

The fundamental importance of steam is realized by any one, who has had any connection with industrial or transportation problems. It is the medium we know best, and the "genesis" of all our works. It is the most flexible and reliable medium, and the best "carrier" for special purposes. While we hear vague rumours of developments pending in ether energy, atomic energy; heat energy, as obtained from steam, is that upon which most reliance is placed.

In no branch of engineering has a greater advance been achieved than in the generation of steam for all purposes.

You are familiar with the story of the results of Watt's observation of the tea kettle. From that observation the first steam boiler was evolved. Watts considered 6 pounds as the ideal pressure at which to work. No advance over this was obtained until Richard Trevithick invented the high pressure Cornish boiler about the year 1800, working at what was then considered the high pressure of 25 pounds. Since that day, over 120 years ago, no real change in the principle of the method of generating steam has taken place, although, of course, with improvements in engineering methods and qualities of metals &c, it is now common practice to have boilers working at pressures ranging from 200 pounds to as high as 450 pounds, - as at Newcastle Power Station. The old principle governs, - namely, that of placing water in a boiler and applying heat to it until its temperature is raised and corresponds with that of steam at the desired pressure. To convert the water into steam the latent heat of evaporation has to be added. The work which can be accomplished by steam in any form is dependent upon the number of heat Units available

We find, to express it in simple language, that at 200 pounds pressure 534 heat units (sensible heat) are required to be added to the water to raise it to the boiling point temperature, and 844 heat units (latent heat) have to be added to convert it into steam. Roughly about two thirds of the heat units required are needed to overcome the latent heat of evaporation. Yet the addition of this latent heat does not increase the temperature by 1° F. - and for purposes of work may be considered as useless heat.

In the Benson Steam Generator the inventor has taken the bold step of working at or above critical pressures and temperatures, and in this method the necessity of providing the latent heat of vapourisation is avoided, thus an economy of roughly, two thirds of the heat units required to be provided in present day systems, is effected. The essential feature is that steam is generated at or above the critical pressure and temperature of water, - i.e. at or over 3200 pounds per square inch and 706° F. It has been found that there is no difficulty in providing plant and materials, and in operating under these conditions. A Benson Steam Generator of first imperfect design, was erected at the works of the English Electric Company, Rugby, and first brought into successful operation on Feb'y 20, 1924, since that date an improved design, constructed by Siemens Schuckert Werke, of Berlin, has been brought into successful operation at Siemenstadt, Germany, and the ease with which Benson Steam can be applied to turbines for the generation of Electric power has been completely demonstrated. Both of these plants - the latter being a commercial unit of 2000 K.W. capacity, are giving satisfactory demonstrations.

Under the conditions noted above it is found that it is practical to superheat very cheaply to any required degree, without altering the temperature or pressure, but by altering the volume of the steam. It therefore follows that superheated steam, at a high pressure, and a moderate temperature, but containing a very large number of heat units for useful work, can be cheaply obtained. It has been found that there are no mechanical difficulties in the way of applying the heat energy, that obviously becomes available by taking advantage of this expansion and temperature drop, to the generation of electric power. It is further claimed that an efficiency, from coal to switchboard, of 30 per cent can be demonstrated, - which is an enormous advance.