squares, which law also governs the intensity of light at various distances from its source.

But there is another limiting factor to really satisfactory service, and that is "fading." A line may be drawn with considerable accuracy around a transmitter that will show the point in any direction at which fading will commence. The factors which control this fading distance are practically independent of the power of the transmitter, and they are the class of country over which the waves are propagated and the wavelength of the waves themselves.

Table 4 shows the distance of the fading ring from a transmitter over various classes of country and on various wavelengths. From a study of this table it is seen that the longer the wavelength the greater the true service range or distance between the transmitter and the locality where fading commences, irrespective of the class of intervening country, and also, for any given wavelength the distance between the transmitter and the fading ring is governed by the class of intervening country, being greatly reduced over rough country.

It is seen that a 200-metre station will give satisfactory reception over only ten miles of mountainous country, against fifty miles over flat country. Likewise that a 400-metre station has a true service range of over twice as far.

The Ground Wave.

REFERRING to figs. 1a and 1b, we see that the ground wave component has a more direct and therefore a shorter path than its less direct companion the sky wave. The varying distances covered by the waves traversing each of these two paths cause a swinging phase difference between the ground wave and the sky wave, such that when as in 1a the two components are in phase, the signal strength is twice its normal value, and as in 1b where the two components are in phase opposition, they neutralise each other completely, and the signal strength is zero.

The intense fading or hashing which is very noticeable at distances as shown in table 4 is largely due to this cause, and it becomes less pronounced as the distance from the first fading ring is increased, due to the attenuation of the ground wave. While the sky wave gives satisfactory signal strength over great distances, the quality of reception is all too often marred by distortion. Indeed it is far more often present than not, and very few long-distance signals arrive as clear and crisp as they left the transmitter. The more perfect a radio set is from a tonal standpoint the more obvious the distorted signals are in its output. Many home-built radio sets suffer so much from inherent distortion that their owners are immune to distortion, and they are so used to the tone of their own sets that true tone quality sounds strange to them.

A Cause of Distortion.

AN accepted cause of distortion is known as the differential sideband theory. A radio phone signal is comprised of a narrow band of frequencies which may be classed as the carrier frequency and two sidebands, the frequency of one being above, and that of the other below, the carrier frequency.

Due to the refractive index being influenced by the frequency, it stands to reason that any two signals of different frequencies will, after refraction from the heaviside layer be in slightly different phase relation to each other to what they were previously, and as the Heaviside layer is constantly on the move, and varying in density, it is readily conceivable that the signals must often arrive distorted and mushy.

As long ago as 1826 a German astronomer, Heinrich Schwabe, found by long and patient observation that the number of sunspots on the sun varied from year to year in a cycle of a little over eleven years. In recent times it has been observed that distant radio reception is strongly influenced by the sunspot cycle of Herr Schwabe, as shown for recent years in fig. 5. In those years of maximum sunspots radio

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Six Talks on

"The Life and Work of Bernard Shaw"

By the

Rev. William A. Constable, M.A.

To be broadcast from 1YA, Tuesday, October 20, at 7.30 p.m.

Synopsis of No. 2.—Later Life.

SHAW'S interest in social problems and first attempts at public speaking began in 1879, when he joined the Zeletical Society. After hearing a speech by Henry George and reading his "Progress and Poverty," he became an enthusiastic "Single Taxer." But at a Socialist meeting at which he spoke he was told to read Marx's "Capital," and did so, in French, in the British Museum Library.

Then he joined the "Fabian Society," in 1884, and came into intimate contact with a remarkable group, including Graham Wallas, Sydney Webb, Sydney Olivier, Mrs. Besant, William Morris and Cunningham Graham—all of whom later became famous. He served on the St. Pancras Vestry before the London County Council was formed, and out of his practical experience wrote "The Common Sense of Municipal Trading." He is still a member of the Fabian Society and a keen Socialist, as his recent "Intelligent Women's Guide to Socialism and Capitalism" bears witness.

His journalistic career began in 1885, when he joined the staff of the "World" as art critic. His unconventional way of putting what he believed began to win him the license of a jester, but as he says: "All the time the real joke is that I am in earnest."

In 1888 he joined the "Star" as music critic, and the initials "G.B.S." began to be famous. His favourite musicians were Mozart, Beethoven and Wagner, and he proved to be a champion of Wagner when most of the critics were openly hostile.

In 1894 he became the dramatic critic of the "Saturday Review" and the champion of the much-reviled Ibsen. He has always been a lover of Shakespeare; but he mercilessly criticised and ridiculed those who praised Shakespeare for wrong reasons and produced his plays in wrong ways and mangled versions.

Shaw's career as a dramatist began in 1892 with "Widowers' Houses." "Mrs. Warren's Profession" was banned by the censor. "Arms and the Man" was his first play to achieve even a small success. Later came "Candida," "The Devil's Disciple," and "Caesar and Cleopatra." the two latter produced by that great actor Forbes Robertson.

In 1898 he married Miss Charlotte Payne-Townshend. From 1904 to 1908, the Vedienne-Basher management of the Court Theatre introduced many new and now famous dramatists to the theatre. Its success was, however, mainly due to the growing popularity of Shaw's plays, especially "Man and Superman" and "John Bull's Other Island."

The most important of his later plays include "The Doctor's Dilemma," "Fanny's First Play," "Androcles and the Lion," "Pygmalion," "Heartbreak House," "Back to Methuselah," "Saint Joan," "The Apple Cart." and he is, at present at the age of over 75, engaged on a new play.

He is by far the most widely-known English writer in the world to-day. His plays have been performed in most of the capitals and large towns of Europe and America, and recently he was awarded the international Nobel Prize for Literature.

Questions for discussion by groups:—

(1) Is Shaw's remark, "I am an expert picker of other people's brains, and I have been most fortunate in my friends," applicable to Shakespeare or any other dramatists or writers?

(2) Does Shaw's method of saying which he sincerely believes in a humorous, or irritating or even flippant way, succeed in making people think for themselves?

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via the sky wave has been poor, and in the years when the sunspots were at a minimum it showed a marked improvement.
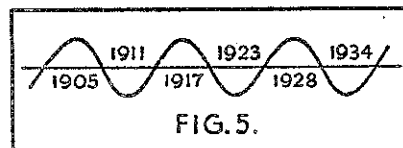
Sunspot Cycles.

SCIENTISTS now believe that the sunspot cycles are caused by the gravitational pull of the planets on the sun, which pull reaches its maximum at periods closely corresponding to those of maximum sunspot activity, due to the additive attraction of the planets as they line up each eleven years or so.

It is believed that this gravitational pull of the planets affects the sun in much the same way as the moon affects the earth and her tides; the sun being in a molten state, the pull causes its fiery surface to open up and release flaming vortices that reach out into space for many times the diameter of our world. It is to be expected that such unusual activity will affect the radiations of ultra-violet, and light and heat waves that reach the Earth (they all travel at the same speed of 186,000 miles per second), and indeed records prove the theory.

Years of Maximum Activity.

REFERRING again to figure five we see that the years 1905, 1917 and 1928 were the years of maximum activity in the solar regions, and we know that those years brought hot summers and droughts in many parts. Likewise, as would be expected, the ultra-violet radiations reaching the Earth in those years were more intense, and although 1905 was before the era of broadcasting as we know it, the years 1917 and 1928 were noticeably poor for

FIG. 5.

long distance reception. . . . On the other hand, about 1923 when the sunspot cycle was at its ebb some remarkable long-distance reception was obtained on what are now considered really obsolete sets.

We are now nearing the next ebb period in the sunspot cycle, and what do we find—the summers are becoming colder, the seasons less defined, and the whole Earth is probably darker than it was about 1928. The ionizing ultra-violet radiations are less intense, and radio reception is improving perceptibly. Probably in 1934-35 the long-distance records of 1923 will be eclipsed generally.

Further evidence to prove this theory is visible on the stumps of recently felled trees. It is occasionally observed that every eleventh ring or thereabouts is wider, showing that the tree made greater growth in that year, due to greater heat, and possibly in some measure to the stimulating impetus of the ultra-violet radiations it was subjected to.

Summary.

IN summing up our observations, the following facts seem to stand out in relief:—

That the sky wave component does not give really satisfactory service, and that only those listeners living within the first fading ring of a transmitter get really satisfactory reception.

That the longer the wavelength of a transmitter and the greater its power the greater is the number of listeners who derive true service from that transmitter.