LONGINES-WITTNAUER

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RESERVE POWER INDICATOR

LeCOULTRE CALIBER 481

There are numerous devices for recording the amount of mainspring power stored in the barrel. They were employed very early in the marine chronometer and later in the accurate, railroad-type pocket timepiece. Now they perform a useful service in the self-winding watch.

The principle of every such device is that when the mainspring is wound through the ratchet, manually or automatically, a special train of gears connected to the ratchet moves an indicator across a graduated dial showing the extent of this winding. The barrel teeth, too, are connected to the same train so that when it utilizes the mainspring's power, this same train is made to reverse itself and the indicator hand moves in the opposite direction.

Most of these types of reserve-power indicating devices are designed so that the ratchet moves the indicator in one direction, while the barrel, going also in the same direction as the ratchet, influences the indicator in the opposite direction. This is done most often by introducing an additional gear between the ratchet and the indicator train. These units are composed of a system known as differential gearing (a series of gears connected to different power sources, permitting the different speeds of each source to influence the same axle, such as the post upon which an indicator hand might be fitted). An automobile uses a similar system so that each rear wheel may be turned at different speeds as when making a sharp turn or maneuvering for parking.

In figure 1 is the system used by the LeCoultre Calibre 481. This has an ingenious yet simple differential device to show the power stored by the self-winding or the manually wound mainspring.

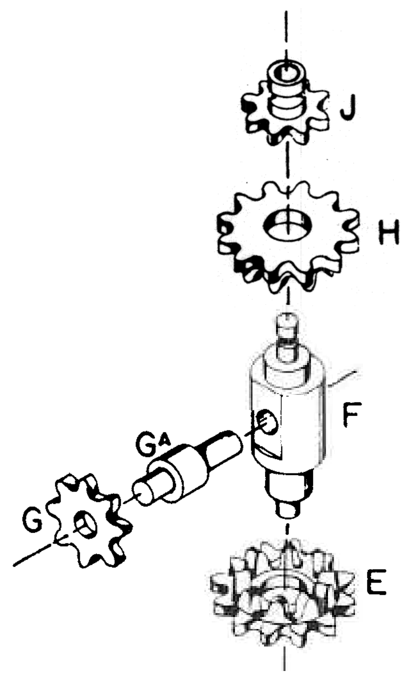


Figure 1—Exploded, schematic view of the differential for reserve power indicator such as used with the LeCoultre Cal. 481.

This view shows the scheme of the differential in exploded section. The differential axle *F* (also called a satellite spindle) pivots freely between the upper and lower plates of the movement. The upper differential gear *H* and the lower gear *E* are free to turn on shoulders of the differential axle. Both wheels *H* and *E* have dual sets of radial and crown teeth. The differential pinion *G* is mounted on the shoulder of the cross-arbor *GA* and is free to turn on this arbor. The top pivot of *F*, with its notch, extends up through the dial plate, and the driving pinion *J* snaps onto this pivot like a cannon pinion.

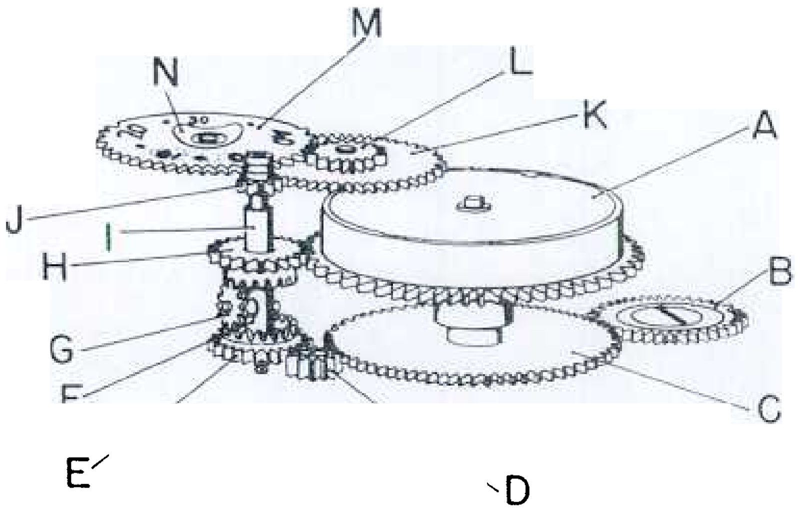


Figure 2—Looking at the differential as it is geared to the barrel and the ratchet wheel from the dial-up position. Parts *K, L, M, N* are fitted to this unit above the dial plate but under the regular dial.

Figure 2 shows the differential as assembled to the winding mechanism, in the dial-up position. *A* is the mainspring barrel whose teeth are enmeshed with the satellite wheel *H* of the differential. The ratchet wheel *C*, wound either manually through the crown wheel *B* or through the self-winding train, is engaged with the reversing pinion *D* which serves to change the direction of the wheel *E* when the ratchet is the motivating factor. The differential pinion *G* is shown mounted on its cross arbor and enmeshed with the crown teeth of both the lower and upper satellite wheels *H* and *E*. The driving pinion *J* is shown here snapped into place under the regular dial; this drives the intermediate wheel *K*, and the pinion *L* is enmeshed with the dial-disk *M*. The dial-disk is kept in place under the dial by its dial washer *N*. The dial-disk *M* has teeth cut only partially around its circumference. Its uncut portions serve to indicate the outer limits of the winding range.

Figure 3 shows the action when the ratchet wheel, wound manually or by the automatic train, winds faster than the barrel can unwind. Here, the ratchet *C*, moving counterclockwise (in the dial-up position), rotates the reversing pinion *D* in the clockwise direction, which in turn moves the satellite wheel *E* in the counterclockwise direction. The differential pinion *G* is turned downward in the direction of the arrow by the crown teeth of wheel *E*. Since this pinion *G* is also geared to the crown teeth of wheel *H* and this upper wheel cannot move because it is geared to the comparatively motionless barrel, the differential pinion *G* will have to roll around it as shown at *F*. The cross-arbor of pinion *G* thus causes the differential axle *F* to turn counterclockwise. The driving pinion *J*, clutch-tight on the protruding pivot of axle *F*, is also carried counterclockwise. This causes the intermediate wheel *K* to turn clockwise and its pinion thus turns the indicator disk in the counterclockwise direction so that the numbers on this disk, showing the amount of running time in the barrel's power, grow progressively greater. Notice that the portion of this disk from 10 to 0 is shaded, usually in red. This is to notify the wearer that there is not much action remaining in the barrel.

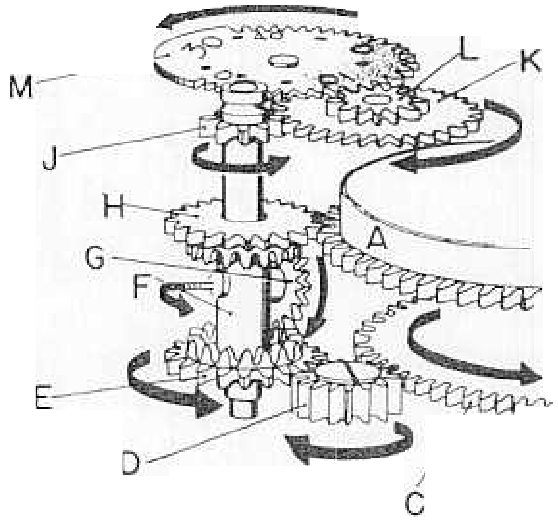


Figure 3—Showing the action of the indicator mechanism when the winding of the ratchet takes place. Follow the action starting from the ratchet *C*, and continue up through the reverser *D*, the lower satellite wheel *E*, the differential pinion *G*, the axle *F*, the (cannon) driving pinion *J*, the intermediate wheel *K* and the dial-disk *M*. The upper satellite wheel *H* and the barrel *A* are considered as motionless in this sequence.

The schematic drawing in Figure 4 shows the sequence when the winding is not in action, but the barrel and mainspring are now being unwound. The barrel *A* is moving in the counterclockwise direction. The barrel teeth cause the satellite wheel *H* to turn clockwise, and its crown teeth, engaged with the differential pinion *G*, cause this to turn upwards or counterclockwise. Because the lower satellite wheel *E* cannot move with the pinion *G* as it is connected to the reverser pinion *D* and the ratchet *C*, the differential pinion *G* must therefore roll around the wheel *E*, carried along by the upper satellite wheel *H* and turning with it.

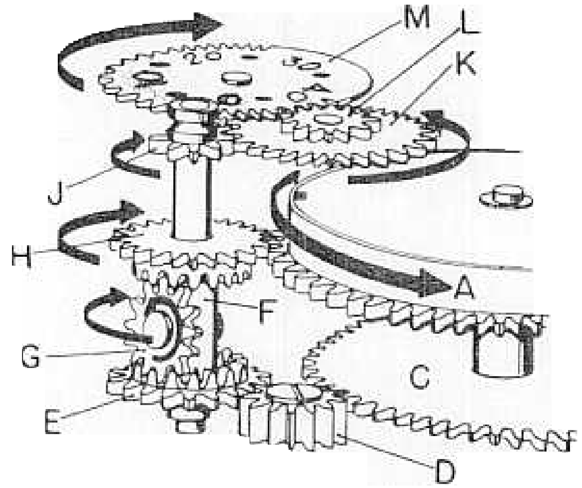


Figure 4—This figure shows the action and direction of the differential parts when the winding is motionless but the barrel and mainspring are unwinding. Follow this sequence from the barrel *A* through the upper satellite wheel *H* to the differential pinion *G*, the differential axle *F*, the driving pinion *J*, the intermediate wheel and pinion *K* and finally to the dial-disk *M*. Notice that in this figure the last of the teeth of the disk *M* are against the pinion *L* of the intermediate wheel. Any further action of the unwinding will cause the axle *F* to slip-clutch with the driving pinion *J*.

Since the differential pinion *G* is attached to the cross-arbor which is part of the differential axle *F*, the axle *F* turns in the clockwise direction as shown by the arrow. The driving pinion *J* turns with this axle and moves the intermediate wheel *K* and its pinion in the counterclockwise direction. The pinion *L* thus turns the dial-disk in the clockwise direction so that the numbers, shown through the regular dial's aperture, become regressively smaller.

In this illustration, the dial-disk *M* is shown enmeshed with the pinion *L* of the intermediate wheel *K*, so that the dial-disk's teeth are locked at the point where the rim of this disk ceases to have teeth. The aperture will then show *O*, indicating that the watch should either be worn or wound manually.

As with other watches using a "cannon-pinion" type of driving pinion like pinion *J*, should its clam-notch require tightening, this should be done in moderation, introducing only enough friction to permit it to be carried around and still carry both the intermediate wheel and pinion and the dial-disk. Should the pinion *J* be made too tight on the axle *F*, this may cause rebounding of the balance when the maximum winding has taken place, either manually or through the automatic winding train, regardless of the slip-spring. This is because axle *F*, influenced by the tight pinion, exerts additional force on the barrel teeth through the upper satellite wheel *H*.

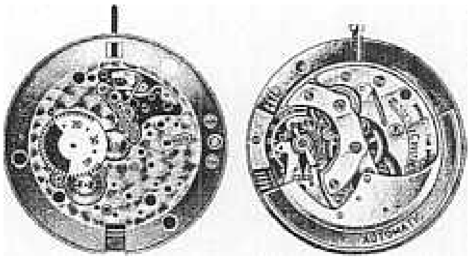
When oiling this device, use a heavier oil, such as a clock oil, at the pivots and shoulders of the axle *F* and at the bearing of *G*, and apply just a little to the crown teeth of the upper and lower satellite wheels *H* and *E*. Do not oil the snap-on part of the axle *F*. However, place a small amount of clock oil at the bearing hole of the reverser pinion *D*. Assemble as in these figures; no special position is required when positioning the disk *M*; merely wind this manually until you can feel the slip-spring take action. The disk's aperture will then read 40.

RESERVE POWER INDICATORS

Reserve Power Indicators for self-winding watches are typical of the worthwhile innovations in watch design which have been pioneered by LeCoultre. The first automatic watch with reserve power indicator was made by LeCoultre and rapidly copied by others. You, as a watchmaker familiar with LeCoultre movements and mechanical designs, will appreciate both the fine quality of LeCoultre workmanship and the practical worth of the many LeCoultre innovations.

You will be interested to know that LeCoultre is one of the few watchmakers who successfully made the transition from hand to machine manufacture. The firm was established in 1833, and early handmade LeCoultre watches, of exquisite workmanship, are treasured historic items in many collections. Antoine LeCoultre, founder of the firm, was one of the great geniuses at watchmaking. An early achievement was the generation of a pivot from a single piece of steel for which accomplishment LeCoultre was awarded a prize at the British International Exposition of 1851. In that same year, LeCoultre began the manufacture of stemwinding watches years ahead of the field.

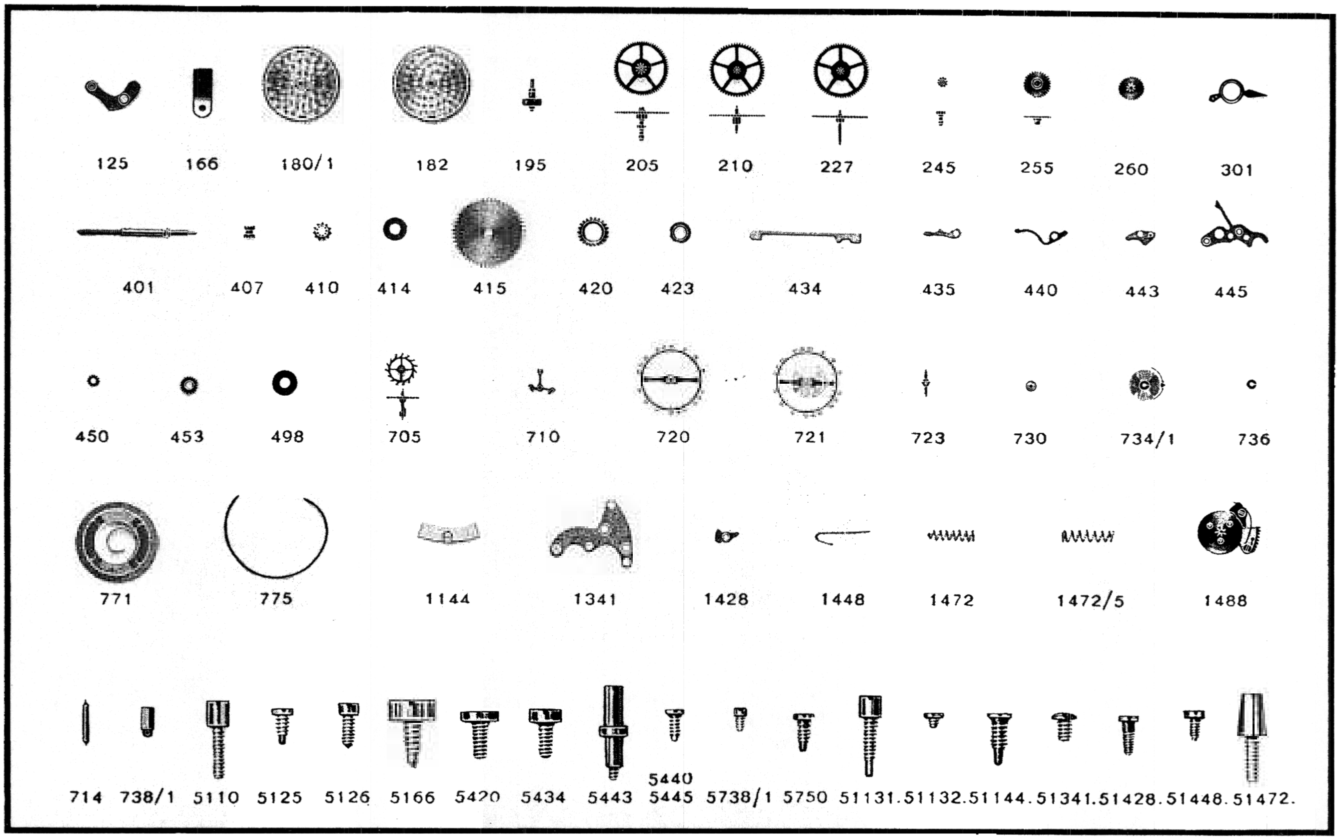
Among the sensational items now in regular production by LeCoultre are the most complicated watch, the thinnest pocket watch and the smallest wrist watches in all the world. The latter, about the size of a matchhead, has 85 perfectly formed parts and keeps remarkably good time.



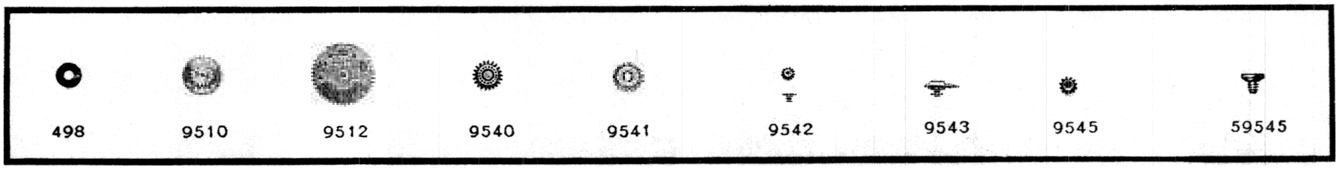
CAL. 12" - 481

BASE CAL. 12" - 476

LECOULTRE



125	Pallet cock
166	Casing clamp
180/1	Barrel complete with mainspring
182	Barrel and cover
195	Barrel arbor
205	Center wheel and pinion, drilled, with cannon pinion
210	Third wheel and pinion
227	Sweep second wheel and pinion
245	Cannon pinion with clam-notch for sweep second (mention height)
255	Hour wheel for sweep second (mention height)
260	Minute wheel
301	Regulator for flat hairspring
401	Winding stem (mention ø of threading)
407	Clutch wheel
410	Winding pinion
414	Crown wheel seat
415	Ratchet wheel
420	Crown wheel
423	Crown wheel core
434	Clicking spring
435	Yoke
440	Yoke spring
443	Setting lever
445	Setting lever spring
450	Setting wheel
453	Additional setting wheel
498	Friction washer
705	Escape wheel and pinion
710	Jewelled pallet fork and staff
714	Pallet staff
720	Balance with roller, pivoted (mention ø of jewel hole)
721	Balance with flat hairspring, regulated (mention ø of jewel hole)
723	Balance staff, pivoted
730	Roller
734/1	Flat hairspring, regulated, triangular stud
736	Collet for flat hairspring
738/1	Triangular stud for flat hairspring
771	Mainspring with brake spring
775	Brake spring
1144	Banking stop
1341	Oscillating weight bearing
1428	Stop click
1448	Stop click spring
1472	Banking stop spring (weight)
1472/5	Banking stop spring (bridge)
1488	Pawl winding wheel
5110	Bridge screw
5125	Pallet cock screw
5126	Center wheel cock screw
5166	Casing-clamp screw
5420	Crown wheel screw
5434	Clicking spring screw
5443	Setting lever screw
5440-5445	Yoke spring and setting lever spring screw
5738/1	Triangular stud screw
5750	Dial screw
51131	Screw for oscillating weight upper bridge
51132	Screw for oscillating weight lower bridge
51144	Banking stop screw
51341	Oscillating weight bearing screw
51428	Stop click screw
51448	Stop click spring screw
51472	Banking stop spring screw
605	Jewel for third wheel, upper
606	Jewel for third wheel, lower
612	Jewel for sweep second wheel, upper
615-616	Jewel for escape wheel, upper and lower
620-621	Jewel for pallet staff, upper and lower
1641	Jewel for oscillating weight, upper
1642	Jewel for oscillating weight, lower
1628	Jewel for pawl winding wheel, upper
1679	Bushing for pawl winding wheel, lower



498	Friction washer
9510	Driving runner for indicator wheel
9512	Indicator wheel
9540	Upper satellite wheel
9541	Lower satellite wheel
9542	Satellite pinion
9543	Satellite spindle
9545	Intermediate connecting wheel for upper satellite wheel
59545	Screw for intermediate connecting wheel for upper satellite wheel