N° 28,259 A.D. 1902

Date of Application, 22nd Dec., 1902

Complete Specification Left, 21st Sept., 1903—Accepted, 12th Nov., 1903

PROVISIONAL SPECIFICATION.

'Improvements in or relating to Condensers and Cooling-apparatus"

I, WILHELM MAYBACH, of Cannstatt, in the Kingdom of Wurttemberg, German Empire, Engineer, do hereby declare the nature of this invention to be as follows:—

My invention relates to improvements in condensers and has for its purpose to provide a condenser of more simple and durable construction than has heretofore been possible.

Condensers built of short pipes situated one near the other, so that only small spaces are left between the pipes, to allow the flow of the gas or steam to be condensed are already known, especially for use with motors. These condensers are usually constructed by fixing the pipes in front and back plates after the manner of water-tube boilers. In order to simplify this construction, I use pipes, the ends of which are so formed that when the pipes are placed together a structure is formed in which no spaces are left at the ends. Naturally the outer diameter of the pipes must be smaller in the middle part than at the ends in order to form the spaces, through which the gas to be condensed passes. For this purpose pipes of any convenient cross section may be employed having enlarged ends adapted to lie one against the other. The whole assemblage of pipes is surrounded with a casing into which the steam to be condensed or other gas is admitted at the one end and flows out at the other.

The pipes may be manufactured in any convenient way, such as for instance by expanding the ends of the pipe, or by compressing the middle portion.

Obviously pipes of different form or varied cross section may be used in the same condenser.

The corners of the pipes may be broken. In this case however, the spaces occurring at the ends must be stopped by pins, solder or the like

The most simple way of manufacturing the condenser consists in assembling the pipes in a suitable casing and then dipping the ends of the same into fluid solder, so that the ends are soldered together. It will be understood that the pipes may be fixed in any other convenient way, as for instance by simply pressing them together, in which case it is advantageous to arrange a small layer of packing between the ends.

That portion of the tubes which lies between the enlarged ends may be corrugated or otherwise shaped, if desired, to increase the cooling surface presented to the gas passed through the apparatus.

It will be understood that apparatus constructed according to this invention is not restricted to employment as a condenser, but may also be employed as a cooler for water and the like.

Dated this 22nd day of December 1902.

BOULT, WADE & KILBURN
Agents for the Applicant,

[*Price* 8*d.*]

COMPLETE SPECIFICATION.

"Improvements in or relating to Condensers and Cooling-apparatus."

I, WILHELM MAYBACH, of Cannstatt, in the Kingdom of Wurttemberg, German Empire, Engineer, do hereby declare the nature of this invention, and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

My invention relates to improvements in condensers and has for its purpose to provide a condenser of more simple and durable construction than has heretofore been possible.

Condensers built of short pipes situated one near the other, so that only small spaces are left between the pipes, to allow the flow of the gas or steam to be condensed are already known, especially for use with motors. These condensers are usually constructed by fixing the pipes in front and back plates after the manner of water-tube boilers. In order to simplify this construction, I use pipes, the ends of which are so formed that when the pipes are placed together a structure is formed in which no spaces are left at the ends. Naturally the outer diameter of the pipes must be smaller in the middle part than at the ends in order to form the spaces, through which the gas to be condensed passes. For this purpose pipes of any convenient cross section may be employed having enlarged ends adapted to lie one against the other. The whole assemblage of pipes is surrounded with a casing into which the steam to be condensed or other gas is admitted at the one end and flows out at the other.

In the accompanying drawings which illustrate one method of carrying out this invention—

Figure 1 is a side elevation of one of the elements of the condenser;

Figure 2 is a similar view showing three elements placed together;

Figure 3 is an end elevation in part section of several elements placed together;

Figure 4 is a similar view showing a slight modification; and

Figure 5 shows diagrammatically a complete condenser.

Like letters indicate like parts throughout the drawings.

Each element of the condenser according to this invention comprises a tube having a middle portion *a* and enlarged end portions *b*. The exterior walls of the end portions are shaped to form a square at each end of the element so that when a number of elements are placed side by side and one above the other the end portions lie in contact with each other, whilst intersecting channels *o* are formed throughout the whole collection of elements between the middle portions *a*. To build up a condenser of these elements a number of the tubes placed side by side and vertically one above the other are enclosed in a casing *f*, as shown in Figure 5. The elements are conveniently placed in a horizontal position and the casing is provided with an inlet orifice *d* at the upper end and a discharge orifice *e* at the lower end. The tubes *a b* are open at both ends to the atmosphere or to any device by which air may be caused to circulate through them, whilst the fluid to be cooled or condensed enters at the orifice *d* in the casing and passing between the tubes by the intersecting passages formed between the smaller portions of the tubes is finally discharged from the condenser by the outlet *e*. To prevent leakage of fluid between the enlarged ends of the tubes the whole aggregation of tubes when in position is conveniently dipped into a bath of molten solder so that the end of each tube is soldered to its neighbours and leakage prevented. The main body *a* of the tubes may be of any convenient cross section not

necessarily the same as that of the ends and the ends may take any shape desired provided it allows of their being built together without spaces occurring between them as described.

Obviously pipes or elements of different form or varied cross section may be used in the same condenser. Such an arrangement is shown in Figure 4 where those tubes nearest the casing are made of triangular cross section, whilst the rest of the tubes are of square cross section.

The pipes may be manufactured in any convenient way such as for instance by expanding the ends of the pipe or by compressing the middle portions.

The corners of the pipes may be broken or rounded, but in this case the spaces occurring at the ends must be stopped by pins, solder, or the like.

It will be understood that the pipes may be secured together in any other convenient way than that described, as for instance by simply pressing them together, in which case it is advantageous to arrange a small layer of packing between the ends. To press the tubes together and maintain them in position with the packing between their ends they may be bound by means of wire or by suitably formed bands and the whole enclosed in a casing such as *f*, Figure 5; or the casing may form the binding member.

The parts *a* of the tubes may be corrugated or otherwise shaped if desired to increase the cooling surface presented to the gas or liquid passed through the apparatus.

It will be understood that apparatus constructed according to this invention is not restricted to employment as a condenser, but may be also used as a cooler for water and the like, its object being to serve as a cooling device for fluids in whatever form.

Having now particularly described and ascertained the nature of my said invention, and in what manner the same is to be performed, I declare that what I claim is:—

1. In a condenser or cooler the combination with an aggregation of tubes of the kind described each having an enlarged end adapted to fit closely to its neighbour of packing placed between the ends of the tubes and a band or casing to bind the tubes together and hold them in place, substantially as described.

2. A condenser or cooler formed of tubes having enlarged ends the main body of tubes being of a certain cross section say square and combined with tubes of a different cross section to fill in spaces between them and the walls of the casing or chamber but all provided with enlarged ends, substantially as described.

Dated this 21st day of September 1903.

WILHELM MAYBACH.
Boult, Wade & Kilburn,
Agents for the Applicant.

Redhill: Printed for His Majesty's Stationery Office, by Love & Malcomson, Ltd.—1903

A.D. 1902. Dec. 22. N°. 28,259.

MAYBACH'S Complete Specification.

(1 SHEET)

Fig. 1.

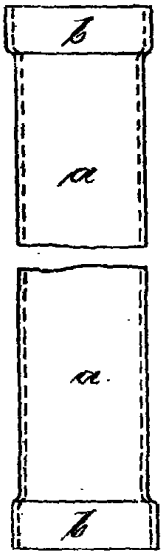


Fig. 2.

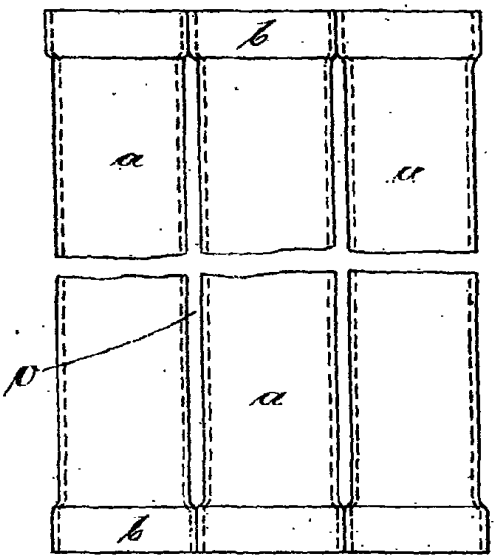


Fig. 4.

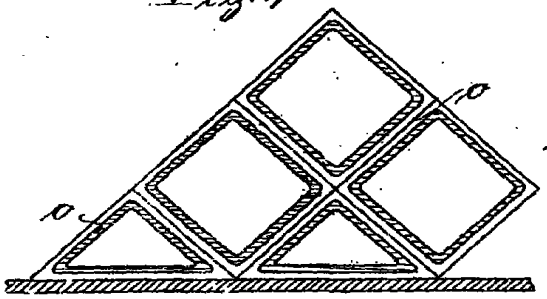
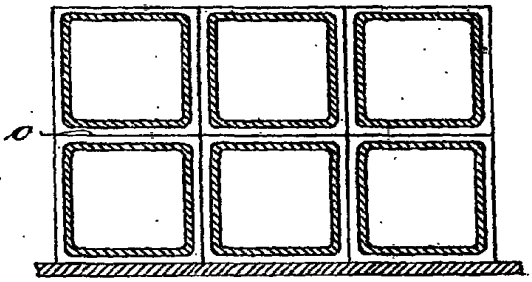


Fig. 3.



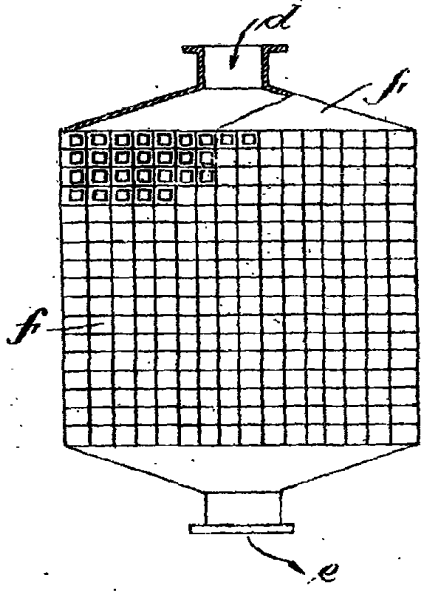


Fig. 5.

[This Drawing is a reproduction of the Original on a reduced scale.]

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