"Experiments in short-wave (i. e. 60 to 15 meters) transmission made during the past two years have definitely brought to light many peculiarities which were entirely unexpected as extensions from our many years of long-wave experience," said Mr. Baker. "Until recently any announcement of long-distance short-wave transmission was put down as an unexplained freak by the average radio man, and dismissed from his mind. As the number of such reports increased, we could no longer be content to dismiss them as freaks. We were forced to abandon our preconceived notions as to what normal short-wave transmission should be.

"As a typical example of the peculiarities of short-wave transmission, let us describe the experience obtained with a 5 kw., 30 meter transmitter. Here the signal strength rapidly decreases as we leave the transmitter and reaches the lower useful limit at about 70 miles. This short range is what might be called the unexpected value as viewed from our long-wave experience. If now we continue to greater distances the signal remains out until we reach approximately 450 miles, where the day signal unexpectedly becomes strong again.

"Continuing to greater distances we find the signal gradually falling off in intensity and reaching the limit in the vicinity of 4500 miles by day. On a summer night the signal does not reappear after the 70 miles extinction until we are approximately 2000 miles from the transmitter, after which the signal falls off gradually to a very low value at 7500 miles."

These effects, which vary in amount according to the wave length and power of the transmitting station, are explained by the investigators as being due to the presence high up in the atmosphere of a layer of free electrons, of which the atoms of matter are supposed to be made. Nearby receiving sets hear the transmitting station by the direct waves as these go out in all directions from the aerial, but these waves that rise in the air enter this electron layer, and are refracted so that they are bent downwards again. However, the waves which ascend almost or entirely vertically are not refracted, and so are not brought back to the earth, and the 450 mileday limit represents the line reached by the waves which have just been far enough from the vertical to be refracted. At night time the layer of free electrons is at a greater altitude and so the nearest return of the "sky wave", as it is termed, is farther than in the day.

Fading, the bane of the broadcast listener's existence, may be caused when the sky wave comes back to earth within the limit of the ground wave, causing interference between the two. However, as the work of Mr. Baker and Mr. Rice has revealed some of the laws which govern the short waves, it may now be possible to design sets which will give the best transmission between two particular points.

BODY MAY PUT UP WITH DEFECTIVE DIET

Evidence that the bodies of men and animals are not quite so exacting in their protein food demands as biochemists had supposed is obtained from important experiments in nutrition performed at the University of Illinois, by Drs. William C. Rose and Gerald J. Cox.

The experiments resulted in successful use of an artificial product to replace histidine, which was previously thought to be one of the 20 building stones of protein essential for the growth and development of men and animals.

The fundamental raw materials for the survival, growth and reproduction of animals have been grouped under four heads; sufficient fat or sugars to supply energy for body heat and locomotion; a small amount of metallic salts; accessory substances, known as the vitamins; and nitrogenous materials containing some of each of the 20-odd "amino-acids" of which the proteins are constructed.

Hitherto, animals fed on artificial diets lacking one or more of the amino-acids, failed to develop properly. Dr. Rose demonstrated, however, that experimental laboratory animals reached maturity if instead of histidine a substance similar but lacking the characteristic amino group, was eaten.

"This is the first time that a synthetic product, devoid of an amino group, successfully replaced histidine", Dr. Roso explained. "Growth, while not so rapid, was decided."

Presumably, the successful substitute, imidazole lactic acid, stole an amino group from other amino-acids in the artificial diets.

The discovery may be of twofold practical significance, it is pointed out. Proteins classed as "incomplete", such as gelatin which lacks three of the essential amino-acids, may be rendered adequate from the nutritional point of view. by the addition of relatively simple compounds. Again, future economic or agricultural conditions may render it expedient to manufacture food proteins, instead of waiting for the process to be carried on naturally by plants. In such an event, the synthetic chemists now know that substances approximating, but not duplicating the natural materials, may be adequate for maintaining the health and functioning of the body.

The report is of particular interest in view of the fact that histidine is a constituent of nearly all common proteins and as such has been regarded as fundamental.

BEE AND SILKWORM DISEASES MAY BE FOUGHT WITH OXYGEN

Diseases of bees, silkworms, fishes and even plants, caused by the minute one-celled animals known as protozoa, may be banished by means of the common element oxygen applied under pressure, according to Dr. L. R. Cleveland of the Harvard University Medical School. Preparation of immunizing cultures against certain diseases, ridding stored nuts and grain of insects, and the study of the life-relations between the protozoa in the bodies of animals and the animals that thus harbor them, are other problems suggested whose solution may be sought by means of oxygen under pressure.

One of the most troublesome and expensive diseases of silkworms, Dr. Cleveland points out, is caused by a certain protozoan species. He has found in his earlier studies that infected insects can be placed in bottles of pure oxygen at moderately high pressures without harm to the insects but that after this treatment the protozoa are all dead. He therefore suggests this treatment for protozoan-plagued silkworm colonies, and for bee "nuclei", consisting of a queen and a few workers, with which a hive is usually started when a choice bee strain is to be introduced.

After pointing out the possibility of obtaining protozoan-free plants and insects for the purpose of making a study of certain puzzling plant diseases, Dr.