

complexity of the operations involved, then you wonder that it has been so simply accomplished. You might expect it to require a four-story building and a staff of twenty men instead of the corner of an auditorium no longer than a millionaire's drawing-room.

So long as we restrict our interest to curiosity or scientific development, we are satisfied with a picture consisting of but 2500 image points which makes a recognisable image on a two-inch square screen. But, for entertainment purposes, we wish both greater size of the reproduction and considerably greater detail. To secure the equivalent of a good magazine picture, three by four inches square, we must analyse and reproduce at least 120,000 points each sixteenth of a second or 1,920,000 instead of 44,250 impulses per second. We should then be able to derive the considerable entertainment of watching an animated image about half the size of a magazine page, created and controlled by a radio signal. Three or four persons could then perform in a complete diminutive stage setting with reproduction sufficiently clear to make their individual facial expressions readily discernible.

This is indeed a modest specification, but to accomplish it required nothing less than fifty-fold the capabilities of the Bell system television machine.

A reasonable request to the research engineer—to fifty-fold the speed of any operation! It is no less difficult than to build a family automobile able to travel along at a speed of 3500 miles per hour. Although certain elements of the television system, like the photo-electric cell and the neon tube, are capable of handling millions of impulses per second, the problem of producing a commercial, fool-proof and economical device on the principles at present known and understood is fairly comparable with an assignment to build the 3500-mile an hour automobile.

ONE of the greatest unsolved problems is to secure communication channels to handle this traffic barrage of signals. To transmit the detailed three-by-four moving picture by present known methods would require 100 wire circuits or, to do it by radio, ether channels equivalent to two broadcasting bands of 100 channels each!

The difficulties seem almost insurmountable, and to predict when this will be accomplished is a guess which only a stock promoter would hazard. So long as television requires the transmission of an impulse for every point of the subject image with sufficient rapidity to repeat the process sixteen or twenty times a second, we are still navigating in the row-boat stage of the problem with an uncharted ocean before us.

What we await is a radical and fundamental discovery which will completely change the nature of the process employed. Until that discovery is made, television will remain little more than a laboratory experiment appealing to the curiosity of those seeking to peer into the future. Emphatically, it is not an entertainment device.

Everyone read some months ago of a drama broadcast from a station in Schenectady, the first television drama ever radiated. It was hailed through the press as a great achievement, and photographs of the artists broadcasting in the studio were freely distributed and published. But no one, to my knowledge, outside of the organisation which transmitted the programme is credited with successfully reproducing it. The publicity man can hardly be blamed for passing out a good and true story, if the newspapers will publish it. Give the television publicist his due; he distributed no misstatement when he announced the broadcasting of a television drama for that, indeed, was accomplished. The fact that no one successfully received it, although a few capable experimenters tried, was a pardonable omission from the story. The whole incident and the publicity

it was given was unfortunate, however, for one important reason; unintentionally it gave a false impression that practical home television is an immediate prospect, and that we may expect it to be here to-morrow.

Not many weeks after this publicity the executive in charge of the broadcasting station involved testified before the Federal Radio Commission. After some six months of regular television transmissions, he declared, such transmissions were discontinued because of lack of interest, even on the part of amateur experimenters, and not a single complaint was received from anyone protesting the cessation of these television broadcasts.

We have been told that thousands of experimenters are looking in at television images which are being transmitted by various laboratories, particularly in the eastern part of the United States, but evidently they are not very serious about it.

Another station, in Chicago, which also transmitted television images for six months, stopped its transmissions and no looker-in protest resulted. The fact is, there were no lookers-in; many tried to assemble television receivers, but so few succeeded in obtaining any results, and those who did found them so unsatisfactory and lacking in entertainment value, that they soon tired of working patiently for hours to enjoy the thrill of viewing for a bare fraction of a second the flickering and almost unrecognisable image of a human face.

AS I write these lines, I read a two-column story in the New York "Times," a dispatch from London, stating that a much-publicised television inventor transmitted talking film by television "with a substantial measure of success" and that the "voice transmission" was clearer than usually attainable with sound pictures in the theatre. What crass imposition to declare the successful broadcasting of sound as a credit to television!

It is unfortunate that television has been seized upon as an opportunity for the stock promoter because it encourages misleading publicity and discredits legitimate experimental work. But there is a precedent for this premature exploitation of a half-finished invention. Millions of dollars were invested in worthless radio telephone companies in the late nineties and the first years of the present century. These companies made bona fide demonstrations of radio telephony by methods long ago discarded because they were impractical, just as television can to-day be demonstrated.

I do not hold that it is improper to predict the ultimate perfection of television. I am convinced as anyone that it is coming, but the invention which will make it practical and commercially useful has simply not been announced, and has probably not yet been evolved.

We understand certain crude methods of reproducing a moving image at a distance, but it is no more like the television which would threaten the drama than the flint and steel is like an arc lamp. As a matter of fact, the principles used in the most advanced television devices of to-day are fundamentally like those which have been understood and demonstrated since the early 80's. We have recently applied these fundamental principles with greater effectiveness by the use

of certain amplifiers and electrical devices used in radio broadcasting and telephone art. But, I repeat, the real and fundamental discovery which will reduce these complex processes to the point where they can be satisfactorily and economically carried on as home entertainment has not been made.

I realise that what I have stated is at variance with the views which have appeared in the Press. Television is promised as just around the corner. That promise has been made for several years. Laboratory staffs are scrambling feverishly with the problem and vast amounts of capital and research resources are marshalled to solve it. Television has intrigued the imagination of men from the beginning of invention. The past performance of our scientists is such that we would hesitate to describe any accomplishment as beyond their powers. The public appetite is clamouring for television and that demand must be satisfied. So the refining process continues and, sooner or later, the magic touchstone will be found which will convert all the experience which has been gained into a practical utility. But whether that day is one year or twenty years hence is pure conjecture. The essential invention, for all I know, may be announced to-morrow.

POSSIBLY we can gain an insight into the facts by considering how long it has taken to develop aviation. Not so long ago we celebrated the twenty-fifth anniversary of heavier-than-air flight. Intensive progress for a quarter of a century has brought aviation to the point where some 50,000 passengers were carried in a year. The fact that one American in four thousand is now an air passenger once a year is an indication that we are on the threshold of commercial development. The automobile, likewise, required a quarter of a century of commercial development and use before it became a general utility of the American family. It may be more than coincidence that twenty-five years also elapsed between the first demonstrations of the radio telephone and its first widespread application, radio broadcasting.

Television has been subjected to intensive research for not more than ten years, although it has engaged the thought of scientists for a somewhat longer period. Solely on the basis of logic and precedent, fifteen years more of development will be necessary to practical and widespread use of television. Very probably, however, television will develop more rapidly, because radio, the automobile and the aeroplane were handicapped by lack of resources, while television is richly endowed. So, while fifteen more years of research and development would not be an unreasonable expectancy in the light of past performances of science, intensive progress may make it a matter of only five years.

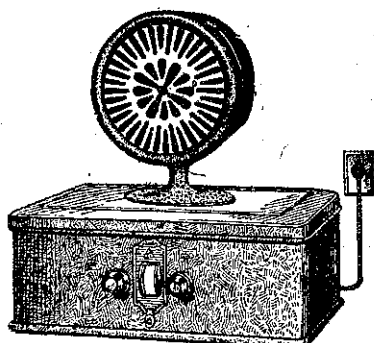
Yet we must not forget that we still await a revolutionary invention. That invention will make the course of television as clearly obvious as if we had unexpectedly focused a telescope upon a distant star for which we had been searching. That day will come. Indeed, it may be upon us.

HOW would its coming effect the legitimate drama? If television (Concluded on page 9.)

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