

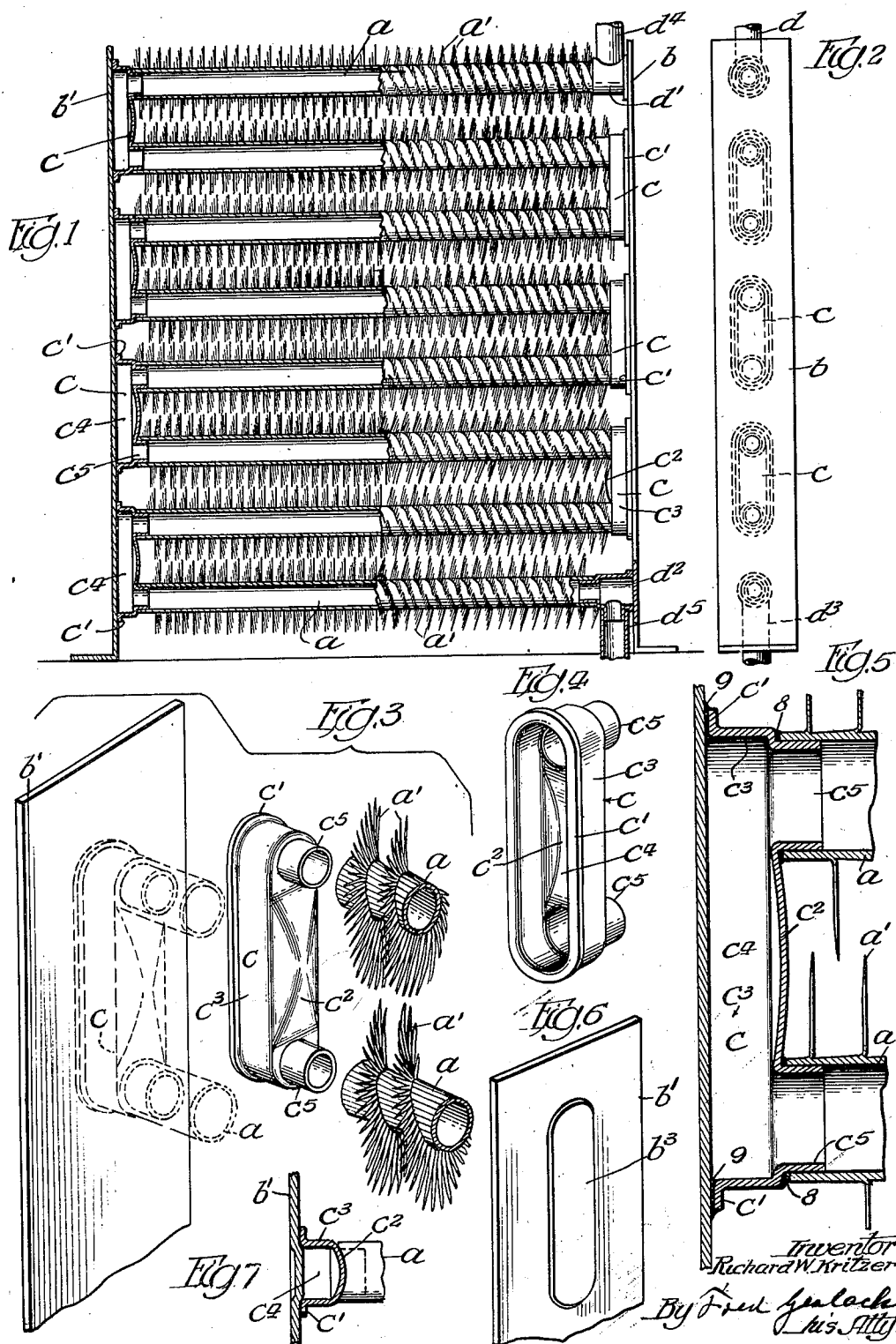
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HEAT EXCHANGE COIL

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HEAT EXCHANGE COIL

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2 Claims. (Cl. 257—149)

The invention relates to heat exchange or transfer coils.

The type of heat transfer coil now most commonly used for refrigerating and other purposes, comprises sections of tubing provided with extended surfaces, such as fins or spines, for heat transfer supporting-plates through which the tubes extend and return bends at the outer sides of the supporting-plates for serially connecting the tubes to cause the fluid therein to flow through all portions of the coil. Fabricating a coil with such return bends is costly. It also involves providing terminal portions on the tubes without extended surfaces for connection to the return bends.

The objects of the invention are to provide: a heat transfer coil in which stamped shells which can be produced at a low cost, can be utilized to form, with the contiguous faces of the end-plates, individual ducts between pairs of tubes; a heat transfer coil in which imperforate supporting-plates at the outer ends of the coils are utilized with the stamped shells on the inner or confronting faces of the plates to form the return connections between the ends of the tubes; a coil in which the return connections are formed by shells disposed between the ends of the tubes and the inner faces of the imperforate supporting-plates; a heat transfer coil which can be produced at a low cost; and other objects which will appear from the detailed description.

The invention consists in the several novel features which are hereinafter set forth and are more particularly defined by claims at the conclusion hereof.

In the drawing: Fig. 1 is a view, partly in section and partly in side elevation, of a heat transfer coil embodying the invention. Fig. 2 is an end view. Fig. 3 is a perspective of one of the supporting-plates, one of the shells, and the ends of a pair of tubes before they have been assembled. Fig. 4 is a perspective of one of the shells. Fig. 5 is a section on an enlarged scale through one of the shells, one of the plates, and a pair of the tubes. Fig. 6 is a perspective of a modified form of supporting-plate. Fig. 7 is a section through the supporting-plate illustrated in Fig. 6, and one of the shells connected thereto.

The invention is exemplified in a heat transfer coil which comprises a series of parallel tubes *a*, each provided with integral spines *a'* cut from the wall of the tube and bent to extend outwardly for efficient heat transfer; a pair of supporting and confronting end-plates *b*, *b'*, and shells *c* for

serially connecting the ends of the tubes. The plates *b*, *b'* have substantially flat faces and constitute supports at the ends of the coil. The shells *c* are secured to the plates, support the tubes, and function as connections between pairs of tubes for conducting the fluid from one end of one tube to the corresponding end of the next tube in the series. The tubes have open ends to which the shells are connected.

Each shell *c* is stamped from sheet-metal, for example, 20 gauge steel, has an open side contiguous to the inner face of a supporting-plate, and an out-turned marginal or rim flange *c'* which has a meeting face joined to the inner face of a supporting-plate, as hereinafter described; a side-wall *c²*; and a connecting-wall *c³* between wall *c²* and flange *c'*. The walls of each shell are shaped to form, with the portion of the inner face of a supporting-plate between the rim *c'*, a duct or chamber *c⁴* for connecting a pair of tubes. Wall *c²* of each shell *c* is provided with a pair of integral tubular extensions which fit and telescope into the ends of a pair of tubes *a*, respectively, and connect pipes *a* to the shell so that each pipe will have communication with the duct *c⁴* in the shell. A characteristic of these shells is that each forms an individual connection between a pair of tubes. They are shaped so they can be produced from sheet-metal by stamping or drawing, in large quantities, and at a low cost. The contour of the rim-flange conforms substantially to the open side of, or the duct *c⁴* in, the shell. The portions of the supporting-plates at the open sides of the shells are imperforate so they will form the outer walls of the ducts *c⁴* in the shells *c*. The supporting-plates may also be stamped of sheet metal. The shells *c*, being disposed at the inner faces of the supporting-plates, dispense with the necessity of extending the pipes *a* through or into the supporting-plates.

The shells *c* are secured to the supporting-plates to serially connect, for the passage of fluid, the ends of pairs of tubes adjacent one supporting-plate and then the ends of a pair of tubes adjacent the opposite plate for the successive flow of fluid through the entire series of tubes of the coil. The first tube *a* of the series is connected to an elbow-fitting *d'*, which fits against, and is secured to, the inner face of the supporting-plate *d*, and is adapted for connection to an inlet pipe *d¹*. The last tube of the serially connected series is connected to a similar elbow-fitting *d²* which is secured to the inner face of supporting-plate *d* and is adapted for connection to an outlet pipe *d⁵*. These fittings may also be formed of stamp-

ings and are welded to the supporting-plate, as hereinafter described.

In fabricating the coil, the tubes *a* are telescoped over the extensions *c*⁵ of the shells *c* and over similar extensions on fittings *d*, *d'*. Suitable welding material 8 is placed between the ends of the tubes and the walls *c*² of the shells *c* and said fittings. Suitable welding material 9 is placed between the contiguous faces of flanges *c'* of the shells *c* and the fittings *d*, *d'* and the inner faces of the supporting-plates. The shells, pipes, and fittings *d*, *d'* and plates are then assembled together and held in assembled relation by suitable clamps or a frame applied to the supporting-plates. The assembled structure is then placed in an oven, which is supplied with an inert gas, such as hydrogen, and heated to a suitable temperature to weld together all the shells and the supporting-plates, and the pipes and the shells at all surfaces where the welding material has been applied. In this manner the flanges *c'* of all of the shells *c* will be simultaneously welded to the abutting faces of the supporting-plates and the ends of the tubes will be simultaneously welded to the shells *c*. The fittings *d* and *d'* may be simultaneously and similarly welded to the supporting-plates and tubes. Upon completion of the welding operation, all of the parts of the coil will be united together in a unitary structure so that the tubes and shells will be supported in their desired positions and fluid-tight connections will be formed between the shells and the inner faces of the supporting-plates and between the tubes and the shells.

Figs. 6 and 7 illustrate a modification in which the supporting-plates are provided with slightly indented portions *b*³ which conform to the contour of the open sides of the shells and fit within the rims *c*². These indented portions *b*³ serve to spot or locate the shells on the plates during the assembly of the coil.

The invention exemplifies a heat transfer coil, in which the shells have open sides and are shaped so they can be produced by stamping sheet-metal. Each individually forms a return connection between a pair of tubes. This makes it possible to place the shells in any arrangement desired on the plates. The supporting-plates are disposed at the outermost ends of the coils, are flat and imperforate and are utilized to close one side of the shells and form chambers therein for communication between the ends of pairs of tubes. This avoids projections beyond the outer faces of the supporting-plates, which is of importance where it is desired to utilize to the fullest extent the space available for the coil. The shells, being provided with tubular extensions, which telescope into the ends of the tubes, make it possible to use sections cut from continuously spaced tubing. Heretofore, when return bends have been used with spined tubing it has been necessary to remove the spines from the end portions of the tubes for joints with return bends or to make special provision for eliminating the spines on

the end-portions joined to the return bends. The welding of the rims of the shells to the supporting-plates results in the production of a strong structure. The construction of the supporting-plates, shells and tubes, makes it possible to weld or join together all of the parts of the structure in a single operation and this also results in a lowering of the cost of production of the coil.

10 The welding described may be carried out by any suitable method for permanently uniting and joining the parts together and the term "welding," as herein used, is to be understood to include such methods.

15 While the invention can advantageously be used with tubing provided with integral outstruck spines, it can also be advantageously used with finned tubing or tubing having other forms of extended surfaces. The coil described and illustrated includes a single row of tubes, but it will be understood that the invention may be embodied in a coil with multiple rows of pipes serially connected by shells, in any number desired.

The invention is not to be understood as restricted to the details set forth, since these may be modified within the scope of the appended claims, without departing from the spirit and scope of the invention.

Having thus described the invention, what I claim as new and desire to secure by Letters Patent is:

1. A heat transfer coil comprising a pair of supporting end-plates in confronting relation, a series of tubes between the plates and provided with extended surfaces for heat transfer, and separately formed stamped shells for individually forming connecting-ducts between pairs of tubes, each shell having an open side contiguous to one face of one of said plates and a wall terminating in a rim welded to the contiguous face of the plate, the contiguous face of the plate and said wall forming a closed duct between a pair of tubes, the contour of the rim of each shell conforming substantially to the duct in the shell, a pair of tubes being connected to said duct, the faces of the plates being provided with portions for spotting the separately formed shells on the plates.

2. A heat transfer coil comprising a pair of end plates, stamped hollow shells disposed at the inner sides of the end plates, each shell having an open outer side, an inwardly projecting surrounding wall-portion having its margin welded to the inner side of an end plate and an integral wall-portion spaced inwardly from one of the end plates by the surrounding wall-portion, and pairs of tubes provided with extended surfaces for heat transfer joined to the inner walls of the shells, the shells and the inner faces of the plates forming ducts on the inner sides of the plates between pairs of tubes, respectively, the plates being provided with means for spotting the shells on the plates.

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