The Moorhead Receiver—Annihilator of Time and Distance

TRULY the last fifty years have been the greatest in point of achievement in inventions, increasing the senses of man, giving him control of time and distance. When we knew nothing of the telephone and the telegraph, and long before wireless communication was the acknowledged success it is today, we spoke of "annihilating distance!" We annihilated distance with a fast running horse, we did the same wonderful thing with the steam railroad and the telegraph and the telephone, and long before that with Fulton's 5-mile-an-hour steamboat.

Then, too, we had the wireless telegraph; this was a marvel, remarkable in its present day development, but it has remained for a San Francisco inventor to place in the hands of the United States and allied governments a means of such annihilation which pales all others into insignificance.

This is the vacuum valve which is the true ear of a radio set. Without some form of detector radio communication would be impossible, also the more sensitive the detector is the greater distances can be covered. This vacuum valve is by far the most sensitive device known. By the addition of one of these valves to any wireless equipment the range is increased many times. Before the perfection of the vacuum valve a distance of 3000 miles was considered very good but the ranges of communication are now governed only by the size of the earth when the valve as perfected by Moorhead is used.

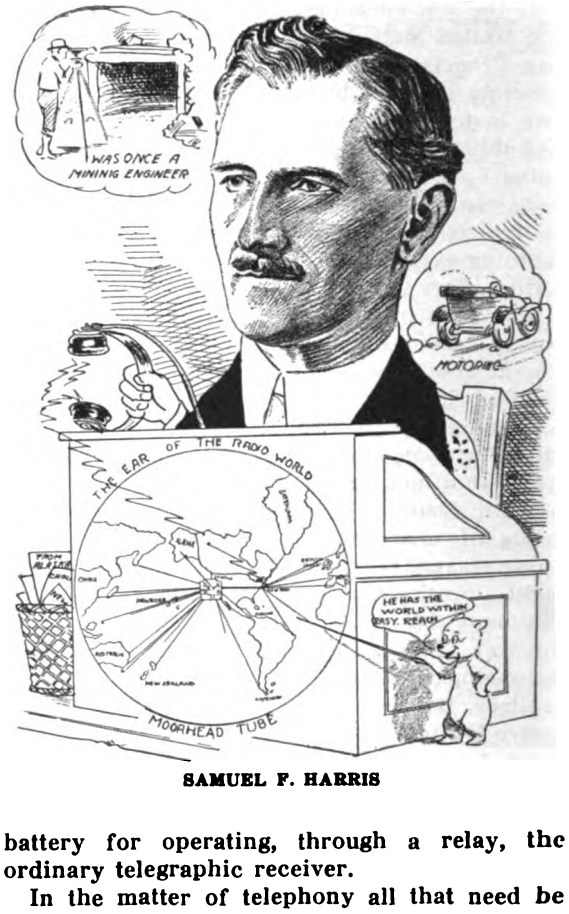
This is the invention of Mr. Otis B. Moorhead, now of the Moorhead Laboratories, of which his close associate, Mr. S. F. Harris, is the president and Mr. Henry East, secretary-treasurer.

Probably a word as to Mr. Moorhead is necessary before giving any sort of description of his receiving device. Mr. Moorhead is a young man, he is only 27 years of age. But this is an era of accomplishment by young men, a time of great achievement. Of course, when the years devoted exclusively to the study of air transmission by Mr. Moorhead are taken in consideration his youth is forgotten, for his interest and subsequent research began when the ordinary youth gives his time to mere growth and lumbers around in what is known as the calf age. Mr. Moorhead was an authority on this subject when still in his teens. And when the statement is made that more than ten years of continual research and experimentation has been carried on and compressed in a territory or space of less than two and one-half inches in diameter, the amount of study and patient toil given over to his tasks is something to almost appal. Within that small space, a glass bulb, he has contracted all that is known about radio activity, as far as concerns the receiving of messages, the plucking of the spoken or the code messages, transmitted either by the Morse System or by the spoken word, from the atmosphere.

These developments, these discoveries, these adjustments of his ideas with those of others, this use of new elements and old, have all been made under our noses, vulgarly speaking, and we have not been made aware of it. And, in that small bulb are still greater undiscovered possibilities, other elements not yet harnessed to the use of man, just as marvelous and inspiring as those which, today, through Mr. Moorhead's discoveries, are made to do the work of governments in defeating the enemy. Through the use of this bulb, an innocent looking affair of glass, a round globe with an imprisoned wire spring, enclosed in a tube, Uncle Sam listens to what may be said at Nauen, Germany, at Shanghai, or anywhere on the face of the globe, through wireless telegraphy or telephony.

Permanent records on wax and photograph films have been made of signals sent by German stations and have been decoded by experts. This is done on the Pacific Coast and signals emanating from Hanover, Germany, are photographed by using this sensitive vacuum valve.

A technical description would be of no benefit to the reader and it might be harmful in revealing certain principles of great value to the enemy. The apparatus used in connection with the bulb has nothing that is new or startling in its make-up. It is a modification of the ordinary receiving wireless apparatus. The message is taken from the air through antennae in the same way as the ordinary wireless message but in the wireless telegraph, which Marconi patented in 1897, the receiving apparatus antennae was placed in circuit with a coherer and a small battery for operating, through a relay, the ordinary telegraphic receiver.



SAMUEL F. HARRIS

In the matter of telephony all that need be said is that the transmitter causes fluctuations in waves and that these in turn affect the receiver.

Mr. Moorhead is the logical successor of Joseph Henry, Hertz, Oliver Lodge and many others. His invention, in its practical operation, is as far ahead of the Marconi receiver as the modern ocean carrier is over the original pad-dle-wheel steamer.

Soon after the Marconi wireless became a practical thing, the stumbling block in receiving the faint impulses given by powerful stations, thousands of miles away, became apparent and the needs of the wireless service dictated that something should be done to overcome its shortcomings in that direction. Wireless communication has, at no time, been an intricate thing in its broadest principles or application. Men knew the principle and even children applied it and the wireless neighborhood plant became quite a common thing.

But the Marconi device, perfect as the world thought it, fell far short of accomplishment and Marconi and others, among them De Forest, Fleming, Braun, Eccles, and Fessenden, continually working at the possibility of overcoming the difficulties found in the coherer apparatus. Moorhead solved it, after De Forest, and a few others, came very near the solution but fell short. Edison discovered the clue, but, at the time of the discovery, antedating any of the others, wireless telegraphy was a laboratory experiment. Edison took out a patent on his idea but, after the lapse of years, the patent died and the idea, too. Moorhead adapted all that the others knew and then applied himself to a study of known elements, and after attempting the capture of the waves fluctuations, in their faintest character, he, like the others, had to confess himself beaten, until he hit upon a principle, which may be roughly described as addition and subtraction. By the development of the ordinary incandescent bulb into a cage for the capture and holding of the wave fluctuation, through a small platinum spring encased in a metal tube (pure nickel), and the creation of currents, hitherto unused in this manner, the wave fluctuation of whatever intensity, or the lack thereof, was acutely registered. Making use of the opposing elements that had hitherto

A busy corner in the exhaust process room—Otis B. Moorhead standing in center and Samuel F. Harris to the right.

prevented proper records being had, it became a simple matter of posing the one against the other and by a process of subtracting the weaker from the stronger arrive at the message, no matter how weakly it might be received.

Put in other words the principle of the thing is as follows: The very small current received from a distant transmitting station is made to control large currents in the receiving station. This feeble current is sometimes a small fraction of a millionth of an ampere or less than the energy that a house fly exerts when it flies across the room. The current generated in the valve is thousands of times greater than the received current, but it is controlled absolutely by the feeble current which comes from the distant station. The telephones that convert this current into sound are operated by the comparatively large current generated in the valve, but this current is, in turn, controlled by the far distant station, so that no matter how far the sending station is away from the receiving station the most feeble currents will operate the receiving set when equipped with the Moorhead valve.

And, in all the development of this wonderful instrument and its logical complement, the transmitter, the machinery necessary to the manufacture in quantities had to be devised. It was like invading an entirely new field, miniature spot welders came into use, blowing of glass by machinery, making the manufacture of bulbs in large quantities possible, machines for creating a vacuum had to be devised, machines for crimping wires as fine as the finest hair, welding blow pipes for platinum, copper and nickel wires had to be invented and a multitude of minutiae had to be conquered before anything like success in quantity production was arrived at, and then the girls to operate the machines had to be educated to a new trade.

All of this was done through the use of Mr. Moorhead's wonderful inventive powers, and the result is seen today in the delivery under contract of instruments to the British Government and to several branches of the United States Government.

At the present rate of 50,000 bulbs per month, something uterly impossible in the application of any of the old methods in bulb manufacture (when the delicate internal mechanism of the valve is taken into consideration), an output not realizable by any other plant in the world today, and, when taking into consideration the infancy of the wireless business today and the utter lack of statistical information, consequent on this condition, no one, though most intimately associated in wireless development, could hazard a guess as to future demands. No one can therefore estimate the needs of any one government, including that of the United States, but enough is reliably known to say that the resources of this establishment, in its full capacity output, will be taxed for many years to come to keep up even with the present demand without the inevitable increase.

We have spoken of the receiver and its wonderful achievement in recording the faintest wave fluctuations. The transmitter is in its way just as wonderful. There has been contracted into a space scarcely larger than an ordinary despatch box all the necessary equipment for wireless telegraph or telephone transmission of messages and, aside from the necessary power apparatus, the two instruments, the receiver and the transmitter would easily fit in a large-sized suit case.

The Moorhead laboratories are not now trying to commercialize their product. They have enough to do to furnish instruments for the special contracts in hand during the war, but the day, when peace dawns, is not far distant, when the Moorhead apparatus will make it possible for the man of business, the householder, the ship captain, the manager of the factory and, in fact, every man and woman who today uses a telephone to own an apparatus and communicate with any one anywhere, subject only to the limitations of the sending machine and the necessary co-operation in the tuning of the instruments so as to make the affinity perfect.

It is to the great shipping interests, to the big export-import trade that will develop after the war this news is of paramount value. It transcends in importance anything that has happened in ten years for the furtherance of quicker intelligence and trade and the cementing of commercial bonds, the stretching and touching the hands of nation and nation in a brotherly clasp across the seas.

THE GROWING OF RICE IN THE STATE OF CALIFORNIA

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have been gathered by a writer in the Los Angeles *Times* and the following is quoted:

In Southern California

"The principal tests of rice south of the Tehachapi have been made in Orange county and in Imperial Valley. In the former region several small parcels of land were planted last year. Four acres were tried out by George Mansberger at Wintersberg, and H. Carter planted three acres in the same vicinity. The crop grew well, according to reports, but the harvest was not such as to make it clear that rice would yield more than other crops that have been grown on the same land. There was also some question as to whether the conditions so near the ocean were just what was required.

"The experiments in Imperial Valley are said to have been rather inconclusive, due to the lack of proper care of the plots planted. The opinion in Imperial Valley seems to have been, too, that the established crops were so profitable as to make it unwise to attempt the growing of the new crop, especially in view of the amount of water required for the extended flooding of rice. No doubt exists, as a result of the experiments made in the south, that rice would do as well in many southern districts as in the north, were its production to be undertaken.

"But, although the south has hesitated about taking up rice culture, the same cannot be said of Southern California capital. Los Angeles men are heavily interested in a number of the largest rice-growing syndicates of the Sacramento Valley."

Price to be Fixed

There are five varieties of rice grown in the United States. The so-called Japanese varieties are planted almost exclusively in California, a kind known as the Wateribune being the one principally grown in this State.

The Government fixed a price of $4.10 for a 100-pound sack of California "paddy" rice laid down at the warehouse for the season of 1917-1918. A commission of growers, of whom Mr. Pearson of this city is one, has been appointed by the Food Administration to determine prices for 1918-1919. Rice straw, which formerly was burned, was in great demand by the army last year at $15 a ton for use in packing of all kinds and as bedding for cavalry horses.

Cultural Conditions

The best rice land is a heavy loam with a clay subsoil, although one of the advantages of rice growing is that the crop will thrive in lands that are too heavily impregnated with alkali to be well suited to other crops. The land is prepared as for wheat, being plowed, disked and harrowed. A hundred pounds of seed is drilled in to each acre. Then the contours are run and water turned on for twenty four hours. The land is then drained for an other twenty-four hours. Next comes a floodin lasting two days, followed by another drainin for a like period. By this time the rice is com ing up.

From then on the land is kept under from tw to ten inches of water until ten days befor harvest, which takes place in October. Th grain is cut with binders, shocked and let dr for from two to four days, when it is threshe in a regular rice thresher.

The growers of rice have their troubles wit aquatic weeds and these in their way are jus as bad as the weed pests the "dry-land farmer has to contend with.

The water weeds, if unchecked, will take ric land in a short time. The solution when th trouble becomes too serious is the drastic on of draining the water from the land a year unt the water plants perish. An intelligent rotatio of rice with dry-land crops is held by mos growers to be advisable and is being more an more practiced.

Since rice became an important Californi crop much land in the rice country has in creased from $50 to $75 an acre to $200 an over. It is estimated that there is an all-aroun 200,000 acres of land in the Sacramento Valle alone suitable for rice, with large areas in th San Joaquin Valley and elsewhere that can b advantageously used for the crop.

Rice as a Food Cereal

This country produces many cereals that hav in a large measure taken the place of whit wheat flour as a substitute and gradually ou housewives and our bakers are becoming mor proficient in the use of these but the real benef to the American people is lost to sight becaus it is not made plain to them that the majorit of the substitutes, including rice, when prop erly mixed one with the other produces brea and pastry that is just as tasty as any mad from the over-refined wheat product an in addition, possessing far greater nutritiv quality.

Rice, as a food, is not used to the extent should be in the United States and a publicit campaign should be inaugurated by the ric growers in the country to educate our peopl in making this cereal just as staple a food a wheat. Manufacturers and growers of othe food products have created an ever-increasin market for their products and this in turn ha encouraged others to enter into the growin and manufacturing of various foods necessar to the life of the nation. We have seen the rip olive enter the field as a relish after the orang had been "sun-kissed" into public favor. W have seen the California prune and the Cal fornia raisin increase in use all over the cou try, due to the judicious use of printer's ink For a time California olive oil came to the fro and was driving the Italian and the Spanish o a lively race for public favor.

The rise in favor of California products—oliv oil, ripe olives, prunes, oranges, raisins an other products, immediately after a sustaine campaign of publicity is one of the best moder proofs of the value of publicity.

On the other hand, the gradual loss of publi favor, when the campaign is stopped is add tional evidence of the fact that advertising is a asset and must not be thoughtlessly thrown asid or lost through lack of conservation when onc the public favor has been gained.

California rice should have a State brand, s that it might be known all over the country an its vogue should be firmly established throug a judicious advertising and campaign by th growers and the maunfacturers of rice product Who will lead?