

Four Important Wartime Developments Described by the Eminent Scientist and Inventor of the Parsons Steam Turbine—Sir Charles Parsons—before the "British Association for the Advancement of Science."

Sir Charles Parsons on War Inventions

THE work of scientists in the war occupied the greater part of the Presidential address delivered before the *British Association for the Advancement of Science* at its meeting at Bournemouth by Sir Charles A. Parsons, inventor of the marine turbine engine.

British scientists, he said, "worked in close collaboration with the men of science of the allied nations and eventually produced better war material, chemicals and apparatus of all kinds for vanquishing the enemy and the saving of our men than had been devised by the enemy during many years of preparation, planned on a basis of total disregard of treaties and the conventions of war.

As illustrating the immense difference between the recent and all preceding wars, Sir Charles gave some interesting figures. At Waterloo 9,044 artillery rounds, with a weight of 37.3 tons, were fired, whereas in the last offensive in France on the British front alone 943,837 artillery rounds, weighing 18,080 tons, were fired. Again, in the entire South African war 273,000 artillery rounds, weighing 2,800 tons, were fired, while on the British front in France during the entire war over 17,000,000 rounds were fired!

SOUND RANGING AND LISTENING DEVICES.

Many of the new war devices Sir Charles left to be discussed in the meetings of the sections, but he dwelt on *sound-ranging* and *telephonic listening* methods. By the end of 1916, he said, the whole front in France was covered by devices which enabled the British to locate the position of the enemy's batteries merely by sound. In 1918 more batteries were thus detected than by any other means, and a single good set of observations could give the position of an enemy gun at 7,000 yards range to within about fifty yards. Listening devices were also largely used at sea, but it was found that the motion of the vessel carrying them when the sea was rough, and also the noises caused by dragging the devices themselves thru the water made them useless.

HOW THE WHALE HELPED PERFECT SUBMARINE DETECTORS.

"So," Sir Charles went on, "the assistance of eminent biologists was of invaluable help at this juncture. Experiments were made with sea lions by Sir Richard Paget, who found that they have directional hearing under water up to speeds of six knots. Also Professor Keith explained the construction of the hearing organs of the whale, the ear proper being a capillary tube too small to be capable of

performing any useful function in transmitting sound to the relatively large aural organs, which are deep-seated in the head. The whale, therefore, hears by means of sound waves transmitted thru the substance of the head. It was further seen that the organs of hearing of the whale, to some extent, resembled a hydrophone.

"The course now became clear. Hollow towing bodies in the form of a fish or porpoise were made of celluloid, varnished canvas, or very thin metal, and a hydrophone suitably fixed in the centre of the head. The body is filled with water, and the cable towing the 'fish' contains insulated leads to an observer aboard the vessel. When towed at some distance behind the chasing ship the disturbing noises are small, and enemy noises can be heard up to speeds of 14 knots and at considerable distances."

Other listening devices made use of the echo, and were developed until they could pick up a submarine a mile away. Sound-ranging stations were established ashore, and from them ships steaming in a fog were informed of their positions accurately for ranges up to 50 miles.

SHIPS PILOTED THRU MINES BY CHARGED CABLES.

Another device, used first by the Ger-

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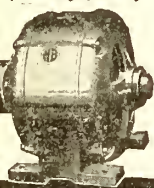
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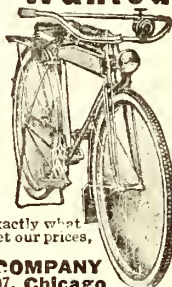
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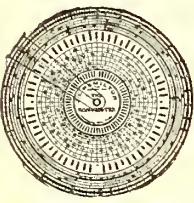
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Sir Charles Parsons on War Inventions.

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Another device, used first by the Germans and afterward by the Allies, consisted of an insulated cable laid on the bottom of the sea, mark a passage thru a mine field or other intricate channel. One end of it was earthed and an alternating current was past along it. Delicate devices were then installed on the vessel, and these enabled it to follow the cable accurately. Sir Charles said that by this means ships were guided for a distance of fifty miles and followed the cable with as much precision as a railless electric street car follows a trolley wire.

BORING INTO THE EARTH FOR POWER.

Sir Charles also discust what England could do when its coal supplies began to give out, saying:

"One cannot but realize that, failing new and unexpected discoveries in science, such as harnessing molecular and atomic energy in matter, the great position of England cannot be maintained for an indefinite period. At some time more or less remote, long before the exhaustion of our coal, population will gradually migrate to those countries where natural sources of energy are most abundant."

He suggested that a new form of energy might be discovered by sinking a shaft twelve miles deep, * that is, about ten times as deep as any in existence. It would cost \$25,000,000 and take about eighty-five years, but not only would much useful knowledge concerning the internal constitution of the earth in relation to minerals of high specific gravity be gained from it, but it might also solve the problem of obtaining power.

"In Italy, at Lardarello," Sir Charles said, "boreholes have been sunk which discharge large volumes of high pressure of steam which is being utilized to generate about 10,000 horse power by turbines. At Sol Fatara, near Naples, a similar project is on foot to supply power to the great works in the district. It seems, indeed, probable that in volcanic regions a very large amount of power may be in future obtained directly or indirectly by boring into the earth."

Sir Charles also spoke of the intense pressure produced by moderate forces closing up cavities in water. A committee appointed by the Admiralty investigated during the war the rapid corrosion of propeller blades of some ships performing arduous duties. It was "found that the corrosion was due to the intense blows struck upon the blades of the propellers by the nuclei of vacuuous cavities closing up against them. Tho the pressure bringing the water together was only that of one atmosphere, yet it was proved that a nucleus of 20,000 atmosphere might be produced." Sir Charles said this great pressure might be generated under some conditions in rivers and waterfalls when the velocity in river current exceeded fifty feet per second, and was probably as great a source of corrosion as the washing down of boulders and pebbles.

*This scheme was fully described in Mr. Gernsback's editorial, "Tapping the Earth's Heat," in the March, 1919, issue of the "Electrical Experimenter."

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