

(No Model.)

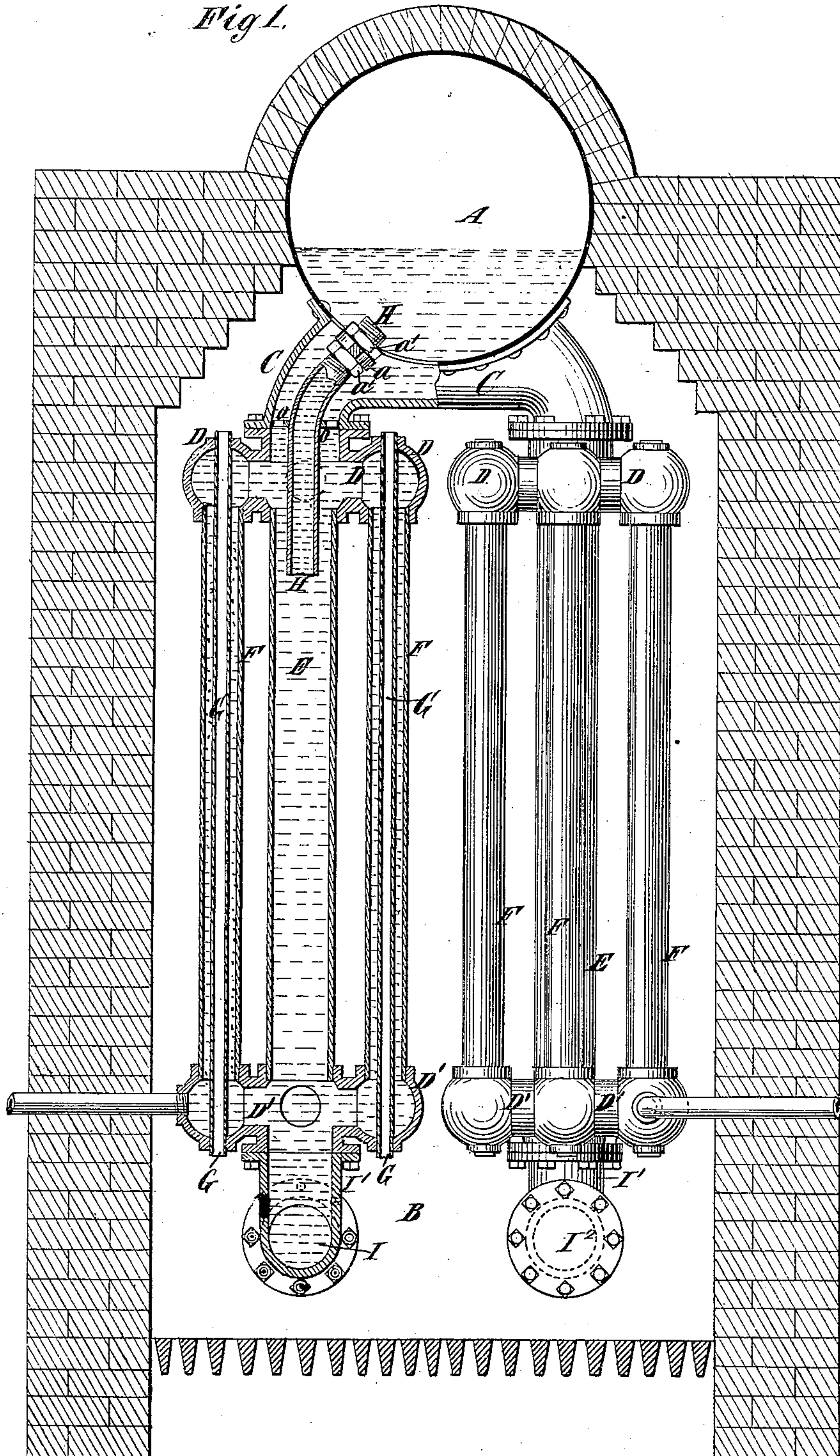
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W. E. KELLY.
STEAM GENERATOR.

No. 246,395.

Patented Aug. 30, 1881.

Fig 1.



Witnesses:
Frederick Haynes
H. B. Webb

Inventor: *William E. Kelly*
by his Attorney
Frederick Brown

(No Model.)

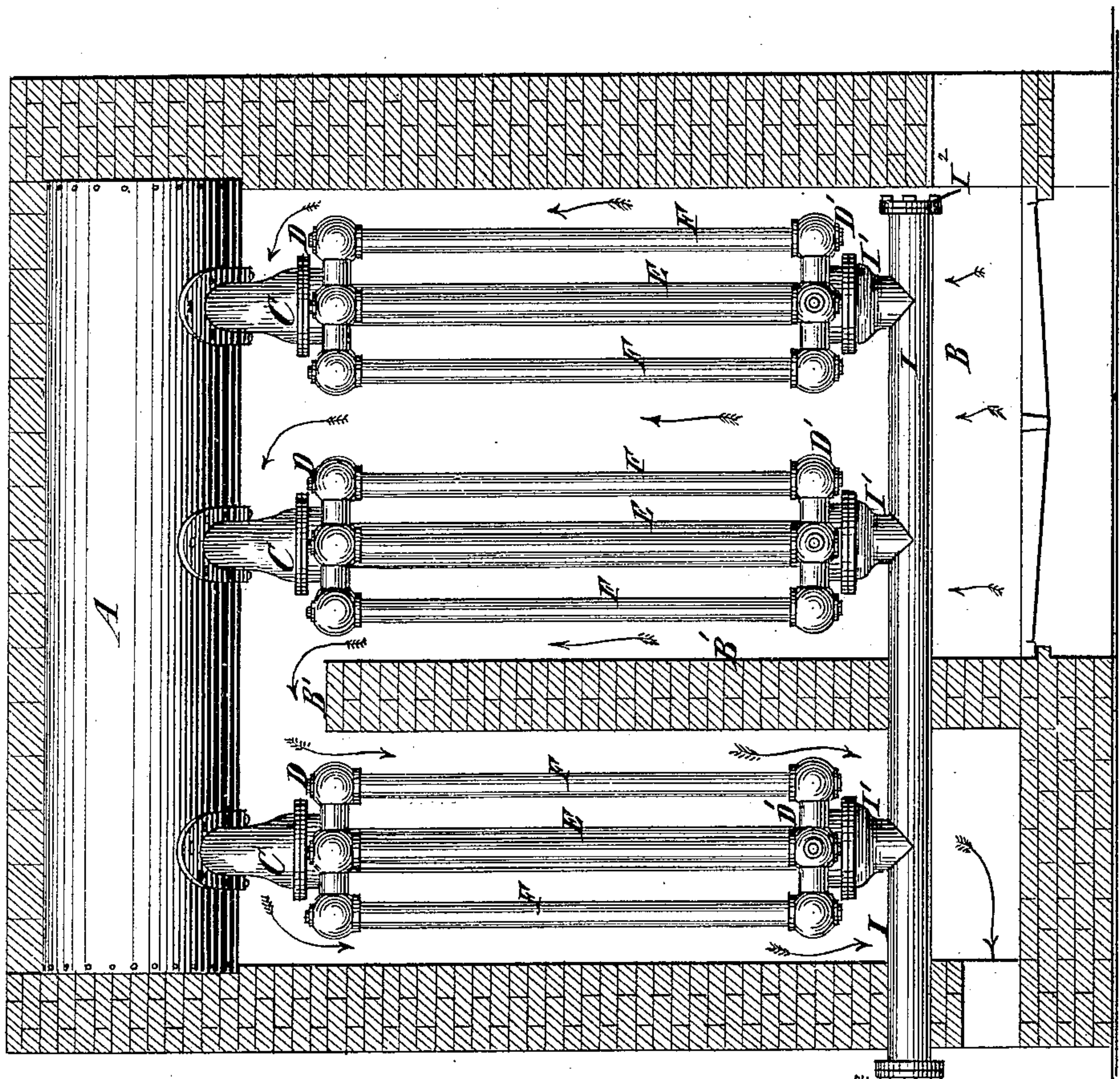
2 Sheets—Sheet 2.

W. E. KELLY.
STEAM GENERATOR.

No. 246,395.

Patented Aug. 30, 1881.

Fig 2.



Witnesses

John Becker
Jas H. Haynes

Inventor

William E. Kelly
by his Attorney
Pount Brown

UNITED STATES PATENT OFFICE.

WILLIAM E. KELLY, OF NEW BRUNSWICK, NEW JERSEY.

STEAM-GENERATOR.

SPECIFICATION forming part of Letters Patent No. 246,395, dated August 30, 1881.

Application filed November 5, 1880. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM E. KELLY, of New Brunswick, in the county of Middlesex and State of New Jersey, have invented certain new and useful Improvements in Steam Generators or Boilers, of which the following is a specification.

My invention relates to sectional boilers in which are combined a number of sections, each consisting of a series of upright pipes or tubes providing for the downward and upward circulation of water, all connected and in communication with each other at both ends by means of horizontally-extending connecting chambers or pieces, and a drum with which the several sections are connected each by means of a throat leading directly from the upper connecting chamber or piece. When such boilers are in operation the heat of the fire produces a rapid upward circulation through certain of the pipes or tubes, which are constructed or arranged so that the fire has more effect upon the water in them than in certain other of the pipes or tubes, and the tendency of the highly-heated water and steam is to pass upward through the throat connecting the section with the drum. An equal amount of water must, however, pass downward from said drum through said throat, to take the place of the water displaced by heat, and the upward current of highly-heated water and steam and the downward current of colder water meeting in the throat produce a violent agitation, which results in a large amount of water being taken up by the steam and carried out of the boiler, causing the boiler to prime to a degree which greatly impairs its efficiency.

The object of my invention is to obviate this difficulty; and to this end it consists in the combination, with a steam-drum and a section comprising upright tubes or pipes arranged to provide for an upward and downward circulation and an upper and preferably also a lower horizontally-extending connecting piece or chamber, through which said tubes or pipes all communicate with each other, of a throat between the upper connecting piece or chamber and said drum and a circulating-pipe arranged within said throat, and having one end opening into the drum and the other end projecting into said upper connecting piece or

chamber. Inasmuch as the water is coolest near the center of the throat, a downward current will be produced through the circulating-pipe and an upward current of steam and hot water around said circulating-pipe and through the said throat. Certain of the pipes of the section may have fire-tubes extending directly through them and through the connecting pieces or chambers, and the water in said pipes being more exposed to the fire an upward circulation will be produced through them. The same result might be produced in a less degree by grouping a number of pipes around a pipe considerably larger, the latter pipe then being the one through which the downward circulation would take place. The circulating-pipe leading from the drum preferably communicates with the pipe through which is the downward circulation.

The invention also consists in the combination, with a drum and a series of sections extending downwardly from said drum, and each comprising pipes or tubes arranged to provide for an upward and downward circulation, of a pipe or conduit communicating with the lower ends of said sections, opposite the pipes through which is the downward circulation. By this construction the pipe or conduit connecting the sections is made to serve the purposes of a sediment-chamber, and it also provides for a circulation between the several sections in addition to the independent circulation of each section.

In the accompanying drawings, Figure 1 represents a transverse section of a drum and furnace, and also a pair of boiler-sections, one of which is in section and the other in elevation, and which are combined with and connected to the drum according to my invention; and Fig. 2 represents, upon a small scale, a side view of said drum, a series of sections extending downwardly therefrom, a sediment-chamber connecting said sections, and a longitudinal section of a furnace.

Similar letters of reference designate corresponding parts in both figures.

A designates a horizontally-arranged drum, and B a furnace under said drum, by which the heating of the boiler is effected. In addition to said drum the boiler comprises two or more sections, which are arranged in pairs be-

low the drum and within the furnace, the sections of each pair being connected with the drum by a throat, C, as clearly shown. Each of the sections comprises a number of upright
 5 pipes or tubes, which are arranged or constructed to provide for a downward and upward circulation, and which are connected at each end by upper and lower hollow horizontally-extending connecting pieces or chambers,
 10 D D', through which said pipes or tubes all communicate with each other. As here shown, a pipe, E, has arranged around it a number of pipes, F, which are preferably of smaller diameter, wherefore their contents will be more
 15 easily affected by heat. The connecting pieces or chambers D D' are each composed of a series of spherical portions concentric with the pipes or tubes E F, and formed in a single casting. The pipes or tubes E and F extend from
 20 one to the other of these connecting pieces or chambers, and are expanded into holes or openings provided for their reception in the under side of the upper connecting piece or chamber, D, and the upper side of the lower connecting
 25 piece or chamber, D'. If, as here shown, the pipe E is larger than the pipes F, and the pipes F are arranged so as to somewhat shield or protect the pipe E from the fire, the water in the outer pipes, F, being the hottest, will circulate upward, while the water in the pipe E
 30 will circulate downward; but in order to provide for a rapid and positive upward and downward circulation I arrange within the pipes F fire tubes or flues G, which extend through
 35 both the connecting pieces or chambers D D', and are expanded into openings prepared for their reception.

The boiler so far as described is not an essential feature of my invention, and though
 40 here chosen for purposes of illustration my invention is applicable to other boilers in which are sections comprising tubes or pipes arranged to produce upward and downward circulation, connecting pieces or chambers through which
 45 all the pipes or tubes communicate, and a throat between the upper connecting piece or chamber and the drum. When the boiler is in operation the upward current of highly-heated water and steam and the downward current of cooler water
 50 have to pass in opposite directions through the throat C, and the two opposed currents meeting in said throat produce a constant and violent agitation, which results in a large amount of water being taken up by the steam
 55 and causes the boiler to prime.

In order to separate the upward and downward currents in the throat C, and enable each current to move uninterrupted by the other, I arrange in the throat C of each section a circulating-pipe, H, the position of which is clearly
 60 shown in the left-hand section of the drawings. This pipe H is arranged centrally or nearly centrally in said throat, with its upper end opening into the water-space of the drum, and its lower end projecting into the upper connecting piece or chamber, D. For better ef-

fect the said circulating-pipe is preferably prolonged or extended through said upper connecting piece or chamber, D, and opens into the pipe E, in which is the downward circulation,
 70 below its connection with said upper connecting piece or chamber.

The pipe H may be supported in any suitable manner. As here represented the throat C has attached to or cast with it a bridge-
 75 piece, in which is a bearing, a; and the pipe H may be held in said bearing by nuts a', screwed upon the pipe both above and below said bearing.

Near the lower end of the throat C the circulating-pipe has secured upon it by a pin a
 80 set-screw, or otherwise, a collar or band, o, which is provided with projecting arms or prongs, which enter the throat C and hold the circulating-pipe in proper position therein.
 85

In lieu of being formed by a separate piece, the circulating-pipe H might be formed in the same piece with the throat C by casting.

When the boiler is in use, the outside of the throat C being exposed to the heat of the furnace, the hottest water will be around its circumference, and hence the upward circulation will tend to be around the circumference, and the downward circulation near the center of
 90 said throat. If, however, there is no means of separation between these two currents, they will oppose each other and produce priming, as well as retard the proper circulation of the boiler. Where the circulating-pipe H is employed the downward circulation will be constant and uninterrupted through the said pipe,
 95 while the upward circulation of the hotter water will be constant and uninterrupted around said pipe and through the throat C. It will thus be seen that the said circulating-pipe forms a separating wall or diaphragm between
 100 the upward and downward currents, and greatly assists the circulation of the boiler as well as prevents priming. Where the lower end of the circulating-pipe projects into the upper end of the pipe E, as shown, the strong downward current through said circulating-pipe produces a suction in the pipe E and tends to draw down the cooler portion of the water escaping from the upper ends of the pipes F, while the
 105 hotter water passes upward into the drum. In case the stronger or preponderating current should be downward through the pipe E, it will create a suction upon the circulating-pipe and produce a much more rapid current through
 110 the same.

I designates pipes or conduits, one for all the right-hand sections of the boiler and one for all the left-hand sections thereof. The said
 115 pipes or conduits are shown as straight and provided with upwardly-projecting branches I', which are connected to the lower connecting pieces or chambers, D', opposite the ends of the pipes or tubes E through which is the downward circulation, so that the said pipes or conduits
 120 have a free communication with all the sections. Hence solid matters, which would otherwise

accumulate in the sections, will be deposited in the said pipes, which will thus serve the purpose of sediment-chambers. The said pipes or conduits are preferably provided with a removable head or blank flange, I², at each end, by removing which a clear opening is afforded directly through them, so that they may be easily inspected and all matter deposited therein can readily be removed.

10 The furnace as here shown is constructed with a bridge-wall, B', through which the pipes or conduits I extend; and as the sections behind said bridge-wall will be less exposed to the heat of the fire than the two sections in front of said
15 bridge-wall the connection of the pipes or conduits I with all the sections will tend to promote the circulation of water down through the sections behind the bridge-wall and up through the two sections in front thereof, each section
20 having meanwhile an upward and downward circulation in itself. All the sections may, however, communicate with one pipe or conduit in a manner similar to that in which they connect with the drum, or the two pipes or conduits might be connected with each other at
25 one or both ends.

What I claim as my invention, and desire to secure by Letters Patent, is—

30 1. The combination, with a steam-drum and a section comprising upright pipes or tubes arranged to provide for an upward and downward circulation, and a horizontally-extending piece or chamber at the upper end of said section, through which all said pipes or tubes commu-
35 nicate with each other, of a throat between the said connecting piece or chamber and said drum, and a circulating-pipe arranged within said throat and having one end opening into said drum and the other end projecting into
40 said connecting piece or chamber, substantially as and for the purpose specified.

2. The combination, with a steam-drum and a section comprising upright pipes or tubes arranged to provide for an upward and downward circulation, and a horizontally-extending
45 connecting piece or chamber at each end thereof, of a throat between the upper connecting piece or chamber and said drum, and a circulating-pipe arranged within said throat and having one end opening into said drum and
50 the other end passing through said upper connecting piece or chamber and opening into the pipe in which is the downward circulation, substantially as and for the purpose specified.

3. The combination, with a steam-drum and
55 a section comprising upright pipes or tubes and a horizontally-extending connecting piece or chamber at each end thereof, and fire-tubes passing through certain of the pipes or tubes to provide for an upward circulation therein,
60 of a throat between the upper connecting piece or chamber and said drum, and a circulating-pipe arranged within said throat and having one end opening into said drum and the other end projecting into said upper connecting piece
65 or chamber, substantially as and for the purpose specified.

4. The combination, in a steam-generator, with a steam-drum and a series of sections extending downwardly therefrom and each comprising pipes or tubes arranged to provide for
70 an upward and downward circulation, of a pipe or conduit communicating with the lower end of each section opposite the pipe which provides for a downward circulation, whereby I produce
75 an upward and downward circulation in each section and a circulation between the several sections, substantially as specified.

WILLIAM E. KELLY.

Witnesses:

HAYDN C. KELLY,
JOHN H. KELLY.