W. J. STILL.

MANUFACTURE OF GILLED TUBULAR HEAT INTERCHANGING APPARATUS.

APPLICATION FILED NOV. 11, 1913.

1,095,477.

Patented May 5, 1914.

2 SHEETS—SHEET 2.

Fig. 2.

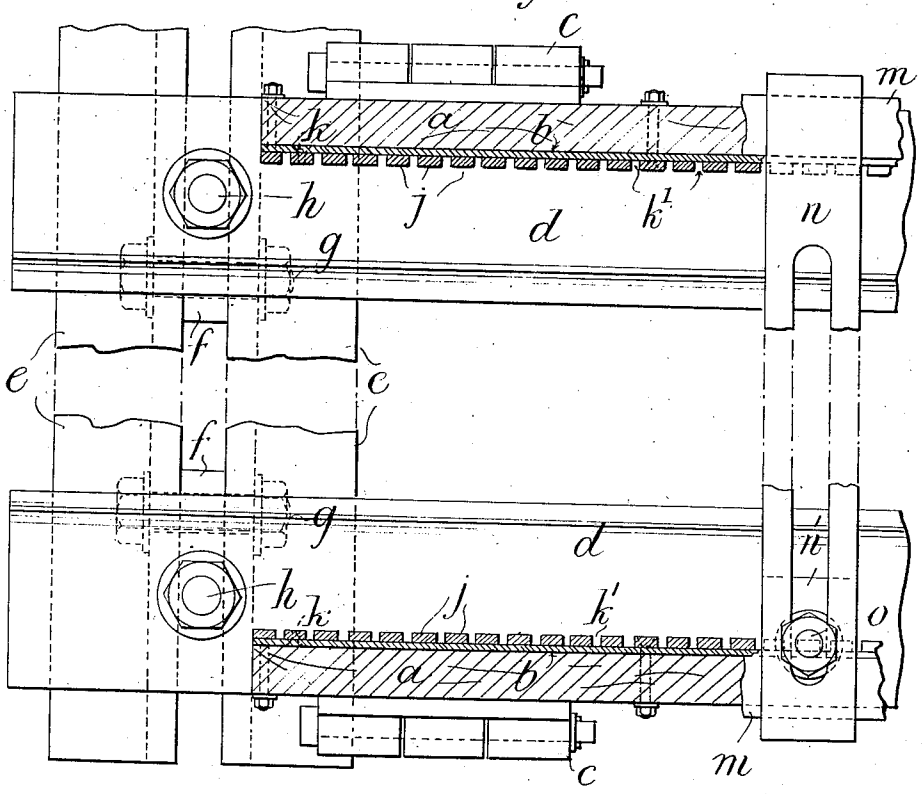
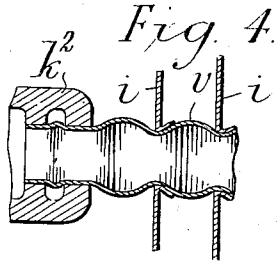


Fig. 4.



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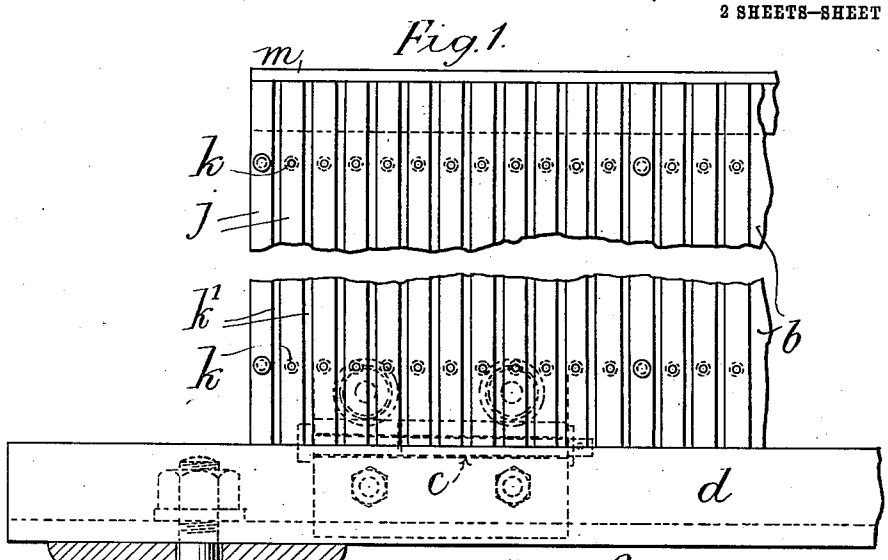
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2 SHEETS—SHEET 1.

Fig. 1.



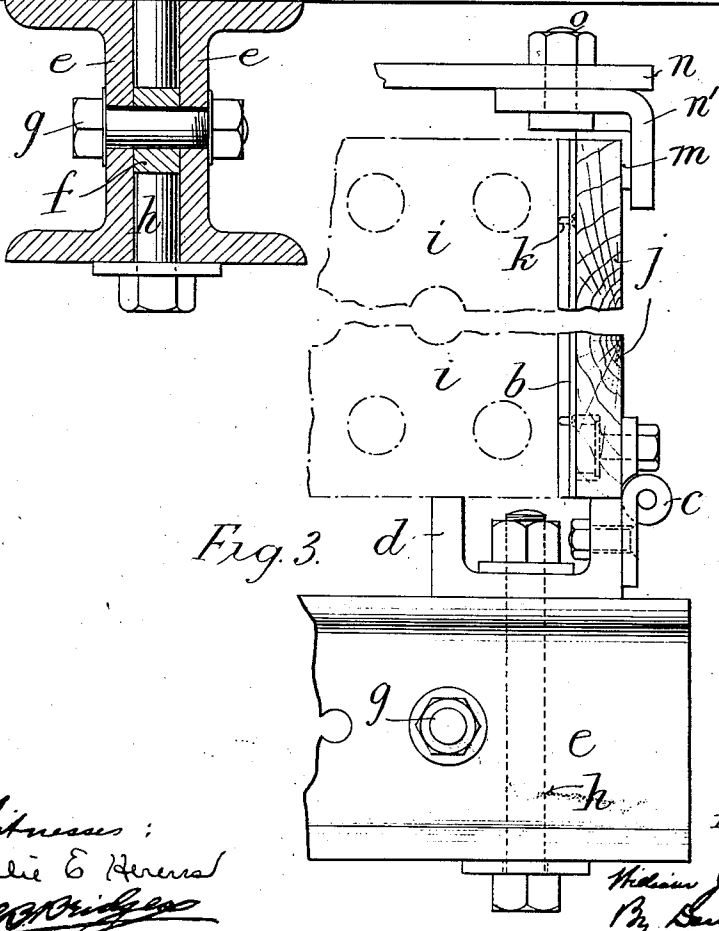


Fig. 3.

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UNITED STATES PATENT OFFICE.

WILLIAM JOSEPH STILL, OF WEST EALING, ENGLAND.

MANUFACTURE OF GILLED TUBULAR HEAT-INTERCHANGING APPARATUS.

1,095,477. Specification of Letters Patent. Patented May 5, 1914.

Application filed November 11, 1913. Serial No. 800,334.

To all whom it may concern:

Be it known that I, WILLIAM JOSEPH STILL, a subject of the King of Great Britain and Ireland, residing at West Ealing, in the county of Middlesex, England, have invented Improvements in or Relating to the Manufacture of Gilled Tubular Heat-Interchanging Apparatus, of which the following is a specification.

This invention relates to the manufacture of heat interchanging apparatus comprising tubes of relatively large diameter having gills spaced apart at relatively great distances thereon.

I have already shown in the specification of British Letters Patent No. 10223 of 1911, how tubes can be mechanically expanded into gills having flanges in contact with each other but while such a method is alone applicable where the tubes are small and the flanges are in contact, it has been found that when the tubes are large and the gills spaced wider apart, it is commercially practicable to employ the known method of obtaining the expansion directly by liquid under pressure with the aid of stoppers inserted in the tube if precautions be taken to hold the gills apart so that the flange of one does not abut against the adjacent gill and to employ spacing blocks that do not clamp the flanges of the gills to the tube as has been proposed heretofore, thus permitting the tube to more readily respond to the expanding pressure.

The object of the present invention is to quicken and simplify the manufacture of apparatus of the kind referred to by expansion of the tubes by liquid under pressure. For this purpose according to the present invention there is used apparatus comprising means, in the form of a rack, into which the several gills can be readily slipped and held in position ready to have the tubes passed through them and a header applied, if need be, after which the expansion of the tubes into the gills, and also the header, if employed, is effected by liquid under pressure by the aid of a tube stopper constructed with a liquid pressure intensifier so that no flexible connection is necessary to carry the high pressure liquid. For example, where there is sufficient repetition work two racks may be employed, the spacing portions of which are non-adjustable, the said racks being each adapted to be hinged to a suitable bar or support and being provided with a lever or equivalent whereby they can be moved from the position in which they serve to hold the tube gills apart into the release position, such lever being rendered necessary more especially in cases where longitudinal contraction of the tube, due to lateral expansion, is such as to cause a binding of the racks with the gills. In the case of long tubes it may be found convenient to divide each rack into sections capable of independent movement and where it is required to frequently manufacture tubes in which the pitch of the gills differs, the racks may be constituted of elements that can be adjusted longitudinally of their support, be replaced by others of a different character, rearranged in position, or used in different combinations. These racks are not to be confused with spacing blocks which it has been proposed to insert between gills upon tubes and clamp them in contact with the tubes to resist bursting.

In the accompanying drawings, Figure 1 is a part sectional elevation, Fig. 2 a plan and Fig. 3 an end elevation of a portion of a rack arrangement according to the invention. Fig. 4 is a sectional view illustrating, in an exaggerated way, the appearance of a tube expanded into a header and gills supported by the rack means.

As shown in Figs. 1, 2 and 3, two oppositely disposed wooden sides *a* are faced with sheet metal *b* and hinged at *c* to channel irons *d* each of which is supported in an adjustable manner at the end by a slotted bearer comprising two channel irons *e* placed back to back, separated by distance pieces *f* and clamped together by bolts *g*, the arrangement being such as to enable clamping bolts *h* for the channel irons *d* to pass through the space between the channel irons *e*, to admit of lateral adjustment of the channel irons *d* and attached parts. The tube gills or plates, of which one is shown at *i* in Fig. 3, rest upon the channel irons *d* and are separated in proper spaced relationship by metal strips *j* which are fixed, as by screws *k* to the sheet metal facings *b* so as to form a number of vertical grooves k^1 open at the top for the reception of the tube flanges or gills *i*. A strengthening length of angle iron *m* may be fitted to the upper edge of each side *a*, such angle irons being engaged by a tie bar which may be formed of two parts *n*, n^1, one viz. *n*, being slotted and connected to the other n^1

by a bolt *o* for the purposes of lateral adjustment of the parts.

Fig. 4 illustrates in exaggerated form, the condition of the tube *v* after expansion into the tube gills or plates *i* and the portion k^2 of a header.

With the apparatus constructed as described it will be seen that when the sides *a* have been moved into and fixed in position for use, the gills or plates *i*, which have previously been formed with a number of flanged holes for the reception of the tubes to be fixed therein, can be quickly dropped into the vertical grooves k^1 and held at the required distance from each other with the flanged holes in each in proper register with the flanged holes in the others so that the tubes to be secured in the gills or plates can be easily and quickly inserted through the flanged holes in the several gills or plates and afterward expanded, as indicated in Fig. 4, by fluid under pressure, as by the aid of stoppers and a liquid pressure intensifier. The grooved sides *a* can then be moved apart to release the combined gills and tubes forming the required gilled tubular structure and admit of the removal thereof after which the operation can be quickly repeated for producing another gilled tubular structure.

What I claim is:—

1. In the manufacture of tubular heat interchanging apparatus embodying a number of gills having flanged holes in which one or more tubes are to be secured by expansion, means for marginally holding such gills, comprising grooved holders, an adjustable supporting base therefor, the said base consisting of members, by which the grooved holders are respectively carried, independently movable in a lateral direction and means for holding the members in the positions into which they are adjusted, so that gills of different widths can be accommodated.

2. In the manufacture of tubular heat interchanging apparatus embodying a number of gills having flanged holes in which one or more tubes are to be secured by expansion, means for marginally holding such gills, comprising a pair of oppositely disposed racks, an adjustable supporting base therefor, the said base consisting of members, to which the racks are respectively hinged, independently movable in a lateral direction and means for holding the members in the positions into which they are adjusted so that gills of different widths can be accommodated.

3. In the manufacture of tubular heat interchanging apparatus embodying a number of gills having flanged holes in which one or more tubes are to be secured by expansion, means for holding such gills comprising a pair of oppositely disposed racks, members to which the racks are hinged, supports upon which the members aforesaid are adjustable in position in a lateral direction and adjustable means for holding the racks in engagement with the marginal portions only of the gills.

4. In the manufacture of tubular heat interchanging apparatus embodying a number of gills having flanged holes in which one or more tubes are to be secured by expansion, means for holding such gills comprising a pair of oppositely disposed racks, longitudinal members to which the racks are hinged to turn about horizontal axes, supports comprising pairs of transverse members spaced apart and upon which the longitudinal members are placed and bolts connecting the longitudinal and transverse members together and passing between the members of each transverse pair thereof.

5. In an apparatus of the class set forth, the combination of a pair of vertical racks provided with vertical grooves in their inner faces, a bodily movable supporting member attached to the lower edge of each rack, base beams for sustaining said supporting members, means for fastening said supporting members to said base beams in their adjusted positions, and adjustable means connecting the top edges of the racks, for the purpose set forth.

Signed at U. S. consulate London this 31 day of October, 1913.

WILLIAM JOSEPH STILL.

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