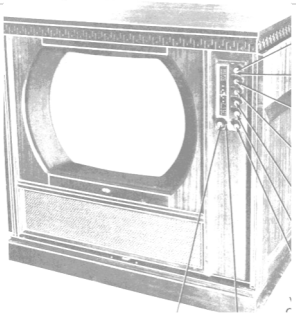
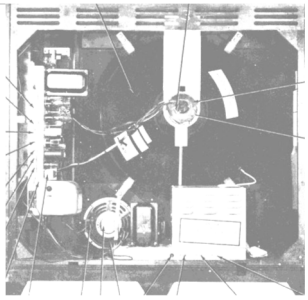
May, 2025

Volume 2 Number 5





WHAT'S NEW IN OLD TVS

The Newsletter of the Early Television Foundation

Greetings Early Television Fans,

This is Volume 2, Number 5 of the Early Television Foundation Newsletter. **The May Zoom meeting will be on Saturday, May 24 at 8 PM.** To all of you that attended the convention, you have proven your devotion to the hobby by enduring rain and cold above and beyond the call of duty**.** And **thanks to all of the volunteers** who made it happen. Many enjoyed the Field Sequential color TVs. The next pages will tell you about Cliff Benham, who made many of them work.

The prizes for this years raffle have been announced. Start to plan where you will put a DuMont Royal Sovereign or an RCA CTC 5 or a third place prize, a FADA 10 inch set. See the website for more info and to start buying your tickets.

We Want to hear from you !

newsletter@earlytelevision.org

Editors: Mike Molnar and Robert Ring

In this issue:

Renew your 2025 Membership

We are always looking for:

- **Letters** from members
- **Tech Tips** from service experiences
- **My first TV** (family stories?)
- **My favorite TV** (and why)
- **Stories** of working in the business.
- **Articles** that can be added in whole or in parts.
- **Biographies** of members

Clifford "Sequential Color" Benham

Whenever I've had the chance to wander around the Museum, I would find myself by the Field Sequential Color displays. This long extinct format from the very early 1950's with its impressive color images, always caught my attention. It also catches the attention of others interested in color tv history, but none more than it caught Cliff Benham. This picture shows him looking up as he was busy working on one of the items in the Museum. The following is an excerpt from Cliff's obituary.

Clifford 'Sequential Color' Benham, 78, of West Grove, Pennsylvania passed away in his sleep on the 13th of April 2023 at a friend's home. He was born on January 3rd, 1945 in St Petersburg, FL.

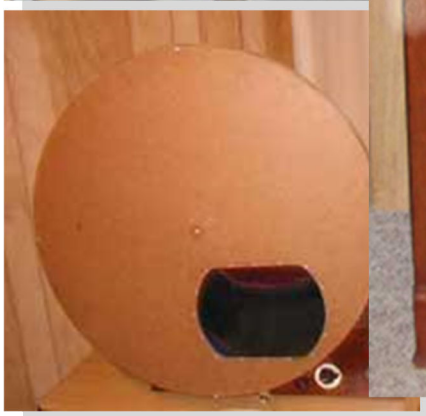
A lifelong tinkerer, he obtained his bachelor's degree in broadcast engineering at St Petersburg Junior College before beginning his career in television with WLCY Channel 10 (later changed to WTSP 10). He also worked for a time at channel 13, WTVT. He relocated to West Grove, PA around 1985 to take a position at QVC. There Cliff was responsible for the very first telecasts of QVC being a success and remained with the company for 20 years, leaving in 2006 as chief engineer. He then worked briefly at Comcast as director of broadcast engineering, before fully retiring around 2012.
In retirement he contributed to the hobby of television collecting by giving presentations covering the early years of color broadcasting systems, with an emphasis on the CBS color wheel system. This system preceded the all-electronic NTSC standard and differed by spinning a 6-segmented disc with primary colors in front of a black and white screen to create color images. By contrast, the all-electronic NTSC standard used a shadow mask picture tube having the 3 primary colored phosphors inside the tube itself.

Cliff will be remembered by his friends in the collecting communities of Audiokarma.org and Videokarma.org, the members of SMPTE and the IEEE, and the patrons of the Early Television Foundation in Hilliard, OH. His friendship and his contributions to the hobby will be missed.

I've asked ETF President Steve McVoy to tell us of his time working with Cliff and the many projects Cliff accomplished for the museum.

Cliff was the expert we relied on to bring to life the field sequential color sets in our collection. His many projects included restoring our DuMont industrial monitor. It was missing the motor control chassis. Cliff built us a replica, and got the monitor working.

.He also provided replacement color wheels for our other CBS field sequential sets. Every year he made at least one trip to Hilliard to repair sets that had stopped working, and to improve the operation of others.



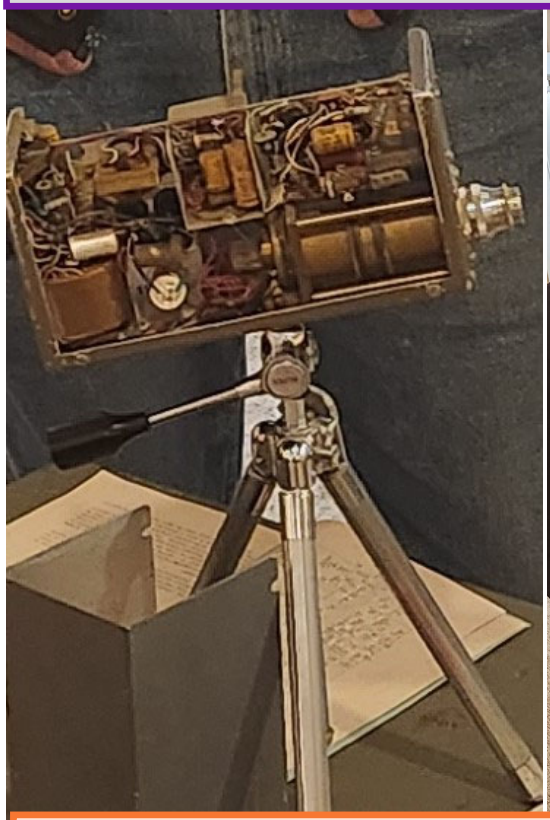
Cliff also restored our NTSC color wheels sets: The Col-R-Tel, Colordaptor, and drum receiver.

Some of Cliff's Projects

Cliff often brought some of his projects to display at the conventions.

In this display he made comparison of three color field sequential and a two color field sequential color system. In some scenes it's hard to see the difference without the three color image for comparison

Around the 2025 Convention



Above: Geoff Bourne brought for display, a historic miniature solid state TV camera built by RCA Labs in the mid 1950

Below: Steve McVoy greets some of the VMC members "Veterans of Many Conventions"

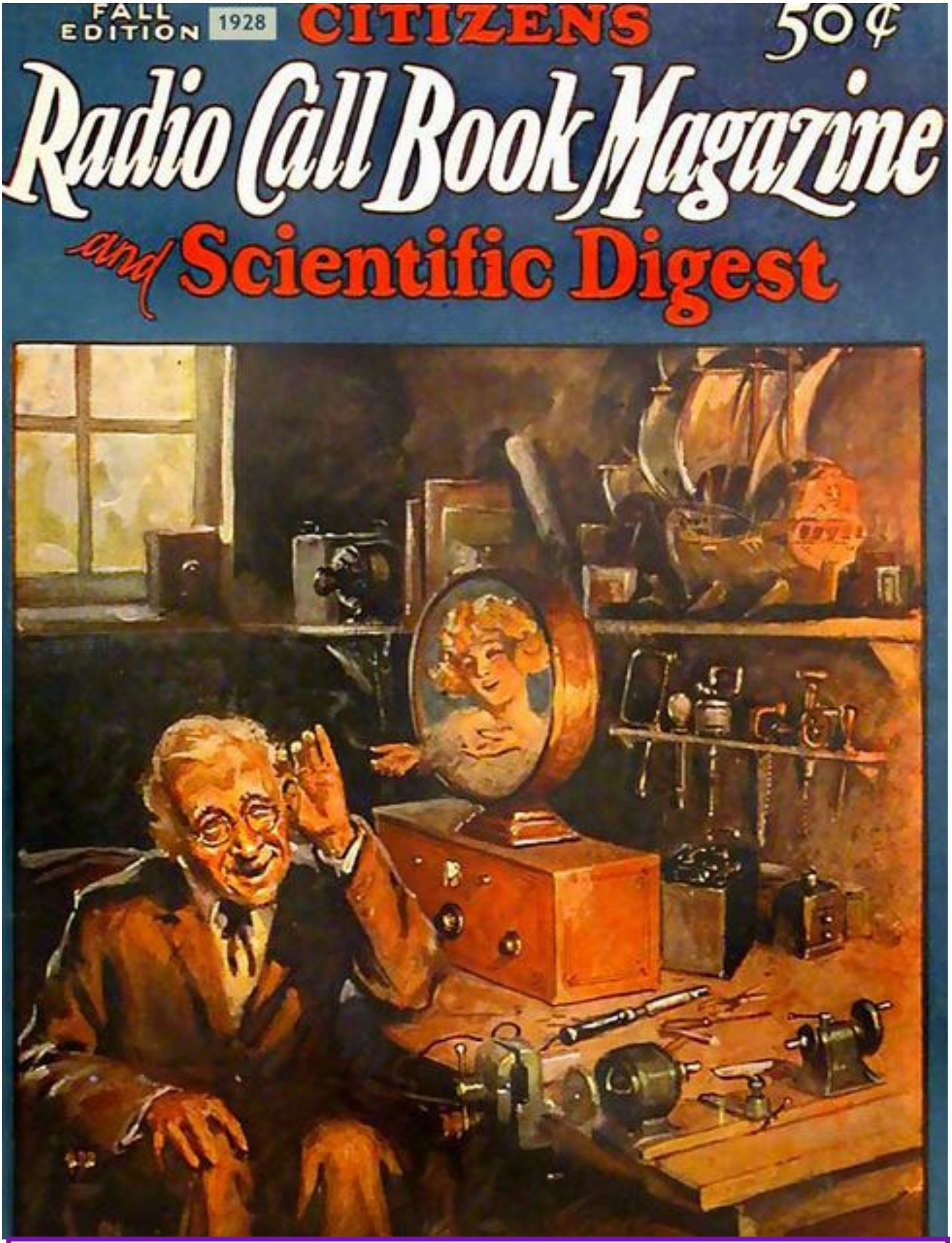
Around the 2025 Convention

Auction Items are setup

Bidders are checking out the various items

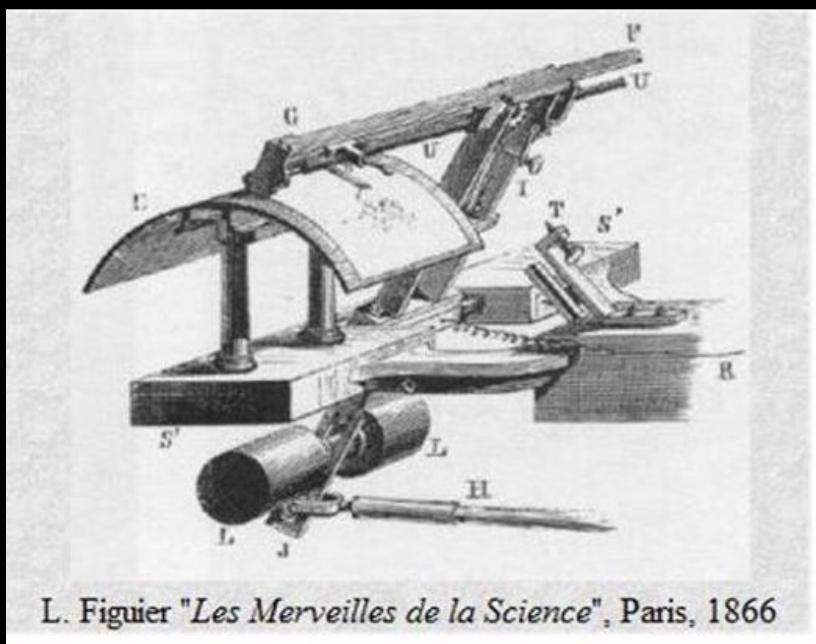
And spontaneous conversations break out

It seems that at every convention I get to see something that I've never seen or heard of before. This year it was the JVC model TM-1450TU. It uses a unique field sequential color system called LCCS which means Liquid Crystal Color Shutter. I saw it in operation and it is a remarkably clear image. The system developed by Tektronix for early color oscilloscopes, utilizes clear liquid crystals that are triggered to sequence between red, green and blue filters, producing very impressive color pictures, as seen below. The monitor/TV is on loan from Dave Abramson. In his demo, when he waved his fingers across, you can see the filter action. You can see much more about this on the ETF website.

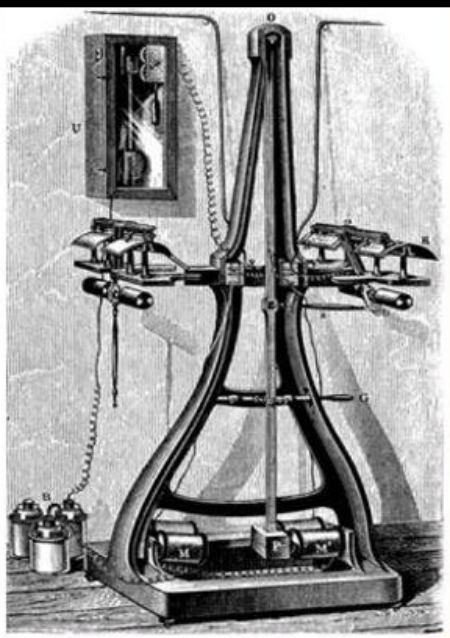


Sometimes your mind can hear a prettier picture on a radio than it can see on a television

After we published Part 1 of “Pictures by Radio for the Home” we heard from member James Hawes who pointed out that the system proposed by Alexander Bain in 1842 was developed two decades later by Giovanni Caselli. His Pantelegraph system was used to send text and signatures over telegraph lines. This example of an actual image is shown below.

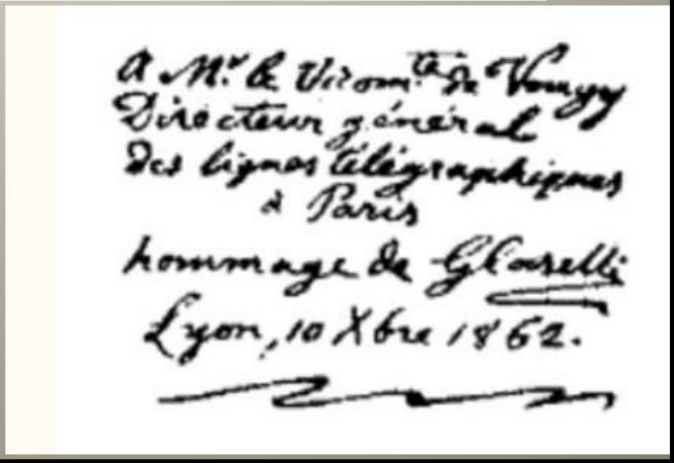


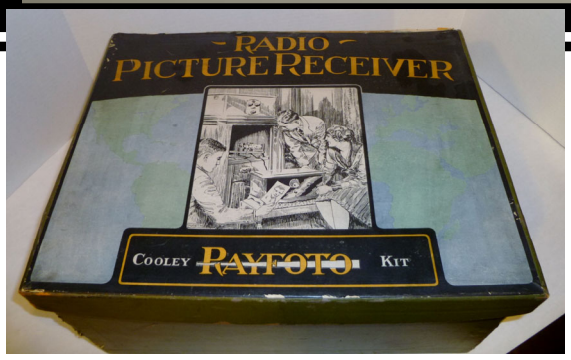
L. Figuier "*Les Merveilles de la Science*", Paris, 1866



In the 1860s, the Pantelegraph, nvented by Giovanni Caselli, was used to send signatures and other images over telegraph lines.

The system, as suggested by Bain, utilized synchronized pendulums.





Now we are ready for part two of *Pictures by Radio for the Home*

Fig. 14. Rayfoto company logo from a company sales brochure. (http://www.earlytelevision.org/pdf/rayphoto.pdf)

1927, he became a staff member at the *Radio Broadcast* Laboratory. Around this time period, Cooley formed the Radiovision Corporation in New York to produce a kit of parts shown Fig. 14 to help radio fans build receivers of their own.

Who Would Build This...and Why

In the early 1920s, most of the broadcast radios were "homebrew" sets. Some were built from kits and others from published plans. The most avid home experimenters came up with their own plans for the best set. By the late 1920s, the large majority of sets being sold were factory made. The talented experimenter was always looking for the next project to astound friends and family. In *Radio Broadcast* magazine articles, authors would often state that after receiving their first radio picture, they got a much bigger "kick" over telling their friends they received pictures than telling them they received a west coast station the night before.[13]

Also there was the lure of the promotional material such as the fight scene shown in Fig. 15. Imagine sitting back and getting a picture of a prizefight to look at while you listened to the next round. This new technology was certainly the next best thing to being there. Sample images such as the one of the young lady reproduced in Fig. 16 were supplied in the manual.

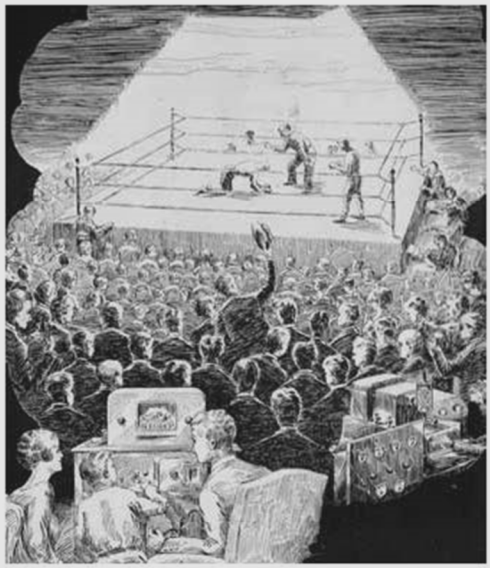


Fig. 15. Rayfoto promo sketch. (Rayfoto Owner's Manual, frontspiece)

Fig. 16. Cooley Rayfoto sample image. (*Radio Broadcast Magazine*, Vol. XII, No. 2 Dec. 1927, p. 114)

Building the Kit

Cooley expected that competent experimenters would be purchasing the kit shown in Fig. 17. With that in mind, and to keep costs low, he supplied only the major components that the builder would not have around his shop or could not purchase at his local radio supply store, for example, the parts shown in Fig. 18. He also made the assumption that the builder would use his or her home radio to listen to the program and would switch the speaker leads to the picture receiver when the picture broadcast started. Cooley also presented the option of building a cabinet with a spring-wound phonograph motor to turn the printer cylinder of the receiver or to use a coupler to turn the cylinder with a Victrola turntable spindle, as shown in Fig. 19.

Construction of the electronic part of the receiver is straightforward and was certainly within the capabilities of the radio builder of the day. Blueprints were supplied for a front panel layout and a component layout. Cooley's Precision Printer is the major component of the kit. It includes the cylinder for mounting the photographic paper and gearing to match a motor. A coupler was also provided to attach the printer to a Victrola. The kit builder also received the Corona Coil, which was a Tesla Coil that would produce a high-frequency, high-voltage discharge, and a Corona Indicator, which consisted of a small glass chamber with two metal rods spaced to produce a

Fig. 17. Open Rayfoto kit. (Author's collection)

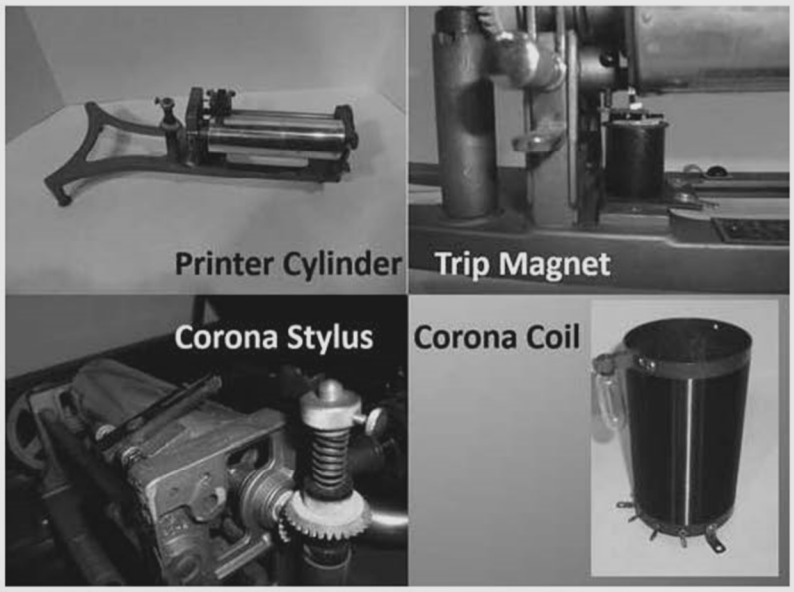


Fig. 18. (Left) Major components in the Rayfoto kit. (Author's collection)

Fig. 19. (Below) Printer installed on a Victrola. (Author's collection)

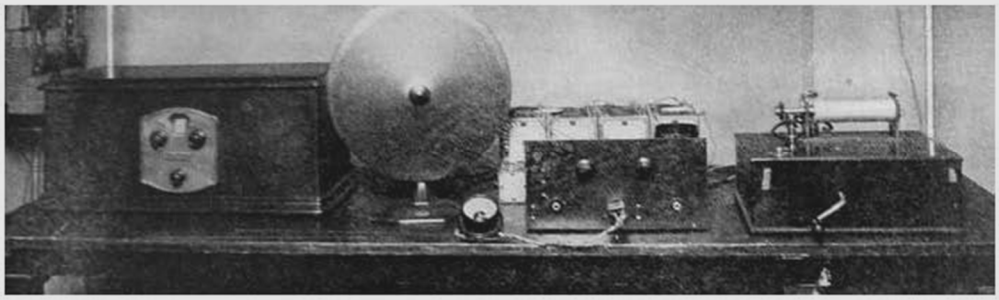


Fig. 20. Rayfoto at WOR radio station. (*Radio Broadcast*, Vol. XII, Jan. 1928, p. 215)

corona. This allowed the operator to visually confirm the proper corona setting. A modulation transformer of Cooley's own design was included to provide the best operation, and a sensitive relay was also supplied; this released the trip magnet that released the cylinder to make each succeeding revolution. The finished kit shown in Fig. 20 resembled a tabletop radio but with the additional printer and batteries.

How it Works

The article in the November 1927 issue of *Radio Broadcast* together with the owner's manual gives a clear explanation of how the Cooley system works. A drawing (Fig. 21) shows the components in the transmitter. A photograph is attached to a cylinder, and the cylinder is advanced on a lead screw. Each turn of the screw by the motor advances the cylinder by 1/80 of an inch. Therefore, a picture five inches long would be scanned by 400 lines. As shown in the drawing, a chopper disc is rotated on the motor shaft. An intense beam of light is passed through the perforated disc. The disc is designed to chop the steady light source into 120 pulses per linear inch of scanning. The picture to be transmitted is four inches wide plus one inch of white paper. In

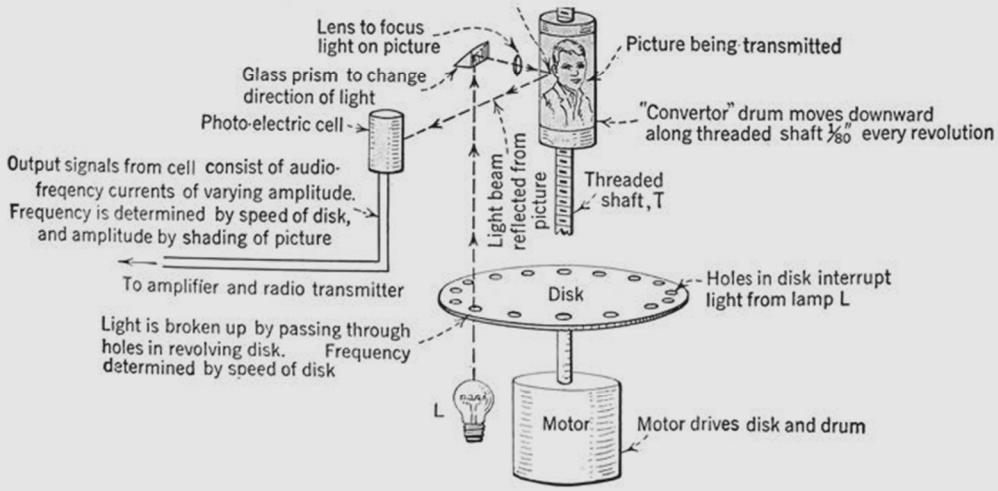


Fig. 21. Simplified diagram of Cooley Rayfoto transmitter. (Rayfoto Owner's Manual, p. 4)

this way, the light is chopped into 480 flashes of light per line of the image. The white segment is used to provide time for a synchronizing pulse for each line of the image. The variations of light intensity reflected from the photograph are picked up by the photocell. The synchronizing pulse is a 1500 Hz note, and the picture signal is an 800 Hz note, amplitude modulated by an amplifier connected to the photocell (see Fig. 22). A modulation of 100% is black, and a modulation 0% is white. This scheme creates an amplitude-modulated signal that includes the 25-millisecond synchronizing pulse, with the output signal level designed to match the typical microphone level at the transmitter (Fig. 23).

The Rayfoto Picture Receiver shown in Fig. 24 is also described in the article. The basic functions are shown in the block diagram of Fig. 25. The outputs of the Rayfoto electronics connect to a printing cylinder. One output line connects to a trip magnet that is located

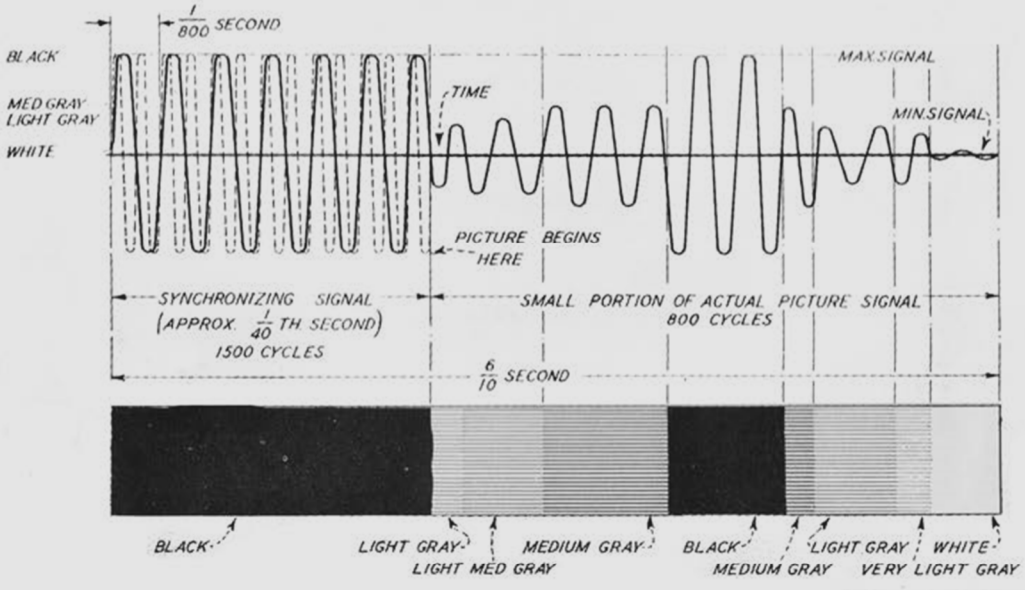


Fig. 22. Diagram of Cooley Rayfoto signal processing. (Rayfoto Owner's Manual, p. 5)

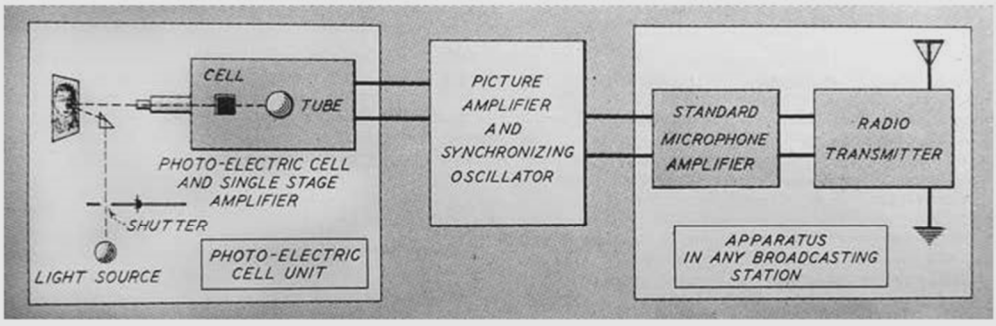


Fig. 23. Block diagram Rayfoto transmitter. (Rayfoto Owner's Manual, p. 4)

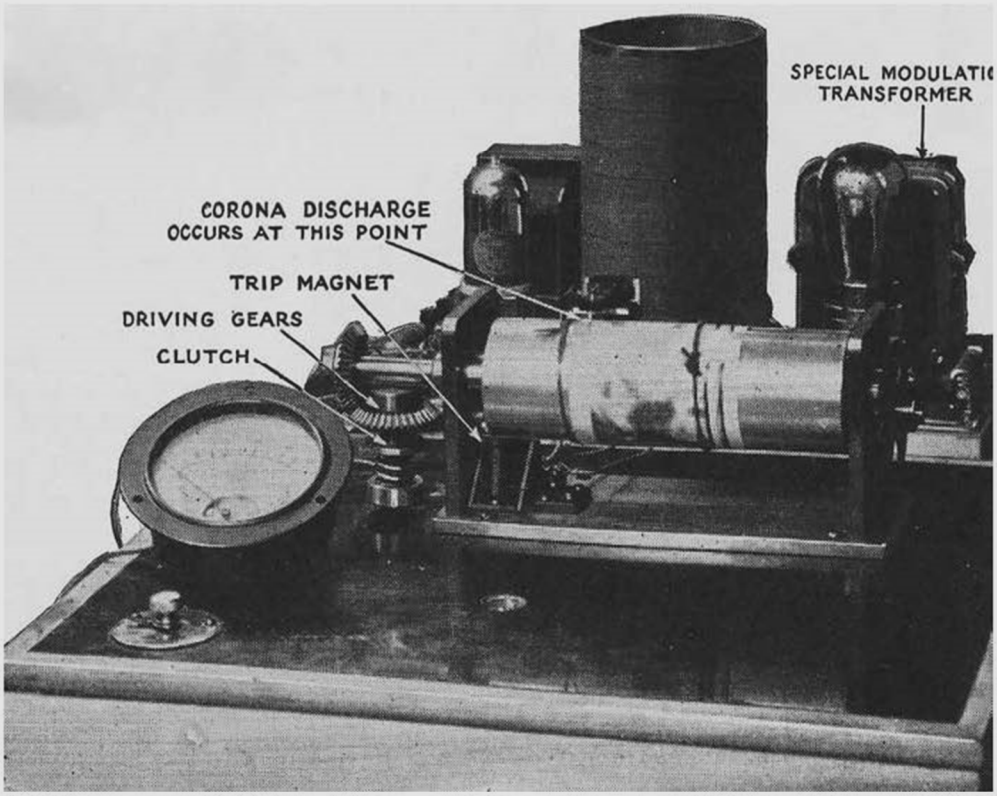


Fig. 24. Component layout of a Rayfoto receiver. (*Radio Broadcast*, Vol. XI, Oct 1927, p. 343)

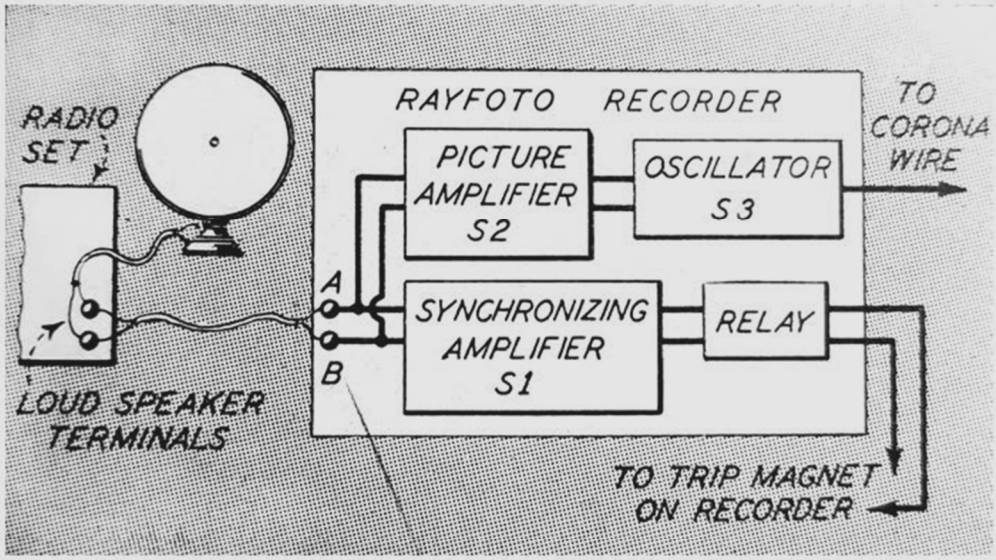


Fig. 25. Block Diagram Rayfoto receiver, (Rayfoto Owner's Manual, p. 6)

under the cylinder. A motor drive is connected to the cylinder that is held still by a mechanical catch. When the synchronizing signal energizes the trip magnet the catch is released to allow the cylinder to make one turn. Photographic paper is placed on the printer cylinder and the corona wire is attached from the electronics. The high-frequency corona from the receiver is wired to a corona stylus. This device is similar to the steel stylus in a Victrola shown in Fig. 26, and it is positioned just above the paper. The stylus is then advanced on a lead screw of similar design to the screw in the transmitter. As the cylinder turns and advances, the corona exposes the paper in proportion to the incoming picture signal.

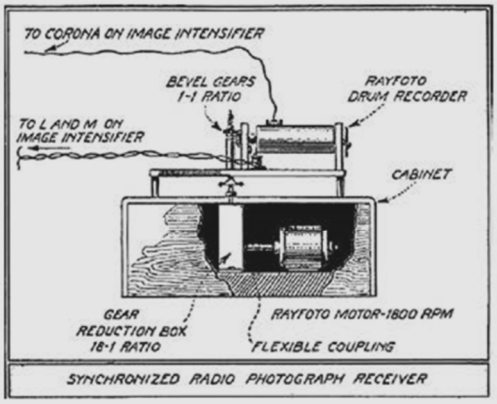


Fig. 26. Sketch of Rayfoto printer. (Rayfoto Owner's Manual, p. 15)

The schematic diagram of Fig 27 shows a three-tube circuit, each tube having the purpose shown in the diagram—picture amplifier, oscillator, and synchronizing circuit. The picture amplifier raises the input signal sufficiently to

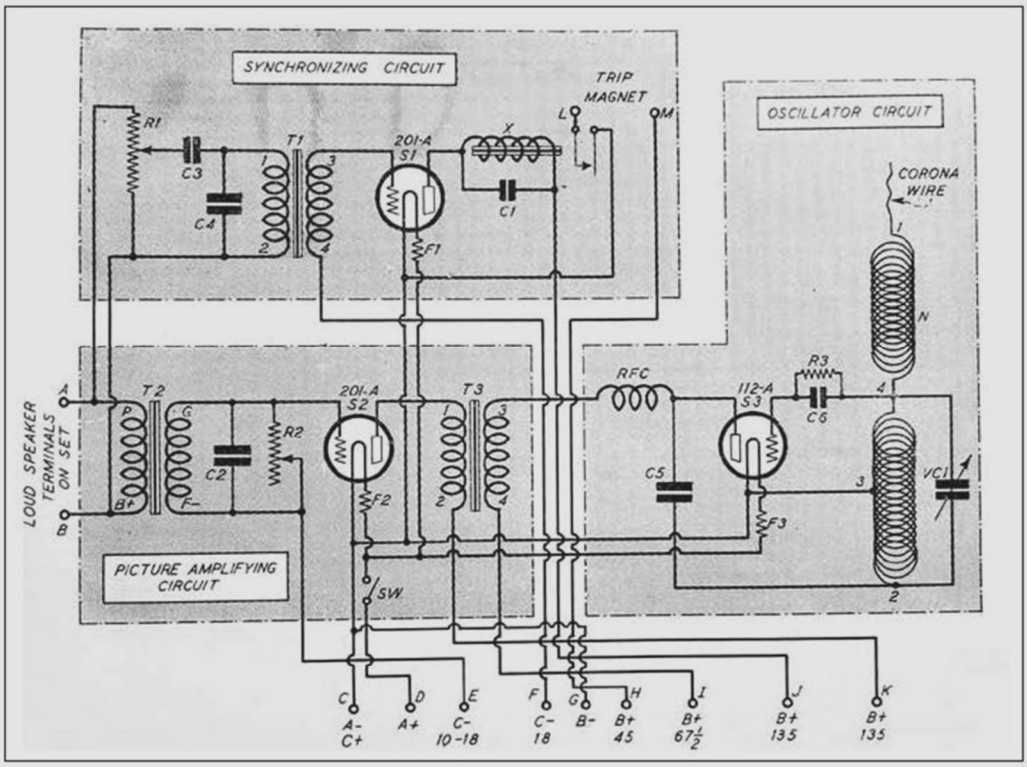


Fig. 27. Schematic diagram of Rayfoto receiver. (Rayfoto Owner's Manual, p. 10)

drive the modulation transformer. The oscillator tube generates a high-frequency signal that is modulated by the picture amplifier and drives the primary of the Corona Generator Coil. The synchronizing circuit, through the variable resistor R1, allows adjustment of the signal level and passage of the 1500 Hz synchronizing signal for each line. The triode S1 drives the relay X in the plate circuit, which enables the trip magnet at the cylinder. R1 can be adjusted to prevent false trips or missed synchronizing pulses.

The function of each synchronizing pulse is to open the trip magnet so the cylinder is released to start a line and the corona stylus exposes the photographic paper at intensities equal to the bright and dark areas of the scanned photographs. At the end of each line, the cylinder is held up waiting for the next synchronizing pulse to start the process again. This will happen 400 times to produce a 4 by 5 inch image of arguably acceptable quality (see Fig. 28).

This likeness of Governor Alfred E. Smith would be considered a good average Rayfoto production.

Fig. 28. Rayfoto image of New York Governor Alfred E. Smith. (Rayfoto Owner's Manual, p. 17)

Cooley Rayfoto is "On the Air"

Having broadcasters interested in providing programming that included a picture transmission was as important to the success of the Cooley System as it was to have a large number households purchase receivers. As the number of receiver purchases increased, so did the number of broadcasters who wanted to be part of what they hoped would be the next craze. One of the first broadcasters was WMCA in New York. Their weekly program featuring the "Radio Visionairies" would begin by sending their audience a picture of that night's performance, such as the one shown in Fig. 29. The picture would enhance the radio fan's enjoyment as they listened to the rest of the program. A list of Rayfoto broadcasters is shown in Table 1.[14] The

Fig. 29. Station WMCA's "Radiovisionaires." (Rayfoto Owner's Manual, p. 22)

Table 1. Rayfoto broadcasters as of 1928.

STATION	LOCATION
WMCA	New York, New York
CKNC	Toronto, Canada
CJRM	Moose Jaw, Saskatchewan
WJR	Detroit, Michigan
KMOX	St. Louis, Missouri
WFIL	Philadelphia, Pennsylvania
KFEL	Denver, Colorado
KSTP	St. Paul, Minnesota
KFPY	Spokane, Washington
KWCR	Cedar Rapids, Iowa
WFBL	Syracuse, New York
KXA	Seattle, Washington

first broadcast was on November 5, 1927, at WOR in Newark, NJ, then located in the Bamberger's Department Store and operated by chief engineer Jack Poppele.[15] A display of a picture receiver was set up in the store to attract customers. The station must have taken a wait-and-see attitude as WOR does not appear on the table of regular broadcasters, but others jumped on the bandwagon. In some areas experimenters formed clubs where members could show off their best images and help new members get started.

To help the Rayfoto user get started, the kit included a phonograph recording of sample images. The picture receiver can be attached to the output lines of a phonograph, and the operator can test his receiver and practice setting the corona. The operator's manual and the articles in *Radio Broadcast* gave samples of image defects and adjustments required to cure them, for example the unwanted lines appearing in the image on the right side of Fig. 30.

Fig. 30. Rayfoto comparison with image defects. (*Radio Broadcast*, Vol. XII, Jan. 1928, p. 216)