They should be instructed to make use of it each time the clock is wound to insure it settles back to an even beat. If the customer insists on leaving a floor clock on an unstable surface such as a thick carpet, they must be instructed to use the auto beat setting mechanism each time the clock is disturbed or sinks deeper in one direction or the other.

By their nature, auto beat setting mechanisms are not perfect, but they do solve more problems than they cause if they are understood by the people in contact with them.

Section 3

Timing Hermle Movements

When the clock is ready to be put back in operation careful consideration must be given to re-establishing its timekeeping ability. Wall and mantle clocks can be timed on the bench, but it is best to make the final timing adjustments on floor clocks in the location where they will be operating.

Many customers are reluctant to learn how to adjust the timekeeping rate on a floor clock. They expect it to keep time within a minute or so a week and are often more willing to adjust the minute hand each time they wind the clock instead of applying the required corrections to the pendulum.

In instructing those customers who are willing to regulate their own floor clocks, it is important that they understand that the timekeeping rate is governed by the location of the center of the bob. If they operate the adjusting mechanism and fail to move the bob, no change in the timekeeping rate will result. If possible, the customer should record exactly how far the bob

actually moves when they make a timing adjustment. They can avoid placing fingerprints on the pendulum if they wear cotton gloves when they make these adjustments.

When customers are reluctant or incapable of adjusting their own floor clocks it is best to accomplish this service for them. This can be done quickly and accurately using a portable electronic timing device. Hermle movements lend themselves to being timed with these instruments as the model numbers and other data necessary to identify them are stamped on the back of each movement. Hermle has supplied the timing data on their movements to the manufacturers of these timers so it can be included in the manuals that accompany these instruments when they are purchased.

There are two different types of portable electronic timers on the market today that lend themselves to timing floor clock movements. Although they both deliver excellent results it is important to understand the differences between them.

One of these portable timing instruments uses a system that measures the time interval between each tick the timepiece produces. The time interval between ticks can be electronically averaged to even out differences caused by microscopic irregularities in the escapement. A figure based on this average will appear on the screen of the instrument. This figure can then be compared to the tables supplied with the instrument. Once the time interval that is known to be correct for the movement being tested has been determined, the appropriate adjustments can be applied to the regulating mechanism on the clock. The clock can also be put in perfect beat with this type instrument.

The second type of timer utilizes a completely different timing system. It electronically computes the number of beats the escapement produces in one hour. The actual sample reading can be taken in about two minutes and this figure can then be compared with the tables supplied with the instrument. When the correct number of beats per hour has been determined, the clock can be regulated so the figure on the screen matches the one known to be required for accurate timekeeping. Some timers using this principle can be used to put the clock in beat.

Both timing systems can be counted on to deliver accurate results. If the regulating nut is not disturbed and there are no appreciable changes in the environment in which the clock is operating, it will continue to deliver accurate timekeeping service when the rate has been established using one of these instruments.

Tables to use these instruments for timing Hermle mechanical movements are included on the following pages.

Hermle

TABLE A

THIS TABLE CAN BE USED WITH
TIMING INSTRUMENTS THAT MEASURE
THE AMOUNT OF TIME
BETWEEN EACH TICK

(Movement Model Number)					Pendulum Length in CM	Time of one Pendulum Swing
141 151 241 351 1051 451	1151 461 1161 781 791	341	131 261 771	471 1171		
X					11	0.2988
		X			11	0.2992
X					12	0.3059
X					15	0.3365
X					16.5	0.3578
			X		18	0.3703
X					21	0.4048
			X		21	0.4054
X					23	0.4411
			X		23	0.4411
X					25	0.4536
		X	X		25	0.4545
X					26.5	0.4662
X					27	0.4487
X					29	0.4602
X					31	0.4770
			X		31	0.4761
X					32	0.4884
			X		32.5	0.5084
		X			33.5	0.5106
X					34	0.5259
		X			35	0.5333
			X		34	0.5357
X					38	0.5398
			X		39	0.5660
X					43	0.5737
X					45	0.5888
		X			45	0.5890
			X		45	0.5882
X					48	0.6276
X					52	0.6477
X					55	0.6804
			X		55	0.6818
X					66	0.7484
X					75	0.7912
X					85	0.8477
X				X	94	0.9090
X				X	100	0.9375
X				X	114	1.0000

Hermle

TABLE B

THIS TABLE CAN BE USED WITH
TIMING INSTRUMENTS THAT MEASURE
THE NUMBER OF BEATS THE CLOCK
MOVEMENT PRODUCES IN ONE HOUR

(Movement Model Number)					Pendulum Length in CM	Number of Beats per Hour
141 151 241 351 1051 451	1151 461 1161 781 791	341	131 261 771	471 1171		
X					11	12046
		X			11	12030
X					12	11766
X					15	10697
X					16.5	10062
			X		18	9720
X					21	8892
			X		21	8880
X					23	8245
			X		23	8160
X					25	7936
		X	X		25	7920
X					26.5	7722
X					27	8022
X					29	7818
X					31	7546
			X		31	7560
X					32	7371
			X		32.5	7080
		X			33.5	7050
X					34	6844
		X			35	6750
			X		35	6720
X					38	6669
			X		39	6360
X					43	6274
X					45	6113
		X			45	6111
			X		45	6120
X					48	5791
X					52	5557
X					55	5286
			X		55	5280
X					66	4809
X					75	4549
X					85	4246
X				X	94	3960
X				X	100	3840
X				X	114	3600

Section 4

The Pendulum Assembly

The condition of the pendulum plays an important part in the ability of the clock movement to run reliably and deliver good timekeeping service. This is often overlooked during servicing, repair or restoration work done by uninformed clockmakers.

Pendulums are manufactured so their components lock together. This stabilizes the pendulum and insures it will travel in a predictable arc. If a person with no knowledge of clockmaking has altered these parts the operation of the clock can be adversely affected.

The suspension bridge must be secure. If the bridge is not tightly fastened to the movement the clock will probably refuse to run reliably. The suspension springs installed in Hermle movements have no extra space between the slot and the upper block of the suspension spring.

The suspension spring must be free to move backwards and forwards. There should be a slight friction between the slot in the bridge and the top block of the suspension spring. The weight of the pendulum should be able to move the block backwards and forwards. This action is important as it prevents the suspension spring from binding if the clock case settles forward or backwards into a carpet.

The correct screw should always be used to secure the suspension spring in place. The use of pins and wire should be avoided as these have no ability to adjust the amount of space between the slot in the suspension bridge and the top block of the suspension spring.

The pendulum leader should hook securely to the bottom block of the suspension spring. Again, there should be a limited amount of friction between these parts when they are assembled. The pendulum leader should be capable of moving forward and backwards on the pin in the bottom block, but not laterally.

The pendulum should hook securely onto the pendulum leader and remain in place. When installing the pendulum on a movement that is already mounted in a case, double check with a mirror to insure that the pendulum is properly secured in place and that the hook has seated completely.

Some pendulum bobs are made with a recess in the bob that accommodates a slot cut in the top of the rating nut. The purpose of preparing these parts in this manner is to allow them to lock together. When the rating nut is moved down, the pendulum follows with it. This insures that the pendulum bob actually moves when the rating nut is turned counterclockwise. If the rating nut has been separated from the slot the bob is likely to stay in place and the nut will move down the threaded shaft alone. As there is no connection between the components, no change in timekeeping will occur until the bob has been pushed down to meet the rating nut.

The pendulum bob must fit the pendulum rod in a suitable manner. A bob affixed to a wooden pendulum rod will normally have a tab that holds the components securely together by spring pressure. The friction provided by this device should be sufficient to prevent any excess movement between the bob and the rod. The pendulum bob should be able to slide along the pendulum rod smoothly but without any excess play.

Lyre pendulums must be handled carefully. If the component parts have not been fastened securely in place the timekeeping ability of the clock can be adversely affected. It is best to handle these pendulums with cotton gloves when removing and installing them.

Hermle

PART D

Timekeeping Adjustments on Balance Units

Hermle balance units provide an excellent means of controlling the timekeeping rate on mechanical movements. Although the modern balance units are more straight forward and easier to understand, the technician should not shy away from servicing the older assemblies. Both units can be replaced, although stocks of the old discontinued floating balance units are rapidly becoming depleted.

Like movements that are fitted with pendulums, those using balance units must be in good running order before they can be expected to perform to their maximum capability. By their nature, badly maintained pendulum clock movements seem to continue to operate and deliver acceptable timekeeping service. However, movements with balance units do not seem to be as tolerant. If the movement is not in good running order, there is a good chance the balance unit will not operate with acceptable vigor and the timekeeping rate will be totally unacceptable until the cause of the problem has been dealt with.

Timing adjustments should not be attempted on a movement with a balance unit that is operating in a sluggish manner. If the clock movement cannot sustain the balance unit with acceptable vigor throughout a complete winding cycle, any attempts to regulate it will be futile. Sluggishness in the balance unit is usually caused by excessive friction in the movement or in the balance unit itself.

Like any other endeavor, it is best to understand what to expect from a well maintained clock movement fitted with a balance unit. The balance should move with a rhythmic tick when it is correctly in beat. Beat adjustments can be made by changing the relationship between the arbor that supports the balance wheel and the collet on the inner coil of the hairspring. With the beat adjusted, the balance should make at least a complete turn before it reverses itself. This action should be accomplished with reasonably good vigor and at the exact frequency required to deliver precise timekeeping service. The tables supplied with most modern electronic timing instruments will show what figure should appear on the display to achieve accurate timekeeping results. It is prudent to take several readings during a winding cycle as the consistency of the balance rate over an eight day period is a good indicator of the condition of the movement.

Section 1

Hermle Balance Units

Two balance units are listed in the Hermle Spare Parts Lists and in the catalogs of supply houses that carry these items.

BO 19 - 00090

BO 19 - 00080

Hermle

The BO 19 - 00090 is used on smaller movements such as Model 130. The BO 19 - 00080 is used on larger movements such as models 140, 150, 340 and 350. This makes it extremely easy to order balance units as the BO 19 - 00090 fits almost every movement in the Hermle inventory except the 130 series.

Hermle balance units operate very much like the conventional escapements found on many antique clocks. The escape wheel teeth lift the pallets. The pallets are affixed to a lever. As the lever comes in contact with a set of pins affixed to the balance wheel an impulse is applied at exactly the right moment. Once the pallet has done its job of propelling the balance it remains locked in place until the pins on the balance wheel unlock it and the process repeats itself.

The major differences between Hermle balance units and conventional escapements of this nature lie in the guard and fork design. The Hermle guard consists of a ring suspended on an arm extending from the balance wheel arbor. A gap appears in the ring which allows the guard pin on the lever to interact with it. While the balance is traveling to the right, the guard pin remains outside the ring. As the balance travels to the left the guard pin travels inside the ring. This arrangement insures that the fork will always be in position to receive the pins mounted on the balance wheel. Properly adjusted, the horn on the fork should never touch the ring while the balance is in operation.

The rating data for Hermle balance units is stamped on the inside surface of the rear plate.

This notation reads:

\
+

10 Sec per Day

–
/

The area between the marks is about 1/8th of a turn, indicating that a full turn of the regulator would change the rate of the movement about 60-80 seconds per day.

Hermle balance units have banking pins that can be adjusted. These pins serve to protect the pallets from accidental damage as they limit how far the fork can travel. When the banking pins have been precisely adjusted, they can contribute considerably to the efficiency of the operation of the escapement.

These balance units rarely go out of adjustment on their own. If they have fallen into the hands of an unskilled repairman they can be received needing adjustments. The beat can be set by carefully placing a watchmaker's screwdriver blade in the hairspring collet slot and turning it until the balance wheel rests with the pins engaging the fork at its centermost position. This can be checked by stopping the power in the time train and noting where the balance wheel comes to rest on its own. Insure that the hairspring is left in a level state after this adjustment has been accomplished.

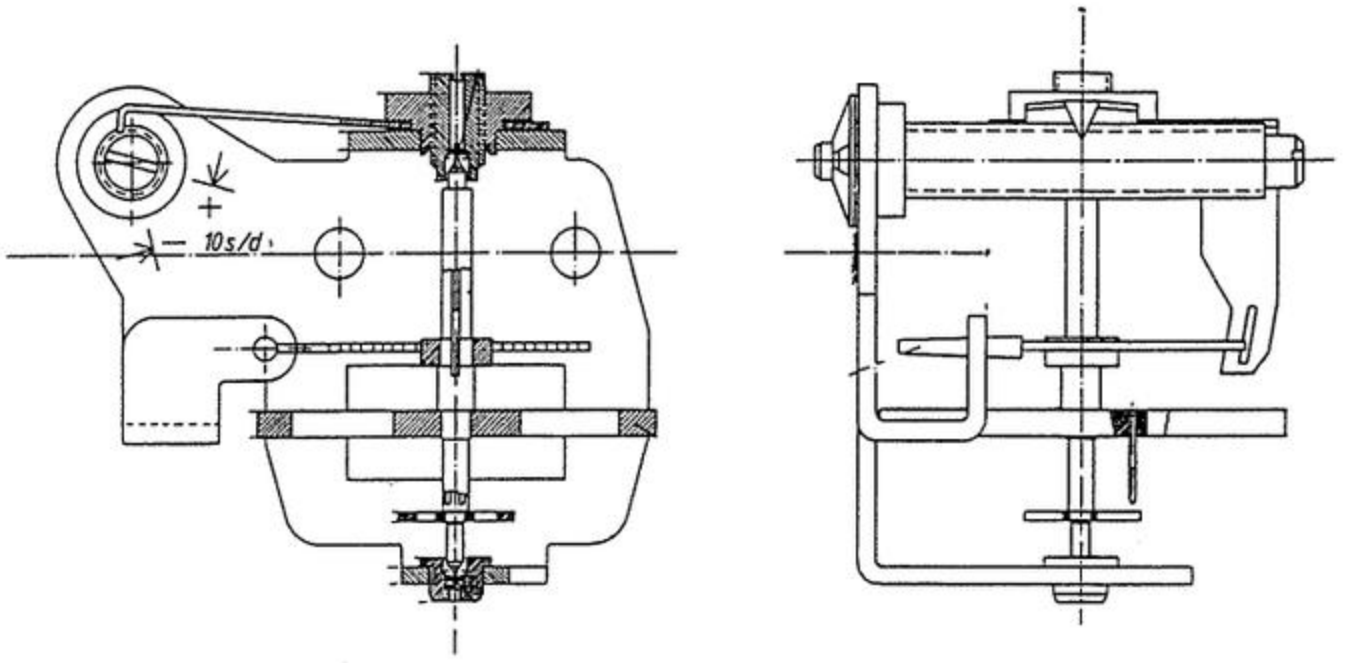
Although it is easier, faster and more practical to buy replacement balance units, Hermle balances can be disassembled for cleaning and restoration work. Measure and note exactly where the hairspring is pinned. Once the hairspring is free, the top bearing cap can be unscrewed to release the balance wheel.

As with other balance units of this type, all traces of cleaning residues must be completely removed from the bearing surfaces and they should be completely dry before the reassembly and lubrication process begins. A small quantity of good clock oil should be placed on both the top and bottom bearing surfaces before the balance is reassembled.

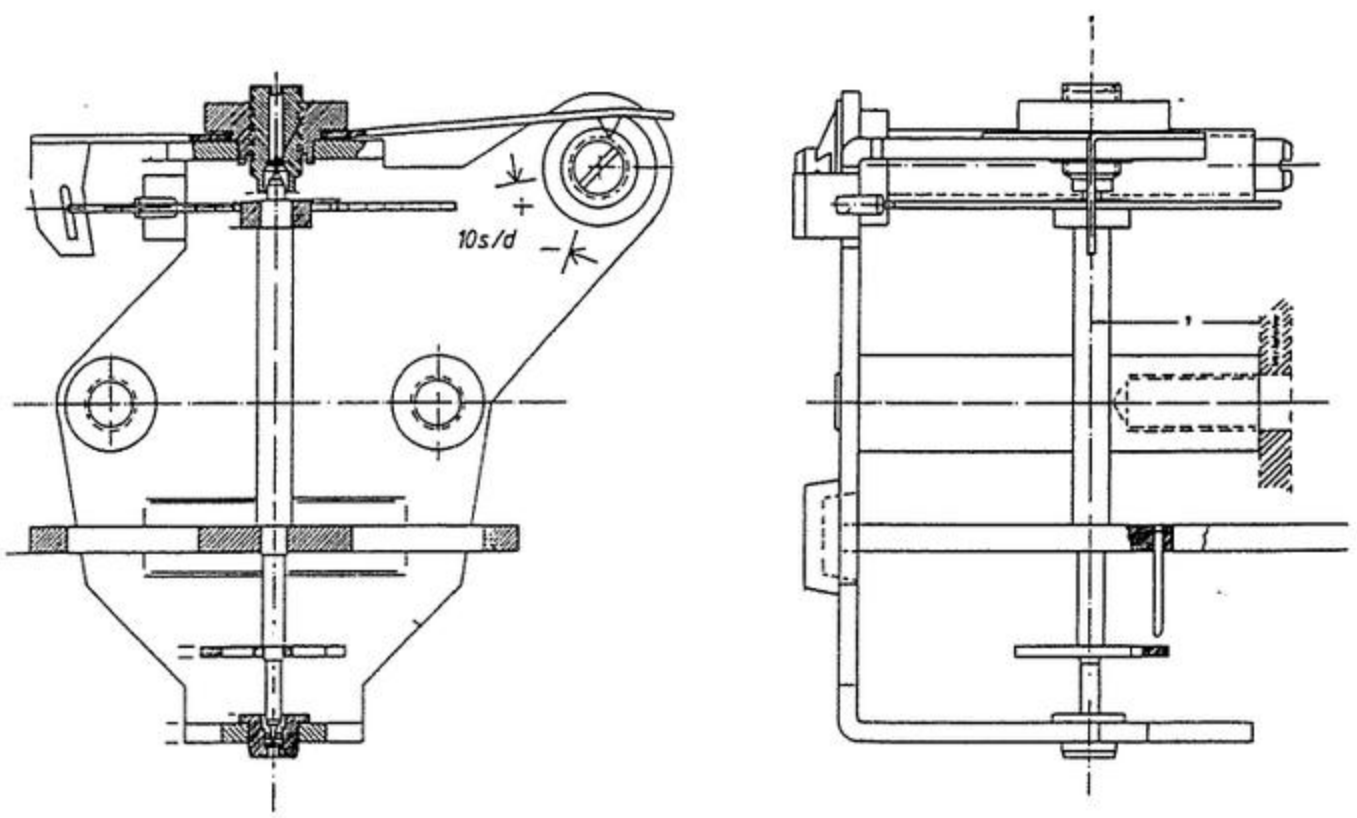
Allow about 1/10th mm endshake in the balance unit. Tightening the top bearing unit too tightly

will result in degraded performance and possible damage to the bearings. Approach the tightening process very carefully and make a series of small adjustments until the proper amount of endshake results.

Unlike the floating balance, rating adjustments are normally made by adding or subtracting weight from the balance wheel. Rating adjustments can be made beyond the range of the regulator by lengthening or shortening the hairspring and repinning it. Of course, this necessitates adjusting the beat to compensate for these adjustments. From a time saving standpoint it is usually wiser to replace a defective balance unit than to spend several hours regulating it or working with the hairspring. If the balance needs extensive adjustments, chances are it has more than one problem and replacing the complete unit is the wiser choice.



Balance Unit for Model 130



Balance Unit for Models:
140
150
340
350
1050

Hermle

Section 2

Floating Balance Units

For several years Hermle produced a considerable number of movements with floating balance units. These movements were well suited for installation in bracket clocks. The floating balance units were very reliable and lent themselves to very respectable timekeeping adjustments. A tremendous number of clocks with floating balances are still in operation or are mounted on movements requiring servicing for reasons other than because of malfunctions in these units.

Because they were not constructed like the traditional balance wheel mounted on an arbor, these units were not completely understood by many clockmakers. They failed to understand that the principles of operation were essentially the same as the traditional balance unit, only the suspension and guard functions were arranged in a slightly different manner.

When a floating balance is in good order, it has the advantage of not having to contend with friction caused by the weight of the balance wheel bearing down on the end of the pivot. There are no arbor pivots on a floating balance that must support the weight of the wheel as there are in a traditional balance system. The balance wheel is literally suspended by the hairspring. A taunt wire running through jeweled bearings installed in the tube that supports the wheel holds the assembly in its proper place so it can contact the lever that drives it.

In most instances the cause of sluggishness in a clock movement equipped with one of these units is excess friction in the train, not in the floating balance itself. The main cause of failure in floating balance units is usually gummy residues and accidental damage. Many uninformed clockmakers thought they could improve the performance of a sluggish unit by oiling it. As the oil hardened and collected dust, the freedom of the unit was hampered even more.

One cardinal rule of working with floating balance units is to understand that the jewels that the guide wire runs through should be clean, dry and free of any abrasive or gummy residues. Cleaning can be accomplished by placing the unit in a good solvent that has the capability of dissolving gummy oil, thoroughly rinsing the bearings and then completely evacuating any remaining liquid likely to turn into gummy residues.

This latter point is important. The solvents used must be chosen carefully. If a fast drying solvent is used it is likely to damage the hairspring. Fast drying solvents cool as the liquid evaporates. The solvent selected must also lend itself to being evacuated from the tube. To insure that all of the solvent is removed from the tube the unit should be upended and a piece of very absorbent paper placed at the junction between the guide wire and the bottom jewel. This will draw the solvent out of the tube by capillary action as it settles to the bottom of the tube. This process may take several hours and it is advisable to start cleaning the floating balance early in the repair or restoration process so the unit will be completely dry and free of residues when the movement is ready to receive it. No attempt should be made to fit the balance unit on the movement if there is any evidence of solvent remaining in the tube.

New style balance units are readily available and can be substituted for floating balances that are not capable of working correctly. From a production standpoint this is the wisest course of action. In those cases where the customer desires to keep the original movement intact, it is possible to service floating balance units and restore them to good running order.

Hermle

Section 3

Regulating Floating Balances

Floating balance units can be regulated closely enough to satisfy any customer who understands the limitations of a mechanical clock. These units were made so customers can regulate their own clocks. However, most people are reluctant to do this job themselves until they have been convinced the task can be accomplished without damaging the balance unit. In most cases, it is better for the service technician to regulate the clock if the customer continues to display reluctance in the matter.

Floating balance units allow themselves to be regulated with electronic timing instruments. Some allowance must be made for differences in the rate at the beginning and end of the winding cycle. After the clock movement has been run for a winding cycle the appropriate adjustments can be applied as a result of estimating the difference between the extremes of the electronic instrument readings. The Hermle factory has supplied the manufacturers of these instruments with technical information concerning these balance units and the appropriate rates appear in their instruction books.

Changing the rate on floating balances is an easy matter providing it is in the range of the regulator. A clean balance unit in a recently restored movement should respond to the regulator and should not demand unusually large adjustments. Ideally, a restored movement should leave the shop with the regulator set near the middle of its scale. If this is not practical, it should be adjusted as well as possible. It should not be left resting at either extreme; banked up against the fast or slow regulating stop.

Adjusting a balance that runs much too slow can be accomplished by removing a matched pair of weights from the inner or outer rim. These weights should be directly across from each other so the poise of the balance is not disturbed. Minor adjustments can be made by removing the weights from the inner ring. Conversely, larger rate adjustments can be made by removing a pair of weights from the outer rim. The balance wheel must be properly supported on a suitable anvil that will allow the weight to drop away from the rim when it is tapped out with a small punch. Carefully done, the balance wheel will be lightened and will have sustained no damage in the process.

If another clockmaker has already removed too much weight and the balance operates too fast, a different approach can be taken. In this case more weight will have to be added to the balance wheel. If one does these adjustments on a regular basis it is a good idea to save the pairs of weights removed from other units as they are usually interchangeable.

If replacement weights are not available they can be made from taper pins. A piece of soft sheet metal the same thickness of the balance wheel should be selected. Drill a hole in the sheet metal that is just slightly larger than the empty weight holes that are to be filled in the rim of the balance.

Insert the taper pin in the hole in the sheet metal as far as it will go and clip it off. Finish the new weight by filing the top and bottom while it is secured by the sheet metal. The second weight can be produced using the same method. The new pair of weights can then be installed in the balance by pressing them into an empty hole on the inner or outer rim of the balance unit.

These adjustments can be carried out in a scientific manner if uniform conditions and materials are available. However, it is best to use data collected about regulating floating balance units only as a guide. Each unit will respond to the addition or subtraction of weight in just a little bit different manner. It is best to observe each individual clock movement during a test run extending over a complete winding cycle and make the necessary adjustments based on these observations.

Hermle

Part E

Mainsprings

The mainspring is one of the most important components in a mechanical clock movement. However, mainsprings are often overlooked because people fail to understand that it is important to inspect and service them on a regular basis. Each time the movement is disassembled and cleaned, the mainsprings should receive the same service.

To deliver maximum power, a mainspring must be clean and capable of expanding completely within its barrel. The barrel must be in good condition and free of any dents or obstructions that might interfere with the uniform uncoiling of the mainspring. Abraded areas on the barrel walls or cover are a signal that a new mainspring barrel should be considered as excessive friction is occurring where deep marks appear.

The condition of the bearing surfaces on the mainspring barrel is important. If the bearing surfaces in either the spring barrel or its cover are worn, it will have an adverse effect on the way the barrel rotates. Excessively worn barrels do not run true and they are not capable of delivering power at a reliable rate throughout the winding cycle.

In recent years Hermle has made a considerable number of improvements in their spring barrels. If replacements can be obtained from fresh stocks, better performance and longer life can be expected. The brass barrel covers on the new units provide an excellent bearing surface, virtually eliminating wear problems in the vicinity of the winding arbor.

If a clock has been in the hands of another repairman it is advisable to check the mainsprings. It has been a traditional practice of uninformed repairmen to try and overcome wear problems in clock movements by installing heavier mainsprings than the manufacturer did originally. Of course, this only compounds the problem and makes it all the more necessary to accomplish the restoration work the movement needed in the first place. Technical data on mainsprings and tables addressing their correct application are presented in Chapter IV.

Several improvements have been made in Hermle mainsprings in recent years. New unbreakable mainsprings made in the same manner as watch springs can be expected to virtually eliminate many of the traditional problems faced by the clockmaker.

Section 1

Removing and Installing Spring Barrels

Whenever the plates are separated, or work is being accomplished on one of the trains, the power should be let down. This is best accomplished with a let down tool made specifically for this purpose. These are available from suppliers of horological tools and the most practical type is one with interchangeable inserts so different size winding squares can be accommodated.

With the power of the mainspring restrained by the let down tool, the click can be held away from the rachet. The let down tool can then be allowed to slip at a controlled rate in the hand, letting the spring down slowly and gently.

Once the power has been let down, the mainspring barrel can be removed from the movement. Remove the screw that holds the retainer for the rachet wheel in place. When the screw has been removed the retainer can be lifted off. The rachet can then be lifted off the winding square with the fingers. Do not be alarmed if the winding arbor moves forward during this process.

The winding arbor can now be withdrawn from the spring barrel arbor. As the arbor has a slotted keyway, slight resistance may be encountered. If the arbor is reluctant to disengage a small flat faced brass punch can be placed on the end of the arbor on the backside of the movement and given a tap with a hammer.

Once the winding arbor has been withdrawn, the spring barrel can be removed from the movement. In most chiming clocks the hammer assembly must be removed to allow the spring barrels from the time and chime trains to be slipped out.

Refitting the mainspring barrels is accomplished using the reverse procedure. The barrel is placed in its appropriate position between the plates. The winding arbor is inserted and aligned with the keyway. When the winding arbor is fully seated the rachet can be put in place. Because it is sometimes difficult to gain access to the bearing surfaces of the mainspring barrels, they should be lubricated before placing them in position.

With the rachet and click engaged, the retainer can be placed over the rachet and the screw inserted. The last step is to tighten the screw down carefully and check to insure it is not interfering with any of the moving parts inside the plates. This last point is especially important as many screws look alike and if one slightly too long is mistakenly used to secure the retainer it can cause a stoppage. Some mysterious stoppages can be traced to uninformed clockmakers substituting improper screws in these locations.

Section 2

Removing Mainsprings

From a labor charge standpoint, the most economical means of replacing broken or damaged mainsprings is to order a complete new barrel assembly. This is the recommended means of dealing with mainsprings for service and repair work, especially if it is carried out in the customer's home.

Occasionally a customer will want a Hermle movement restored. In this situation removal of the mainsprings will be required so they can be cleaned and lubricated. There is absolutely no way to clean and properly lubricate a mainspring while it is encased in the barrel.

The first step in removing the mainspring from the barrel is to remove the cover. This can be done by giving the barrel arbor a sharp rap with a brass hammer or by using a screwdriver in the

aperture on the cover. Be careful not to damage the rim on the spring barrel if a tool is used to pry the cover off.

The mainspring should be removed using a mainspring winder. The type with the auxiliary barrels that capture the compressed mainspring are recommended as they prevent distortion and are probably the safest to use. Once the mainspring has been captured in the axillary barrel it can be disconnected from the hook in the spring barrel. The mainspring, now retained in the auxiliary barrel, can be removed and the components separated without any damage or danger to the technician.

Once the barrel has been removed the hole in the end of the spring can be engaged by the hook on the mainspring winder. The mainspring can then be wound up just enough to release the auxillary barrel. Once this has been accomplished the spring can be unwound at a controlled rate.

After the mainspring has been removed it should be wiped clean with a cloth moistened with kerosene or mineral spirits. Mainsprings can be soaked in clock cleaning solution, but it is not recommended that they be cleaned with ultrasonic power. If the train and plate components have been cleaned in an ultrasonic cleaning tank the same solution can be used to clean the mainsprings. It is best not to turn on the ultrasonic system while the mainsprings are in the tank. Therefore, it is best to leave the mainsprings until the end of the cleaning cycle.

After they have been rinsed it is best to dry the mainsprings with a clean cloth. As petroleum based rinsing solutions evaporate they tend to cool the surface of the metal, so it is best to dry them with a cloth immediately after removing them from the rinsing solution. This practice will eliminate any possibility of fractures appearing in the mainsprings as a result of the cleaning process. It also removes all of the rinsing solution, insuring that no residues will remain after the springs have dried.

Before reassembling a clean and dry mainspring it should be checked for cracks and fissures. Special attention should be given to the areas where the hole engages the hook on the spring barrel or the winding arbor. Check the edges of the mainspring to insure no cracks have formed. If rough surfaces appear on the coil surfaces the mainspring should be discarded and a replacement ordered.

Mainsprings are rewound in the opposite sequence they were removed in. Before starting to wind the mainspring, place several drops of clock oil between the coils so it will be spread by the winding process. The Spring is rewound on the mainspring winder and captured with the auxillary barrel. The free end of the mainspring is disconnected from the hook on the mainspring winder.

The captured mainspring can now be inserted into the spring barrel. Rotate the spring barrel until the tail of the spring hooks in place. The mainspring is wound up just enough to allow the auxillary barrel to be withdrawn. The mainspring is then let down at a controlled rate until it comes to rest in the spring barrel.

Hermle

CHAPTER III

SPECIAL FEATURES

Hermle

PART A

The Auto Night Shut Off

The automatic night shut off feature used on Hermle movements is very reliable and will provide trouble free service. All Hermle movements capable of executing Westminster or triple chime melodies can be equipped with this device. If requested, any movement with a model number between 340 and 1171 with these chime capabilities can be equipped with the automatic night shut off feature.

The automatic night shut off mechanism will rarely require attention unless the clock has suffered accidental damage or the relationship between the gears has been inadvertently upset by a misinformed clockmaker. This section of the service manual will be of the greatest importance to those who have disassembled the movement during the repair or restoration process.

The automatic night shut off is fairly easy to understand. Basically, it consists of a double wheel/cam assembly that is driven by a large pinion affixed to the tube carrying the hour hand. The gearing arrangements between these components causes the double wheel/cam to rotate once during a 24 hour period.

The double wheel/cam remains in constant mesh with the large pinion on the hour tube. The on/off lever has a ramp that causes the double wheel/cam assembly to move closer to the front plate or away from it. When the wheel is allowed to move closer to the plate the automatic night shut off is considered to be in engaged. The switch position on the dial will reflect this by indicating it is on.

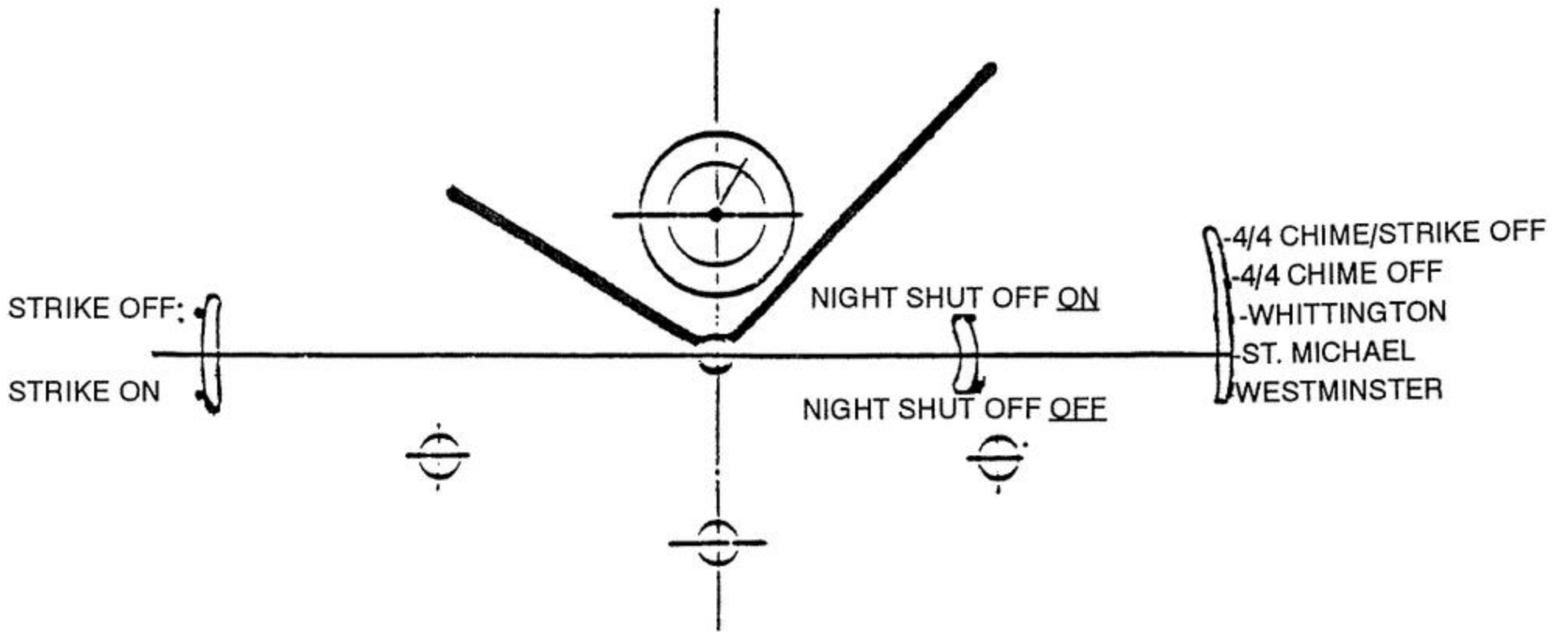
During the hours of 10:45 PM and 7:00 AM the high lobe of the cam will restrain a tab affixed to the lever that activates the chime and strike mechanisms. (Note: Movements manufactured in Germany are set to shut off between 9:45 PM and 6:00 AM.) When this lever is restrained and cannot fall, the chime and strike trains will be held in the warning position. When the end of the cam is reached the levers are allowed to drop and the clock will continue chiming and striking in the normal pattern.

When reassembling the movement it is not difficult to replace the components of the automatic night shut off in their correct position. Position the hour snail to reflect the desired shut off time. Place the automatic night shut off switch assembly in place and lubricate it sparingly with white grease. Put the double wheel/cam assembly in place so the leading edge of the cam has just begun to lift and restrain the tab on the lever that operates the chime and strike trains. Install the retaining clip and rotate the pinion on the hour tube 8 turns. A clutch mechanism will allow the pinion to turn with a controlled amount of friction.

Once 8 turns have been applied to the pinion on the hour tube the end of the cam will have been reached and the levers will be able to drop and resume their functions. The clock will be able to chime and strike again. This should take place at 7:00 AM. Adjustments can be made by removing the retaining clip and moving the double wheel/cam assembly forward or backward one or two teeth at a time until the shut off and resumption of chiming occur at exactly the correct times.

Hermle

THE AUTOMATIC NIGHT SHUT OFF FEATURE CONTROLS



ATTENTION: If the movement is equipped with an automatic shut off feature and the lever is set to the "ON" position, the weights will not drop from 10:45 PM and 7:00 AM (the weights on movements manufactured in Germany will not drop from 9:45 PM to 6:00 AM.)

Hermle

PART B

Understanding The Stopworks

Of all of the special features prestige clock manufacturers have placed on their movements, the stopworks is probably the least understood. It is not uncommon to find that uninformed clockmakers have removed these components as they did not know how to install them correctly after replacing a cable or disassembling the movement. Sometimes these parts can be found lying on the bottom of a clock case. In most instances they can no longer by recovered and new parts must be procured.

The stopworks is a fairly easy device to understand. It consists of two sets of wheels that mesh with each other and rotate when the winding arbor is turned. These wheels do not cause any friction or reduce the amount of power available to the train so there is no reason to suspect them if there is a reduction in power. However, if no power is being transferred from the cable drum to the train, the positioning of the stopworks should definitely be checked. This is especially prudent if it is suspected that another person has removed and repositioned them for any reason.

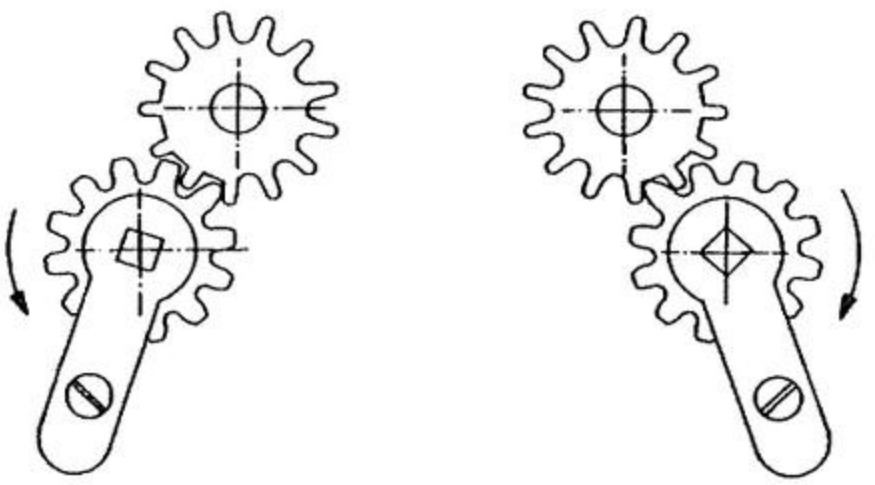
The wheels in the stopwork mechanism are cut in a special pattern. The wheel attached to the winding arbor has a total of seventeen teeth. Sixteen of these teeth are of equal height and the seventeenth is taller. The idler wheel is cut in a different fashion, having a total of eighteen teeth which provides eighteen notches. Seventeen of these notches are of an equal depth and the eighteenth is more shallow than the others.

It is easiest to let the cable supporting the weight down to its full length before reassembling the stopworks device. The drum should be positioned so the recess for the end of the cable is located at about nine o'clock or slightly higher. This position ensures that the end of the cable will be securely retained when the stopworks device engages to stop the downward travel of the weight.

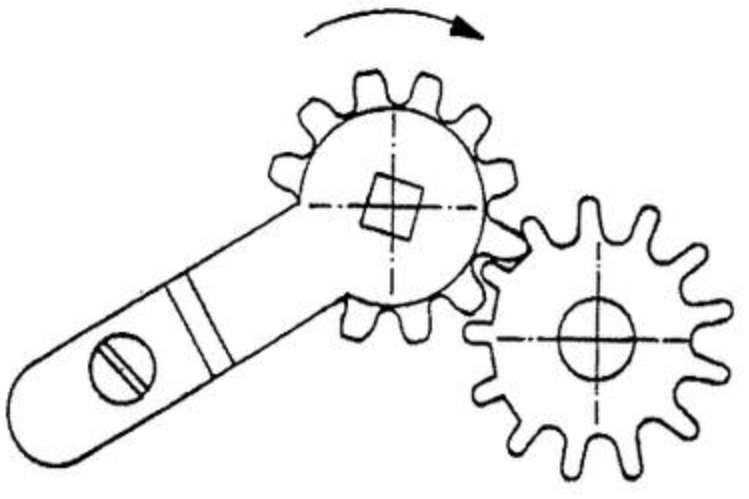
Start with the long tooth and the shallow notch aligned so they face each other. Install the long tooth so it mates with the shallow notch. Due to their configuration it will be impossible for these teeth to mate correctly so they should be oriented downward. Secure the retaining devices for both wheels in place and conduct a check to insure the mechanism is working correctly.

To check the stopworks, a mark should be placed on the winding arbor. Starting from the locked position, it should be possible to rotate the winding arbor eighteen full turns before the stopworks engage. When the long tooth meets the short notch again it will be impossible for them to mate correctly and they will lie oriented in an upward position, being able to go no farther. If locking occurs before eighteen turns have taken place, the placement of the wheels in relation to each other will need to be checked.

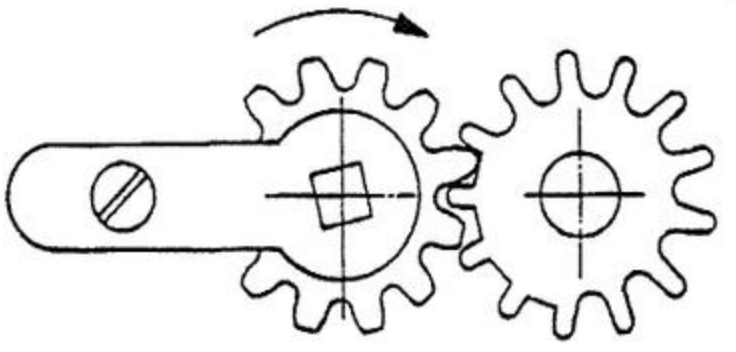
Hermle



Stopwork Mechanism
Models 241 - 870 / 871 / 873 / 830 / 831 / 833 / 850 / 851 / 853 / 880 / 881 / 883

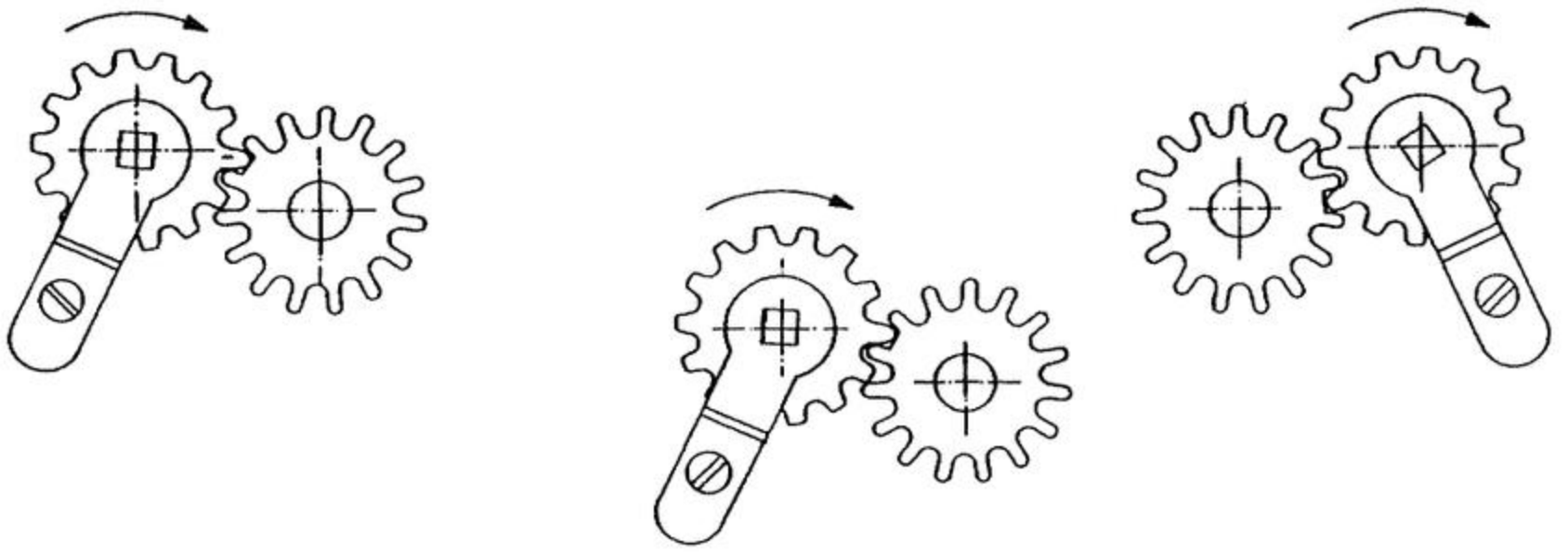


Stopwork Mechanism
Models 351 - 830 / 831 / 833 / 850 / 851 / 853
Models 3351 - 850 / 851 / 853

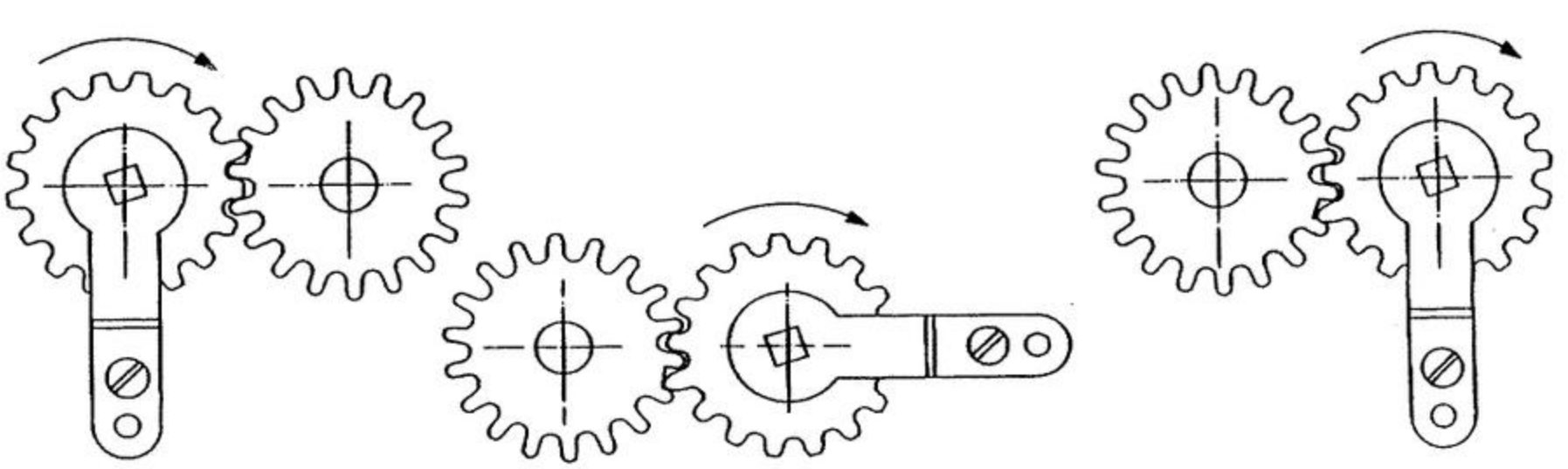


Stopwork Mechanism
Model 781 - 000 / 001 / 003

Hermle



Stopwork Mechanism
Models 461 - 850 / 853
Models 1161 - 850 / 853



Stopwork Mechanism
Models 471 - 850
Models 1171 - 850

CHAPTER IV

CLEANING AND LUBRICATION

Hermle

PART A

Cleaning Hermle Movements

Cleaning has different meanings to some people than to others. It is often necessary to insure that the customer understands exactly what is involved in cleaning a clock movement in a proper manner.

No clock movement can be properly cleaned and lubricated unless it has been completely disassembled.

In rare instances lubrication can be accomplished on a relatively new movement without cleaning. In all other instances there is always an opportunity for dust and other abrasive materials to be washed into the pivot holes by the addition of fresh oil. If the movement is not disassembled, extreme care must be taken to remove the gummy residues in the oil sinks that surround the pivots and to remove any abrasives that might remain after this has been accomplished.

Once the movement has been completely disassembled, it should be cleaned in a petroleum based cleaning solution. Several of these solutions are available from major manufacturers that specialize in these products. Water based cleaning solutions are not recommended. Although the steel surfaces may appear dry after their use, rust tends to accumulate a considerable time afterwards on movements cleaned in water based solutions.

Rinsing should be accomplished with a petroleum based rinse solution procured from a reputable supplier. If it is not considered practical to use rinses specially formulated for cleaning clocks, a good grade of clean mineral spirits can be substituted. Water and alcohol rinses are not considered suitable for rinsing Hermle movements. If there is no choice but to use these, every precaution must be taken to insure that the parts are completely dry before they are reassembled.

The number of rinses used will determine the final cleanliness of the clock movement. Rinsing in two fairly clean solutions is necessary to remove all traces of the clock cleaning solution. If all of the cleaning solution is not removed, it will leave a gummy residue after it dries.

Under no circumstances should plastic parts be placed in cleaning solutions. The hammers should be removed and set aside along with auto beat mechanism as well as any other plastic components in the movement.

Drying of movements after cleaning can be accomplished with or without the use of heat. If time is not a critical factor the preferred method of drying is to upend each part on an absorbent material so all of the rinse can drain off the part during the drying process. This technique insures that there will be very little residues remaining on the parts. Heat can be used, but it has a tendency to cook residues trapped in the rinsing solution. It is not unusual to find that components such as chain wheels will operate with a sticky sensation when they have been dried with heat and cleaning residues have been trapped between the moving parts.

Hermle

PART B

Lubricating Hermle Movements

The Lubrication procedures to be used on Hermle movements can be summarized as follows:

Oil bearing surfaces that rotate against each other.

Grease Surfaces that slide against each other.

In principle, this is simple guidance. However, knowing what to lubricate and not to distinguishes the well informed clockmaker from the rank amateur.

For example:

Each pivot protruding through the plates should be given a small drop of oil. Each is a rotating surface.

Each lever on the front is also a rotating surface in a sense, as it makes a partial revolution. However, they should not be oiled. These bearing surfaces tend to work better when they are clean and dry. As oil hardens and becomes gummy it hampers the operation of these components.

The application of grease has to be approached with the same degree of care.

For example:

The strike hammer damper or rebound mechanism requires grease because the components slide against each other.

On the other hand, the auto beat correction mechanism parts slide against each other but they should never be greased. This assembly is preset at the factory with the proper friction and lubricants of any kind will render it inoperative.

There are some techniques that distinguish a good lubrication job from a poor one:

Apply oil in small quantities so it does not run down the plates. If the oil is allowed to run down the plates it will carry the lubricant with it that would otherwise remain in place around the pivot.

Some oiling is best accomplished while the movement is disassembled. The components of the center wheel can only be oiled when they are completely disassembled. It is also easier to oil the bearing surfaces on mainspring barrels before they are placed back in the movement.

Apply grease with a small piece of sharpened pegwood. Only enough grease needs to be applied to allow the components that slide against each other to spread it between the surfaces needing lubrication. Excess grease should be removed once this spreading action has taken place.

Hermle

The selection of lubricants should be carried out very carefully. Favorable results can be obtained using the following guidelines.

Choose oils and greases specifically made for clockmaking purposes. Household and automotive lubricants are not well suited for horological applications.

Select lubricants made by major manufacturers. Their desire to protect their reputations is your guarantee of quality. Be careful of lubricants packaged by other than manufacturers, as it is difficult to know exactly what is in the container.

White grease works well for horological work and is available from several horological supply sources. These greases are specially formulated and provide very satisfactory service.

Buy new oil and grease periodically. Like everything else, lubricants have a limited life. The old lubricants can be used for other than horological purposes if economy is a major consideration.

Avoid lubricating a movement that needs cleaning. Adding new oil to old oil is like adding thinner to varnish. The best results can be obtained by applying lubricants to clean and dry surfaces.

The popularity of spray lubricants has presented the trade with some very serious problems. Some of these products contain moisture displacing chemicals and solvents designed strictly for automotive applications. They should never be used in servicing Hermle clock movements. Spraying a movement with any lubricating substance will invite dust to attach itself to the affected surfaces. As the lubricant hardens, the residues and dust are likely to interfere with the proper operation of the movement. Only the pivots and sliding surfaces should be lubricated. The plates should be left dry and free of lubricants.

Each of the following parts of this section has been organized according to the type of movement requiring lubrication. The correct table can be located by using the Quick Reference Guide that follows. Another option is to locate the model number of the movement printed at the top of each of the lubrication tables. The lubrication tables in this manual are arranged in the following manner:

Section 1	Spring Driven Movements With One Train
Section 2	Weight Driven Movements With One Train
Section 3-a	Spring Driven Pendulum Movements With Two Trains
Section 3-b	Spring Driven Balance Wheel Movements With Two Trains
Section 4	Weight Driven Movements With Two Trains
Section 5-a	Spring Driven Pendulum Movements With Three Trains
Section 5-b	Spring Driven Balance Wheel Movements With Three Trains
Section 6	Weight Driven Movements With Three Trains
Section 7	Combination Spring and Weight Driven Movements
Section 8	Quartz Driven Mechanical Movements

Hermle

QUICK REFERENCE LUBRICATION TABLE

This table is designed to provide a means of locating the instructions needed to lubricate each Hermle movement in an expedient manner when the model number is known.

MOVEMENT MODEL	SECTION	PENDULUM BALANCE	MOVEMENT MODEL	SECTION	PENDULUM BALANCE
130	3-b	Balance	461-050	6	Pendulum
131	3-a	Pendulum	461-853	6	Pendulum
132-071	3-b	Balance	471-050	6	Pendulum
140 /150	3-b	Balance	471-850	6	Pendulum
141 /151	3-a	Pendulum	771	1	Pendulum
141-031	3-a	Pendulum	781-800	2	Pendulum
141-051	3-a	Pendulum	791-680	1	Pendulum
241	4	Pendulum	987	8	Quartz
241-870	4	Pendulum	987M	8	Quartz
261-030	4	Pendulum	1050-020	5-b	Balance
340-020	5-b	Balance	1050-050	5-b	Balance
341-020	5-b	Balance	1051-030	5-a	Pendulum
350-020	5-b	Balance	1051-850	7	Pendulum
350-060	5-b	Balance	1151-030	6	Pendulum
351-020	5-a	Pendulum	1151-050	6	Pendulum
351-030	5-b	Balance	1161-050	6	Pendulum
351-051	5-b	Balance	1161-853	6	Pendulum
351-850	7	Pendulum	1171-050	6	Pendulum
451-030	6	Pendulum	1171-850	6	Pendulum
451-050	6	Pendulum	1171-890	6	Pendulum

If the model number is not known, it can be identified from the photographs in Chapter VIII. A reference regarding which lubrication table to use is located on the page which has the photograph of the movement.

Hermle

Section 1

Spring Driven Movements With One Train And A Pendulum

LUBRICATION POINTS

MODELS 771, 791-680

Oil
All pivots extending through the front and rear plates
The spring barrel bearing surfaces
The contact point between the pallet faces and each escape wheel tooth
The center wheel bore and hand clutch components
The click bearing
The contact point between the click and the click spring

Note: Never oil the washers on the auto beat setting mechanism

Grease
Contact surfaces between the crutch and pendulum leader
The contact points between the hammer tail and the cam on the center shaft on Model 791-680

Note: If the mainspring has been removed and cleaned, the coils should be given a light coating of lubricant.

Section 2

Weight Driven Movements With One Train And A Pendulum

LUBRICATION POINTS

MODEL 781-800

Oil
All pivots extending through the front and rear plates
The bearing surfaces between the great wheel and its arbor
The contact points between the ratchet and the great wheel
The contact points between the pallet faces and each escape wheel tooth
The center wheel bore and hand clutch components
The click bearing where it is attached to the great wheel
The contact point between the click and the click spring
The pulley bearings

Note: Never oil the washers on the auto beat adjusting mechanism

Grease
The sliding surfaces between the crutch and pendulum leader
The stopwork components

Hermle

Section 3-a

Spring Driven Movements With Two Trains And A Pendulum

LUBRICATION POINTS

MODELS 131, 141 / 151, 14-031, 141-051

TIME TRAIN

Oil
All pivots and the winding arbor extending through the front and rear plates
The pallet faces and the tip of each escape wheel tooth
The center wheel bore and hand clutch components
The click bearing where it attaches to the plate
The contact point between the click and the click spring
The spring barrel bearing surfaces

Note: Do not lubricate the autobeat setting mechanism

Grease
The sliding surface between the crutch and the pendulum leader

STRIKING TRAIN

Oil
All pivots and the winding arbor extending through the front and rear plates
Hammer pivots
The click bearing where it attaches to the plate
The contact point between the click and the click spring
The bearing surfaces between spring barrel and the arbor

Grease
The strike hammer lifting face and each star wheel tooth
Each of the strike hammer rebound mechanism sliding surfaces
The outer edge of the gathering pallet cam and locking face
The bearing surfaces on the silencing device, if installed

Note: If the mainsprings have been removed and cleaned, they should be given a light coating of lubricant before being replaced in the barrel.

Section 3-b

Spring Driven Movements With Two Trains And A Balance Wheel

LUBRICATION POINTS

MODELS 130, 132-71, 140 / 150

TIME TRAIN

Oil
All pivots and the winding arbor extending through the front and rear plates
The pallets and the top of each escape wheel tooth
The center wheel bore and hand clutch components

The contact point between the click and the click spring
The spring barrel bearing surfaces

Note 1: If the old style floating balance is installed, do not oil the bearings

Note 2: If the movement is fitted with a new style balance unit, the top and bottom bearing should be oiled sparingly with clock oil before the unit is reassembled

Grease
No surfaces require grease in this train

STRIKING TRAIN

Oil
All pivots and the winding arbor extending through the front and rear plates
The hammer pivots
The click bearing where it attaches to the plate
The contact point between the click and the click spring
The spring barrel bearing surfaces

Grease
The strike hammer lifting face and each star wheel tooth
Each of the strike rebound mechanism sliding surfaces
The outer edge of the gathering pallet cam and locking face
The bearing surfaces of the silencing device, if installed

Note: If the mainsprings have been removed and cleaned, they should be given a light coating of lubricant before being replaced in the barrel

Section 4

Weight Driven Movements With Two Trains And A Pendulum

LUBRICATION POINTS

MODELS 241, 241-870, 261-030

TIME TRAIN

Oil
Both Chain and Cable Driven Movements
All pivots extending through the front and rear plates
The pallet faces and the tips of the escape wheel teeth
The center wheel bore and hand clutch components
The click bearing where it is attached to the great wheel
The contact point between the click and the click spring

Chain Driven Movements
The bearing surfaces between the arbor and the chain sprocket
The contact point between the tension spring and the retaining clip

Cable Driven Movements
The great wheel bearing surfaces
The contact surfaces between the cable drum ratchet and the great wheel
The pulley bearing

Note: Never oil the washers on the auto beat setting mechanism

Grease
The crutch and the pendulum leader sliding surfaces

STRIKING TRAIN

Oil
Both Chain and Cable Driven Movements
All pivots extending through the front and rear plates
The click bearing where it attaches to the great wheel
The contact point between the click and the click spring
The hammer pivots

Chain Driven Movements
The bearing surfaces between the chain sprocket and the arbor
The contact point between the tension spring and the retaining clip

Cable Driven Movements
The great wheel bearing surfaces on the arbor
The contact surfaces between the cable drum ratchet and the great wheel
The pulley bearing

Grease
Both Chain and Cable Driven Movements
The strike hammer lifting surfaces and each star wheel tooth
The strike hammer rebound mechanism sliding surfaces
The outer edge of the gathering pallet cam and locking faces
The bearing surfaces of the silencing device, if installed

Section 5-a

Spring Driven Three Train Movements With A Pendulum

LUBRICATION POINTS

MODELS 351-020, 1050-050, 1051-030

TIME TRAIN

Oil
All pivots and the winding arbor extending through the front and rear plates
Pallet faces and the tips of the escape wheel teeth
The center wheel bore and hand clutch components
The click bearing where it attaches to the plate
The contact point between the click and the click spring
The spring barrel bearing surfaces
Note: Never oil the washers on the auto beat setting mechanism

Grease
The sliding surfaces between the crutch and pendulum leader

STRIKING TRAIN

Oil
All pivots and the winding arbor extending through the front and rear plates
The click bearing where it attaches to the plate

The contact point between the click and the click spring
The spring barrel bearing surfaces

Grease
The strike hammer lifting lever and each star wheel tooth
The strike hammer rebound mechanism sliding surfaces
The outer edge of the gathering pallet cam and locking face
The bearing surfaces of the silencing device, if installed

CHIME TRAIN

Oil
All pivots and the winding arbor extending through the front and rear plates
The spring barrel bearing surfaces
The pivots on the chime drum
The click bearing where it attaches to the plate
The contact point between the click and the click spring

Grease
All chime hammer tails at the lifting contact points
The chime hammer pivot points
The control cam surfaces
The locking surfaces in contact with hook faces
The chime hammer sliding surfaces in the rebound mechanism
The silencing device bearing surfaces, if installed
The chime selector switch fork, if installed

Note: If the mainspring has been removed and cleaned, they should be given a light coat of lubricant before being replaced in the barrel.

Section 5-b

Spring Driven Three Train Movements With A Balance Unit

LUBRICATION POINTS

MODELS 340-020, 341-020, 350-020, 350-060, 351-030, 351-051 and 1050-020

TIME TRAIN

Oil
All pivots and the winding arbor extending through the front and rear plates
The pallets and the tips of the escape wheel teeth
The center wheel bore and hand clutch components
The click bearing where it attaches to the plate
The contact point between the click and the click spring
The spring barrel bearing surfaces

Note: Do not lubricate the bearings on the old floating balance units.

The top and bottom pivots on the new style balance units should be lubricated sparingly with clock oil before the unit is reassembled.

Grease
There are no lubrication points requiring grease in this train

STRIKING TRAIN

Oil
All pivots and the winding arbor extending through the front and rear plates
The click bearing where it is attached to the plate
The contact point between the click and click spring
The spring barrel bearing surfaces

Grease
The strike hammer lifting lever and each star wheel tooth
The strike hammer rebound mechanism sliding surfaces
The outer edge of the gathering pallet cam
The bearing surface of the silencing device, if installed

CHIME TRAIN

Oil
All pivots and the winding arbor extending through the front and rear plates
The spring barrel bearing surfaces
The pivots on the chime drum
The click bearing where it attaches to the plate
The contact point between the click and the click spring

Grease
All chime hammer tails at the lifting points
The chime hammer pivot points
The control cam surfaces
The locking surfaces
The sliding surfaces on the chime hammer rebound mechanism
The bearing surfaces of the silencing device, if installed
The chime selector switch fork, if installed

Section 6

Three Train Weight Driven Movements With A Pendulum

LUBRICATION POINTS

MODELS 451-030, 451-050, 461-050, 461-853, 471-050, 471-850, 1151-030, 1151-050, 1161-853, 1171-050, 1171-850 and 1171-890

TIME TRAIN

Oil
Both Chain and Cable Driven Movements
All pivots extending through the front and rear plates
The pallet faces and the tips of the escape wheel teeth
The center wheel bore and hand clutch components
The click bearing where it mounts on the great wheel
The contact point between the click and the click spring

Chain Driven Movements
The bearing surfaces between the chain sprocket and the arbor
The contact point between the tension spring and the retaining clip

Cable Driven Movements
The bearing surfaces between the arbor and great wheel
The contact surfaces between the cable drum ratchet and the great wheel
The pulley bearing

Note: Never oil the washers on the automatic beat setting mechanism

Grease
The crutch and pendulum leader sliding surfaces
The auto night shutoff cam, if fitted
The auto night shutoff on-off switch, if fitted
The stopworks, if fitted

STRIKING TRAIN

Oil
Both Chain and Cable Driven Movements
All pivots extending through the front and rear plates
The click bearing where it is mounted on the great wheel
The contact point between the click and the click spring
The hammer pivots

Chain Driven Movements
The bearing surfaces between the arbor and the chain sprocket
The contact point between the tension spring and the retaining clip

Cable Driven Movements
The bearing surfaces between the arbor and great wheel
The contact surfaces between the cable drum ratchet and the great wheel
The pulley bearing

Grease
Strike hammer lifting lever and each star wheel tooth
The strike hammer rebound mechanism sliding surfaces
The outer edge of the gathering pallet cam
The silencing device bearing surfaces, if installed
The stopworks, if fitted

CHIME TRAIN

Oil
Both Chain and Cable Driven Movements
All pivots extending through the front and rear plates
The click bearing where it is attached to the wheel
The contact point between the click and the click spring

Chain Driven Movements
The bearing surface between the arbor and the chain sprocket
The contact point between the tension spring and the retaining clip

Cable Driven Movements
The bearing surfaces between great wheel and arbor
The contact surfaces between the cable drum ratchet and the great wheel
The pulley bearing

Grease
All chime hammers at the lifting contact points
The chime hammer pivot points
The bearing surfaces of the silencing device, if installed
The outer edge of the control cam surfaces
The chime hammer rebound mechanism sliding surfaces
The chime selector slide
The chime selector switch fork, if installed
The stopworks, if installed

Section 7

Combination Weight and Spring Driven Movements With Three Trains and a Pendulum

LUBRICATION POINTS

MODELS 351-850 and 1051-850

TIME TRAIN

Oil
All pivots extending through the front and rear plates
The pallet faces and the tips of the escape wheel teeth
The center wheel bore and hand clutch components
The click bearing on the great wheel
The contact point between the click and the click spring
The bearing surfaces between the cable drum and the arbor
The contact points between the cable drum ratchet and the great wheel
The pulley bearing

Note: Never oil the washers on the auto beat setting mechanism

Grease
The surface between the crutch and the suspension leader

STRIKING TRAIN

Oil
All pivots and the winding arbor extending through the front and rear plates
The click bearing
The contact surface between the click and the click spring
The bearing surfaces between spring barrel and the arbor

Grease
The strike hammer lifting lever face and each star wheel tooth
The strike rebound mechanism sliding surfaces
The outer edge of the gathering pallet cam
The bearing surfaces of the silencing lever, if installed

CHIME TRAIN

Oil
All pivots and the winding arbor extending through the front and rear plates
The spring barrel bearing surfaces
The chime drum pivots
The click bearing
The contact point between the click and the click spring

Grease
All chime hammers at the lifting contact points
The control cam surfaces
The cam locking surfaces in contact with hook faces
The chime hammer sliding surfaces in the rebound mechanism
The bearing surfaces on the silencing lever, if installed
The chime selector switch fork, if installed

Section 8

Quartz Driven Movements With Mechanical Trains

LUBRICATION POINTS

MODELS 987 and 987M

Oil
All pivots extending through the front and rear plates

Note: Use oil sparingly on this type movement

Grease
Hand setting clutch parts
The faces on the star wheel teeth that rotate the pendulum

Note: Use grease very sparingly on this movement
Be very careful not to allow lubricants of any type to reach the electronic circuits in the motor unit

Hermle

CHAPTER V

OBTAINING PARTS FOR HERMLE MOVEMENTS

Hermle

PART A

Using The Spare Parts List

Over the years Hermle has developed the most extensive spare parts supply system in the world for their clock movements. Virtually every part for every modern movement produced by a Hermle factory can be ordered by the service technician. These parts are not supplied directly to the service technician by the factory, but can be procured through almost any of the major horological supply houses serving the trade.

The supply house must have the correct information to provide the part needed by the service technician. Hermle has developed a system that makes it very easy to obtain this information. After the correct information has been forwarded to the material house the correct part will arrive in a very short period of time, even if the supplier must order it from the factory.

The information needed to place an order can be obtained from the Hermle spare parts list. Each movement is clearly identified by its model number, a diagram showing an exploded view and by a photograph. Hermle spare parts lists are readily available through most horological material suppliers at a nominal fee.

Information identifying most Hermle movements is stamped on the back plate. The only exception to this practice is when a major company has ordered a significant quantity of movements and specifically instructed the factory to omit the Hermle identification data or to use their model numbers instead. In many instances, these model numbers are readily available and can be interpreted so the Hermle spare parts lists can be used to order the required part. Even if the model number cannot be obtained, the photographs and data provided in the spare parts lists are usually sufficient to identify the movement.

Hermle movements have a considerable amount of data stamped on the back plate. The model number of the movement is usually stamped in bold numbers or as a combination of numbers and letters. Sometimes there will be as few as three numbers. On other occasions there might be as many as seven numbers followed by one or two letters. A positive identification of the movement can be made from these numbers and they play an important part in insuring the correct part will be sent. When pendulum or pendulum suspension parts are being ordered it is very helpful if the pendulum length figure stamped on the back plate is included. Part B of this manual explains how to interpret the information on the back plate of a Hermle movement.

Once the movement model has been determined, the spare parts list can be used to identify the specific part needed. Parts identified by a letter in a circle may have special lengths, special diameters or perform specific functions on some models. When ordering a part designated by a letter in a circle, be sure to include all of the data requested in the ordering instructions. Examples of these parts are interchangeable handshafts that may have specific lengths, hour hand tubes that must match the handshaft length, or suspension components for different styles of pendulums.

Once the part has been identified on the drawing the illustration number can be used to obtain the stock number. The stock number is found on the back of the diagram. Simply match the illustration number of the required part with the stock number and record it on the supply house order form. Be sure to include the specific measurements or information requested if the part is identified by a letter in a circle. If there is any doubt concerning the need for information about the movement or its special features, it should be included.

Hermle

PART B

Information on Hermle Movement Plates

Data on the back of Hermle movement plates is arranged in the following order:

-------	Year of Manufacture
----------	Company Name / Logo
------	Model Number
------	Pendulum Length
----	Beats Per Minute

This data will appear on the back of the movement in the format seen below:

F	Year of Manufacture
Hermle	Company Name / Logo
451-050	Model Number
94 cm	Pendulum Length
66.00	Beats Per Minute

In 1988 Hermle started using letters to identify the year of manufacture. A = 1988, B = 1989, C = 1990, D = 1991, E = 1992 and F = 1993.

Before 1988 the company stamped the last two digits of the year of manufacture on the back plate.

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CHAPTER VI

TECHNICAL INFORMATION

Hermle

PART A

Floor Clock Weights

The weights can tell the service technician a lot about the condition of a clock movement and the way in which it has been operating. If each of the weights does not descend at a uniform rate, it is an indicator that an intermittent stoppage or a malfunction is occurring in the train with the slow descending weight.

Over a twenty four hour period each weight should drop approximately the same amount. Quite obviously, there will be slight variations in the positions of the chime, strike and time train weights at different hours of the day. This occurs as it takes more chain / cable to execute twelve strokes at noon or midnight than it does to sound a single hammer blow at one o'clock.

In some instances the customer may not understand the effect of moving a selector lever and will inquire why the weights are behaving differently than before. It is not unusual for a house guest spending the night to move a silencing switch and fail to mention it to the homeowner in the morning. Upon responding to problems of this nature the service technician can often save a considerable amount of work by checking the position of selectors that influence weight drop patterns immediately upon his arrival.

Service technicians are often called upon by professional moving companies to prepare floor clocks so they can be transported. Most professional moving companies prefer that the weights be removed from the clock by the service technician, although their own employees will pack them as they see fit. It is advisable to disassemble the shells and the fillers before turning them over to the people doing the packing. Very few moving company employees realize that the sheer weight of the steel or lead filler is capable of mutilating the thin brass weight shell even though it is adequately padded and has been placed in a suitable container.

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Section 1

Weight Requirements For Hermle Movements

MOVEMENT NUMBER	CHAIN/CABLE SPECIAL FEATURES	TIME TRAIN		STRIKING TRAIN		CHIMING TRAIN	
		WT/kg	WT/lbs	WT/kg	WT/lbs	WT/kg	WT/lbs
241	Chain	2.0	4.42	2.0	4.42		
241	Cable	3.6	7.95	3.6	7.95		
261	Chain	1.2	2.21	1.2	2.21		
351	Cable	2.75	6.07				
451	Chain	2.15	4.7	2.15	4.7	3.0	6.6
451	w/sec hand or lyre ped	3.0	6.6	2.15	4.7	3.0	6.6
461	Chain	2.6	5.7	2.6	5.7	3.5	7.7
461	Cable	3.5	7.7	3.5	7.7	4.5	9.9
471	Chain	3.5	7.7	3.5	7.7	4.5	9.9
471	Cable	3.5	7.7	3.5	7.7	4.5	9.9
781	Cable	3.6	7.95				
791	Chain	2.0	4.42				
1051	Cable	2.75	6.07				
1151	Chain Lyre ped < 165 mm	2.15	4.7	2.15	4.7	3.3	7.3
1151	Sec hand and/or Lyre > 165mm	3.3	7.3	2.15	4.7	3.3	7.3
1161	Chain	2.6	5.7	2.6	5.7	4.5	9.9
1161	Cable	3.5	7.7	3.5	7.7	4.5	9.9
1171	Chain	3.5	7.7	3.5	7.7	4.5	9.9
1171	Cable	3.5	7.7	3.5	7.7	4.5	9.9
1171	Cable Tubular	3.5	7.7	3.5	7.7	8.4	18.5
2071-850	Cable (Special Ex)	4.5	9.9	4.5	9.9	6.0	13.2

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Section 2

Weight Drops Resulting From Selector Settings

(EXAMPLE: MODEL 1171 - 850)

CHIME/STRIKE SELECTOR LEVER COMBINATIONS

STRIKE LEVER	STRIKE	WEIGHT	CHIME LEVER	CHIME	WEIGHT
ON POSITION	YES	DROPS	ON POSITION OF WESTMINSTER, ST. MICHAEL OR WHITTINGTON	YES	DROPS
OFF POSITION	NO	DOESN'T DROP	ON POSITION OF WESTMINSTER, ST. MICHAEL OR WHITTINGTON	YES	DROPS
ON POSITION	YES	DROPS	OFF POSITION 4/4	NO	DROPS
OFF POSITION	NO	DOESN'T DROP	OFF POSITION 4/4 & STRIKE	NO	DOESN'T DROP

Section 3

Weight Fall Data For Floor Clocks

Quite often customers will inquire about the possibility of having a new movement installed in an older case. In other instances they may be interested in upgrading their present movement to obtain special features available on the higher grade models.

The weight fall data presented below is helpful for determining whether or not the case can accommodate the new movement.

Movement Model	Chain/Cable Driven	Weight Drop In 24 Hours
451	Chain	124.0 mm
461 / 1161	Chain	122.4 mm
461 / 1161	Cable	119.2 mm
471 / 1171	Chain	142.0 mm
471 / 1171	Cable	147.0 mm
1171 Tubular	Cable	147.0 mm

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PART B

Wheels, Pinions and Timekeeping

Clocks are of interest to many people, some of whom understand the technical aspects and others who do not. It is not uncommon to encounter a workman who will proudly announce that he replaced a defective wheel in a clock with one from a similar movement that was found in the junk box. The clock runs now, but since the new wheel was installed it refuses to deliver an accurate timekeeping rate.

In the illustration above it is evident that even though the movements appeared similar, there was probably a difference in the gear trains. Undoubtedly, the replacement part that was substituted appeared similar, to the original, but actually had a different number of teeth on either the wheel or the pinion.

Skilled craftsmen understand that it is important to measure wheels and count the teeth and pinion leaves. If a clock movement like the one described above is brought to them they can diagnose it quickly and easily if they have the proper references at hand. The tables that follow are designed to assist the service technician in dealing with problems involving wheels, pinions, pendulum lengths and timekeeping rates.

One does not need to get deeply involved in the technical aspects of horological engineering to understand the importance of keeping the correct wheels and pinions in a clock movement. A quick look at the following tables will reveal that a relatively small change in the gear ratios will render a noticeable difference in timekeeping.

Looking at the tables covering Model numbers 141, 151, 241, 351, 451 and 461, the first entry addresses a movement using an 11 cm pendulum. The second entry pertains to one using a 12 cm pendulum. The difference between the wheels in these movements can be found in the number of teeth on the intermediate wheel. The movement with the shorter pendulum requires 86 teeth. The movement with the longer pendulum requires 84 teeth on the intermediate wheel. However, the center wheel will turn at the same rate on both movements.

In the example above there is a 1 cm difference in the pendulums. If the wheel with 86 teeth is replaced by one with only 84 and the shorter pendulum remains in place there will be a noticeable difference in the timekeeping rate.

The following tables can be used to solve problems like those presented above. Using the data stamped on the back plate of the movement and these tables, a skilled craftsman can determine immediately what the proper combination of wheels, pinions and pendulum lengths should be for any Hermle movement.

The use of these tables is illustrated in the following example:

A Movement Model 141-031 arriving with an 11 cm pendulum length should have the following combination of wheels and pinions:

Minute Wheel	88
Intermediate wheel pinion	7
Intermediate wheel teeth	86
Escape wheel pinion	7

The correct pendulum length can be checked against the notation on the back plate of the movement. If the pendulum is of a different length, a correct replacement should be ordered.

11 cm	(Correct Pendulum Length)

200.783	(Beats Per Minute)

If the pendulum is of the correct length, the wheel teeth and pinion leaves should be checked against the tables in this section. If the number of teeth or leaves differs on any wheel or pinion from those shown in the tabular data for a model 141-031 movement, a correct replacement wheel should be ordered to correct the timekeeping problem.

Note that a separate table is provided in this section for Movement Mode 341. This movement is unique in the design of its time train and requires special attention in this regard.

Other Hermle mechanical movements can be grouped into the following categories regarding the layout of the time train:

Group 1	**Group 2**	**Group 3**	**Group 4**
Models 351	Models 141	Models 131	Models 471
351	151	261	1171
461	241	771	
1051	781		
1151	791		
1161			

MODEL 341

Pendulum Length (CM) ---------- Beats Per Minute (BPM)	**Time Train Wheel / Pinion**	**Number of Teeth / Leaves**	**Pendulum Length (CM) ---------- Beats Per Minute (BPM)**	**Time Train Wheel / Pinion**	**Number of Teeth / Leaves**
11 CM	Center wheel	56	25 CM	Center wheel	48
--------	Third wheel pinion	8	--------	Third wheel pinion	10
200.5 BPM	Third wheel	44	132 BPM	Third wheel	40
	Forth wheel pinion	8		Forth wheel pinion	10
	Forth wheel	50		Forth wheel	66
	Escape wheel pinion	8		Escape wheel pinion	8
23 CM	Center wheel	48	31 CM	Center wheel	48
----------	Third wheel pinion	10	----------	Third wheel pinion	10
136 BPM	Third wheel	40	126 BPM	Third wheel	40
	Forth wheel pinion	10		Forth wheel	63
	Forth wheel	68		Escape wheel pinion	8
	Escape wheel pinion	8			

Hermle

Pendulum Length (CM) ---------- Beats Per Minute (BPM)	Time Train Wheel / Pinion	Number of Teeth / Leaves	Pendulum Length (CM) ---------- Beats Per Minute (BPM)	Time Train Wheel / Pinion	Number of Teeth / Leaves
38.5 CM	Center wheel	48	35 CM	Center wheel	48
--------	Third wheel pinion	10	--------	Third wheel pinion	10
108 BPM	Third wheel	40	112.5 BPM	Third wheel	45
	Fourth wheel pinion	10		Fourth wheel pinion	8
	Fourth wheel	54		Fourth wheel	40
	Escape wheel pinion	8		Escape wheel pinion	8
33.5 CM	Center Wheel	48	45 CM	Center Wheel	50
----------	Third wheel pinion	10	----------	Third wheel pinion	10
117.5 BPM	Third wheel	47	101.851 BPM	Third wheel	44
	Fourth wheel pinion	8		Fourth wheel pinion	9
	Fourth wheel	40		Fourth wheel	40
	Escape wheel pinion	8		Escape wheel pinion	8

MODELS

141, 151, 241, 351, 451, 461, 781, 791, 1051, 1151, 1161

Pendulum Length (CM) ---------- Beats Per Minute (BPM)	Time Train Wheel / Pinion	Number of Teeth / Leaves	Pendulum Length (CM) ---------- Beats Per Minute (BPM)	Time Train Wheel / Pinion	Number of Teeth / Leaves
11 CM	Center wheel	88	23 CM	Center wheel	80
--------	Intermediate wheel pinion	7	--------	Intermediate wheel pinion	7
200.783 BPM	Intermediate wheel	86	137.428 BPM	Intermediate wheel	74
	Escape wheel pinion	7		Escape wheel pinion	8
12 CM	Center wheel	88	25 CM	Center wheel	88
--------	Intermediate wheel pinion	7	--------	Intermediate wheel pinion	8
196.114 BPM	Intermediate wheel	84	132.275 BPM	Intermediate wheel	74
	Escape wheel pinion	7		Escape wheel pinion	8
15 CM	Center wheel	80	26.5 CM	Center wheel	88
--------	Intermediate wheel pinion	7	--------	Intermediate wheel pinion	8
178.285 BPM	Intermediate wheel	84	128.700 BPM	Intermediate wheel	70
	Escape wheel pinion	7		Escape wheel pinion	8
16.5 CM	Center wheel	86	27 CM	Center wheel	80
--------	Intermediate wheel pinion	8	--------	Intermediate wheel pinion	7
167.700 BPM	Intermediate wheel	84	133.714 BPM	Intermediate wheel	72
	Escape wheel pinion	7		Escape wheel pinion	8
21 CM	Center wheel	84	29 CM	Center wheel	78
--------	Intermediate wheel pinion	8	--------	Intermediate wheel pinion	7
148.200 BPM	Intermediate wheel	76	130.371 BPM	Intermediate wheel	72
	Escape wheel pinion	7		Escape wheel pinion	8

Hermle

Pendulum Length (CM) / Beats Per Minute (BPM)	Time Train Wheel / Pinion	Number of Teeth / Leaves
31 CM -------- 125.775 BPM	Center wheel Intermediate wheel pinion Intermediate wheel Escape wheel pinion	86 8 72 8
32 CM -------- 122.850 BPM	Center wheel Intermediate wheel pinion Intermediate wheel Escape wheel pinion	84 8 72 8
34 CM -------- 114.075 BPM	Center wheel Intermediate wheel pinion Intermediate wheel Escape wheel pinion	78 8 72 8
38 CM -------- 111.150 BPM	Center wheel Intermediate wheel pinion Intermediate wheel Escape wheel pinion	76 8 72 8
43 CM -------- 104.568 BPM	Center wheel Intermediate wheel pinion Intermediate wheel Escape wheel pinion	78 8 66 8
45 CM -------- 101.887 BPM	Center wheel Intermediate wheel pinion Intermediate wheel Escape wheel pinion	76 8 66 8
48 CM -------- 96.525 BPM	Center wheel Intermediate wheel pinion Intermediate wheel Escape wheel pinion	72 8 66 8
52 CM -------- 92.625 BPM	Center wheel Intermediate wheel pinion Intermediate wheel Escape wheel pinion	76 8 60 8

Pendulum Length (CM) / Beats Per Minute (BPM)	Time Train Wheel / Pinion	Number of Teeth / Leaves
55 CM -------- 88.183 BPM	Center wheel Intermediate wheel pinion Intermediate wheel Escape wheel pinion	74 9 66 8
66 CM -------- 80.166 BPM	Center wheel Intermediate wheel pinion Intermediate wheel Escape wheel pinion	74 9 60 8
75 CM -------- 75.833 BPM	Center wheel Intermediate wheel pinion Intermediate wheel Escape wheel pinion	70 9 60 8
85 CM -------- 70.777 BPM	Center wheel Intermediate wheel pinion Intermediate wheel Escape wheel pinion	70 9 56 8
94 CM -------- 66.0 BPM	Center wheel Intermediate wheel pinion Intermediate wheel Escape wheel pinion	80 13 66 8
100 CM -------- 64 BPM	Center wheel Intermediate wheel pinion Intermediate wheel Escape wheel pinion	80 13 64 8
114 CM -------- 60.00 BPM	Center wheel Intermediate wheel pinion Intermediate wheel Escape wheel pinion	80 13 60 8

Hermle

MODELS

131, 261, 771

Length (CM) ---------- Beats Per Minute (BPM)	Time Train Wheel / Pinion	Number of Teeth / Leaves
23 CM	Center wheel	48
--------	Third wheel pinion	10
136 BPM	Third wheel	40
	Fourth wheel pinion	10
	Fourth wheel	68
	Escape wheel pinion	8
25 CM	Center wheel	48
--------	Third wheel pinion	10
132 BPM	Third wheel	40
	Fourth wheel pinion	10
	Fourth wheel	66
	Escape wheel pinion	8

Length (CM) ---------- Beats Per Minute (BPM)	Time Train Wheel / Pinion	Number of Teeth / Leaves
31 CM	Center wheel	48
--------	Third wheel pinion	10
126 BPM	Third wheel	40
	Fourth wheel	63
	Escape wheel pinion	8

MOVEMENTS

471, 1171

Length (CM) Beats Per Minute (BPM)	Time Train Wheel / Pinion	Number of Teeth / Leaves
94 CM	Center wheel (large wheel I)	80
--------	Center wheel (small wheel II)	46
66 BPM	Intermediate wheel	75
	Intermediate wheel pinion	10
	Escape wheel (large wheel I)	30
	Escape wheel (small wheel II)	50
	Second hand wheel	55
	Second hand pinion	10
100 CM	Center wheel (large wheel I)	80
-------	Center wheel (small wheel II)	46
64 BPM	Intermediate wheel	75
	Intermediate wheel pinion	10
	Escape wheel (large wheel I)	30
	Escape wheel (small wheel II)	45
	Second hand wheel	48
	Second hand pinion	10
114 CM	Center wheel (large wheel I)	80
--------	Center wheel (small wheel II)	46
60 BPM	Intermediate wheel	75
	Intermediate wheel pinion	10
	Escape wheel (large wheel I)	30
	Escape wheel (small wheel II)	50
	Second hand wheel	50
	Second hand pinion	10

Hermle

PART C

Mainspring Technical Data

Information was presented in Chapter II on how to remove and install mainsprings. This section is designed to provide technical information about Hermle mainsprings. It can be used in conjunction with catalogs distributed by supply houses to obtain mainsprings needed for repair or restoration work being accomplished on Hermle movements.

Mainsprings can be measured in several different ways. The preferred method of determining the thickness is by measuring the end of the spring with a standard micrometer. Take several measurements along the spring to confirm the reading and to insure that the end has not been thinned. The width can be measured with a caliper or an appropriate engineer's scale. The mainspring can be stretched out to obtain the length measurement, however, a more practical method is to use a flexible tape measure and leave the spring in its coiled condition.

Most books on horological theory provide formulas for determining the correct length of a mainspring based on measurements obtained from the barrel. It is rarely necessary to use these formulas when replacing the mainsprings in Hermle movements as they are well documented and the correct replacement parts can be ordered based on the model number or spring barrel number. The tables in Part C are particularly helpful in making these determinations.

Section 1

The Hermle Mainspring System

Those engaged in service and repair work will find it convenient and economical to order complete spring barrel assemblies from their suppliers. The amount of time and labor saved more than outweighs the cost of the replacement parts.

For those engaged in restoration work, it is helpful to be able to order the components of the spring barrel assembly that are needed to complete the job at hand. Hermle mainsprings lend themselves to being easily removed with a mainspring winder and replacement springs are readily available.

Hermle manufactures several spring barrel assemblies for its mechanical movements. The number of the unit is stamped on the barrel cover and is plainly visible. If there is no evidence that an improper spring barrel has been substituted, a replacement barrel can be ordered using the old or worn unit as a guide.

Because of the tremendous amount of force the bearings of the spring barrel must endure, wear is inevitable. Failure to keep the bearing surfaces in these assemblies clean and lubricated has been a major contributor to premature wear. Recent improvements have been made in the ma-

terials used in spring barrels which will improve their durability. However, continued attention needs to be given to keeping the bearing surfaces clean and well lubricated.

If a movement arrives with a missing spring barrel it is not difficult to determine which unit to order. The spring barrels required for each movement are identified on the spare parts list. The mainspring table in this manual also identifies the correct barrel for each movement and is very helpful for confirming that a correct replacement barrel has been installed by another clockmaker.

By their nature, mainsprings compress and become set. Some antique mainsprings have lasted two or three lifetimes. Other springs that were not manufactured under exactly the same conditions lasted only a short amount of time and had to be replaced shortly after they were installed. The same is true today, and the clockmaker should not be surprised if a mainspring needs replacement because it has become set. Hermle has minimized this problem with new alloy mainsprings but some of the older ones may still need attention on an occasional basis. The table in this manual showing which mainsprings are used in each spring barrel is very useful for ordering replacement mainsprings.

Section 2

Reference Table for Mainspring Sizes

BARREL NUMBER	MAINSPRING DIMENSIONS (MM)
10	17 x .45 x 1490
11	17 x .42 x 1500
20 & 56	17 x .38 x 1200
21 & 50	17 x .40 x 1200
31	12 x .34 x 1150
32	12 x .42 x 1100
33	12 x .32 x 1150
40	17 x .38 x 1100
41	21 x .40 x 1550
42	17 x .40 x 1100
54	21 x .42 x 1900
55	21 x .45 x 1800

Hermle

Section 3

Table of Hermle Mainspring Applications

BARREL	MOVEMENT MODEL NUMBERS THIS BARREL IS USED IN:		
	TIME TRAIN	STRIKE TRAIN	CHIME TRAIN
10	140	140 141	
11	141 781 791		
20			
21	150 151		
30			
31		130 132	
32	130 131 771		
33	132	131	
40	340 341		
41			340 341
42			
50		350 351 1050 1051 -020 -050 -060	
52	350 351 1050 1050 -020 -050 -030 -060		
54			350 351 -020 -030 -060
55			1051 030A 1050 1051 -020 -050 351-050
56		351-030 1051-030	
57			

Hermle

CHAPTER VII

SPECIALIZED WORK
ON
HERMLE MOVEMENTS

Hermle

PART A

Bushing Hermle Movements

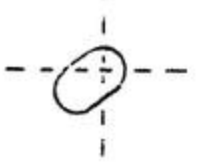
Bushing is a topic that is often misunderstood. There is a difference between good and poor bushing work. The competent service technician must make every effort to understand what good bushing practices consist of and properly equip himself to do this type of work. If this is not feasible, he should select a clockmaker who is skilled in this type of work to do it for him.

To be considered as a proper bushing job, the center of the newly bushed pivot hole must lie at the exact position the original did. Even though the clock movement may tolerate an error in centering, the life of the bushing and the long term performance of the clock may be adversely affected by a poor centering job.

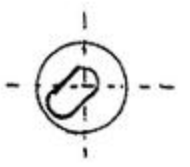
The question often arises whether or not it is worthwhile to install bushings in a movement that can be replaced. When presented with the costs and options many customers elect to have their original movement restored. On the other hand, many people will see the practicality in exchanging the movement for a new one as the clock can usually be put in good running order with a respectable guarantee for a lower cost.

The skilled craftsman will either elect to make his own bushings or buy them from a reputable supplier. He will also buy a set of cutters that are properly matched to the bushings. The cutters will make a hole slightly smaller than the bushing so it will be held in place with a tight friction fit.

Locating the original center of the pivot hole is not difficult. The direction of the wear is usually determined by studying the direction in which the train wheels rotate. Once the outline of the original pivot hole has been determined the center can be marked. This can be done on the inside of the plate where it will not show. Place a small cross designating the location of the original center across the worn pivot hole. Using the center of the cross as a reference, the hole to receive the bushing can be placed at exactly the right location.

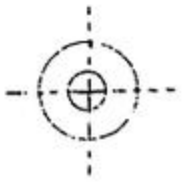


The bushing cutter should be mounted initially in a special handle designed to hold it securely in place. The cutters are designed so metal can be removed from the pivot hole on one side at a time. Rotate the cutter by hand until the unworn portion of the hole has been increased to the point that its diameter includes the area that was affected by wear.



The hole should now be round and well centered on the cross that marks the center of the original pivot hole. Once the center has been reestablished the cutter can be mounted in a bushing machine or a drill press. The cutter will remove an equal amount of material from the edges of the hole and maintain the center that was established by hand. This method is especially useful when dealing with thick plates such as those found in larger floor clock movements.

When it has been confirmed that the hole for the bushing is correctly centered on the cross, the bushing can be installed in the plate. It can be pressed in with a bushing machine or pounded in with a flat faced punch. The bushing should be flush with the inside surface of the plate.



If the bushing rests above the surface of the outside face of the plate it can be trimmed down with a round cutter designed for forming oil sinks. The new bushing should be finished so it matches the appearance of the other oil sinks. A well polished oil sink will retain the oil, whereas one with a rough surface is likely to allow the oil to creep out onto the plate.

Hermle

PART B

Repivoting Hermle Movements

Quite often movements will be encountered that have excessive wear in the pivot holes. This is usually most noticeable in the pivot holes supporting the second wheel. A movement in this condition will obviously require bushing before it can be expected to sustain itself and deliver reliable timekeeping service.

If the plates were worn by pivots with rough surfaces there is no sense in simply bushing the clock and putting it back in operation. The rough surfaces on the pivots will continue to erode the new bushings and the clock will refuse to sustain itself after a relatively short period of time.

Two options exist for the service technician at this point. The wheels with the rough pivot surfaces can be replaced or repivoted. Of these two options, replacement is recommended for two reasons.

1. Repivoting is a time consuming and expensive task, even when it is done on a regular basis in a well equipped shop.
2. Perhaps of greater importance, recent improvements have been made in the manufacturing of wheel arbors. Better material and improved production processes make replacing the wheel the most sensible option.

For those who have found that repivoting may be economically feasible the procedure is outlined below:

A length of hardened steel slightly larger than the original pivot should be selected and faced. Select a drill that is just slightly smaller than the rod so a friction fit can be accomplished.

The first step in this process is to remove the defective pivot entirely. This can be done on a watchmaker's lathe or on a microlathe. Once the pivot has been removed, the arbor should be faced. With this accomplished, strike a center with a graver or with a center drill. Insure that the indentation is formed exactly in the center of the arbor.

With the center established, drill a hole with a depth that measures about three times the diameter of the original pivot. The soft metal in the arbor usually offers little resistance and this depth can be achieved quite easily.

Measure the depth of the hole that has just been prepared in the wheel arbor. Mark that portion of the hard steel rod that will be inserted in the hole with a scriber to designate where it will meet the bottom of the hole. Add the length of the pivot to the is figure. Allow about half a millimeter of extra material so a rounded and finished end can be placed on the new pivot.

Reduce the diameter of the end of new plug just to the point where it enters the hole in the arbor with a respectable friction fit. The end of the new pivot plug should go about three quarters the depth of the hole in the arbor before friction prevents it from going farther. If the replacement pivot plug fits too tightly, the portion that will be inserted in the hole should be reduced on the lathe. When the trial fitting has been accomplished successfully, drive or press the plug in place.

Finish the end of the plug and reduce the new pivot to its proper diameter. Polish the surfaces on the new pivot to a mirror finish. Round the end of the new pivot with a stone and polish it to a mirror finish. Spin the wheel between a set of cone centers in a lathe or in a depthing tool to insure the new pivot is true and properly centered.

With the repivoting accomplished, the pivot hole can be bushed. As a final check, insert the new wheel in its pivot hole and secure the plates together. The wheel should spin freely and there should be no evidence of run out in the new pivot.

Hermle

CHAPTER VIII

HERMLE MOVEMENT MODELS; THEIR IDENTIFICATION AND CHARACTERISTICS

Hermle

PART A

Quick Reference Tables

The tables in this section are designed to provide the service technician with a concise reference addressing the features on each Hermle movement. These tables have been divided into two parts:

The first table covers wall, bracket and mantle clocks

The second table covers floor clock movements

Section 1

Quick Reference Table

WALL, BRACKET AND MANTLE CLOCKS

	Time Only, Striking, Westminster, or Triple Chime	Spring Driven or Weight Driven	Balance or Pendulum	Plate Width mm
130	Striking	Spring	Balance	90 mm
131	Striking	Spring	Pendulum	90 mm
132-071	Ships Bell	Spring	Platform	90 mm
140/150	Striking	Spring	Balance	85 x 98 mm
141/151	Striking	Spring	Pendulum	85 x 98 mm
141-031	Striking	Spring	Pendulum	85 x 98 mm
141-051	Striking	Spring	Pendulum	85 x 98 mm
241	Striking	Weight Chain	Pendulum	85 x 98 mm
241-840	Striking	Weight Cable	Pendulum	85 x 98 mm
261-030	Striking	Weight Chain	Pendulum	87 x 87 mm
341-020	Westminster	Spring	Pendulum	100 mm x 100 mm
340-020	Westminster	Spring	Balance	100 mm x 100 mm
350-020	Westminster	Spring	Balance	120 mm x 120 mm
350-060	Westminster	Spring	Balance	120 mm x 120 mm
351-020	Westminster	Spring	Pendulum	120 mm x 120 mm
351-030	Westminster	Spring	Pendulum	120 mm x 120 mm
351-051	Westminster	Spring	Pendulum	120 mm x 120 mm
351-850	Westminster	Weight/Spring	Pendulum	120 mm x 120 mm
771	Time Only	Spring	Pendulum	58.5 x 75.5 mm
781-800	Time Only	Weight Cable	Pendulum	78 x 117 mm
791-680	Time Only	Spring	Pendulum	60 x 181mm
987	Time Only	Quartz	None	
1050-020	Triple Chime	Spring	Balance	120 x 120 mm
1051-030	Triple Chime	Spring	Pendulum	120 x 120 mm
1051-830	Triple Chime	Weight/Spring	Pendulum	120 x 120 mm
1051-850	Triple Chime	Weight/Spring	Pendulum	120 x 120 mm

Hermle

Section 2

Quick Reference Table

FLOOR CLOCKS

	Westminster Chime Only	Triple Chime	Number of Hammers and Location	Chain or Cable	Plate Width mm
451-030	X		5 Side	Chain	120
451-050	X		8 Rear	Chain	120
461-050	X		8 Rear	Chain	200
461-853 S	X		8 Rear	Cable	200
471-050	X		8 Rear	Chain	220
471-850	X		8 Rear	Cable	220
1151-030		X	8 Side	Chain	120
1151-050		X	12 Rear	Chain	120
1161-050		X	12 Rear	Chain	200
1161-853		X	12 Rear	Cable	200
1171-050		X	12 Rear	Chain	220
1171-850		X	12 Rear	Cable	220
1171-890		X	9 Rear (Tubular)	Cable	220

Hermle

PART B

Hermle Mechanical Movement Models

This section provides a general description of each Hermle movement. It can be used as a means of identifying the movement. This section is also the starting point for obtaining other information about servicing the movement and obtaining parts for it.

Exploded diagrams of each movement are published in the Hermle Spare Parts List. These diagrams are especially helpful when it is necessary to identify the names and numbers of Hermle parts.

Directions on how to locate the lubrication instructions for each movement are presented in section 2. These notations appear under each movement photograph. The notations direct the reader to a specific lubrication table in Chapter IV.

The movements in this section are categorized by their common characteristics rather than in numerical sequence. The table in section 2 can be used to locate each movement based on whether it is weight / spring driven, if it has a balance or if it has a pendulum.

Although they are not pure mechanical movements, those using a quartz motor to drive a gear train have been included in section 2. Other quartz and electronic movements are addressed in Part C of this manual.

Section 1

Identifying Hermle Movement Models

It is not uncommon to encounter Hermle movements that have another company name stamped on them. This is entirely proper, and they were prepared in this manner by the Hermle factory at the customer's request. They are not forgeries and the service technician can proceed to repair or restore them with full confidence that Hermle replacement parts will fit and perform correctly.

To obtain the maximum benefit from section 2 the service technician should use the manual in conjunction with the Hermle Spare Parts List. To use these documents together it is best to proceed in the following sequence:

1. The model number can be tentatively identified by comparing it to the photograph and the description provided in the paragraph addressing each movement in section 2.
2. If there is no model number on the movement, the quick reference tables in part A can be used to match the major characteristics so the tentative identification can be confirmed.
3. Once a positive identification of the movement has been accomplished the appropriate page can be located in the Hermle Spare Parts List. The movements are arranged by model number.
4. Proceed to service, order spare parts or lubricate the movement using the exploded diagram in the Spare Parts List in conjunction with this publication.

Hermle

Section 2

Hermle Mechanical Movement Descriptions and Specifications

A. Spring driven movements with one train

Model 771

B. Weight driven movements with one train

Model 781

C. Spring driven movements with two trains

1. Movements with pendulums
   Model 131
   Model 141*/151

2. Movements with balance units
   Model 130
   Model 132
   Models 140* / 150
   *Fourteen day movements

D. Weight driven movements with two trains

Model 241
Model 261

E. Spring driven movements with three trains

1. Movements with pendulums
   Model 351
   Model 1051

2. Movements with balance units
   Model 340
   Model 350
   Model 1050

F. Weight driven movements with three trains

Model 451
Model 461
Model 471
Model 1151
Model 1161
Model 1171

G. Movements with a combination of weights and springs

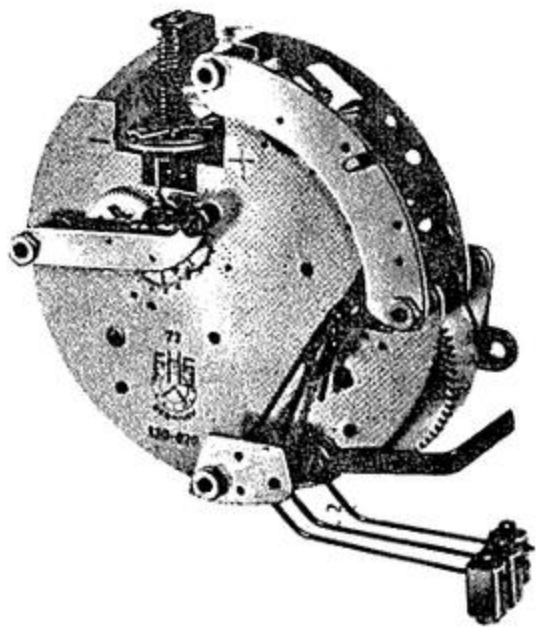
Model 351-850
Model 1051-830

H. Mechanical movements driven by quartz motors

Model 987 (Without Rotary Pendulum)
Model 987 (With Rotary Pendulum)
Model 987M (Without Rotary Pendulum)

Hermle

130



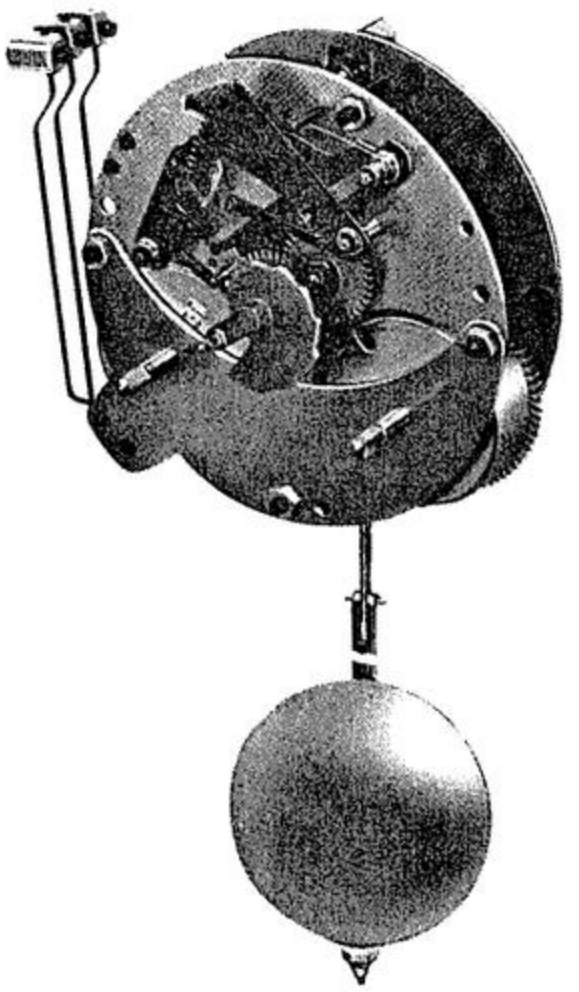
Spare parts list movement no. 130

Model 130 is an eight day movement with the capability of striking the half hour. It can be fitted with several different striking arrangements. Several striking options are available on this movement. This model uses a balance unit.

Dimensions: 90 mm in diameter with an internal distance between the plates of 21.1 mm / 10.6 mm.

Model 130 should be lubricated as outlined in Chapter 4, Part B, Section 2. Use the instructions for a balance wheel movement.

131



Spare parts list movement no. 131-030

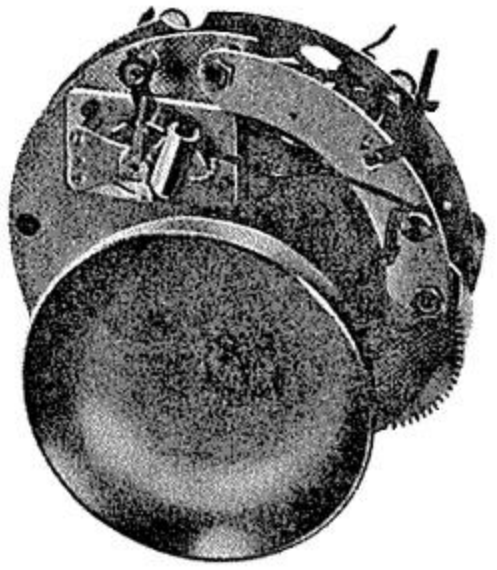
Model 131 is an eight day pendulum movement with the capability of striking the half hour. Several striking options are available on this movement.

Dimensions: The movement is 90 mm in diameter with an internal distance between the plates of 20 mm.

Model 131 should be lubricated as outlined in Chapter 4, Part B, Section 3.a. Use the instructions which cover pendulum movements.

Hermle

132-071



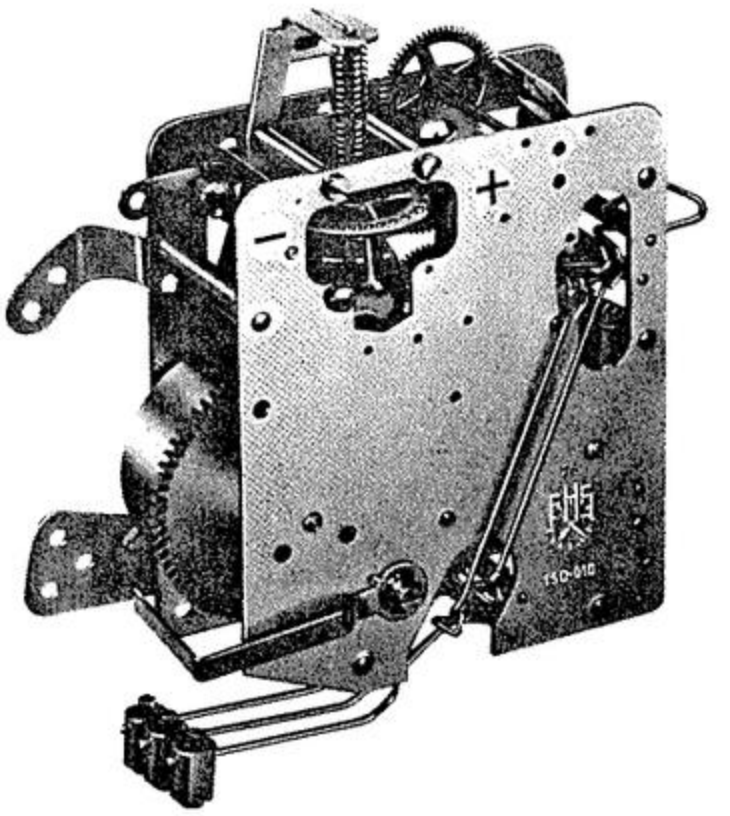
Spare parts list movement no. 132-071

Model 132-071 is an eight day ships bell striking movement with the capability of striking the half hour. The movement is fitted with a platform escapement.

Note: If the service technician is not qualified to work on this type of escapement, seek the help of a watchmaker.

Model 132-071 should be lubricated as outlined in Chapter 4, Part B, Section 3-b. Use the instructions for balance wheel movements.

140 / 150



Spare parts list movement no. 140

Model 140 is a fourteen day movement with a half hour striking capability. This movement is equipped with a balance unit. Several striking options are available on this movement.

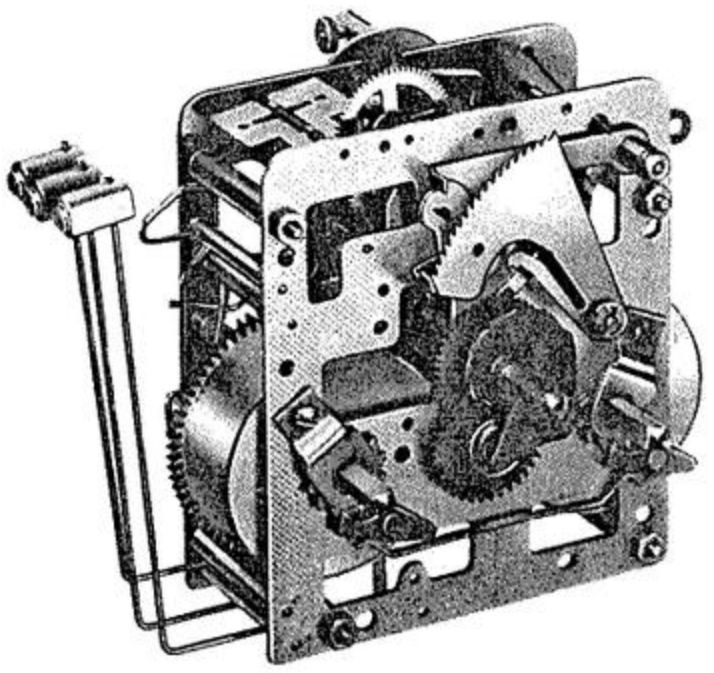
Model 150 is an eight day mechanical movement with a half hour striking capability. It is also equipped with a balance unit. Several striking options are available on this movement.

Dimensions: 85 x 98 mm with a 32 mm distance between the places.

Model 140 / 150 should be lubricated as outlined in Chapter 4, Part B, Section 3-b. Use the instructions for balance wheel movements.

Hermle

141-031



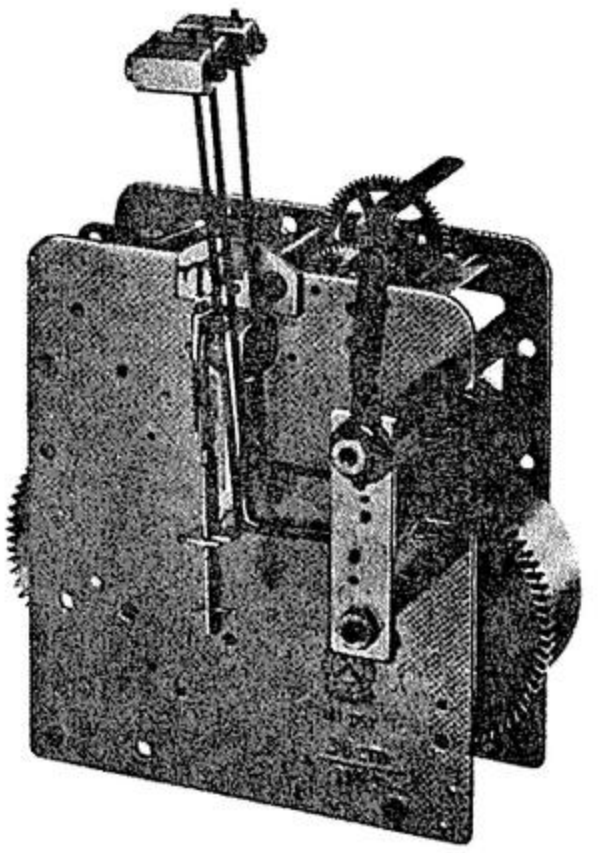
Spare parts list movement no. 141-031

Model 141-031 is a fourteen day movement with a half hour strike. The hammers on this movement are mounted facing the side. It is fitted with a pendulum.

Dimensions: 85 x 98 mm with a 32 mm distance between the plates.

Model 141-031 should be lubricated as outlined in Chapter 4, Part B, Section 3-a. Use the instructions covering pendulum movements.

141-051



Spare parts list movement no. 141-051

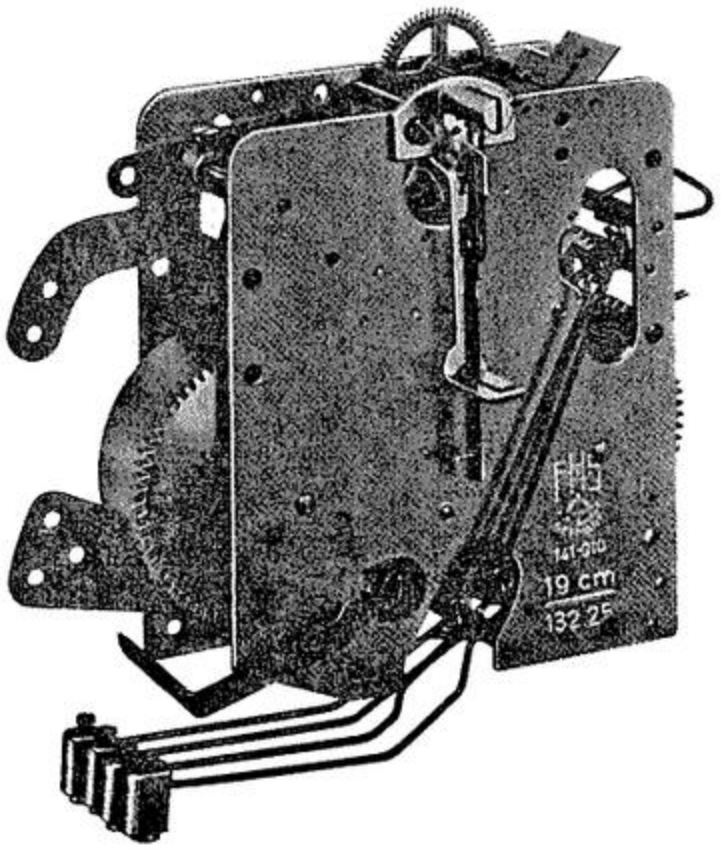
Model 141-051 is a fourteen day mechanical movement with a half hour strike. The hammers are mounted behind the movement.

Dimensions: 85 x 98 mm with a distance between the plates of 32 mm.

Model 141-051 should be lubricated as outlined in Chapter 4, Part B, Section 3-a. Use the instructions covering pendulum movements.

Hermle

141 / 151



Spare parts list movement no. 141

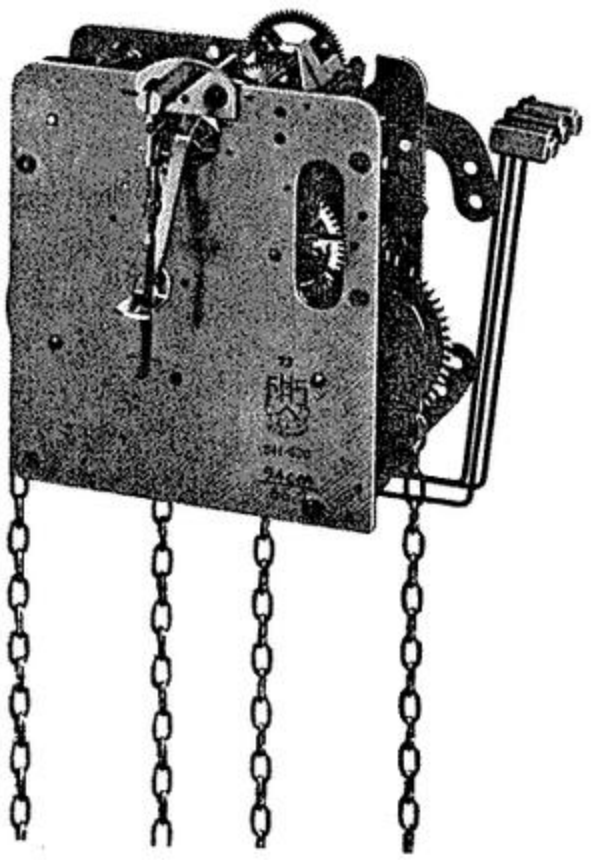
Model 141 is a fourteen day movement with a half hour strike. This movement is equipped with a pendulum. Several striking systems are available for this movement.

Model 151 is an eight day movement with a half hour strike. This movement is equipped with a pendulum. Several striking systems are available for this movement.

Dimensions: 85 x 98 mm with a 32 mm distance between the plates.

Models 141 / 151 should be lubricated as outlined in Chapter 4, Part B, Section 3-a. Use the instructions covering pendulum movements.

241



Spare parts list movement no. 241-030

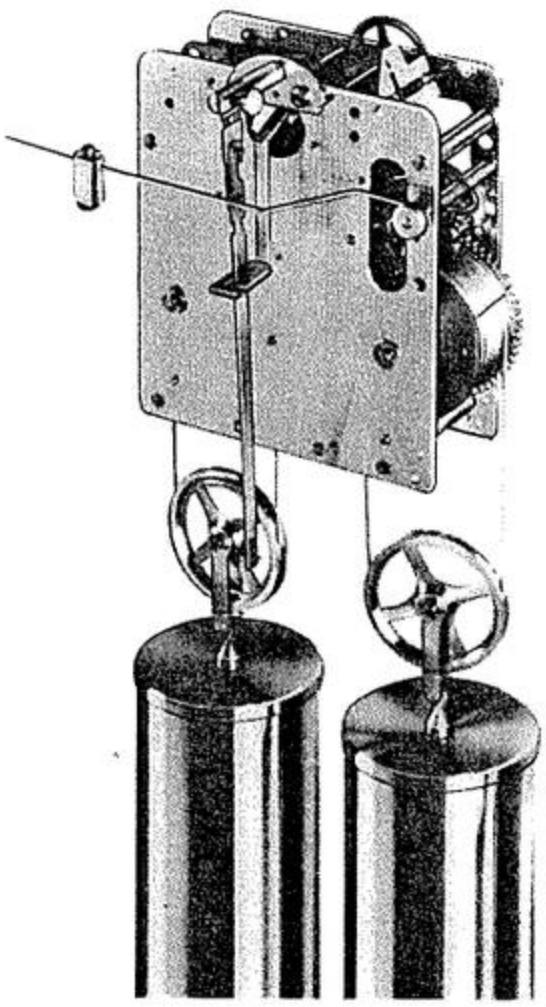
Model 241 is an eight day weight driven movement. This movement is fitted with a pendulum. Several striking options are available on this movement.

Dimensions: 85 x 98 mm with a distance of 32 mm between the plates.

Model 241 should be lubricated as outlined in Chapter 4, Part B, Section 4.

Hermle

241-840



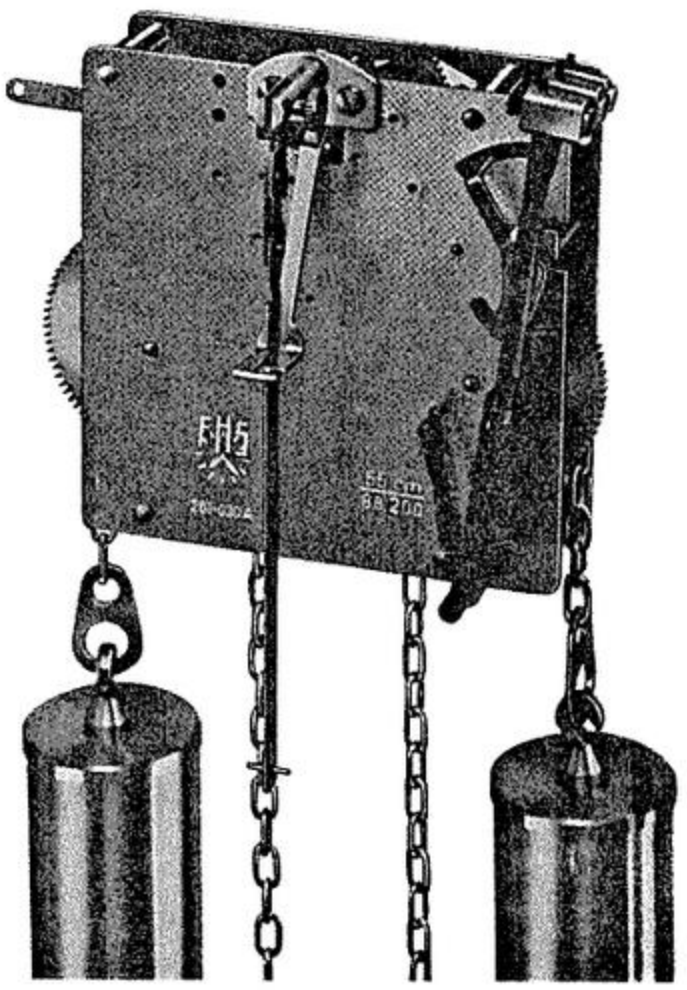
Spare parts list movement no. 241-840

Model 241-840 is an eight day cable driven movement with a half hour strike. The movement is fitted with a pendulum. The hammer is mounted on the rear of this movement.

Dimensions: 85 x 98 mm with a distance of 32 mm between the plates.

Model 241-840 should be lubricated as outlined in Chapter 4, Part B, Section 4.

261-030



Spare parts list movement no. 261-030

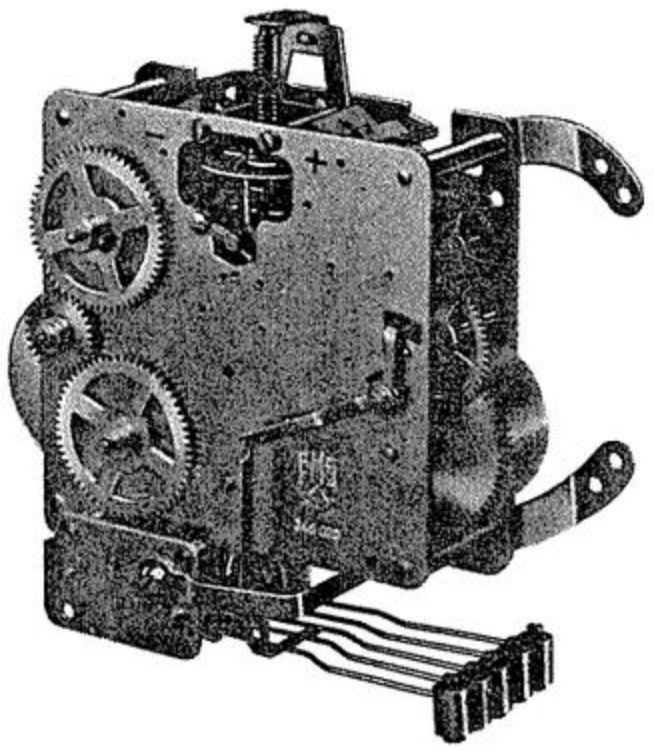
Model 261-030 is an eight day weight driven movement. It is fitted with a pendulum. Several striking options are available on this movement.

Dimensions: 87 x 87 mm with a distance of 20 mm between the plates.

Model 261-030 should be lubricated as outlined in Chapter 4, Part B, Section 4.

Hermle

340-020



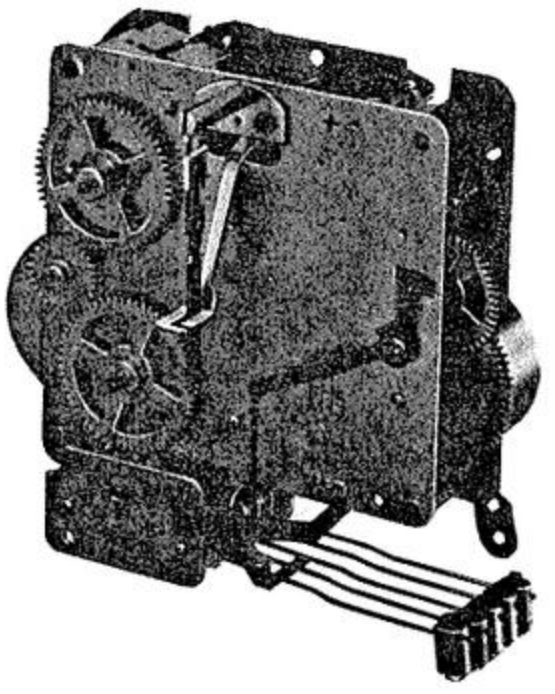
Spare parts list movement no. 340-020

Model 340-020 is an eight day Westminster spring driven chime movement. It is fitted with a balance escapement system. The hammers are mounted on the bottom of this movement.

Dimensions: 100 x 100 mm with a distance between the plates of 32 mm.

Model 340-020 should be lubricated as outlined in Chapter 4, Part B, Section 5-b. Use the instructions for balance wheel movements.

341-020



Spare parts list movement no. 341-020

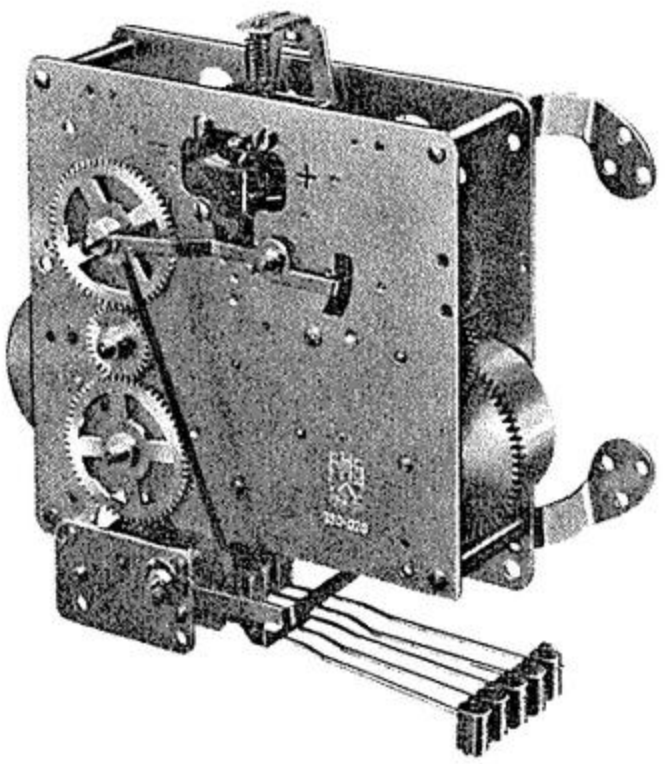
Model 341-020 is an eight day 4/4 Westminster chime movement. It is fitted with a pendulum. The hammers are mounted on the bottom of the movement.

Dimensions: 100 x 100 mm with a distance between the plates of 32 mm.

Model 341-020 should be lubricated as outlined in Chapter 4, Part B, Section 5-a. Use the instructions for a pendulum movement.

Hermle

350-020



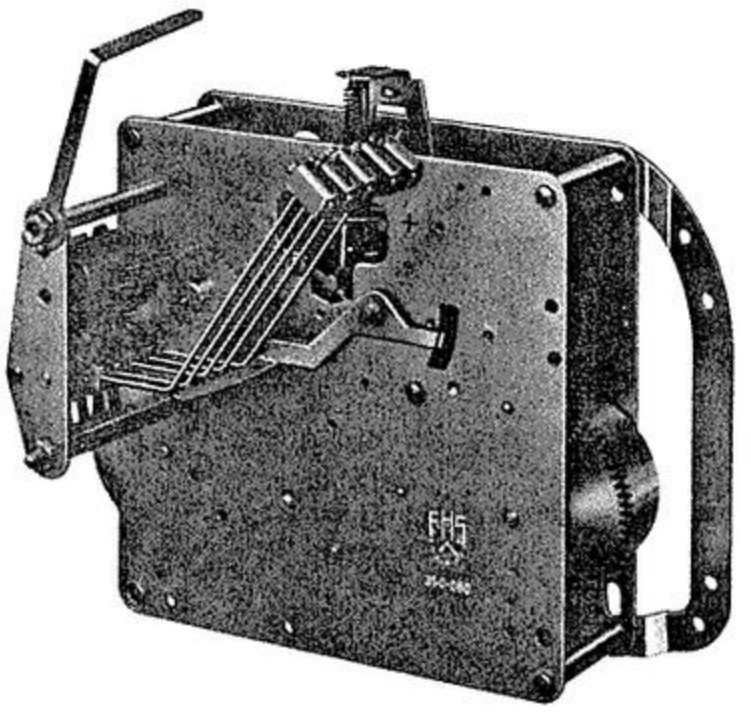
Spare parts list movement no. 350-020

Model 350-020 is an eight day Westminster chime movement. It is spring driven and is equipped with a balance unit. The hammers are mounted on the bottom of this movement.

Dimensions: 120 x 120 mm with an internal distance of 32 mm between the plates.

Model 350-020 should be lubricated as outlined in Chapter 4, Part B, Section 5-b. Use the instructions for a balance wheel movement.

350-060



Spare parts list movement no. 350-060

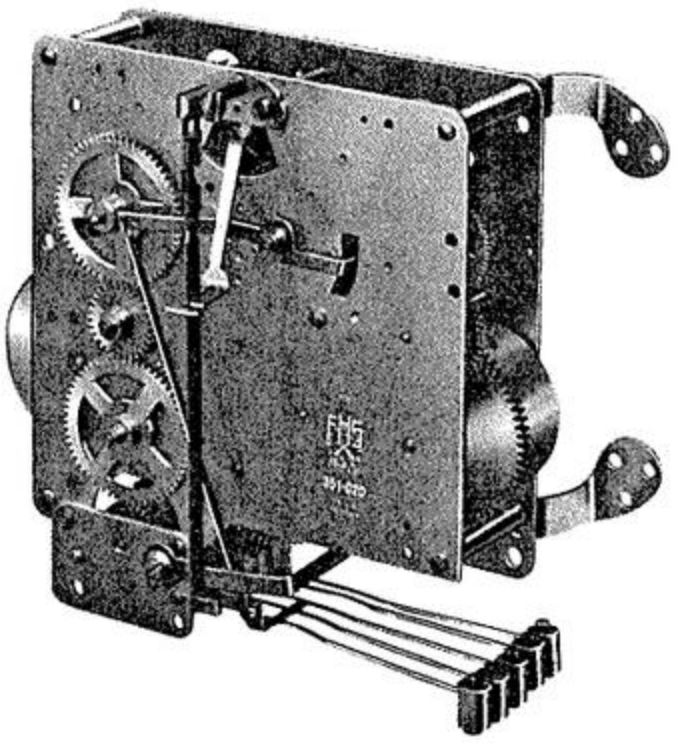
Model 350-060 is an eight day movement with a 4/4 Westminster chime. The movement is equipped with a balance unit. The hammers are mounted at an oblique angle to the plates on the rear of the movement.

Dimensions: 120 x 120 mm with 32 mm between the plates.

Model 350-060 should be lubricated as outlined in Chapter 4, Part B, Section 5-b. Use the instructions for a balance wheel movement.

Hermle

351-020



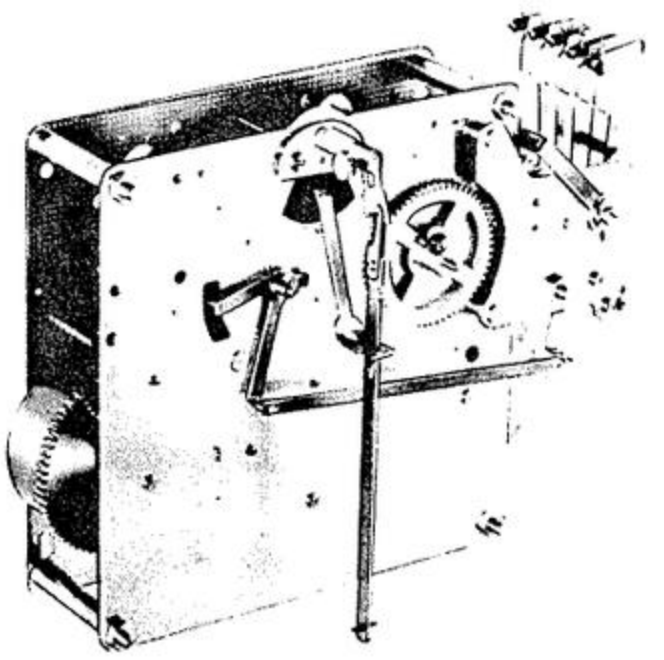
Spare parts list movement no. 351-020

Model 351-020 is an eight day movement with a 4/4 Westminster chime. The movement is fitted with a pendulum. The hammers are mounted on the bottom of this movement.

Dimensions: 120 x 120 mm with an internal distance between the plates of 32 mm.

Model 351-020 should be lubricated as outlined in Chapter 4, Part B, Section 5-a. Use the instructions for a pendulum movement.

351-030



Spare parts list movement no. 351-030

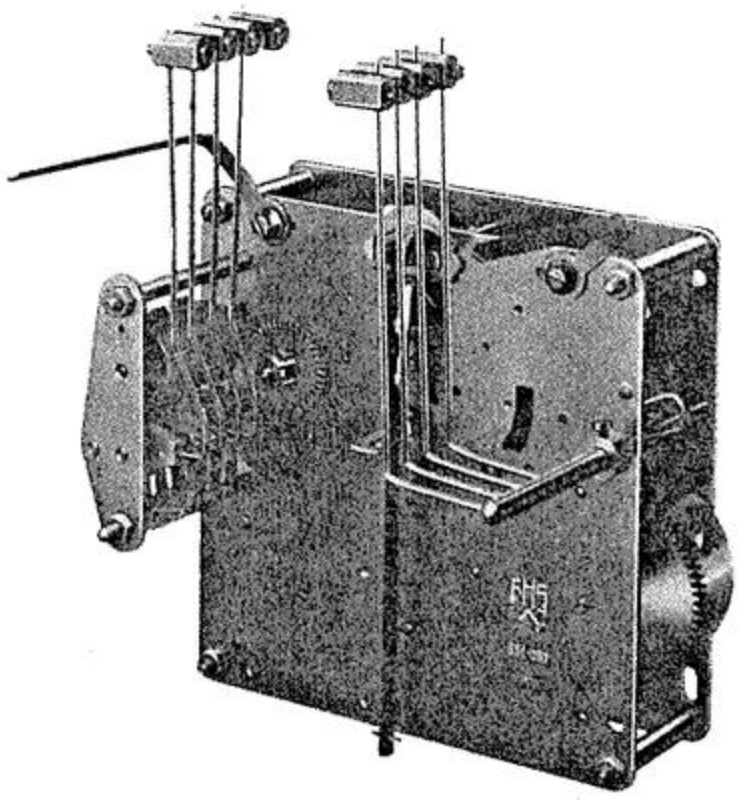
Model 351-030 is an eight day movement with a 4/4 Westminster chime. The movement is fitted with a pendulum. This model has five side mounted hammers.

Dimensions: 120 x 120 mm with a distance between the plates of 32 mm.

Model 351-030 should be lubricated as outlined in Chapter 4, Part B, Section 5-a. Use the instructions for a pendulum movement.

Hermle

351-051



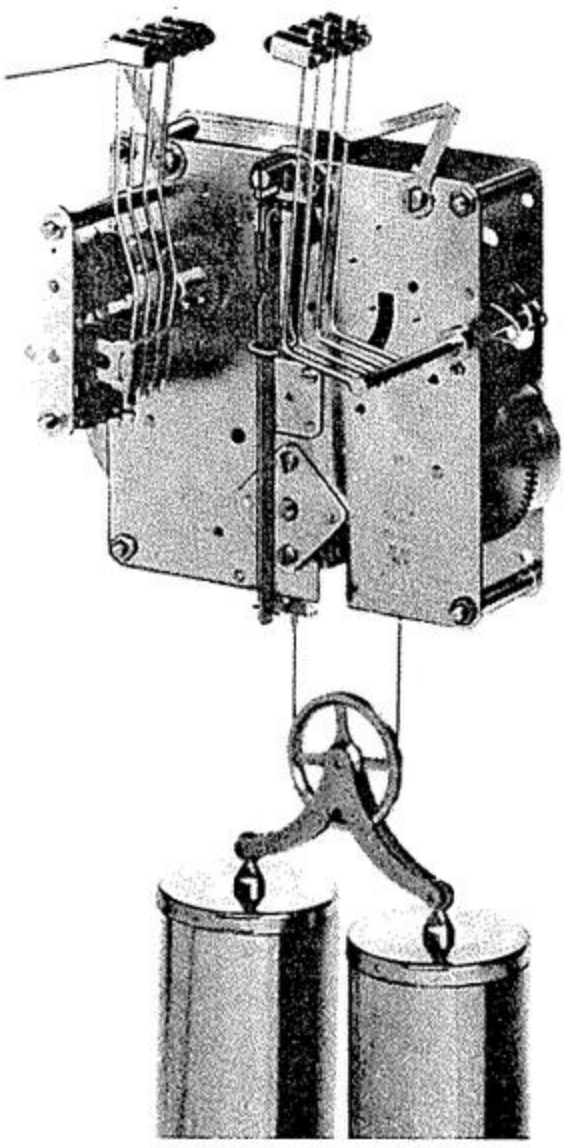
Spare parts list movement no. 351-051

Model 351-051 is an eight day movement with a 4/4 Westminster chime. Eight hammers are mounted behind the movement. This model is fitted with a pendulum.

Dimensions: 120 x 120 mm with a distance between the plates of 32 mm.

Model 351-051 should be lubricated as outlined in Chapter 4, Part B, Section 5a. Use instructions for a pendulum movement.

351-850



Spare parts list movement no. 351-850

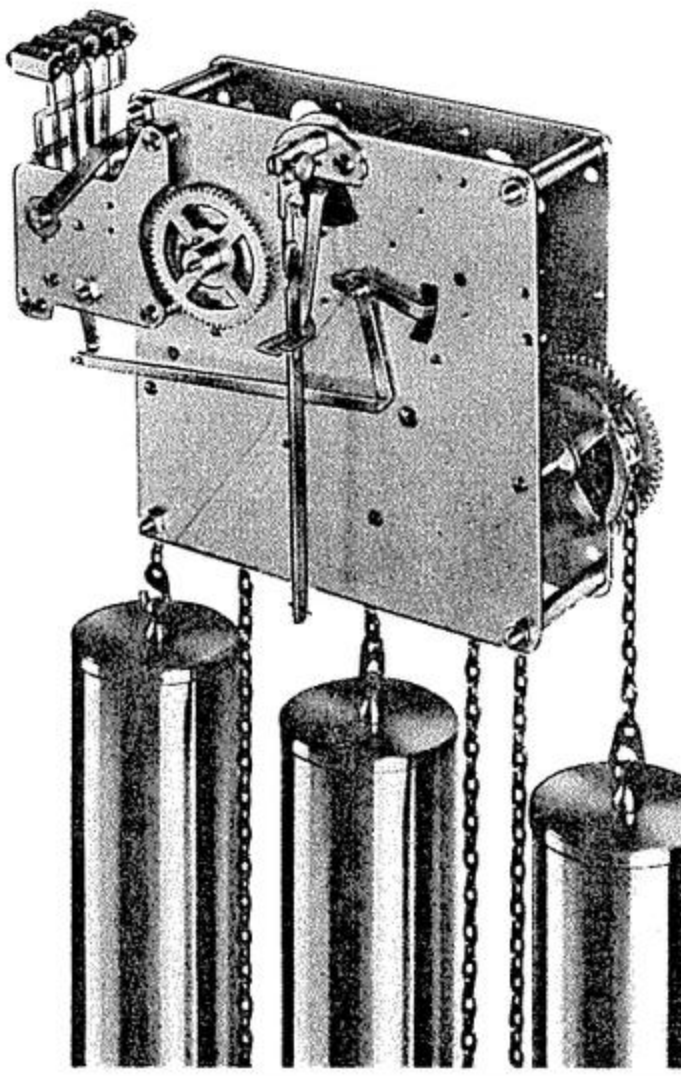
Model 351-850 is an eight day Westminster chime movement. The time train is weight driven. The strike and chime mechanisms are key operated. This model is fitted with eight hammers on the rear of the movement. It is fitted with a pendulum.

Dimensions: 120 x 120 mm with a distance between the plates of 32 mm.

Model 351-850 should be lubricated as outlined in Chapter 4, Part B, Section 7. Use the instructions for a pendulum movement.

Hermle

451-030



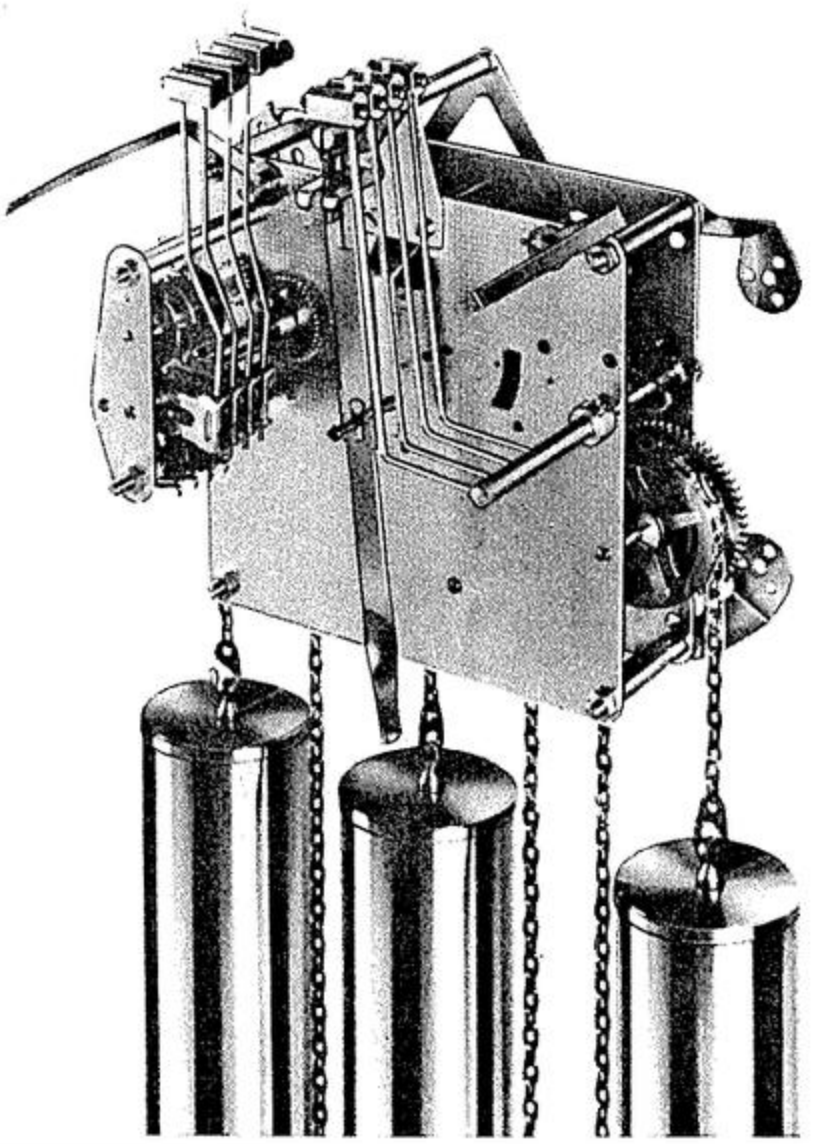
Spare parts list movement no. 451-030

Model 451-030 is a weight driven eight day 4/4 Westminster chime movement. This movement has five hammers mounted on the side. This model is fitted with a pendulum.

Dimensions: 120 x 120 mm with a 32 mm internal distance between the plates.

Model 451-030 should be lubricated as outlined in Chapter 4, Part B, Section 6.

451-050



Spare parts list movement no. 451-050

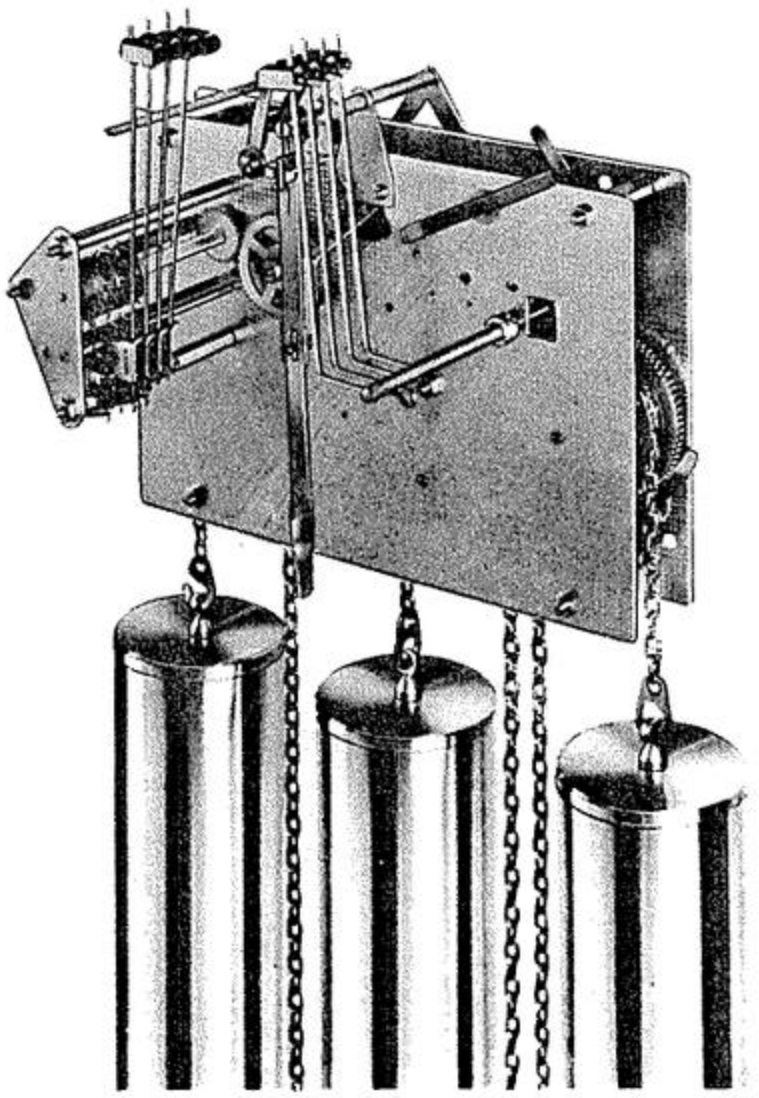
Model 451-050 is a weight driven eight day 4/4 Westminster chime movement. It is fitted with a pendulum. Eight hammers are mounted on the rear of this movement.

Dimensions: 120 x 120 mm with an internal distance between the plates of 32 mm.

Model 451-050 should be lubricated as outlined in Chapter 4, Part B, Section 6.

Hermle

461-050



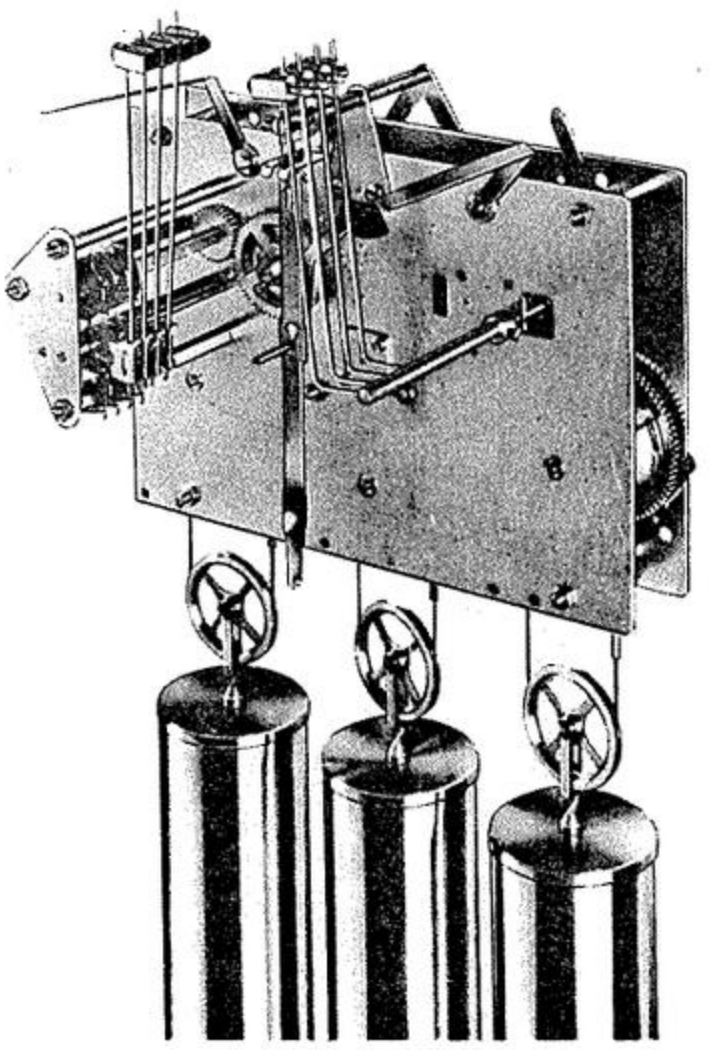
Spare parts list movement no. 461-050

Model 461-050 is a weight driven eight day 4/4 Westminster chime movement. It is fitted with a pendulum. Eight hammers are mounted on the rear of this movement.

Dimensions: 120 x 120 mm with an internal distance between the plates of 32 mm.

Model 461-050 should be lubricated as outlined in Chapter 4, Part B, Section 6.

461-853



Spare parts list movement no. 461-853

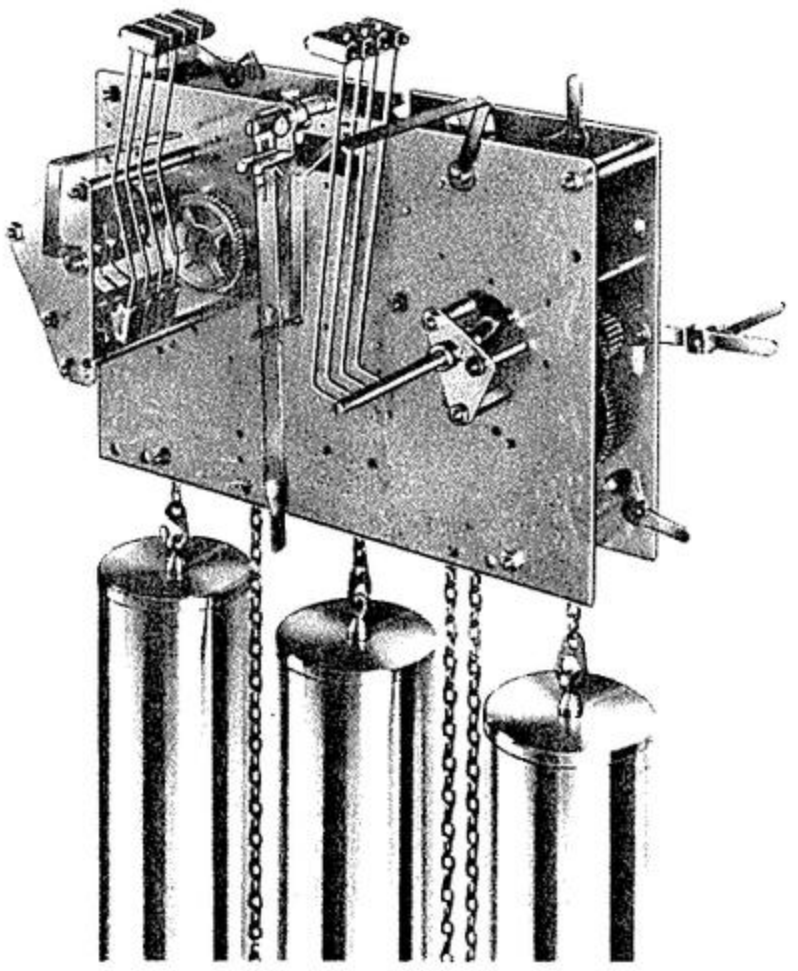
Model 461-853 is an eight day cable driven 4/4 Westminster chime movement with eight hammers mounted on the back plate. This model is fitted with a pendulum.

Dimensions: 200 x 140 mm with an internal distance between the plates of 32 mm.

Model 461-853 should be lubricated as outlined in Chapter 4, Part B, Section 6.

Hermle

471-050



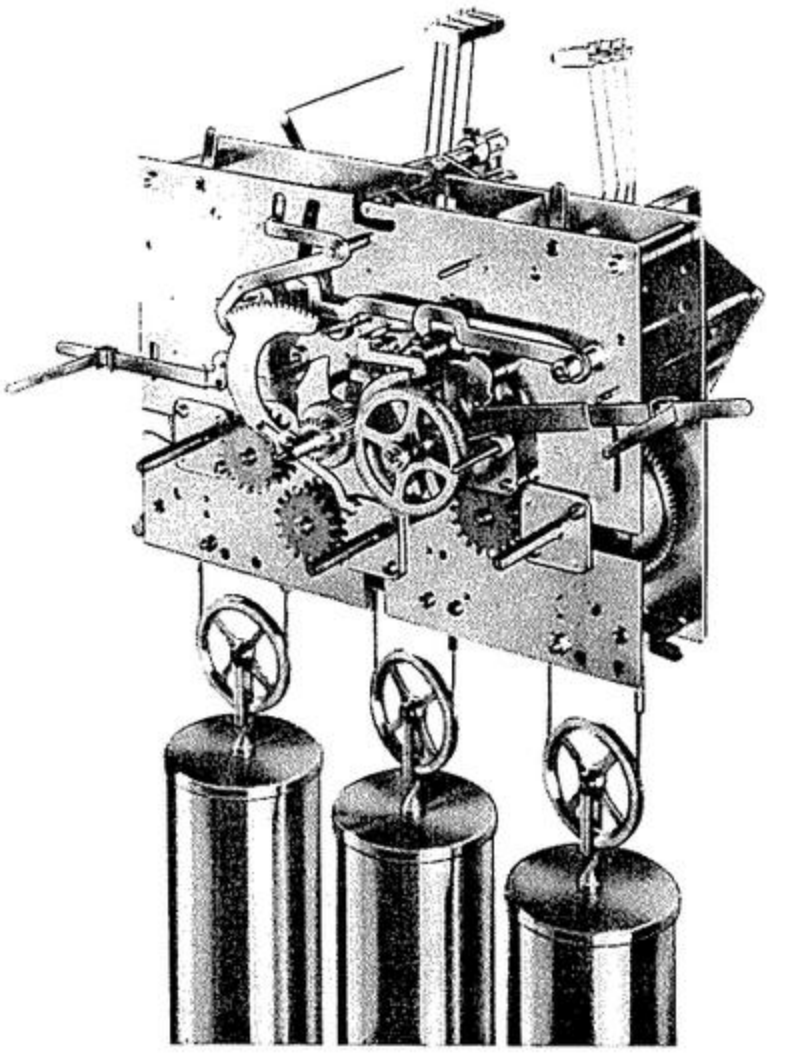
Spare parts list movement no. 471-050

Model 471-050 is a weight driven eight day 4/4 Westminster chime movement. Eight hammers are mounted behind this movement. This model is fitted with a pendulum.

Dimensions: 220 x 152 mm with an internal distance between the plates of 40 mm.

Model 471-050 should be lubricated as outlined in Chapter 4, Part B, Section 6.

471-850



Spare parts list movement no. 471-850

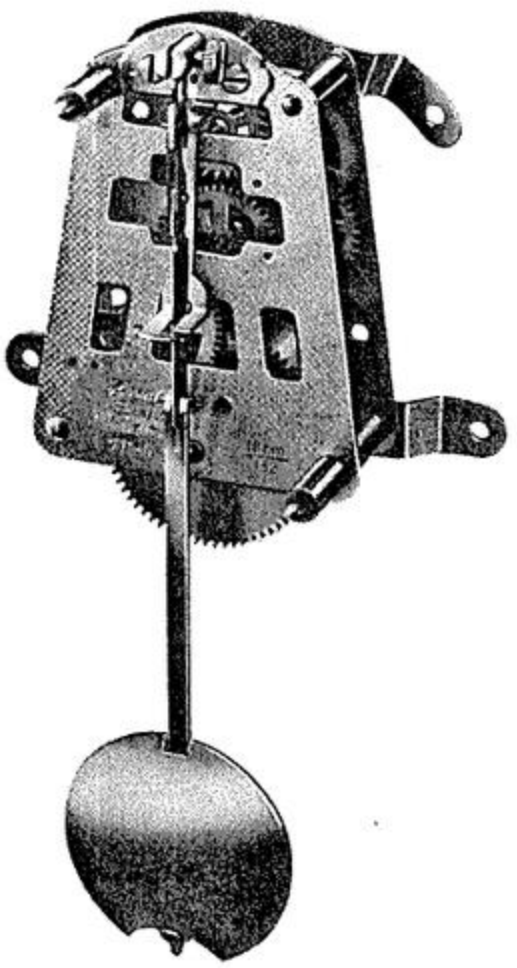
Model 471-850 is an eight day cable driven 4/4 Westminster chime movement. The hammers are mounted behind this movement. This model is fitted with a pendulum.

Dimensions: 220 x 152 mm with an internal distance between the plates of 40 mm.

Model 471-850 should be lubricated as outlined in Chapter 4, Part B, Section 6.

Hermle

771



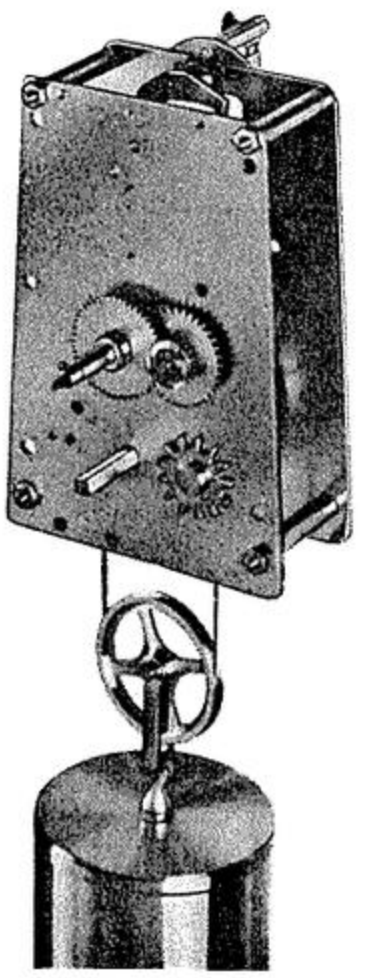
Spare parts list movement no. 771

Model 771 is an eight day keywound movement that has only one train designed for timekeeping purposes.

Dimensions: 58.5 x 75.5 mm with a 20 mm internal distance between the plates.

Model 771 should be lubricated as outlined in Chapter 4, Part B, Section 1.

781-800



Spare parts list movement no. 781-800

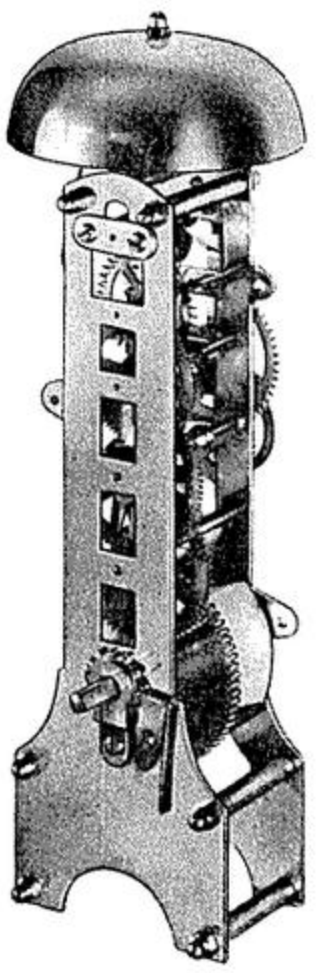
Model 781-800 is an eight day keywound movement that has only one train designed for timekeeping purposes. The movement is fitted with a pendulum.

Dimensions: 78 x 117 mm with 32 mm between the plates .

Model 781-800 should be lubricated as outlined in Chapter 4, Part B, Section 2.

Hermle

791-680



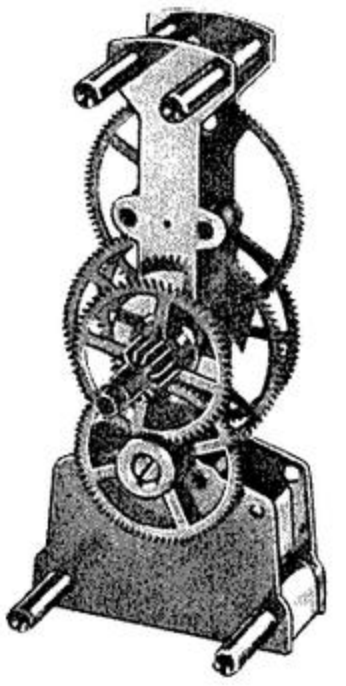
Spare parts list movement no. 791-680

Model 791-680 is an eight day keywound skeleton movement that has only one train designed for timekeeping purposes. The movement is fitted with a pendulum.

Dimensions: 60 x 181 mm with 32 mm between the plates.

Model 791-680 should be lubricated as outlined in Chapter 4, Part B, Section 1.

987



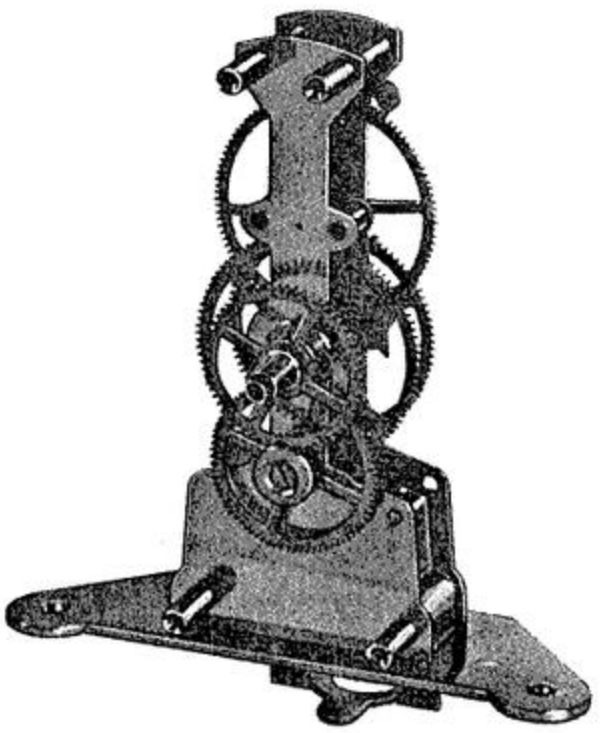
Spare parts list movement no. 987
Quartz skeleton movement

Model 987 is a skeleton movement integrating a quartz motor and a mechanical train. This model does not have a rotor drive mechanism.

Model 987 should be lubricated as outlined in Chapter 4, Part B, Section 8.

Hermle

987

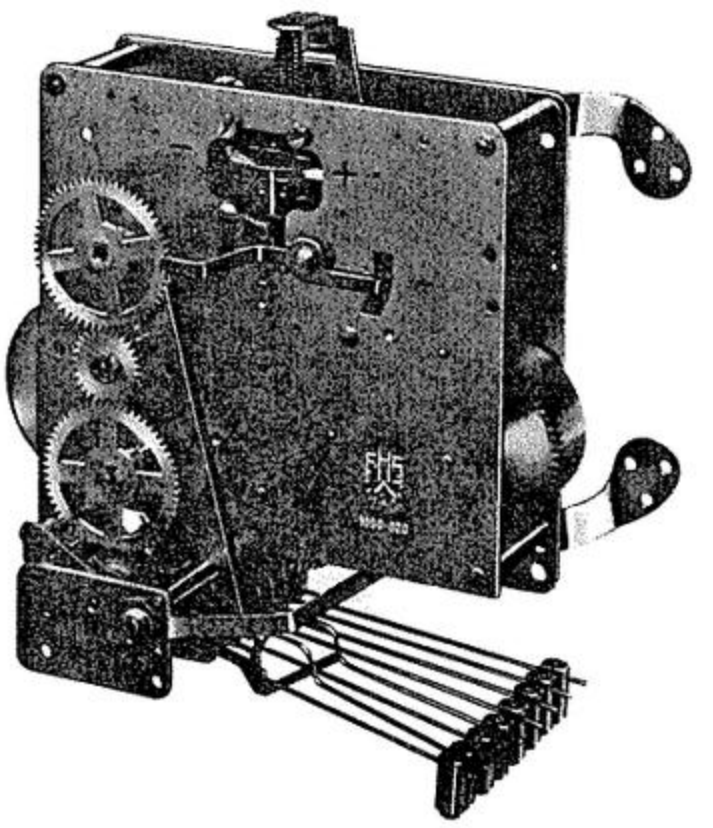


Quartz skeleton movement for 400 day clock

Model 987 is a skeleton movement integrating a quartz motor and a mechanical train. This model has a rotor drive mechanism.

Model 987 should be lubricated as outlined in Chapter 4, Part B, Section 8.

1050-020



Spare parts list movement no. 1050-020

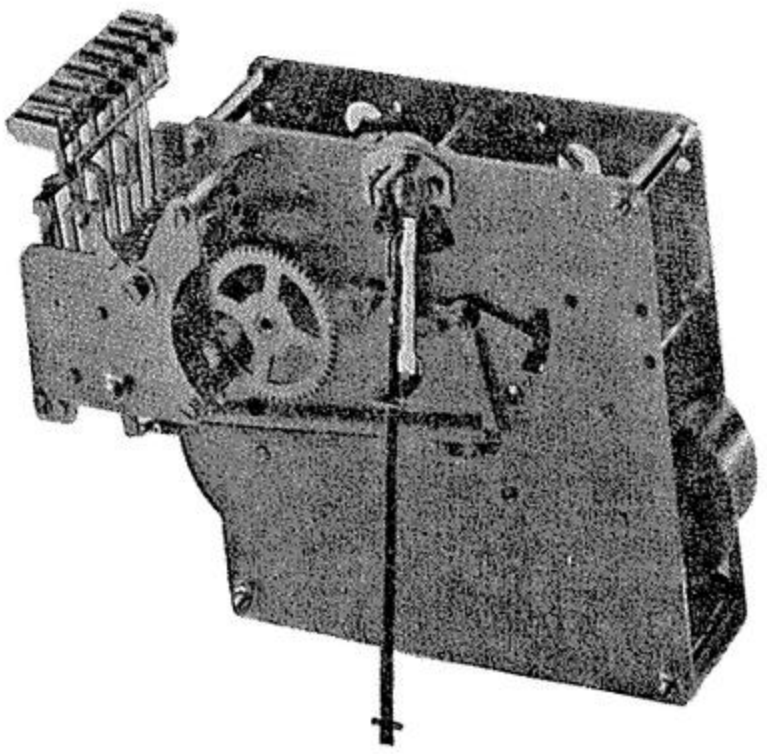
Model 1050-020 is an eight day triple chime movement. It has a 4/4 Westminster, Whittington and St. Michael chime capability. The movement is fitted with a balance unit. Eight hammers are mounted on the bottom of this movement.

Dimensions: 120 x 120 mm with 32 mm between the plates.

Model 1050-020 should be lubricated as outlined in Chapter 4, Part B, Section 5-b.

Hermle

1051-030



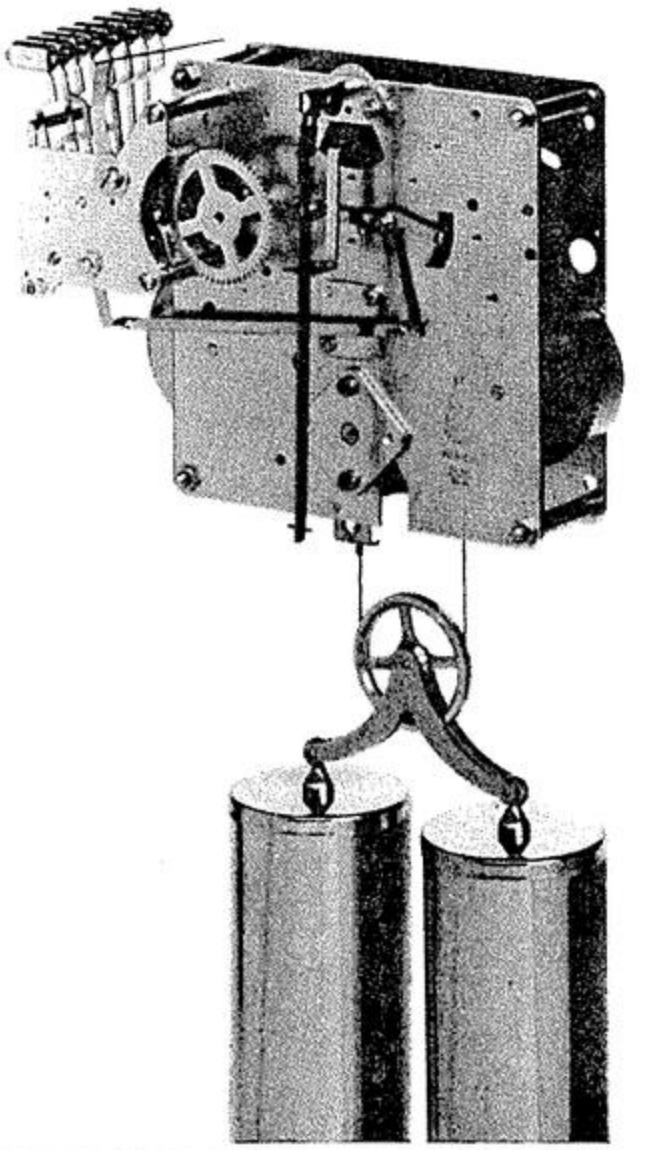
Spare parts list movement no. 1051-030

Model 1051-030 is an eight day triple chime movement. It has a 4/4 Westminster, Whittington and St. Michael chime capability. The hammers are mounted on the side of this model. It is fitted with a pendulum.

Dimensions: 120 x 120 mm with a 32 mm internal distance between the plate.

Model 1050-050 should be lubricated as outlined in Chapter 4, Part B, Section 5-a. Use the instructions for pendulum movements.

1051-830



Spare parts list movement no. 1051-830

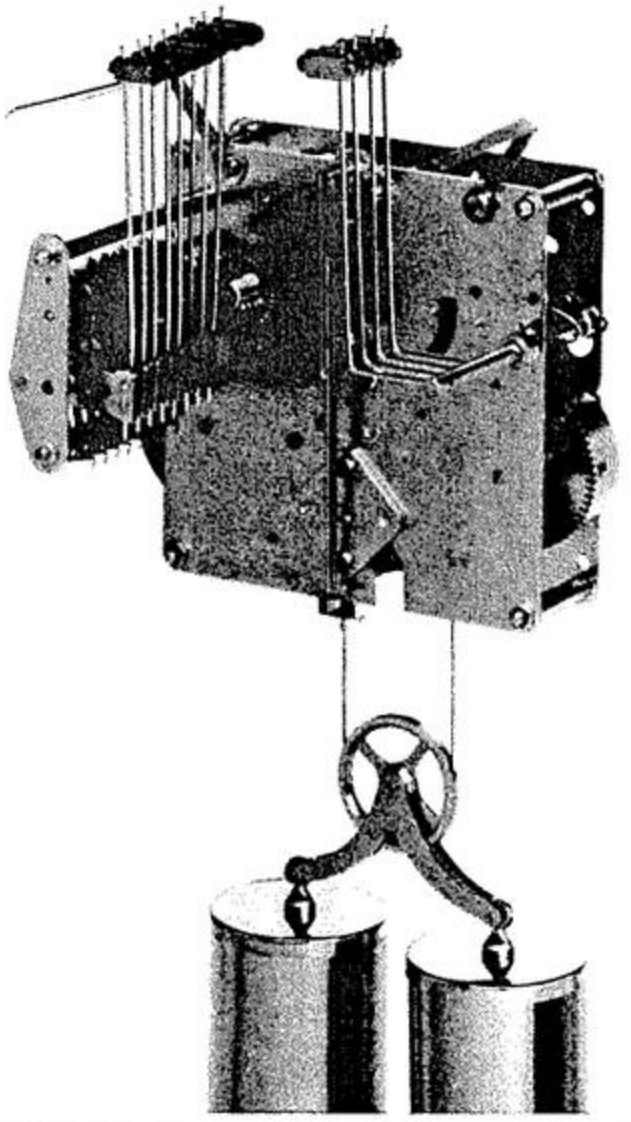
Model 1051-830 is a triple chime movement with Westminster, Whittington and St. Michael melodies. The time train is weight driven. The hour strike and quarter hour trains are spring driven. This movement has eight hammers mounted on the side. It is fitted with a pendulum.

Dimensions: 120 x 120 mm with an internal distance between the plates of 32 mm.

Model 1051-830 should be lubricated as outlined in Chapter 4, Part B, Section 7.

Hermle

1051-850



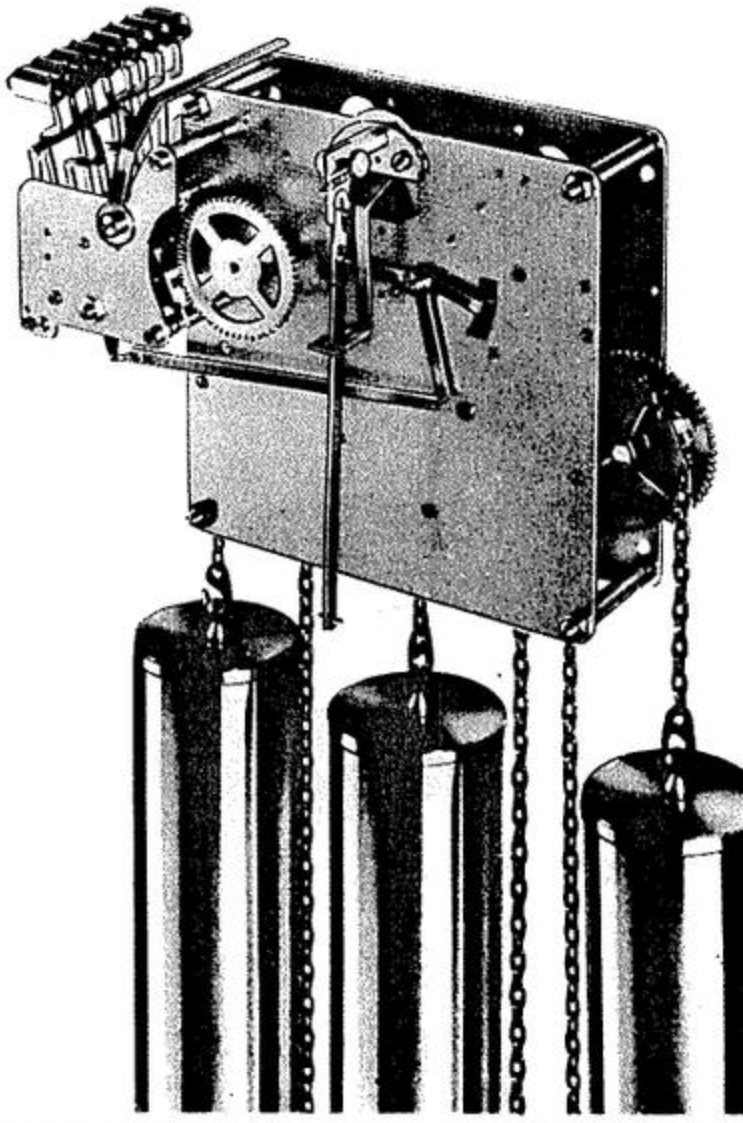
Spare parts list movement no. 1051-850

Model 1051-850 is a triple chime movement with Westminster, Whittington and St. Michael melodies. The time train is weight driven. The hour strike and quarter hour trains are spring driven. This movement has eight hammers mounted on each side of the chime rods. It is fitted with a pendulum.

Dimensions: 120 x 120 mm with an internal distance between the plates of 32 mm.

Model 1051-850 should be lubricated as outlined in Chapter 4, Part B, Section 7.

1151-030



Spare parts list movement no. 1151-030

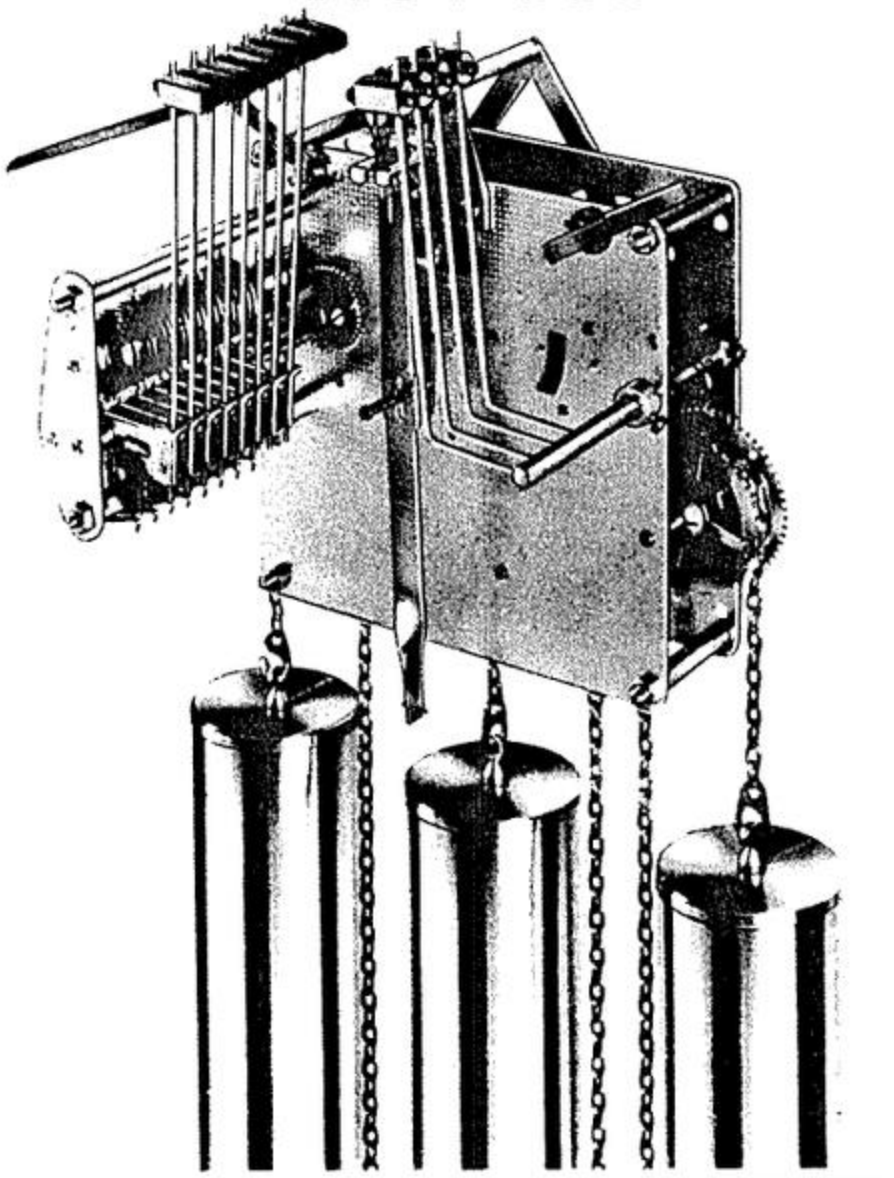
Model 1151-030 is an eight day weight driven movement with Westminster, Whittington and St. Michael triple chimes. The hammers are mounted on the side. It is fitted with a pendulum.

Dimensions: 120 x 120 mm with a distance between the plates of 32 mm.

Model 1151-030 should be lubricated as outlined in Chapter 4, Part B, Section 6.

Hermle

1151-050



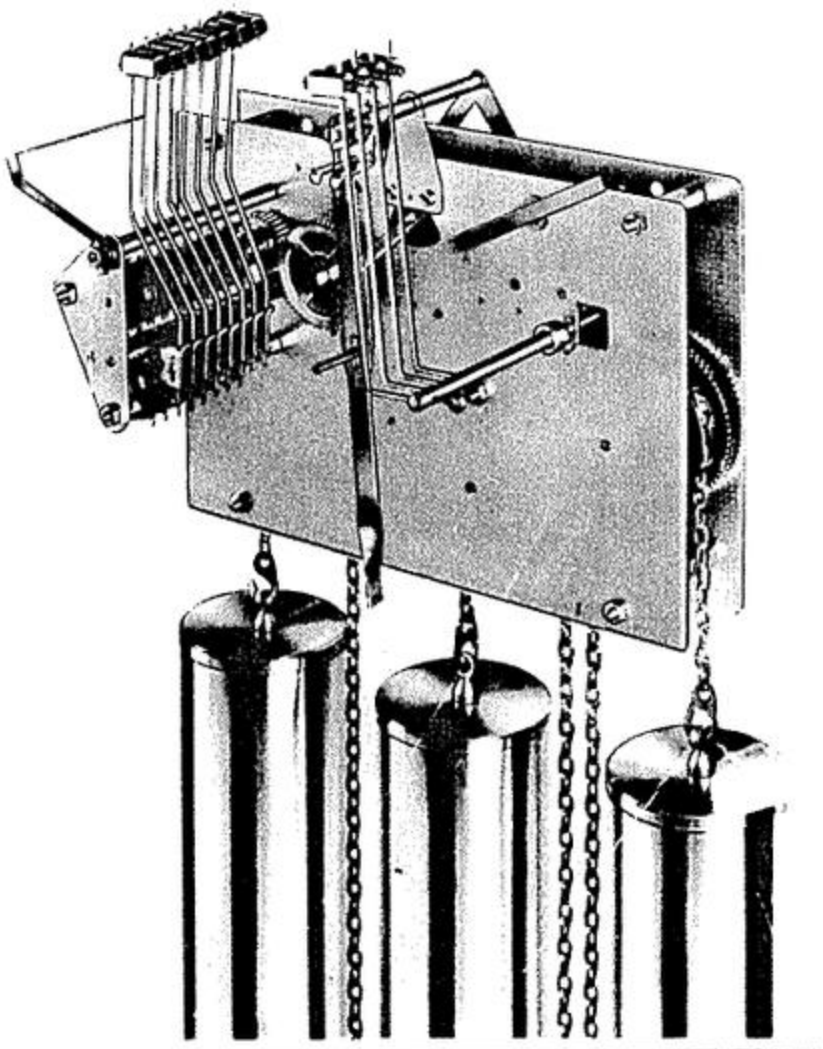
Spare parts list movement no. 1151-050

Model 1151-050 is an eight day weight driven movement with Westminster, Whittington and St. Michael triple chimes. The hammers are mounted on each side of the gong unit. It is fitted with a pendulum.

Dimensions: 120 x 120 mm with a distance between the plates of 32 mm.

Model 1151-050 should be lubricated as outlined in Chapter 4, Part B, Section 6.

1161-050



Spare parts list movement no. 1161-050

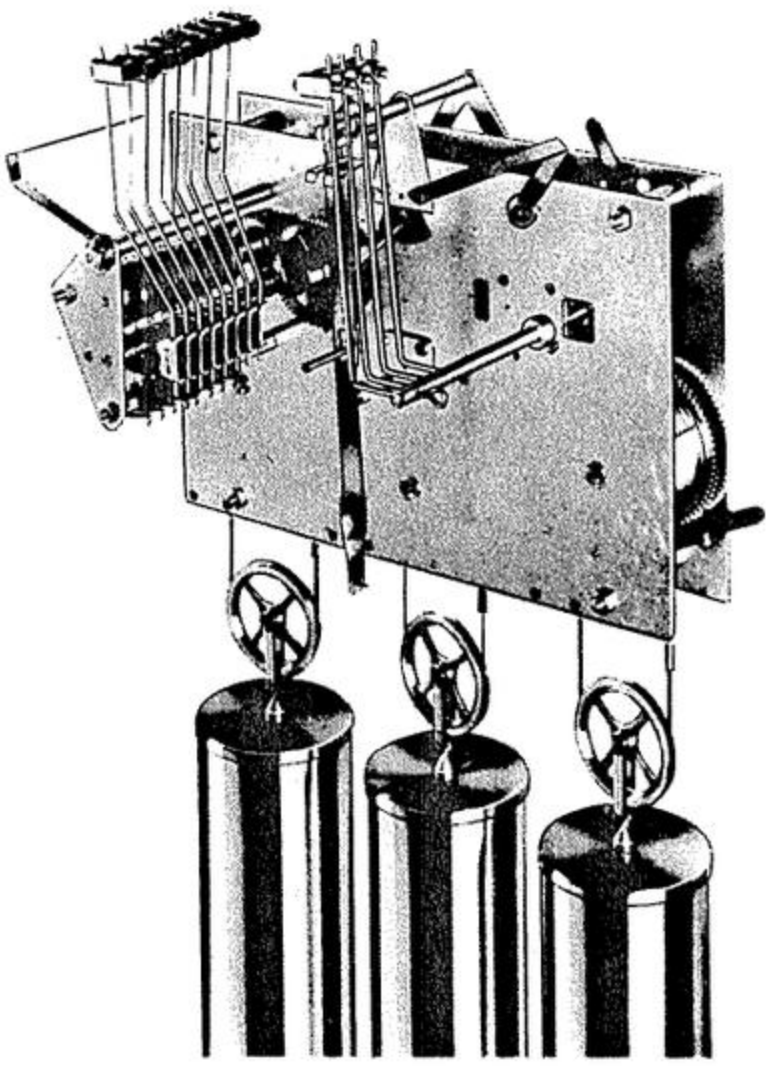
Model 1161-050 is an eight day weight driven movement with Westminster, Whittington and St. Michael triple chimes. The hammers are mounted on each side of the gong unit. It is fitted with a pendulum.

Dimensions: 200 x 140 mm with an internal distance between the plates of 32 mm.

Model 1161-050 should be lubricated as outlined in Chapter 4, Part B, Section 6.

Hermle

1161-853



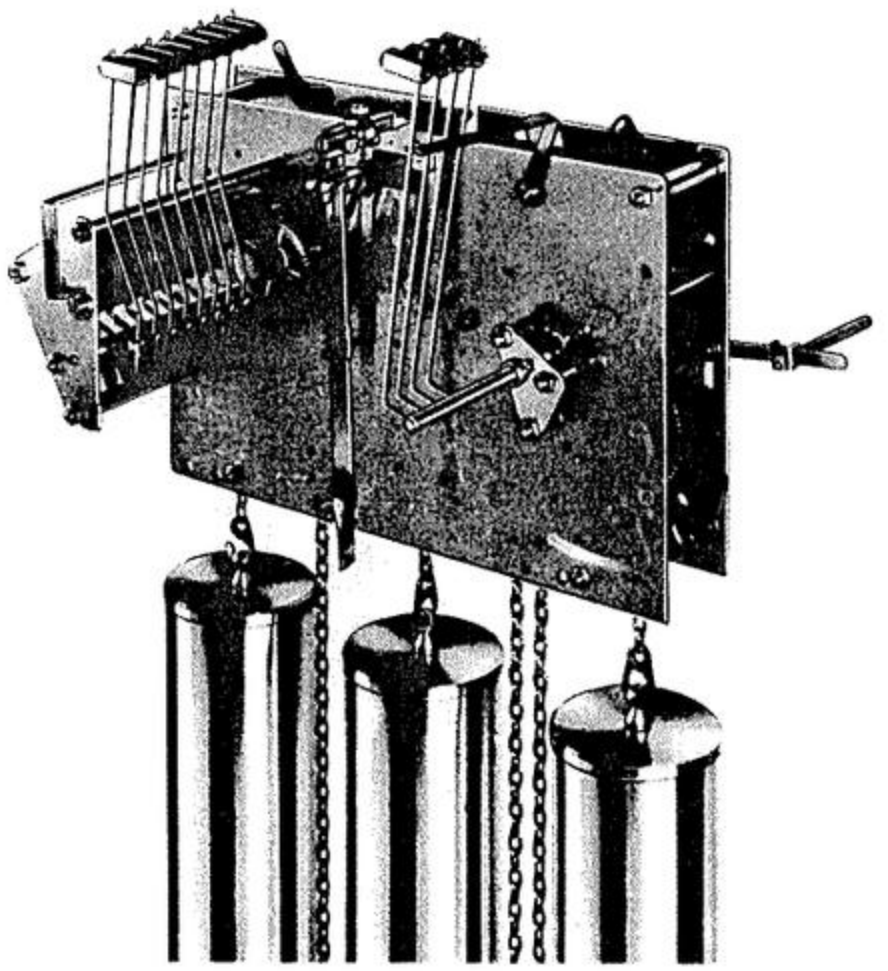
Spare parts list movement no. 1161-853

Model 1161-853 is an eight day cable driven movement with Westminster, Whittington and St. Michael triple chime capabilities. The hammers are mounted on both sides of the chime rod unit. This model is fitted with a pendulum.

Dimensions: 200 x 140 mm with an internal distance between the plates of 32 mm.

Model 1161-853 should be lubricated as outlined in Chapter 4, Part B, Section 6.

1171-050



Spare parts list movement no. 1171-050

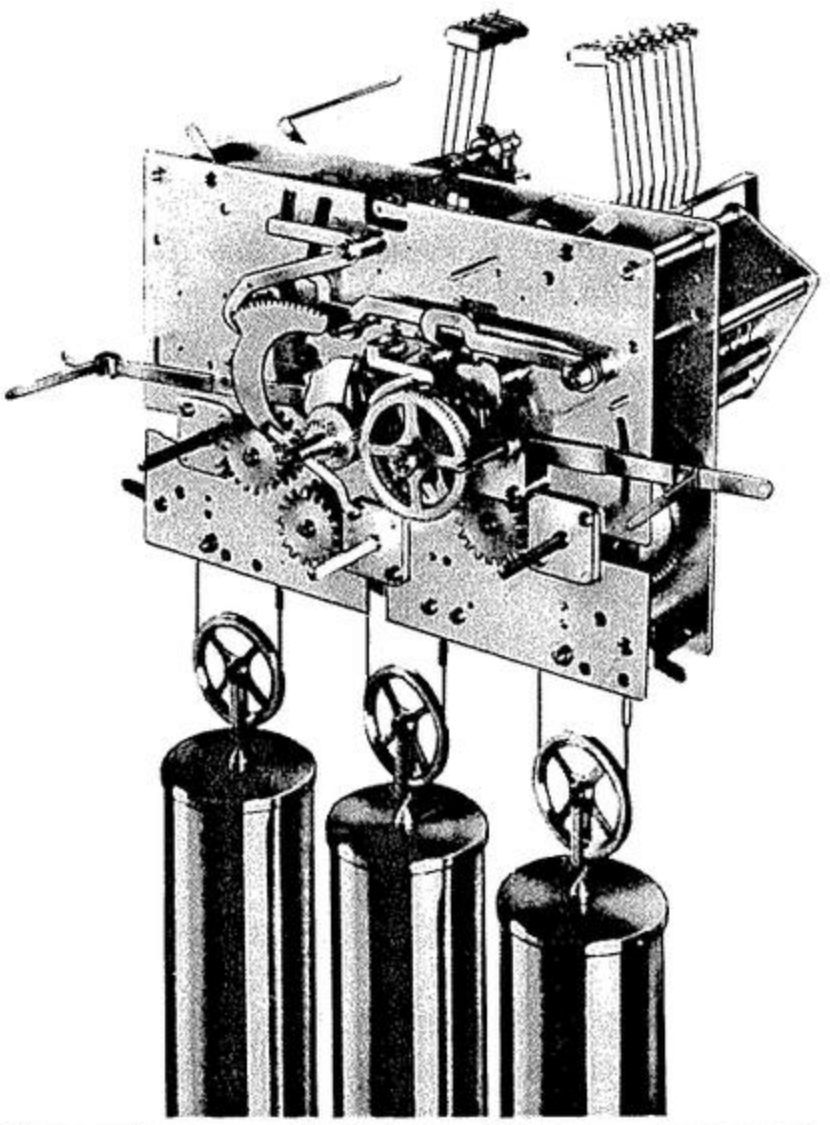
Model 1171-050 is an eight day weight driven movement with Westminster, Whittington and St. Michael triple chimes. The hammers are mounted on each side of the gong unit. This model is fitted with a pendulum.

Dimensions: 220 x 152 mm with a distance of 40 mm between the plates.

Model 1171-050 should be lubricated as outlined in Chapter 4, Part B, Section 6.

Hermle

1171-850



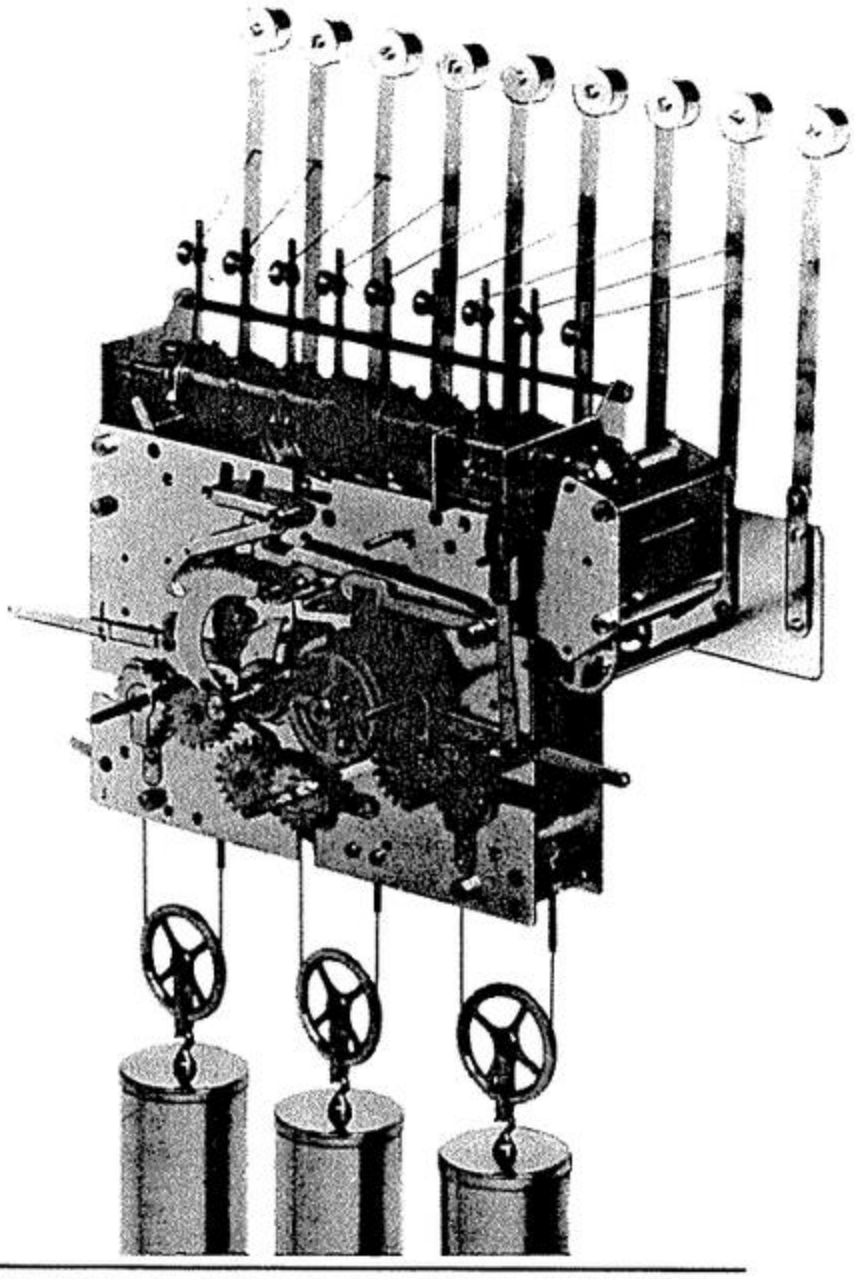
Spare parts list movement no. 1171-850

Model 1171-850 is an eight day cable driven movement with Westminster, Whittington and St. Michael triple chimes. Twelve hammers are mounted on both sides of the chime rod unit. It is fitted with a pendulum.

Dimensions: 220 x 152 mm with an internal distance between the plates of 40 mm.

Model 1171-850 should be lubricated as outlined in Chapter 4, Part B, Section 6.

1171-890



Spare parts list movement no. 1171-890

Model 1171-890 is an eight day cable driven movement with Westminster, Whittington and St. Michael triple chimes sounded on tubular gongs. Nine hammers are mounted on the back of the movement. It is fitted with a pendulum.

Dimensions: 220 x 152 mm with an internal distance between the plates of 40 mm.

Model 1171-890 should be lubricated as outlined in Chapter 4, Part B, Section 6.

This movement has some special features not available on other models which include a synchronizer system which allows the hour hand to be moved without disturbing the striking system, a date feature between the center shaft and the 6 o'clock position and a radial shut off feature.

Hermle

PART C

Hermle Quartz Movements

Hermle manufactures a wide range of quartz movements. These movements are available in several different sizes. There are also several different models that have a variety of functions. Some variations of these quartz movements are:

Standard time only movements

Movements with pendulum drives

Movements with one melody

Movements with multiple melodies

Multi function movements with day, date and moon phase indicators

Quartz 400 day movements with several variations in rotor designs

Due to their nature, quartz movements do not lend themselves to detailed restoration. There are some common sense checks and corrections that can be applied, but beyond that it is more economical for both the customer and the service technician to replace a defective quartz movement.

Some checks that should be made on a quartz movement before it is discarded include:

Checking the condition of the battery

Checking and cleaning the battery contacts

Checking the ability of the movement to operate at low voltages

Checking obstructions to the hands

Checking for loose connections

Checking for excessive dirt or dust accumulations capable of hampering the operation of the movement

The battery should be checked before examining the movement. Quite often batteries will form a thin corrosive film on the terminals which impedes the transmission of the electrical current. A simple and effective means of cleaning these terminals is with a gritty pencil eraser.

The battery should register no lower voltage than that listed in this section as the average consumption figure for the movement being tested. These figures appear in the data under the heading for each movement model in section 1. In most cases this figure is 1.4 V at 134 uA.

The battery contacts in the movement should be checked very carefully. These are subject to the formation of thin coatings of corrosion, especially in humid climates. Quite often if an expired battery has been left in a movement it will cause extensive damage in the area where the terminals are located.

Once the battery terminals have been cleaned the timekeeping ability of the movement can be checked. As very few service technicians have the sophisticated test equipment to perform checks on the amount of time elapsing between the impulses in a quartz movement, it is best to accomplish this test by running the unit. If the movement is installed in its own case and the dial has a minute track the test can be made with enough accuracy to advise the customer about the condition of the movement without using special equipment.

To perform this test, simply place the movement in operation and set it with a precision time source such as a radio time signal. If the movement will operate correctly for one hour it will probably deliver reliable service. Thereafter, several checks should be made at twenty four hour periods to confirm that the movement is not losing time. If a loss is detected it indicates there is excessive friction in the train and the movement should be replaced.

Replacement movements can be ordered from suppliers stocking Hermle spare parts. Include the model number, hand shaft length and a short description of the functions the movement performs. In the absence of a model number the dimension of the movement should be included. Diagrams and detailed descriptions of Hermle quartz movements are included in this section to assist the service technician make a positive identification of the movement needing replacement.

Hermle

Section 1

Quartz Movements

TECHNICAL DATA PERTAINING TO HERMLE QUARTZ MOVEMENTS

Movement Models:
W 2100
W 2120
W 2200
W 2220

Model 2100

Battery: LR 6-AA Size
Operating Voltage Range: 1.2-1.7 V
Typical Average Consumption at 1.4V: 135 uA
Accuracy at Room Temperature: ± 1 S/D
Available with/without Metal Hanger
Central Second Feature*
Suitable for 3 Ways of Mounting:
- Central fixing screw
- Tapping Screw
- Snap-in system

*see handshaft lengths available in the following table

Model 2120

Battery: LR 6-AA Size
Operating Voltage Range: 1.3-1.7 V
Typical Average Consumption at 1.4V: 135 uA (Movement); 25 mA (Melody-module); Battery lasts < 1 year due to melody-module
Accuracy at Room Temperature: ± 1 S/D
Available with/without Metal Hanger
Central Second Feature*
Suitable for 3 Ways of Mounting:
- Central fixing screw
- Tapping Screw
- Snap-in system

*see handshaft lengths available in the following table

Model 2200

Battery: LR 6-AA Size
Operating Voltage Range: 1.2-1.7 V
Typical Average Consumption at 1.4V: 180 uA
Pendulum Length: 300 mm
Available with Integrated Hanger
Accuracy at Room Temperature: ± 1 S/D
Available with central second feature*
Suitable for 2 Ways of Mounting:
- Central fixing screw
- Tapping Screw

Pendulum Lengths: please see accessories
*see handshaft lengths available in the following table

Model 2220

Battery: LR 6-AA Size
Operating Voltage Range: 1.3-1.7 V
Battery lasts < 1 year due to melody-module
Accuracy at Room Temperature: ± 1 S/D
Available with Integrated Hanger
Central Second Feature*
Suitable for 2 Ways of Mounting:
- Central fixing screw
- Tapping Screw

Pendulum Lengths: please see accessories
*see handshaft lengths available in the following table

Hermle

TECHNICAL DATA PERTAINING TO HERMLE QUARTZ MOVEMENTS

Movement Models:
W 2112
W 2113
W 2212
W 2213

Model 2112

Battery: LR 14-C Size
Operating Voltage Range: 1.2-1.7 V
Typical Average Consumption at 1.4V: 435 uA
Accuracy at Room Temperature: ± 0.7 S/D
Available with/without Metal Hanger
Central Second Feature*
Suitable for 3 Ways of Mounting:
- Central fixing screw
- Tapping Screw
- Snap-in system

*see handshaft lengths available in the following table

Model 2212

Battery: LR 14-C Size
Operating Voltage Range: 1.2-1.7 V
Typical Average Consumption at 1.4V: 480 uA
Accuracy at Room Temperature: ± 0.7 S/D
Available with Integrated Hanger
Central Second Feature*
Suitable for 2 Ways of Mounting:
- Central fixing screw
- Tapping screw

Pendulum Lengths: please see accessories
*see handshaft lengths available in the following table

Model 2113

Battery: LR 14-D Size
Operating Voltage Range: 1.2-1.7 V
Typical Average Consumption at 1.4V: depends on volume and selected chime
Accuracy at Room Temperature: ± 0.7 S/D
Available with/without Metal Hanger
Central Second Feature*
Suitable for 3 Ways of Mounting:
- Central fixing screw
- Tapping Screw
- Snap-in system

*see handshaft lengths available in the following table

Model 2213

Battery: LR 14-C Size
Operating Voltage Range: 1.2-1.7 V
Typical Average Consumption at 1.4V: depends on pendulum length, volume and selected chime
Accuracy at Room Temperature: ± 0.7 S/D
Available with Integrated Hanger
Central Second Feature*
Suitable for 2 Ways of Mounting:
- Central fixing screw
- Tapping screw

Pendulum Lengths: please see accessories
*see handshaft lengths available in the following table

Hermle

HANDSHAFT LENGTHS ON HERMLE QUARTZ MOVEMENTS

Handshaft Lengths Found On Models:
W 2112
W 2113
W 2212
W 2213

Nr. #	A	Diameter of Second Hand Shaft	Diameter of Minute Hand Shaft	Diameter of Hour Hand Shaft
W2112-0083000-00	9,5	0,8	2,5	3,7
*W2112-0013000-00	10,0	0,8	M3,5 x 0,35	5.0
W2112-0053000-00	12,5	—	M3,5 x 0,35	5,0
W2112-0063000-00	12,5	0,8	2,5	3,7
*W2112-0023000-00	15,0	0,8	M3,5 x 0,35	5,0
*W2112-0033000-00	20,0	0,8	M3,5 x 0,35	5,0
W2112-0046000-00**	51.5	—	M3.5 x 0.35	5.0

Handshaft Lengths Found On Models:
W 2100
W 2120
W 2200
W 2220

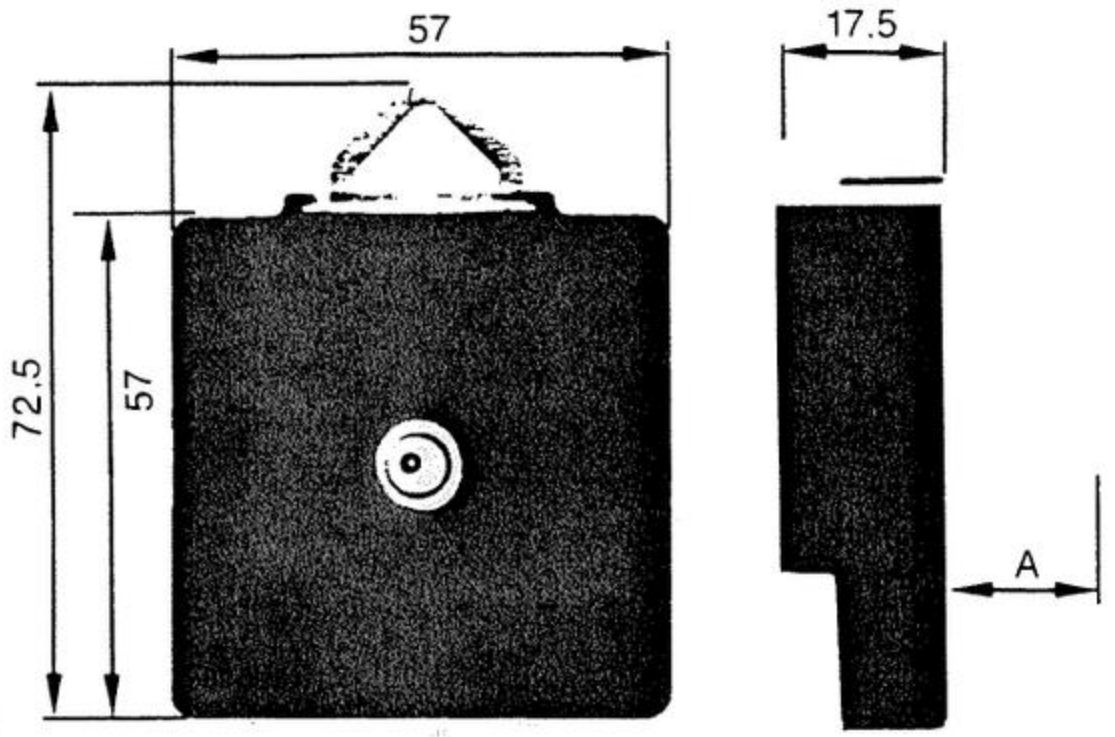
Nr. #	A	Diameter of Second Hand Shaft	Diameter of Minute Hand Shaft	Diameter of Hour Hand Shaft
W2100-0070000-00	6,1	0,8	2,5	3,7
W2100-0080000-00	10,5	0,8	2,5	3,7
*W2100-0010000-00	11,0	0,8	M3,5 x 0,35	5,0
W2100-0050000-00	13,5	—	M3,5 x 0,35	5,0
W2100-0060000-00	13,5	0,8	2,5	3,7
*W2100-0020000-00	16,0	0,8	M3,5 x 0,35	5,0
*W2100-0030000-00	21,0	0,8	M3,5 x 0,35	5,0
W2100-0040000-00**	52,5	—	M3,5 x 0,35	5,0

*Standard
** Only available with supplement

All measurements are in millimeters

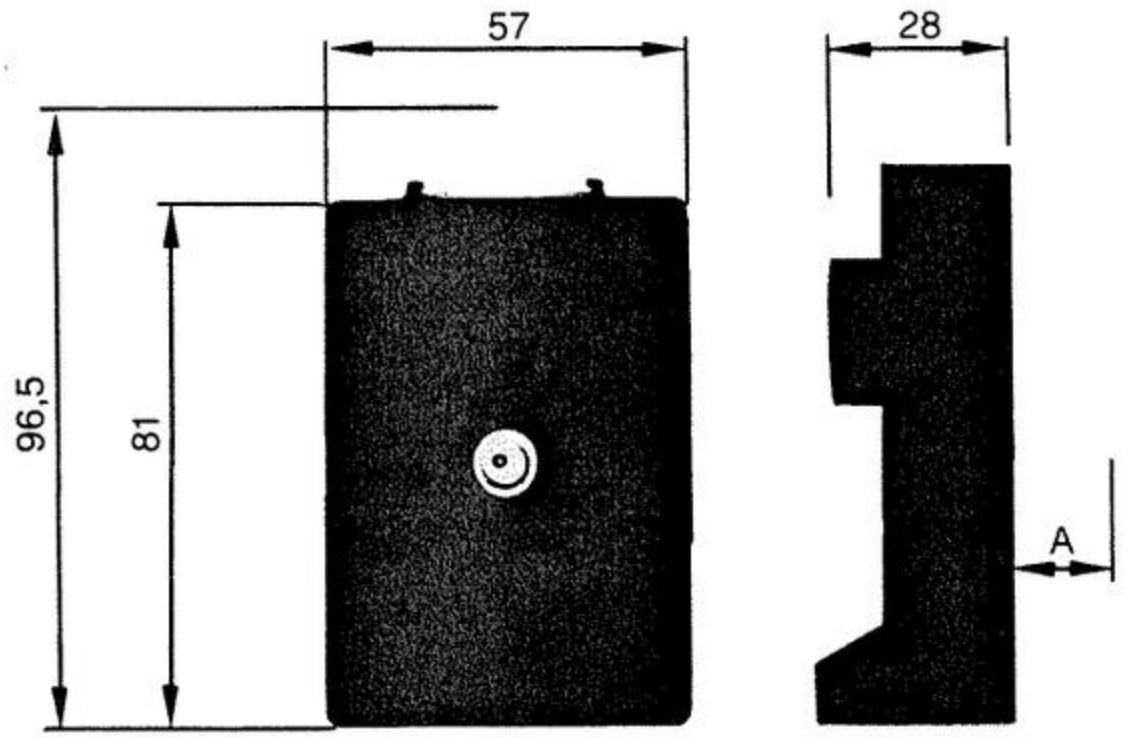
Hermle

W2100



Quartz Movement

W2112

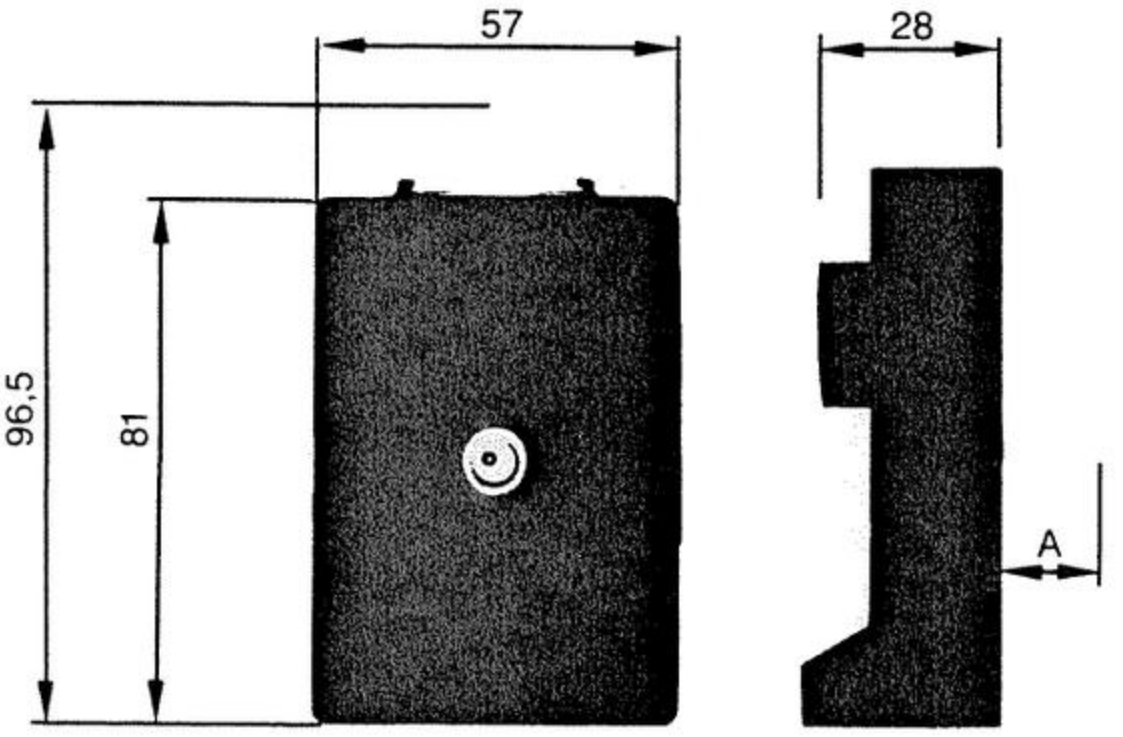


Quartz movement with 4/4 Westminster chime

All measurements are in millimeters

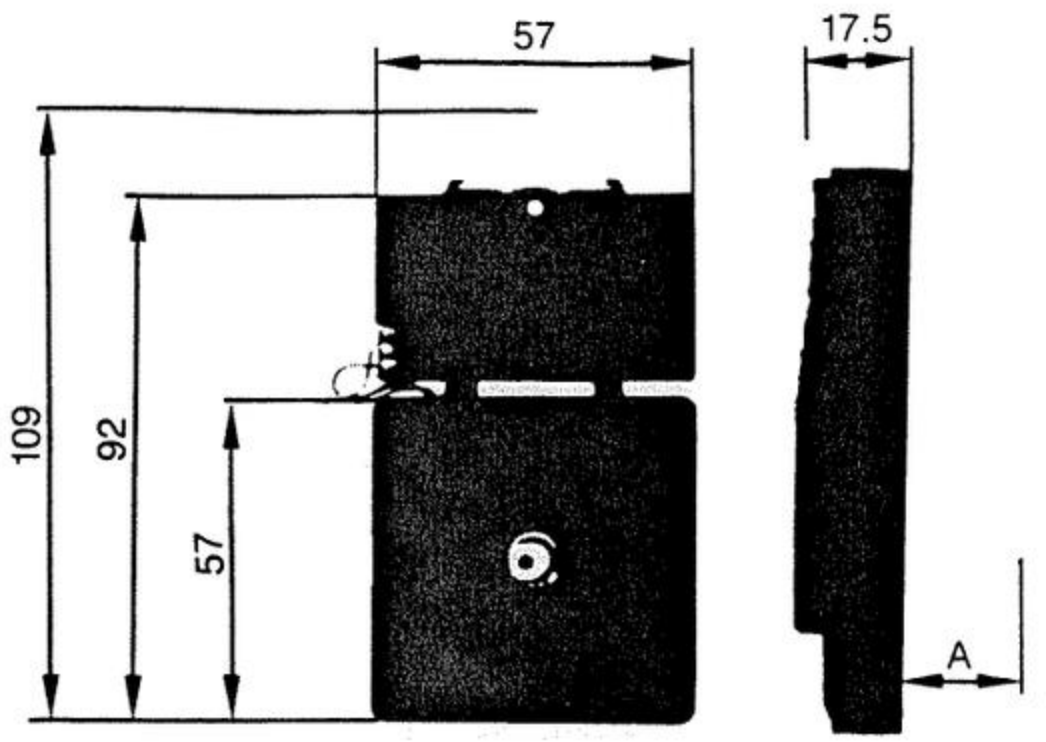
Hermle

W2113



Quartz Movement with 4/4 Westminster - Bim Bam

W2120

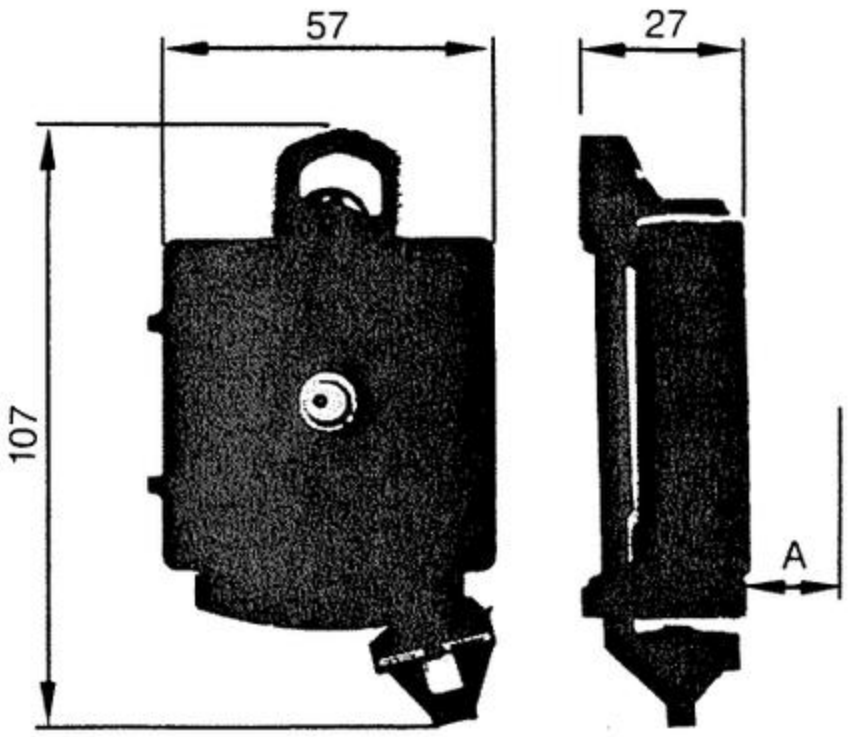


Quartz movement with melody (Westminster)

All measurements are in millimeters

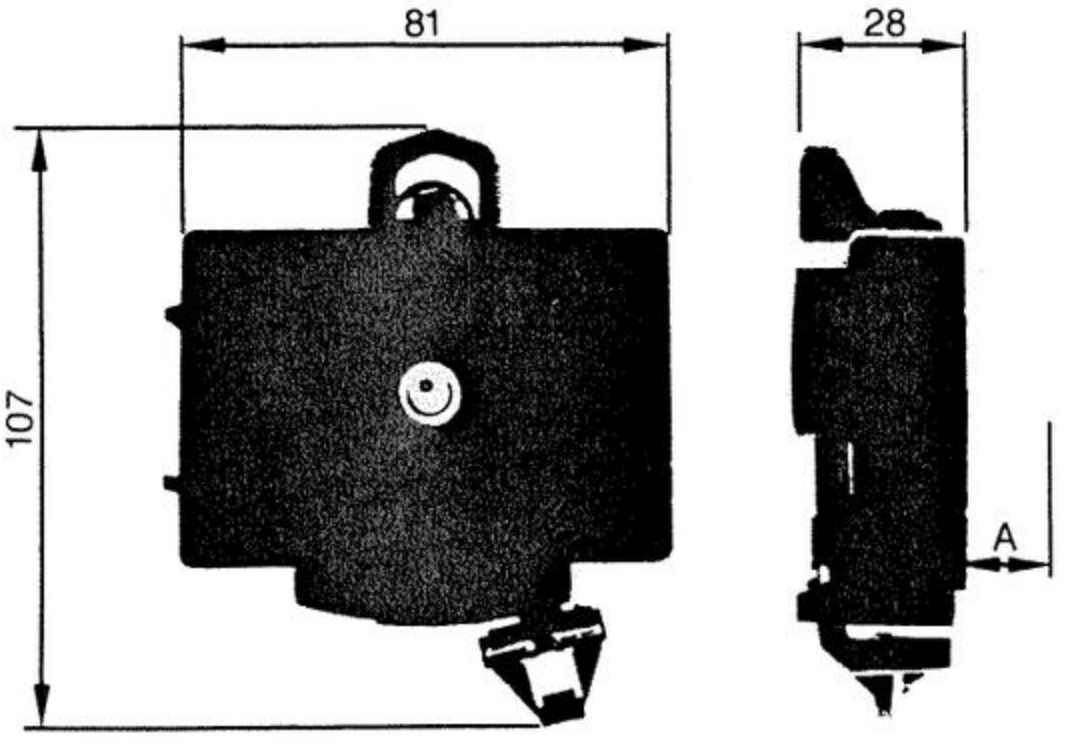
Hermle

W2200



Quartz Movement with pendulum drive

W2212

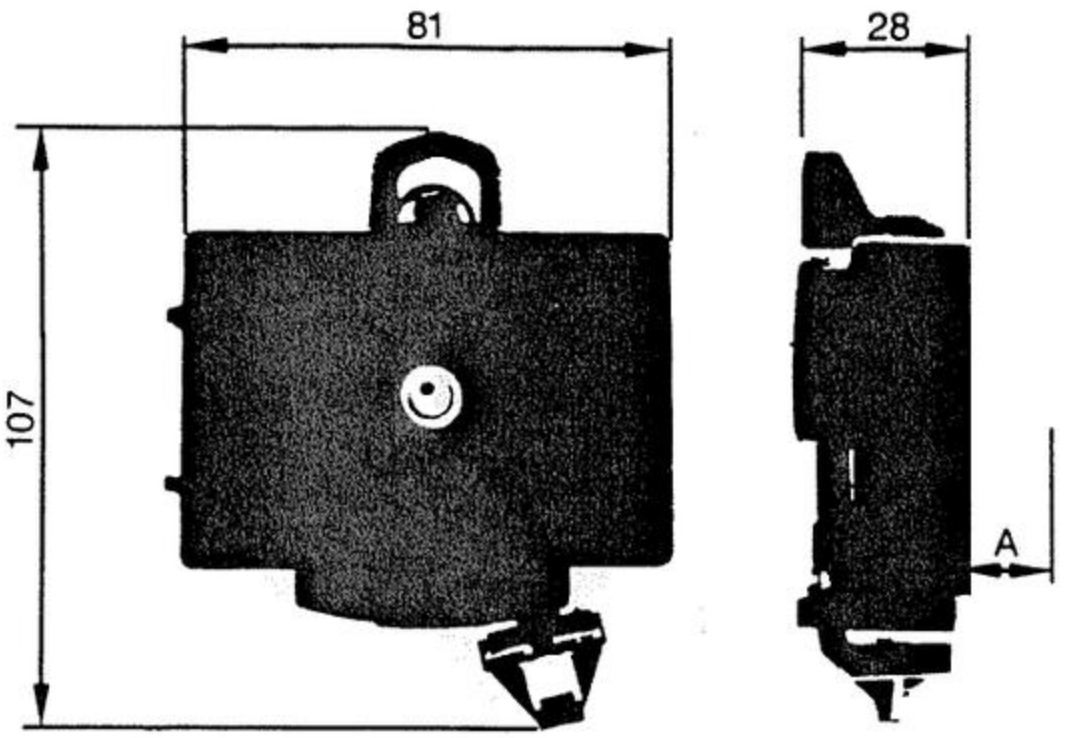


Quartz movement with pendulum and 4/4 Westminster chime

All measurements are in millimeters

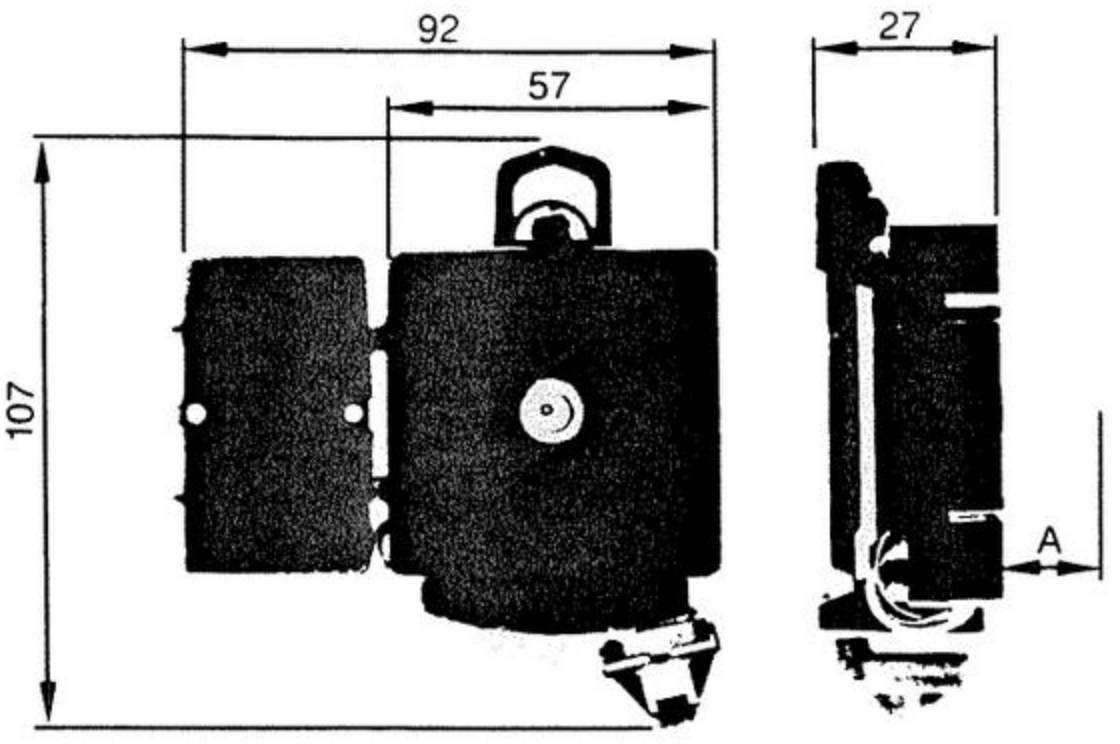
Hermle

W2213



Quartz Movement with 4/4 Westminster - Bim Bam

W2220



Quartz movement with pendulum drive and melody (Westminster)

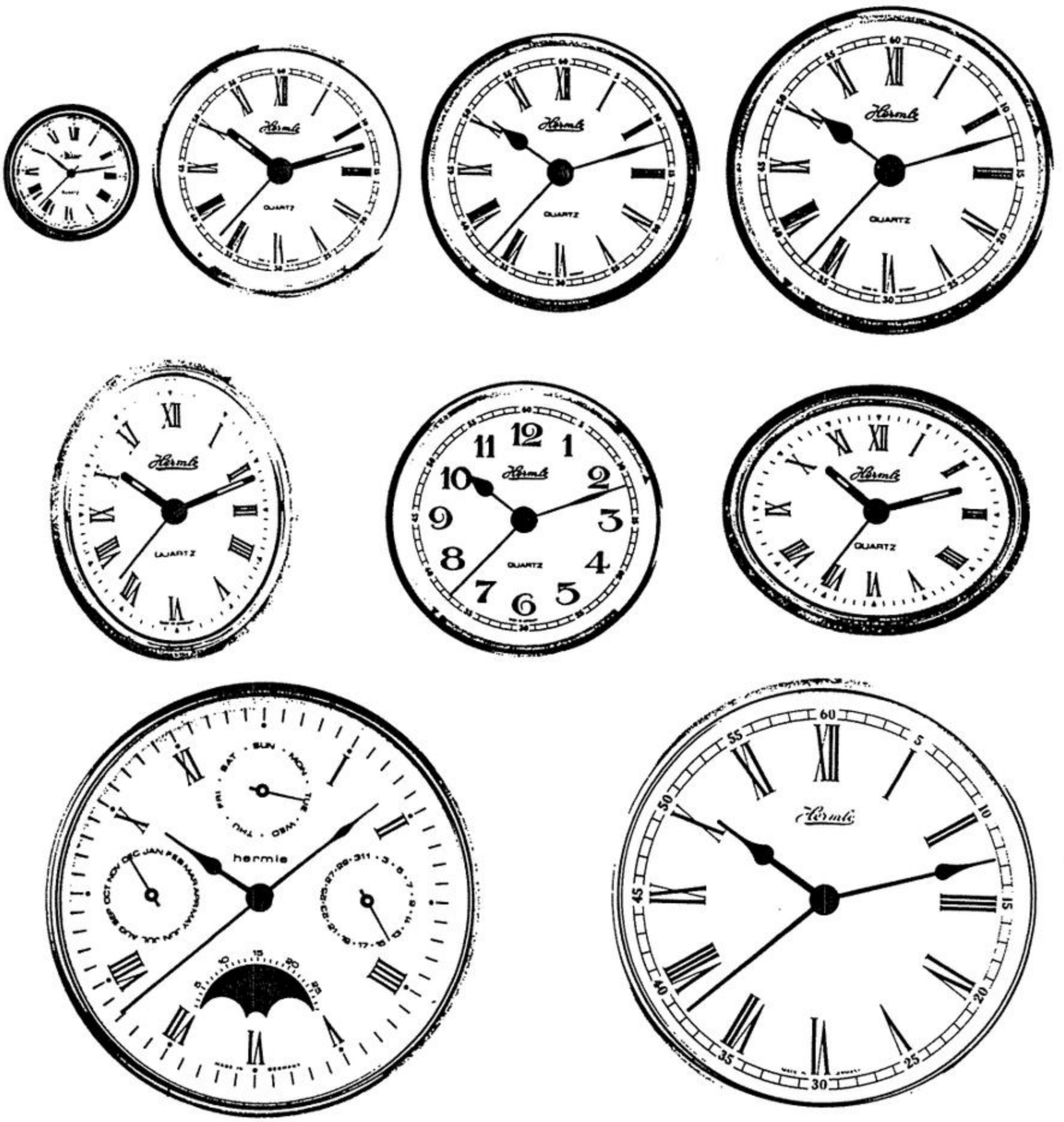
All measurements are in millimeters

Hermle

Section 2

Hermle Quartz Insert Units

Different Hand Styles and Dials are Available



Hermle manufactures a variety of quartz replacement fit up movements in the following sizes: 35 mm, 60 mm, 66 mm, 72 mm, 85 mm, 103 mm and 113 mm. Oval movements are available measuring 80 mm x 60 mm.

Hermle

Section 3

Hermle Quartz Movement Fittings

Accessories:

Each movement with a 11, 16, 21 mm handshaft length is furnished with the following accessories:

Rubber Washer
Center fixation screw in brass
Hand nut in brass
Hanger

Quartz Insert Fittings:

A	nickel	brass	black
3,9	E007-099701	E007-099702	E007-099703
5,0	E007-099801	E007-099602	E007-099803
7,0	E007-099901	E007-099902	E007-099903
9,0	E007-100001	E007-100002	E007-100003
11,0	E007-100101	E007-100102	E007-100103
13,0	E007-100201	E007-100202	E007-100203
15,0	E007-100301	E007-100302	E007-100303

Handnut:

For clock-movement without second hand	E008-005101	E008-005102	E008-005103
For clock-movement with second hand	E008-005001	E008-005002	E008-005003

Hanger:

E001-06480

Rubber Washer:

E027-04160 3.0 thickness
E027-04130 0.2 thickness

Hour Hand Bush:

E007-07280

Loudspeaker:

A 29 mm diameter speaker can be integrated to the movement.
A 50 mm diameter speaker can be mounted with a plastic retaining ring at the back of the movement.
A 66 mm diameter speaker can be supplied with a metal ring attached to the movement.
A 77 mm speaker can be supplied with a plastic retaining ring attached to the movement.

Technical Data:

Maximum permissible pendulum weight:
120 g
Maximum pendulum length:
800 mm
Minimum permissible spacing between iron parts of pendulum magnet:
8 mm
Permissible hand sizes:

	min	sec
Length	≤ 160	≤ 80 mm
Weight	≤ 8	≤ 2 g
Unbalance	≤ 6	≤ 0.2 gcm

Additional accessory information available upon request.

Hermle

Section 4

Servicing Electronic 400 Day Clocks

GROUP 18 ELECTRONIC ANNIVERSARY CLOCKS

1. Open the battery cover and use a flat tool such as a knife blade or tweezer handle to remove the back cover. Insert the tool between the case cover (1.1) and the back part of the case (1.2), pressing slightly forward towards the dial as shown in Diagram 1.

2. The pendulum spring (2.1) is illustrated in Diagram 2. The spring has an upper block (2.2) and a lower block (2.3). A shifting pin (2.4) is located in the middle of the spring.

3. The lower block (2.3) snaps into the pendulum receptacle (3.1) as illustrated in Diagram 3.

4. Remove the pendulum unit (3.1) and the damaged suspension spring (2.1). Use a small screwdriver (3.3) to separate the lower suspension block (2.3) from the pendulum receptacle as shown in Diagram 3.

5. Install the new E-021-02823 pendulum suspension spring. Press the bottom block of the new spring into the receptacle in the pendulum unit. It should snap into place and the block should be flush with the top of the pendulum when it has been correctly installed.

6. Guide the suspension spring through the round opening in the bottom of the case and fasten it in position where the original was located (2.5).

7. Insure that the shifting pin (2.4) is sitting to the left of the star wheel (2.6) and the movement lever (2.7). The star wheel must be capable of moving the shifting pin (2.4) and movement lever (2.7) to the left when the movement is running.

8. Replace the back cover by placing the bottom part (1.4) into the case opening (1.3) and pressing it back into the original position.

Diagram 1

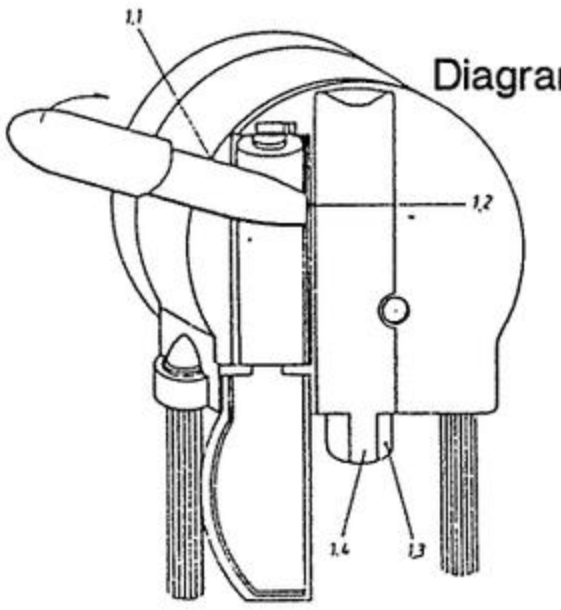


Diagram 2

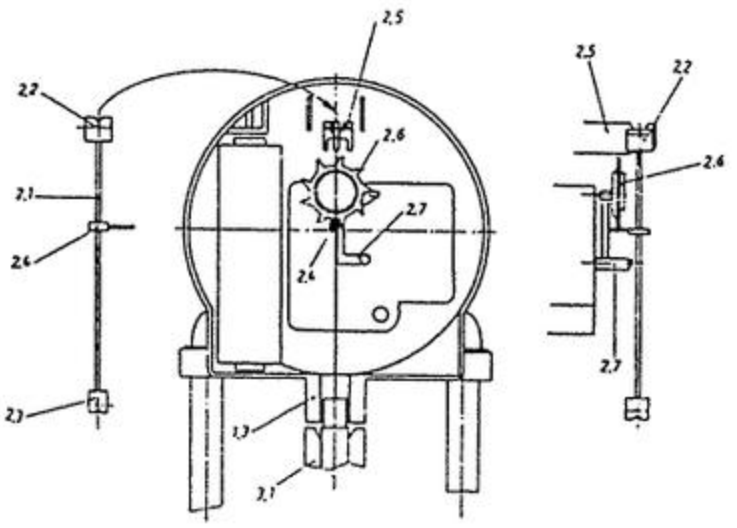
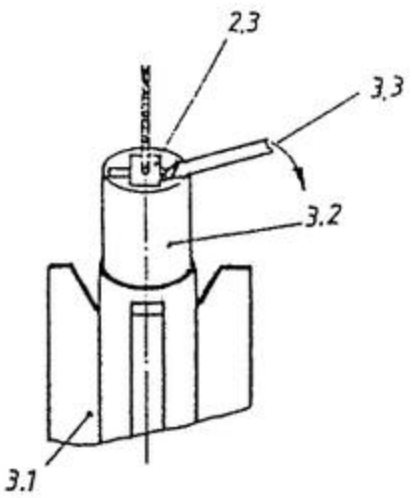


Diagram 3



Hermle

Servicing Electronic 400 Day Clocks

MODEL 84 ELECTRONIC ANNIVERSARY CLOCKS

CHANGING THE PENDULUM SPRING

1. Use a sharp knife to remove the back cover. Place the point of the knife between the case (1.1) and the back cover (1.2) to a depth of approximately 3 mm. Twist the knife to separate the back cover from the case. The cover can be removed and set aside.

2. The pendulum wire can be seen once the cover has been removed. It is a bronze wire (2.1) with a top block (2.2), an activating pin (2.4) and a bottom block (2.3).

3. Remove the damaged suspension spring from the slot that supports it (2.5). Place a new suspension spring (E021-02833) in the slot shown at (2.5). Be sure that the pin (2.4) is positioned to the left of the star wheel (2.6) and the movement stop lever (2.7). The star wheel must be able to turn easily to move the activating pin (2.4) to the left.

4. Hook the lower block (2.3) to the pendulum. When this has been completed, place the back cover in its original position and snap it in place.

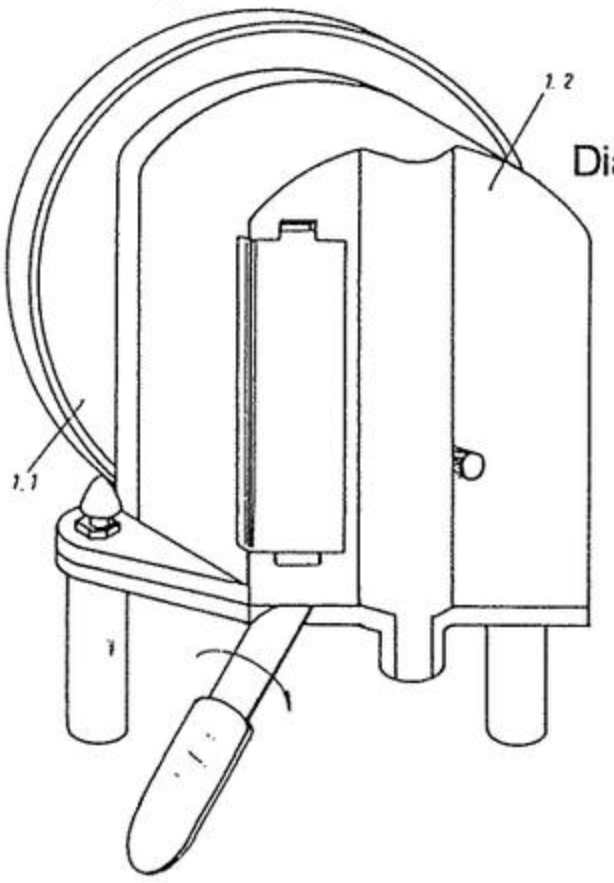
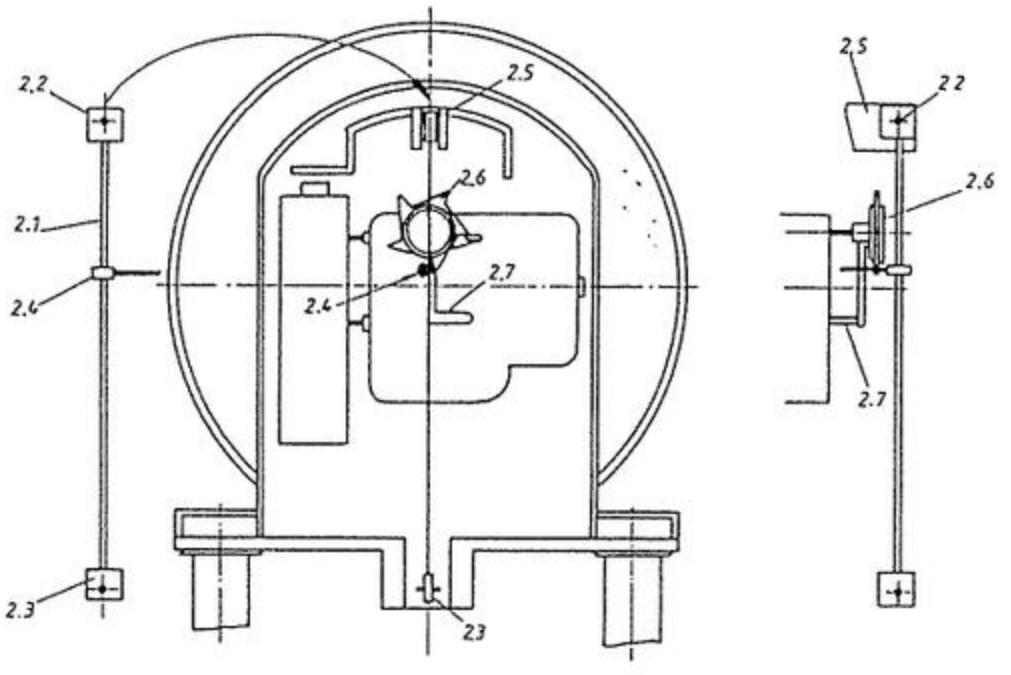


Diagram 1

Diagram 2



Hermle

CHAPTER IX

SERVICE

Hermle

PART A

Service Work In The Home

Each major clock manufacturer will have their own ideas on how they expect service technicians to represent them when doing work in the customer's home. Most competent service technicians will inquire if the companies they represent have published any information on this topic in addition to their technical service manuals. In many cases a letter or the cost of a telephone call will prove to be a good investment if detailed information on this subject can be obtained.

Each service technician has his own way of working. In most cases it is advantageous to educate the customer in every aspect of the service work that they care to become involved in. The more the customer understands about what is being accomplished, the more appreciation they will have for the skill of the person doing the work. Very few customers have the ability to successfully apply what they learn from watching a service technician, so there is little chance that future business will be lost from allowing an interested clock owner to watch the work being performed.

Before removing the movement from the case it is a good idea to study the parts behind the dial and to understand how the hands are secured to the clock. The hand nut can be removed with a nutdriver of the appropriate size or with a pair of pliers with smooth jaws. Care **must** be taken not to scratch the nut or the finish on the hands during this process. The hands can then be removed from the clock with the fingers. It is a good idea to carry a small box to place these in as the customer will not be impressed if these parts are not taken care of properly.

Different clock manufacturers use a variety of methods to mount the dial and movement in the case. Most major manufacturers mount the movement on a seatboard and the movement may or may not be attached to the dial. In those instances when they are installed separately, the dial is sometimes attached to the case rather than to the movement. On other occasions, the dial will be attached to the movement with four or more pillar posts which are secured to the front plate of the movement with tapered pins or a suitable locking device. The mounting arrangement can usually be seen quite readily through the side openings or from the back of the clock case once it has been opened. When servicing some models of clocks sold as kits the service technician can expect to find the movement and dial attached to a framework that allows the complete assembly to be removed as a unit.

If the clock has a moon dial or other special features, study how these are mounted. These mechanisms are not complicated and it is fairly easy to determine how to remove and reinstall the movement without disrupting their ability to function correctly. If the clock has special shutoff features or control levers that protrude through the dial special planning may be required to insure they will be capable of functioning correctly when the clock is reassembled.

The pendulum and weights should be removed and placed on a suitable cloth spread on the floor. A large clean cloth with a soft texture should be carried for this purpose. As these parts are always visible to the customer, he/she will not be favorably impressed if they are not properly protected from scratches. Clean cloth gloves should be worn during this process.

As a general rule Hermle floor clock movements will be mounted on a seatboard. Several manufacturers use screws with knurled heads or combination nutdriver/screwdriver heads. These

screws usually extend through the slot cut to accommodate the chains or cables that power the movement. A small metal plate that the screw passes through usually rests on the underside of the seatboard and allows the movement to be drawn down securely. Once the hands have been taken off, these screws can be removed from the movement. As with the hands, these parts should be secured in a suitable container and placed where they will be readily available when the clock is reassembled.

The path by which the movement will be removed from the case will have been determined by the clock manufacturer. Some case designs allow the movement to be removed through the side panel openings. Sometimes the chime rods will allow the movement to pass by them without being removed. In other instances the chime rods will have to be removed before the movement can pass through the opening in the side of the clock case. On other occasions, the case manufacturer may have intended for the movement to be removed through a panel on the back of the clock. As if these were not enough variations, some clock manufacturers have designed their cases so the movement can be removed from the front of the case when a frame that secures the dial in place has been removed. It is sometimes helpful to carry a pair of sponge rubber pads and a few rubber bands to silence the chime rods when the movement is being removed. Although no damage is being done, loud noises that the customer does not totally understand can sometimes be distressing.

Once the movement has been serviced or repaired it can be installed in the clock base. If the chime rods have remained in place it is often helpful to hold all of the chime hammers back with rubber bands until the movement has been secured on the seatboard. This technique not only helps to pass the movement past the chime rods, but keeps the hammers from making noise while the movement is being secured in place.

Once the weights and pendulum have been installed, the clock can be leveled and prepared for timing. Every effort should be made to stabilize the clock, especially if it has been placed on a rug with a thick pad under it. If the clock case is not stable, the movement will not be able to sustain itself and render reliable timekeeping service.

If electronic timing instruments are used to adjust the rate of the clock, explain them to the customer. It is well worth while to use these instruments to demonstrate how little actual movement the rating nut requires to make a significant change in amount of time the clock will gain or lose during a specified period of time. This step will often save an unpaid return visit because the customer has mistakenly moved the rating nut well beyond the location where it should be for the clock to deliver accurate timekeeping service.

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PART B

Installing Movements in Cases

There are several things that must be taken into consideration when placing the movement in the case. Although this may not seem important, the way a movement is installed will often determine how well it will run. In some instances the movement may be in perfect condition, but unable to function because it was not cased correctly.

The movement must be stable. All screws supplied with the movement should be used. All screw holes in the mounting fixtures should have a screw placed in them whenever it is practical to do so.

Refrain from overstressing mounting screws. If these protrude through a seatboard, they should be tightened down so the movement is restrained, but not so tightly that the pillar posts are bent.

Insure that chains or cables are not binding or coming in contact with the seatboard. Any obstruction to the chains hanging straight down can result in the links disengaging from the sprocket teeth on the great wheel.

Insure that the handshaft is clear of the aperture in the dial. Excess friction against the tube that carries the hour hand can cause problems in timekeeping and may affect the ability of the clock to sustain itself.

Insure that the movement is installed at a right angle to the dial. In extreme cases the minute hand can come in contact with the dial when the movement is not properly aligned.

If special features such as moon dials are affixed to the movement, insure that they are not in contact with case members. Any interference with these items will cause excess friction and affect the ability of the clock to sustain itself.

Insure that the pendulum leader is free of the seatboard. Any contact at this point will adversely affect the ability of the clock to sustain itself.

If a new replacement movement is being installed, time can be saved by making a template of the screw hole locations in the mounting brackets while they are still attached to the old movement. This template can be used to position the mounting brackets on the new movement.

Check to insure the weights can pass by the lower door frame of the case. The click on an outside great wheel can be released and the weight lowered to make this check.

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PART C

Trouble Shooting

A QUICK REFERENCE TROUBLE SHOOTING GUIDE

The pendulum wobbles

This is probably the result of a damaged suspension spring.

The pendulum moves from front to rear

The crutch slot probably does not lie at a right angle to the plate and should be adjusted.

The pendulum has a low amplitude all the time

There is probably excess friction in the train, escapement or suspension system. Check to insure the suspension leader is centered in the slot from front to rear. If this is free check for wear or gummy oil on the pallets.

The pendulum has a low amplitude right before each quarter

There may be excessive friction in the system that activates the chime train. The spring tension may be too tight on the lever that rides on the cam affixed to the hand shaft. There may be excessive friction caused by wear or a loss of lubrication on the sliding surfaces that lift the levers to unlock the train as it moves to the warning mode.

The movement continues to chime or strike

Something is failing to lock correctly. Check to insure the levers can fall into place freely. If someone else has worked on the clock before, check to insure that the shut off mechanisms are timed correctly.

The clock will not strike

First, check the position the customer has the strike lever in. Next, check for causes of friction such as wear or gummy oil.

A weight drops without restraint

If the chain has been installed correctly, check to insure that the click and the click spring are in good operating condition.

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INDEX