

Aug. 23, 1966

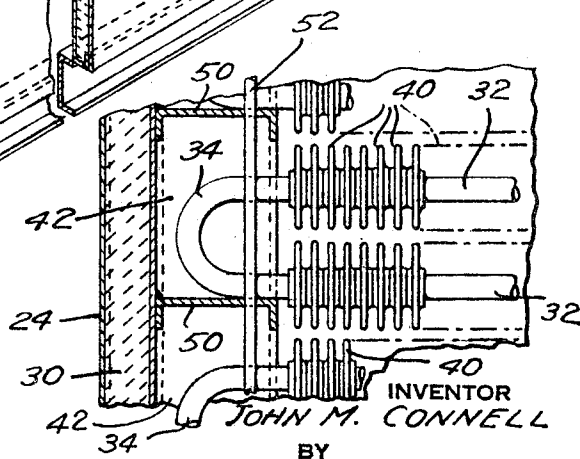
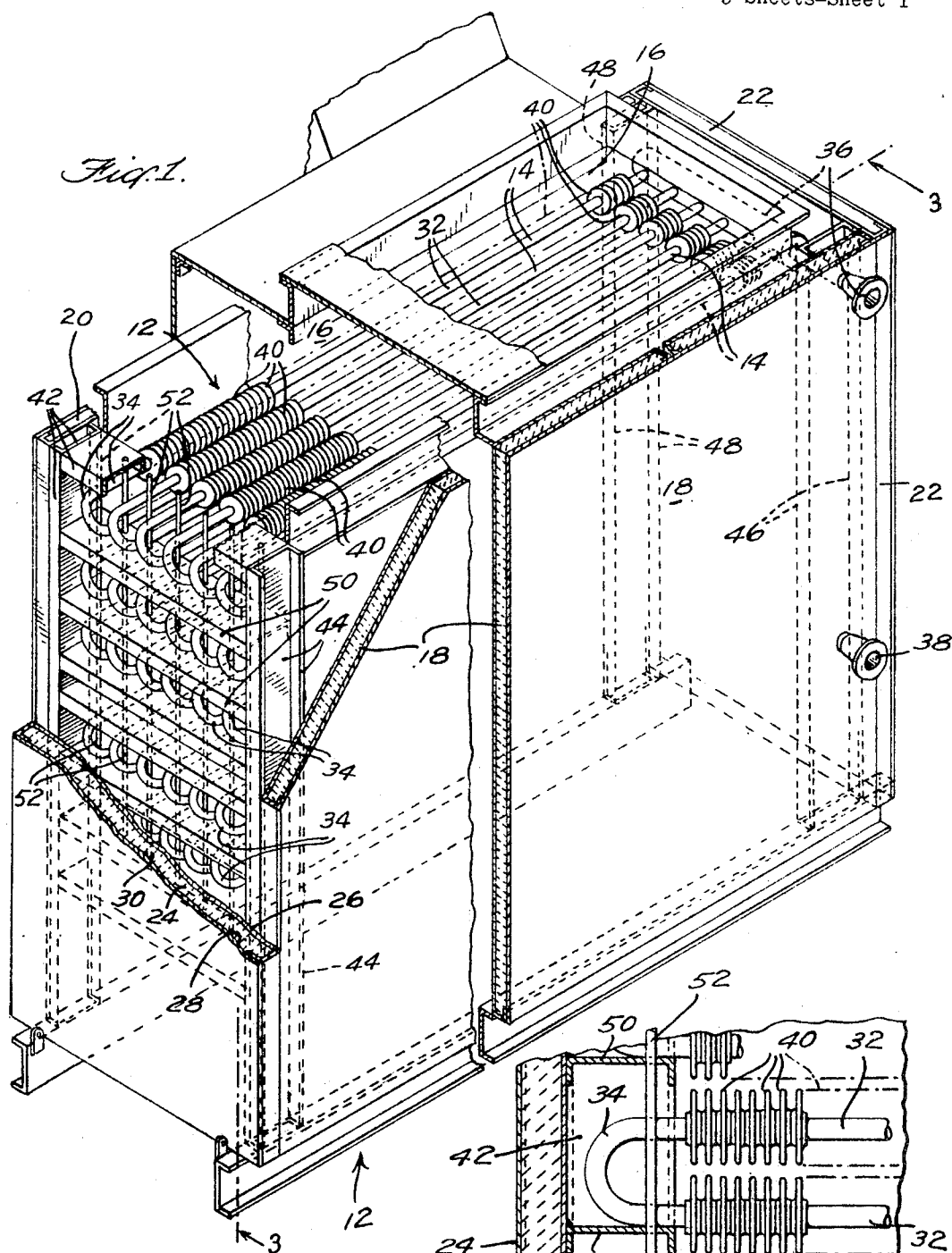
J. M. CONNELL

3,267,914

ECONOMIZER SUPPORT

Filed Oct. 27, 1964

3 Sheets-Sheet 1



INVENTOR
JOHN M. CONNELL
BY
Richard H. Thomas
ATTORNEY

Aug. 23, 1966

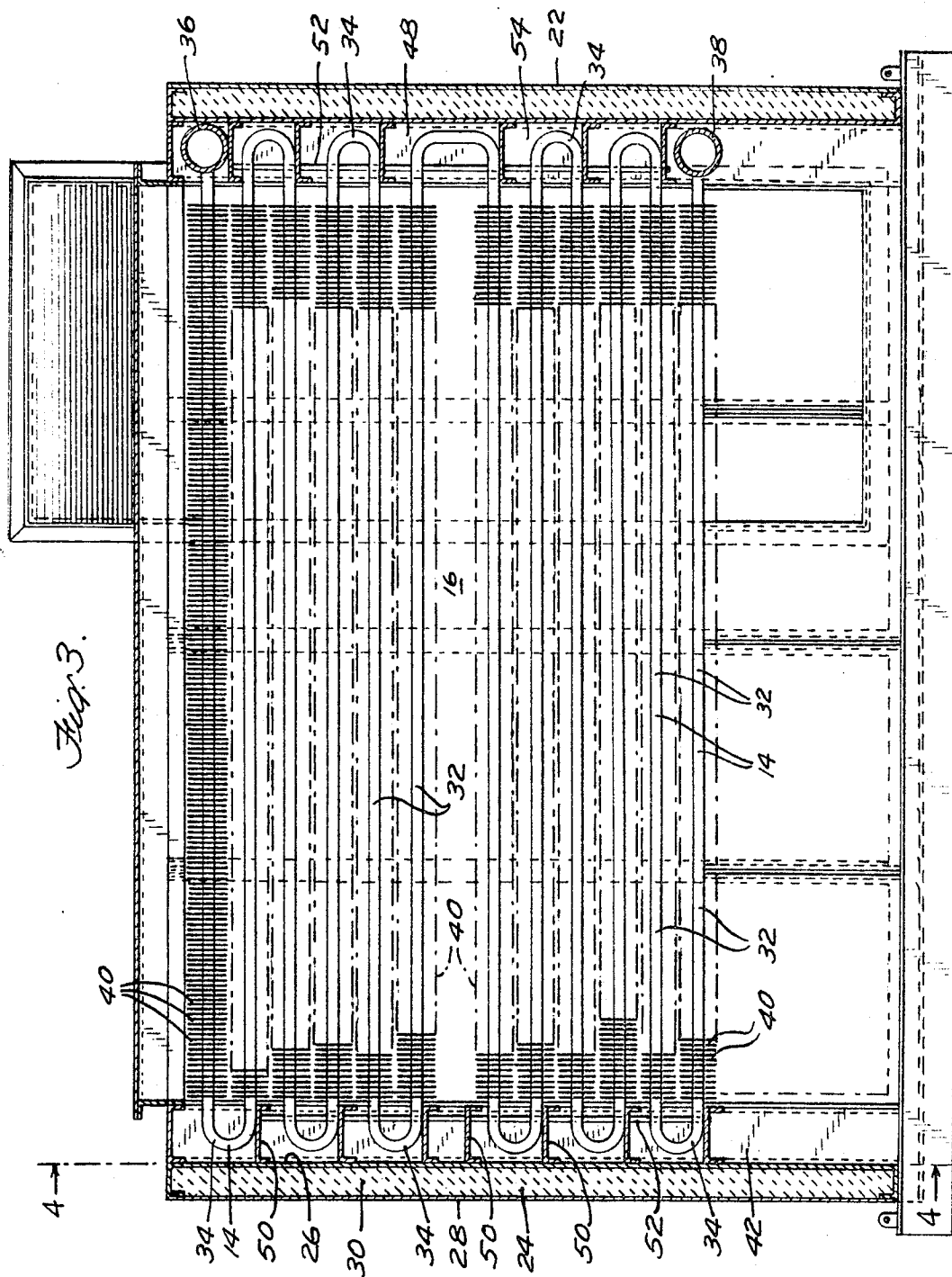
J. M. CONNELL

3,267,914

ECONOMIZER SUPPORT

Filed Oct. 27, 1964

3 Sheets-Sheet 2



INVENTOR
JOHN M. CONNELL

BY
Richard H. Thomas
ATTORNEY

Aug. 23, 1966

J. M. CONNELL

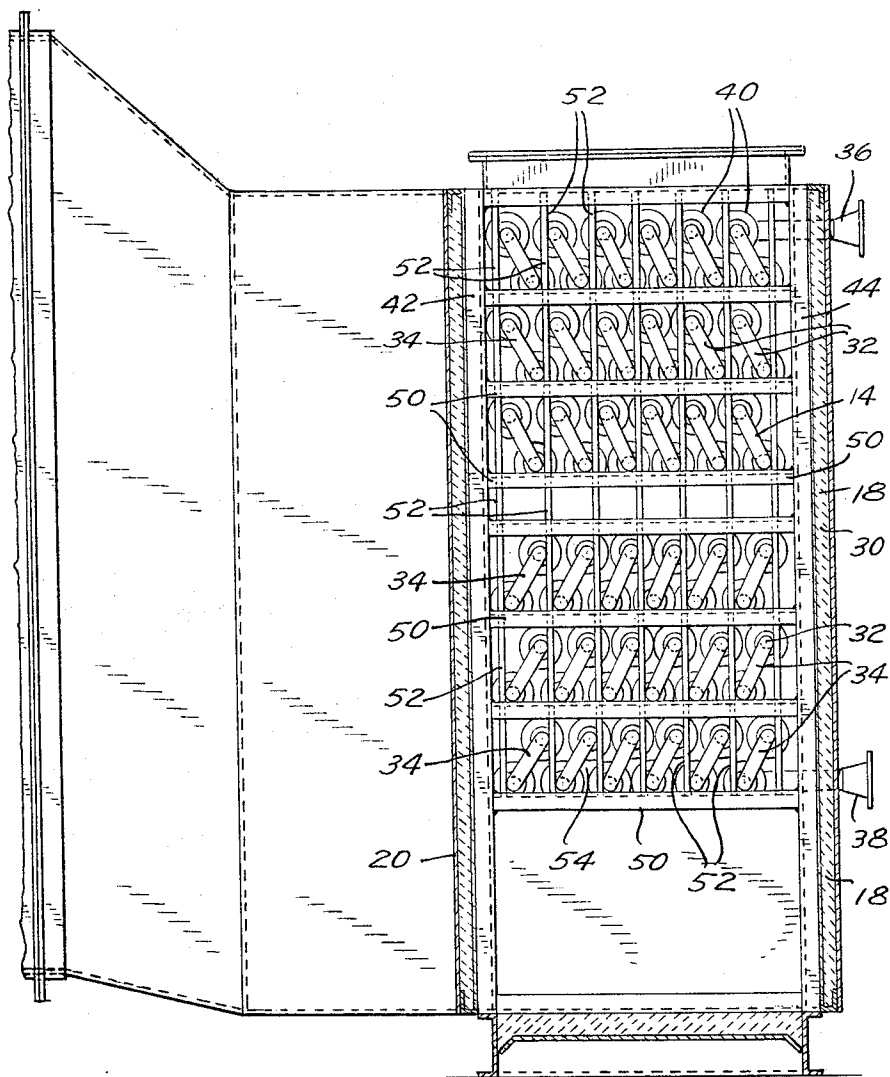
3,267,914

ECONOMIZER SUPPORT

Filed Oct. 27, 1964

3 Sheets-Sheet 3

Fig. 4.



INVENTOR
JOHN M. CONNELL
BY
Richard H. Thomas
ATTORNEY

1

2

3,267,914

ECONOMIZER SUPPORT

John M. Connell, Mountain Lakes, N.J., assignor to Foster Wheeler Corporation, New York, N.Y., a corporation of New York

Filed Oct. 27, 1964, Ser. No. 406,752

3 Claims. (Cl. 122—510)

This invention relates to improvements in economizers for steam boilers, and in particular, to a novel support for economizer tubes having fins called "gills" or "gill rings" fitted thereon, shown in Patent No. 2,855,643, to Anselmini et al.

In certain forms of economizers for steam boilers, it has heretofore been the practice to employ a plurality of transverse tubes united at or near their ends to rectangular vertically oriented tube plates, the latter forming walls of the economizer heating chamber. The tubes are connected by suitable headers outside the wall or walls thus formed and within header box enclosures. The cast iron "gills" or "gill rings" are shrunk fit onto the tubes in the space between the tube plates.

An example of this arrangement is set forth in U.S. Patent No. 1,392,675, granted to John E. Bell. Several difficulties are encountered with this practice. For instance, this method of construction necessitates that a sealing ring or a gasket be used at the tube sheet to prevent gases from entering the header boxes and by-passing heating surfaces. Also, considerable exactness has been required in the placing of the gill rings on the tubes. During the shrinking operation of the cast iron "gills" on a tube, there is a variance in the over-all longitudinal dimension of the tube. One procedure now is to measure the length of "gill" elements on a nearly completed hair pin separately adding a fit-section of varying length for accurately obtaining the over-all length of "gill" surface required.

The present invention provides a means for assembling "gilled" ring economizers without the use of a tube sheet eliminating the necessity for this fit-up operation. Small variations in the installed lengths of the extended surface is of little practical consequence.

In accordance with the invention, there is provided an economizer construction consisting for wall means including at least two opposed walls defining a vertically extending hot gas passageway. A plurality of vertically oriented side-by-side tube banks are disposed within the passageway, each bank comprising a plurality of parallel straight tube sections connected by tube bends to define a sinuous circulating fluid element. Support assemblies for the tube banks comprise spaced apart vertically oriented channels, and a plurality of spaced horizontal shelf members between the channels. The support assemblies are disposed against the opposed walls of the passageway to define a plurality of horizontally extending compartments opening inwardly to the hot gas passageway, with the shelf members arranged to support the tube sections beneath each tube bend thereof. The assemblies further include vertical spacer elements or bars extending through the shelf members holding the tube banks in spaced apart relationship.

The invention and advantages thereof will become more apparent upon consideration of the following specification and accompanying drawings, in which:

FIGURE 1 is a reduced scale perspective view with parts broken away showing an economizer in accordance with the invention, including walls and internals thereof;

FIGURE 2 is an enlarged scale section side view of a portion of the wall and support construction in accordance with the invention;

FIGURE 3 is a side section view of the entire economizer taken along lines 3—3 of FIG. 1; and

FIGURE 4 is an enlarged section view taken along lines 4—4 of FIGURE 3.

Referring to the drawings, and in particular, FIG. 1, the economizer 12 comprises a plurality of banks of tubes 14 disposed within a rectangular vertically extending hot gas passageway 16 defined by vertically extending side-walls 18 and 20 and end walls 22 and 24. Each of the walls is provided with inner and outer plates 26 and 28 and insulation 30 between the plates.

The banks of tubes 14 are vertically oriented, and are disposed side-by-side within the gas passageway, each bank comprising a plurality of horizontal straight tube lengths 32 connected by U-tube bends 34, to define a sinuous fluid circulating element extending between upper and lower headers 36 and 38 (FIG. 4, adjacent end wall 22). To increase the heat transfer efficiency of the tubes, extended surface elements or fins 40 (FIG. 2) called "gill" rings are formed on the outside of the tubes providing an additional amount of surface area for gas contact. Against the end walls 22 and 24, a plurality of side channels 42, 44, 46 and 48 (FIG. 1) extend vertically, the channels having a U-shaped profile, their major surface being aligned with the side walls 18 and 20 and a flange thereof being against the end walls. Extending between the channels (the major surfaces thereof) are a plurality of shelves 50 at spaced apart vertical locations. The tube elements are arranged so that they are supported on each of the shelves beneath the U-bend portions thereof, the width of the channels and shelves being such that the "gill" rings 40 extend almost up to the shelves but are spaced somewhat from the shelves as shown in FIG. 2. A plurality of vertical spacer bars 52 pass through holes in the supporting shelves to define between each shelf a plurality of side-of-side compartments 54. The U-tube bends 34 are then inclined in each compartment to rest obliquely (FIG. 4) against opposite spacer bars. The tube sections are thus automatically indexed by the bars and shelves.

As an aspect of the invention, the shelves act as barriers against the vertical flow of gas along the end walls 22 and 24 by-passing the tube elements and extended surface of the tubes.

In assembly, the "gills" or "gill rings" are shrunk fit on the tubes to reasonable tolerances, but not to the close tolerances of length and position required when using tube sheets. Following assembly of the gill rings, the U-tube bends and straight tube lengths are assembled into the desired tube elements making up a bank, and the banks are then inserted at one end within a prefabricated channel and shelf support assembly. The opposing channel and shelf support assembly is then prefabricated and slipped into place around the opposite end of the bank.

It is now apparent that the system completely eliminates the requirement for fit-up rings necessitated by small variations in length occurring during manufacture, and also eliminates the requirement for a gasket or machined mating surfaces between a tube sheet and a gill ring or cast iron extended surface element. Independent growth or shrinkage of the elements relative to each other, or the supporting rack, is inherently provided for.

Although the invention has been described with respect to a specific embodiment, many variations within the spirit and scope of the following claims will be apparent to those skilled in art. For instance, although the invention has been described with respect to an economizer, it should be understood that the concept of the invention are applicable to other types of heat exchangers (e.g. waste heat boilers, steam air heaters), involving the indirect exchange of heat between two fluids, at different temperature, one of which is confined in a plurality of tubular elements.

What is claimed is:

1. An economizer comprising
 wall means including at least two opposed walls defining a vertically extending hot gas passageway;
 a plurality of vertically oriented side-by-side tube banks;
 each bank comprising tube sections including parallel straight tubes connected by tube bends to define a sinuous circulating fluid element;
 support assemblies for the tube banks each comprising spaced apart vertical oriented channels;
 a plurality of horizontal shelf members between the channels at vertically spaced intervals;
 the support assemblies being disposed against said opposed walls to define a plurality of horizontally extending compartments adjacent each wall opening inwardly to the hot gas passageway;
 the shelf members being adapted to support the tube sections beneath each tube bend thereof;
 the support assemblies further comprising vertical spaced elements extending through the shelf members in engagement with the parallel tubes holding the tube sections upright and the tube banks in spaced apart relationship.
2. An economizer according to claim 1 including extended surface elements on the straight tubes of the tube banks substantially the full length thereof.

3. An economizer comprising
 wall means defining a rectangular vertically extending hot gas passageway;
 a plurality of vertically oriented side-by-side tube sections, each section comprising parallel horizontal straight tubes connected by tube bends to define a plurality of sinuous circulating fluid elements;
 support means at opposed ends of the sections each comprising spaced vertical channels, spaced apart horizontal shelf members extending between the channels and disposed against said wall means, the shelf members being arranged to support the tube sections beneath the tube bends thereof; and
 vertically aligned spaced apart rods extending through the shelf members in engagement with the tube sections holding the tube sections upright and against horizontal sideways movement.

References Cited by the Examiner

UNITED STATES PATENTS

1,662,353	3/1928	Williams	-----	122—510 X
2,119,118	5/1938	Sengstaken	-----	122—510

FOREIGN PATENTS

935,872	9/1963	Great Britain.
---------	--------	----------------

KENNETH W. SPRAGUE, *Primary Examiner.*