Oct. 16, 1928. 1,687,832

B. P. COOPER

STEAM GENERATOR

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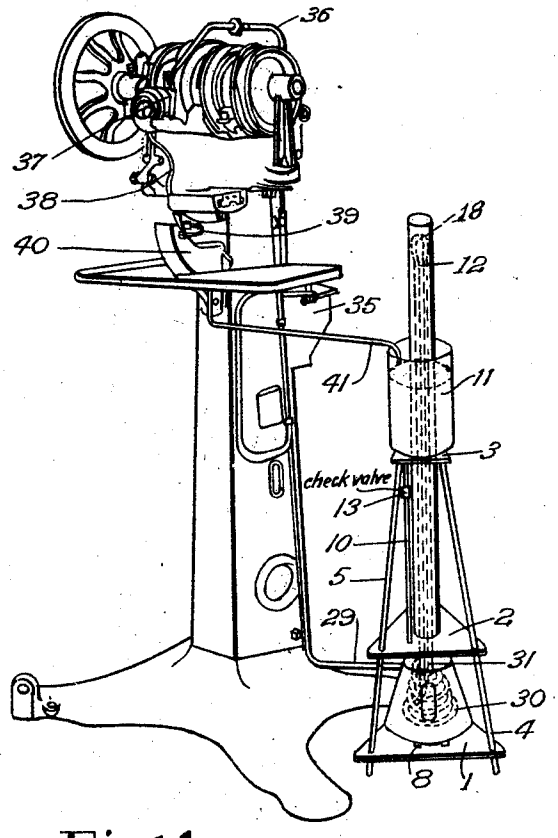


Fig. 1.

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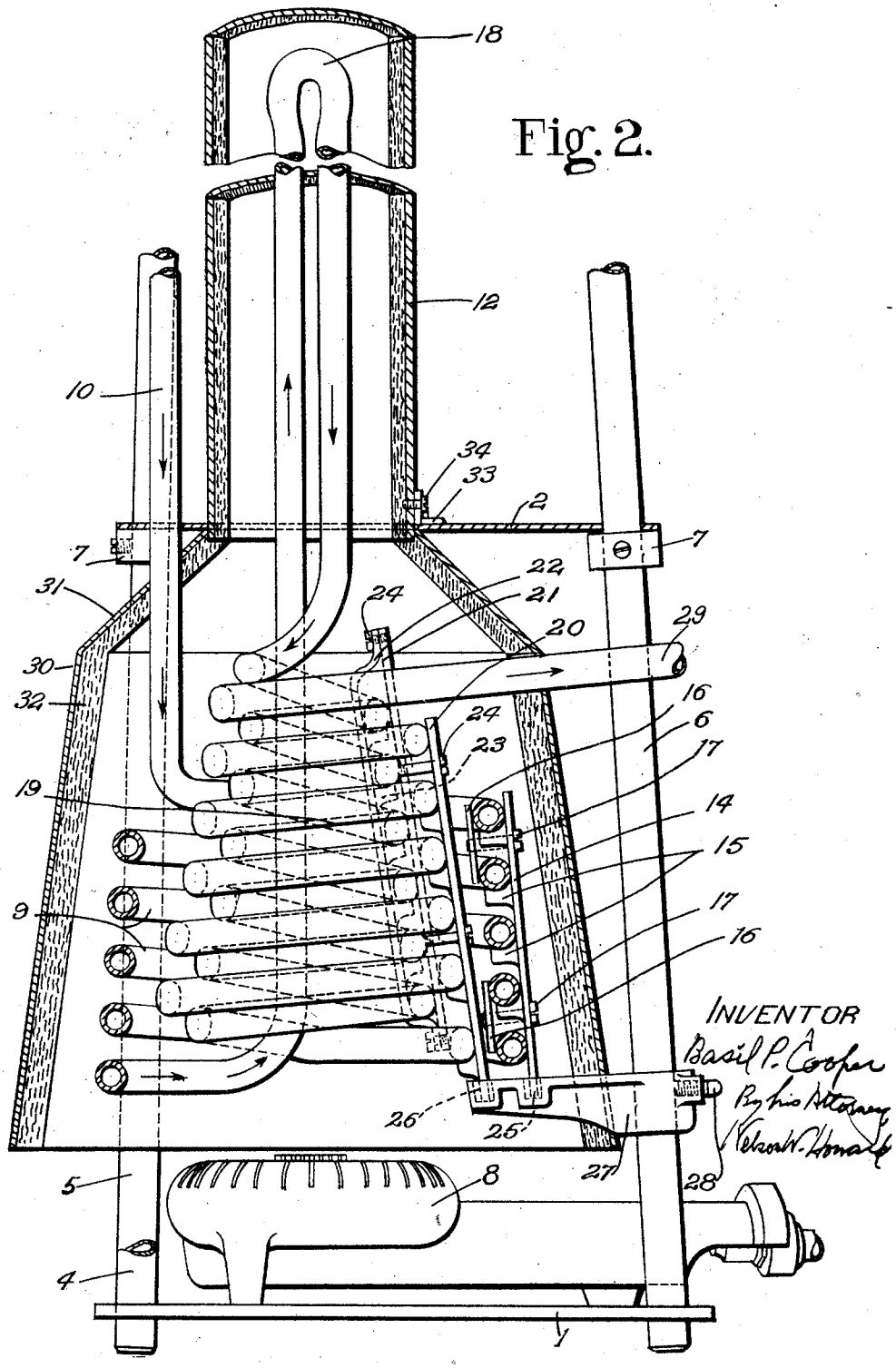
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Fig. 2.



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UNITED STATES PATENT OFFICE.

BASIL POMEROY COOPER, OF LEICESTER, ENGLAND, ASSIGNOR TO UNITED SHOE MACHINERY CORPORATION, OF PATERSON, NEW JERSEY, A CORPORATION OF NEW JERSEY.

STEAM GENERATOR.

Application filed December 26, 1922. Serial No. 608,990.

This invention relates to steam generators and particularly to an improved form for the rapid generation of superheated steam.

Application Ser. No. 608,935, filed December 26, 1922, in the name of Richard Marmaduke Jones, discloses a new form of generator for generating superheated steam which is particularly adapted for the use of those inexperienced in the operation of steam boilers and which is especially applicable for use in connection with welt-sewing, outsole-stitching and like machines employed in the manufacture or repair of boots and shoes, in addition to being useful in almost all other instances where steam is required for heating purposes.

The present invention provides a generator, of the type above referred to, comprising a novel organization so constructed and arranged as to insure that water will not enter the superheating chamber and also provided with enlarged and more efficient means for utilizing heat in the generation of steam. At the same time, the illustrated generator retains all of the advantages of generators organized as set forth in the above-mentioned application, such as ease of filling, quick starting, the reduction of boiler pressure to practically atmospheric pressure so that official inspection of the boiler is unnecessary, the prevention of the formation of most of the water pockets in the passages of the apparatus being heated, the automatic means for blowing out these passages if water should form, and the return of warm water to the generator.

Certain features of the invention comprise a water reservoir open to the atmosphere, a source of heat, a vertical frusto-conical coil of piping in which steam is generated, a second and double frusto-conical coil of piping located within the first coil and in which the steam is superheated, an inverted U-tube connection between the steam-generating and the superheating coils of piping, this U-tube connection extending above the coils and above the highest possible water level in the reservoir so that water is prevented from entering the superheating coils, suitable pipes for connecting the reservoir and other parts of the system and a heat-retaining housing surrounding the coils, the burner and the U-tube.

Other features of the invention will become fully evident from a consideration of a particular example which, purely by way of illustration, will now be described with reference to the accompanying drawings and said features will be particularly pointed out in the appended claims.

In the drawings:—

Figure 1 shows a form of steam generator according to the invention, applied to a curved hooked needle lockstitch outsole stitching machine of usual type; and

Figure 2 is a part sectional elevation of the steam generator shown in Figure 1.

Like reference characters indicate like parts in both figures of the drawings.

In the illustrated construction, the generator and water supply means therefor are supported by a framework comprising three triangular plates 1, 2 and 3, through the corners of which pass posts 4, 5 and 6 having collars fixed on them. The triangular plates rest on these collars, two of which are shown at 7, 7 Figure 2. An annular gas burner 8, by which the generator is heated, is connected to a gas supply and rests on the lower triangular plate 1.

An outer frusto-conical coil of piping 9 is connected, by pipe 10, to a water tank or reservoir 11 which is supported on the upper triangular plate 3 and surrounds a chimney 12 referred to hereinafter. A check valve indicated at 13, Fig. 1 prevents back flow of the water into the tank under pressure of the steam in the generator. The outer coil is supported by three bars, one of which is shown at 14, having projections 15 on which the coils are supported and by which they are kept uniformly spaced apart. Bars 16 and screws 17 clamp the coils against the bars 14. The lower end of the outer coil 9 passes upwardly and is bent to form an inverted U-tube 18 and then passes down-

wardly to the upper end of a double coil 19 positioned within the outer coil 9. The loop 18 reaches above the top of the tank 11 so that the head of water in the tank cannot cause flow of water into the coil 19 but only into the coil 9. The frusto-conical coil 19 is double and is supported within and partly above the coil 19 by three supports, one of which is shown in Fig. 2, each comprising three bars 20, 21 and 22. The bars 20, 22 have projections 23 which support the coils of the double coil 19 and keep them uniformly spaced apart so as to allow free passage of the burner gases around the coils. The coils are clamped between the bars 20, 21 and 22 by screws 24. The bars 14 and 20 are supported in recesses 25, 26 formed in brackets 27 fixed by screws 28 on each of the posts 3, 4 and 5.

The direction of flow of water from the tank and of steam generated therefrom through the coils 9 and 19 is shown by arrows in Figure 2, the flow being down the pipe 10, downwardly through the outer coil 9, up, over and down the inverted U-tube 18, downwardly through the inner part of the double coil 19 and upwardly through the outer part of the coil and then along a pipe 29 to the apparatus to be heated.

The coils are enclosed in a slightly conical heat-retaining housing or casing 30 having a coned top 31 from which projects the chimney 12. The casing, coned top and chimney are lined with asbestos 32 in order better to retain the heat. The casing 30 is supported by the brackets 27 and the chimney by brackets 33, fixed to the chimney by screws 34, and resting on the triangular plate 2.

In a stitching machine of the type shown in Figure 1, the steam passing from such a generator is preferably passed along the pipe 29 up to a wax pot 35. From the wax pot the uncondensed steam and the condensed steam (the latter blown along by the former) pass along a pipe 36 to a shuttle casing 37 and then down a pipe 38 to heat a thread take-up lever of the machine. The steam then passes along a pipe 39 to a steam chest 40 and the residue of uncondensed and the whole of the condensed steam then pass along a pipe 41 to be discharged from the open end thereof into the open tank 11.

The steam generator shown in Figure 1 operates in the following manner. If the coils 9 and 19 are empty and the tank 11 is filled with water, the outer coil 9 will fill, the water then rising in the adjoining arm of the inverted U-tube 18 to the level of the water in the tank. When the water in the outer coil is heated and a small pressure of steam (due to friction in the heating conduits of the machine or other apparatus being heated, and the resistance of condensed steam therein) is created, the return of water to the tank is prevented by the check valve 13 which closes under this pressure and the steam generated passes over the inverted U-tube 18 and down to the double inner coil 19 where it becomes highly superheated on its passage to the pipe 29. Whenever pressure in the coils falls, water again flows from the tank through the check valve to the outer coil to be immediately converted into steam, superheated in the inner coil and passed to the machine. There is thus speedy, steady delivery of steam from the generator to the machine since the outer coil 9 can at no time contain much water and the latter is, when the generator has become thoroughly heated, delivered to the coil at a substantial temperature owing to the addition of hot condensed steam to the tank 11 and to the heating of the latter by the chimney 12.

It will be seen that, with the large area of coiled pipe exposed to the flame of the burner, the generator as illustrated will be especially efficient both in generating steam and in subsequently superheating it. Furthermore, because of the inverted U-tube connection which extends above the water-level of the system between the generating and superheating portions of the generator, it is impossible for a careless operator to fill the generator full enough to cause water to enter the superheating portion. As in generators of the type hereinbefore mentioned, both the inlet and outlet of the boiler are open to the atmosphere so that only the slight pressure necessary to overcome the frictional resistance to the flow of steam in the system can ever be developed, and this automatically varies in proportion to the resistance so that pockets of water in the system are automatically cleared.

Having fully described my invention, what I claim as new and desire to secure by Letters Patent of the United States is:

1. A steam generating device, having in combination, a fuel burner, a heat retaining housing surrounding the burner, a plurality of sets of connected, vertically arranged, coils of piping within the housing and heated by the burner, and a water reservoir open to atmospheric pressure and connected to the inlet end of the piping, one set of coils being arranged to be used for generating steam from water therein and another set being arranged to be used for superheating the steam generated in the first-mentioned set, the connection between said sets of coils comprising an inverted U-tube extending above the highest possible water-level of the reservoir, and located within the heat-retaining housing.

2. A generator for superheated steam, having, in combination, a water reservoir open to atmospheric pressure, a source of heat, a frusto-conical coil of piping in which

to generate steam, a connection between the reservoir and said coil, a second frusto-conical coil of piping in which to superheat the steam and located within the first mentioned coil, and an inverted U-tube connection between said coils, said connection extending above the highest possible water-level of the reservoir and beyond the coils, the coils and said connection being positioned to receive heat from said source.

In testimony whereof I have signed my name to this specification.

BASIL POMEROY COOPER.