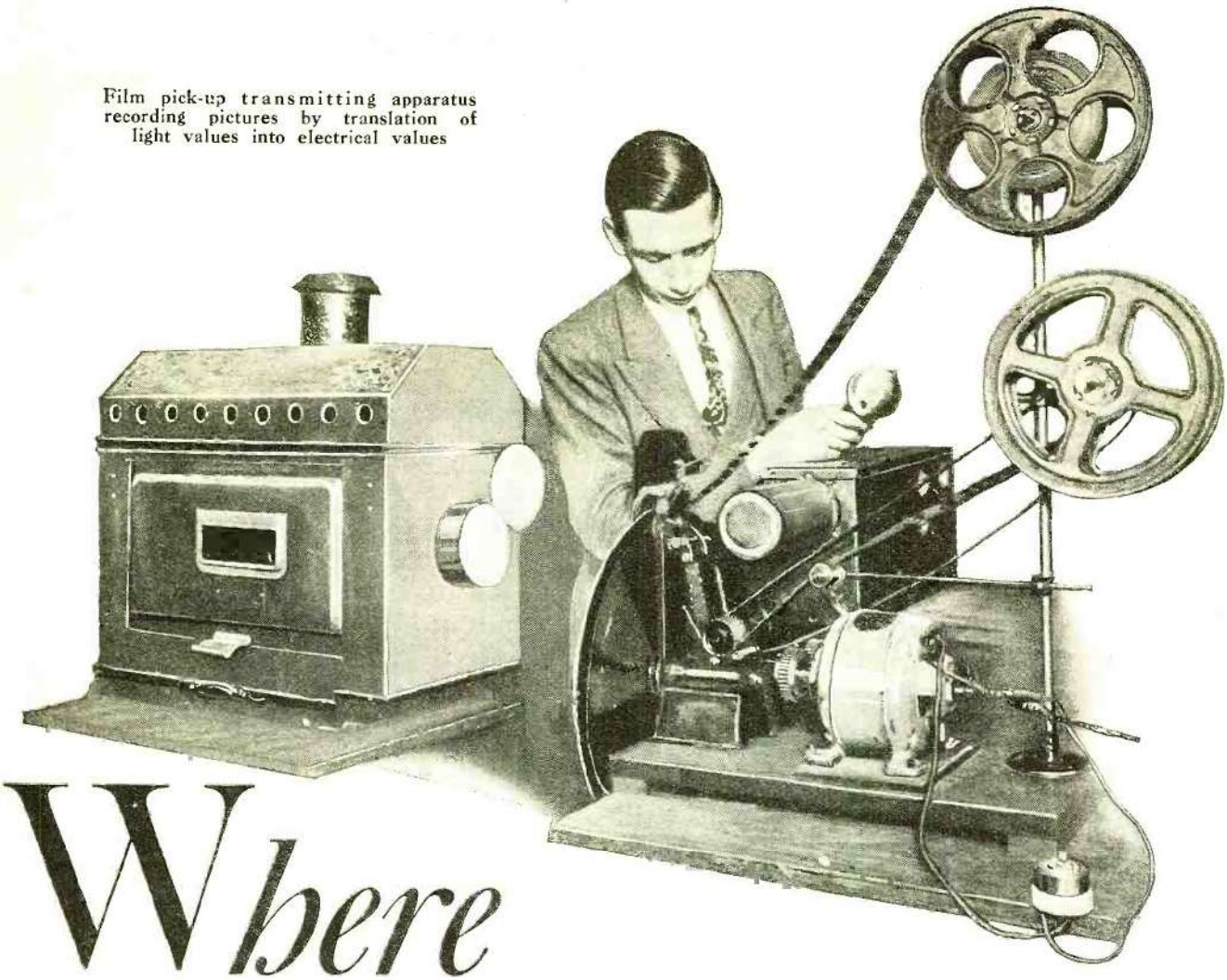

Film pick-up transmitting apparatus recording pictures by translation of light values into electrical values

Where TELEVISION *is* TO-DAY

The commercial television receiver begins to take form

By D. E. Replogle

TELEVISION is pretty much the same story as the "House that Jack Built." Most of us recall that one feature of Jack's House led to another and still another, in an endless chain. In television development, the situation is much the same; the solution of one feature leads to a new problem, the solution of which uncovers still another problem, and so on. Nevertheless, with the application of intensive research and specialized engineering effort, many problems of practical television have already been solved, and we are now on the eve of commercialized sight broadcasting.

For a correct appraisal of practical home television, it is well at the start of any discussion to differentiate between the ideal and the practical. Thus, there

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are two broad schools of television thought today, both correct in their own way, and both working toward the future of the art. The first school seeks ultimate perfection and is quite unhampered by considerations of time, effort and money. Even at this early date this school is endeavoring to demonstrate a highly refined form of television including excellent detail and even natural colors. The demonstrations of the Bell System engineers are most representative of this school, for no time, effort nor money is being spared to achieve the desired end. With an eye to a future important use of long-lines telephone service, the telephone engineers are pioneering in television just as they did in radio broadcasting.

The splendid development of broadcasting possibilities through experimental station WEAF and the original Red Network, finally bringing about the most profitable use of wire networks yet uncovered, is now being repeated in the case of television. However, it should be noted that these efforts have to do solely with the most elaborate form of television, using as many telephone wire chan-

nels as may be necessary, the most elaborate kind of equipment and no end of engineering talent for the setting up and operation of the system.

But what about simple, inexpensive, feasible home television? To answer that question, we turn to the second school of television thought, which concerns itself with the prompt development of a satisfactory television system for home use. In this school the paramount consideration is to bring about a compromise between the ideal and the practical. Engineers are fully aware of the limitations of the existing technique of scanning or dissecting the image into a number of lines. They have come to accept the relatively narrow radio channels placed at their disposal as the connecting links between transmitter and receiver. They fully realize the need for simple and inexpensive equipment. Hence their development efforts are predicated on definite limitations at the very start. It is a matter of striving for the best possible results, under the existing circumstances. Above all, it is imperative that at least a start be made.

To the average individual, it is the second school of thought that merits discussion. The first school is interesting, of course, and such achievements as excellent detail and natural colors are to be admired. However, immediate interest focuses on a system for home use, just as the average individual is more interested in a home movie outfit than in the elaborate and costly talking picture system for the palatial picture theatre.

All of which leads to the modest results obtainable with a really practical television system. While the enthusiastic novelist and the dreamy inventor may have sold the public the idea of viewing a Broadway revue or a football game in vivid form on the television screen, the fact remains that such achievements are still in the dim future. For the present, we are in the babyhood of the television art, and must be contented first of all to master our ABC pictures. And so we are down to the brass tacks of practical home television. Let us see, then, what has taken place in this specific field.

Television experimentation began in earnest in July, 1925, when C. Francis Jenkins of Washington, D. C., a noted inventor in the fields of motion picture projection, ultra-speed cinematography and facsimile communication, inaugurated a radio television or sight broadcasting service from his experimental station, W3XK, at Washington, D. C. Despite the limited power of 50 watts, this station soon had a following of television experimenters extending from coast to coast and border to border. Mr. Jenkins sought the co-operation of radio amateurs and experimenters and received it in ample measure. To further television interest, he even supplied television kits at cost. While the "lookers-in" had to build their own equipment, they have grown in numbers to something like 20,000 at the beginning of this year.

¶ The enthusiastic novelist and the dreamy inventor may have sold the public the idea of viewing a Broadway revue or a football game in vivid form on the television screen, but the fact remains that such achievements are still in the dim future.

¶ Our greatest problem at present is one of coverage. We are making field-strength measurements, and hope to know shortly precisely what to expect by way of a dependable television area.

¶ Sound broadcasting—a far simpler technique—required almost a decade for development into satisfactory merchandise. With sight broadcasting, we may well expect to take the same time to attain satisfactory equipment for general use.

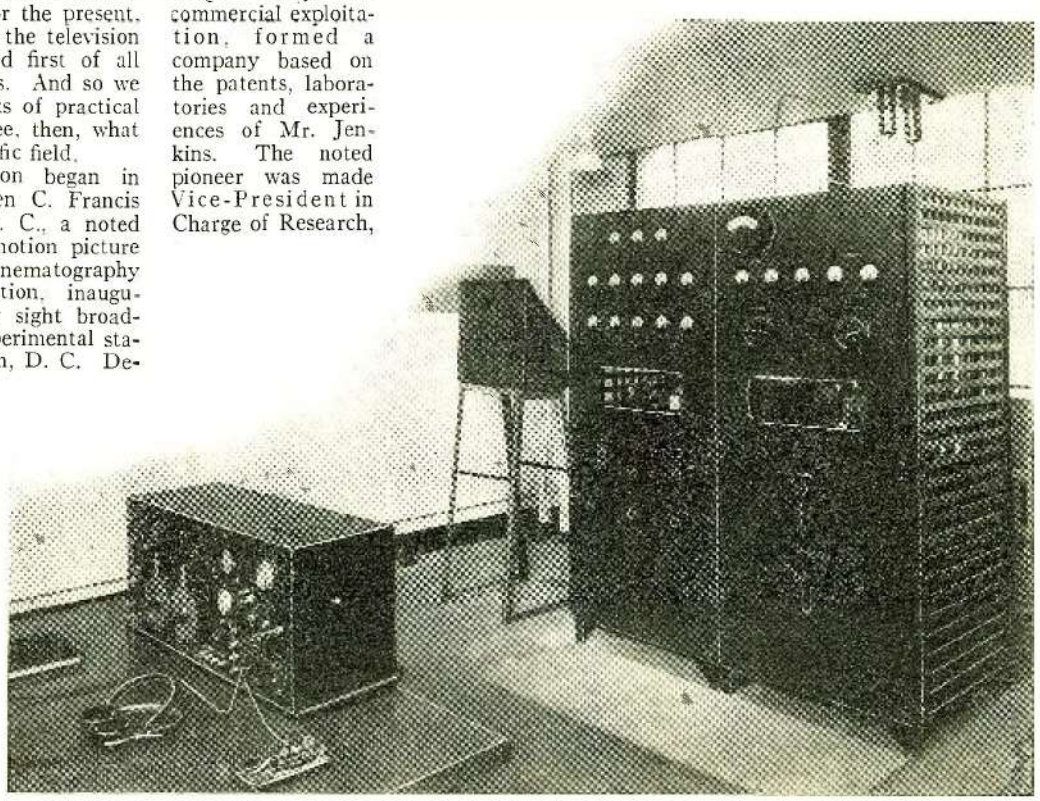
In November, 1928, a group of capitalists and business men, having decided that the Jenkins television experiments had attained a practical stage ready for commercial exploitation, formed a company based on the patents, laboratories and experiences of Mr. Jenkins. The noted pioneer was made Vice-President in Charge of Research, with headquarters in his laboratories at Washington. Meanwhile, the commercialization of the Jenkins television system was centered in the main offices and engineering laboratories at Jersey City, so as not to hamper the functions of pure research by the urgent demand for immediate results.

More than a year has elapsed since the formation of the television organization. The engineering development during the past thirteen months has been concentrated mainly on the evolution of a practical home televisor or device for converting television signals into animated pictures, together with a satisfactory sight broadcasting service.

At first, the engineering development centered about the home televisor model of Mr. Jenkins, comprising a horizontally mounted motor, scanning drum and revolving switch, contained in a cabinet with an inclined mirror and magnifying lens on top. The scanning drum was provided with a four-target neon lamp and light-conducting rods leading from light source to holes in the drum. The revolving switch served to flash the targets in proper rotation. Several drawbacks were soon uncovered in the practical development of this device.

The next step was to mount the motor and drum vertically, so that the luminous dots of the drum might be viewed directly through shadow-box and magnifying lens, entirely housed in an attractive cabinet. This arrangement, while a decided improvement over the model with exposed mirror and magnifying lense, still made use of the four-target neon lamp, light-conducting rods, and revolving switch.

The Jenkins scanning drum makes for a compact home televisor, in contrast with the usual bulky scanning disc.



Transmitting room of television broadcasting Station W2XCR, showing transmitter, television monitor, and code receiver

While the latter requires only one revolution for the scanning or assembly of each picture by means of its 48 holes through which the glowing plate of the neon lamp is seen, the former illuminates only one-quarter of its holes, or 12, with each revolution, so that four revolutions are required to assemble one picture. The basic feature of the scanning drum had to be retained in any subsequent refinement, because of its inherent advantages over the usual disc.

The design which has been finally worked out possesses the original compactness plus remarkable simplicity, low cost and improved detail. Briefly, the refined televisor comprises a vertically mounted driving motor and scanning drum, a selector shutter with four curved slots, and a single plate neon lamp. The scanning drum requires four revolutions for each complete picture of 48 holes. The selector shutter, with curved slots, serves to mask all but the twelve holes of that particular revolution and is driven at one-quarter the speed of the drum, by means of reduction gearing. The revolving switch has been dispensed with, as well as the light-conducting rods. The apparatus can be made comparatively silent.

The Jenkins Televisor, which converts television signals into pictures for home entertainment

The refined Jenkins Televisor is now in production and samples are being shipped to various points for extensive and exhaustive tests under actual home conditions. The commercial model is in the form of an attractive cabinet measuring approximately 18 to 18 by 24 inches. At the front end is a recessed opening or shadowbox, through which the pictures are viewed. A magnifying lens set back in the shadowbox, serves to enlarge the pictures sufficiently to be viewed by four to eight "lookers-in" at a time. The shadowbox permits of viewing the pictures in subdued light, as contrasted with the absolute darkness formerly required.

Directly below the shadowbox is the control panel, with two toggle switches. The top switch can be thrown to "Loud-speaker" or "Picture" position, while the lower switch serves to start, accelerate and stop the driving motor. The vertical framing is accomplished by snapping the motor switch one or more times, until proper framing is obtained. The horizontal framing is accomplished by a simple adjustment of the motor frame.

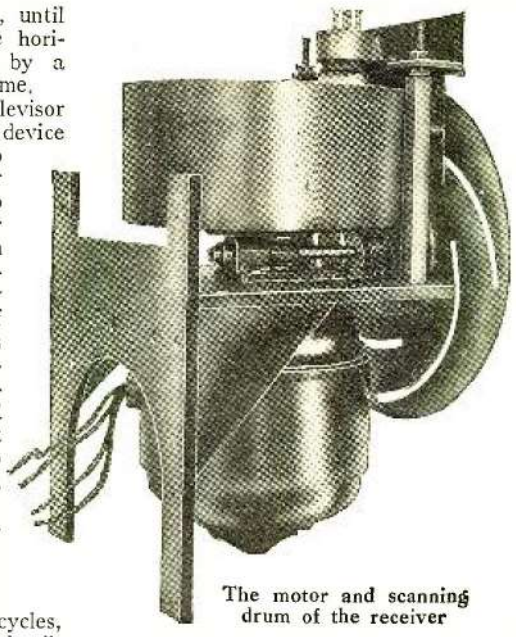
It should be noted that the televisor is simply the "unscrambler" or device which translates audio signals into pictures, just as the loudspeaker translates audio signals into sounds. Therefore, the televisor must be employed in combination with a short-wave radio set, a suitable amplifier and a satisfactory radio power unit. The usual type of regenerative short-wave receiver is by no means ideal for good television reception. Regeneration introduces distortion. Also the usual short-wave receiver cuts off at about 3,000 cycles, which, while no handicap in audible reproduction, is fatal to pictorial detail.

Therefore, the Jenkins engineering staff has found it necessary to develop a satisfactory short-wave set, without regeneration, with an audio range up to at least 20,000 cycles, in order to improve pictorial detail. Likewise with the audio amplifier: transformer coupling being unsatisfactory for good detail, suitable resistance-coupled amplifiers have been developed. Television workers have found that their efforts only began with the evolution of a practical televisor, since a suitable radio set and amplifier had to be developed as companion equipment.

With a full appreciation of the limitations of lay operation, the televisor has been made as simple as possible. The amplifier output is led to the televisor. Also, a loud-speaker is connected with the televisor. To tune in a television signal, the first toggle switch is thrown to the "Loud-speaker" position and the receiver is tuned until the characteristic buzz-saw note is heard loudest. Then the switch is thrown to the "Picture" position, and the motor switch is thrown to start the motor. Looking into the shadowbox, the "looker-in" sees a series of horizontal luminous streaks or bands, weaving a pattern of pink and black figures. If the portions of two frames or pictures are seen at one time, one above the other, the motor switch is flipped one or more times to obtain proper framing. That is all there is to television reception—so far as the "looker-in" is concerned.

Meanwhile, however, the television workers must provide satisfactory signals—suitable pictures to be snatched out of space. The transmitting end has presented many problems due to the wider range of frequencies handled. Special amplifiers have had to be developed, with many stages of special resistance-coupled amplification. Extraordinary precautions have had to be taken in shielding the components and conductors.

During the past year, the development engineers have designed and constructed two powerful television transmitters, one about five miles north of Washington,



The motor and scanning drum of the receiver

with the historic call letters W3XK, originally employed by Mr. Jenkins in his pioneer sight broadcasting, and the other at Jersey City, with the call letters W2XCR. Both stations have been operating on regular schedule, practically every day, with voice announcements, half-tone pictures and animated shadowgraphs. Many problems have had to be solved in the development of these stations and even now there is still much to be done before entirely satisfactory television service is established in the two territories to be covered by these stations. Our greatest problem at present is one of coverage. We have fitted up a truck with a receiving set for making signal strength measurements and shortly hope to check up on our service range, so as to know precisely what to expect by way of a dependable television area.

Aside from the technical phase of television broadcasting, another consideration has been that of the subject matter. With the present 48-line picture, the amount of detail that can be handled is quite limited. For the sake of comparison, let us take a square inch of the usual half-tone engraving in the newspapers, which represents about the equivalent of a 65-line television picture. If we mark off a section ¼ inch square, we have

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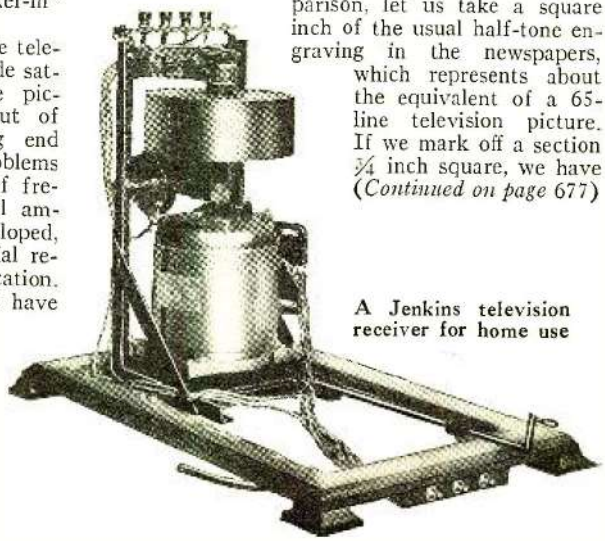

A Jenkins television receiver for home use

Where Is Television Today

(*Continued from page* 631)

about the equivalent of our present 48-line television picture. Our subject matter is limited to simple close-ups, such as the human face, hands, or simple objects with minimum detail, when working with half-tone or full gradation of tones. With the Jenkins transmitters and televisors, half-tone pictures can be handled with just as much detail as is possible in 48-line interpretation. However, due to the space limitations—the necessity of concentrating on close-ups—we have preferred to concentrate on shadowgraphs, or plain black-and-white pictures, whereby the detail is interpreted in broader terms, permitting of handling correspondingly larger figures, such as full-length human beings, together with some background.

Black-and-White Images

These shadowgraph pictures, often called radiomovies, permit of telling a story in an altogether novel and attractive manner, just as the animated cartoon on the motion picture screen is a charming variation from the minute pictorial detail of the usual photoplay. As still another problem of television development, the services of expert scenario writers and picture directors have been enlisted, to the end of evolving interesting stories for the television audience. It is fully realized that while the scientific interest in television may have justified such subjects as a child jumping rope or playing with a ball, in shadowgraph form, the "lookers-in" are already beginning to take interest in the subject matter, which simply spells programs.

All in all, we are on the eve of commercial home television. There are many problems still to be solved, but it seems best to seek the solution of these problems in the everyday use of television. Just as the automobile manufacturer must learn the weak points of his new model in actual usage, so in television we may be pardoned for enlisting the public in our future experimentation.

Future Sight Broadcasting

Furthermore, it is only by having the public take part in this pioneering that we can secure the necessary encouragement and support for the vast amount of development work that still lies ahead of us.

Sound broadcasting—a far simpler technique—required a half dozen years for development into practical merchandise and almost a decade to become satisfactory merchandise. With sight broadcasting, we may well expect to take at least five years and most likely a decade to attain satisfactory equipment for general use. Meanwhile, however, there is plenty of thrill in television. There are many potential pioneers, ready to take part in the everyday development of the young art. And so, with all the cards on the table, we are now ready to welcome television into the home, without unreasonable expectations on the one hand or unwarranted promises on the other.