Over 100 years ago, Mr. Oscar F. Forsberg, assignor to the Western Electric Company, filed a patent application for an Electromagnet on August 31, 1911; on November 17, 1914 the patent was issued (1,117,485). Today, this Electromagnet is commonly referred to as the Western Electric double coil relay.

On November 5, 1912, Mr. Forsberg, received a patent for a Coin Collector. Patent number 1,043,219 is referred today as the model 50A prepay coin collector and
incorporates the double coil relay design. In summary, his invention consists of a coin gauge, coin chute or coin channel, a coin hopper, double coil relay, associated wiring, upper and lower housing, backplate and other related parts.

While the basic electrical and mechanical function of the Western Electric (W.E.) double coil relay remained unchanged from 1912 until the introduction of the single coil relay circa 1960, there were several manufacturing changes to the relay during the 50-year period. The purpose of this article is to point out those changes to give the reader a better understanding of which relay design and configuration used in various coin collectors (as-built at the factory) during these years. This article will show the differences in the relays beginning with those used in the model 50A of 1912 through the model 223G of the late 1950s. This will help the reader to identify which W.E. double coil relay he or she has in their collection and which coin collector it would have been installed in when built at the factory.
1912

We’ll start with the prepay relay for the 50A coin collector built in 1912. This photo shows an early double coil relay and typical of that found in a 50A coin collector from 1912. The only exception is that the trigger return spring (see photo) was added in the early 1920s. This is an example where an update was added several years after the initial manufacture.
The early double coil relays used two 500 ohm coils with a minimum operating voltage of ±70. The upper operating limit of this relay is +110V. In the Coin Refund position a negative -110 volts is applied to the Tip side of the line with respect to Gnd. In the Coin Collect position a positive +110 volts is applied to the Tip side of the line with respect to ground. Several years later, the 500 ohm coils were replaced with 510 ohm coils with a minimum
operating voltage of \( \pm 60 \) volts and an upper operating limit of \( \pm 110 \) volts (all voltage is direct current).

The early relay had a design flaw. As you see in the photo below, when installed, there is practically no distance between the Coin Hopper vane pin and the back of the permanent magnet, a.k.a the “Bent Magnet”.

![Image of Coin Hopper Vane Pin and Back of the Bent Magnet]
Circa 1914

Spring Bracket Redesign

The early 1912 spring bracket, with the bent magnet installed toward the rear of the relay, was replaced with a redesigned spring bracket. As part of the redesign, the bent magnet was installed toward the front of the relay as shown in the AFTER picture below.
The new design eliminated the close tolerance between the coin hopper vane pin and the back of the bent magnet. The new spring bracket is shown, as early as 1914, installed on a similar W.E. electromagnet (relay) in a Substation Message-Register; patent number 1,162,007 filed Oct 15, 1914.

1920

A coin trigger return spring was added in the early 1920s and serves as a shock absorber in order to eliminate the possibility of false operation due to jarring according to the patent (1,545,662) filed on October 29, 1920. The trigger return spring is made of phosphor bronze. The photos below shows the patent drawing and a photo of

AFTER

REDESIGNED SPRING BRACKET

BENT MAGNET INSTALLED TOWARD FRONT
an actual trigger return spring installed on one of my relays.

P-231256 Coin trigger equipped with trigger return spring

TRIGGER RETURN SPRING

TRIGGER SPRING RIVETS

TRIGGER SPRING
Circa 1929

Sometime prior to 1929, Western Electric changed the spring bracket design again. A change was made to the spring bracket arms. The redesign offered a larger surface area for installing the armature restoring springs.
Protecting Guard for Coin Collector Relay Coil

In 1929, W.E. announced the development of a protecting guard (P-225654) for the left relay coil of No. 50 type coin collectors to protect the coil against damage in assembling the upper housing to the coin collector due to the corner of the housing in contact with the coil. The guard is made of nickel plated spring brass and slips around the left coil of the relay. It covers approximately three-quarters of the length of the coil and about two thirds of the circumference. The guard is snapped on the coil and held there under its own tension and a bent lug at the upper edge engages the slot in the spool head and prevents it from turning. The guard is shown below.
Circa 1934

The 1912, 1921 and 1929 spring brackets, previously held to the armature pivot frame by two solid brass rivets, were replaced by semi-tubular brass rivets. The semi-tubular rivets are installed in reverse direction from the solid rivets. Specifically, the semi-tubular rivet heads are visible on the front of the spring bracket whereas the solid rivets are mounted in reverse direction (the heads are not visible from the front). The relay below is dated III 34 and shows the semi-tubular rivets. This style of relay would have been used on the W.E. 161 payphones in 1934.
New coil design

In May 1935 W.E. began the manufacture of a new paper filled, green colored, coin collector coil. The saving was estimated to be $0.20 per collector. These coils were for use in both the 7-J coin collector as well as public station coin collectors. The coil protecting guard (P-225654) was not used with the new coils. The older black cloth coils were stamped 510 to represent 510 ohm resistance; however, the new coils are not stamped even though they too are 510 ohm.
These new coils would have been used in the W.E. 161 payphone relays after May 1935.

1936

The trigger return spring of the early 1920s was replaced with a round wire return spring (P248496).

This style relay would be found on a W.E. 161 payphone.
PERMANENT MAGNETS

The two styles of permanent magnets are shown below. The first style (referred to as a bent magnet) was used from 1912 through 1940. The second style (round magnet) is found in relays beginning in the early 1940s. One problem with the bent magnets was a tendency to lose magnetism over time. These magnets had to be “recharged” from time to time.
1942-1948

More changes by 1942. The previous armature with three screws on top (2 hold down and 1 center adjustment screw) was replaced with one screw. The photos below illustrate the change. In addition, the bent magnet was replaced with the round magnet. These relays were used in the 181G payphones.
1949-early 60s

The pictures below show the style of relay found in Bell System model 191G payphones, for example.

There are slight differences from the 1942 relay. First the single screw on top of the armature was replaced with two screws (not adjustable). Secondly, the armature pivot frame is split where the upper part of the coil mates with the frame. This is discussed later with photos.
These relays installed in Gray/Western Electric model 50A coin collectors.
Circa 1920 (with redesigned spring bracket; no return trigger spring)

These relays installed in late Gray/Western Electric model 50A and early 50G coin collectors
Circa 1922 with trigger return spring and redesigned spring bracket

COIL PROTECTOR AVAILABLE IN 1929

TRIGGER RETURN SPRING

REDESIGNED SPRING BRACKET

NOTE: NO TRIGGER SPRING SHOWN IN THIS VIEW

These relays installed in Gray/Western Electric model 50G coin collectors

NICKEL PLATED BRASS
Circa 1929 front view

These relays installed in Gray/Western Electric model 150G coin collectors

FRONT VIEW (CIRCA 1929) WITH COIL PROTECTOR; LATER SPRING BRACKET

COIL PROTECTOR AVAILABLE IN 1929

SPRING BRACKET DESIGN WITH LARGER SPRING MOUNTING HOLES
1929 top view

REAR VIEW (CIRCA 1929)

NICKEL PLATED BRASS

NOTE: COIL PROTECTOR NOT SHOWN IN THIS PICTURE
These relays installed in Western Electric model 161 payphones circa 1934.

Dated: III 34 along with several refurbishment dates.

Trigger return spring (early 20s style); later wire wound style not available until 1936.
DATED: 6 36

SEMI-TUBULAR BRASS RIVETS WITH RIVET HEADS ON FRONT SIDE (THIS SIDE)

NEW PAPER STYLE COILS (GREEN COLOR) BEGAN MFG MAY 1935

1936 top view

ROUND WIRE RETURN SPRING

BENT STYLE MAGNET

BRASS
ARMATURE REDESIGN (early 1940s)

The armature design was changed from 3 screws to 1 screw as shown below.
Early 1940s-1948 front view

These relays installed in Bell System model 181G payphones

Early 1940s-1948 top view
Early 1940s-1948 rear view

1949 Armature pivot frame redesign & Armature

1912-1948 no split in armature pivot frame

1949 to early 60s split in armature pivot frame
These relays installed in Bell System model 191G payphones (for example)
1949 to early 60s rear view
Two contact spring assembly P-145641 used on P-145749 model relays (1912-early 60s)
Three contact spring assembly PP-36410 used on P-145749 relays for the Gray No. 76 and the Gray/Western 50S; both Canadian. Shown in George Long’s patent 1,383,472 (filed May 1920 and issued July 1921) for an Automatic Electric Pay Station, the telephone is normally inoperative, the transmitter and dial being shunted by a circuit which passes through an additional pair of contacts in the relay spring assembly. When the coin trigger lever falls it causes these contacts to become separated, thus removing the shunt and placing the dial and transmitter in the telephone circuit.
D-96590 Dial Shorting Relay, 3-Spring contacts

Outer ground contact spring

INNER GROUND CONTACT SPRING

DIAL SHORTING SPRING

NOTE: This assembly is designed differently than the above PP-35410

THIS RELAY DATED
2 50

TWO SOLDER CONTACTS AND ONE SCREW CONTACT
P-10C117 Dial Shorting Relay, 4-Spring contacts (late 50s early 60s)

This relay installed in Bell System model 223H, for example.

DIAL SHORTING SPRINGS

GROUND CONTACT SPRINGS

ONE SCREW AND THREE SOLDER CONNECTIONS; THIS RELAY WAS REFURBISHED IN 1957 (57R) AND THEN AGAIN IN 1961 (361R)
Relay mounting plate

The relay mounting plate rust resistant coating (gray) color (1912 to 1948) changed circa 1949 to a gold/yellow color.

AS-BUILT versus REFURBISHED RELAYS

This article identifies relays in their as-built configuration (factory built) for various years from 1912 through the early 1960s. Some relays were sent back for refurbishment over the years for repair, adjustment,
updating etc. Therefore, your relay may not reflect the factory as-built configuration.

Parts illustration of circa 1929 relay

![Diagram of a relay](image-url)
RECOMMENDED READING

I highly recommend you read Mr. Stan Schreier’s article titled, “Understanding the Western Electric Double Coin Relay” at:
http://www.antiquetelephonehistory.com/coinrelay.php

Mr. Schreier provides a detailed, easy-to-understand, explanation regarding the operation of the double coil relay. A fantastic article and a must read for those interested in just how the relay actually works!

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