

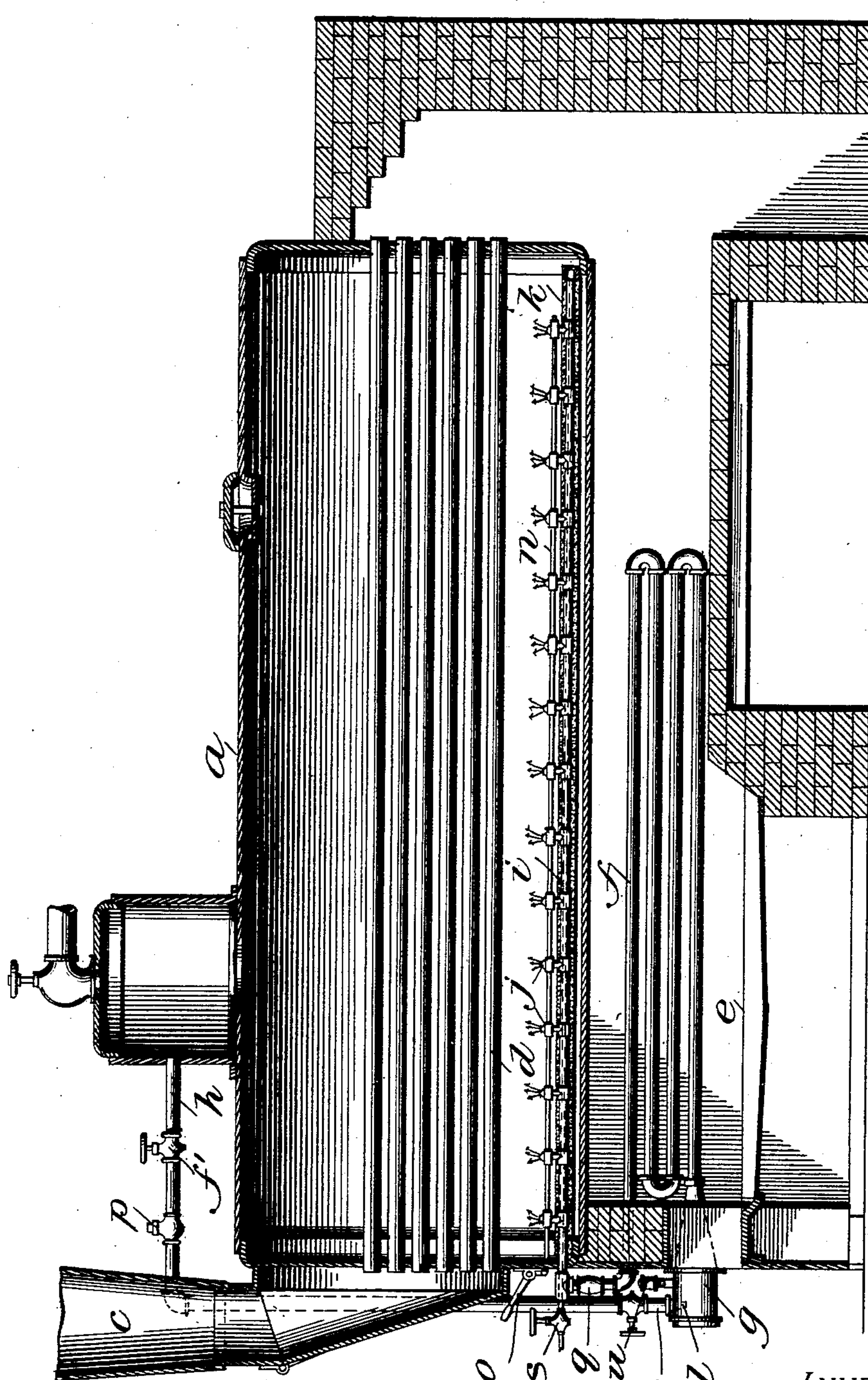
No. 677,292.

Patented June 25, 1901.

S. M. TRAPP.  
PROCESS OF GENERATING STEAM.

(Application filed July 5, 1900.)

(No Model.)



WITNESSES:

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# UNITED STATES PATENT OFFICE.

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## PROCESS OF GENERATING STEAM.

SPECIFICATION forming part of Letters Patent No. 677,292, dated June 25, 1901.

Application filed July 5, 1900. Serial No. 22,595. (No model.)

*To all whom it may concern:*

Be it known that I, SAMUEL M. TRAPP, a citizen of the United States, residing at Seattle, in the county of King and State of Washington, have invented certain new and useful Improvements in Processes of Generating Steam; and I do declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawing, and to the letters of reference marked thereon, which forms a part of this specification.

My invention consists in a process of generating steam in a boiler by the action of superheated steam or hot air injected into direct contact with the water in the boiler as contradistinguished from generating the steam by radiated or conducted heat.

It also consists in the generation of the steam by injecting the heating agent of high temperature, either steam or hot air, into direct contact with the water in conjunction with a heating agent, such as steam or heated products of combustion, passed through the body of the water by means of pipes or tubes, so as to apply heat by conduction or radiation to the body of the water.

It further consists in the process of generating steam by injecting into direct contact with the water steam or hot air heated to a high temperature, the steam or hot air at the point of discharge into the water being protected against being chilled by the lower temperature of the water.

In carrying out my invention the steam may be taken from the boiler itself and superheated in suitable coils located in the fire-box of the boiler and thence conducted into the boiler below the water-line and there injected into direct contact with the body of the water, or it may be taken from any other source than the boiler and superheated in any other manner than that mentioned, and if hot air is used instead of steam the air may be superheated in suitable coils arranged in the fire-box of the boiler or superheated elsewhere and conducted into the boiler and there injected into the body of the water below the water-line of the boiler.

As a suitable means for carrying out my process I have illustrated in the drawing a

suitable apparatus, the drawing illustrating a vertical longitudinal section through a boiler-furnace adapted to carry out the process.

In the drawing the letter *a* represents the boiler, with steam-dome *b*, stack *c*, flue or flues *d*, and a furnace or fire-pit *e*. Arranged in any convenient location in the fire-pit is a superheater *f*, connected at one end to an expansion-chamber *g*, which in turn is connected by pipes *h* with some part of the boiler above the water-line—for instance, with the steam-dome *b*—so as to draw steam therefrom. The other end of the superheater is connected to a regulating delivery and distributing tube or device *i*, provided with a plurality of outlets or nozzles *j*, leading into the water in the boiler. I prefer to place the tube *i* itself within the boiler, as shown, and to surround it with an insulating-coating *k*, the inner part of which is fireproof and the outer part waterproof, so as to prevent the superheated steam or the hot air which will be delivered into the tube *i* from becoming chilled by the body of water in the boiler about the tube, thus maintaining the heating agent at the point where it will be injected into the body of water at a high temperature. All of the outlets or nozzles *j* are provided with regulating valve devices or gates *m*, adapted to operate in unison and be connected for this purpose to a common operating-rod *n*, having a handle or operating-lever *o* outside of the boiler, so that the delivery-apertures of all the nozzles can be simultaneously adjusted to correspond to the requirements at any particular time. At suitable places in the superheater connections—for example, at *p* in the intake-pipe and at *q* in the delivery-pipe—are arranged check-valves which permit passage of steam only in one direction—namely, toward the delivery end, as indicated by the arrows. The regulating and delivery tube *i* contains a smaller tube *r*, extending almost its entire length and opening at an end into the outer tube *i* and at its other end to the atmosphere, so that when a valve *s* in said tube *r* is open steam will pass from the superheater the whole length of tube *i* and thence through inner tube *r* to the outer air. A hand-valve *f'* is provided in the intake-pipe *h*.

The process is worked as follows: Steam is



raised in the boiler in the usual manner, the  
 valves *f'* and *s* are opened, and the gates or  
 valves *m* are closed, and the steam which is  
 conducted from the steam-space of the boiler  
 5 is passed through and superheated within the  
 coils in the fire-box and passes from the coils  
 and allowed to blow through said superheater  
 and through the delivery-tube *i* and out into  
 the atmosphere until the tube *i* will be made  
 10 so hot that there will be no chilling of the  
 incoming superheated steam from the super-  
 heating-coil or other source. After the tube  
*i* has thus been preliminarily heated and the  
 steam coming from the superheater is "red-  
 15 hot," or substantially so, the tube *i* is closed  
 by the valve *s*, so that the steam will not  
 pass out into the atmosphere, and the hand-  
 lever *o* is operated to open the gates *m*, and  
 the superheated steam is then forced by its  
 20 own expansive tendency into and through the  
 water in the boiler, thus imparting to the  
 latter the heat which it has received in the  
 superheater. The tube *i* having been pre-  
 liminarily heated, as mentioned, the steam  
 25 from the superheater entering the tube *i* is  
 injected into the body of the water without  
 having its temperature lowered, the prelimi-  
 nary heating of the tube *i* to a temperature  
 above that of the water preventing the water  
 30 from chilling the steam received into the tube  
*i* from the superheater. The steam thus be-  
 ing injected into the body of water while  
 red-hot will cut or evaporate its way into  
 the water, and by the gravitating action of  
 35 the water the steam will be forced upwardly  
 through the same. This injection of the  
 red-hot steam into the boiler-water pro-  
 duces a most powerful heating effect and  
 will constitute the main steam-producing  
 40 element in the boiler. This injection of  
 the steam into the body of the water also  
 supplements the heating action of the ordi-  
 nary heating-tubes extending through the  
 boiler, and thus the action of one of said  
 45 heating means is supplemented by that of  
 the other, and the evaporative capacity of  
 the boiler will thus be materially increased.

Instead of admitting steam and injecting  
 it into the body of water, as described, I may  
 50 employ highly-heated air instead of steam,  
 said air being employed in the same manner  
 as that described for the steam, except that the  
 heated air may be taken from any suitable  
 source instead of taking steam from the boiler,  
 55 and said air may be impelled through the su-  
 perheater in the fire-box by means of a pump  
 suitably connected with the pipes or coils, and  
 this highly-heated air after being applied to  
 heat the tube *i*, as previously described for the  
 60 steam, will subsequently be injected into the  
 body of the boiler-water in the same manner  
 as before described for the steam, the prelimi-  
 nary heating of the tube *i* preventing the hot  
 air being chilled by the water in the boiler.

65 While I have illustrated and described an

apparatus suitable for carrying out my proc-  
 ess, it must be understood that the process is  
 not confined in its working to the employ-  
 ment of such an apparatus, as the process is  
 entirely independent of the form of appara- 70  
 tus that may be employed. It is to be fur-  
 ther understood that the apparatus illustrated  
 is not claimed in this application, but will  
 form the subject of a separate application  
 therefor. It is also to be noted that in work- 75  
 ing the process herein described the super-  
 heated steam from the superheater is caused  
 by its own expansive pressure to move for-  
 ward in the direction of the point of injec-  
 tion into the body of the water, the check- 80  
 valves in the steam-supply pipe preventing  
 backward pressure and the preliminary heat-  
 ing of the tube *i* causing the steam to be in-  
 jected under its full expansive pressure into  
 the body of the water. 85

Having described my invention and set  
 forth its merits, what I claim is—

1. The process of generating steam which  
 consists in forcing, by its own expansive pres- 90  
 sure, a current of steam heated to a high tem-  
 perature into the water to be evaporated, the  
 steam being protected against reduction of its  
 temperature at the point of discharge into the  
 water by being received into a delivery-cham- 95  
 ber preliminarily heated and maintained at a  
 temperature above the temperature of the  
 water.

2. The process of generating steam which  
 consists in applying heat by radiation or con- 100  
 duction to the body of the water and sup-  
 plementing the same by injecting directly  
 into the body of water a heat-producing agent  
 at a high temperature, the temperature of said  
 heating agent being maintained against the  
 lowering of its temperature at the point of 105  
 discharge into the water.

3. The process of generating steam which  
 consists in injecting into the body of the wa-  
 ter a heating agent at a high temperature,  
 said agent being superheated previous to its 110  
 injection into the water, and preventing chill-  
 ing of said superheated agent by the body of  
 the water at the point of its injection into the  
 water.

4. The process of generating steam which 115  
 consists in heating to a high temperature a  
 heat-imparting agent, delivering said agent  
 into a chamber or channel under the body of  
 water to be heated, said chamber or channel  
 being heated to and maintained at a temper- 120  
 ature higher than that of the water above it  
 so as to prevent the heating agent being  
 chilled, and injecting said heating agent di-  
 rectly into the body of the water.

In testimony whereof I affix my signature 125  
 in presence of two witnesses.

SAMUEL M. TRAPP.

Witnesses:

W. H. REMINGTON,  
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