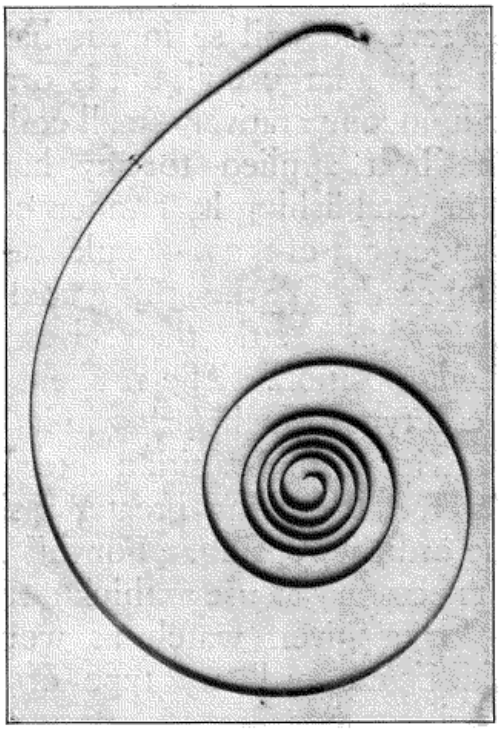
HE ELGIN SERVICE BUREAU BULLETIN

Subject:
Mainsprings

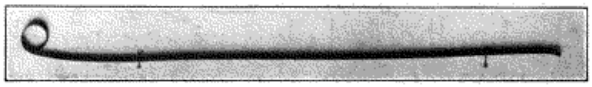
Issued by the
Elgin National Watch Company
Elgin, Illinois, U. S. A.

MISSING PAGES

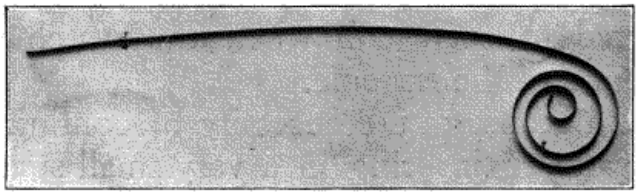
This copy of the Mainspring Service Bulletin is missing the front cover and the first two pages (one sheet of paper). I have reconstructed the front cover, but I do not know what was on the first two pages. I suspect that the first page was an introduction that basically said that "mainsprings are important". The second page I'm not so sure about. My guess is that it starts discussion how mainsprings are made. Maybe one day I will find a complete copy of this bulletin.



Ordinary type of spring



Ordinary type of spring ready for coiling after tempering



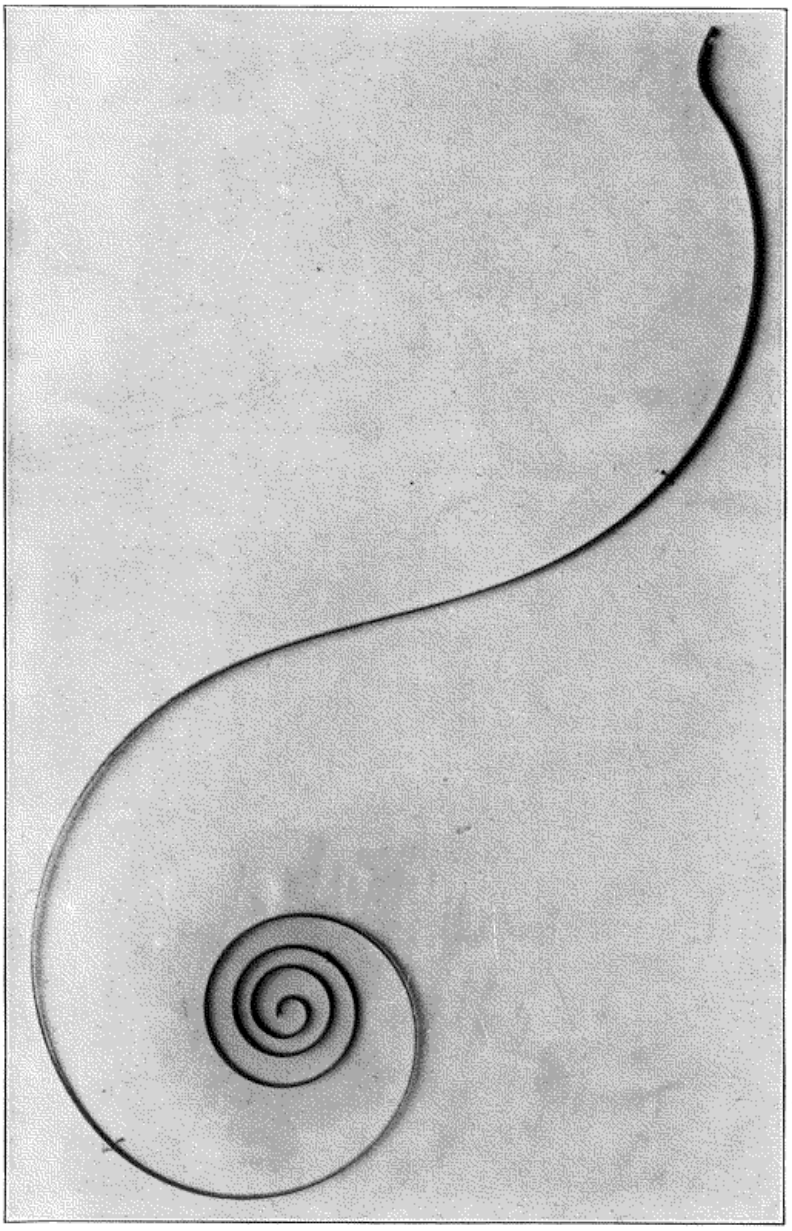
Ordinary type of spring partially coiled after tempering

The resilient, or more properly speaking, the reversed coil spring, is hardened straight or in a large coil, but is drawn to temper in a comparatively small coil.

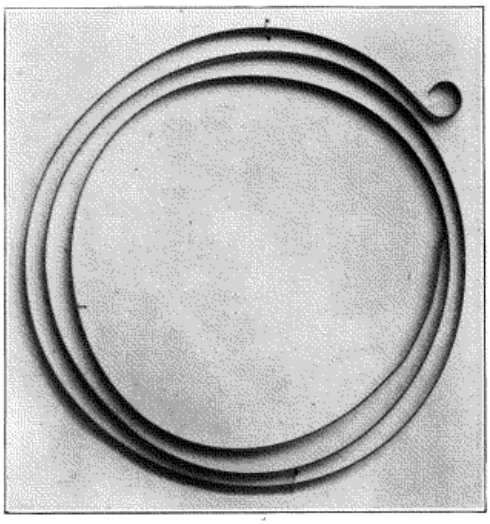
The heat applied to any hardened spring in establishing its temper changes the arrangement of the molecules of which it is composed. As the spring cools these minute particles settle themselves into a permanent position. The resilient or reversed coil type of mainspring in its efforts to resume its normal position after having been reversed develops greater resiliency than the ordinary spring. For this reason it is not necessary to use as thick a resilient spring for a given watch as would be required if the ordinary type of spring were used.

In the process of manufacturing the mainspring the end of the inner coil must be annealed for a short distance so that the barrel arbor hook hole may be punched; at the point where this annealing stops is a brittle spot and the spring is apt to break at this point if kinked. A kink in the innermost coil is liable to be transferred to each coil when the watch is wound to the extreme.

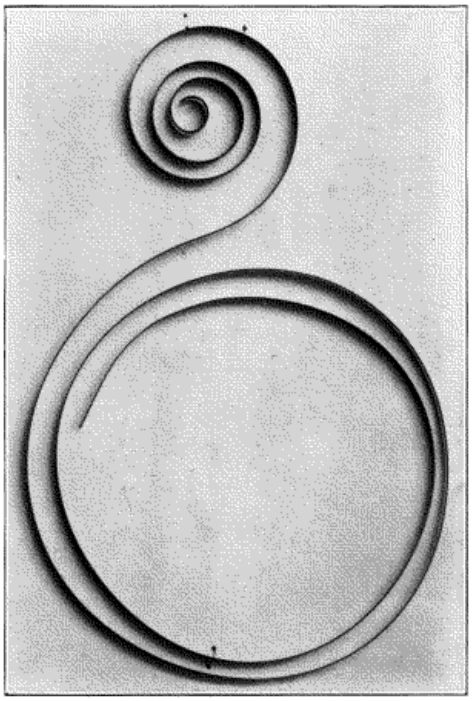
Because of the necessity of confining a watch mainspring in a very small space



Resilient type of spring



Resilient spring ready for reversing



Resilient spring partially reversed

it is always under a strain. That this strain may not be greater than is absolutely necessary, it is desirable that the spring be placed in the watch barrel so that its naturally curved coils are disturbed as little as possible.

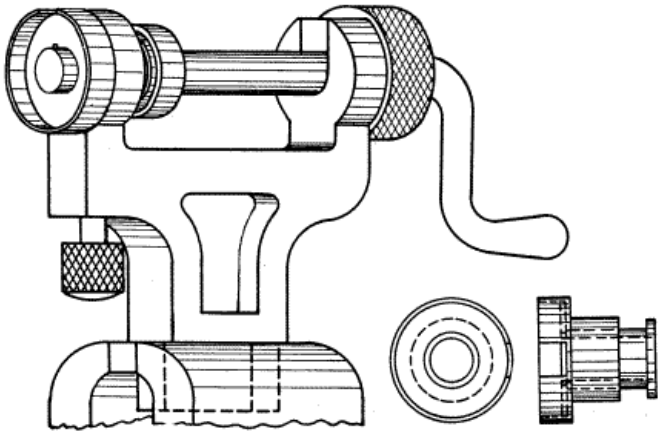
The proper placing of mainsprings in the watch barrel will greatly reduce breakage, and the initial investment in suitable tools for doing this work, together with care in using, will prove in the long run an economy.

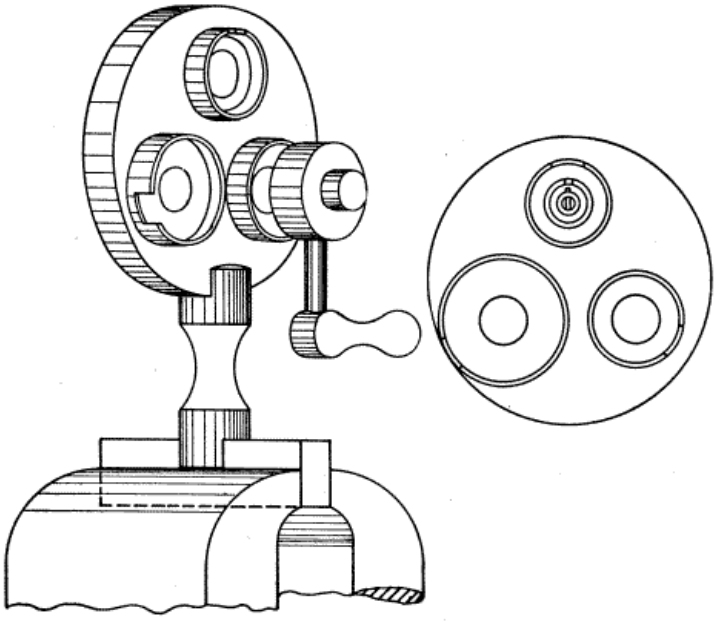
TOOLS

The tools necessary are a good mainspring winder and a pair of plyers of the correct form for shaping the innermost coil of the spring. A gauge for measuring the width and thickness of springs accurately is also necessary.

WINDERS

Winders should have several sizes of barrels to suit different size watches; also different arbors of sizes as near as possible to the watch barrel arbors that the springs are to be used in connection with. On the following page are illustrations of two different forms of mainspring winders arranged with different sized barrels and arbors. Both forms are excellent and may be had from tool and material dealers.

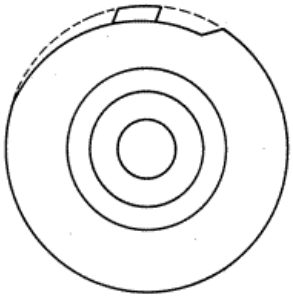




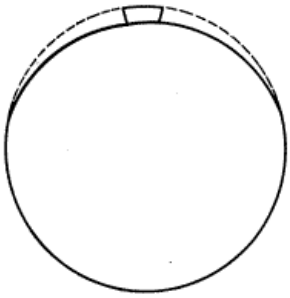
ARBORS

The hook of the winder arbor should not exceed in length the thickness of the spring to be wound upon it, and the end of the hook should conform to the arc of the arbor. The ideal arbor to wind a mainspring upon is the snailed barrel arbor of the type usually used in watches of domestic manufacture. As a mainspring winder arbor snailed in one direction from the hook is not practical to use for winding all springs, the winder arbor should be snailed in each direction from the hook.

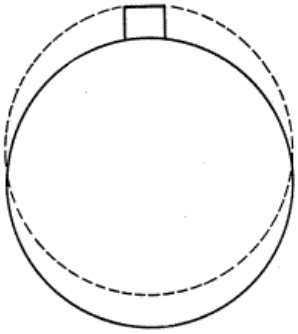
The dotted lines in the illustrations on the following page represent the completed circle of the arbor in its relation to the end of the hook and it will be observed that a spring may be wound either on the barrel arbor or mainspring winder arbor of correct design without cramping or kinking. If wound on the winder arbor of incorrect design the long hook with square corners is almost sure to make a kink, which is very apt to cause the breaking of the spring, either on the winder or soon after placing in the watch.



Snailed arbor as used in watches of domestic manufacture



Mainspring winder arbor correctly designed



Mainspring winder arbor of faulty design

MAINSPRING PLIERS

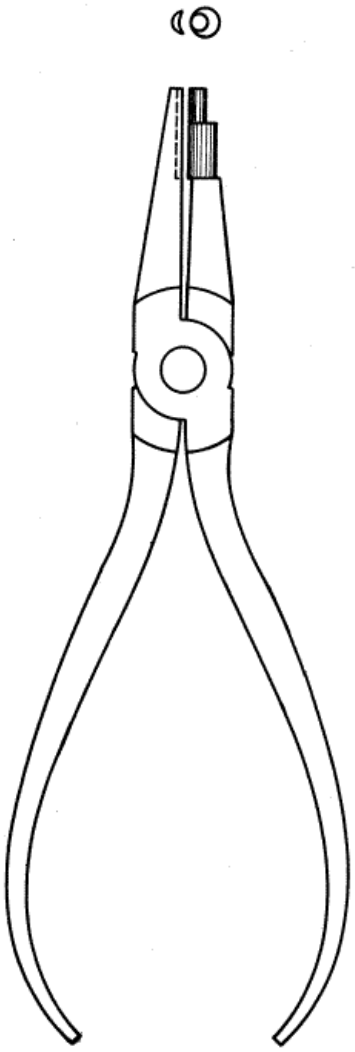
If it is necessary to shape the inner coil of spring in order to make it fit the arbor properly, the shaping should be done with a pair of mainspring pliers.

Tweezers or flat pliers are liable to make kinks and should by all means be avoided in shaping the innermost coil.

GAUGES

In selecting springs for a particular movement for the purpose of comparison the mainspring gauge with notches on its edge for width and with steel slot for thickness may be used. In this type of gauge the slot for measuring the thickness of spring soon becomes worn and is not reliable as a standard to order by. We have examined and tried many of these gauges and both new and old usually show considerable variation at a given point on the scale.

The micrometer caliper in common use by machinists is the most reliable tool for gauging mainsprings, either for width or thickness. It is made to read to the .001 (one thousandth) part of an inch or finer if desired, and may also be had with



Mainspring Pliers

metric divisions. The micrometer caliper with rachet stop is the best type, as the amount of pressure applied in gauging is governed by this device.

SELECTING AND PLACING SPRINGS

In selecting a spring for a particular watch, do not be guided entirely by the old spring, as it may not be of correct dimensions. Break off a short piece from the old spring and try it in the watch barrel and if the upper edge comes a little below the barrel cap shoulder, it is of correct width. If the movement has been running for some time, the chances are that a lighter spring than that which was originally used will answer. Always use as thin a spring as possible consistent with its being strong enough to keep a balance wheel up to a good motion, as the thinner the spring the less liable it is to break or set. The spring should occupy about one-third of the inside diameter of the watch barrel.

When winding a spring on the winder

arbor, do not wind it any further than is necessary to draw it into the winder barrel.

Avoid pressing on the edge of spring with fingers any more than is needful to hold it in the winder barrel—this is important, as too much pressure is liable to distort the coils. The fingers that hold spring in winder barrel when winding should be covered with chamois skin cots. The winding should be done slowly to permit the spring to settle itself into its new confined position gradually.

When the winder arbor is released do not permit it to fly back quickly, as in so doing the hook is apt to strike the end of the innermost coil and cause a kink. In transferring the spring from the winder barrel to watch barrel care should be used so that neither the barrel hook or mainspring brace is damaged. Attention to this point will prevent the spring slipping in the watch barrel.

After the spring is placed in the barrel, before placing the cap, enough good watch oil should be applied to the edges of the spring so that the whole surface has a thin film of oil. Careful oiling

serves the purpose of reducing friction and preventing rust.

In winding a watch the first time after placing a new spring, do not wind it all the way up at once, but do it gradually which will help the spring to adjust itself to the new condition.

CLEANING

In cleaning springs, soak the oil off in benzine and dry in sawdust or with tissue paper. If the drying is done in sawdust, be sure that every particle of dust is removed before placing it in the barrel. If the tissue paper is used for drying, do not straighten the spring by drawing through the fingers, but have the fingers with tissue in them follow the natural curves of the spring.

KINKS

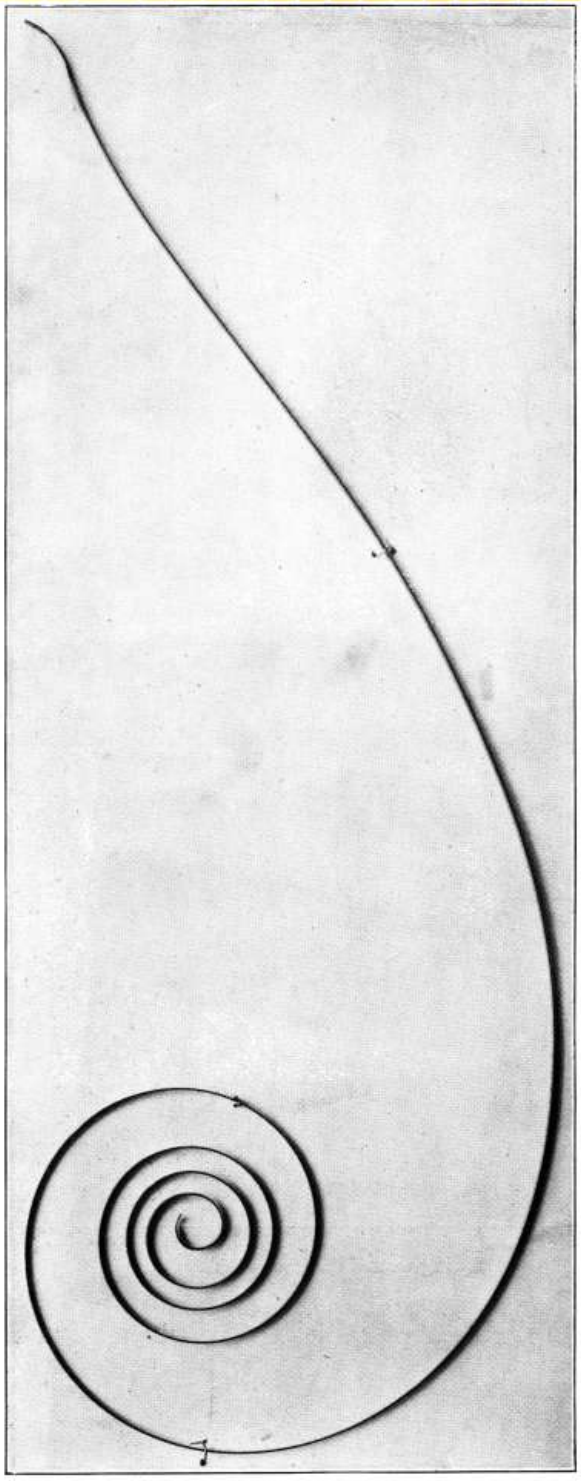
The kinking of a watch mainspring at any stage of its manufacture after tempering or after it is a finished product changes its physical structure at that point and weakens the spring. This may easily

be demonstrated in the following manner: Take a small piece (a few inches will suffice) of a broken mainspring and bend it into a circle, decreasing the size of the circle until the spring breaks. With a pair of flat-nosed pliers bend this freshly broken end shortly just beyond the break and it will be found to be quite brittle. Now bend the piece an inch or more from the end and it will be found comparatively tough.

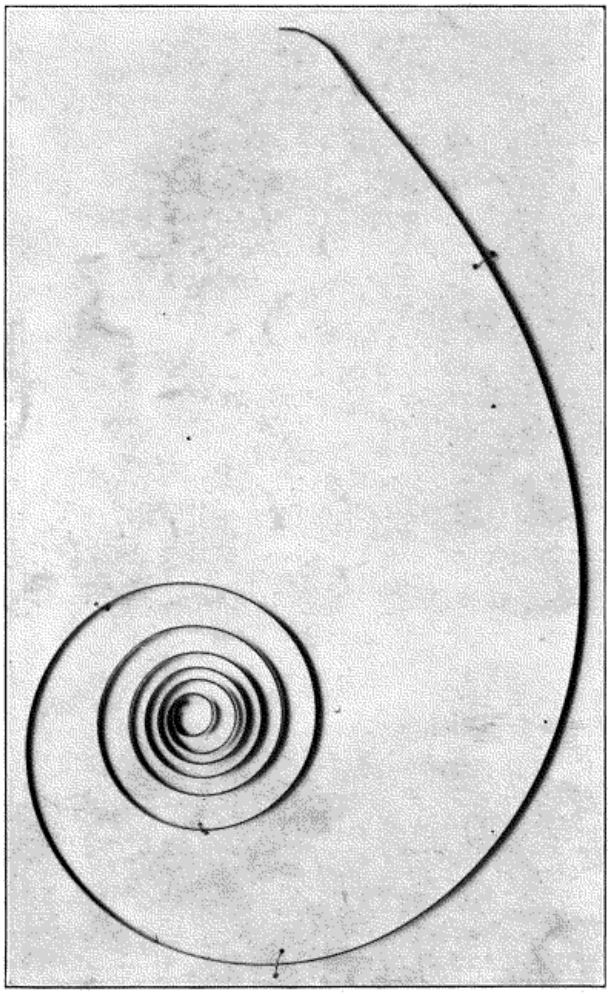
The bending in the first instance destroyed the elasticity and then caused the break and also changed the molecular arrangement in both directions for a short distance from the break.

The following illustrations are of springs from the same lot. The first one was wound up tight on a correct winder arbor and the other on a winder arbor that was smaller in diameter and had a hook that was too long.

The inner coils of the second spring are much more confined than are those of the first spring and also are kinked. The



Spring wound on correct arbor



Spring wound on arbor of faulty design

value of this spring has been greatly reduced because of a strain having been applied to it that it would not receive on the watch barrel arbor designed for it.

A spring should never be wound on a winder with an arbor smaller in diameter than that of the barrel arbor of the watch in which it is to be used.

Placing a spring in the watch barrel with the fingers is very apt to cause kinks, rust, damage to the edge of the spring and cupping. These, with the exception of cupping, are the chief causes of breakage in mainsprings. The cupping increases the friction in the barrel with consequent loss of power.

RUST

Rust is one of the most common, least suspected causes of mainspring breakage. It eats its way into the steel, weakens it and finally causes a break. To prevent this trouble springs should always be kept well oiled and not exposed to the air. Many people cannot touch steel without causing it to rust, and while the handling of any steel parts with the fingers should

be avoided as much as possible. This is particularly true of mainsprings.

It is a well recognized fact that at certain periods of the year there is more mainspring breakage than at others. There seems also to be more mainspring breakage some years than others and in some localities more than in others. As the greatest mainspring breakage usually occurs during the damp and hot months, it is not unlikely that rust is responsible for a large percentage of breakage during these periods.

In closing, we wish to say that the two things most to be avoided are *kinks* and *soft mainsprings*. The first is damaging to springs of any quality and it is quite impossible to get satisfactory time results from a watch which has a soft mainspring.