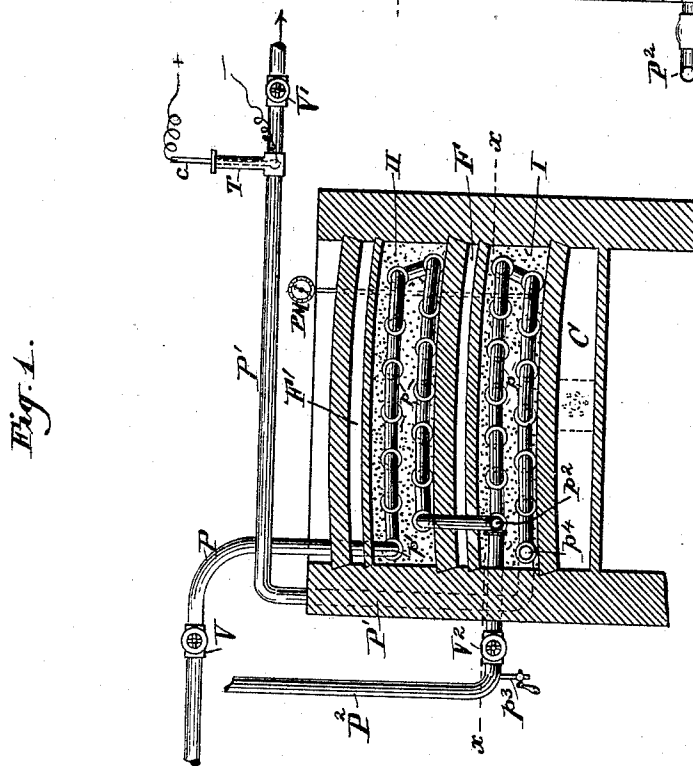
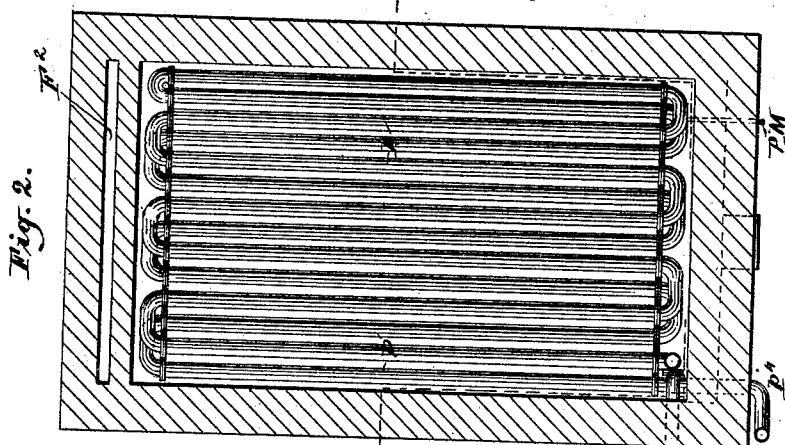


(No Model.)

A. BRATOLUBOFF.
MEANS FOR SUPERHEATING STEAM.

No. 487,317.

Patented Dec. 6, 1892.



Witnesses

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UNITED STATES PATENT OFFICE.

ALEXANDER BRATOLUBOFF, OF BIELAIA TSERKOV, RUSSIA.

MEANS FOR SUPERHEATING STEAM.

SPECIFICATION forming part of Letters Patent No. 487,317, dated December 6, 1892.

Application filed September 1, 1892. Serial No. 444,755. (No model.)

To all whom it may concern:

Be it known that I, ALEXANDER BRATOLUBOFF, a subject of the Emperor of Russia, residing at Bielaia Tserkov, in the Russian Empire, have invented certain new and useful Improvements in Means for Superheating Steam; and I do hereby 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 drawings, and to letters of reference marked thereon, which form a part of this specification.

My invention has relation to apparatus for superheating steam to be used as a motive power or for other purposes.

The advantages derived from the use of superheated steam, especially as a motive power, are well known; yet in its practical use difficulties have been met with, the most serious of which is the impossibility of superheating the steam to any desired degree and maintaining its temperature constant.

My invention has for its object the provision of means whereby the difficulties referred to are overcome and whereby steam can be superheated to any desired degree and its temperature maintained substantially constant. This I accomplish by placing the superheating-pipes out of contact with the direct action of the flame or products of combustion in the furnace of the superheater and by embedding the superheating-pipes in a bad conductor of heat—assand, for instance—whereby said pipes may be kept at a normally-uniform temperature which is not materially or sensibly affected by any variation in the temperature of the heating medium, and by providing means whereby the temperature of the superheated steam may be varied within certain limits by the admixture therewith of steam of lower temperature, practical experiments having demonstrated that the temperature of steam superheated to a given degree does not vary even one degree in twenty-four hours, which may be regarded as a constant temperature for all practical purposes, and this has not heretofore been attained, so far as I am aware.

To these ends the invention consists in the

construction of the heater, in embedding the superheating-pipes in a bad conductor of heat, and in means for lowering the temperature of the superheated steam within certain limits independently of the means usually provided for regulating the heat to which the superheating-pipes are subjected, as will now be fully described, reference being had to the accompanying drawings, in which—

Figures 1 and 2 illustrate a superheater embodying my invention by a vertical and a horizontal sectional view, respectively, the latter being taken on line *xx* of Fig. 1.

The superheater is preferably constructed of brickwork and may form a part of the brickwork of a stationary steam boiler or generator, or it may be entirely separated therefrom. It is divided into a series of chambers, of which I have shown two, (indicated by I and II,) though a greater number may be provided, as may be found necessary. These chambers are separated from each other by horizontal flues *F F'*, that communicate with a combustion-chamber *C* below the heating-chambers *I II* and with a chimney (not shown) through suitable vertical flues *F²*, of which one is shown in Fig. 2, in such manner that the flame or hot gases and products of combustion will flow from the combustion-chamber *C* to flue *F* at one end thereof, through said flue into a vertical flue *F²* at the opposite end, thence into and through flue *F'* to a chimney; or, in other words, the hot gases and products of combustion flow in an upward zigzag direction from the combustion-chamber *C* to the chimney whatever the number of heating-chambers.

I have shown the superheater as more especially adapted to the use of a liquid hydrocarbon as a heating agent, but do not desire to limit myself thereto, as solid fuel may be used by the provision of a suitable furnace or fireplace, which any skilled mechanic can provide.

The superheating-pipes *p* are connected in a well-known manner in a continuous serpentine series, and I have shown two rows of such pipes in each chamber, though a greater or less number may be employed. The initial pipe *p'* of the series of superheating-pipes *p* in the upper chamber *II* is connected to the

steam-supply pipe P, leading to the steam-generator, which pipe P is provided with a suitable valve V. The terminal pipe p^4 of the said series of superheating-pipes in the lower chamber I is connected with the steam-delivery pipe P', provided with a suitable valve V', so that the steam from the generator flows through the series of superheating-pipes in a direction the reverse of that of the hot gases and products of combustion, the steam being gradually heated to the desired degree, which can be readily ascertained by a thermometer T, with which said delivery-pipe P' is provided. It will thus be seen that the pipes are entirely isolated from direct contact with the hot gases and products of combustion of the heating medium, and in practice I embed the said pipes in a bad conductor of heat—as sand, for instance, which when once heated will retain its heat for a long time, so that its temperature will not be sensibly or materially affected by any variation in the heat supplied, such as are inevitable in the usual process of firing, thus rendering it possible to maintain the temperature of the steam substantially constant.

In superheaters of usual construction no means are provided, so far as I am aware, for lowering the temperature of the superheated steam except by correspondingly lowering the temperature to which the superheating-pipes are exposed or subjected, and, as is well known, this cannot be accomplished in such manner as to expeditiously lower the temperature of the superheated steam. In order to effect this reduction in temperature in an expeditious and simple manner, I provide a second supply-pipe P², connected with the steam-generator, which pipe is provided with a suitable valve V² and a valved purge-pipe p^3 for drawing off the water of condensation; but instead of connecting the auxiliary supply-pipe with the superheating-pipe at a point proximate to its connection with the steam-inlet pipe I connect the same with said superheating-pipe at a point proximate to its connection with the exhaust-pipe in the lower chamber I of the superheater—as, for instance, the end pipe p^2 of the upper or second tier of such pipes—so that the steam of lower temperature from the generator is mingled with the superheated steam having the highest temperature, and as the said auxiliary pipe is connected with one of the terminal pipes of the series it is subjected to the greater heat in chamber I but for a very short period of time, the effect of this being equivalent to the cooling of a hot liquid by the admixture therewith of a cold or cooler liquid, and as any reduction of the temperature of the superheated steam is at once indicated by the thermometer T the operation of lowering the temperature of the superheated steam becomes a very simple one.

For the purpose of better controlling the superheating of the steam I provide the lower

chamber I with a pyrometer P M for the purpose of indicating the temperature of the sand therein, and, if desired, the upper chamber II or all the chambers, if there are more than two, may be provided with a pyrometer.

If desired, an electric alarm may be operated by the mercury in the thermometer, a contact, as c, for instance, being adjustable therein, or a throttle-valve in the auxiliary supply-pipe P² may be so controlled, the arrangement of devices for this purpose being well known to electricians and need not be described in detail.

Having thus described my invention, what I claim as new therein, and desire to secure by Letters Patent, is—

1. A steam-superheater comprising a plurality of heating-chambers, superheating-pipes arranged therein, said superheating-pipes being embedded in a bad conductor of heat, a combustion-chamber at one end of the series of heating-chambers, heating-flues connected with the combustion-chamber and encompassing said heating-chambers, and suitable steam supply and exhaust pipes connected with the initial and terminal of the superheating-pipes, for the purpose set forth.

2. A steam-superheater comprising a plurality of heating-chambers, steam-coils arranged therein and connected in a continuous series, a combustion-chamber at one end of the series of heating-chambers, heating-flues connected with said combustion-chamber and extending around three sides of the heating-chambers, and steam connections for supplying steam to and taking steam from the coils, arranged relatively to the latter to cause the steam to be superheated to flow through the coils in a direction opposite to that of the hot gases and products of combustion in the heater-flues, for the purpose set forth.

3. A steam-superheater comprising a plurality of heating-chambers, superheater-pipes arranged in said chambers and connected to form a continuous conduit, said pipes being embedded in a material that is a bad conductor of heat, a source of heat-supply, circulating-ducts for conveying the heat about the chambers successively, a steam-supply pipe connected with the end of the superheating-conduit farthest from the source of heat-supply, and a steam-exhaust pipe connected with the end of said conduit nearest to said source of heat-supply, for the purpose set forth.

4. In a steam-superheater, the combination, with a plurality of superheating-pipes arranged in sets in separate heating-chambers and connected to form a continuous conduit, a combustion-chamber, means for conducting the hot gases and products of combustion around the chambers successively, a steam-supply pipe connected with the end of the superheater-pipe in the chamber farthest from the combustion-chamber, and a steam-exhaust

pipe connected with the end of said super-
heater-pipe in the chamber nearest to the
combustion-chamber, of an auxiliary steam-
supply pipe connected with the superheater-
5 pipe between its terminals and proximate to
the exhaust end thereof, for the purpose set
forth.

In testimony whereof I have signed my
name to this specification in the presence of
two subscribing witnesses.

ALEXANDER BRATOLUBOFF.

Witnesses:

F. KAUPÉ,

N. TSCHERCALOFF.