April 12, 1932. L. E. CONNELLY 1,853,958

STEAM GENERATOR

Filed Dec. 22, 1927 2 Sheets-Sheet 1

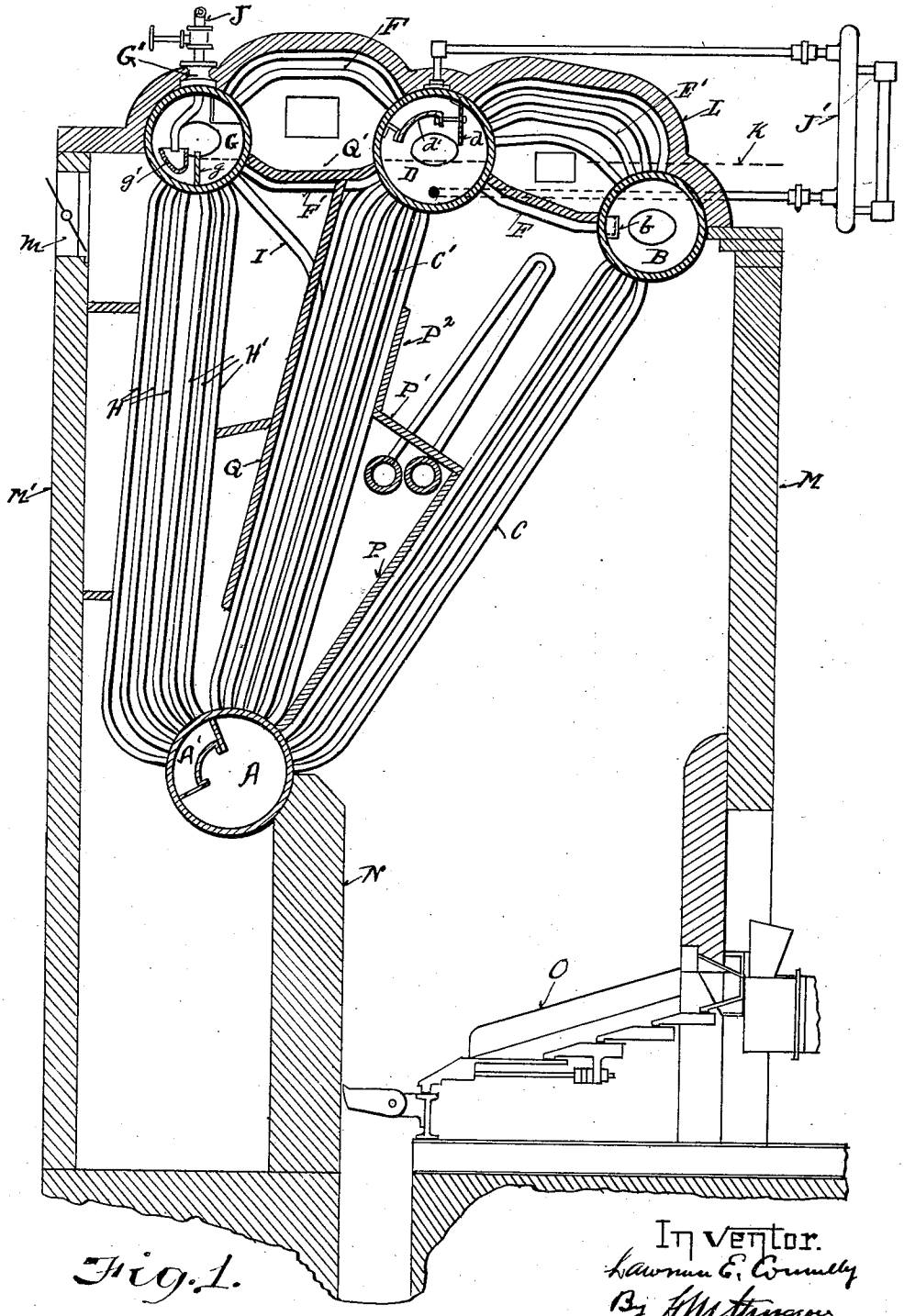

Fig. 1.

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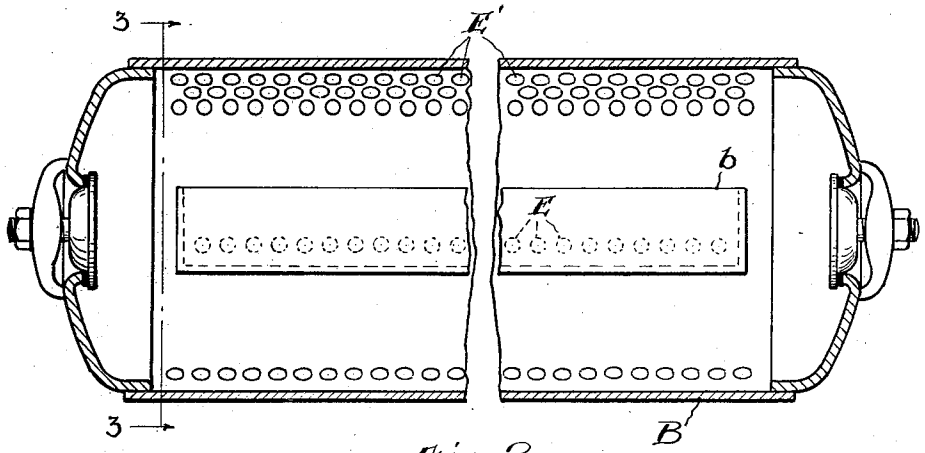

Fig. 2

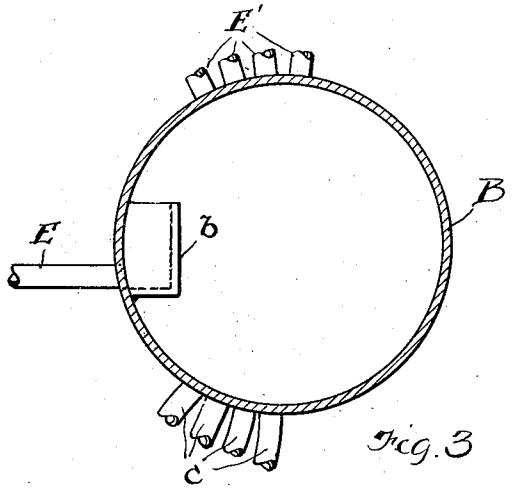

Fig. 3

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UNITED STATES PATENT OFFICE

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STEAM GENERATOR

Application filed December 22, 1927. Serial No. 241,938.

This invention relates to steam generators, and has for its object the construction of a steam generator in which steam is liberated above the water level, so that there will be no surging of water due to the liberating of steam.

The features of this invention are hereinafter described and pointed out and are illustrated in the accompanying drawings in which:

Fig. 1 illustrates a boiler installation embodying the principle of my invention; Fig. 2 is a broken part section and part elevation of the drum B of Fig. 1; and Fig. 3 is a transverse sectional view of the drum of Fig. 2 taken on a plane substantially indicated by the line 3—3.

In Fig. 1, A indicates the lower or mud drum of the generator and B indicates an upper or circulating drum connected with the mud drum A by a bank of upflow water tubes C.

Positioned to the rear and somewhat higher than the drum B is the liberating drum D which is connected with the mud drum A by means of a bank of down flow water tubes C′; said drum D being connected with the drum B by a back of upflow water tubes E located below the water line, and by a bank of water and steam tubes E′ which enter the drum D above the water level, thus discharging steam and water into the drum D directly into the steam space so that the steam is liberated in said drum D above the water level, and therefore there will be no boiling or surging of water in said liberating drum D.

To the rear of the liberating drum D is a steam and feed water receiving drum G which is connected to the liberating drum D by means of a bank of steam conveying tubes F which communicate with the steam spaces in said drums D and G, and by a bank of water conveying tubes F′, and said drum G is also connected with the mud drum A by means of a bank of tubes H which communicate with the compartment A′ therein and with the steam and feed water receiving drum G at the left hand side of the vertical division plate g, and by means of a bank of upflow water tubes H′ which communicates with the compartment A′ and with said drum G at the right hand side of said division plate g, and also by means of a down flow bank of water tubes I which conduct the heated feed water from the right hand side of the division plate g in the drum G to the mud drum A.

Within the circulation drum B there is placed a deflector box b which is open along its upper side and closed at its under side, which deflects the uprising water and steam entering said drum from up-flowing tubes C, so that steam from said bank of tubes C will not enter the bank of tubes E, to boil upward through said bank E into the water in the liberating drum D and will only flow through the bank of tubes E′ and be liberated in the liberating drum D above the water level therein. Within the liberating drum D are placed steam deflecting plates d, and d'. The deflector plate d is placed in front of the ends of the bank of tubes E′, so that water and steam entering the drum D from the bank of tubes E′ will be deflected downward and will fall into the water therein, and the steam will flow around said deflector plate d and pass around the same to the bank of steam conveying tubes F and flow through the same into the drum G from which it will flow through the exit G′ to the point of use. J indicates the feed water supply pipe from which feed-water flows into the trough g' which distributes the same evenly through the length of the drum G. J′ indicates a water column apparatus to indicate the height of the water level K. This apparatus is connected with the drum D. Over the top of the drums B, D and G is a roof wall L and in front of the generator is a front wall M, and behind the same is a rear wall M′, through which is a damper controlled opening m to the smoke flue (not shown). N indicates a fire wall which stands on the floor of the furnace chamber and extends upward to the mud drum A. In the lower part of the furnace chamber between the fire wall N and the front wall M is the fire grate O, shown in the drawings as an automatic stoker in diagrammatic form.

Back of the bank of tubes C is an inclined baffle wall P which extends to the intermediate portion of said bank, from which point

said baffle wall extends to the front of the bank of tubes C′ by a baffle wall P′, and then in front of the bank C′ and a baffle wall P^2 extends upward to a point adjacent to the liberating drum D.

Back of the bank of down flow tubes C′ is another baffle Q, and between the drums D and G is a baffle Q′ above the bank of tubes F, from which the baffle wall Q extends downward to a point adjacent to the mud drum A, so that the fire gas will travel upward from the furnace grate O along the under side of the baffle wall P and then around the upper end thereof and over the upper end of the baffle wall P^2, and then down along the front side of the baffle wall Q and around the lower end of the same, and up among the tubes H and H′ to the damper controlled opening *m* in the rear wall M′.

The water within the drums and tubes will travel upward in the bank of tubes C into the water filled circulation drum B from which the steam and water flows through the bank of tubes E into that portion of the liberating drum D which is above the water line therein, wherein the steam will be liberated from the water, and the water will fall down into the water therein, and the steam will flow into the steam conveying tubes F and flow therethrough into the steam receiving drum G from which it will flow through the nozzle G′ to the point of use. By means of this construction the steam is liberated in the drum D above the water therein and there will be no boiling or surging of water in the boiler outside of the water tubes C, circulation drum B and tubes E′.

It will be noted that I have raised the circulation drum B sufficiently to permit the bank of tubes E to take the boiling water out of the top of the drum B and convey it into the upper portion of the liberating drum D where the steam is liberated above the water level, so that the water therein can remain quiet, as there will be no steam bubbling upward through the water in the liberating drum D.

Having thus fully described the construction and operation of this invention it will be evident that many modifications can be made therein without departing from the scope of my invention, therefore what I claim as new and desire to secure by Letters Patent is:

1. In a steam generator, a mud drum, a circulation drum below the water level of the generator, a liberating drum having the water level therein above the circulation drum, a bank of upflow tubes connecting said mud drum and said circulation drum, a bank of tubes connecting the upper portions of said circulation drum and the upper portion of said liberating drum above the water level therein, a steam receiving and feed water receiving drum, a bank of down flow water tubes connecting said liberating drum and said mud drum, a bank of steam conveying tubes connecting the upper portions of said liberating and said steam and feed water receiving drum, a bank of down and up flow water tubes connecting the same with said mud drum, and a baffle plate extending longitudinally of the interior of said liberating drum and disposed opposite the ends of said steam conveying tubes.

2. In an apparatus of the class described, in combination; a steam liberating drum having banks of steam and water inlet and steam outlet tubes connected therewith above the normal water level therein; a vertically disposed baffle plate extending longitudinally of said drum and connected to the inner surface thereof and disposed opposite the ends of said steam and water inlet tubes; and an arc-shaped baffle extending longitudinally of said drum on the interior thereof and supported along one edge by the first mentioned baffle and along the other edge by the wall of said drum to form a steam cavity adjacent the ends of said steam outlet tubes.

3. In an apparatus of the class described, in combination; a circulating drum lying below the normal water level of such apparatus and having banks of steam and water inlet, steam and water outlet, and water outlet tubes connected therewith; and a trough attached to the inner surface of said drum, extending longitudinally thereof, the end of said water outlet tubes opening into said trough and the open side of said trough disposed away from the direction of flow in said drum.

In testimony whereof I affix my signature.

LAWRENCE E. CONNELLY.