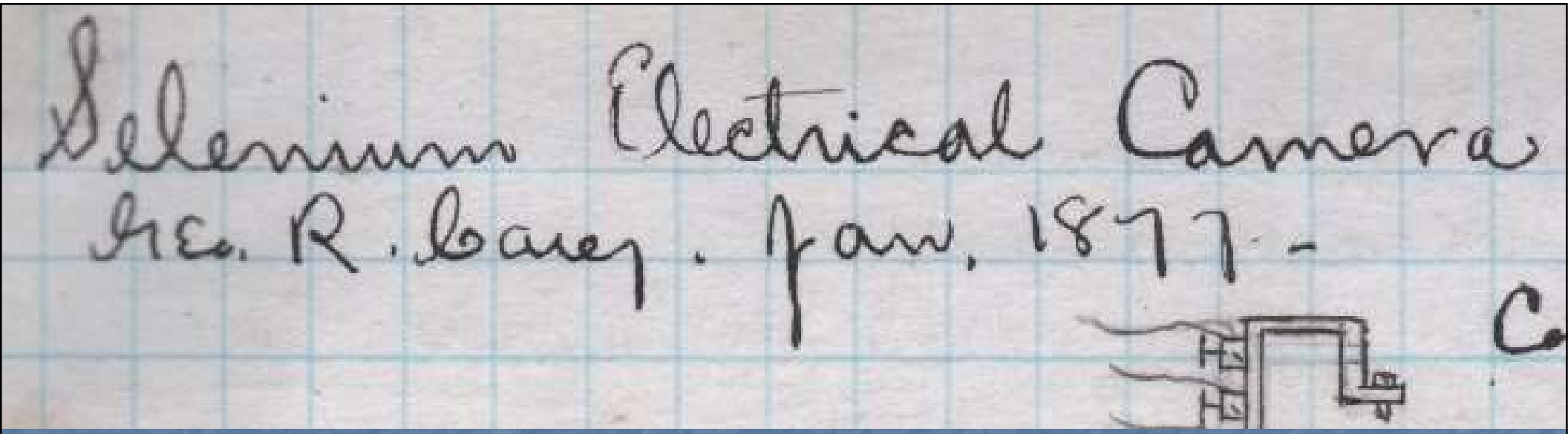

Metamerism
• Metamerism is the matching of apparent color of objects with different spectral power distributions. Colors that match this way are called metamers.
• Metamerism is the basis of nearly all color reproduction, film, video or print.
SMPTE
Become a
"Friend of SMPTE-NY"



The Karpeles Manuscript Library Museums
used with permission

Breaking the Pictures Barrier:
Why Television Research Began in 1877 (and Why No One Knows It)

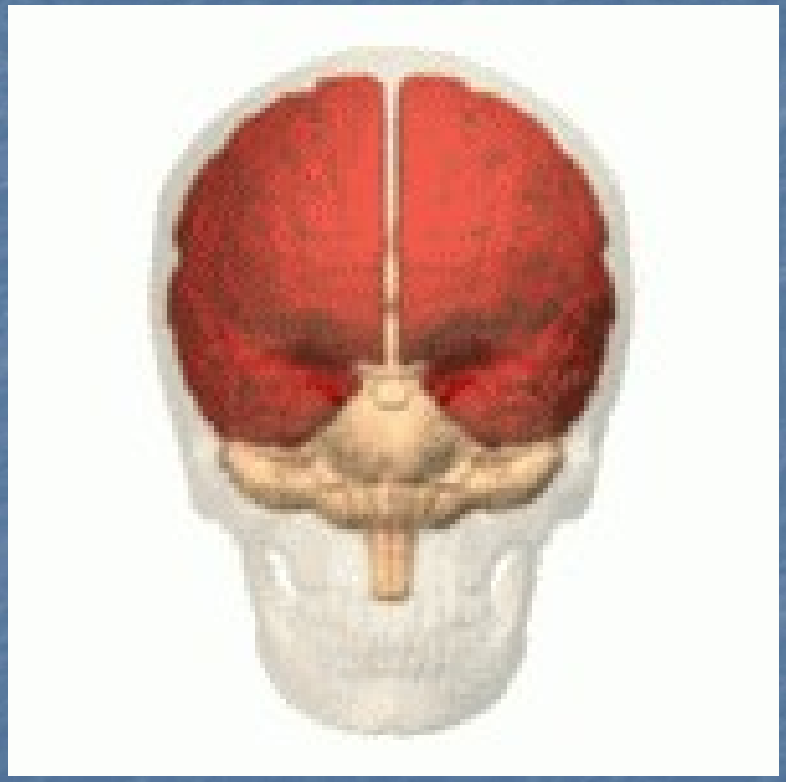
Mark Schubin, SchubinCafe.com

1967 Movie

SPOILER ALERT!

“Cerebrum Communicator”

Coming?



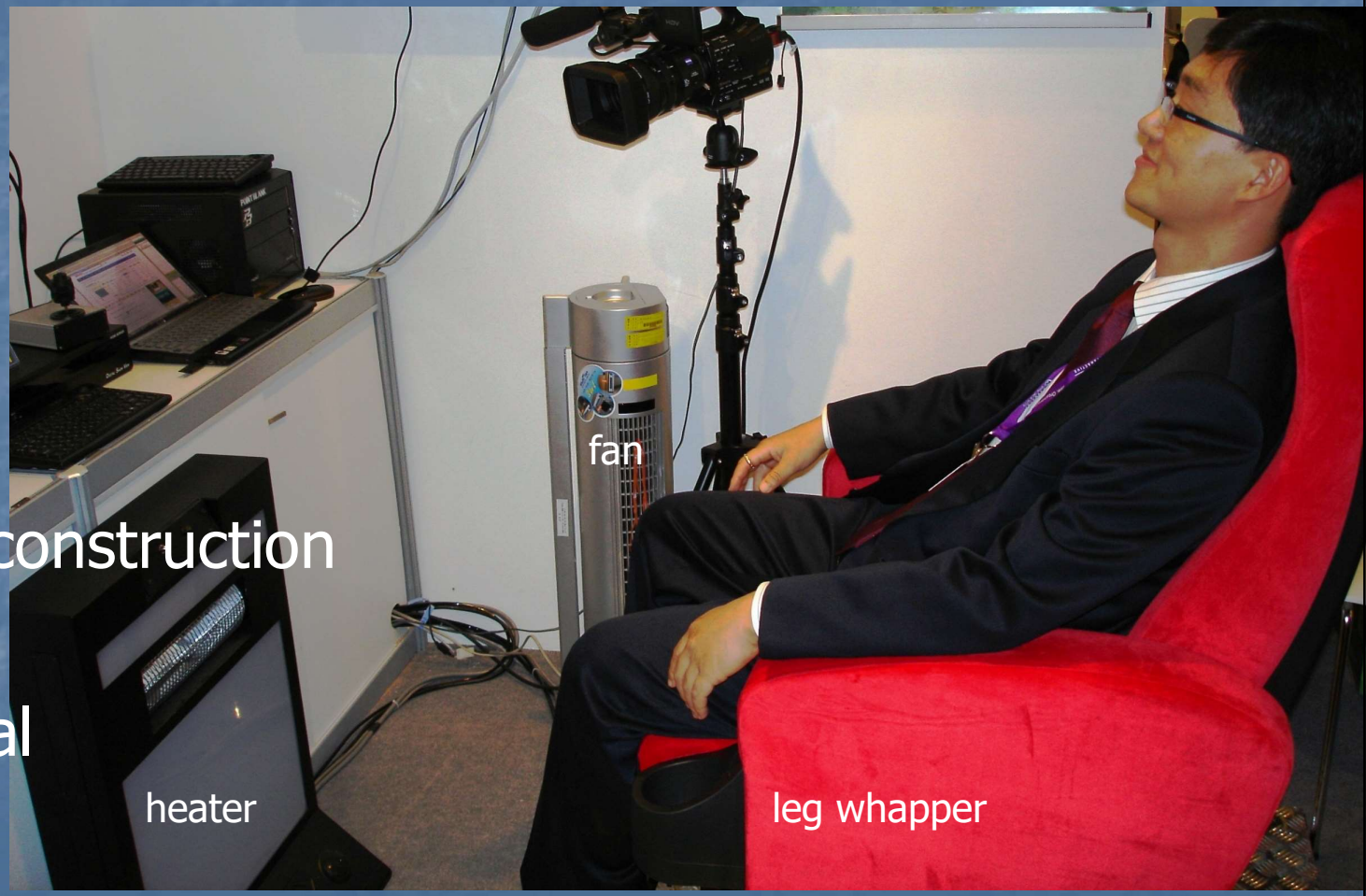
polysensual cerebrum communicator

Polygon data were generated by Database Center for Life Science, BodyParts3D

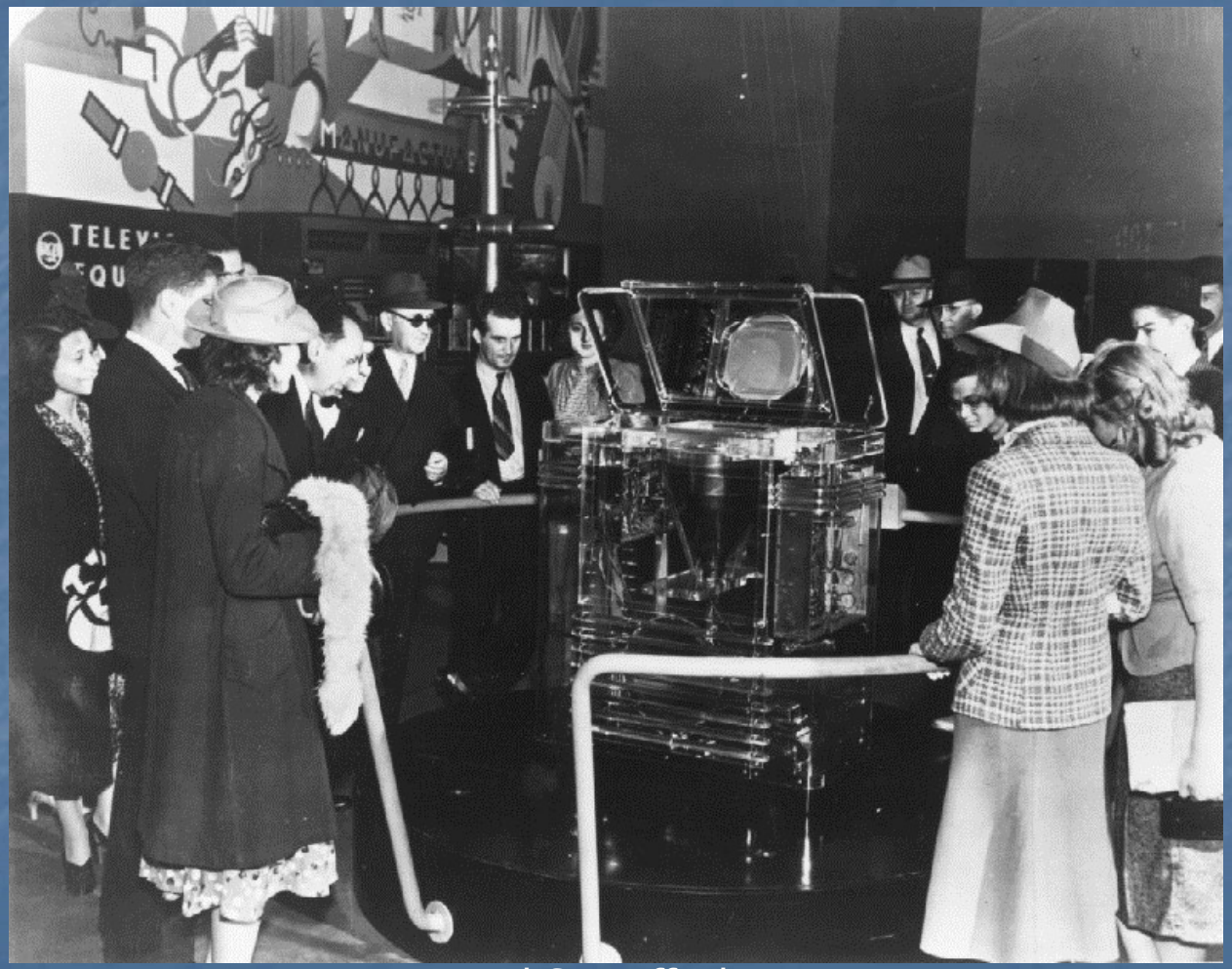
Here (-ish)

- VR
- UHD
- HDR
- WCG
- HFR
- Soundwave Reconstruction
- Haptic/Tactile
- Olfactory/Palatal

ETRI 4D at IBC 2010



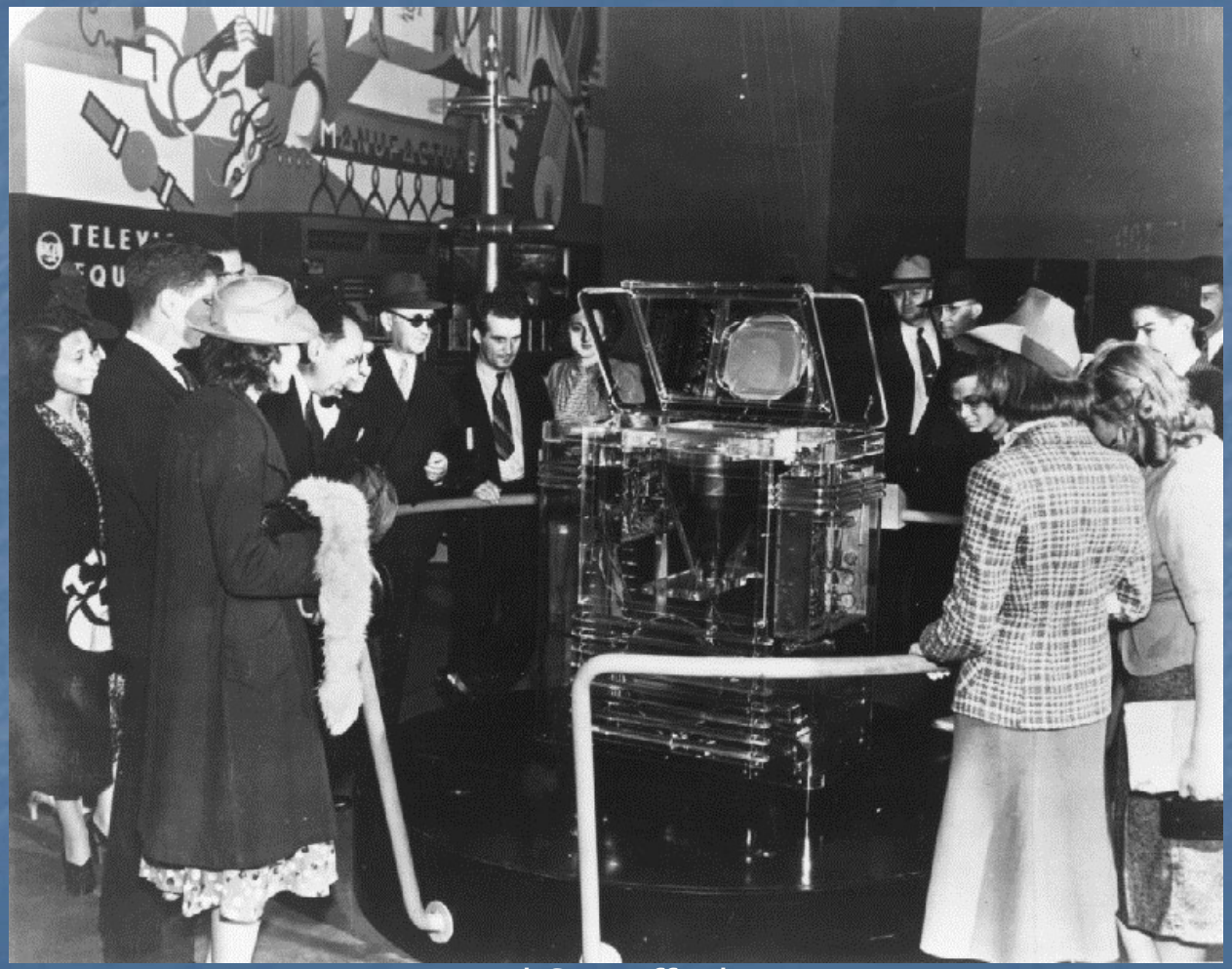
When Did TV *Really* Start?



David Sarnoff Library

common U.S. idea: TV was introduced at the RCA pavilion at the 1939 New York World's Fair

When Did TV *Really* Start?



David Sarnoff Library

common U.S. idea: TV was introduced at the RCA pavilion at the 1939 New York World's Fair (ignores even Crosley, GE, GM, and Westinghouse at same fair)

But (London 1937)

RADIO TIMES TELEVISION SUPPLEMENT, MAY 7, 1937

TELEVISION PROGRAMMES

Markova danced *Blue Bird* with Harold Turner before King George V and Queen Mary. She will be seen in the same ballet today with Anton Dolin.

Markova, a student of Seraphina Astafieva, joined the Diaghilev Ballet in 1924, appearing in *Swan Lake*, *Aurora's Wedding*, *Cimarosiana*, *The Cat*, and *The Story of the Nightingale*. This, and her subsequent work with the Ballet Club, the Camargo Society, and the Vic-Wells company, put her in the first rank of prima ballerinas. Sadler's Wells enthusiasts will remember her dancing in a special season of ballet with Dolin in 1935.

Dolin, whose real name is Patrick Healey-Kay, is a dancer whose fame is known all over the world. He made his first appearance on the stage at the Prince's Theatre in 1916.

3.15 GAUMONT BRITISH NEWS

3.20 SOME CORONATION ARRANGEMENTS

The Director of Television will

9.35 'PICTURE PAGE'
(Fifty-Fourth Edition)

A Magazine Programme of General and Topical Interest

Edited by CECIL MADDEN

Produced by ROYSTON MORLEY

The Switchboard Girl : JOAN MILLER

A characteristic of Cecil Madden's 'Picture Page' that has made it a distinctive part of television programmes has been its unfailing topicality. The big events of the day, celebrities who are headlined in newspapers and eagerly discussed by the public, little-known people who have interesting tales to tell—all these have been featured. This evening's edition will be appropriate to the occasion, the eve of Coronation Day.

Because of programme alterations made necessary by the televising of the Coronation, both editions of 'Picture Page' this week are being televised today instead of tomorrow.

10.0 CLOSE

Wednesday

2.0 THE CORONATION PROCESSION

Televised from the North and South faces of the main arch of Apsley Gate, Hyde Park Corner

Part 1

Views of the Park, and crowd scenes between Stanhope Gate and Hyde Park Corner; and on the south side of Apsley Gate, from Piccadilly by Wellington Arch to St. George's Hospital and Knightsbridge

Part 2

Their Majesties
The King and Queen,
and the complete Procession from Stanhope Gate to Apsley Gate, on its return journey to Buckingham Palace

3.0 CLOSE

9.0 THE POET LAUREATE

John Masefield
will read his Coronation Ode

9.5 MUSIC-HALL CAVALCADE

with

ALBERT WHELAN
TOM COSTELLO
MARIE LLOYD, JNR.
IDA BARR
ADA CERITO
WALTER WILLIAMS
TOM E. HUGHES
ARTHUR PRINCE
AND 'JIM'

Chairman, FRED WILLETT

The BBC Television Orchestra
Conductor, Hyam Greenbaum

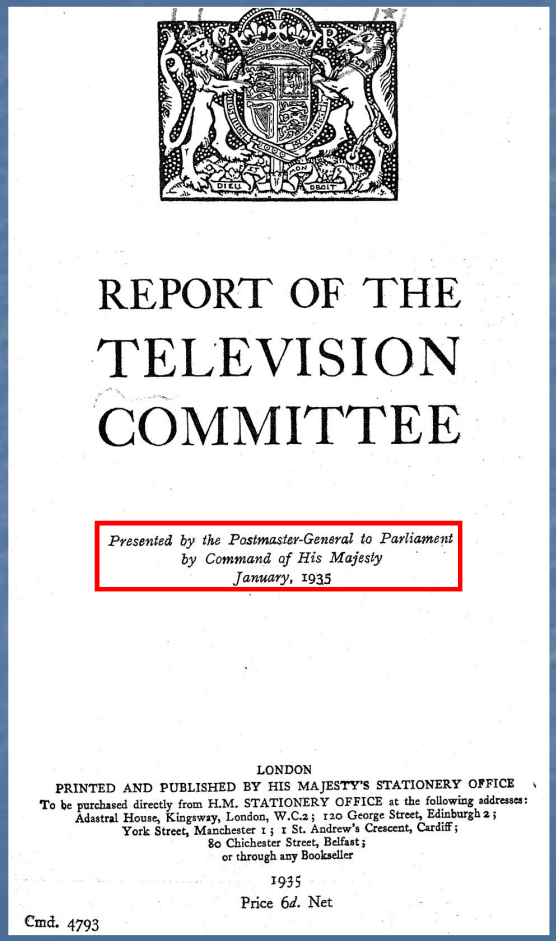
Presentation by Harry Pringle

But

video camera at 1936 Berlin Olympic Games

"television cannon"

But



REPORT OF THE
TELEVISION
COMMITTEE

Presented by the Postmaster-General to Parliament
by Command of His Majesty
January, 1935

LONDON
PRINTED AND PUBLISHED BY HIS MAJESTY'S STATIONERY OFFICE
To be purchased directly from H.M. STATIONERY OFFICE at the following addresses:
Adastral House, Kingsway, London, W.C.2; 120 George Street, Edinburgh 2;
York Street, Manchester 1; 1 St. Andrew's Crescent, Cardiff;
80 Chichester Street, Belfast;
or through any Bookseller
1935
Price 6*d*. Net
Cmd. 4793

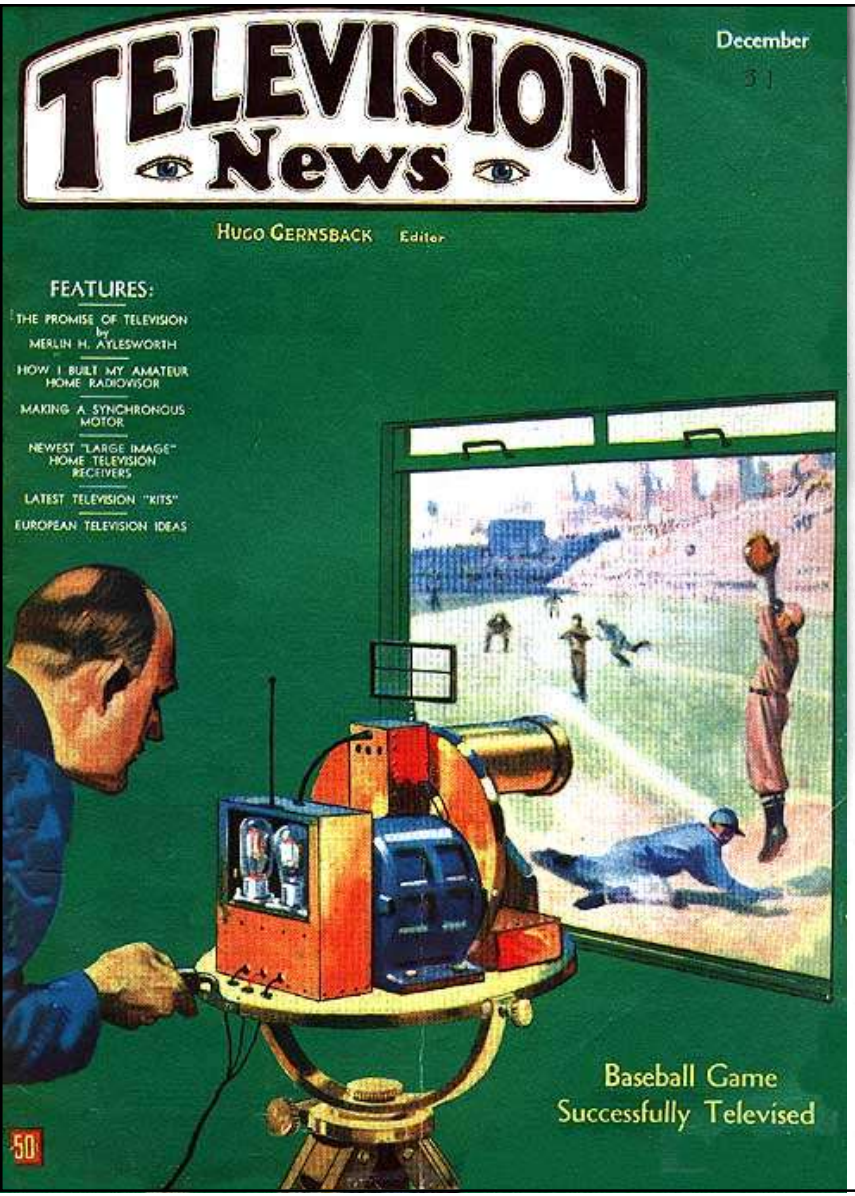
Presented by the Postmaster-General to Parliament
by Command of His Majesty
January, 1935

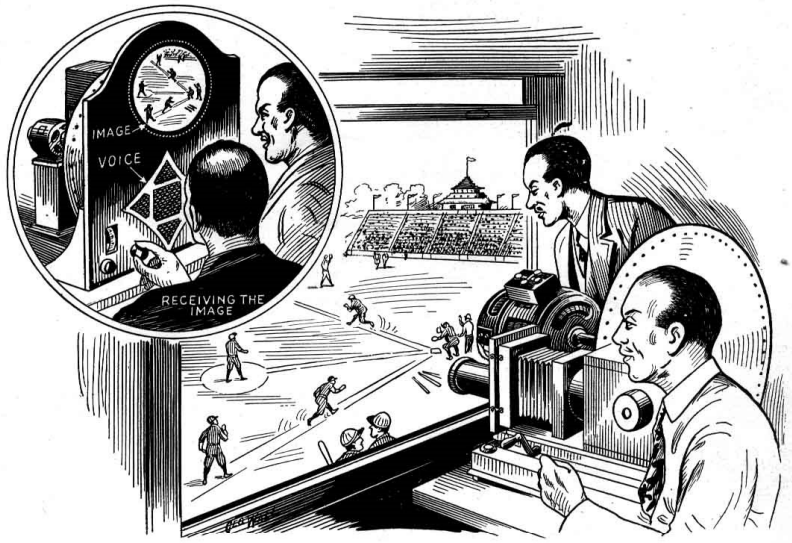
HIGH DEFINITION TELEVISION

27. With a view to extending the application of Television to a wider field and thereby increasing its utility and entertainment value, much attention has been given in recent years to the problem of obtaining better definition and reduced "flicker" in the received pictures.

28. The degree of definition it is essential to obtain is necessarily a matter of opinion, but the evidence received and our own observations lead us to the conclusion that it should be not less than 240 lines per picture, with a minimum picture frequency of 25 per second. The standard which has been used extensively for experimental work

it should be not less than 240 lines





Our artist's picture reproduced above from a photograph appearing in a Japanese magazine, shows that they are wide-awake indeed on television in Japan, for we have not reached the stage in America where we are televising ball-games, although the technical equipment available here is capable of doing so. We predict that by next summer we shall see ball games televised over more than one television system in this country.

STRIKE ONE! GREETS JAPANESE VISUALISTS

By H. WINFIELD SECOR

JAPAN is wide-awake when it comes to the latest advances in television, as the accompanying picture clearly demonstrates. This illustration was made by our staff artist from a photograph, showing a baseball game being televised in Japan. In the illustration shown on our front cover, the apparatus has been somewhat modernized by placing the televisor on gimbals, so that it can be quickly pointed, in any direction, by the operator. Judging by the original photograph, which appeared in a Japanese magazine, the televisor utilized for picking up the baseball game was a stationary affair, and it evidently was focused across the home plate. In the last issue of TELEVISION NEWS, we showed how the Baird experts, in conjunction with the British Broadcasting Company, recently televised the famous English "Derby", so that the present instance affords another link in the chain of evidence that television is indeed marching forward.

Recently a Japanese magazine contained a photograph showing a baseball game being televised. The recent television broadcast of the English Derby, coupled with the televising of fistic encounters in America, demonstrates that television is steadily marching forward.

Public Anxious to "See" Sporting Events

American *visualists*, by the tens-of-thousands, are waiting for the day when prizefights and other athletic events will come to their homes via the television screen. Probably this coming winter will see the first prize-fight shown via television—that is actual prize matches in such large places as Madison Square Garden, New York City. As a matter of actual fact, the Columbia Broadcasting System have shown several "prize ring" scenes over their television station, W2XAB (107 meters) accompanied by voice over W2XE (49 meters). Mr. William Schudt, director of television programs for the Columbia Broadcasting System, and his staff, especially arranged these "studio" boxing scenes between well-known exponents of the fistic art.

About three years ago, the writer saw what was probably the first demonstration, in America, of an "outdoor" pick-up as given by the Bell Telephone Laboratories. At that time a man going through various motions with a tennis racket, was shown on the television screen, which utilized a 60-line scanner. Public demonstrations by the Bell Telephone Laboratories, since then, have been practically all confined to "close-ups" such

(*Continued on page* 392)

But

TV coverage of a Tokyo baseball game 1931

Charles "Slim" Timblin Riotously Funny at RKO-Proctor's

Mitzi's Revue Is Another Headliner

AMERICAN THEATER "TIGER ROSE"

Rent A Car U-DRIVE-IT

A Supreme Event Of This Century

In Schenectady Today

RKO Proctor's Theater

First Showing

In the World

TELEVISION

New Era of Entertainment

The People of Schenectady

BE AMONG THE FIRST TO SEE TELEVISION—TODAY AT RKO PROCTOR'S THEATER

STRAND

VILMA BANKY

A Lady to Love

STATE

The golden calf

"HOLD EVERYTHING"

HAPPY HOUR

RIVOLI

COLONY

"The Vagabond King"

LINCOLN

"Half Marriage"

"The Vagabond King"

RKO PROCTOR'S

TELE-VISION

GARY COOPER

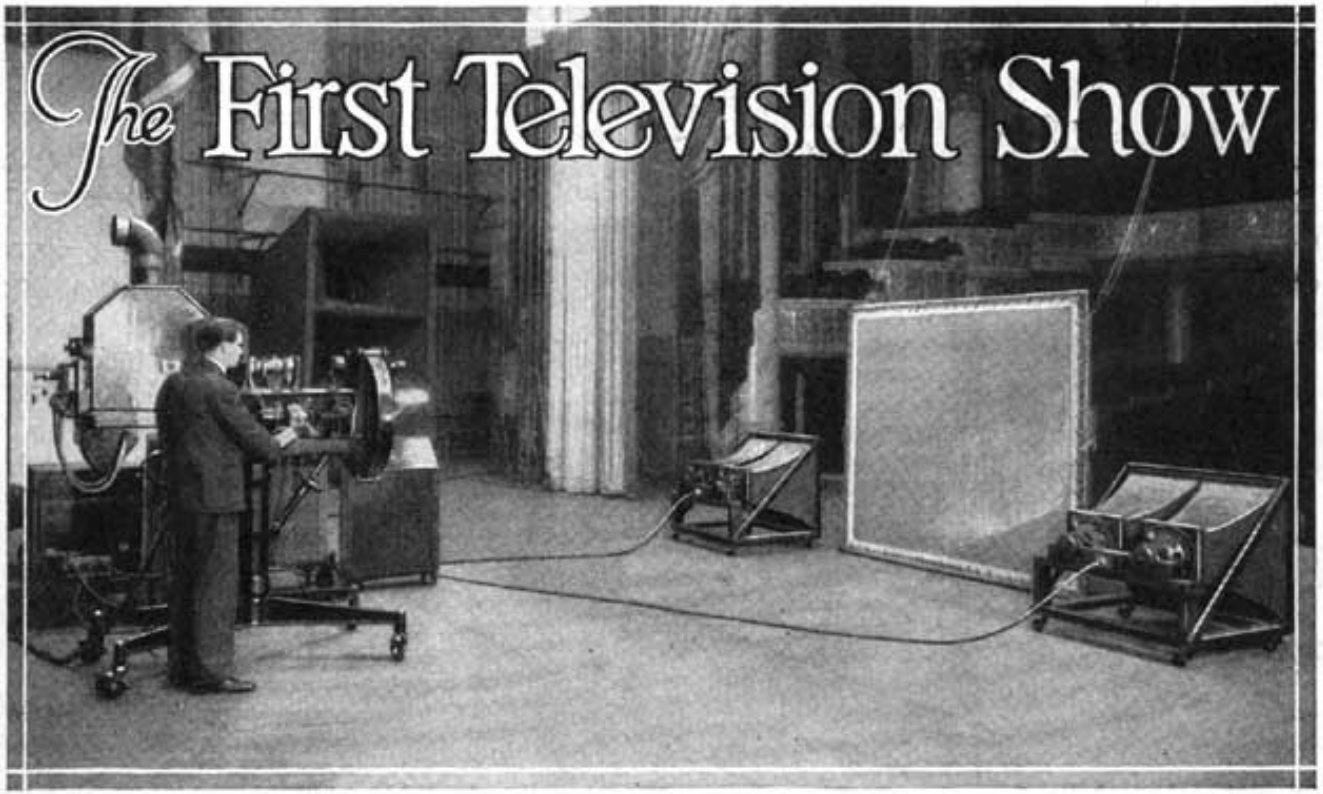
7 DAYS LEAVE

But

ad for a
TV demo
in a 1930
newspaper
The Schenectady Union-Star,
May 22, 1930

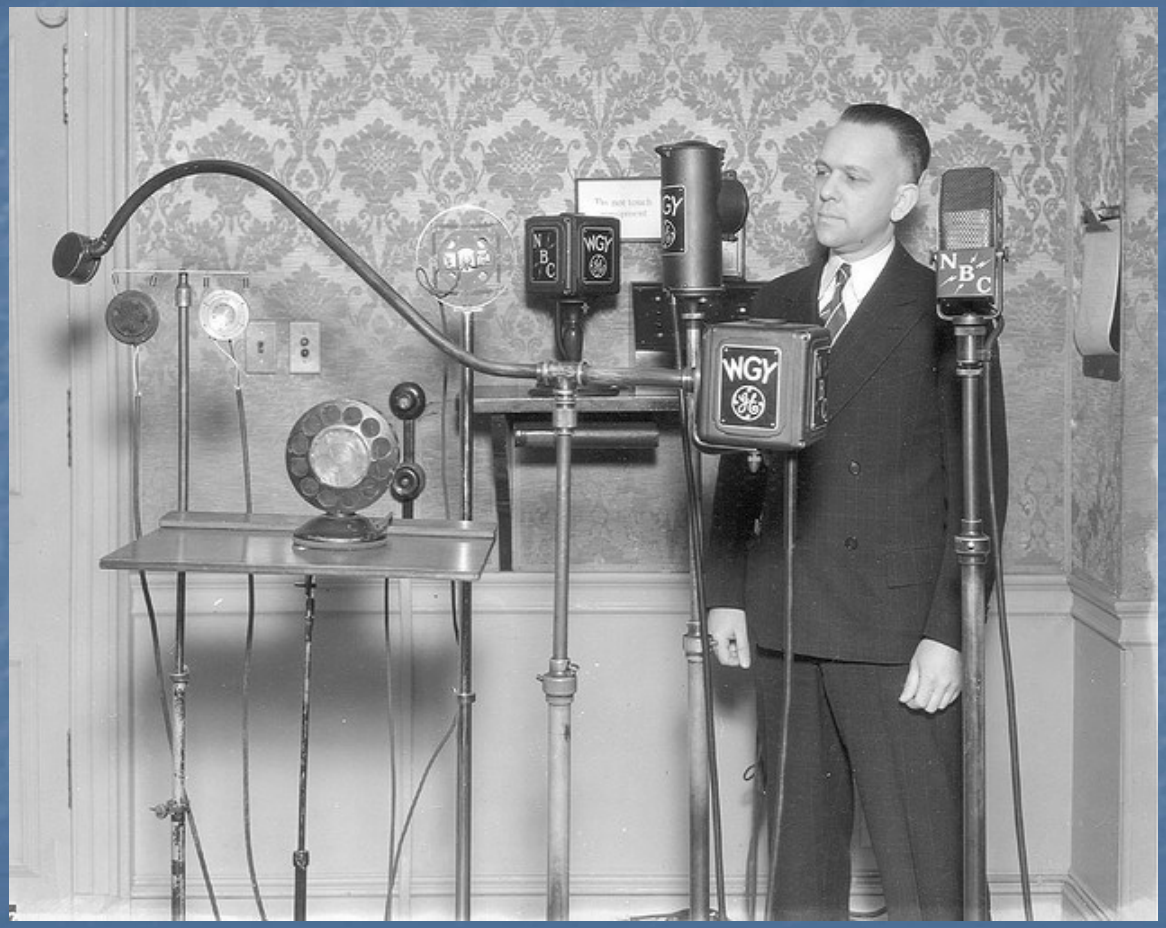
Popular Mechanics Magazine
REGISTERED IN U. S. PATENT OFFICE
WRITTEN SO YOU CAN UNDERSTAND IT
Vol. 54 AUGUST, 1930 No. 2

The First Television Show



R. D. Kell, Operating Television Theater Projector, Showing How the Picture Is Projected from Backstage; beside the Screen Are Loud Speakers for Reproducing Accompanying Radio Voice

But

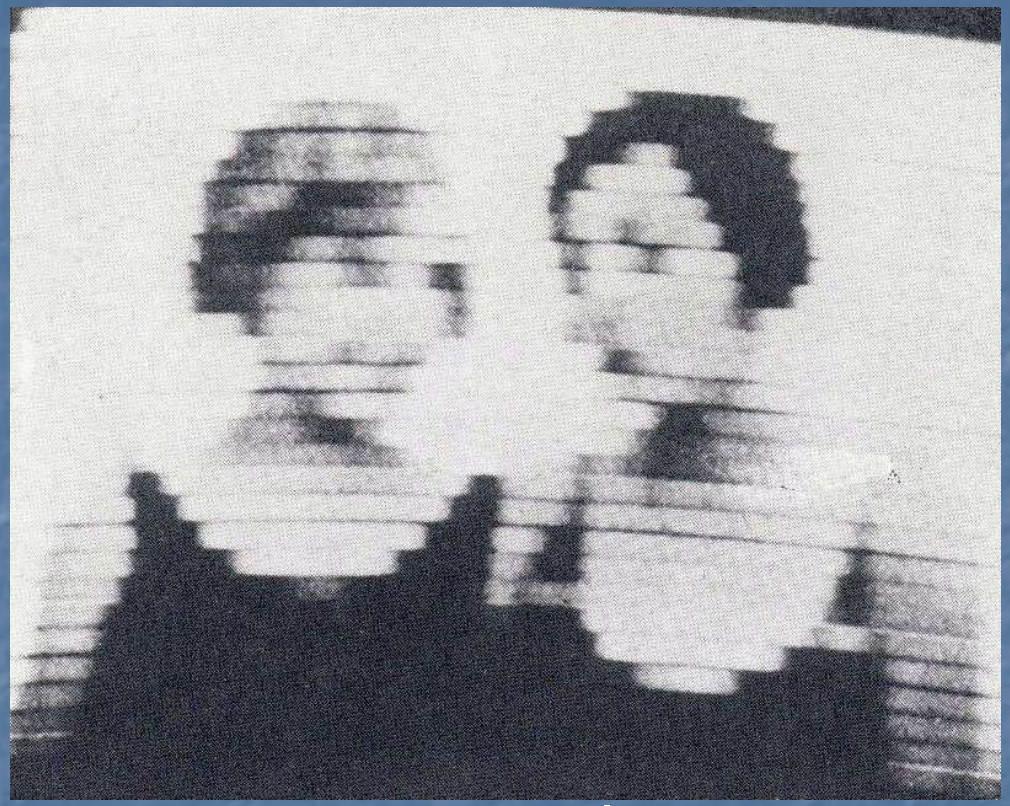


1928: regularly scheduled television newscasts at the same place (GE in Schenectady) with anchor Kolin Hager (shown later)

And

1928: August Karolus demo at the Berlin Radio Show

Introduced Hyping Higher Spatial Resolution

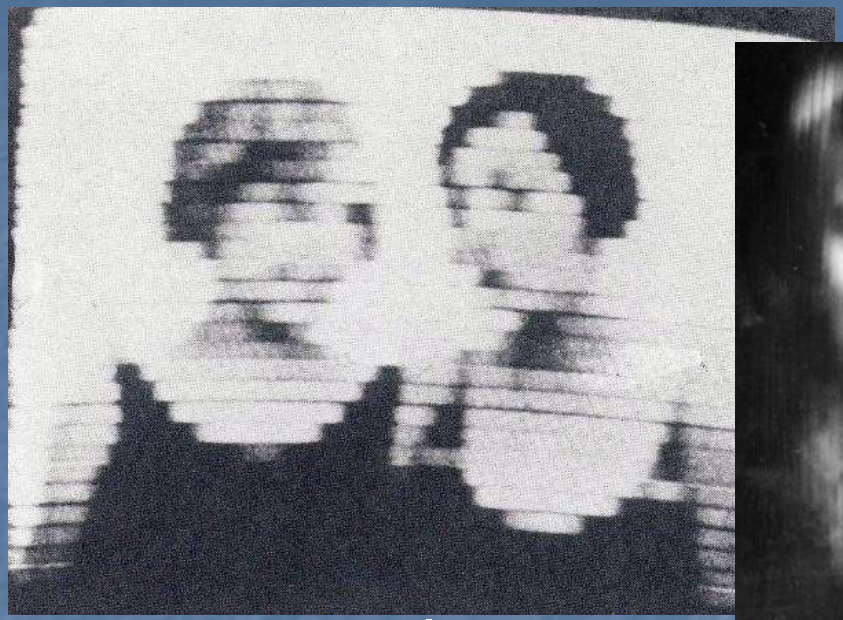


30 scanning lines

96 scanning lines

Gerhart Goebel, "From the history of television - The first fifty years,"
50 Years of Fernseh: 1929-1979, Bosch Technische Berichte, Vol. 6, May 1979

30 Lines Wasn't That Bad



30-line

actual off-screen 30-line photo

96-line

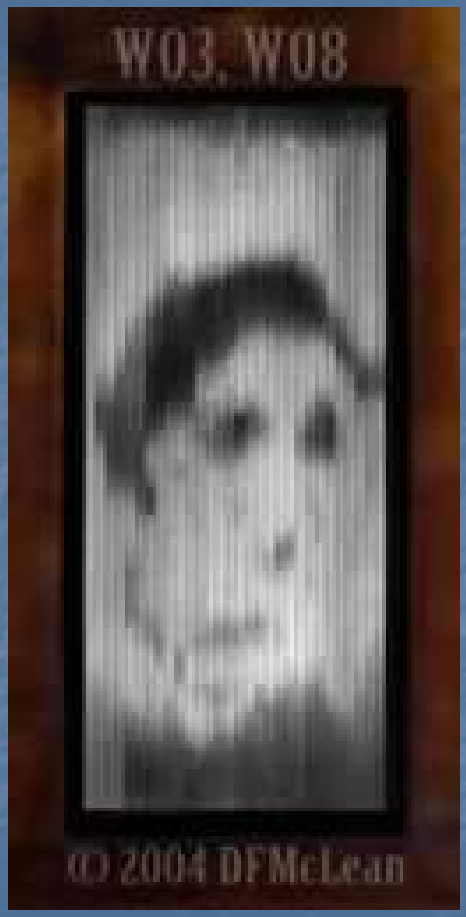
And

1928:
experimental
video recording
Miss Pounsford by
John Logie Baird

restored by
Donald F. McLean
TVDawn.com
used with permission

http://www.tvdawn.com/earliest-tv/phonovision-experiments-1927-28/the-recovered-images/

Got Better Quickly



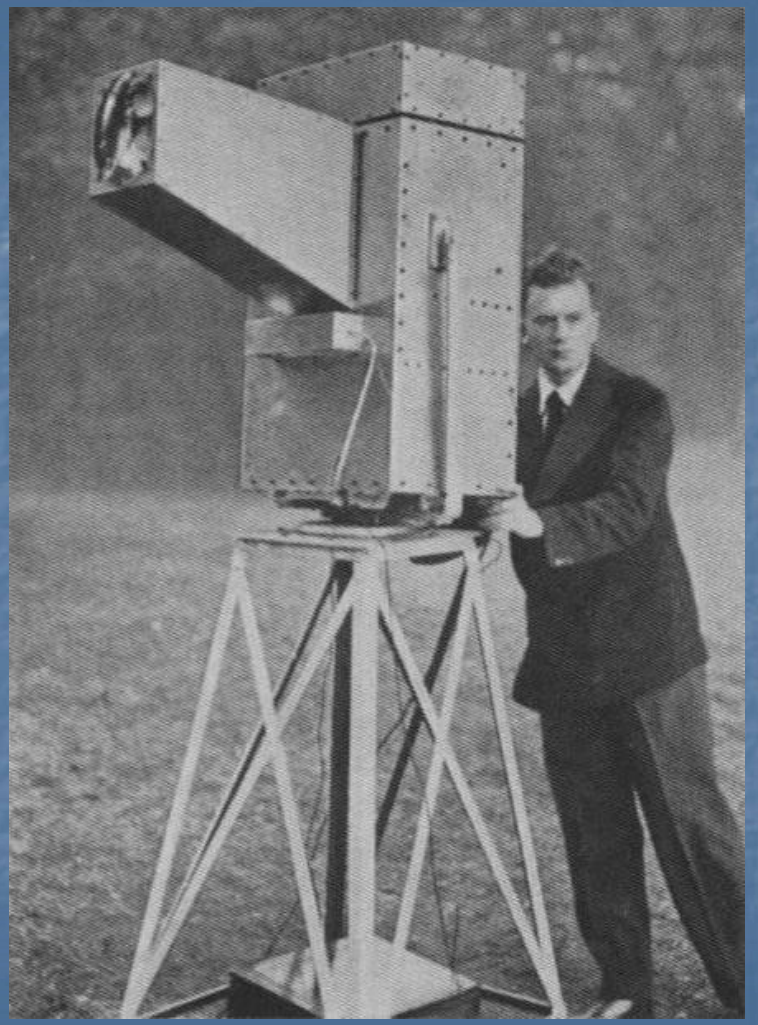
off-air recording
(Baird disk)
of Betty Bolton
singing 1932-5

restored by
Donald F. McLean
TVDawn.com
used with permission

http://www.tvdawn.com/earliest-tv/the-marcus-games-discs-1932-35/betty-bolton/

1928

- Germany, Japan, UK, U.S. (incl. NYC)
- Conventional
  - Regularly Scheduled TV Newscasts
  - Live Remote TV Coverage
  - Dramatic TV Programming
  - Intercity TV Distribution
  - Video Recording with Varispeed Playback
  - Home TV & Theatrical Large-Screen TV
  - Color TV
- Special
  - 3DTV
  - See-in-the-Dark TV
  - Two-Way TV



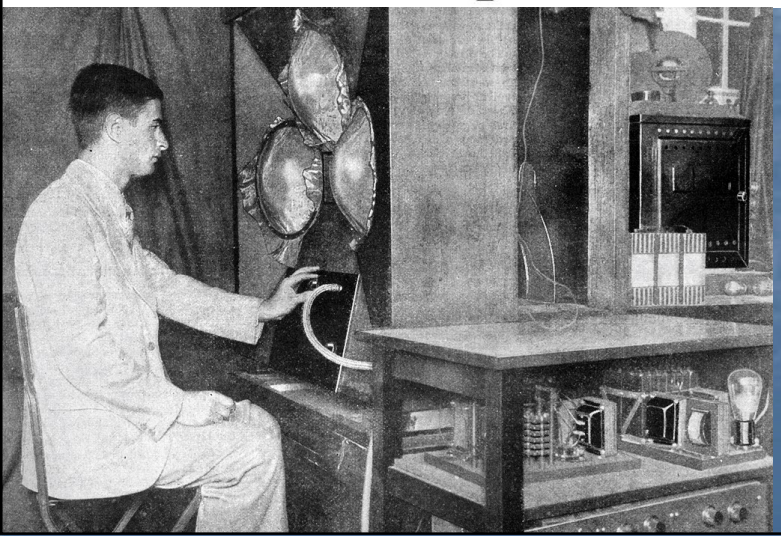
Baird Noctovisor

WRNY to Start Daily Television Broadcasts; Radio Audience Will See Studio Artists

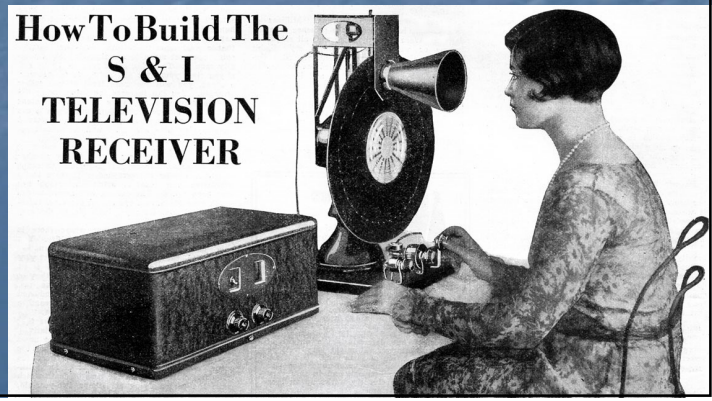
The first regul..r broadcasting of images by television over the radio from New York will begin tomorrow, it was learned last night from Station WRNY in the Hotel Roosevelt. WRNY, which is owned by The Radio News Magazine, has recently transmission as an intermittent high-pitched whirr, varying with the action before the transmitter.

Officers of WRNY saw the images at a set installed in a private home a few hundred yards from the transmitting station.

The New York Times, Aug. 13, 1928



WRNY flying-spot camera
Radio News
Nov. 1928



Science & Invention
Nov. 1928

But

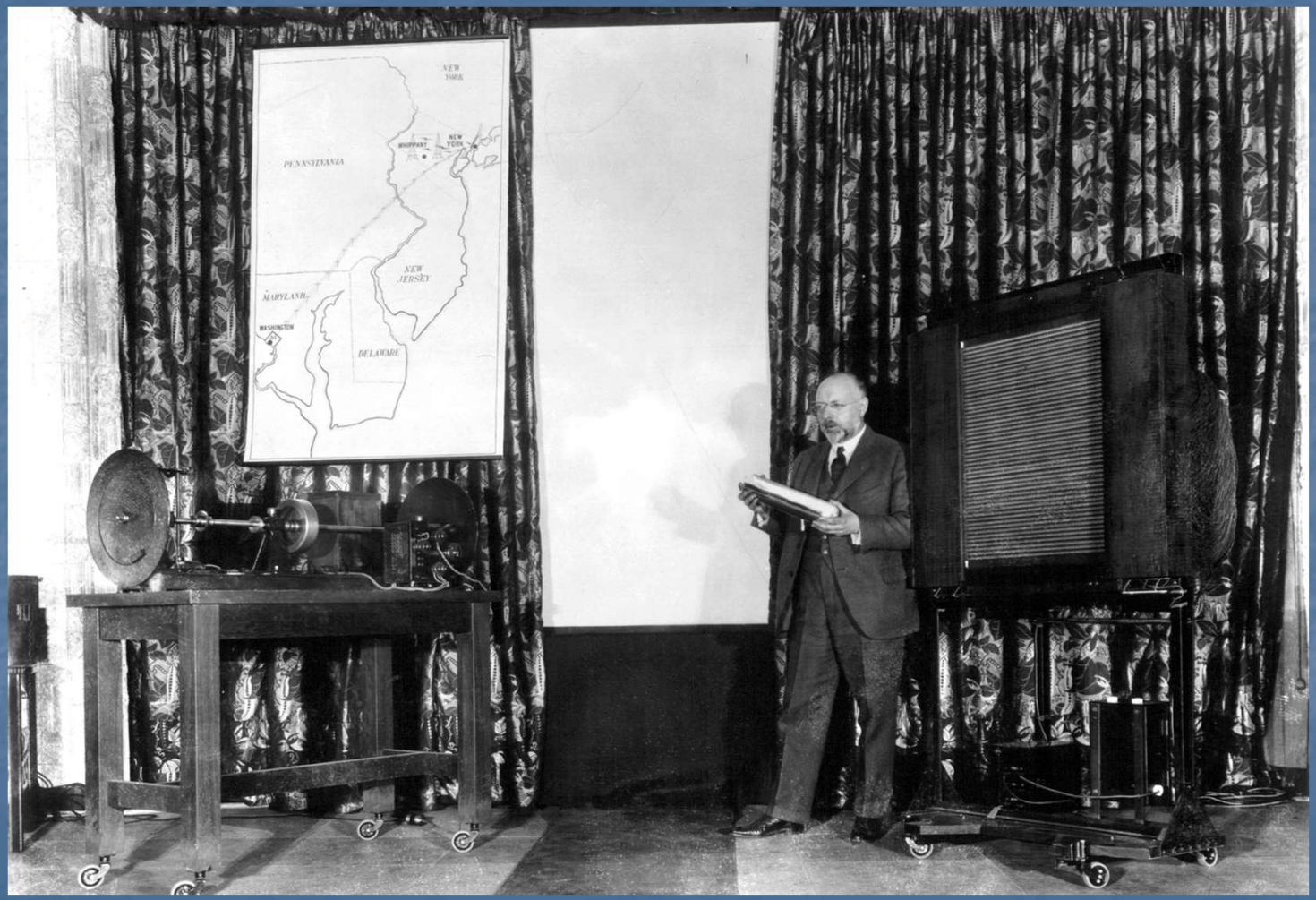
1927: all-electronic scanned television achieved by Philo T. Farnsworth

earlier diagram reported

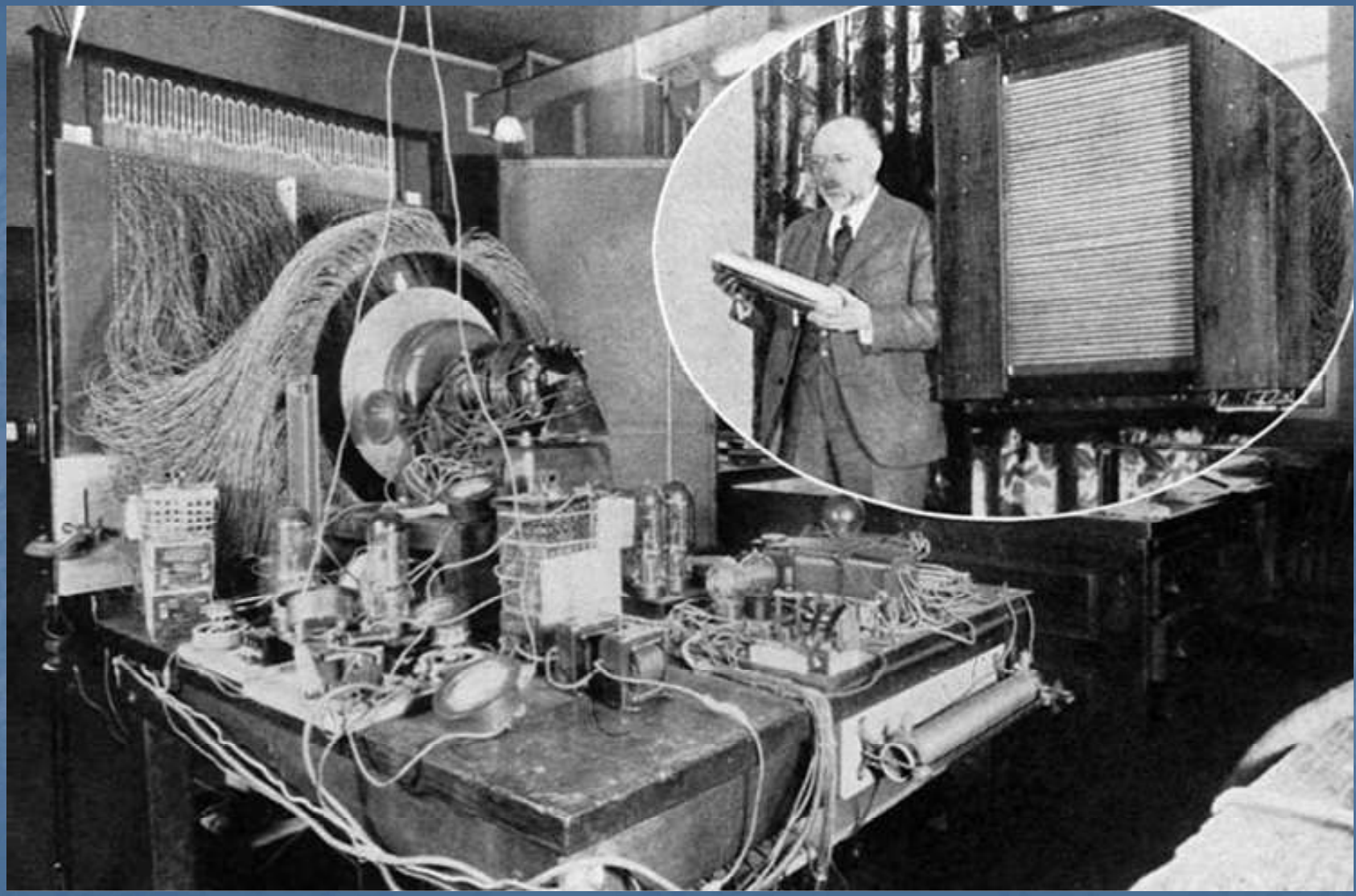
And

1927:
Ernst Alexanderson used speed and phase controls to watch GE's mechanical TV

And



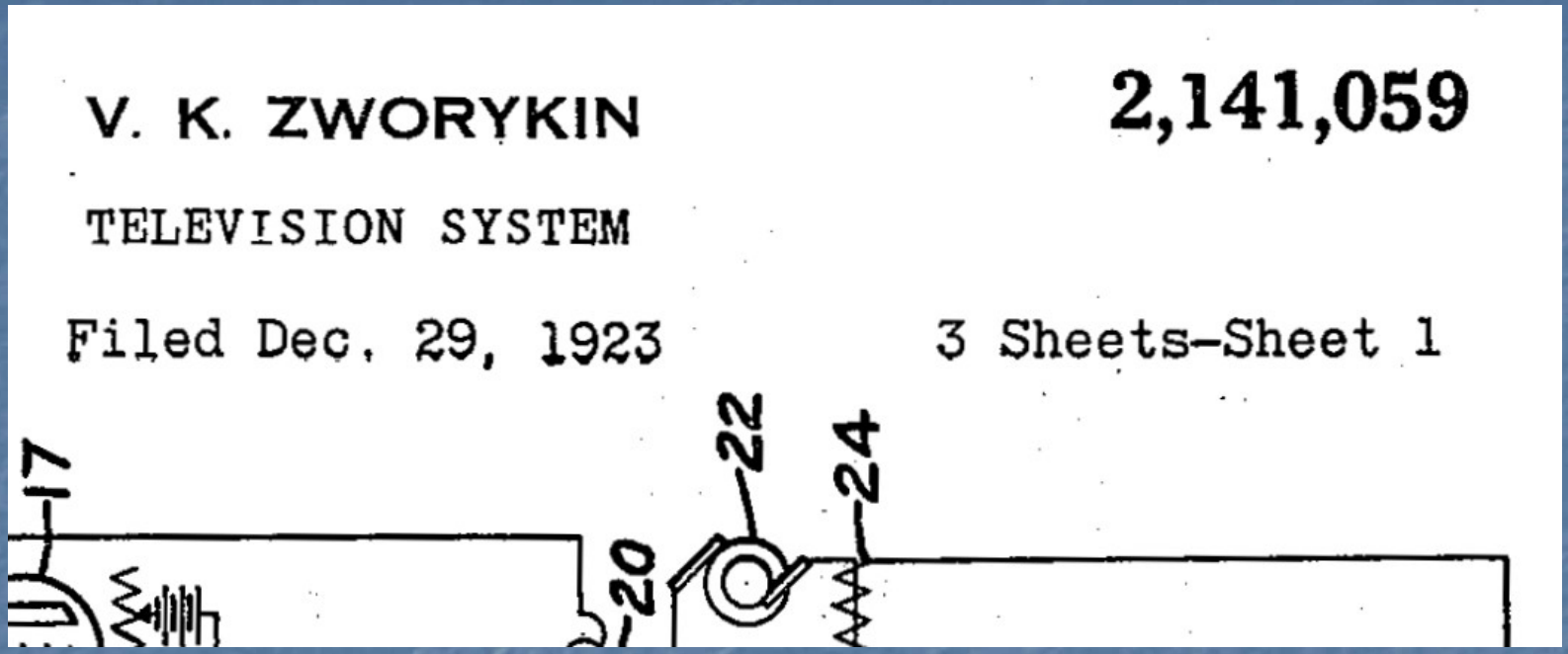
1927: long-distance large-screen TV at Bell Labs in NYC with Herbert E. Ives



But

1926: John Logie Baird demoed TV w/ recognizable faces (1st achieved 1925)

But



V. K. ZWORYKIN

2,141,059

TELEVISION SYSTEM

Filed Dec. 29, 1923

3 Sheets-Sheet 1

17

20

22

24

1923: Vladimir Zworykin filed for a patent on scanned all-electronic television

VARIETY

Published Weekly at 154 West 46th St., New York, N. Y., by Variety, Inc. Annual subscription $7. Single copies 10 cents.
Entered as second class matter December 22, 1905, at the Post Office at New York, N. Y., under the Act of March 3, 1879.

VOL. LXXI. No. 5 NEW YORK CITY, THURSDAY, JUNE 21, 1923 48 PAGES

MOVING PICTURES BY RADIO SUCCESSFULLY DEMONSTRATED

C. F. Jenkins of Washington Developing Experiment—Improvement Will Perfect Them, Inventor Says—U. S. Navy Cooperating

And

1923:
SMPTE-founder
Charles Francis Jenkins
demoed television

Patented Jan. 28, 1930 1,745,029

UNITED STATES PATENT OFFICE

BORIS RTCHEOULOFF, OF LONDON, ENGLAND

TELEVISION AND TELEPHOTOGRAPHY

Application filed February 9, 1927, Serial No. 167,045, and in Russia June 27, 1922.

But

- 1922 patent app. for videotape recording (Russia June 27)
- 2 problems in 1922:
  - no video
  - no tape

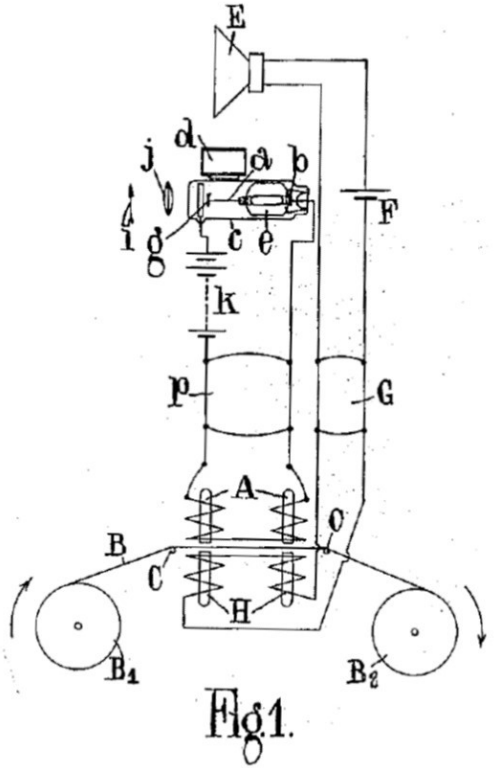


Fig 1.

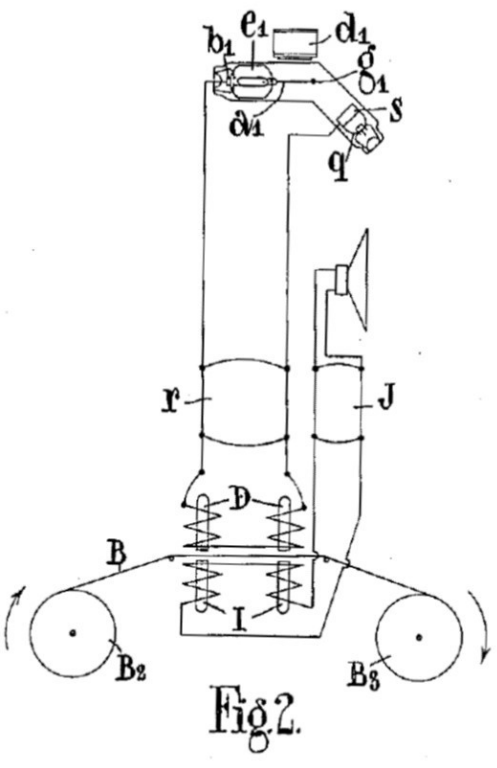


Fig 2.

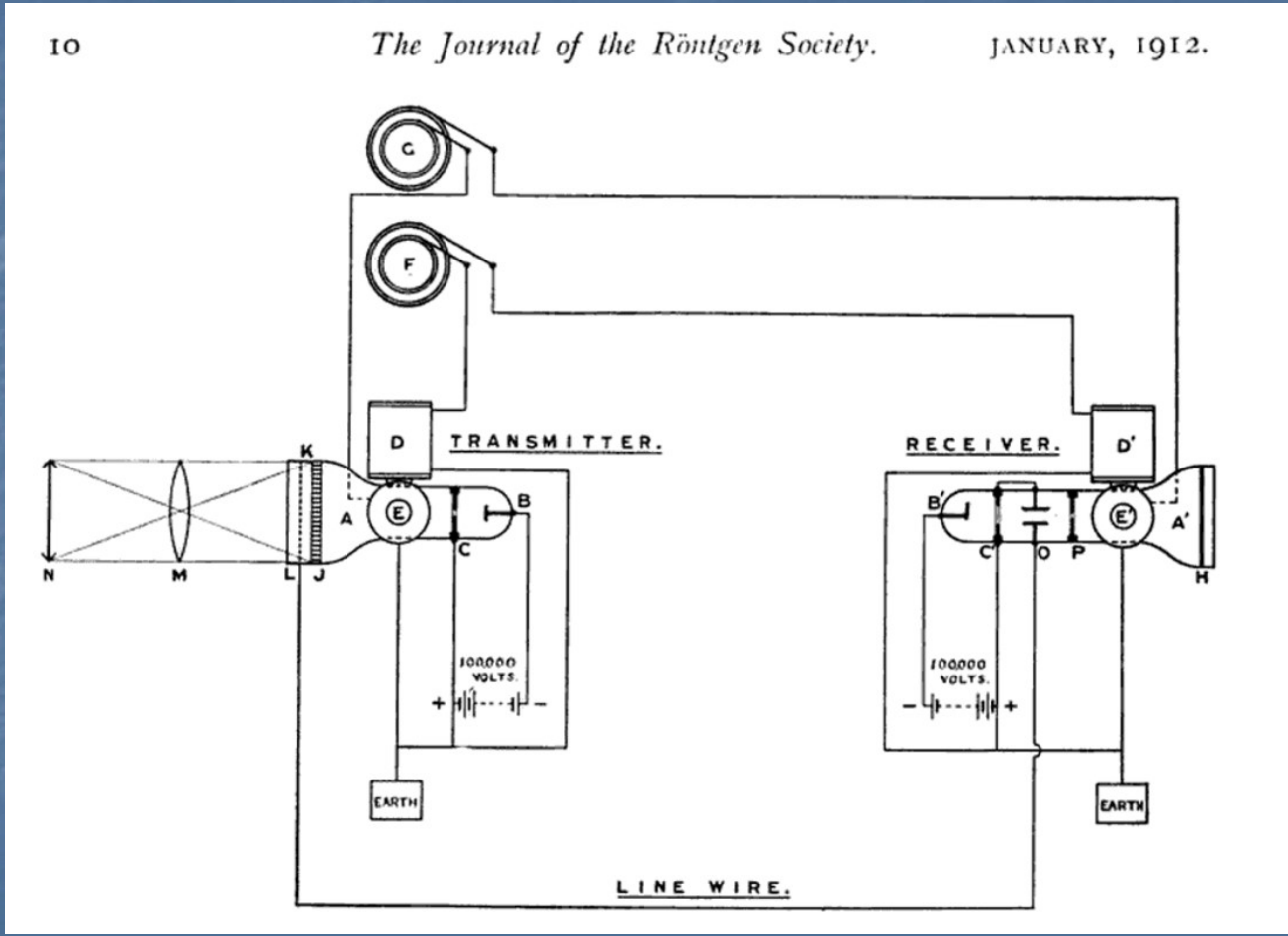
But

SAYS HE'S INVENTED SEEING BY WIRE

Dr. A. M. Low, an English Scientist, Gives a Demonstration of a New Apparatus.

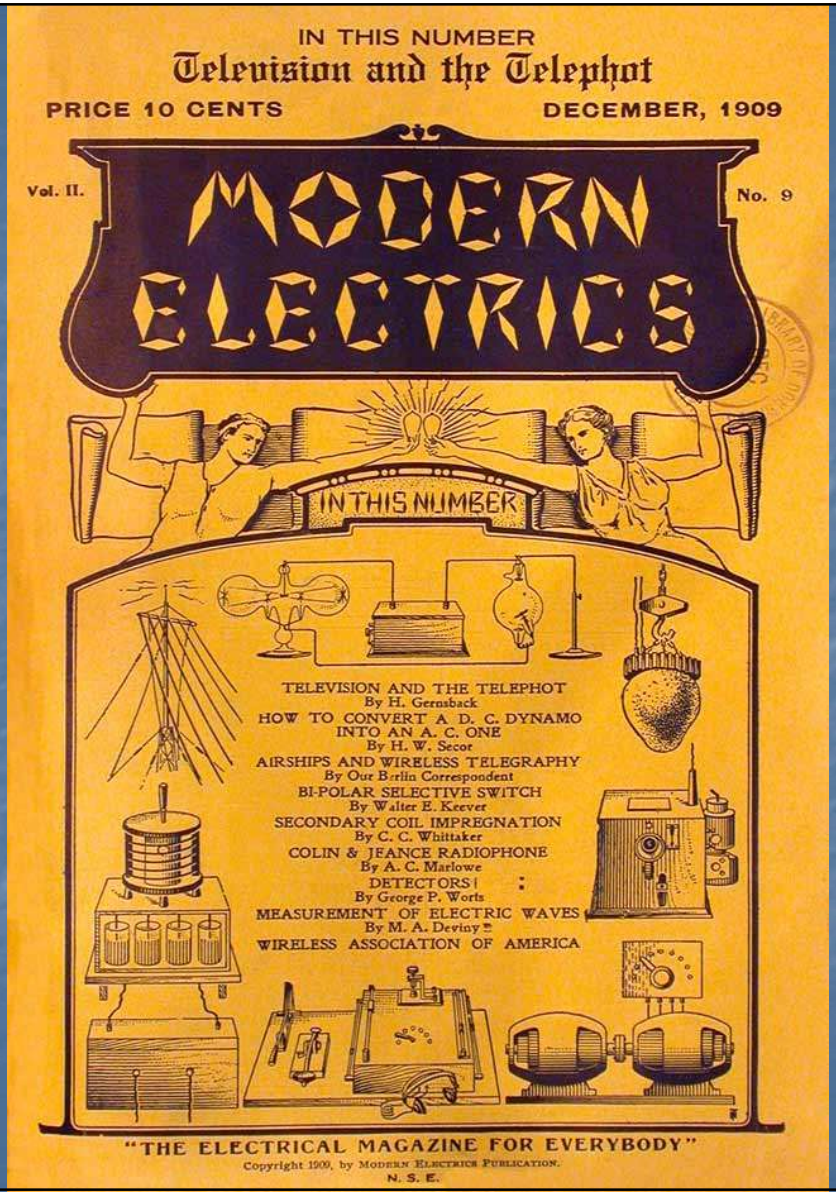
1914: (pre-SMPE) *New York Times* front-page account of a TV demo in London by Archibald Montgomery Low

But



1912: publication of a diagram of all-electronic scanned television by Alan Archibald Campbell Swinton (idea publ. 1908)

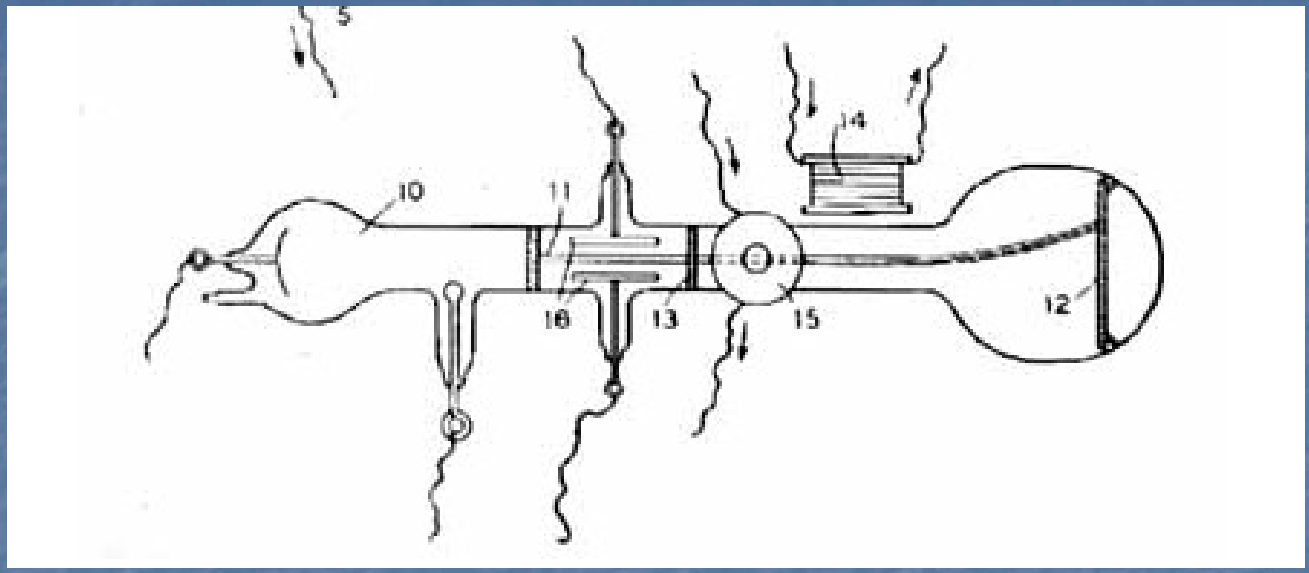
But



1909: television in a consumer publication by Hugo Gernsback

But

Boris Rosing Russian patent 18,076



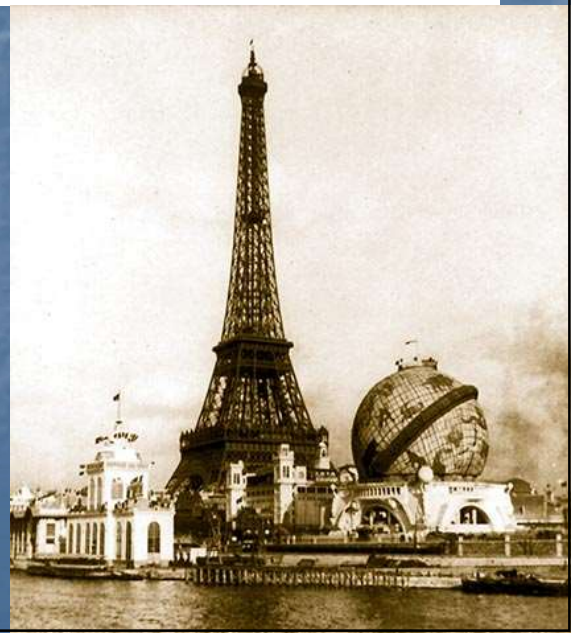
1907: patent-application diagram for a scanned picture tube (and the tube, itself, which *might* date to 1902)

But

At the afternoon sitting on Friday, M. C. Perskyi read a communication on "Television," describing a number of apparatus based on the magnetic properties of selenium.

"The International Electricity Congress," *The Electrician,* September 21, 1900, p. 822

1900: *television* coined at the Paris World's Fair by Russian Constantin Perskyi on August 24

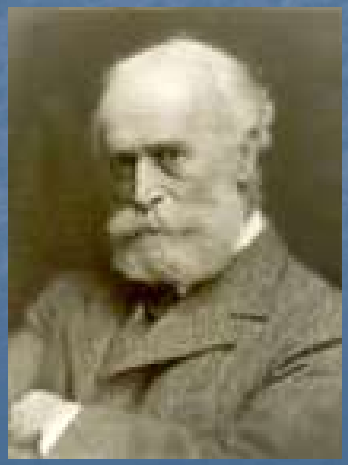


But

At the afternoon sitting on Friday, M. C. Perskyi read a communication on "Television," describing a number of apparatus based on the magnetic properties of selenium.

"The International Electricity Congress," *The Electrician,* September 21, 1900, p. 822

"*Television*? The word is half Latin and half Greek. No good can come of it"
- attributed to Charles Prestwich Scott, editor of *The Manchester Guardian*



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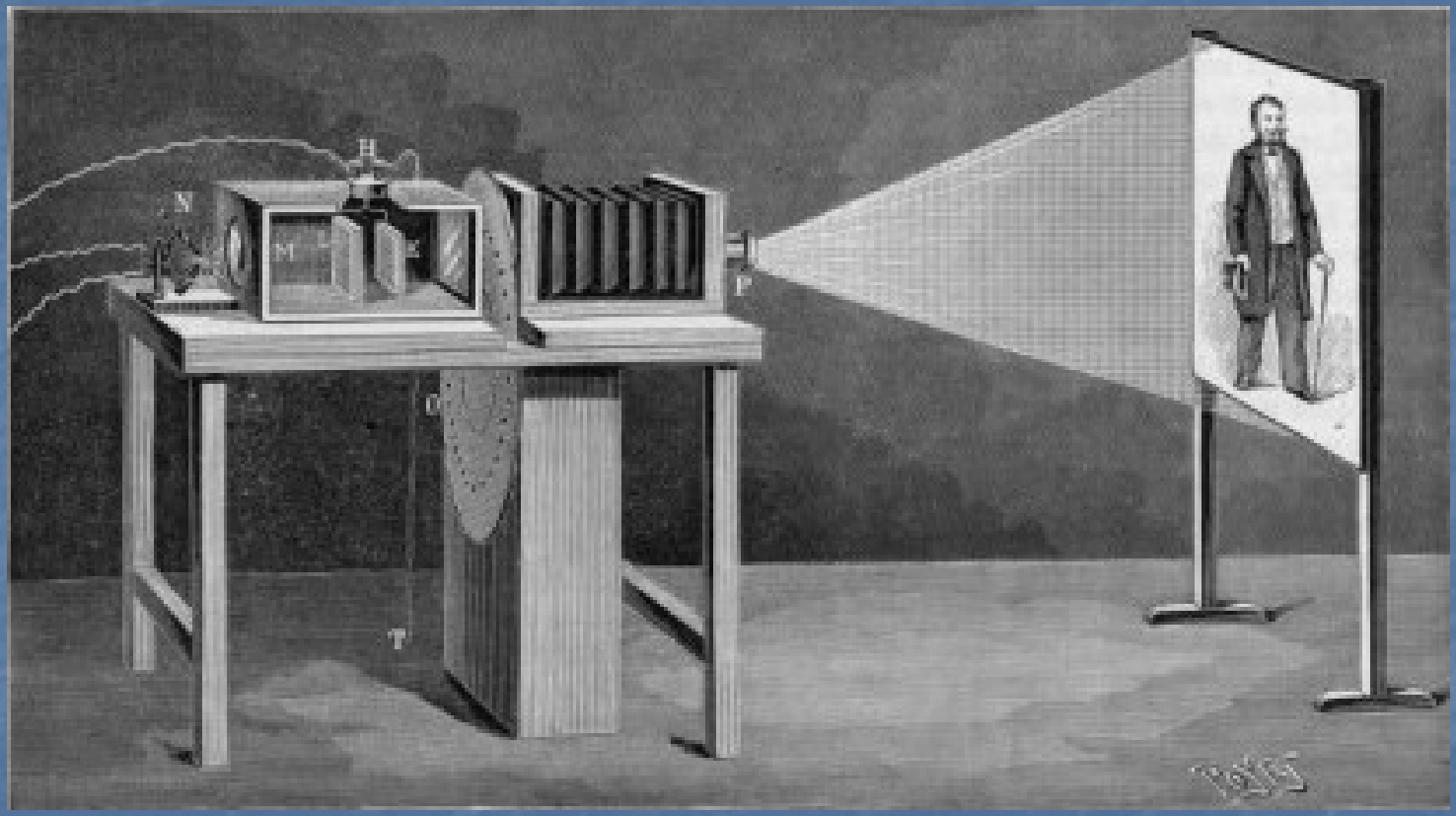


1897: Frantz Dussaud téléoscope

But

[July 25, 1894.]

THE ELECTRICAL ENGINEER.

TRANSMITTING PICTURES BY ELECTRICITY.

BY C. FRANCIS JENKINS.

One of the most interesting subjects before scientific societies at the present time is the problem of transmitting images to a distance by electricity. I offer for what it is worth a theoretical device which may be added to the

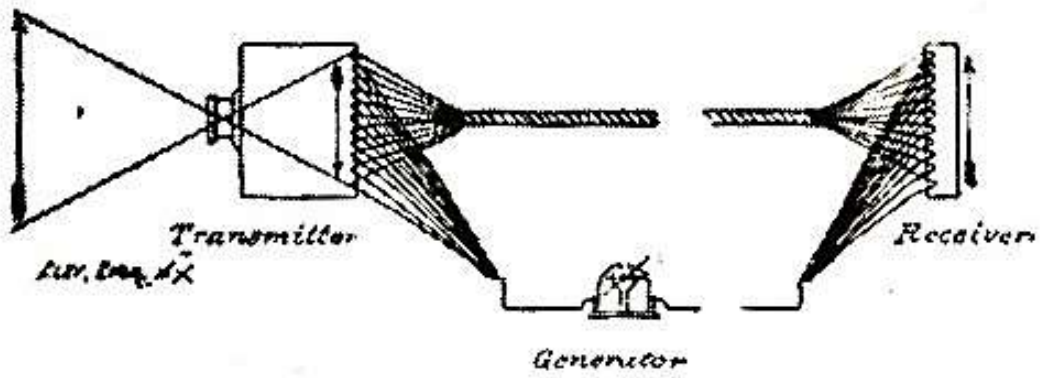


DIAGRAM OF JENKINS' PHANTOSCOPE.

1894: SMPTE-founder Jenkins's first published article on television

But

THE TELECTROSCOPE.

By LEON LE PONTOIS.*

I DESIGNATE by this name an apparatus having for its object the transmission of pictures or views of moving or stationary objects at great distances, and as I use electricity for the purpose of obtaining this result, I call this apparatus a telectroscope.

First let me say that by the transmission of pictures to great distances I do not mean the graphic transmission of sketches or writing as done, for instance, by the very ingenious invention of Prof. Elisha Gray, namely, the telautograph.

I intend to describe to you to-night the general outline of an apparatus that I have conceived for the purpose of seeing over as great distances as we hear by the long distance telephone.

SAS, June 10, 1893

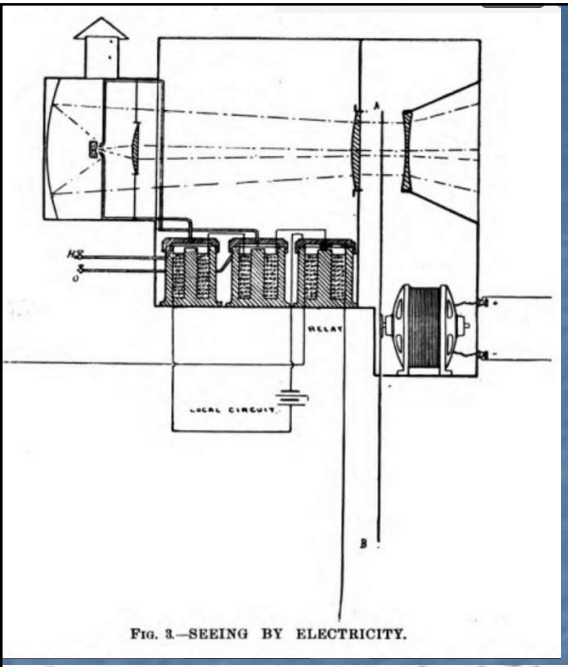


Fig. 3.—SEEING BY ELECTRICITY.

nice TV-set chimney

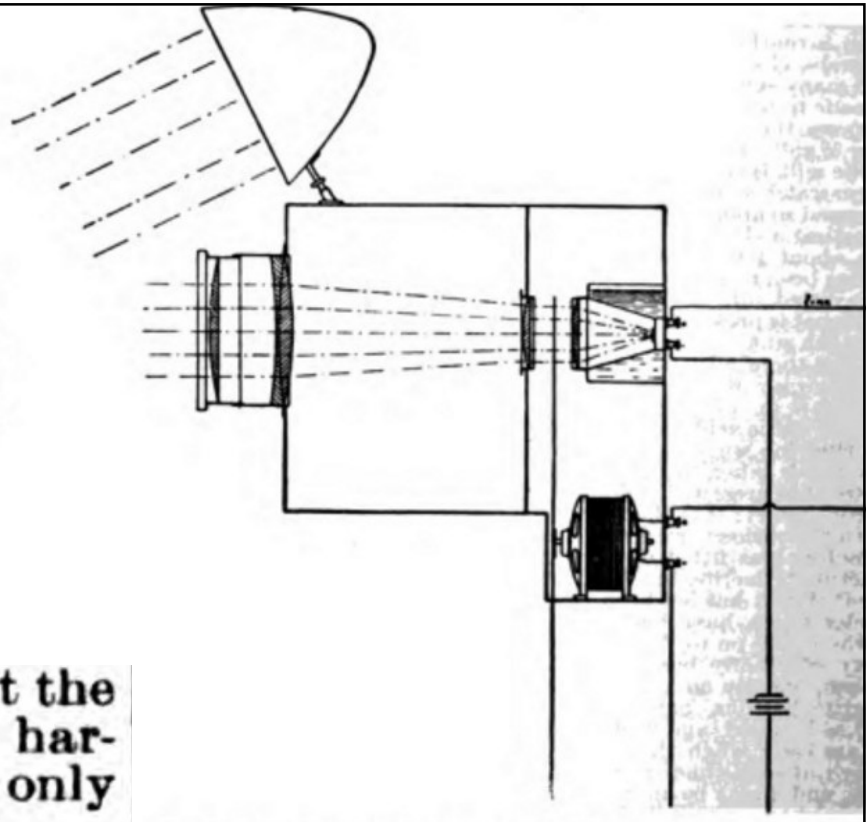


Fig. 2.—SEEING BY ELECTRICITY.

oldest depiction of a camera-mounted light?

give a name to their harmonious groupment (what the musicians call a chord), because each sound or its harmonies vibrates one of our nerves of hearing and only this one.

Vision is the sensation produced on the nerves dispersed all around the retina by the rhythmic motion called light.

Each of the nerves can indistinctly vibrate for the different light radiations known as colors, and we have

* Read before the Pittsburg Electric Club

But

1892: depiction of home shopping by television

Albert Robida, *La vie électrique : le vingtième siècle*

caption translation: purchases via television

D 1891 "Phon. - Tel."

THE CHICAGO EVENING POST

TUESDAY, MAY 12, 1891.

EDISON'S IN CHICAGO.

The Wizard of Menlo Park Stopping at the Auditorium.

TELLS OF HIS LATEST INVENTION

Thomas A. Edison is in the city. The wonder of the age, one of the world's truly great, he bears his honors easily. Naught is there about him to suggest the egotist. A massive head is his, but it is not "big." He is one of those rare men who achieve success and wear it as an ornament. In short, he is approachable as when he started on his great career. In him indeed the lightning has a kind master.

As he entered the Auditorium Hotel this morning the throng that filled the rotunda parted to let him pass. But few knew of his coming, but nearly all recognized his strong, clean cut features from familiarity

THOMAS A. EDISON.

"The electrical exhibit should be together," he said quietly, but with the earnestness of absolute conviction. "The exhibit at the Paris exhibition was divided into many parts, so that to see them all required one to walk about fifty miles. It was a fine display, but its effect and much of its value was lost by reason of its not being together.

"It will be a great mistake to separate the exhibit here. As Professor Barrett, a very worthy, able man, says, it should be together. It might not be of harm to have the dynamos in one building and the rest of the exhibit in another; still, the greatest effect is to be obtained from a grouping of the whole."

Mr. Edison has a cogent explanation of the desire to separate the exhibit.

"It is due to the existence of a commercial nigger in the woodpile," he said with [illegible] "wherein everybody nodded and wondered why he himself had not thought of it before. But the wizard hopes that the commercial nigger will be discovered and ousted and thus by centering the electrical exhibits in one spot obtain a display that has never yet been equaled in the world.

It has been stated that the invention which Mr. Edison is to exhibit at the fair as his piece de resistance is something that will surpass in its surprises anything that ever came from his wonderful workshop. The first wonder was the telephone and following it the phonograph. The one destined for Chicago to present to the world will embrace the elements of both and be equal if it do not exceed the sum of their combined mysteries.

"But," he explained, "this invention will not have any particular commercial value. It will be rather of a sentimental worth. What is it? We-el"—he hesitated as if loth to part with his secret, then seeing the look of expectancy in the faces of his listeners released a diminutive laugh and said:

"It is not yet completed. But when it is it will surprise you. I hope to be able by the invention to throw upon a canvas a perfect picture of anybody and reproduce his words. Thus, should Patti be singing somewhere, this invention will put her full length picture upon the canvas so perfectly as to enable her to distinguish every feature and expression of her face, see all her actions and listen to the entrancing melody of her peerless voice. The invention will do for the eye what the phonograph has done for the voice and reproduces the voice as well, in fact more clearly. I have already perfected the invention so far as to be able to picture a prize fight—the two men, the ring, the intensely interested faces of those surrounding it—and you can hear the sound of the blows, the cheers of encouragement and the yells of disappointment. And when

"The telephone is old," he said; "I want something fresh to attract my mind."

He was much pleased to learn of the progress being made by the officials of the world's fair.

"Everything is running smoothly," said an acquaintance, "and a little variety is now and then given to the work by Colonel Phoebe Couzins."

"Ah," said the wizard, raising his hand in supplication, "a woman is a wonderful being, full of mystery and hard to man[illegible] ago——"

"As electricity!"

"Harder."

It is not expected, as has been stated, that Mr. Edison will take any part in [illegible] Barrett's controversy [illegible] building. As [illegible] he is not [illegible] he expects to spend a great deal of money on his exhibit, but like all the other great electrical firms is willing to trust Professor Barrett with the preliminary arrangements. He has had world's fair talks with the electrical chief and pronounces him a man of good hard sense, able to work up the best electrical exhibit that has ever been brought together. Mr. Edison's own exhibit will be one of the wonders. The Eiffel tower was the only greater attraction at Paris than the Edison exhibit, and the great inventor is confident that his showing here will be equally prominent.

EDISON HIS OWN DOCTOR.

An Interesting Chat on Interesting Topics with the Wizard of Menlo Park.

Some time ago Mr Edison was ill, says the New York *Sunday Sun*, and there was consternation in his home and among his helpers in the workshops. Everybody in the shops, from the small boy who politely evades questioning visitors and successfully avoids betraying Mr. Edison's whereabouts, to the chief lieutenant of the great man, was greatly concerned. His immediate associates overwhelmed Mr. Edison with advice, and all besought him to call in a physician. Mrs. Edison was anxious, too, but very properly refrained from offering any opinions, feeling confidence in her husband's ability to choose the wisest course. He approved of her silence on this subject, and lectured his [illegible] friends thus:

"My friends, you are deceived. I am [illegible] not well, but my ailment is not serious if properly treated. If I were to follow your advice, take all the drugs that you suggest or all that the physician you advise me to call in would prescribe, I would be worse. The fact is my liver is out of order and my kidneys are not in just the condition they should be. I will remedy all that very speedily. My cure will be a change of diet. That is all that is needful in such a case. Come to think of it, I have been eating a great deal of meat lately; now I will stop eating meat altogether and will eat only vegetables."

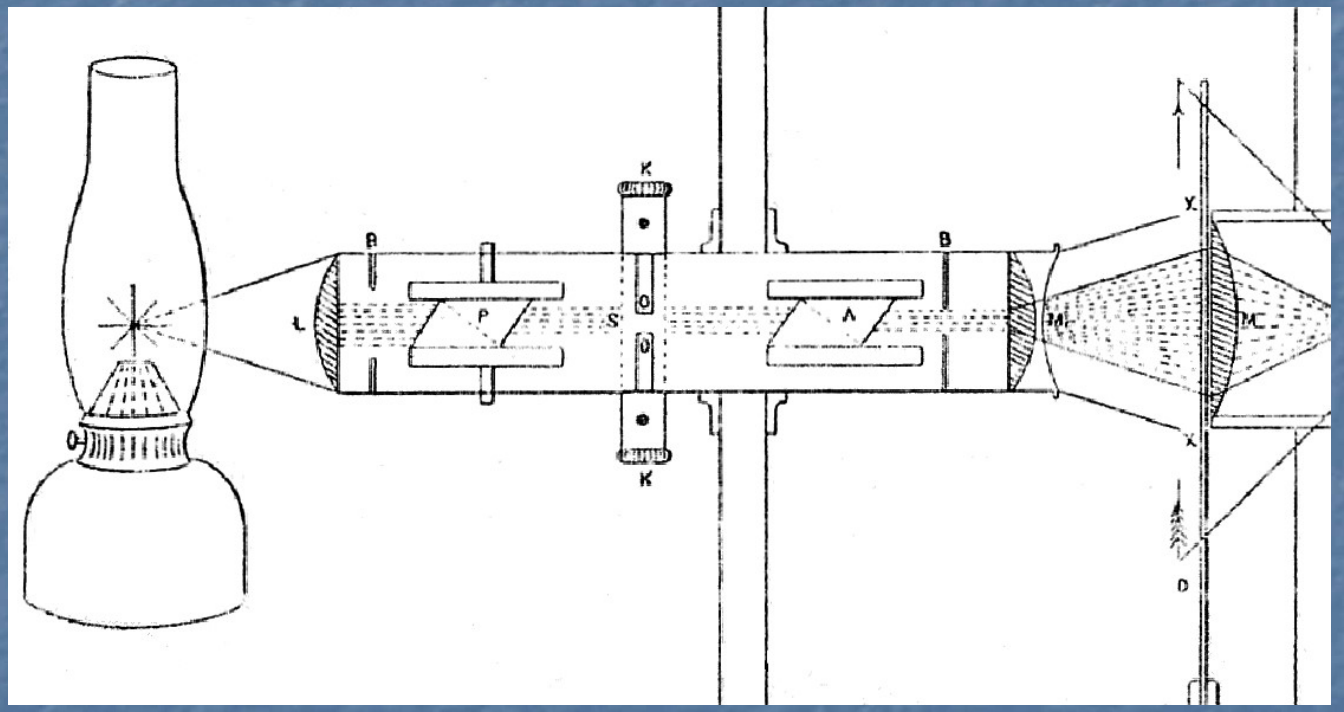
But

1891: Edison said he might introduce color TV at the World's Columbian Exposition

of the singers. When the system is perfected, which I hope will be in time for the fair, the muscles of the singer's face, every glance of the eye, and each expression will be seen. Every colour in the performer's attire, too, will be exactly reproduced. Moreover, the spectator, seated by his own fireside, will see each person in the play move to his or her position in a natural way, just as though they were the very persons themselves."

Evening Post (Wellington) June 27

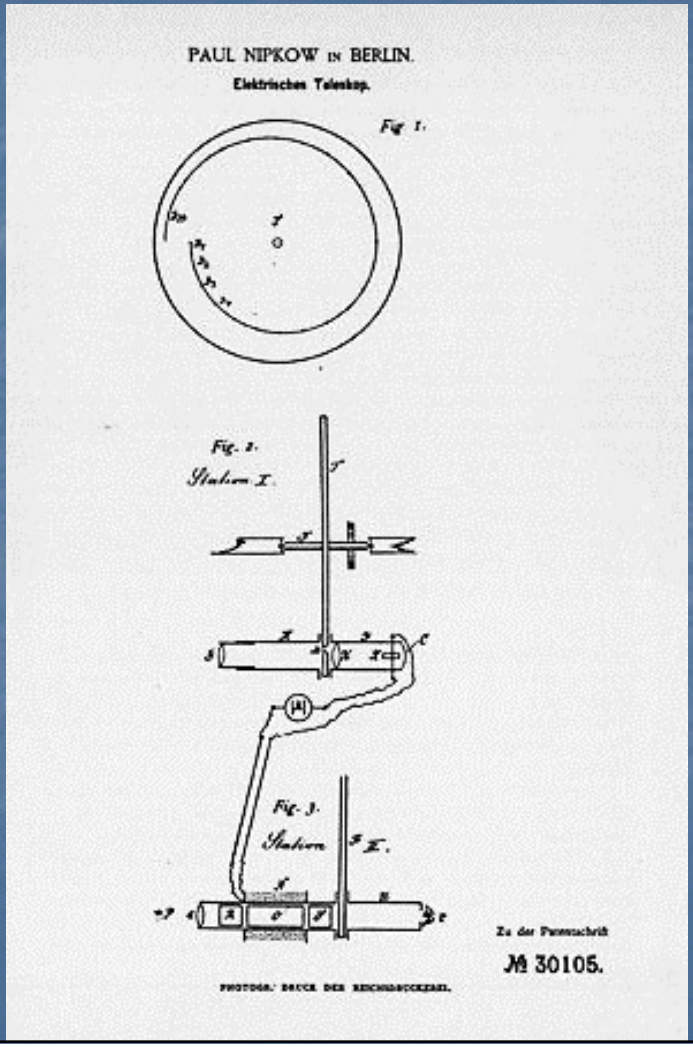
But



Henry Sutton's telephane
The Telegraphic Journal and Electrical Review, November 7, 1890

1890: description of 1885 design for a television system with an oil-lamp backlight in the display

But



PAUL NIPKOW IN BERLIN.

Elektrischen Teleskop.

Fig. 1.

Fig. 2.

Station I.

Fig. 3.

Station II.

Zu der Patentschrift

№ 30105.

PHOTOGR. DRUCK DER REICHSDRUCKEREI.

1885: patent for a complete television system (applied for in 1884)

But

1882: image of HDTV war coverage

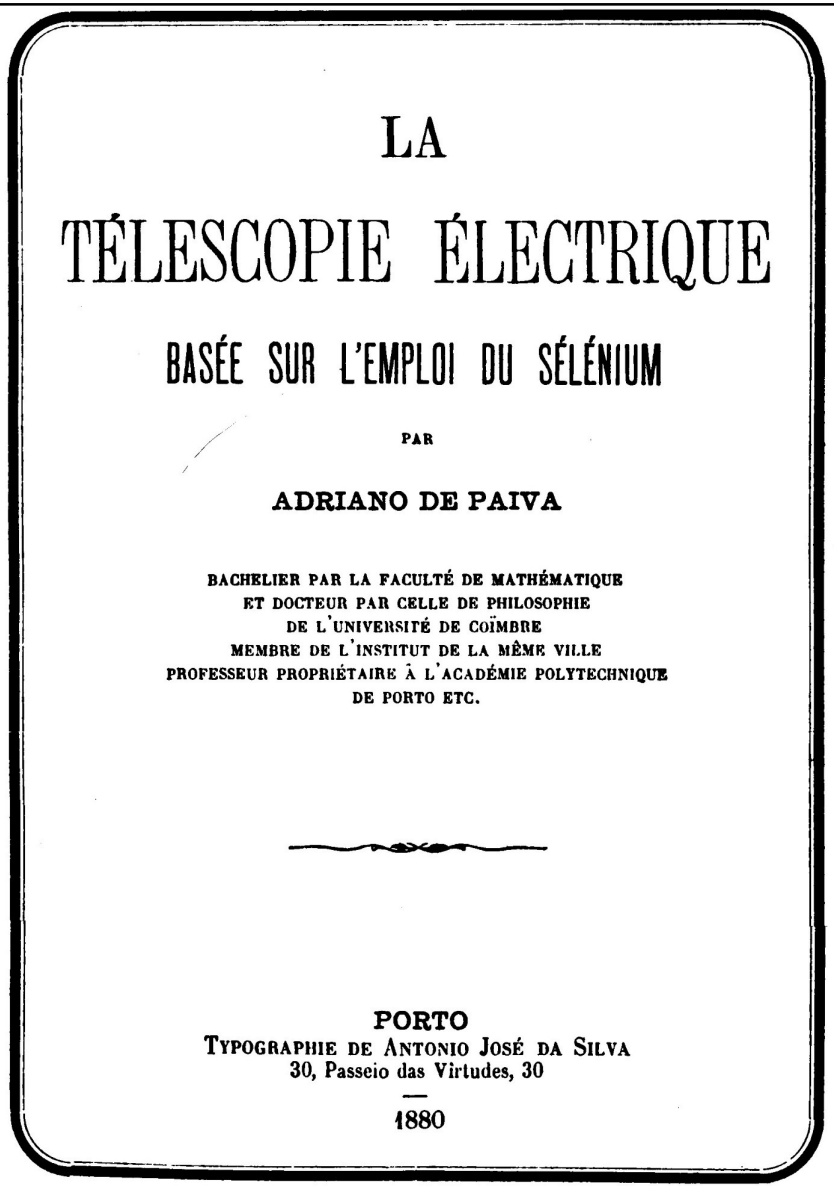
Albert Robida, *Le vingtième siècle*

caption translation: the TV news

Including

handheld camera, "PRESS" marking on the mobile unit, the wounding of the reporter becoming the story, & a <u>really</u> long cord

But



LA

TÉLESCOPIE ÉLECTRIQUE

BASÉE SUR L'EMPLOI DU SÉLÉNIUM

PAR

ADRIANO DE PAIVA

BACHELIER PAR LA FACULTÉ DE MATHÉMATIQUE
ET DOCTEUR PAR CELLE DE PHILOSOPHIE
DE L'UNIVERSITÉ DE COÏMBRE
MEMBRE DE L'INSTITUT DE LA MÊME VILLE
PROFESSEUR PROPRIÉTAIRE À L'ACADÉMIE POLYTECHNIQUE
DE PORTO ETC.

PORTO
TYPOGRAPHIE DE ANTONIO JOSÉ DA SILVA
30, Passeio das Virtudes, 30

1880

1880 book published about television in French, English, & Portuguese

But

AN ELECTRIC TELESCOPE.

[15374.]—It may be of interest to your readers to know the details of some experiments on which I have been engaged during the last three months, with the object of transmitting a luminous image by electricity.

To transmit light alone all that is required is a battery circuit with a piece of selenium introduced at the transmitting end, the resistance of which falling as it is exposed to light increases the strength of the current, and renders a piece of platinum incandescent at the receiving end thus reproducing the light at the distant station.

By using a number of circuits, each containing selenium and platinum arranged at each end, just as the rods and cones are in the retina, the selenium end being exposed in a camera, I have succeeded in transmitting built-up images of very simple luminous objects.

An attempt to reproduce images with a single circuit failed through the selenium requiring some time to recover its resistance. The principle adopted was that of the copying telegraph, namely, giving both the platinum and selenium a rapid synchronous movement of a complicated nature, so that every portion of the image of the lens should act on the circuit ten times in a second, in which case the image would be formed just as a rapidly-whirled stick forms a circle of fire. Though unsuccessful in the latter experiment, I do not despair of yet accomplishing my object as I am at present on the track of a more suitable substance than selenium.

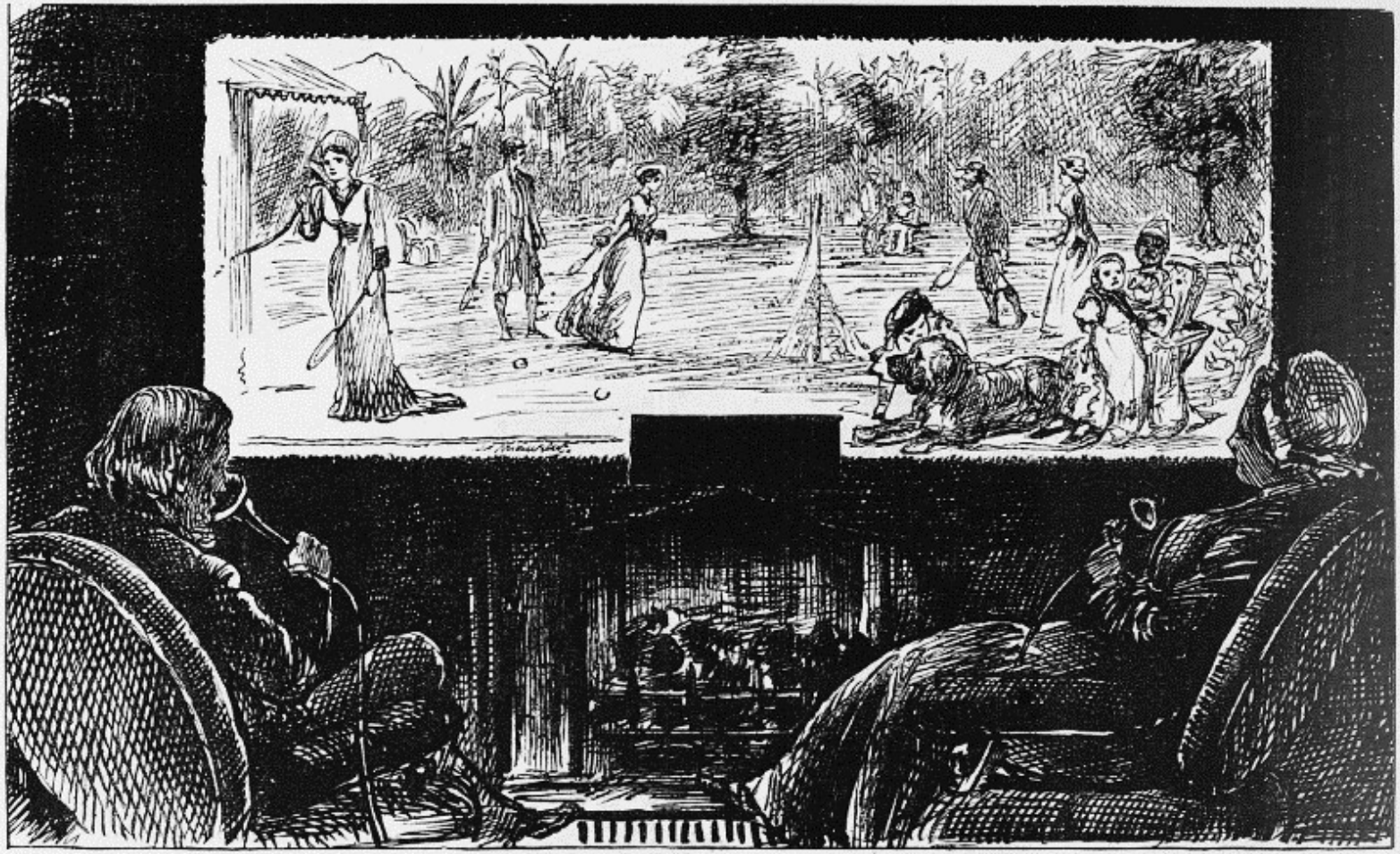
Denis D. Redmond.

Belmont Lodge, Sandford, Dublin.

English Mechanic and World of Science, February 7, 1879, p. 540

1879 report of actual transmission of a video image, including references to scanning and frame rate

PUNCH'S ALMANACK FOR 1879. [December 2, 1878.



EDISON'S TELEPHONOSCOPE (TRANSMITS LIGHT AS WELL AS SOUND).

(Every evening, before going to bed, Pater- and Materfamilias set up an electric camera-obscura over their bedroom mantel-piece, and gladden their eyes with the sight of their Children at the Antipodes, and converse gaily with them through the wire.)

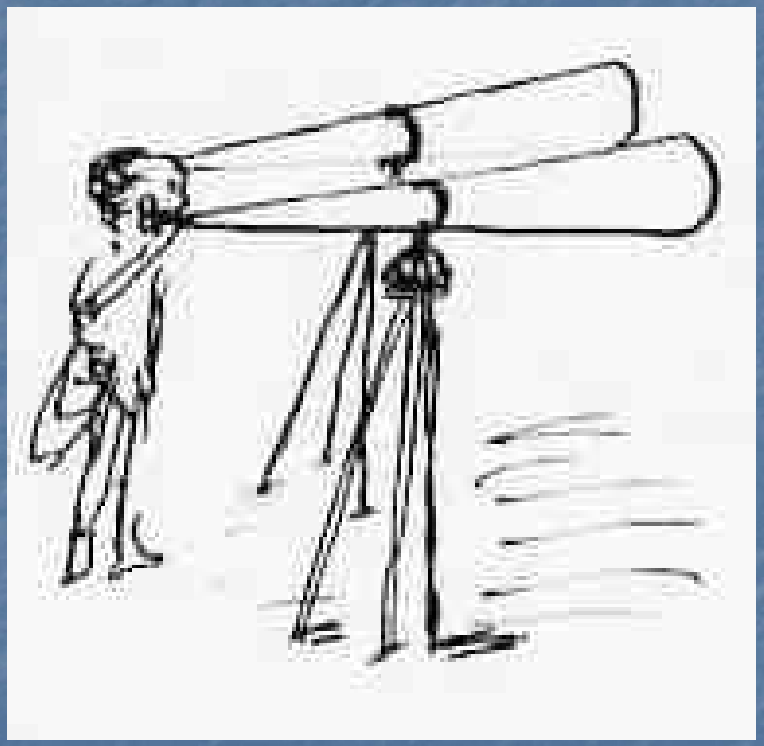
Paterfamilias (in Wilton Place). "BEATRICE, COME CLOSER, I WANT TO WHISPER." *Beatrice (from Ceylon).* "YES, PAPA DEAR."
Paterfamilias. "WHO IS THAT CHARMING YOUNG LADY PLAYING ON CHARLIE'S SIDE?"
Beatrice. "SHE'S JUST COME OVER FROM ENGLAND, PAPA. I'LL INTRODUCE YOU TO HER AS SOON AS THE GAME'S OVER?"

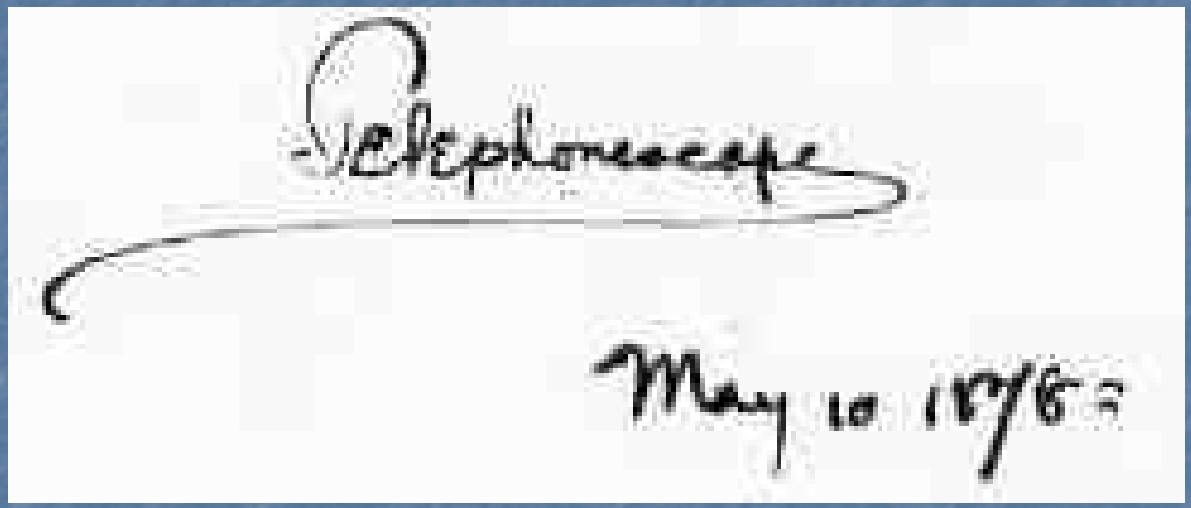
But

1878: published image of television by George du Maurier (called a "prediction" in Erik Barnouw's TV history book *Tube of Plenty*)

EDISON'S ANTI-GRAVITATION UNDER-CLOTHING—(continued).

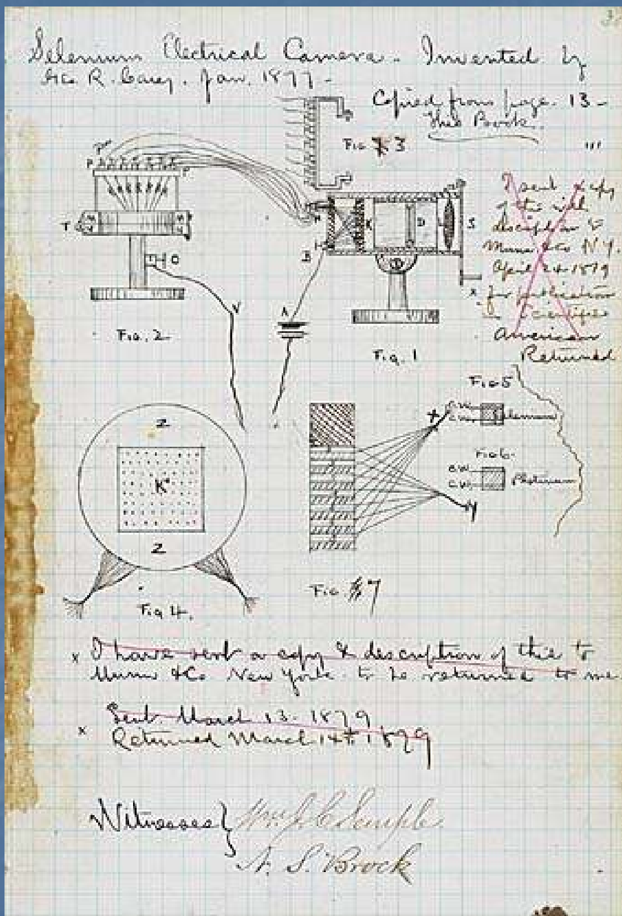
Edison's Real 1878 Telephonoscope





patent caveat

But



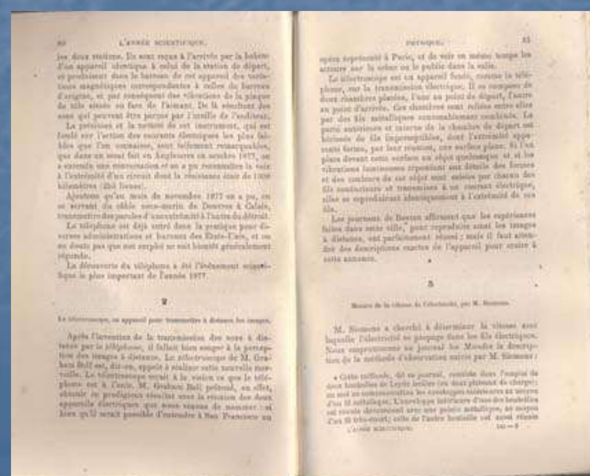

The Sun.

FRIDAY, MARCH 30, 1877.

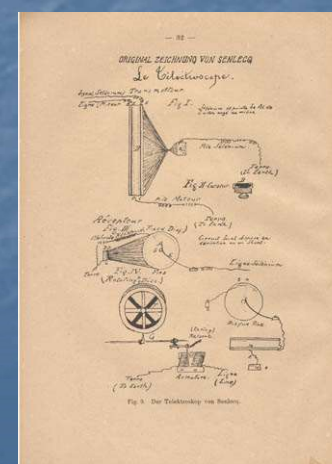
THE ELECTROSCOPE.

Is this Marvel to be the Next Achievement of Modern Science?

To the Editor of The Sun—*Sir:* An emi-




O INSTITUTO



1877:
8 or 9 people writing about or working on television in multiple countries and languages

- John Cammack, London
- George R. Carey, Boston
- "Electrician," New York
- Louis Figuier, Paris
- Frederick Glew, Wakefield, UK
- Julijan Ochorowicz, Lwów, Poland*
- Adriano de Paiva, Porto, Portugal
- William Sawyer, New York
- Constantin Senlecq, Ardres, France

Adriano de Paiva

And Before Them?

1877 1879 1882 1885 1890 1900 1907 1912 1914 1928 1930 1936 1939 2017 future

* publication in Polish, politically different even at the time

Not Quite True

- St. Clare of Assisi (1194-1253)
  - reportedly, one Christmas night, when illness prevented her from leaving her convent cell, she heard and saw the mass at the church across town "as if present in person"
  - on that basis, she was proclaimed Patron Saint of Television by Pope Pius XII, "with all liturgical honors and privileges," February 17, 1958

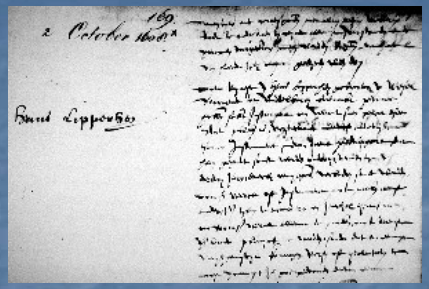
Powerful Displays

Dr. Baptista Damiotti showed two women in Scotland a motion view in Italy via a special mirror system

c. 1828
illustration by John William Wright for Sir Walter Scott's *My Aunt Margaret's Mirror* (magic mirrors, crystal balls, and the like don't have cameras, so can see the future, the past, through walls, mountains, etc.)

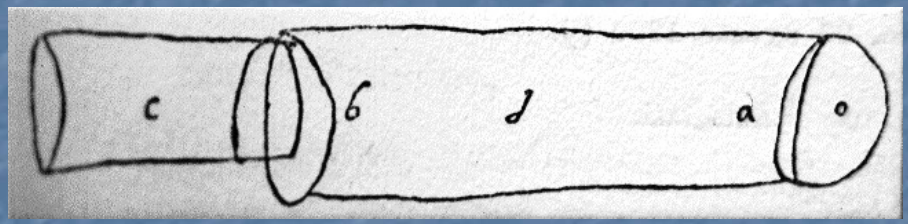
www.metmuseum.org

Besides Faith and Fiction: Telescopes



1608 patent application for a telescope by Hans Lippershey

1609 earliest known illustration of a telescope, by Giambattista della Porta



1884 ad for a telescope using a German word that today means a TV set

Leipzig *Illustrirte Zeitung*

Still No Camera

Back to Scotland

THE

SCOTS MAGAZINE.

FEBRUARY, 1753.

—An expeditious method of conveying intelligence by means of electricity 73.

To the author of the SCOTS MAGAZINE.

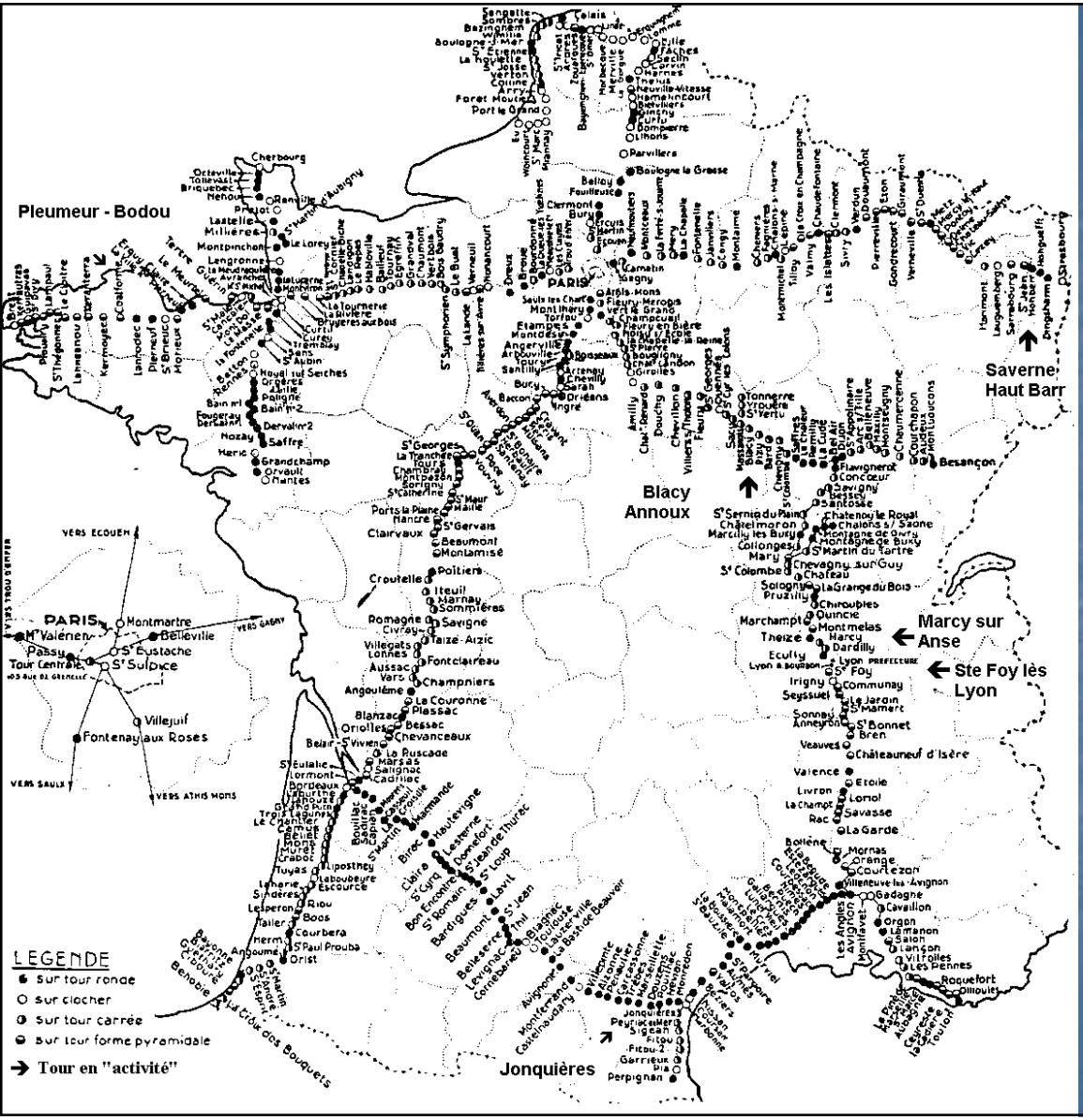
SIR, Renfrew, Feb. 1. 1753.

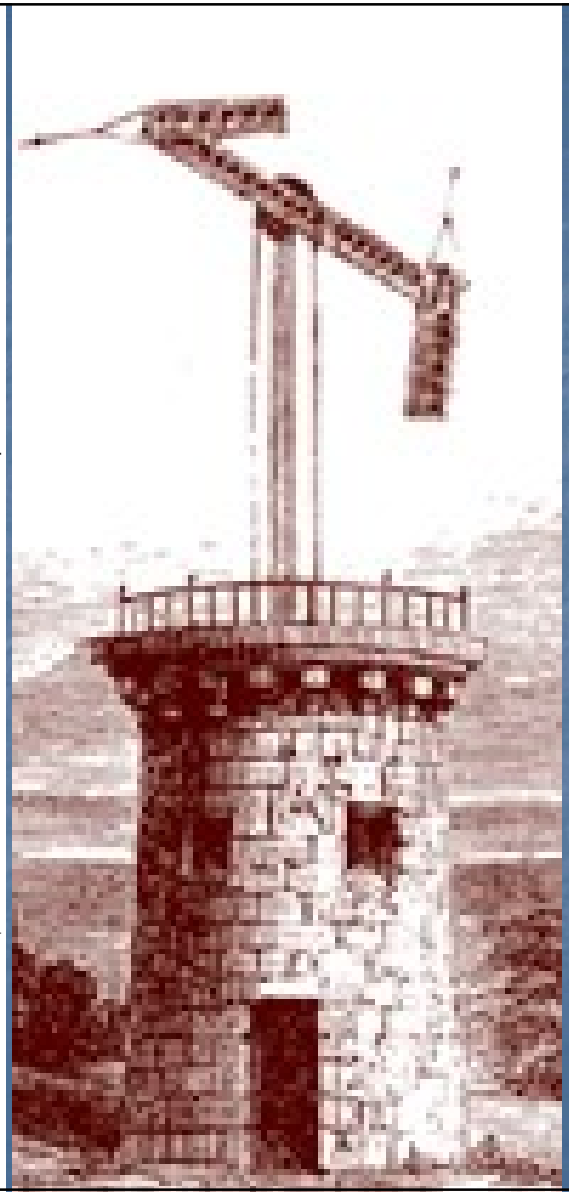
IT is well known to all who are conversant in electrical experiments, that the electric power may be propagated along a small wire, from one place to another, without being sensibly abated by

air. To prevent the objection, and save longer argument, lay over the wires from one end to the other with a thin coat of jeweller's cement. This may be done for a trifle of addditional expence; and as it is an *electric per se*, will effectually secure any part of the fire from mixing with the atmosphere.——*I am, &c.*

C. M.

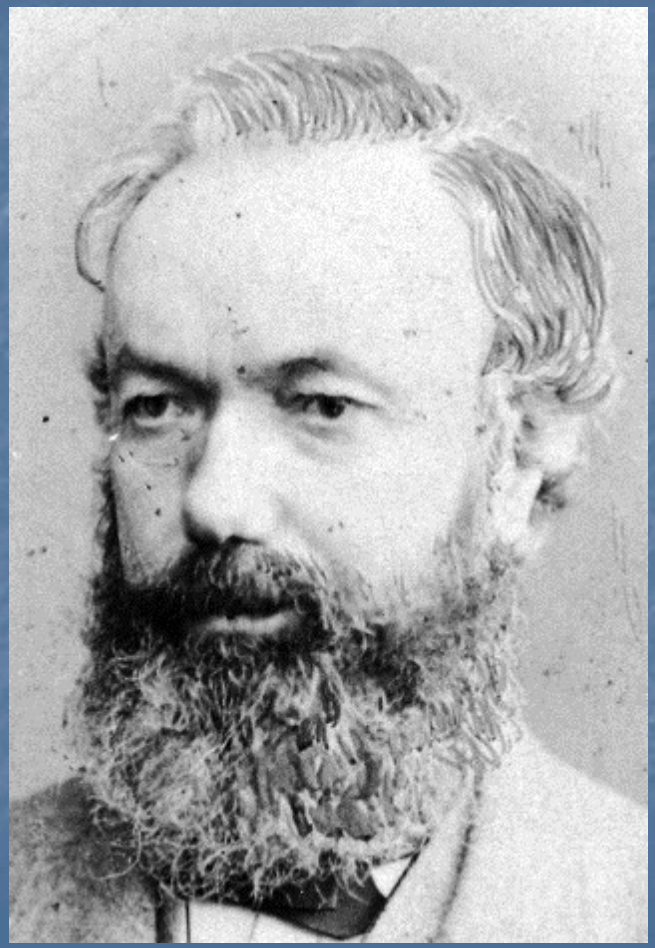
1753: detailed description of electrical telegraphy (including instructions for insulating wires)





1792:
Claude
Chappe
"telegraph"
(originally
"tachygraph"
because
messages
could cross
the country
in minutes)

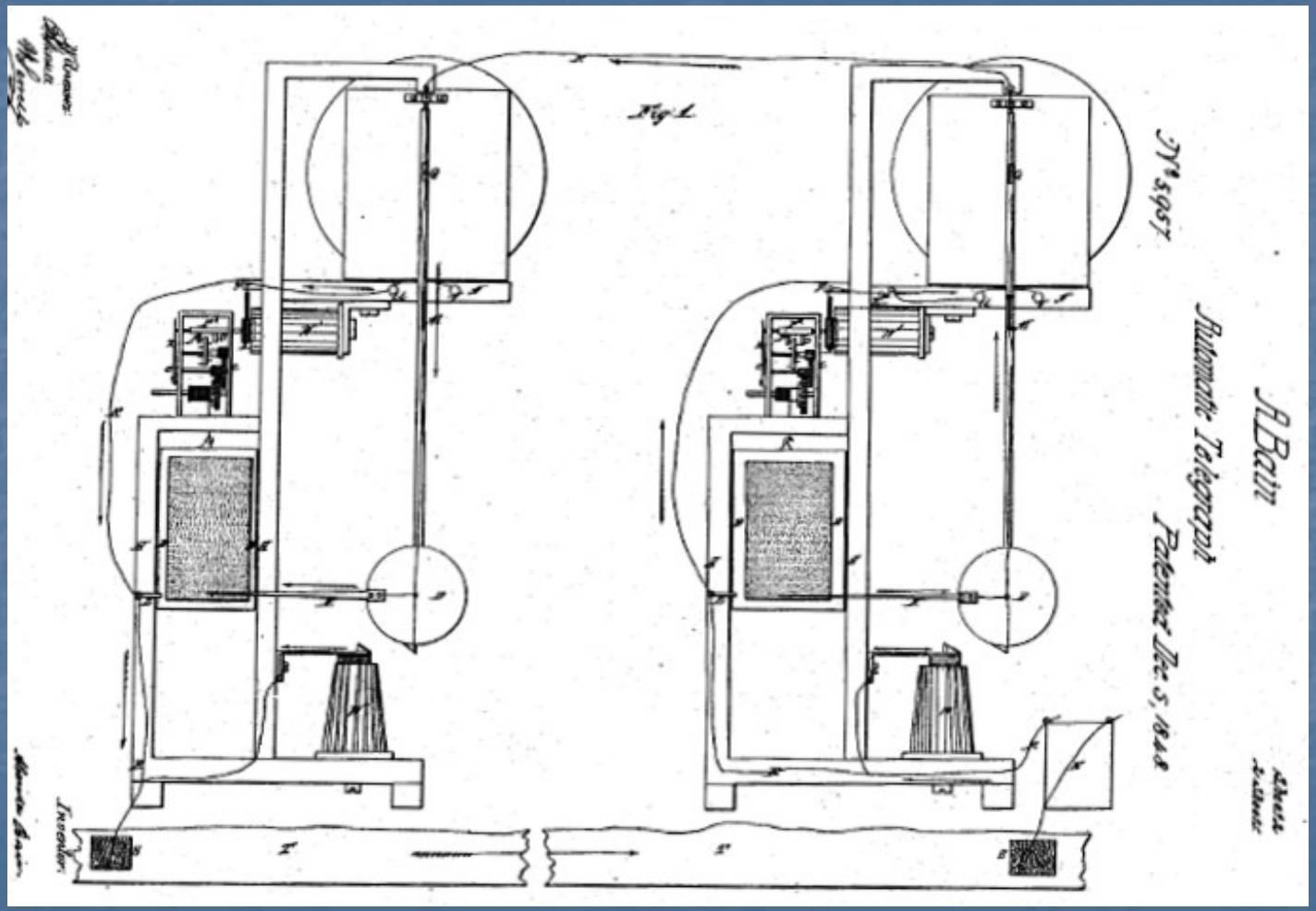
Another Great Scot



1842: having developed the printing telegraph & the remote synchronized clock, Alexander Bain combined them to get scanning for image transmission

The IET Archives

Really?



1843 British patent for the first fax machine (this image from the U.S. patent)

Really

Introduced:
image sending
frames
scanning lines
pixels
line sync
frame sync

In 1997, for the 25th anniversary of the Institute of Image Electronics Engineers, Masayuki Miyazawa built a fax pair based on the 1843 Bain patent

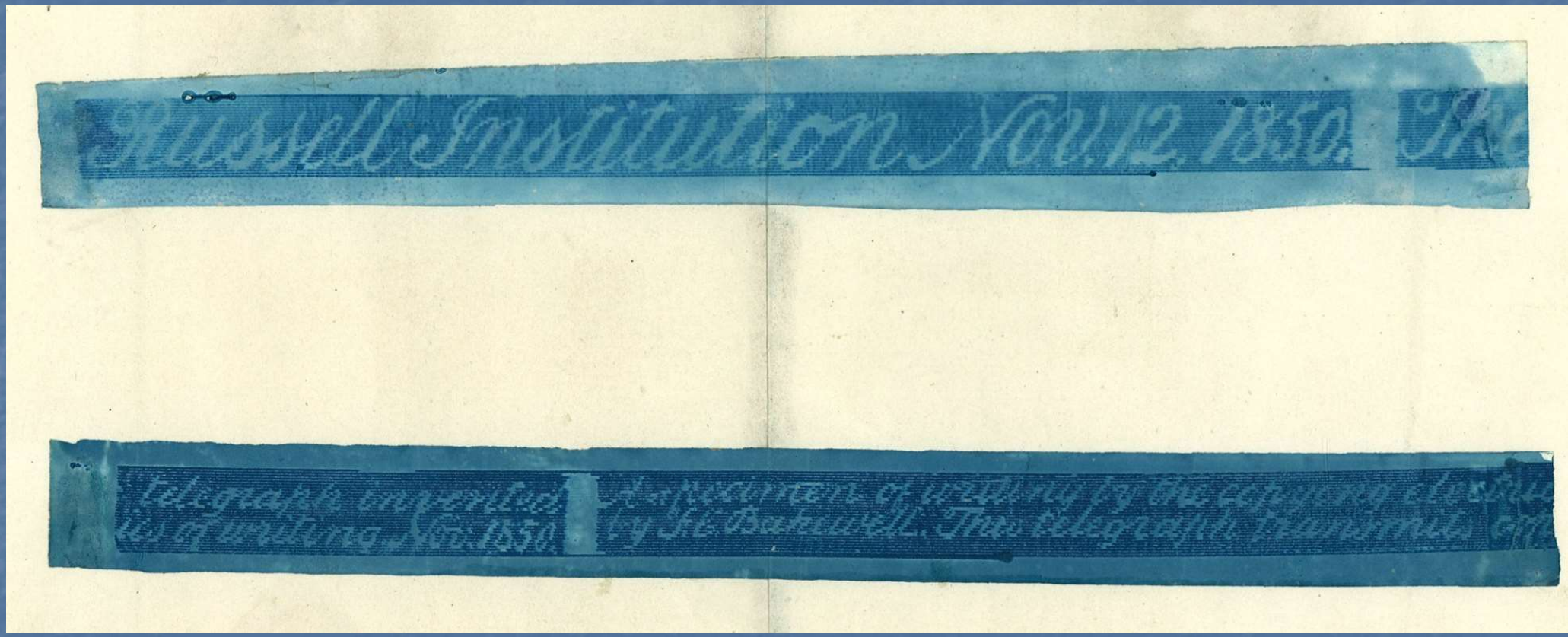
So Bain Won an Emmy

® ATAS/NATAS

…in 2016

http://www.bbc.com/news/uk-scotland-35501830

But Bain Didn't Invent TV, Just Scanning



faxes transmitted in 1850 (oldest existing?) The IET Archives

Giovanni Caselli

1856: began experiments on an improved version of Bain's fax machine

Alexandre Edmond Becquerel

1858: demonstrated an improved version of Caselli's fax at the French Academy of Science

Becquerel Prize

for Outstanding Merits in Photovoltaics

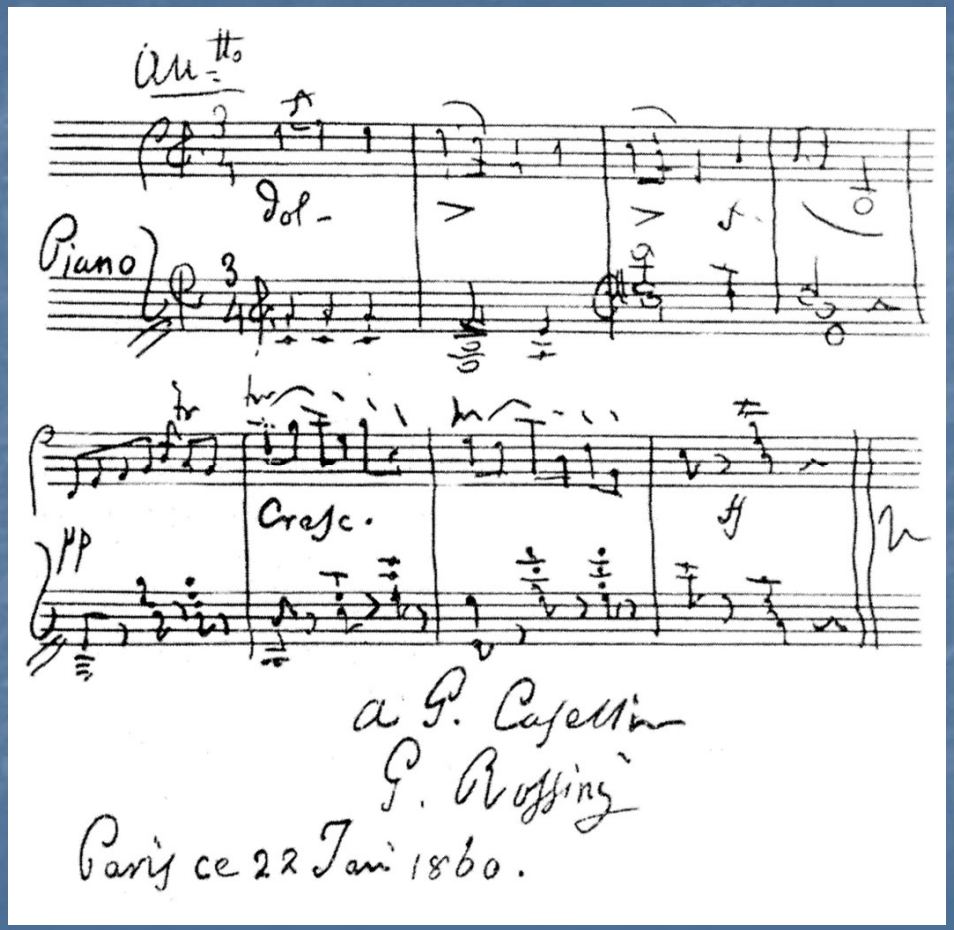
so named because in 1839 Becquerel discovered the photovoltaic effect and published papers about it in scientific journals in multiple countries.

Becquerel Prize

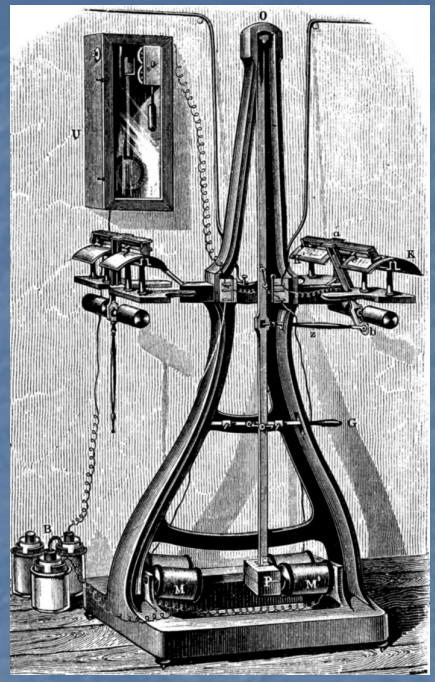
for Outstanding Merits in Photovoltaics

so named because in 1839 Becquerel discovered the photovoltaic effect and published papers about it in scientific journals in multiple countries, and then everyone, including himself, seemingly forgot about it; he never wrote of using it in conjunction with a copying telegraph for a optical input

Sheet Music Transmitted in 1860



Gioachino Rossini

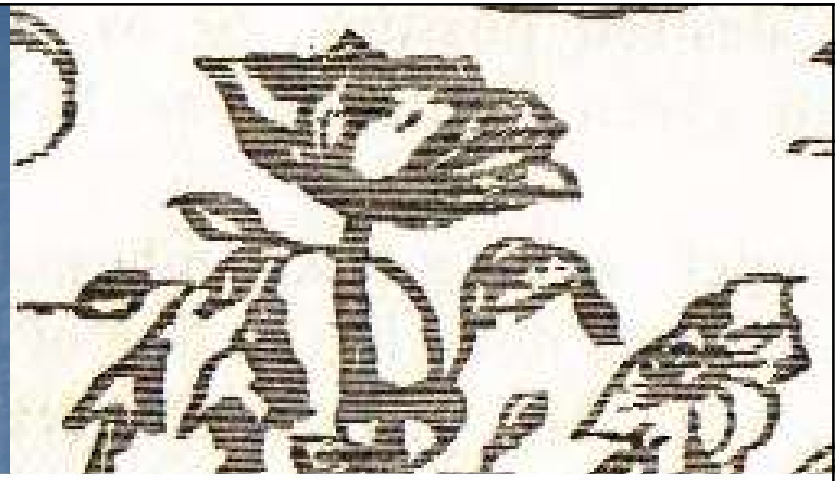


pantelegraph by Giovanni Caselli based on Alexander Bain's 1843 patent

Pantelegraph

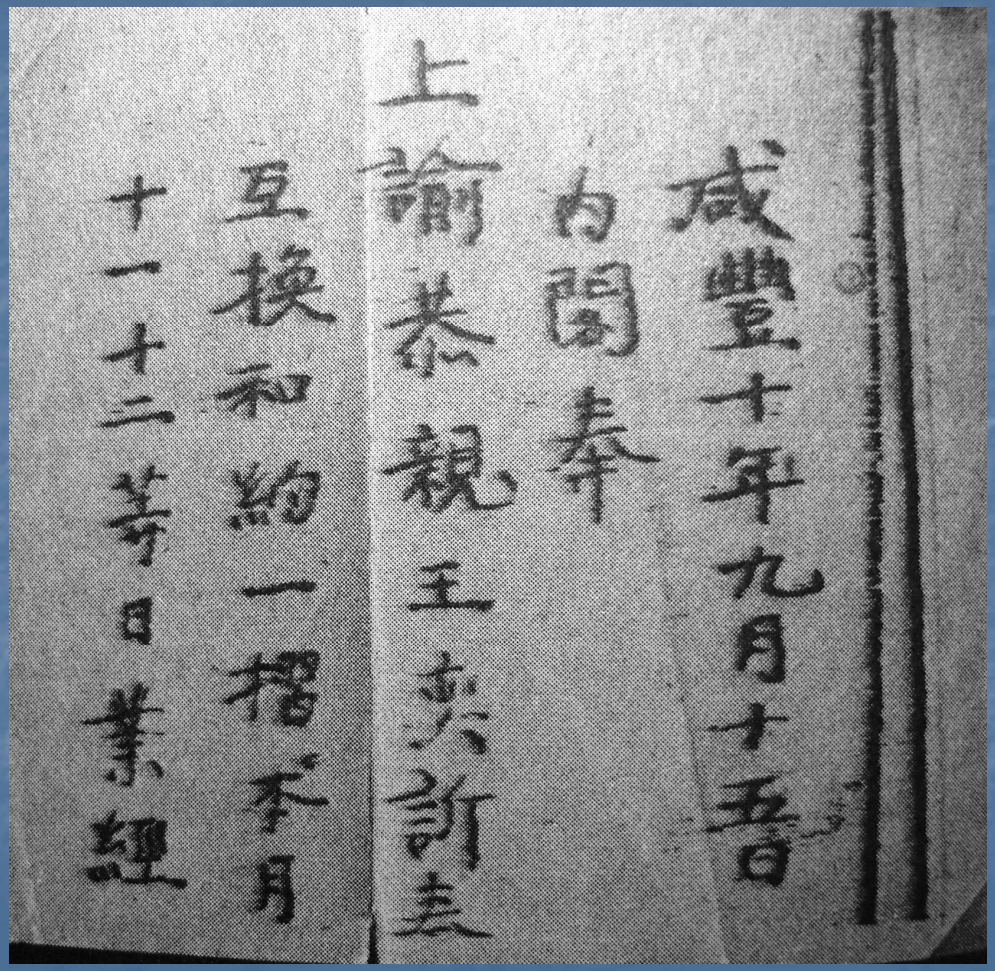
Seeing or Believing?

Genesee Farmer, September 1863



the inventor telegraphed a painting of a full-blown rose from the Observatory to the Bureau of the Telegraphic Administration. The petals were of a beautiful pink color, and the leaves of an equally good green—in short, were exactly like the tints of the original. Rossini also telegraphed to Marseilles by this apparatus a melody which he improvised in honor of the inventor.

Commercial Fax Service: 1865



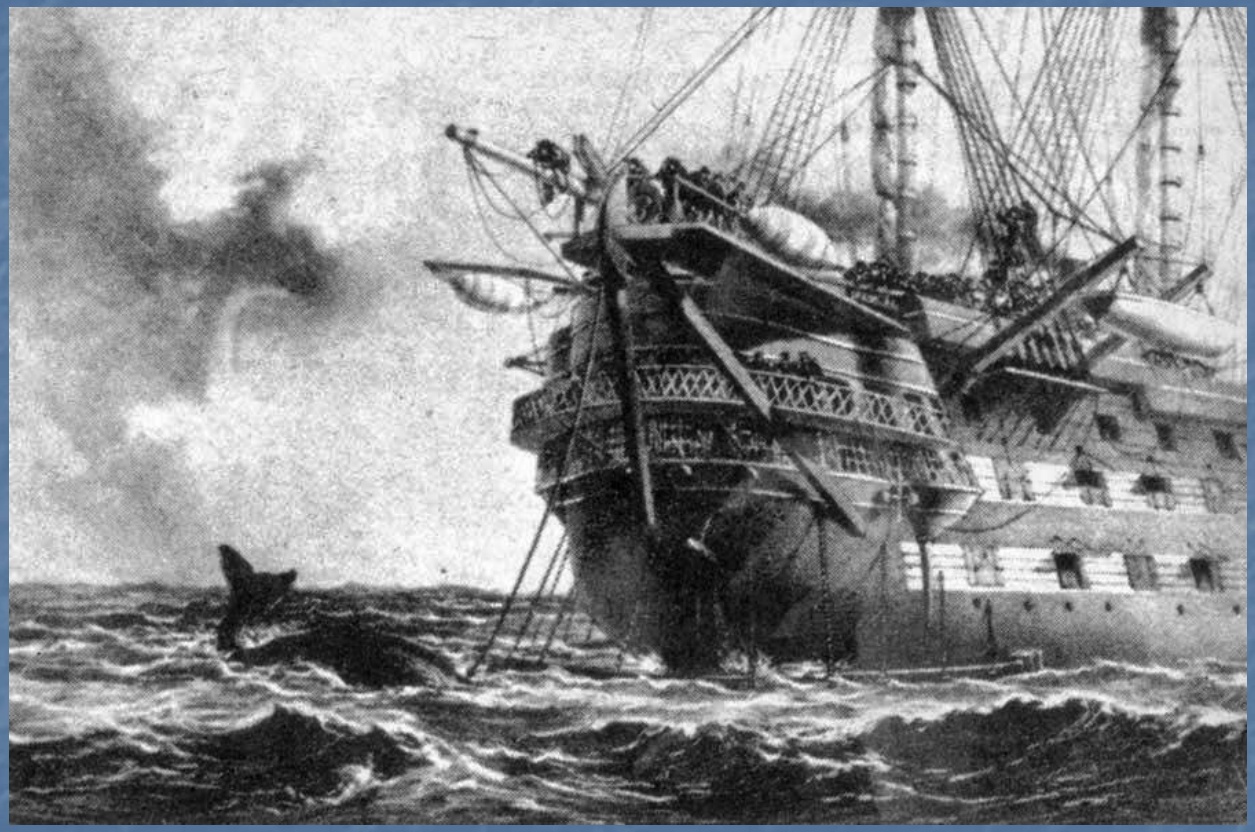
sometimes used for signature verification

All the Pieces in Place But No TV Idea

- camera: Mo-Ti 5th-century BCE
  - camera lens: Girolamo Cardano c. 1550
- electro-optic conversion: Becquerel 1839
- electronic communication: C. M. 1753
- image scanning: Bain 1842
- glow varying with current
  - incandescence: Humphry Davy 1802
  - light valve: John Kerr 1875

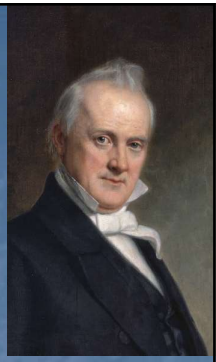
Daguerreotype 1839

Meanwhile, Back at the Telegraph…



1858:
The first transatlantic cable went into operation

99 Words: 16.5 Hours

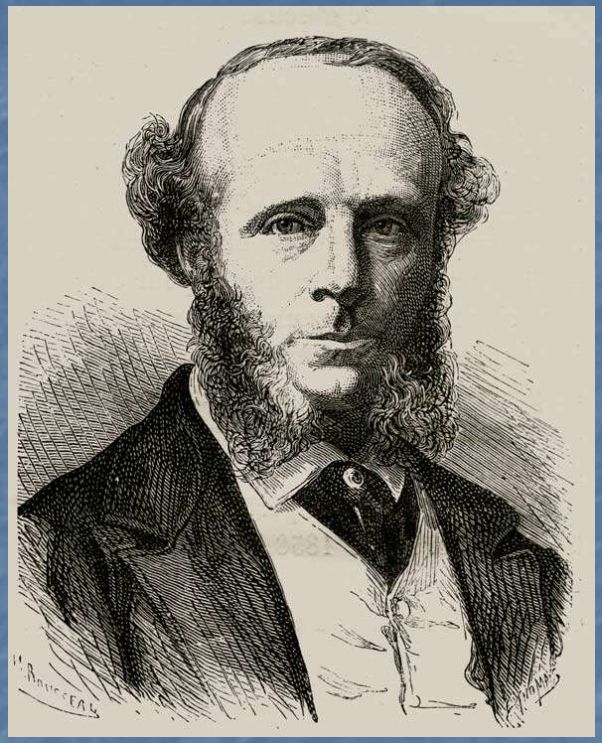


"The Queen desires to congratulate the President upon the successful completion of this great international work, in which the Queen has taken the deepest interest. The Queen is convinced that the President will join with her in fervently hoping that the Electric Cable which now connects Great Britain with the United States will prove an additional link between the two nations, whose friendship is founded upon their common interest and reciprocal esteem. The Queen has much pleasure in thus directly communicating with the President, and in renewing to him her best wishes for the prosperity of the United States."

Edward Orange Wildman Whitehouse

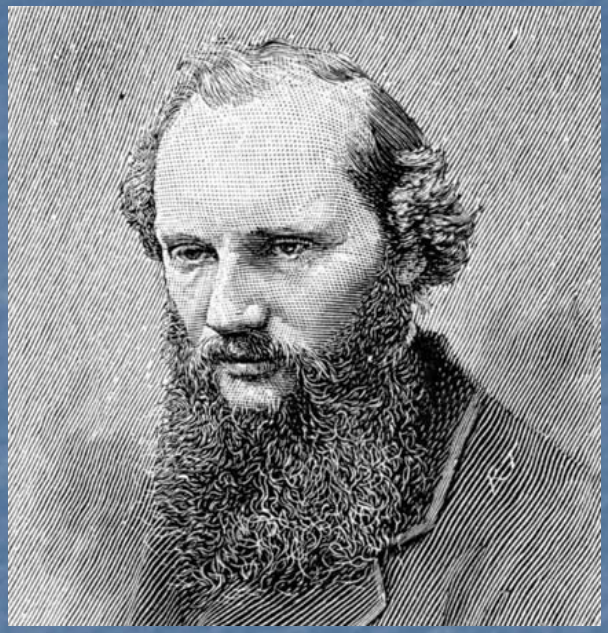
1858:
fired by the board of the Atlantic Telegraph Company (joined in 1856)

Why Was He Fired?

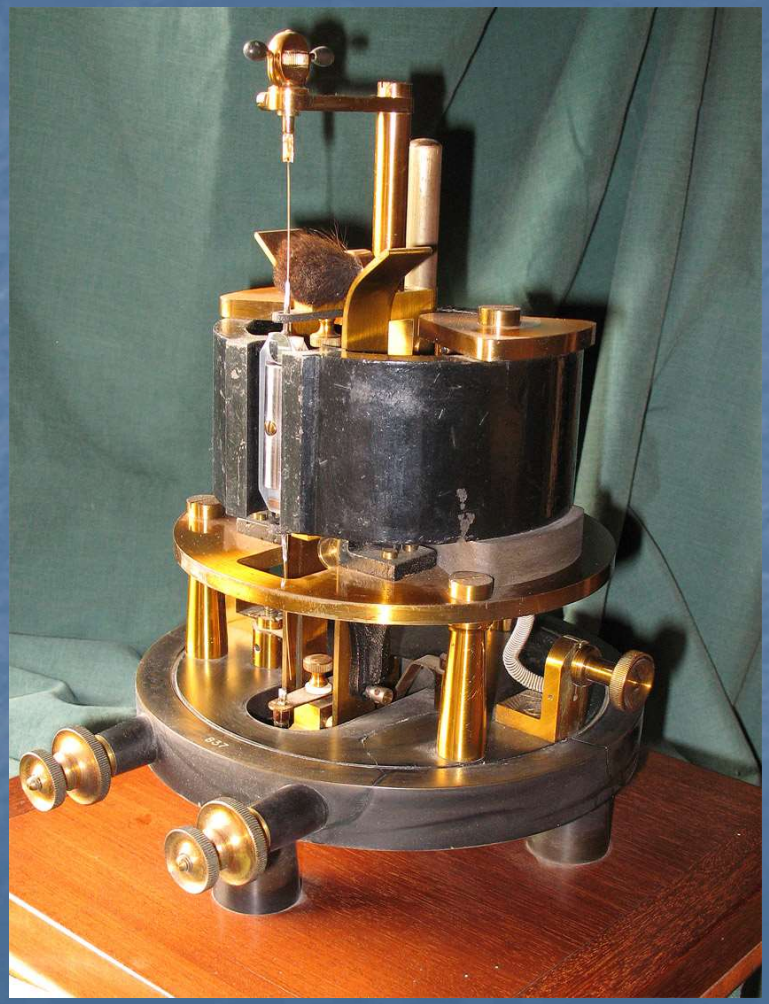


Wildman Whitehouse: Let's put thousands of volts into the cable

William Thomson (later Lord Kelvin): Maybe that's not such a good idea



Thomson's Mirror Galvanometer

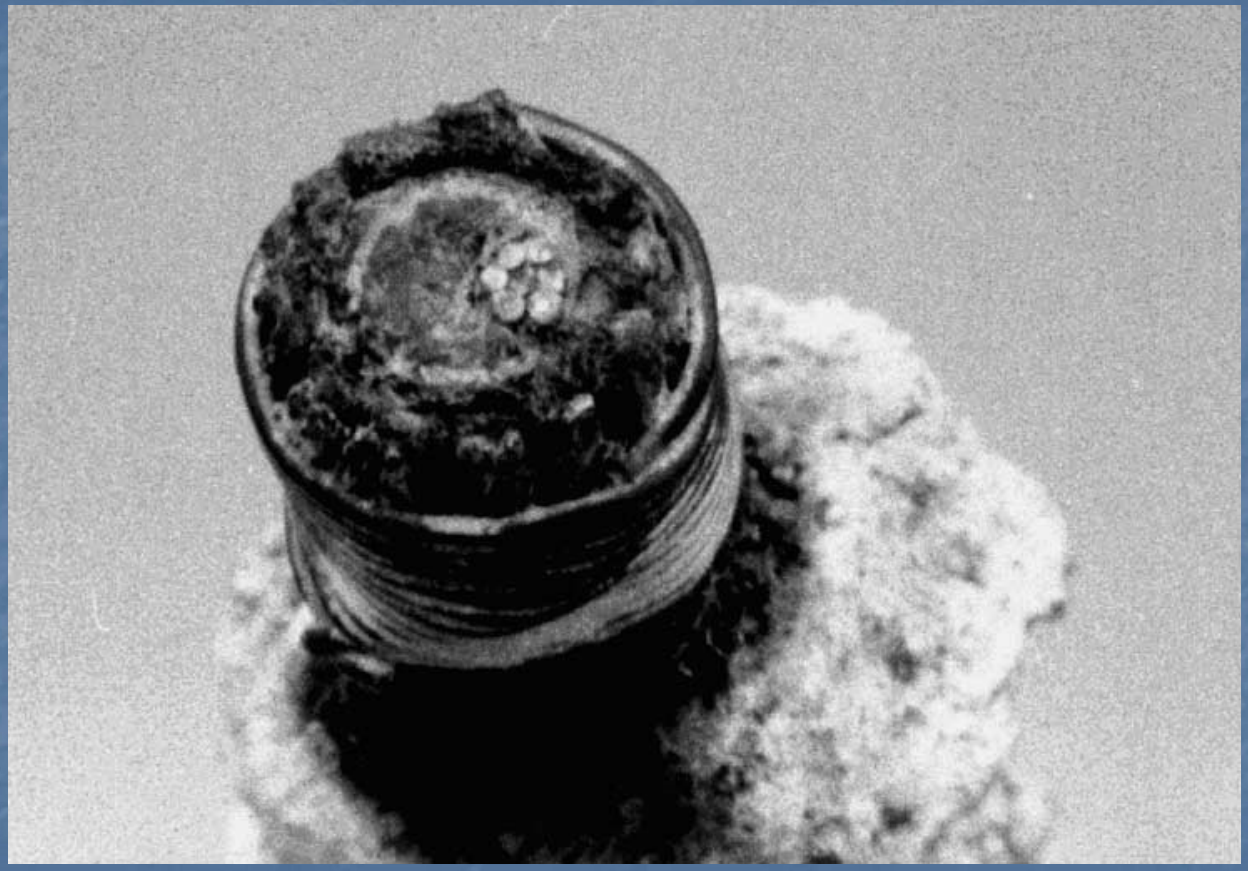


patented 1858

version by H. W. Sullivan used at the Halifax, NS telegraph station shown

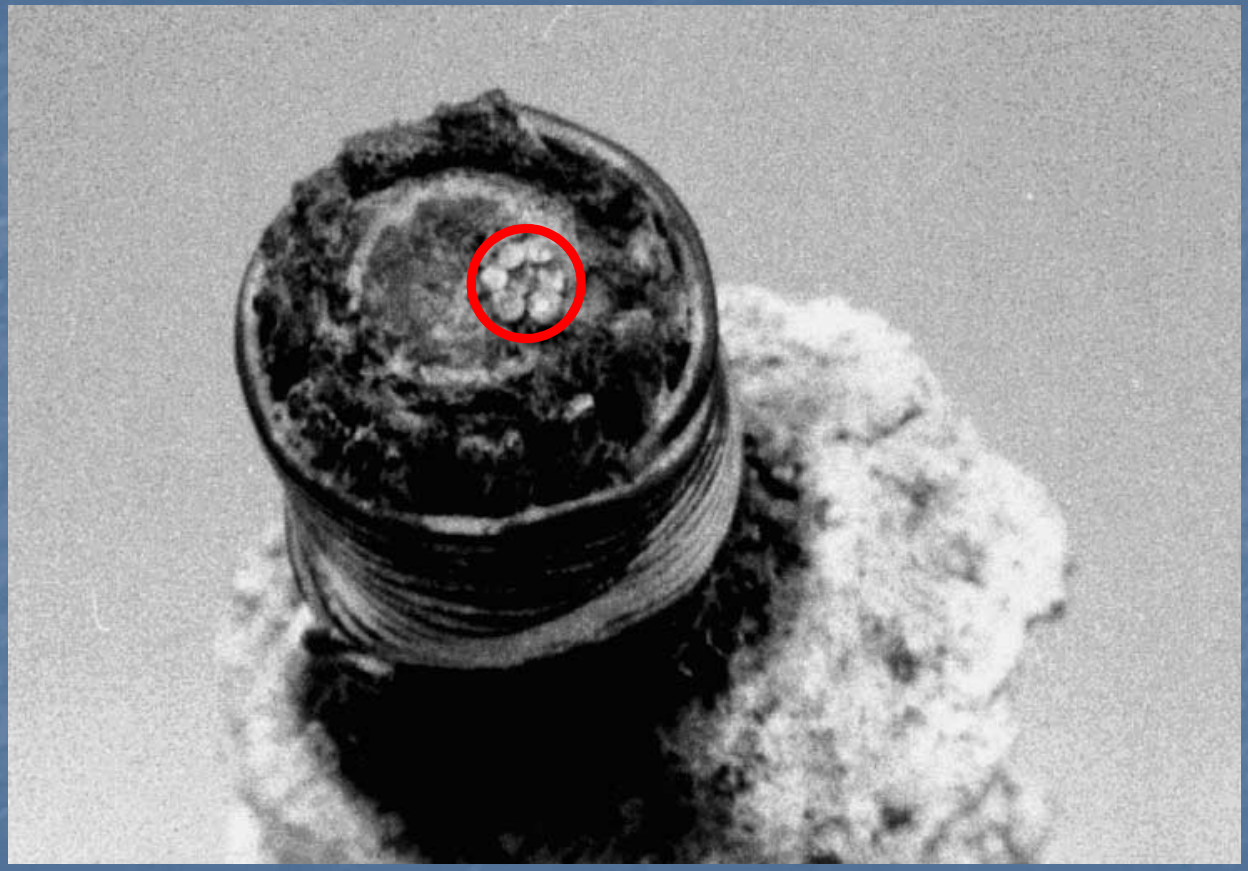
(effectively a precursor of the dynamic micromirror device used in digital cinema projectors today)

High Voltage But Also Defective Cable



http://atlantic-cable.com/Books/Whitehouse/DDC/

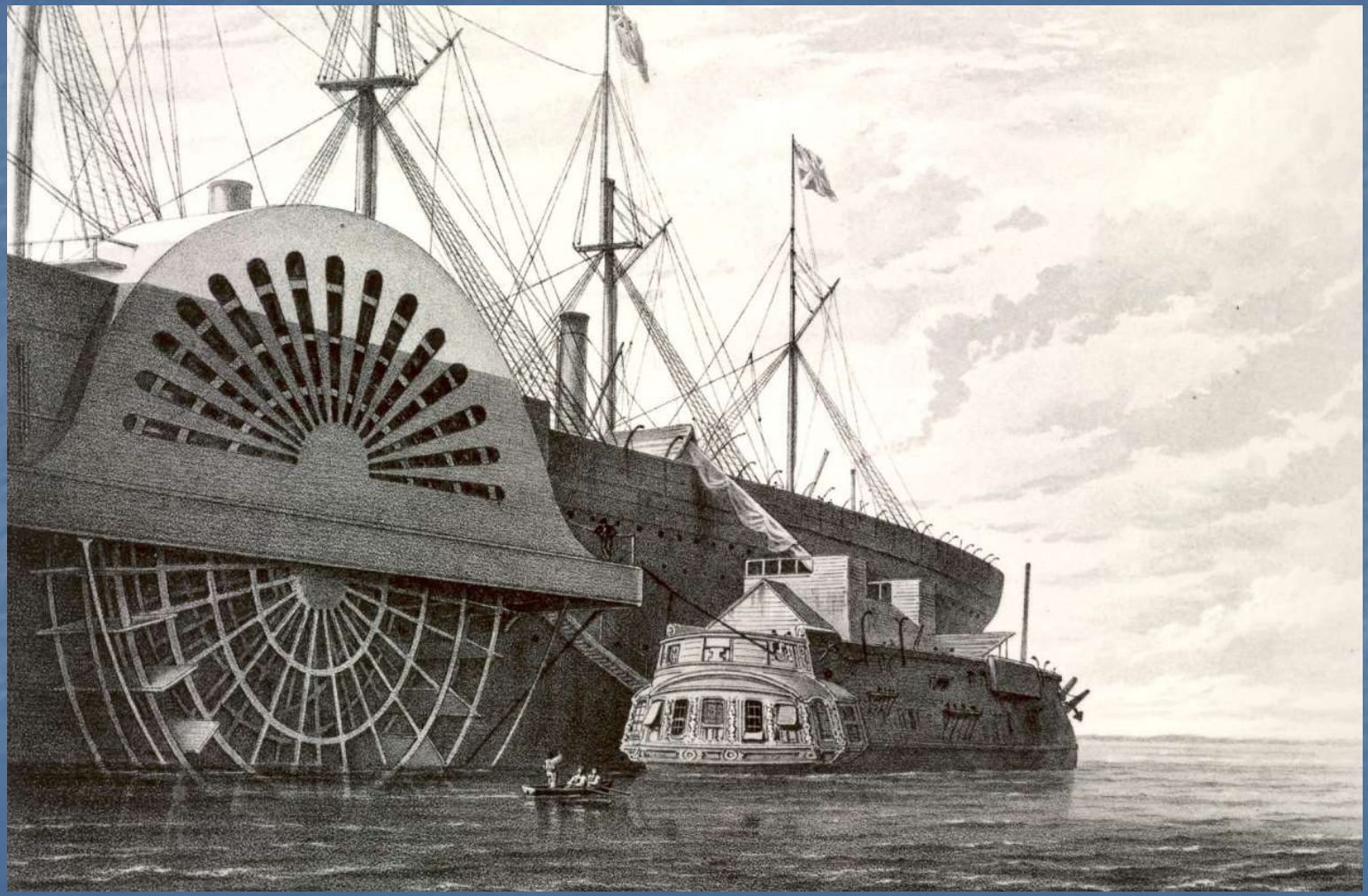
High Voltage But Also Defective Cable



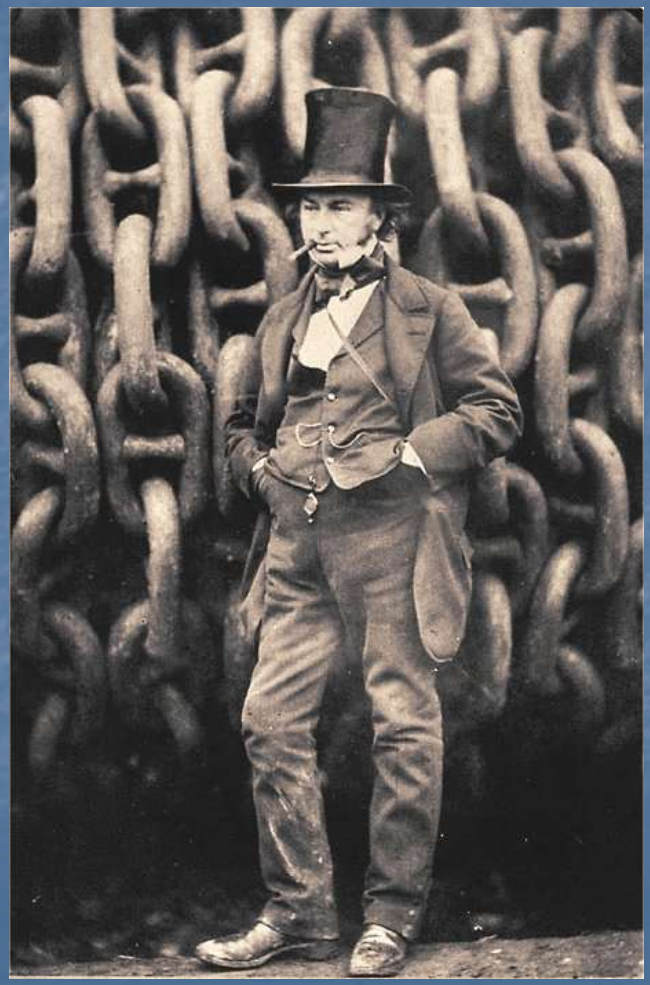
Thomson came to Whitehouse's defense even before this discovery

http://atlantic-cable.com/Books/Whitehouse/DDC/

1866: Second Transatlantic Cable



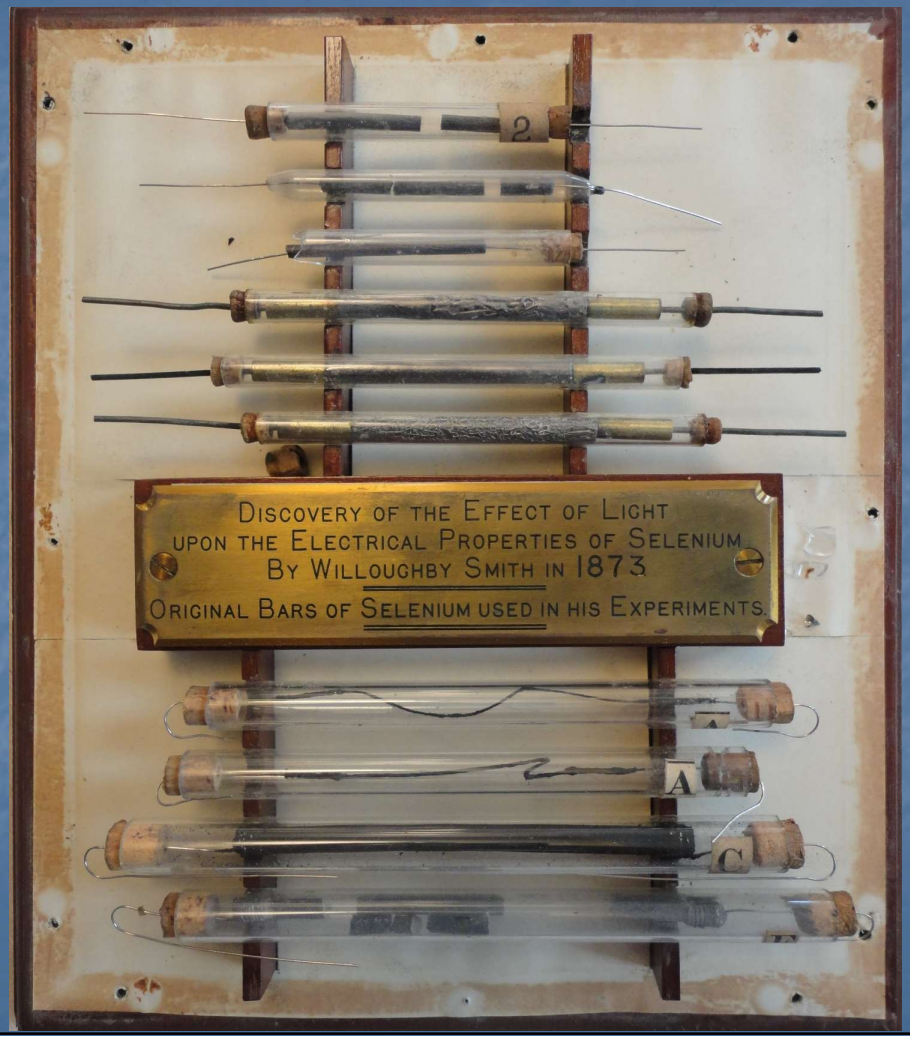
Isambard Kingdom Brunel



Willoughby Smith

needed
to monitor
the health
of the cable

Needed High Resistance



tried tin-foil layers separated by gelatin, then switched to these selenium rods

The IET Archives

Letter Read at STE Meeting

THE ACTION OF LIGHT ON SELENIUM.

The following communication from Mr. WILLOUGHBY SMITH was then read :—

"Wharf Road,

"*4th February*, 1873.

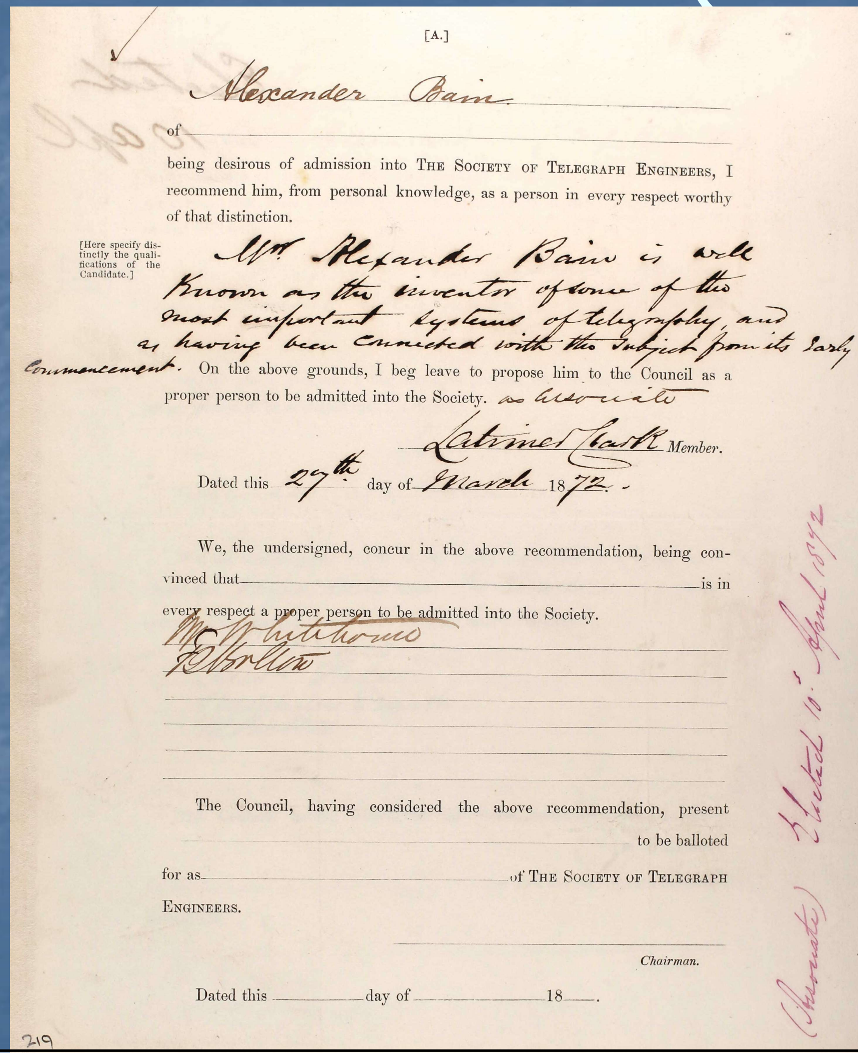
"My dear Latimer Clark,—Being desirous of obtaining a more suitable high resistance for use at the shore station in connection

Journal of the Society of Telegraph Engineers, 12th Feb., 1873

Linda Hall Library (Eng. Societies Library, based on Latimer Clark's Library)

Bain Joined STE in 1872 (its first year)

sponsored by Latimer Clark


[A.]

Alexander Bain

of

being desirous of admission into THE SOCIETY OF TELEGRAPH ENGINEERS, I recommend him, from personal knowledge, as a person in every respect worthy of that distinction.

[Here specify distinctly the qualifications of the Candidate.]

Mr Alexander Bain is well known as the inventor of some of the most important systems of telegraphy, and as having been connected with the subject from its early commencement. On the above grounds, I beg leave to propose him to the Council as a proper person to be admitted into the Society. as Associate

Latimer Clark *Member.*

Dated this 27th day of March 1872.

We, the undersigned, concur in the above recommendation, being convinced that ____ is in every respect a proper person to be admitted into the Society.

W. Whitehouse

F. Bolton

The Council, having considered the above recommendation, present ____ to be balloted for as ____ of THE SOCIETY OF TELEGRAPH ENGINEERS.

Chairman.

Dated this ____ day of ____ 18__.

Elected 10th April 1872 (Associate)

219

The IET Archives

Picked Up in *Nature* on Feb. 20, 1873

EFFECT OF LIGHT ON SELENIUM DURING THE PASSAGE OF AN ELECTRIC CURRENT.

BEING desirous of obtaining a more suitable high resistance for use at the Shore Station in connection with my system of testing and signalling during the submersion of long submarine cables, I was induced to experiment with bars of selenium, a known metal of very high resistance. I obtained several bars varying in length from 5 to 10 centimetres, and of a diameter from 1 to 1½ millimetres. Each bar was hermetically sealed in a glass tube, and a platinum wire projected from each end for the purpose of connection.

The early experiments did not place the selenium in a very favourable light for the purpose required, for although the resistance was all that could be desired—some of the bars giving 1,400 megs. absolute—yet there was a great discrepancy in the tests, and seldom did different operators obtain the same result. While investigating the cause of such great differences in the resistance of the bars, it was found that the resistance altered materially according to the intensity of light to which it was subjected. When the bars were fixed in a box with a sliding cover, so as to exclude all light, their resistance was at its highest, and remained very constant, fulfilling all the conditions necessary to my requirements; but immediately the cover of the box was removed, the conductivity increased from 15 to 100 per cent. according to the intensity of the light falling on the bar. Merely intercepting the light by passing the hand before an ordinary gas-burner placed several feet from the bar increased the resistance from 15 to 20 per cent. If the light be intercepted by rock salt or by glass of various colours, the resistance varies according to the amount of light passing through the glass.

To ensure that temperature was in no way affecting the experiments, one of the bars was placed in a trough of water so that there was about an inch of water for the light to pass through, but the results were the same; and when a strong light from the ignition of a narrow band of magnesium was held about nine inches above the water the resistance immediately fell more than two-thirds, returning to its normal condition immediately the light was extinguished.

EFFECT OF LIGHT ON SELENIUM DURING THE PASSAGE OF AN ELECTRIC CURRENT.

BEING desirous of obtaining a more suitable high resistance for use at the Shore Station in connection with my system of testing and signalling during the submersion of long submarine cables, I was induced to experiment with bars of selenium, a known metal of very high resistance. I obtained several bars varying in length from 5 to 10 centimetres, and of a diameter from 1 to 1½ millimetres. Each bar was hermetically sealed in a glass tube, and a platinum wire projected from each end for the purpose of connection.

discovery by John Mayhew, reported to Joseph May, reported to Smith

Letter to *Nature,* March 6, 1873

Effect of Light on the Electric Conductivity of Selenium

IT is of course impossible not to feel intense interest in the statement (NATURE, vol. vii. p. 303) which Mr. Willoughby Smith makes and which Mr. Latimer Clark endorses. That I have been unable to obtain the same result has doubtless been due to my having worked under conditions different from those existing in Mr. Smith's experiments. My failure has not been one of degree, but has been absolute. I have not only been unable to find that light increases the electric conductivity of selenium, but I have failed to get a current through selenium at all, even through a thickness of 0·1 millimetre. As I do not know how to put myself at once in direct communication with Mr. Smith, perhaps you will permit me to ask him through your columns to guide me on the following points :—

(*a.*) What was the form of battery employed, and what its power of overcoming British Association units of resistance?

(*b.*) What was the molecular condition of the "metal" (*sic*) employed,—*vitreous* or *crystalline*?

(*c.*) Where can "bars" of selenium be obtained which will afford the results stated?

(*d.*) Are there any unstated conditions essential to the successful production of the phenomenon?

HARRY NAPIER DRAPER

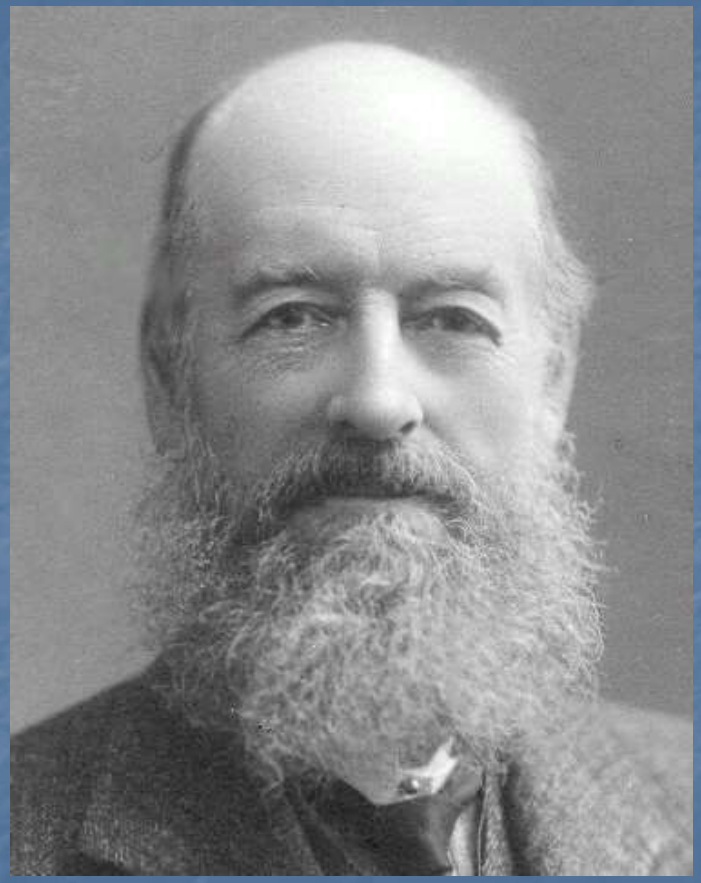
Letter to *Nature,* March 6, 1873

statement (NATURE, vol. vii. p. 303) which Mr. Willoughby Smith makes and which Mr. Latimer Clark endorses. That I have been unable to obtain the same result has doubtless been due to my having worked under conditions different from those existing in Mr. Smith's experiments. My failure has not been one of degree, but has been absolute. I have not only been unable to find that light increases the electric conductivity of selenium, but I have failed to get a current through selenium at all, even through a thickness of 0·1 millimetre. As I do not

polite, but…

Vigorous Defense Leads to Confirmations

Adams
Day
Draper
Gordon



Lawrence Parsons
Earl of Rosse

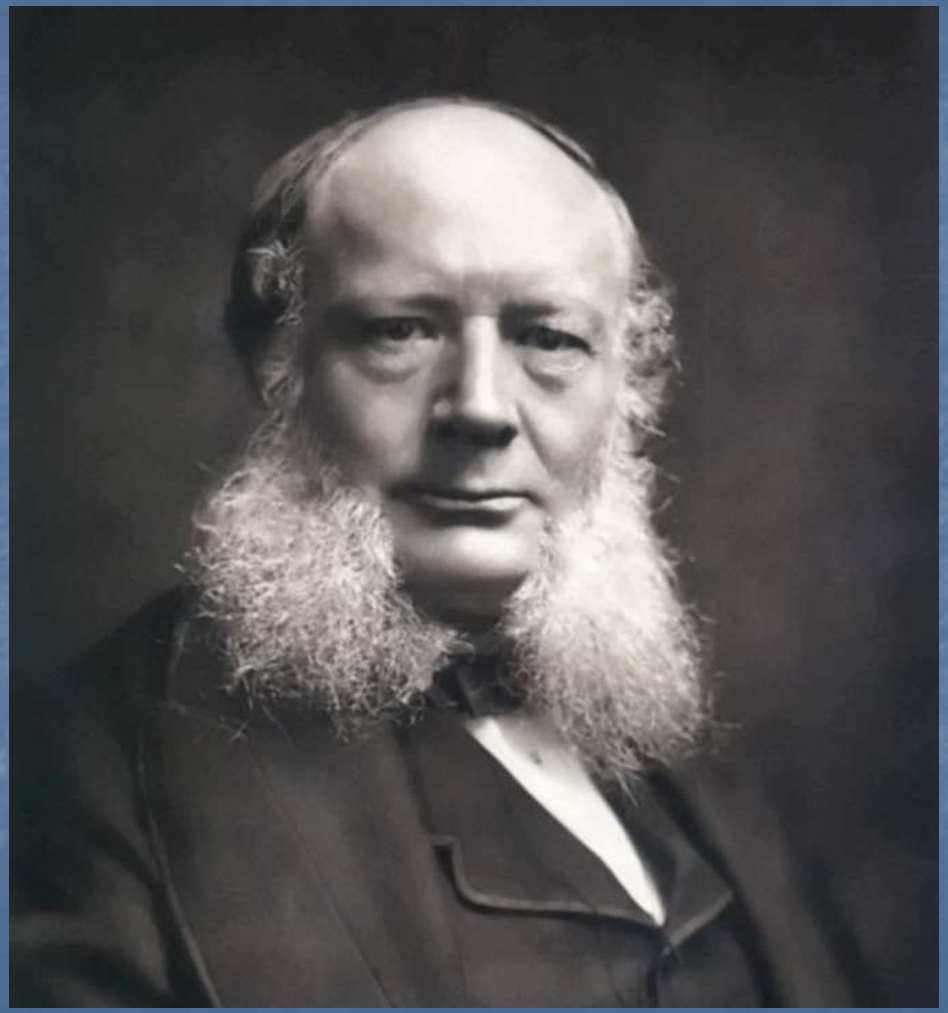
Moss
Obach
Sale
Siemens

Historian Discovers Long-Lost Document?

Metropolitan Opera Archives

Historian Disc… …ct Document?

Charles William Siemens



1st STE president, 1872

Lecture at the Royal Institution

WEEKLY EVENING MEETING,

Friday, February 18, 1876.

GEORGE BUSK, Esq. F.R.S. Treasurer and Vice-President, in the Chair.

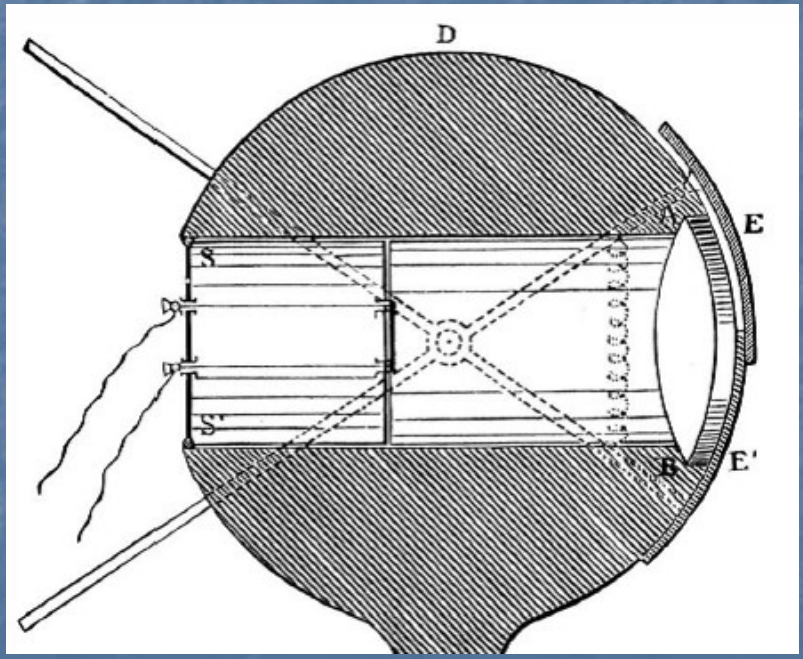
C. WILLIAM SIEMENS, Esq. D.C.L. F.R.S. M.R.I.

The Action of Light on Selenium.

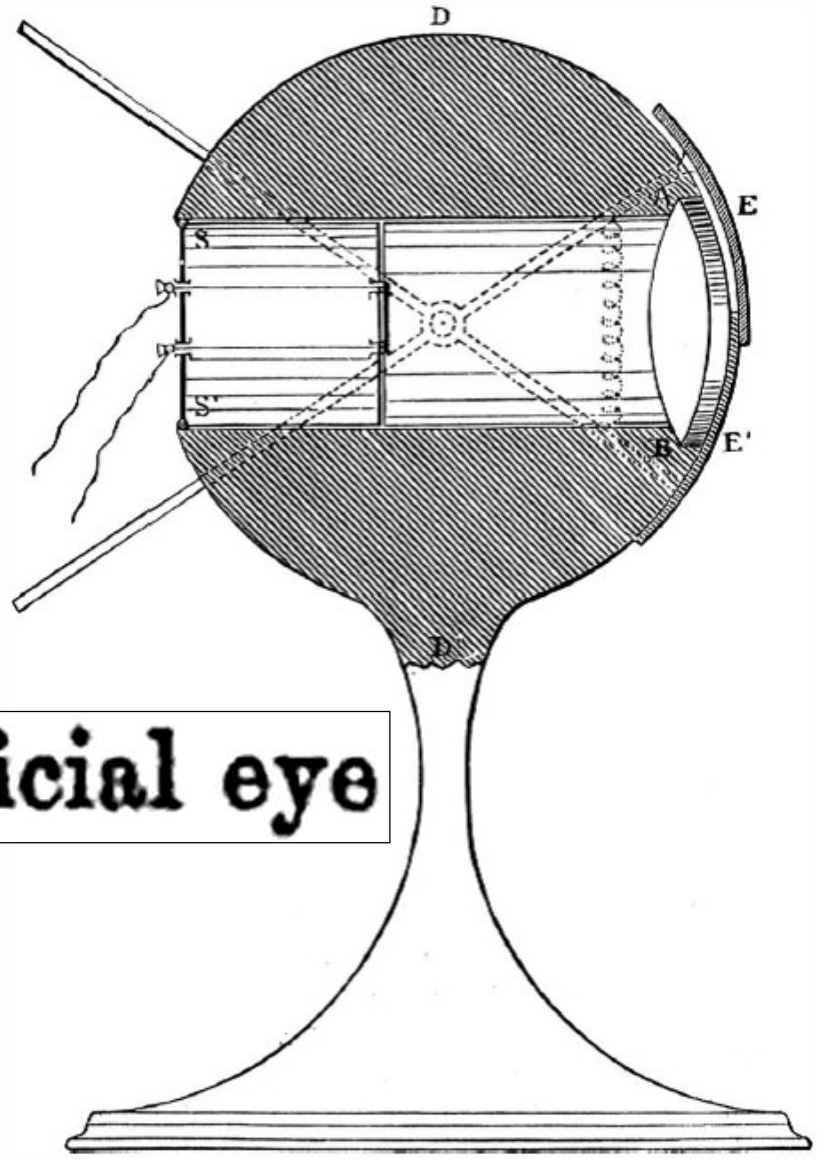
WHEN, upon former occasions, I have ventured upon this arena, it has been for the purpose of placing before you the results of inquiries of my own into special subjects, which circumstance gave me some title to your indulgence.

This evening I cannot claim the same advantage, because the subject matter which I am about to bring before you is almost entirely the result of the investigations of others, and especially of my brother,

Before concluding, I wish to introduce to your notice a little apparatus which I have prepared to illustrate the extraordinary sensitiveness of my brother's selenium preparations, and an analogy between its action and that of the retina of our eye. It consists of a



Here we have then an artificial eye which is sensible to light



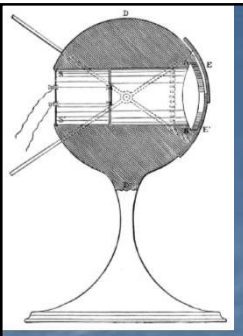
SCIENTIFIC AMERICAN

A WEEKLY JOURNAL OF PRACTICAL INFORMATION, ART, SCIENCE, MECHANICS, CHEMISTRY AND MANUFACTURES.

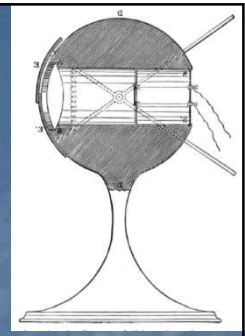
Vol. XXXIV.—No. 19. [NEW SERIES.] NEW YORK, MAY 6, 1876. [$3.20 per Annum. [POSTAGE PREPAID.]

ARTIFICIAL EYES MADE SENSITIVE TO LIGHT.

Among the curious developments of Science is the recent production, by Dr C. W. Siemens, of an artificial eye that is sensitive to light. We wish we could add that it gives vision to the blind; but we cannot, though perhaps it contains a germ of promise in that direction. The new eye is composed of an ordinary glass lens, backed by an artificial retina of selenium. This mineral resembles and is allied to sulphur; it is distilled from bodies that contain sulphur in conjunction with metals, such as iron pyrites, a compound of sulphur and iron.



Every Publication in the World?



- at least English, French, German, Italian, Polish, Portuguese, & Spanish
  - *œil artificiel, Künstliches Auge, occhio selenico, oko sztuczne, olho artificial, ojo artificial*
- "A New Artificial Eye," *The London Medical Record*
- "Artificial Eyes Made Sensitive to Light," *Willamette Farmer* [Oregon]
- "Truly Artificial Eye," *The Great Bend Weekly Tribune* [Kansas]
- [Siemens artificial eye], *The Wallaroo Times* [South Australia]
- "An Artificial Eye," *Bruce Herald* [New Zealand]
- "Siemens' Sensitive Artificial Eye," *Scientific American* (2nd article)
- "An artificial eye," *The Journal of Education for the Province of Quebec*
- "Artificial Eyes Made Sensitive to Light," *The History of the Year 1876*

1877 Television Researchers

- de Paiva

como um curioso instrumento, uma especie de olho artificial, de que seu irmão, o sr. Williams Siemens, fez uma curiosa descripção

O Instituto

- Senlecq

l'application qu'avait déjà faite M. Siemens des propriétés du sélénium à la construction d'un photomètre. Une phrase du livre

La Lumière électrique

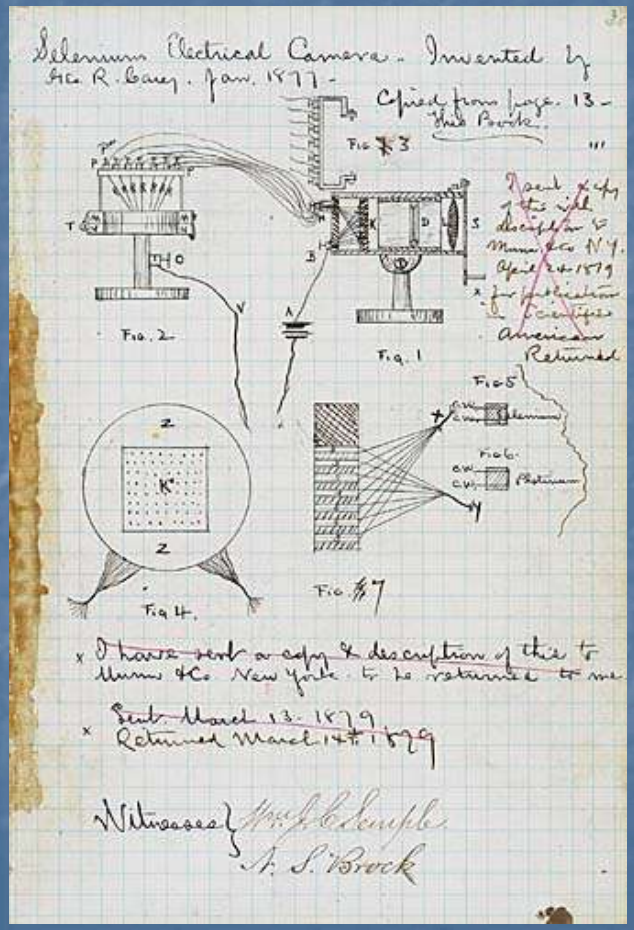
- Ochorowicz

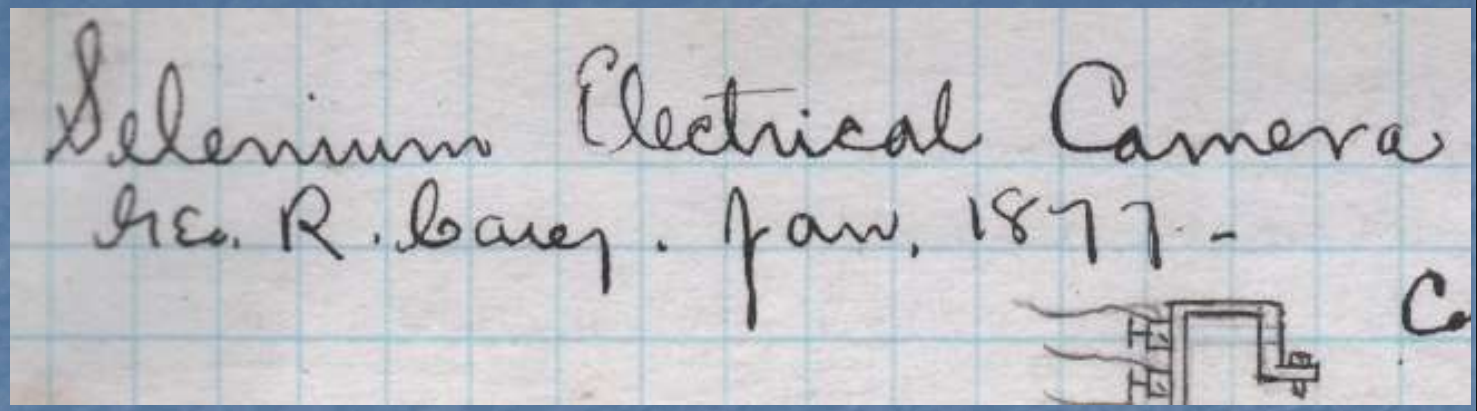
skorzystał w r. z. Siemens wybudowawszy przyrząd bardzo ciekawy, mianowicie oko sztuczne, którego powieki zamykały się pod wraże-

Kosmos

- Carey?

Earliest Known Mention of Electrical Camera

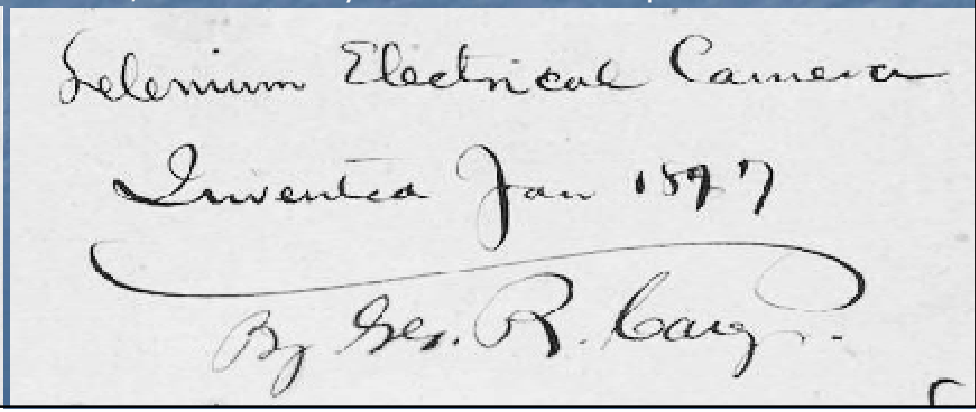




The Karpeles Manuscript Library Museums

from the Caren Archive, auctioned by Bonhams 2014 Apr. 7

single line



12

Notes.

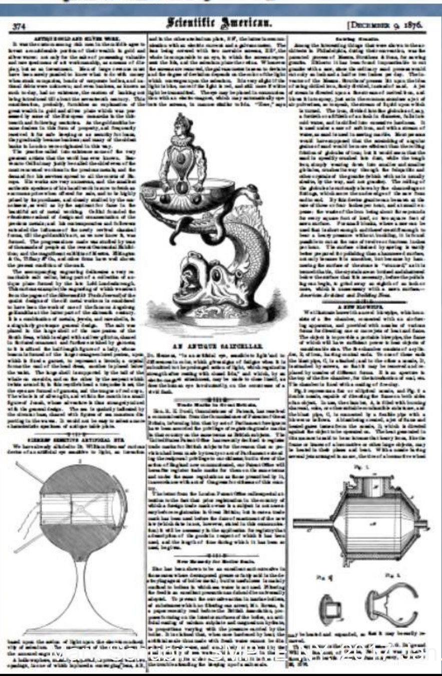
Had my first idea of a (Selenium Electrical Camera) in 1876 after reading an article in December 9 - Page 374 (Scientific American) 1876. I have studied on the idea since then more or less and in January 1877 had worked up the instrument shown on pages 13 - 15 - 17 and so called this date the time of invention although I might with good reason only I invented it between 1876 & 1879 - The Instruments on pages 18 & 21 were invented in June 1878. But I had my first idea of them some months before this date.

S. R. L.
Inventor

SCIENTIFIC AMERICAN

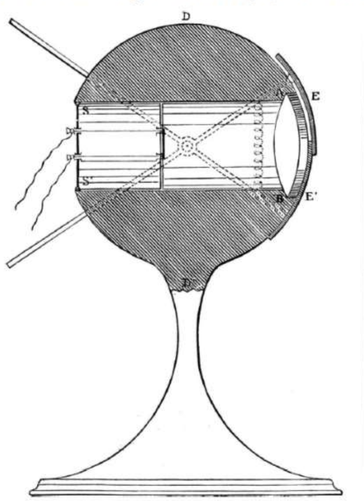
A WEEKLY JOURNAL OF PRACTICAL INFORMATION, ART, SCIENCE, MECHANICS, CHEMISTRY, AND MANUFACTURES.

Vol. XXXV.—No. 24. [NEW SERIES.] | NEW YORK, DECEMBER 9, 1876. | $3.20 per Annum. [POSTAGE PREPAID.]



SIEMENS' SENSITIVE ARTIFICIAL EYE.

We have already alluded to Dr. William Siemens' curious device of an artificial eye sensitive to light, an invention

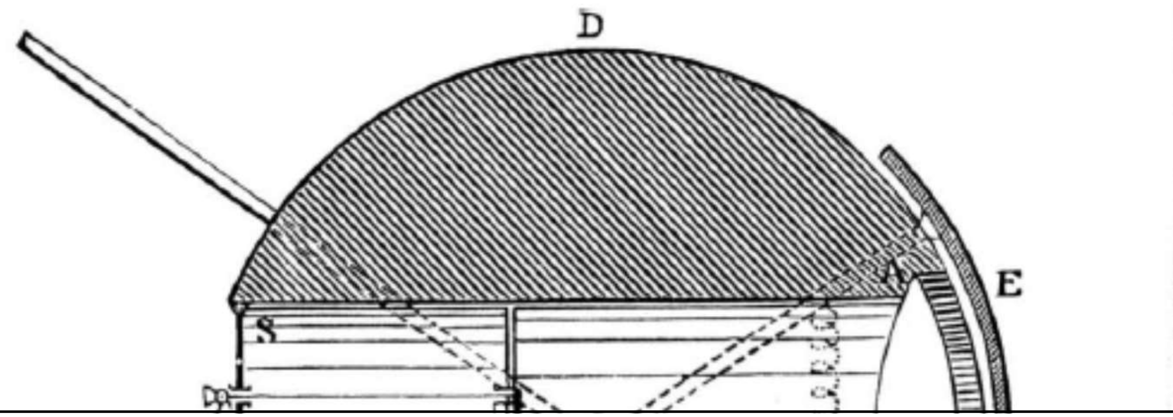


based upon the action of light upon the electric conductivity of selenium. The construction of the eye is shown in the annexed engraving.

A hollow sphere, suitably supported, is provided with two openings, in one of which is placed a converging lens, A B,

SIEMENS' SENSITIVE ARTIFICIAL EYE.

We have already alluded to Dr. William Siemens' curious device of an artificial eye sensitive to light, an invention



AN ELECTRIC TELESCOPE.

[15374.]—It may be of interest to your readers to know the details of some experiments on which I have been engaged during the last three months, with the object of transmitting a luminous image by electricity.

To transmit light alone all that is required is a battery circuit with a piece of selenium introduced at the transmitting end, the resistance of which falling as it is exposed to light increases the strength of the current, and renders a piece of platinum incandescent at the receiving end thus reproducing the light at the distant station.

By using a number of circuits, each containing selenium and platinum arranged at each end, just as the rods and cones are in the retina, the selenium end being exposed in a camera, I have succeeded in transmitting built-up images of very simple luminous objects.

An attempt to reproduce images with a single circuit failed through the selenium requiring some time to recover its resistance. The principle adopted was that of the copying telegraph, namely, giving both the platinum and selenium a rapid synchronous movement of a complicated nature, so that every portion of the image of the lens should act on the circuit ten times in a second, in which case the image would be formed just as a rapidly-whirled stick forms a circle of fire. Though unsuccessful in the latter experiment, I do not despair of yet accomplishing my object as I am at present on the track of a more suitable substance than selenium.

Denis D. Redmond.

Belmont Lodge, Sandford, Dublin.

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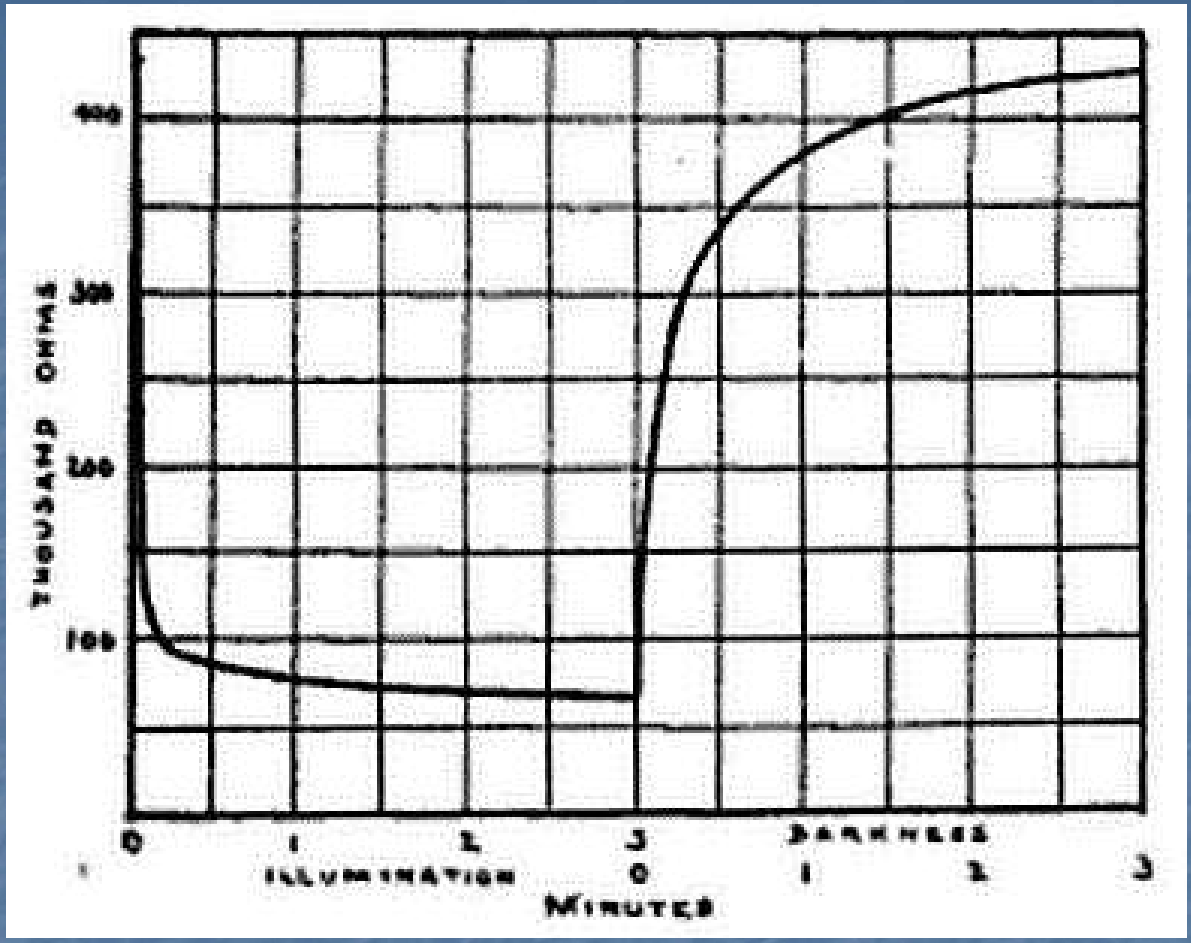
scanning attempted,
frame-rate described



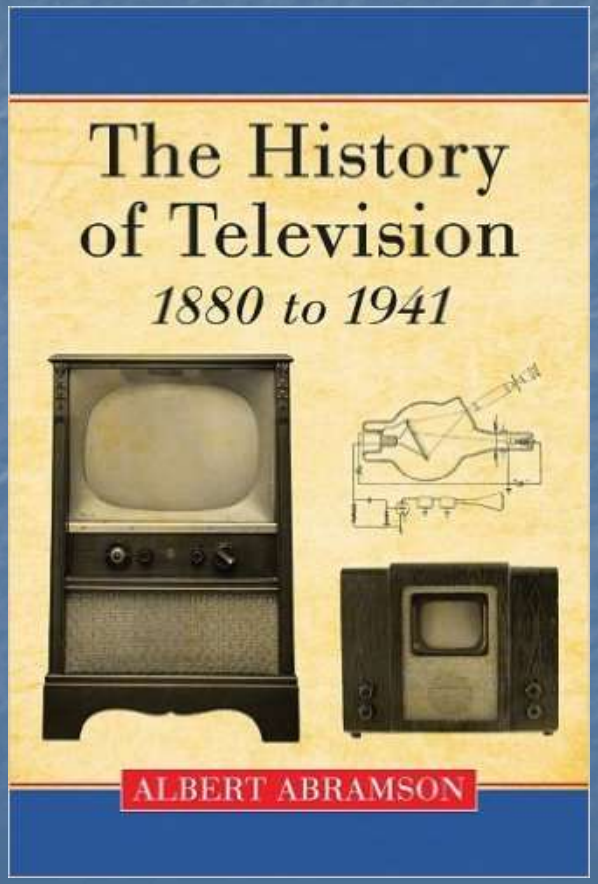
Erich Hausmann, Sc.D., "The Properties of Selenium and Their Applications in Electrotechnics - II" *Scientific American Supplement,* no. 1882, 1912, p.50

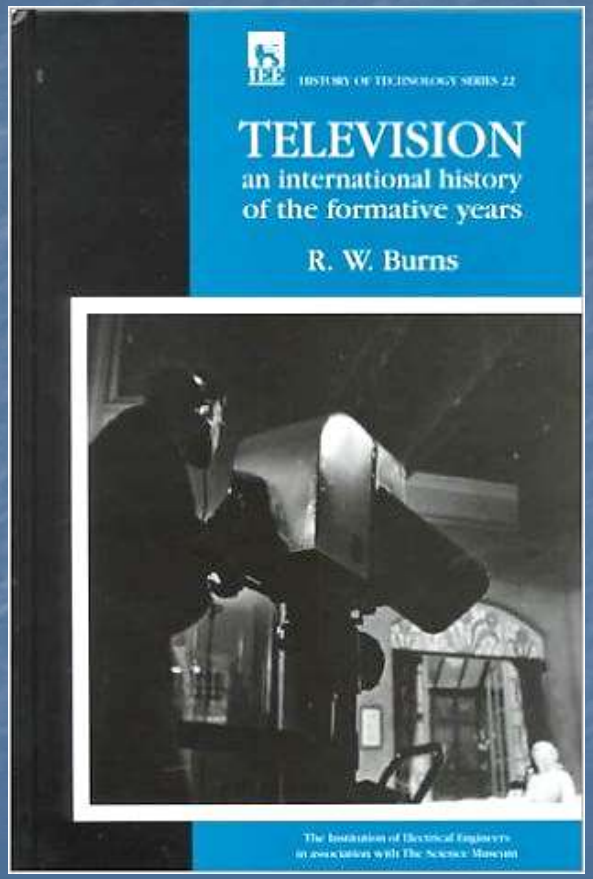
Emmy Awards Earlier This Month (Jan. 7)

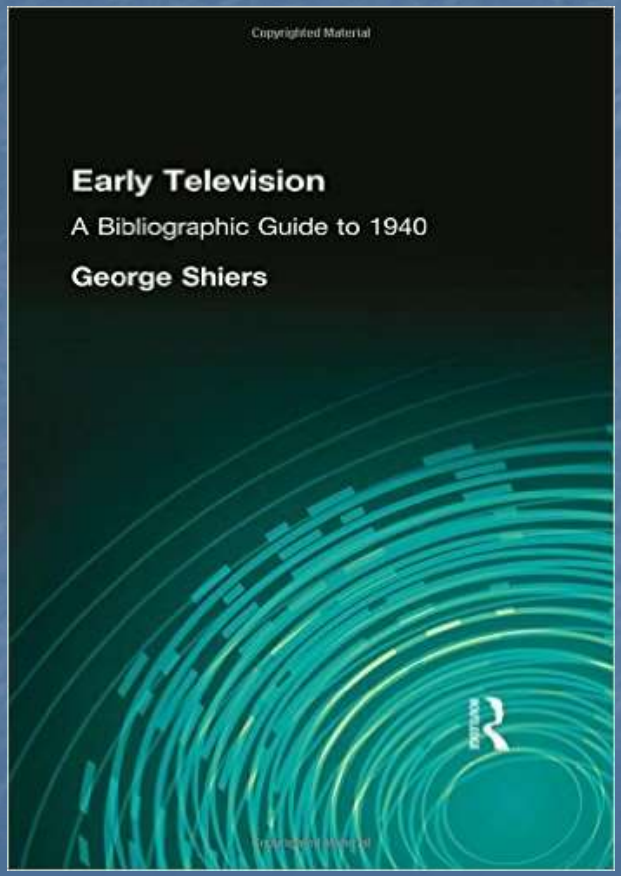
- TCM (Willoughby Smith's company)
- Society of Telegraph Engineers
- Siemens

® ATAS/NATAS

Why Not in TV History Books?







posthumously published

Propagated Error

- Alexandre Dauvillier

1. Projet de Carey. — G.-R. Carey (1) imagina, en 1875, un dispositif qui, bien que fort primitif, répondait à cette conception. Utilisant la photosensibilité du sélénium, qui venait d'être découverte par May, son

"La télévision électrique," *Revue Générale de l'Electricité* 7 jan. 1928

- repeated by (among many others)
  - Campbell Swinton (same year *Discovery* & next *Nature*)
  - Garratt & Mumford, *Proceedings of the IEE*
  - Zworykin, *Proceedings of the IRE*
  - Gorokhov, *Radio Engineering* [*Радиотехника*]
  - many SMPTE papers, including 1976 (60th Anniversary) "101 Years of Television Technology"

Television Inventions.

IN NATURE of April 27, p. 637, a notice appeared of a book by Mr. C. Francis Jenkins, of Dayton, Ohio, entitled "Radiomovies, Radiovision, Television". With some difficulty I have obtained a copy of this book from America, and find in it, in a picture which appears to be on page 74 (though no paging is given), a description copied from a journal of July 25, 1894, ascribing to C. Francis Jenkins an apparatus for transmitting pictures by electricity, under the name of the Jenkins' Phantoscope. This is identical in all essentials with the method of television proposed by G. R. Carey, an American, and dated 1875 according to "La Television Electrique", by A. Dauvillier, published much later, in 1928, by *La Revue Generale de L'Electricite*, of Paris; while an illustrated description of Carey's method also appears in a copy I possess of *Design and Work* for June 25, 1880.

went on to compare Baird's work to the earlier Nipkow patent

A. A.

CAMPBELL SWINTON.

40 Chester Square, London, S.W.1, May 28.

101 Years of Television Technology

By RICHARD S. O'BRIEN and ROBERT B. MONROE
With Contributions by
CHARLES E. ANDERSON and STEVEN C. RUNYON

SMPTE Journal
60th Anniversary Issue

July 1976

A **Historians have differed somewhat on the exact year of Carey's proposal** but a number have placed it in 1875, the year reported above. However, the earliest published reference to Carey's work that could be found during the preparation of this paper was May 1879; therefore, there remains some uncertainty as to the exact year of Carey's proposal.

SMPTE Journal

VOL. 86, NO. 3 MARCH 1977

Historical Notes on Television Before 1900

By GEORGE SHIERS

The Carey Legend

The most prevalent version of the beginnings of television gives credit to an invention by George R. Carey of Boston in 1875. Carey did not claim this early date nor is it supported by contemporary reports. This story appeared, perhaps for the first time in English literature, nearly fifty years ago in a survey article[11] by Alan Archibald Campbell Swinton (1863–1930), well-known electrical engineer of London who was the first to suggest an all-electric television system. He stated:

Nov 1, 2001 | Autographs

Autographs

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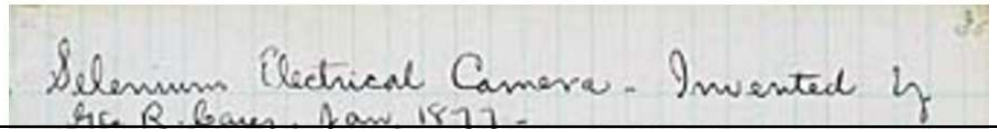

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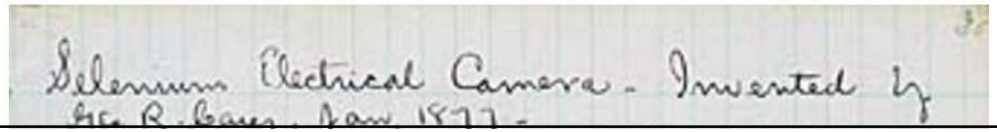

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Early Television

A Bibliographic Guide to 1940

Compiled by George Shiers
Assisted by May Shiers

Edited and Indexed
by Diana Menkes

Project Manager
Christopher H. Sterling

Editorial Associate
Elliot N. Sivowitch

- 1997 published
- 1983 Shiers died

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67 Siemens, (Sir) Charles William (Carl Wilhelm) (1822–1883). "The action of light on selenium." PROC. ROY. INST. 8 (1876): 68–79. Paper read Feb. 18. Also NATURE 13 (Mar. 23, 1876): 407, 408. This report refers to the discovery of the light sensitivity of selenium as being "an observation made first by Mr. May, a telegraph clerk at Valentia...." William Siemens, the younger brother of Werner (56) immigrated to England at the age of twenty. (50, 68)

a fully referenced version of this talk, "What Sparked Video Research in 1877? The Overlooked Role of the Siemens Artificial Eye," will be published in the March 2017 issue of the *Proceedings of the IEEE,* available at IEEEXplore.IEEE.org
http://ieeexplore.ieee.org/xpl/RecentIssue.jsp?punumber=5

These slides are available at bit.ly/smpteny-17-1
Audio/Video of Philadelphia Section presentation at bit.ly/smptephl-17-1

Questions?