C. Francis Jenkins--Television Adventurer

By GEORGE H. CLARK
Radio Historian

Portrait of Jenkins during his active period.

CHARLES FRANCIS JENKINS (1867-1934) of Washington, D. C., was one of radio's most colorful personages, and in his chosen realm of "seeing via the ether" America's best known, most loved pioneer. He was indefatigable in his efforts to create a new art and novel means of serving it, and his personal interest in those with whom he worked, whether in the laboratory or via the web of wireless, was so vital that he made friends everywhere, from the amateurs who listened and looked in to the higher officers of Washington's officialdom.

When Bell brought out the telephone in 1876, the idea of voice-over-wires was followed up by a flood of ideas for sight-over-wires. Strangely enough, these were in general very similar to some of the earlier television principles that followed later. Jenkins was an avid reader of books and magazines of a technical nature, even as a lad, and perhaps some of these primitive plans were noted by him and stored away in his mind.

He came to Washington as a Civil Service employee, and was appointed clerk to the head of the U. S. Life Saving Service, now the U. S. Coast Guard. Passing over the "Government slave" phase of his life, his entry into the world of engineering and of invention was by way of the motion picture field. In 1895 he created and built a moving picture machine, and exhibited it that same year before the Franklin Institute. They thought so highly of it that three years later he was awarded the Elliott Cresson Gold Medal of the Institute, the citation terming this "Phantoscope" "the first successful form of projecting machine for the production of life-size moving pictures from a narrow strip of film containing successive phases of motion." The original device is now in the National Museum, Washington. His interest in the flickering images was so great that he founded the Society of Motion Picture Engineers in 1916 and was its first president. The Society is now international in scope.

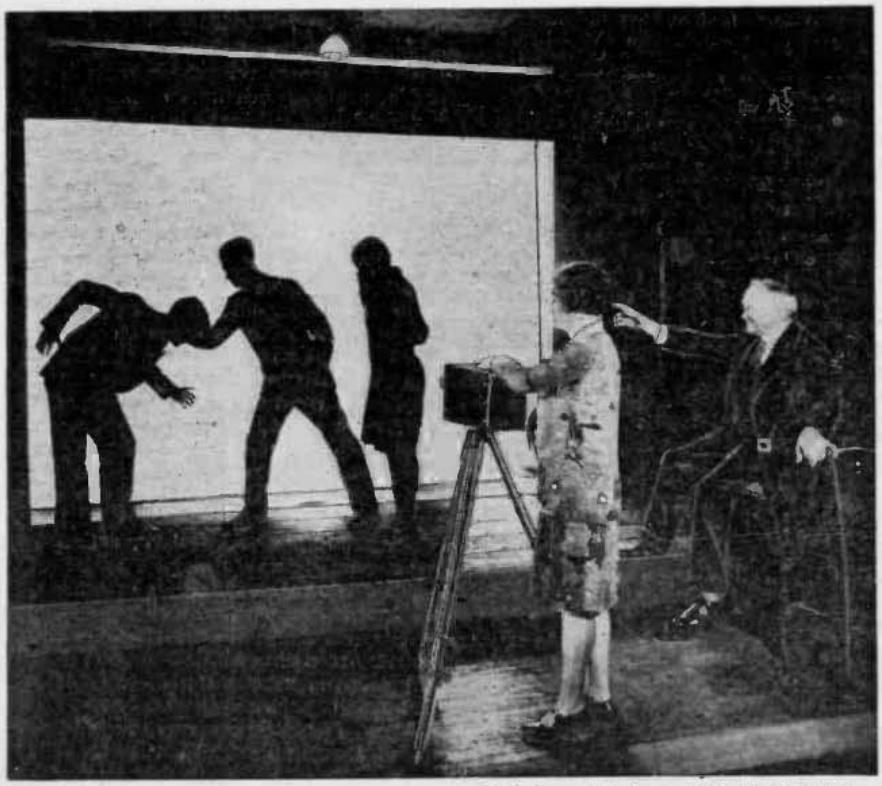
Yet even while he was polishing up his projector for its display in Philadelphia, its use in wireless communication was already in his mind. In 1894 he wrote an article for the July 25th issue of *Electrical Engineer* on the subject of transmitting pictures by wire. The later transfer to the field of radio was inevitable, by the law of genetic descent.

In 1921 he set up a small research laboratory in Washington, surrounded himself by a picked force of young and extremely enthusiastic helpers, and plunged with his characteristic dynamic energy into the investigation and practical construction of transmitting and receiving apparatus.

At that time, Nipkow's disc scanner was universally used for picking out one element of a picture at a time at the sending end and for synchronous reconversion at the receiving end. That device Jenkins adopted. His first task was to teach himself the simple mysteries of scanning, and then the more difficult techniques of making a record. But his mind was far ahead of this work, and even in those elementary days he predicted home movies by radio, prophesying that an "entire opera may some day be shown in the house without hindrance of muddy roads." (Apparently he did not believe that the art of road-building would go ahead as fast as radio and television!)

He then began specific invention, his first venture being the transmission of still pictures by wireless and their reproduction in recognizable form on paper or other medium at a distant point. This, of course, was facsimile radio, or photoradio. His first demonstration on December 12, 1922, was before officials of the U. S. Navy, including Admirals S. S. Robison and H. J. Ziegemeier, Captain J. T. Tompkins, Commander S. C. Hooper, and Lieut. Commanders E. H. Loftin and H. P. LeClair. A report of this demonstration was printed in the *Washington Star* of January 14, 1923.

By 1924 Jenkins had greatly improved his technique, particularly by means of his prismatic ring scanner, which, unlike the scanning disc, provided a receiver picture without lines or dots appearing in it, i.e., of photographic



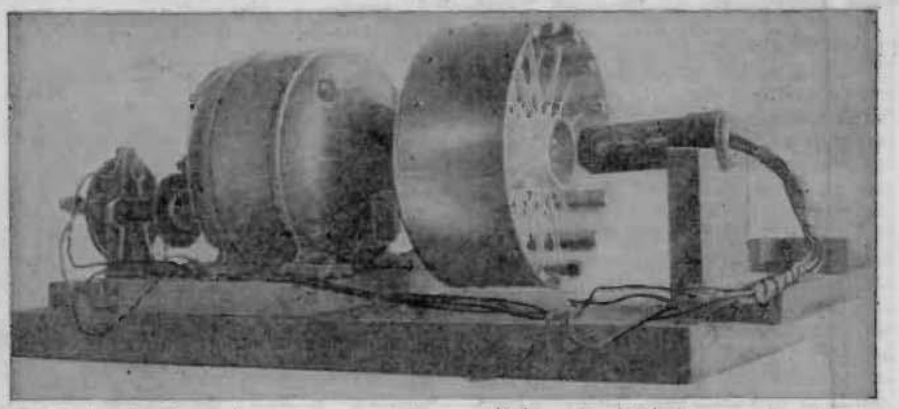
Underwood & Underwood, Washington, D. C.

Jenkins invented a new method of photographing silhouettes for early television broadcasts.

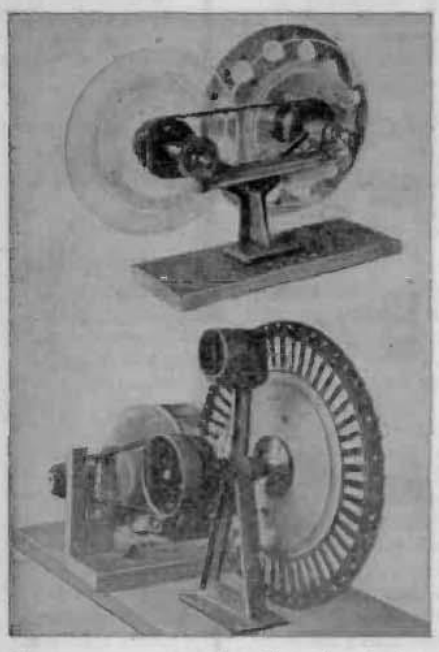
Movie film used in Jenkins' broadcasts.

value. On June 15, 1924, Jenkins made his first 100-line radio photograph, one of the first subjects being a photograph of President Coolidge.

1924 was a telephoto year, for not only was the work described above going on, but the A. T. & T. Co. had stepped into the picture, sending electrical pictures via wire from Cleveland to New York on May 20.



The Jenkins-de Forest drum scanner was the most highly refined television receiver to use mechanical scanning principles. It had four spirals of holes and a multiple neon lamp, light from which was "piped" to the holes in the drum through quartz rods to avoid loss.



The upper scanner employs the prismatic ring.

Radio movies at last!

In the following year, Jenkins graduated to radio-movies, even if they were only silhouettes. His first laboratory demonstration of *radio-vision*, a term which he had coined for "the transfer of pictures via the ether," had been on June 14, 1923. Now, in 1925, he was ready to proceed on a broader scale. On March 31, movies by radio were sent from a standard moving picture machine to a small screen on a distant radio receiver. This was a room-to-room experiment; but early in the week of June 3, 1925, he decided that a public demonstration was in order. The transmitting on this occasion was done by courtesy of the U. S. Navy from its Naval Laboratory station NOF, at Anacostia, with the receiver in the Jenkins Laboratories.

Present were George M. Burgess, director of the Bureau of Standards; Secretary of the Navy Curtis D. Wilbur; Admiral S. S. Robison; Captain S. C. Hooper, U.S.N.; Judge S. B. Davis, Department of Commerce; and W. D. Terrill, Radio Division, Department of Commerce. Incidentally, although it does not appear in the records of the day, the fine Italian hand of Captain Hooper (now Rear Admiral, U.S.N., Ret.) functioned invisibly in all these tests, for it was he, as the Navy's chief protagonist of matters radio, who organized and approved this test.

What did they see? Not much. A small rotating fan, imitating a Dutch windmill, started, stopped, reversed, as air was blown on it from an unseen source. Finally, a chief petty officer at NOF, by direction of Admiral Robison, stood before the television transmitter and wigwagged a message to his superiors standing before the radiovisor in the Jenkins' laboratory. (Captain Hooper, at least, was able to read the message!) Said Mr. Jenkins of this demonstration, "Congratulations were in order, but they seemed to be given in a rather awed manner, as the unfathomable possibilities of this new extension of human vision came to be more and more realized."

Mr. Jenkins further commented, "This first public demonstration of June, 1925, was duly heralded in the press. But there was no spontaneous response from the public until the A. T. & T. sent pictures of living persons from Washington to New York over their wires. No wires were available to me, so I have used wireless." (As if he hadn't intended to use wireless from the very beginning!)

An amateur scans amateurs

As yet, Jenkins had made no effort to interest the public, or at least the amateurs (who were the radio public of that day), in "home reception." That was probably because there was no appreciation of the possible monetary benefit that might ensue; sales of sets to the Navy had a much more immediate enticement.

But Jenkins was a youngster at heart, and still younger youngsters worked under him, so in time he decided to install a broadcast transmitter for radio-movies (plus announcements) on the amateur band. Station 3XK (later W3XK) was approved by the FRC, and four channels were assigned—to over-

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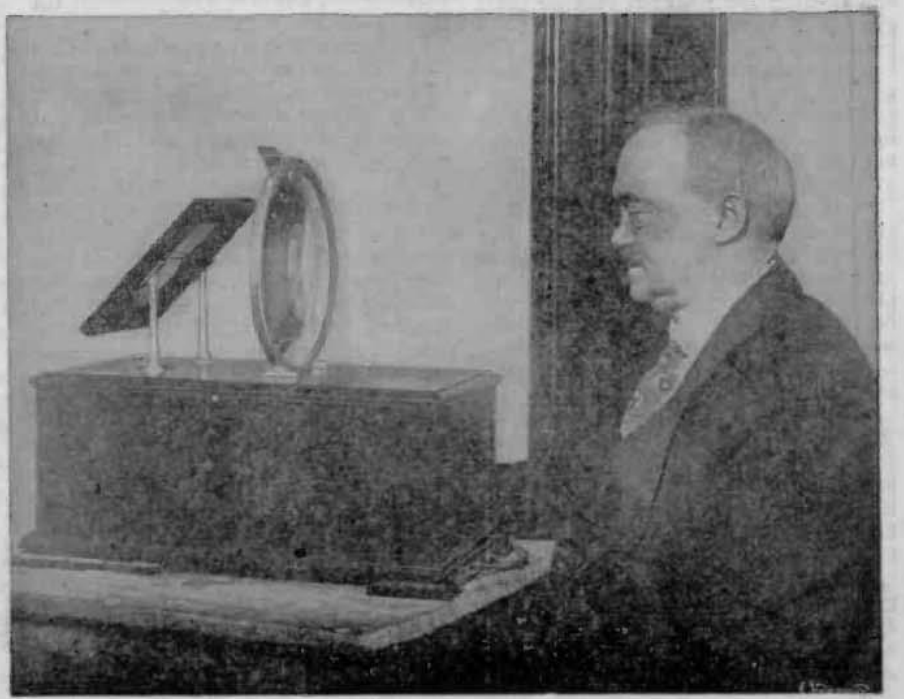


The drum receiver was considered at the time to be a great advance in the art of television.

come skip distance on the short waves used. The first Jenkins radio movie, or radio silhouette, was broadcast on July 2, 1928. During the "talk" part, amateurs were asked to write and give their opinion of the broadcast and tell how it was received, and those who "heard" only were urged to equip their short-wave code receivers with Jenkins picture attachments (discs, motor, light, etc.). Many of them did so, but it was rather difficult for them to lay out, and construct their own spiral discs, although Jenkins gave them full instructions both via broadcasts and by mail on request. So after a short time he manufactured an inexpensive picture attachment and sold it at less than cost. This consisted of a neon lamp, disc, and synchronizer, to be mounted on a synchronous motor.

At first, and for a long time, only silhouettes were broadcast. These seemed perfectly acceptable to the amateurs, most of whom were "kids" either actually or at heart. To produce these silhouettes, Jenkins set up a studio of his own, unique in the movie art, where silhouette movie films could be made as cheaply as ordinary movie films. The stars were recruited from his laboratory staff, except those parts taken by children. Among the latter was little Jane Marie, who came to be known all over the continent as "the little girl bouncing the ball." The studio director was Miss Florence Anthony, (later married to the late George Clark, then a prominent business man of Washington).

Another silhouette well received by the "lookers-in" was "The Old Dutch Girl" of the cleanser ad. A large picture of the Dutch Cleanser can was also televised, showing an early appreciation of commercials. "Possibly," wrote Jenkins in a memo, "we can put in silhouette the little fat boys of Campbell's Soup." Other silhouettes were "The Washwoman," "The Crook," the little girl skipping a rope and then putting it away and turning somersaults, another little girl, Miss Constance, who must have been very clean for every night she washed her doll's clothes and hung them on a line to dry "in a drying breeze," as Jenkins termed it. Then, last but by no means least, was Jacqueline, who did athletic dances with Master Fremont. (I wonder who's tripping her now?)

"Our audience," said Jenkins later, "in those primitive days of 1928 was between 18,000 and 20,000." Letters ranging from Malden, Mass., ("got your picture through the entire transmission despite local severe lightning") to Cedar Rapids, Ia. ("have received every one of your broadcasts"), and even further, south and west, told the story of Jenkins and his unpaid amateur laboratorians. These young home-scientists cared most for the technical pleasure of looking and recognizing, just as later in voice-broadcast days they cared only to receive and log the voice reception, however inane the content. (QST, please note!)

All these transmissions of line pictures were on the amateur wave of 46 meters. "Silhouettes only were sent," said Jenkins, "so that the picture frequency band could be kept within the legal limit, 10 kc. Later, a band 100 kc wide — 4,900 to 5,000 kc — was assigned to us by the FRC so that we could broadcast half-tone movies."

Crude though this early television was, it made its impression as a possible growing art. For example, the *New York Tribune* of June 16, 1925, viewed with alarm as follows:

> Before lending any further aid to Jenkins, the Government should consider its (television's—*G.H.C.*) effect on posterity. It means stagnation to transportation industries when it becomes unnecessary to go anywhere to see anything. In fact, it is in a way a scientific accomplishment of the notion of Mahomet that the mountain should come to him . . .

Opinions differed, as note this quote from *The Grid* de Forest house organ, 1929:

> The success of the Jenkins Washington station for television attracted the attention of financiers, and a financier of New York and Palm Beach undertook the merchandising, under the corporate title of the "Jenkins Television Corporation" of the devices developed by the Jenkins Laboratories.

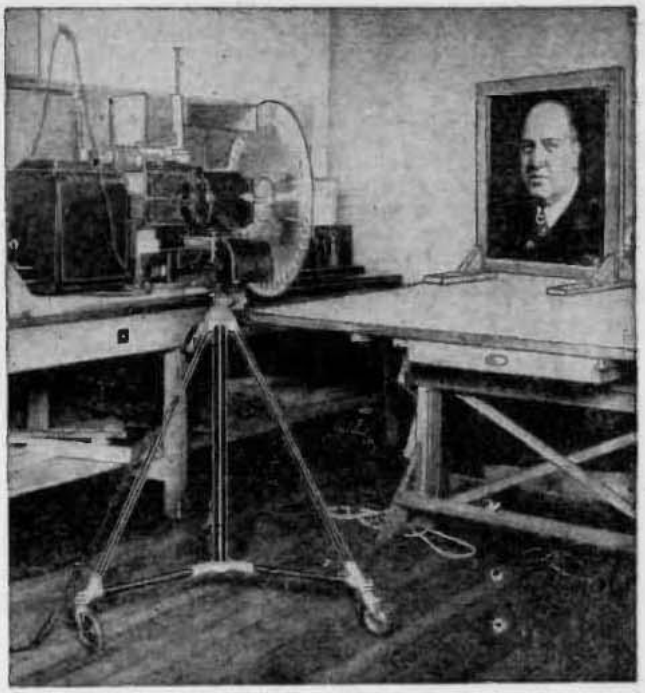
The new control was in the hands of the de Forest Company, of which the Jenkins Television Corporation (of New Jersey) was a subsidiary. On September 27, 1929, the de Forest directors had authorized the purchase of the television company's stock, at the rate of 1 share de Forest common for 1¾ shares of Jenkins. Mr. Jenkins retained his control of the Jenkins Laboratories in Washington, and was vice-president till 1930, when he resigned.

The resignation was partly due to his poor health at the time, partly because he was not "in the saddle" any more, partly because those in the saddle did not cooperate with him and felt they were possessors of a white elephant.

Drum replaces scanner

Before describing the career of the new company in New Jersey, let us consider some of the major developments made by Mr. Jenkins while he was still his own boss. Chief of these are the drum receiver, the plate transmitter and receiver, and the prismatic ring.

The drum receiver was a refinement of the disc scanner, and removed many defects inherent in the latter. In the place of a huge rotating disc with helical holes, he substituted a drum, 6 inches in diameter, the circumferential band of which was pierced with 4 rows of holes, each row being arranged helically. All in all, there were 48 scanning apertures. Inside the drum was a neon light system, not with 1 glow-plate, but with 4 arranged end to end and connected to a commutator so that each plate or "target" was lighted in unison with the rotation of one row of holes on the drum. This complicated structure made it possible to have each target much more brightly illuminated—since lighted only for a short time—than if a single target were lighted continuously.



Jenkins' improved lens-type Nipkow scanner, set up to scan photo of W. T. Barkley, who was then vice-president of the de Forest Radio Co.

To conserve the light—which was placed some distance from the periphery of the drum, and not directly adjacent to the rotating element as in the case of the disc—quartz rods acted as "pipes" to carry the light directly outward without scattering. A drum 7 inches in diameter with 6 helical turns gave a 3-inch picture, twice the area of any picture available with a 36-inch disc, and much brighter. "The drum receiver with quartz rods," said Jenkins in the *Journal of the Society of Motion Picture Engineers* in 1930, "is the best television receiver known. It makes bigger and brighter pictures with simpler mechanism and less amplification than any other form. How long it will remain the best form of receiver no one knows, for thousands of engineers, my own included, are feverishly at work on the problem." Those were prophetic words! "His own engineers" did not succeed, nor did the much better trained de Forest engineers, in making a receiver that would be acceptable in commercial television. It remained for the electron to solve the problem, much as perhaps in the near future the atom may dissolve it!

There is this to be said: that the drum receiver was a product of elegance and—within its limitations—of efficiency. That it was not commercially practical can be ascribed partly to the fact that its inventor was not a particularly commercial-minded person.

Beginning of the end

One of the engineers working "feverishly" on the problem was C. E. Huff-

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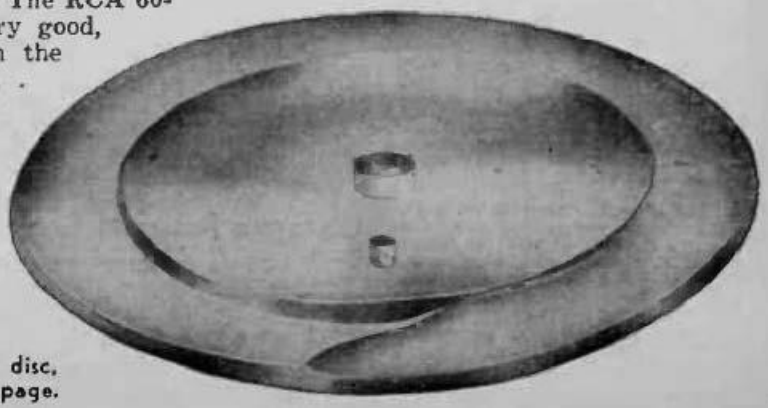
man, of the de Forest television subsidiary. In July, 1929, he recommended that the drum type of scanner be dropped. The drum receiver, he said, caused the neon tube to burn out in a few hours, due to its being run at a very high intensity to compensate for the 60% loss of light in transmission through the quartz tubes. The commutator also introduced disturbances which had to be filtered out of the receiving set, and was also subject to delicate timing adjustments.

At about the same time, a prominent publicity engineer similarly attacked the work of the Jenkins organization as a whole: "I am perturbed at the progress made by others in the television field compared with that of the Jenkins organization: A year ago, at Lexington, Mass., I saw better pictures than Jenkins shows today . . . The RCA 60-line pictures are very good, better in detail than the Jenkins pictures . . . All others are showing half-tones while we play around with silhouettes . . . The work of Bell Labs. is far ahead of anything we can dream of today . . . The Jenkins prizefight film is years behind what others are showing; it is so poor that I shouldn't care to invite newspaper men to see it. . . . It is only from true friends that you can learn the truth, so pardon my frank criticism . . ."

In 1930 shortly after this frank denunciation, Jenkins was asked to design a new receiver. He submitted the old drum type with quartz rods, which would not be acceptable to the radio public. His career as an inventor, or rather as an up-to-date designer, was ended, and his frenzied efforts to "beat the field" affected his heart. In August, 1931, it was reported that he was seriously ill, and that his life was despaired of. Three years later, after a lingering illness, he passed away.



The prismatic scanning disc, described on opposite page.

The prismatic ring

One important element in Jenkins' early apparatus deserves full description here, since no clear explanation has been heretofore published of its nature and the method of its functioning; that is, the prismatic disc or ring.

This consisted of a glass disc (or ring) of selected mirror plate, ground along its outer circumference in a graduated way. From one end to a point half-way round it had its base outward; from this half-way point around to the other end it had its base inward. The warp from one end to the other was gradual. A beam of light passing through this device, when it was rotating, was caused to oscillate, having its hinged action fulcrumed in the plane of rotation of the prism ring. The oscillation was always in the plane of the diameter of the disc from the point where the light passed through the prismatic section.

In effect, the prismatic ring was comparable to a solid glass prism which changes the angle between its sides, "giving to a beam of light passing therethrough a hinged or oscillating action on one side of the prism while maintaining a fixed axis of the beam on the other side of the prism," to quote the inventor directly.

A beam of light passing through a prism is bent toward its base. By mounting 2 disc prismatic rings so that their axes intersect at right angles, the beam can be bent both up and down, and left and right. Nearest the photograph to be scanned is the ring which bends the beam vertically, the other bends it horizontally. The second prism makes 100 revolutions to one of the first.

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"For transmitting radio-pictures," said Jenkins, in his book entitled *Vision by Radio*, "we slice up the picture (figuratively) into slices .01 inch wide, by sweeping the picture across the light-sensitive cell with these rotating prismatic rings. With each downward sweep the picture is moved .01 inch to the right, until the whole picture has crossed the cell . . . The cell converts the light strengths into corresponding electrical values . . . In receiving, with the rotating prismatic rings we draw lines with a point of light across a photographic plate, varying the density as this is done by reason of the varying strength of the incoming signal.

"For sending radio-photographs the picture is projected with a magic lantern through 4 overlapping prismatic rings, 2 of which in rotation sweep the picture vertically across the light-sensitive cell, at the same time that the image is being moved laterally by the other pair of prisms. The light cell in its housing changes the different light values of the picture into electrical values. A rotating perforated disc between lens and cell changes the direct current into interrupted direct current, which is then sent through the amplifying transformer."

The reference to "4 overlapping rings" means that for horizontal as well as vertical prism scanning each disc really consisted of 2 placed side by side, overlapping, for optical correction. In the first prismatic rings there had

been a slight error, which was corrected by Jenkins by using 2 rings, (one with a plus error and one with a minus error) and cementing the 2 rings together.

The prismatic rings were not intended for radio movies at first, but for a high-speed continuous camera (as opposed to the ordinary intermittently moved film), and were so described by Jenkins at the Montreal meeting of the SMPE in May, 1920.

The prismatic ring device was really a deflection apparatus, or, in other words, a scanner. It took the place of the scanning disc but was continuous in operation rather than intermittent. Jenkins was very proud of this device, because it emphasized elegance in the solution of scanning. Simply speaking, he used an "interposed variable prism" instead of a helical scanning disc. It was a very complete and technically elegant device even though complicated and expensive.

Jenkins the man

The indomitable will and faith which C. Francis Jenkins always exhibited are clearly evidenced by his oft-expressed statement, "If a thing is very difficult, it is as good as accomplished; if it is impossible it will take a little time."

The same idea is shown in his treatment of two brilliant scientists whom he obtained from one of the great laboratories of the country. "They did not last long with us," said Jenkins later, "because they spent too much time proving why it wouldn't work instead of figuring how to do it."

He wanted his assistants to carry out his ideas implicitly, even when they were impractical or even impossible. He sur-

Suggested by Grego Baneshuck, New York City

rounded himself in his Washington laboratory with young men and women, "because," he said, "if Jenkins tells them it can be done, they believe it." This had much to do with his final failure, for a few trained engineers in his employ might well have been able to carry his plans from an amateur to a practical status.

However, he gave full credit to these idolizing assistants. After he had succeeded in broadcasting radio movies in 1929, he stated in his dedication of his book *Radio Movies and Television*, published in that same year:

"This thing is done, the long pull is ended. We are broadcasting radio-movie entertainment to thousands, and the credit, in no small measure, is due to the clever and charming young folks who have worked with me—Sybil L. Almand, Florence M. Anthony, Vera T. Hunter, John N. Ogle, Stuart Jenks, Paul Thomsen and Elwood Russey."

He was a man of great vision, with the courage of his convictions, of indomitable will and boundless energy. He loved his fellow men, and was in turn respected by all who knew him and loved by those who had the opportunity of being associated with him. But he had great defects: he was an amateur first and last, and to him inventions were playthings; he would not have others with him who might translate his devices into more practical form, but insisted that they be made by his "adoring assistants" exactly as he directed. Burning with ambition, he admitted no thought of fault or failure, and when he had reached the high point of the old scanning technique, he could not go beyond. Others did.

During his life span, he built the prototype of the moving picture projector now in every movie theater; he invented the spiral-wound all-pasteboard container still so universally used; and as his contributions to radio and television, the foregoing pages will suffice. He was a member of the Franklin Institute, the American Association for the Advancement of Science, the National Aeronautic Association, and was founder and first president of the Society of Motion Picture Engineers.

Pasted in his Washington laboratory was the motto:

"They said it couldn't be done, but he, poor fool, didn't know it and went ahead and did it!"

which is another form of the common expression:

"People saying it can't be done are constantly being interrupted by people doing it."

And, as Zworykin might have said:

". . . by people doing it better!"

The foregoing abstract has been obtained from Mr. Jenkins' three published books—[*Vision by Radio* (1925), *Radio Movies and Television* (1929), *The Boyhood of an Inventor* (1931)]; from *Proceedings of the Society of Motion Picture Engineers*; and from numerous other publications; but chiefly from data copied by the author from Mr. Jenkins' scrapbooks, by permission of the late Mrs. Jenkins, and through the kind intermediation of Miss Florence Anthony, former assistant to Mr. Jenkins and later companion to his wife. Many of the photographs accompanying this article were likewise obtained through the courtesy of Mrs. Jenkins.