

J. BONNER.  
STEAM BOILER.

No. 549,266.

Patented Nov. 5, 1895.

Fig. 1.

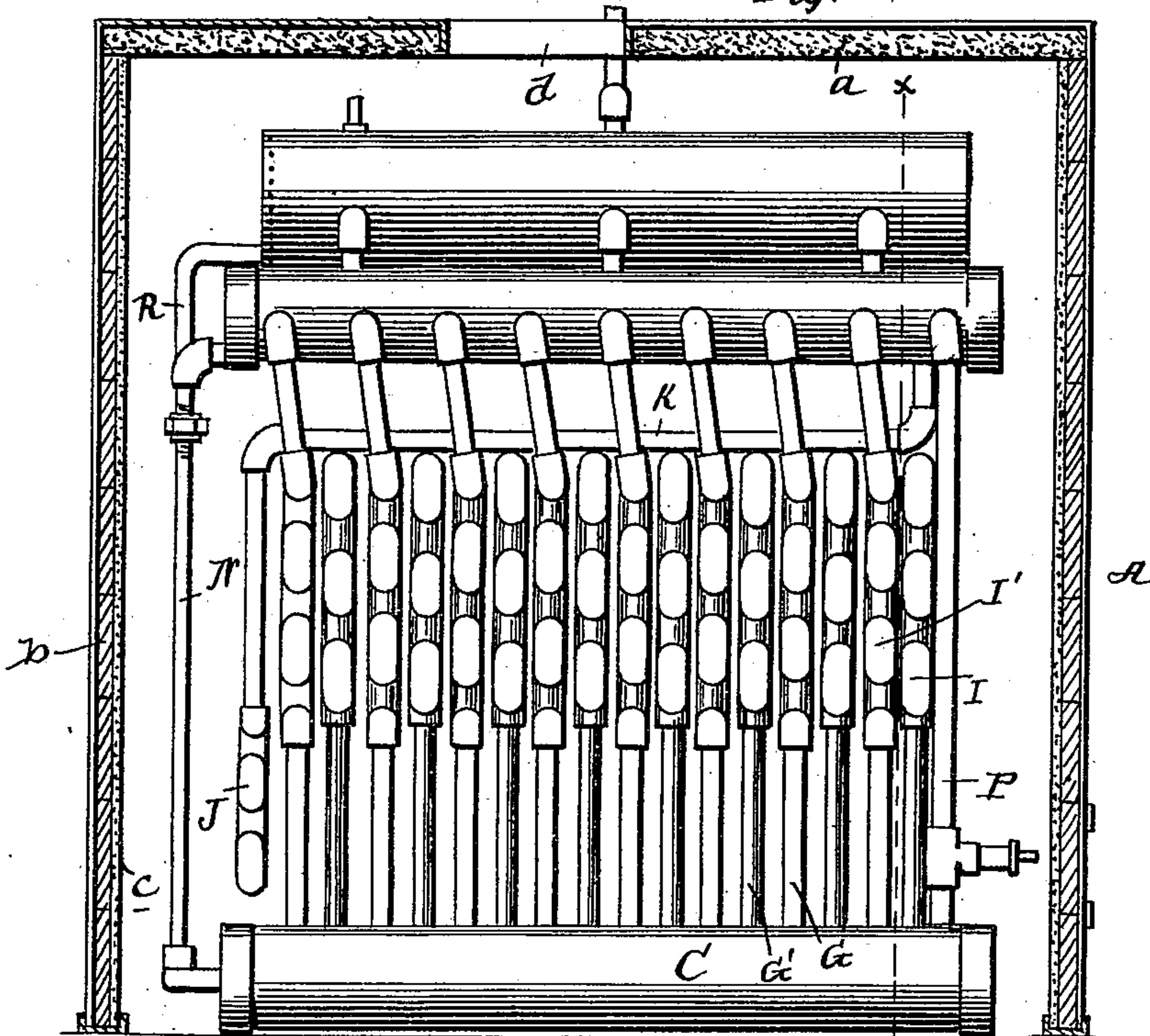
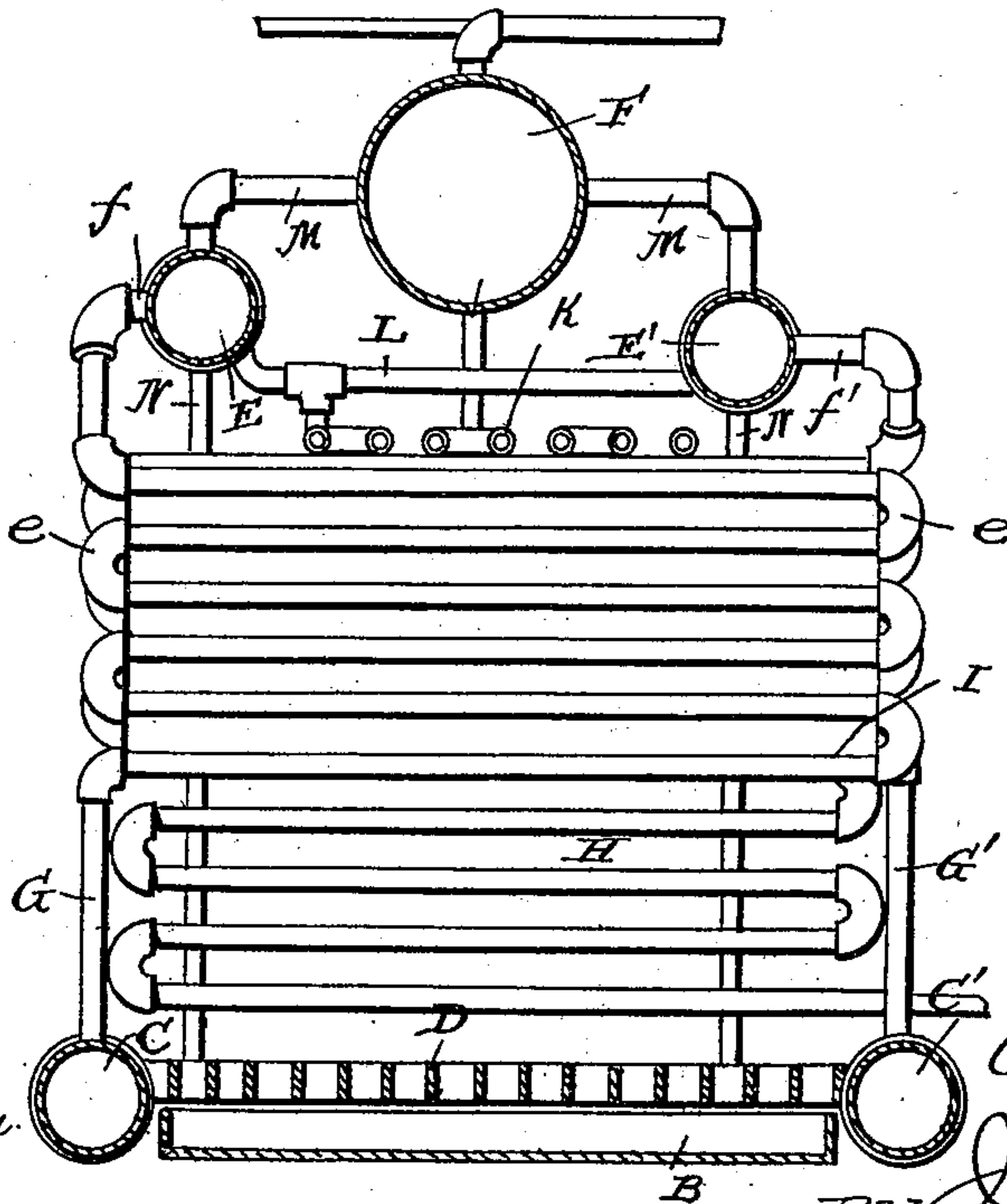


Fig. 2.



witnesses:

*C. H. Gauder*

*N. F. Matthews*

Inventor

*John Bonner*

*James J. Sheehy*

Attorney

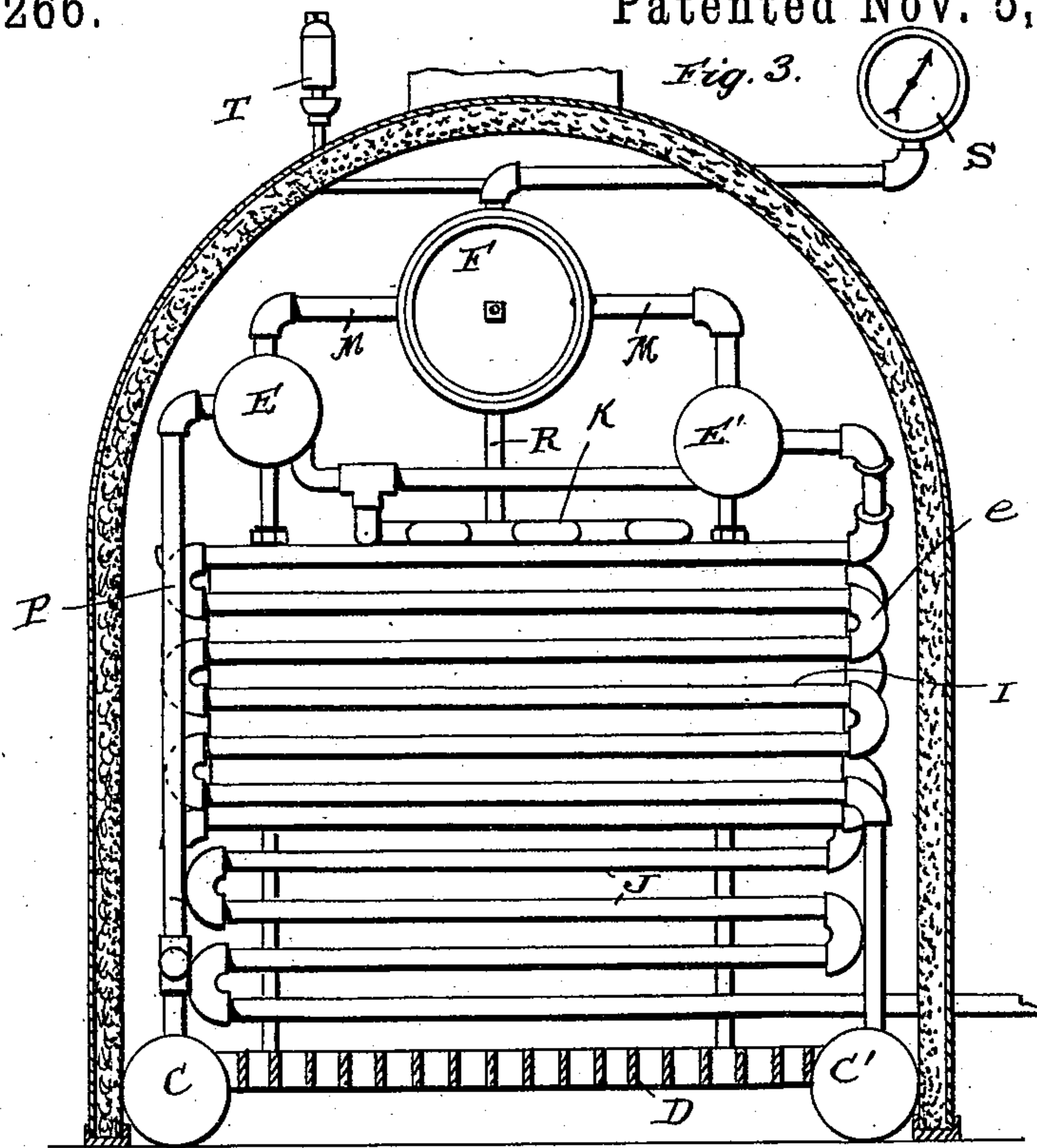
(No Model.)

2 Sheets—Sheet 2.

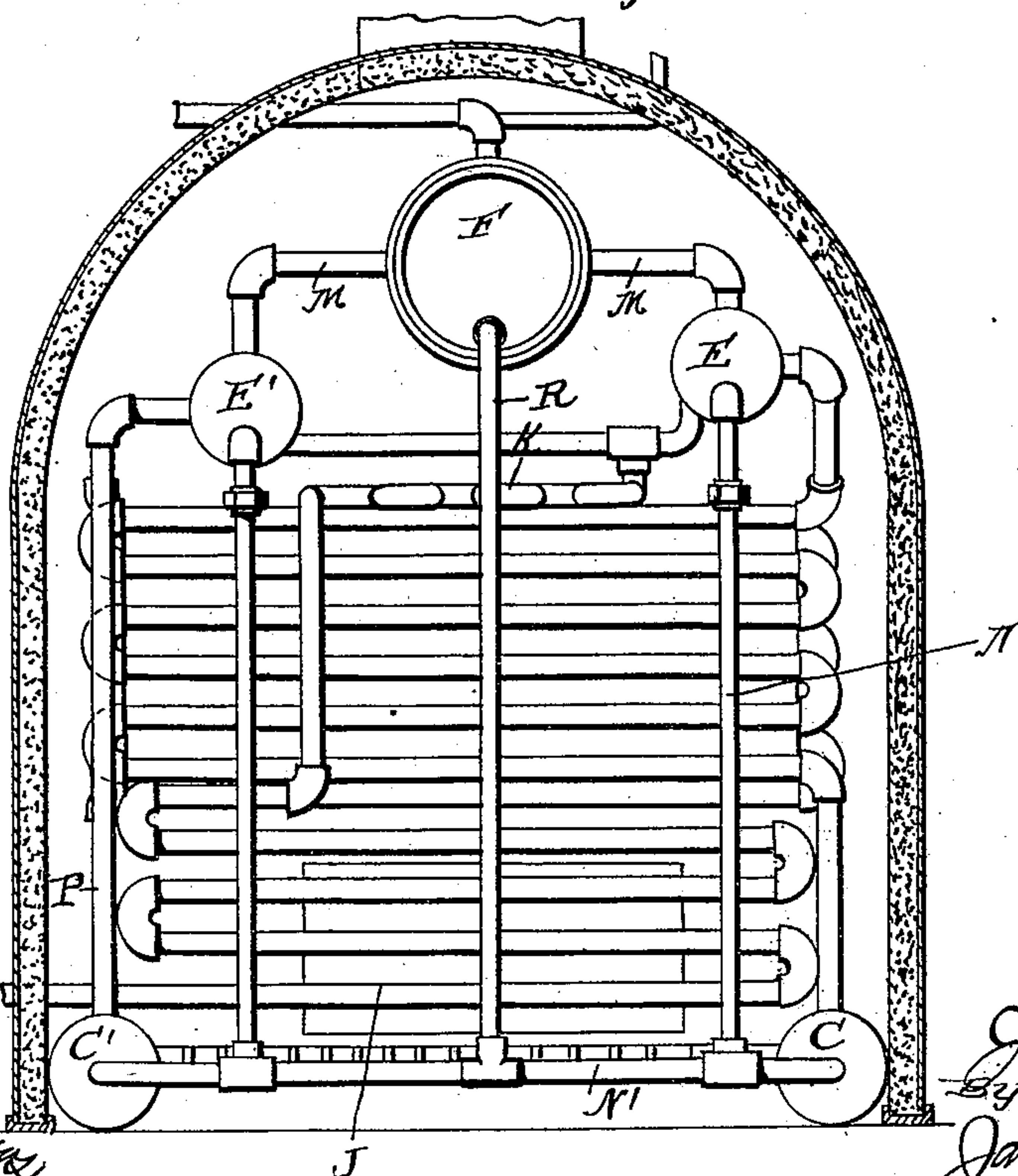
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*Fig. 4.*



Witnesses:

*C. H. Gaeder*  
*N. F. Matthews*

Inventor

*John Bonner*  
By *James J. Sheehy*  
Attorney



# UNITED STATES PATENT OFFICE.

JOHN BONNER, OF TIBURON, ASSIGNOR OF ONE-HALF TO CHARLES W. MOTT, OF SAN FRANCISCO, CALIFORNIA.

## STEAM-BOILER.

SPECIFICATION forming part of Letters Patent No. 549,266, dated November 5, 1895.

Application filed June 17, 1895. Serial No. 553,100. (No model.)

*To all whom it may concern:*

Be it known that I, JOHN BONNER, a citizen of the United States, residing at Tiburon, in the county of Marin and State of California, have invented certain new and useful Improvements in Steam-Boilers; and I do declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to improvements in water-tube steam-boilers; and it has for its general object to provide a very cheap, simple, and compact sectional water-tube boiler in which a thorough circulation may be maintained, and one in which a great amount of heating-surface and large grate-area are afforded and in which the steam is thoroughly separated from the water.

Another object of the invention is to provide a sectional water-tube boiler embodying such a construction that ready access may be had to all of the parts, which may be quickly and easily repaired when necessary.

Other objects and advantages of the invention will be fully understood from the following description and claims, when taken in conjunction with the accompanying drawings, in which—

Figure 1 is a side elevation of my improved boiler within its casing, which is shown in vertical section. Fig. 2 is a vertical transverse section of the boiler, taken in the plane indicated by the line *xx* of Fig. 1. Fig. 3 is a front elevation of the boiler with the casing in section, and Fig. 4 is a rear elevation of the boiler with the casing in section.

Referring by letter to said drawings, A indicates the casing of my improved boiler, which preferably has its side and top walls formed of sheet metal and lined with sheet-asbestos *a* and its front and rear walls formed of cast-iron and lined with bricks *b* of asbestos and fire-clay and sheet-asbestos *c*, and which also has an opening *d* in its top for the connection of a smoke-pipe.

B indicates an ash-pan, which is arranged at the bottom of the casing.

C C' indicate the mud-drums, which are preferably formed of hydraulic pipe and are arranged adjacent to the side walls of the casing.

D indicates the grate, which is connected to the inner sides of the mud-drums C C', as shown, and extends the full length thereof. 55

E E' indicate the separators, which are also preferably formed of hydraulic pipe and are arranged above the mud-drums about the proportional distance illustrated, and F indicates the superheater or steam-drum, preferably of hydraulic pipe, which is of about the proportional diameter illustrated and is arranged in a position slightly above and between the separators E, as shown. 60

Connected to and rising from the mud-drums C C' are vertical pipes G G', which extend upwardly a sufficient distance to form the sides of the fire-box H, where they are coupled to horizontal pipes I I', the pipes I being coupled to the pipes G and the pipes I' to the pipes G', so as to alternate with each other and extend transversely across the top of the fire-box H from side to side of the boiler, where by means of return-bends *e* the pipes I I' are carried back and forth above the fire-box H in the form of elongated coils until the ends of the uppermost pipes *f f'* of these coils enter the outer sides of the separators E E', as shown. 65 70 75

At the rear end of the fire-box H, I arrange the vertical return-bend coil J, which is connected with a source of feed-water supply and extends back and forth transversely across the boiler, so as to form the rear end of the fire-box H and in a measure protect the rear wall of the casing A from the action of the fire. This vertical return-bend coil J merges at its upper end into a horizontal return-bend coil K, which is arranged above the coils I I', so as to be heated by the heat and particles of combustion after they pass through the coils I I', and is connected by a pipe L with the separators E E', as illustrated. 80 85 90

The separators E E' are connected by pipes M with the superheater or steam-drum F, and said separators are also connected, preferably, at their rear ends, with the mud-drums C C', by pipes N N', which are smaller in size than the pipes G G, I I', for a purpose presently to be described. The separators E E' are further connected with the mud-drums C C' by pipes P, and the steam-drum or superheater F is also connected by the pipes R N' with the mud-drums, as shown, so that if 95 100



any water is carried over in the superheater by priming it will run back into the mud-drums.

S indicates an ordinary steam-gage, which is connected with the superheater or steam-drum F, and T indicates an ordinary whistle, which is also connected to the drum F, as shown.

In operation of my improved boiler the water, after passing through the feed-water heating coils J and K and the pipe L, enters the separators E E' and passes through pipes N N' and P into the mud-drums C C'. From the said mud-drums the water and steam rise through the pipes G G' and coils I I' into the separators E E', and from thence the steam and such water as may be carried therewith pass to the drum or superheater F, the water passing back from the superheater F through pipes R R', and from the separators E E', through pipes N, N', and P, to the mud-drums.

As before stated, and as shown in the drawings, the pipes N N' are smaller in diameter than the pipes G G' and I I'. This enables the pipes N N', by resisting the passage of the water, to prevent the water from being forced out of the pipes G G' I I' by the intense heat which would result in the pipes I I' being burned.

The pipes of my improved boiler are preferably formed by steam-pipe of best quality, and ordinary return bends and elbows of good quality are employed. It will therefore be appreciated that no novel styles of fitting are required for the construction of the boiler, and the same may be readily set up by a skilled gas or steam fitter, and may be as readily repaired by removing any desired section of pipe and replacing it by a new section.

It will also be appreciated that, while my improved boiler is very simple and compact, it is adapted to maintain a thorough circulation of water, and in consequence is capable of steaming quickly.

It will be further appreciated that by reason of the construction and arrangement of the parts of my boiler a great amount of heating-surface and large grate-area are afforded, which are important advantages.

Having described my invention, what I claim is—

1. In a sectional water-tube boiler, the com-

bination of a superheater or steam drum F, separators E, E', arranged on opposite sides of and connected by pipes with said superheater or steam drum F, mud drums C, C', and upflow-coils I, I', and downflow-pipes N, N', connecting said separators and mud drums; the downflow pipes N, N', being smaller in diameter than the upflow-coils I, I', substantially as and for the purpose set forth.

2. In a sectional water-tube boiler, the combination of a superheater or steam drum F, separators E, E', arranged on opposite sides of and connected by pipes M, with said superheater or steam drum F, mud-drums C, C', upflow-coils I, I', and down-flow pipes N, N', connecting said separators and mud drums, the vertical return bend-coil J, arranged transverse of the boiler at the back thereof and adapted to be connected with a source of water supply, and the horizontal return bend-coil K, connected with the coil J, and arranged above the upflow coils I, I' and connected with the separators E, E', all substantially as and for the purpose described.

3. A sectional water tube boiler comprising the casing, and the boiler or boiler proper arranged entirely within the casing and comprising the superheater or steam drum F, separators E, E', arranged on opposite sides of and connected by pipes M, with said superheater or steam drum F, mud-drums C, C', upflow-coils I, I', and downflow-pipes N, N', connecting said separators and mud drums, the vertical return bend-coil J, arranged transverse of the boiler at the back thereof and adapted to be connected with a source of water supply, the horizontal return bend-coil K, connected with the coil J, and arranged above the upflow coils I, I', and connected with the separators E, E', the pipes connecting the superheater or steam drum F, and the mud drums, the grate connected to and arranged between the mud drums, and the ash pan arranged beneath the grate, all substantially as and for the purpose set forth.

In testimony whereof I affix my signature in presence of two witnesses.

JOHN BONNER.

Witnesses:

JAMES L. KING,

WALTER N. KEMPSTON.