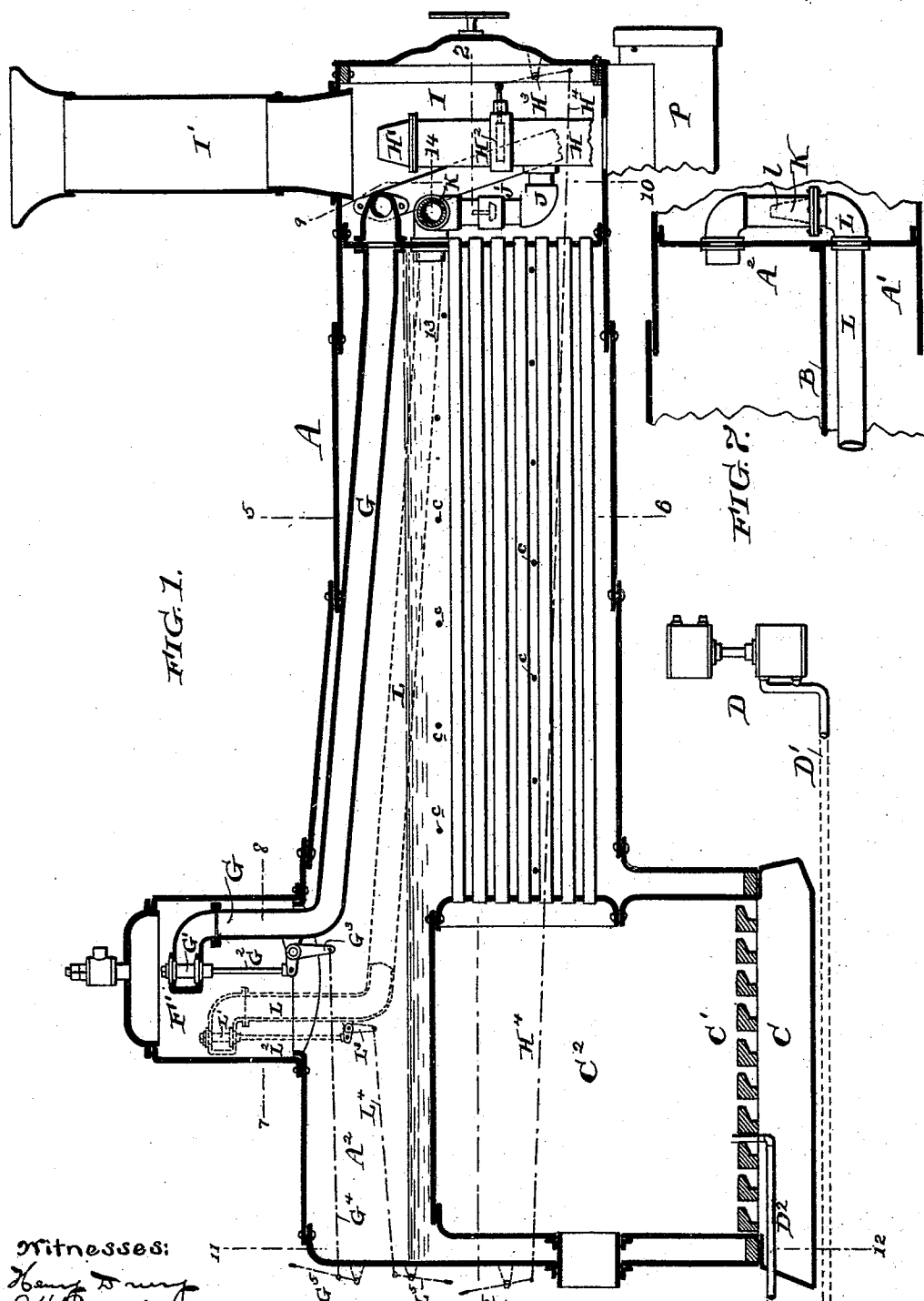


3 Sheets—Sheet 1.

No. 492,766.

Patented Feb. 28, 1893.



Witnesses:

Henry Denny
J. H. Russell

Inventors;

by their att. James T. Chambers

(No Model.)

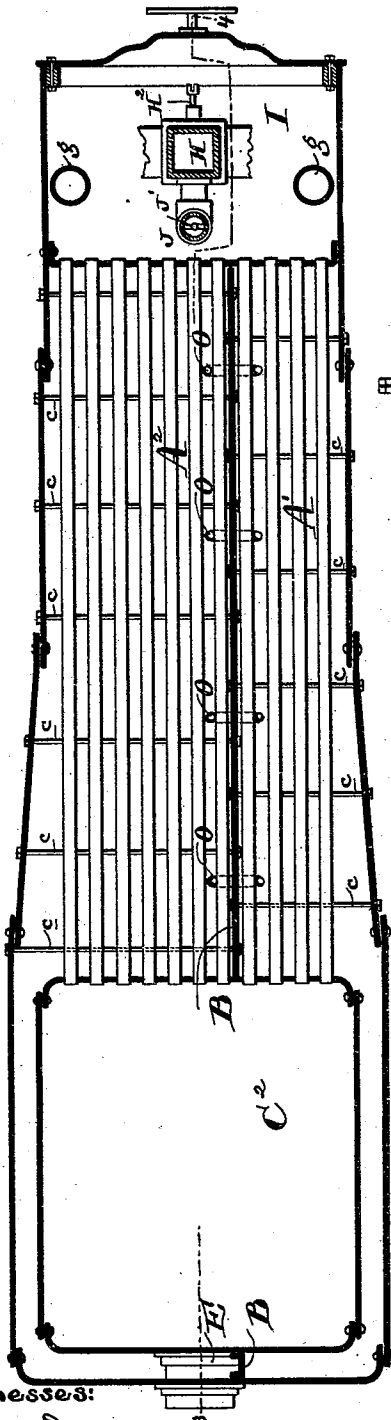
3 Sheets—Sheet 2.

D. A. REAGAN, F. D. SAUPP & A. A. HIBBS.
STEAM BOILER.

No. 492,766.

Patented Feb. 28, 1893.

FIG. 2.



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FIG. 4.

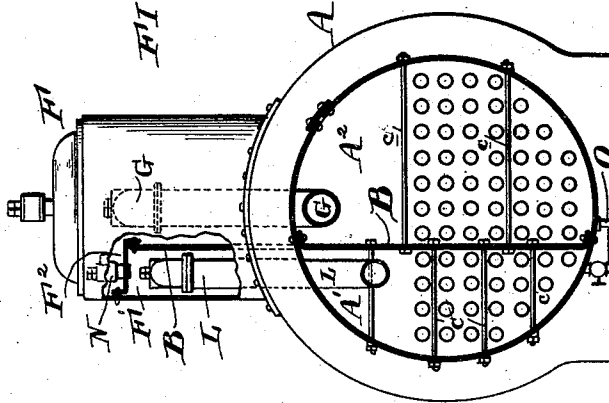
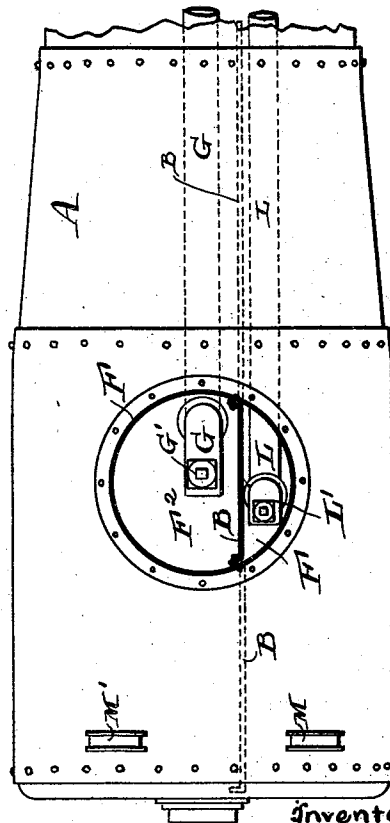


FIG. 3.



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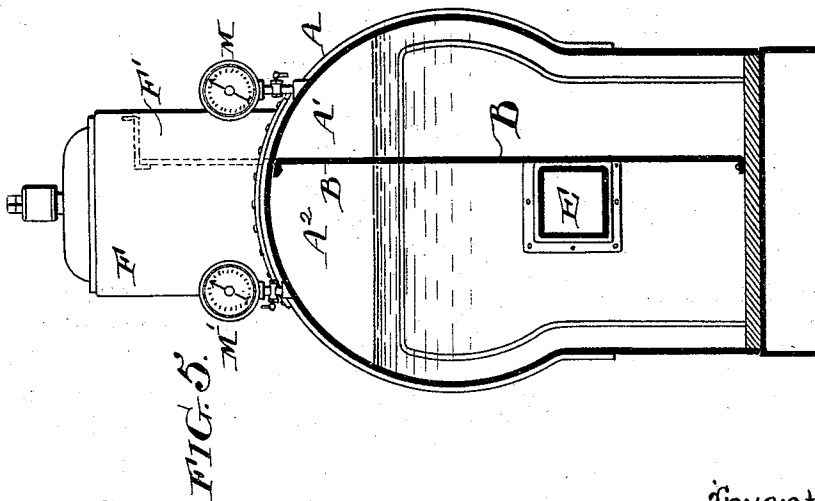
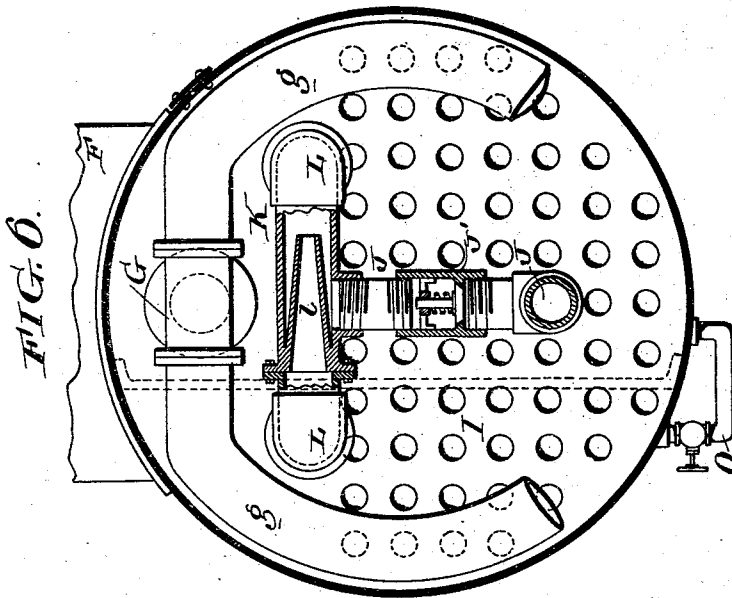
(No Model.)

3 Sheets—Sheet 3.

D. A. REAGAN, F. D. SAUPP & A. A. HIBBS.
STEAM BOILER.

No. 492,766.

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UNITED STATES PATENT OFFICE.

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HIBBS, OF ALTOONA, PENNSYLVANIA, ASSIGNORS TO THEMSELVES,
JOHN Z. KINCH, AND OLIVER H. ORMSBY, OF SAME PLACE.

STEAM-BOILER.

SPECIFICATION forming part of Letters Patent No. 492,766, dated February 28, 1893.

Application filed April 19, 1892. Serial No. 429,755. (No model.)

To all whom it may concern:

Be it known that we, DOMINICK A. REAGAN, FRANK D. SAUPP, and AUGUSTINE ARLINGTON HIBBS, all of Altoona, county of Blair, and State of Pennsylvania, have invented a certain new and useful Improvement in Steam-Boilers, of which the following is a true and exact description, reference being had to the accompanying drawings, which form a part of this specification.

Our invention relates to the construction and operation of steam boilers, and has for its object to economize steam and secure a better circulation of water.

An essential feature of our invention is of the use of two steam boilers containing steam of different pressure and combined with an engine so that the engine receives steam from the low pressure boiler and exhausts to a greater or less extent back into the same boiler. A jet of steam from the high pressure boiler being used to carry the exhaust steam back into the low pressure boiler. Preferably we construct our two boilers in a single shell, dividing it by means of partitions, and we secure a better circulation of the water by connecting the bottoms of the two boilers by small pipes so that water from the high pressure boiler is forced into the low pressure boiler. In this way a practical circulation of the water is secured in both boilers.

Our invention will be best understood as described in connection with the drawings in which it is illustrated, and in which—

Figure 1 is a longitudinal vertical section of a locomotive boiler constructed in accordance with our invention its fire box, smoke box, &c., taken on section line 3—4 of Fig. 2. Fig. 2 is a horizontal section taken on the line 1—2 of Fig. 1. Fig. 3 a plan view of part of the boiler, the dome being shown in section on the line 7—8 of Fig. 1. Fig. 4 is a cross sectional view on the line 5—6 of Fig. 1, a part of the dome being broken away to show its internal construction. Fig. 5 is a cross section on the line 11—12 of Fig. 1. Fig. 6 a cross section on the line 9—10 of Fig. 1. Fig. 7 a sectional view on the line 13—14 of Fig. 1.

A is the boiler shell which is divided into two boilers by means of partitions B, the part

marked A' being the high pressure boiler and the part marked A² the low pressure boiler.

C indicates the ash box, C' the grate and C² the fire box.

D is an air pump having a delivery pipe D' leading into the ash box as shown at D².

E is the fire door.

F is the dome, which like the rest of the boiler is divided by the partition B into a high pressure side F' and low pressure side F².

G is the steam pipe leading from the low pressure dome to the cylinder or engine indicated at P. The admission of steam to pipe G is regulated by a valve G', which, as shown has a stem G² connecting with a bell crank lever G³ which is connected by a rod indicated at G⁴ with a lever G⁵ at the front of the boiler.

H indicates the exhaust pipe leading from the cylinder or engine, as shown, it is brought up into smoke box I opening at H' beneath the stack I'. It is also provided with a valve H² by which its opening into the smoke box can be opened and closed at will. This valve is connected with a lever H³ which in turn is actuated by a connection indicated at H⁴ and leading to a lever H⁵ at the front of the boiler. Below the valve H² a conduit J leads up from the exhaust pipe, and to a pipe or conduit K which enters the low pressure side A² of the boiler, and valve J' situated in the conduit J prevents the escape of steam, but opens freely when the suction tending to draw the exhaust into the boiler overcomes the pressure of steam in the boiler.

L is a steam pipe leading from the high pressure side of the dome into the pipe K having a nozzle l so situated in said pipe K as to form with it an ejecting device, the nozzle l and the pipe K being in effect and in connection with the pipe J an ejector of a familiar character. The admission of steam to pipe L is regulated by a valve L', the stem L² of which connects with one arm of a lever L³, from the other arm of which a connection L⁴ leads to a lever L⁵ at the front of the boiler.

The operation of the device above described can be readily followed. Steam from the low pressure side of the boiler passes through pipe G to the cylinder, and the exhaust from the cylinder passes through a conduit at the

nozzle H' into the stack as long as the valve H² is open and no opposing force diverts its issue. When we desire, however—to carry the exhaust steam back into the low pressure boiler, we permit the high pressure steam to pass into the pipe L, thence through the nozzle l into the pipe K, and thence to the low pressure side of the boiler. The high pressure steam creates a strong suction in the pipe K and its connected pipe J, and this suction draws the exhaust steam into pipe J lifting the valve J' and the mixed high pressure and exhaust steam pass back into the low pressure boiler. The valve H² is of course closed at the same time that the ejector is set in operation.

Referring now to another feature of our invention O O O, &c. indicate small pipes leading from the bottom of the high pressure boiler to the bottom of the low pressure boiler. These pipes are quite small as their function is not necessarily to supply the low pressure boiler with water, but merely to cause jets of water forced out of the high pressure boiler to be forced upward in the low pressure boiler. The advantage of this is two-fold; first, because it causes a downward movement of the water in the high pressure side, and second—because it causes an upward movement of the water in the bottom of the low pressure side: in this way the cold and hot water in each side of the boiler are thoroughly and efficiently mixed together and the efficiency of the boiler materially increased.

We have also shown in Fig. 4 of the drawings an automatic valve N which may be of any usual kind, and which will permit the escape of steam from the high pressure to the low pressure side whenever the pressures vary beyond a normal standard; this is intended for use especially when the pipes O are employed for creating circulation as above described.

played for creating circulation as above described.

In order to provide a draft in the locomotive fire box we have shown a pipe D' leading from air pump D to the fire box.

Having now described our invention, what we claim as new, and desire to secure by Letters Patent, is—

1. The combination of two boilers containing steam at different pressure, a steam conduit leading from the low pressure boiler to an engine, an exhaust conduit having an escape controlled by a valve and a connection J K leading to the low pressure boiler from a point below said valve, and a steam conduit leading into the connection K from the high pressure boiler and forming an ejector as described.

2. The combination of high and low pressure boilers arranged as described so that the low pressure boiler receives steam in part from the high pressure boiler, and water pipes O connecting the bottoms of the two boilers, so as to effect a vertical circulation therein, substantially as specified.

3. A boiler shell A divided into high and low pressure divisions A' and A², an engine, a steam conduit leading from the low pressure division to the engine, an exhaust and a connection therefrom to the low pressure boiler and a steam conduit leading from the high pressure boiler to said connection and forming an ejector therewith to force the exhaust steam in against the boiler pressure.

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