

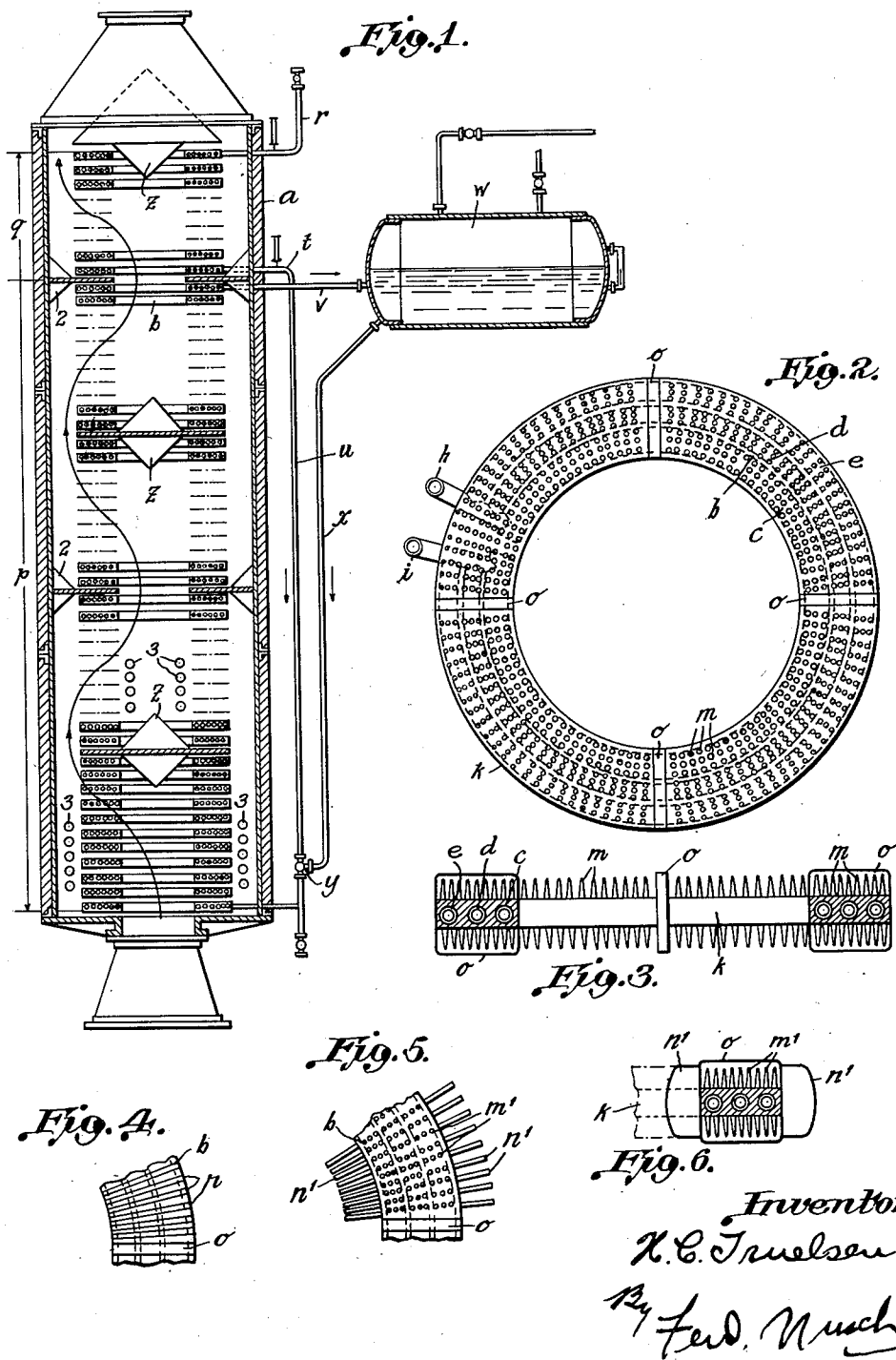
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STEAM GENERATOR

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STEAM GENERATOR

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This invention relates to a steam generator which, together with a feed water preheater and superheater, is composed of similar units, namely similar pipe units connected in series and in which the feed water is preheated, the steam generated and superheated. Each pipe unit consists either of a spirally wound pipe or of several concentric pipes which are cast in a common casing of good conductive material. The particular advantages of this steam generator consist in that it is considerably cheaper and occupies less space than the known steam generators, and further in that the steam generator proper, the feed water preheater and superheater are composed of exactly similar elements. The steam generator may advantageously be employed both as a waste heat plant and also as a normal steam boiler from the smallest to the greatest outputs. Owing to the similar construction of the individual units an accurate adjustment as regards the preheating of the feed water, evaporation and superheating can take place but above all, in the case of vertical plants, they can be fitted subsequently without constructional alterations, as the pipe units can be used alternately as preheater, steam generator or superheater.

Further details of the invention are set forth in the following description.

An embodiment of the invention is illustrated by way of example in the accompanying drawing in which:—

Fig. 1 shows the steam generator in longitudinal section.

Fig. 2 is a top plan view of a pipe unit.

Fig. 3 is a section of a pipe unit.

Fig. 4 shows in elevation part of a pipe unit with radial ribs.

Fig. 5 shows in top plan view part of a pipe unit with needle-like projections.

Fig. 6 is a cross section of Fig. 5.

In the example illustrated separate pipe units *b* are arranged superposed in an insulated sheet metal casing *a*. According to Fig. 2 these pipe units consist of several concentrically arranged pipes *c*, *d*, *e* provided with a common water inlet *h* and water outlet *i*. It is still more advisable to make each unit from one spirally wound pipe. For obtaining better utilization of the heat a jacket *k* of good heat conductive material is arranged around the pipe system of each individual pipe unit, this jacket having on the top side and on the bottom side needle-like projections *m* as shown in Figs. 2 and 3. For these needle-like projections radially extending ribs *n* may be substituted as shown in Fig. 4. Needle-like projec-

tions and radial ribs may be provided both on the same pipe unit. In this instance the needle-like projections *m'* are preferably arranged on the top side and bottom side of the jacket *k* and the ribs *n'* on the inner and outer sides as shown in Figs. 5 and 6. Supporting ribs *o* are likewise cast on the jacket and determine the mutual spacing of the units.

In Fig. 1 the superposed pipe units in the section *p* form the steam generator, whereas the 10 superposed elements in the section *q* form a feed water preheater. The feed water enters the heating system at *r* and flows successively through the individual pipe units until it leaves the system at *t* in a preheated condition approaching the saturated steam temperature. It then passes through the conduit *u* into the lowermost pipe unit, rises in the units of the next following row, being further heated by the gases from combustion passing off in the direction of the arrow and is evaporated. The steam and water mixture passes out of the heating system through the conduit *v* and then arrives in a steam collector *w* in which a separation of the steam and water takes place. The water flows through the conduit *x* into a mixing injector *y*, where it is mixed with the feed water and again forced into the heating system.

In order to lengthen the path of contact of the gases from combustion with the heating units, conductive elements *z* and *2* are provided. If such a system is to be equipped with a superheater this is fitted, according to the temperature conditions, either anterior or posterior to the steam generator. For increasing the draught one or more fans may be arranged at suitable points within the heating system. Steam jet producers serve for removing soot, flue dust and the like from the pipe units especially from the points *m* or ribs *n*. These steam jet producers are preferably arranged in ring shape inside or outside the pipe units. In the drawing 3 designates pipes which are situated outside or inside in the gaps between two pipe units. On the side adjacent the pipe units the pipes 3 are provided with holes through which the steam flows against the elements. It is evident that nozzles may be employed instead of the holes.

I claim:—

1. A steam generator in which the feed water is preheated, the steam is produced and generated, comprising a plurality of angular shaped pipe elements having openings in the centre through which the gases may pass and arranged

in superposed formation, and a casing surrounding said elements and spaced therefrom, flat jackets of good conductive material one cast around each of said elements, needle like projections cast on said jackets, baffles blocking the centre openings and annular baffles between the casing and the units, the baffles blocking the centre openings and the annular baffles being arranged alternately along the length of the casing.

2. A steam generator in which the feed water is preheated, the steam is produced and generated, comprising a plurality of annular shaped pipe elements having openings in the centre through which the gases may pass and arranged in superposed formation, and a casing surrounding said elements and spaced therefrom, flat jackets of good conductive material one cast around each of said elements, radial ribs cast on said jackets, baffles blocking the centre openings and annular baffles between the casing and

the units, the baffles blocking the centre openings and the annular baffles being arranged alternately along the length of the casing.

3. A steam generator in which the feed water is preheated, the steam is produced and generated, comprising a plurality of annular shaped pipe elements having openings in the centre through which the gases may pass and arranged in superposed formation, and a casing surrounding said elements and spaced therefrom, flat jackets of good conductive material one cast around each of said elements, needle like projections cast on the upper and lower sides of said jackets, radial ribs cast on the outer and inner sides of said jackets, baffles blocking the centre openings and annular baffles between the casing and the units, the baffles blocking the centre openings and the annular baffles being arranged alternately along the length of the casing.

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