No. 649,204. Patented May 8, 1900.

J. GROUVELLE & H. ARQUEMBOURG.

MANUFACTURE OF COOLERS OR CONDENSERS.

(No Model.) (Application filed Mar. 7, 1900.)

Fig. 1. Fig. 2. Fig. 3.

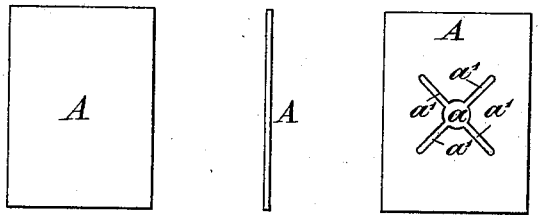
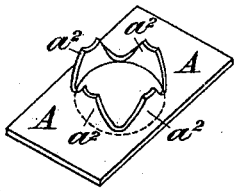


Fig. 4.



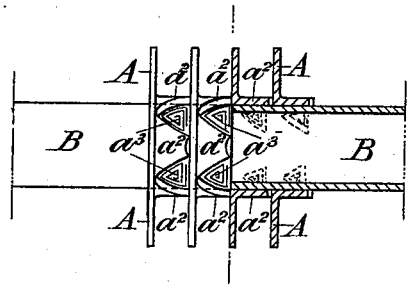


Fig. 5.

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JULES GROUVELLE AND HENRI ARQUEMBOURG, OF PARIS, FRANCE.

MANUFACTURE OF COOLERS OR CONDENSERS.

SPECIFICATION forming part of Letters Patent No. 649,204, dated May 8, 1900.

Application filed March 7, 1900. Serial No. 7,686. (No model.)

To all whom it may concern:

Be it known that we, JULES GROUVELLE and HENRI ARQUEMBOURG, (trading as LA SOCIÉTÉ JULES GROUVELLE ET H. ARQUEMBOURG,) citizens of the French Republic, residing at 71 Rue du Moulin-Vert, Paris, in the French Republic, have invented new and useful Improvements in the Manufacture of Coolers or Condensers, (in respect whereof we have applied for Letters Patent in Germany, dated December 13, 1899, No. 14,066, and in Great Britain, dated January 11, 1900, No. 701,) of which the following is a specification.

This invention relates to the manufacture of apparatus comprising pipes or tubes fitted exteriorly with a number of disks or "gills" and applicable for use as "coolers" and "condensers"—as, for example, in cooling the water circulating in the jacket surrounding the cylinder of a petroleum-engine or in condensing the exhaust-steam in steam-propelled autocars. It is well known that for any such purposes one of the most essential conditions upon which the production of a really serviceable form of apparatus depends is the reduction of the volume of such apparatus to a minimum. This entails the employment of pipes formed with a great number of bends of very short radii, notwithstanding the fact that the pipes are furnished throughout with gills.

Figures 1 to 5 of the accompanying drawings represent our "gilled" pipes, which, so far as the pipe proper is concerned and with a view to the special application herein contemplated, are constructed of copper tinned on the outer surface, while as regards the disks or gills they are made of white-plated metal—that is to say, sheet-iron tinned on both sides. Figs. 1 and 2 are respectively a face view and an end elevation of a plate of such "white" sheet metal intended for use as a gill. Fig. 3 is a face view of the same sheet-metal plate perforated preparatory to being stamped into shape. Fig. 4 is a perspective view of the plate after same has been stamped into the form of a finished gill. Where very thin sheet metal is used, however, the requisite rigidity may be imparted to the gill by corrugating its surface in any suitable manner. Fig. 5 is a view, partly in elevation and partly in longitudinal section, of the pipe fitted with disks or gills.

It will be seen from the figures that the white sheet-metal plate A is provided with a central perforation a, whence extend radial slits or slots a', the distance from the center of the perforation a to the outer end of the slots being practically equal to the external radius of the pipe B. When stamped into shape, the white metal plate A on one of its sides presents a slightly reduced or truncated sleeve—the result of the direct action of the stamping-tool—composed of triangular sections a^2, the internal diameter of the sleeve being such that assisted by the clear space left for the purpose the disks or gills may be readily and quickly threaded upon the pipe B throughout its length. Assuming the gills to be thus threaded or strung in position upon a pipe one end of such pipe should be closed, while its other end is connected with a source of hydraulic pressure—as, for example, as hydraulic press—so that by operating such hydraulic press and adequately raising the pressure within the said pipe the copper of which it consists and which is a ductile metal may be expanded until the outer surface of the said pipe, first, accurately fits the inner surfaces of each of the sleeves, and, secondly, forms a slight swelling upon each of the exposed parts between the triangular sections a^2 of the said sleeve, as shown at a^3.

Before proceeding further we would point out, first, that the shape of the triangular sections of the sleeves here shown is that best adapted both to render them yielding and to insure their tightly gripping the pipe when expanded, as before stated, while the discontinuous form given to those sleeves is the only one which for practical purposes admits of the pipes being bent into numerous curves of very small radii without a flaw, the triangular sections composing the said sleeves being capable of a certain amount of elasticity and freedom of action which permits of the imbrication of their turned-up parts, provided the sheet metal employed in constructing the gills is sufficiently thin; secondly, that when once the gills have been brought into juxtaposition the distances at which they are placed apart are for all practical purposes

satisfactory, inasmuch as these distances, resulting as they do from the fact that the sleeve of one gill abuts against the plane surface of the adjacent gill are—as in all properly-constructed gilled pipes—practically equal to the radius of the external circumference of the pipe; thirdly, that convenient proportions between the dimensions of the several parts are provided for, in the case of our gilled pipes, owing to the circumstance that the distances between the gills (which stand in a predetermined proportion to the radius of the external circumference of the pipe, as above stated,) increase with the radius of the external circumference of the pipe. This being understood, we will suppose that by putting one or a number of our improved gilled pipes to practical use a cooler or a condenser, as the case may be, has been constructed, say, in a serpentine or coil form and of any degree of complexity. As the coiling or bending of the gilled pipe or pipes may prevent a perfectly-close contact between the interior tinned surfaces of the sleeves and the tinned outer surface of the pipe (especially at the bends) one extremity of the coil is closed and its opposite end connected with a source of hydraulic pressure, so that any defects resulting from the above-mentioned operation may be made good. The coil is, moreover, placed for a suitable period in a heating-chamber, wherein the temperature is maintained at a degree approaching the point of fusion of tin. Upon withdrawing the said coil from the heating-chamber it will be found in a faultless condition as regards conductibility, all its constituent parts being united without showing the slightest break. That this must be so will be readily understood, more especially seeing that the tin (of which we effect a species of autogenous welding) having been previously distributed evenly and brought into close contact with itself at all points cannot exhibit any flaws or breaks after fusion.

We may mention in conclusion what follows as a matter of course from the foregoing remarks that if absolutely necessary the metal plates constituting the gills might be tinned on one side only.

What we claim as our invention, and desire to secure by Letters Patent, is—

The herein-described method of manufacturing coolers or condensers, consisting in fitting ductile metal pipes, tinned on their exterior, with "gills" formed of plate metal whereof the surface is also tinned, uniting the gills and pipes by subjecting the interior of the latter to hydraulic pressure, bending the "gilled" pipes into the form desired, again subjecting same to hydraulic pressure applied internally, and finally exposing the gilled pipes to a temperature adapted to fuse together the contiguous tin coatings, substantially as set forth.

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