No. 666,392. Patented Jan. 22, 1901.

J. PLAYER.

LOCOMOTIVE BOILER.

(Application filed Apr. 25, 1900.)

(No Model.)

7 Sheets—Sheet 1.

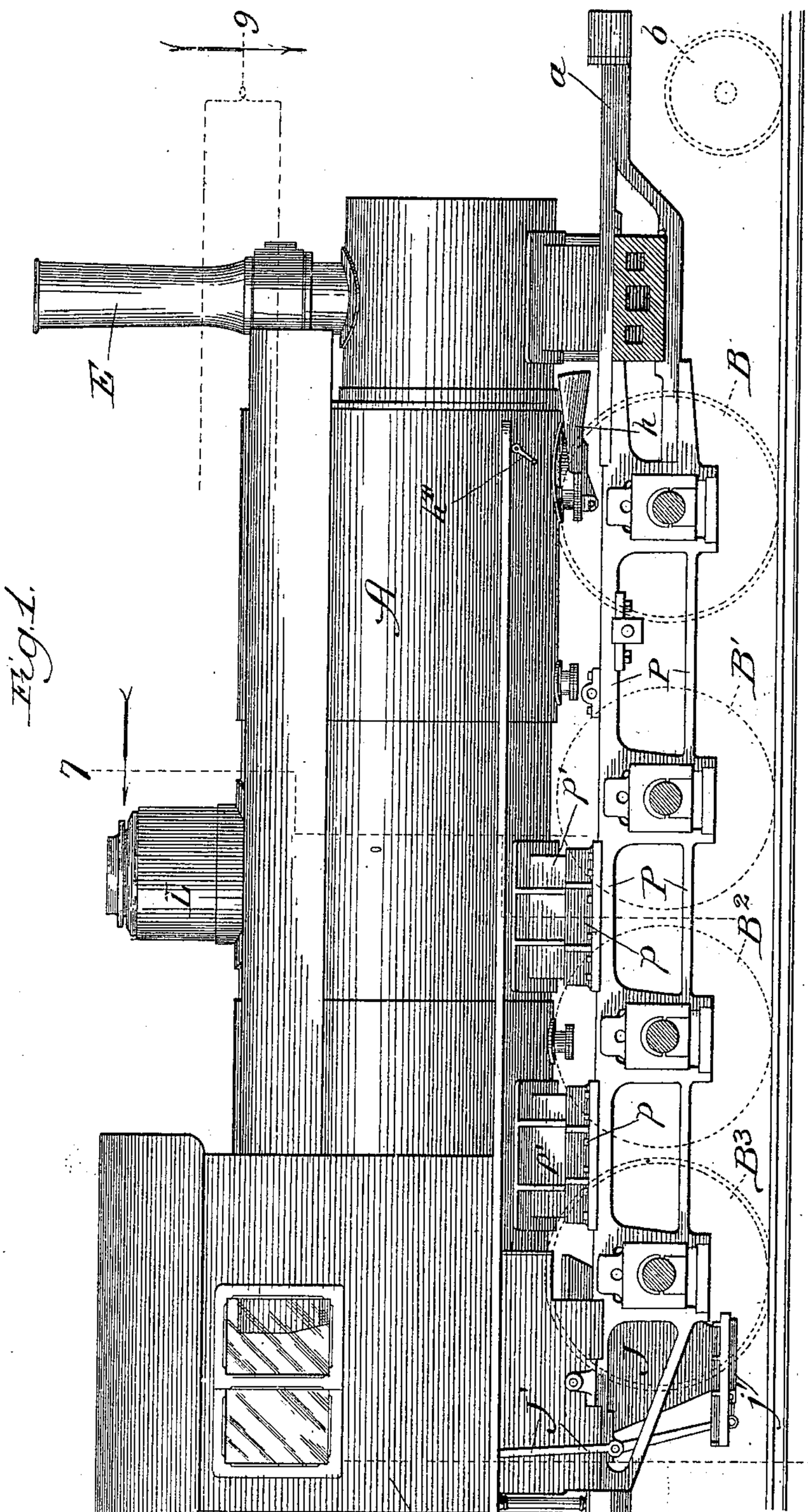

Fig. 1.

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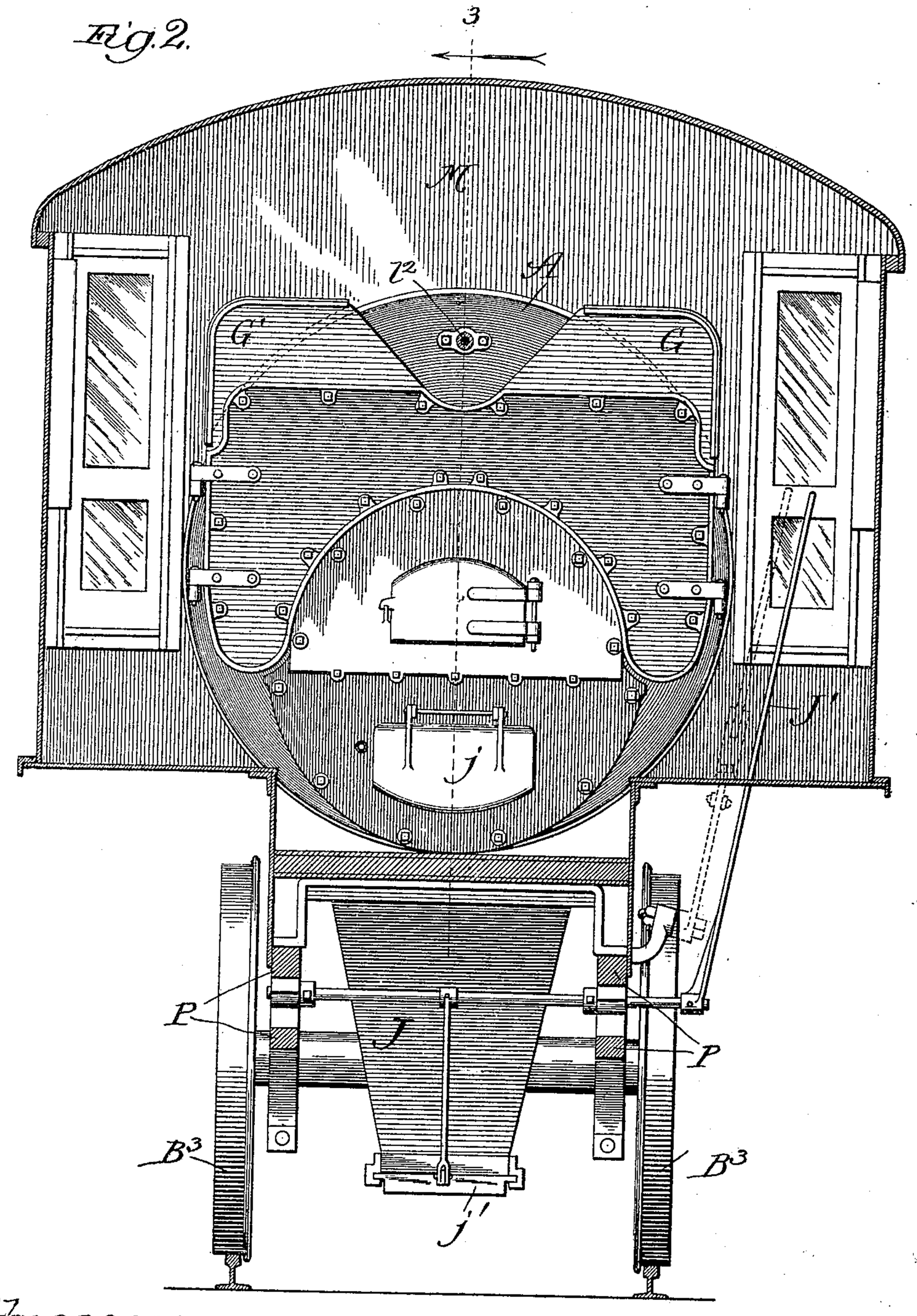
Fig. 2.



Witnesses:
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7 Sheets—Sheet 3.

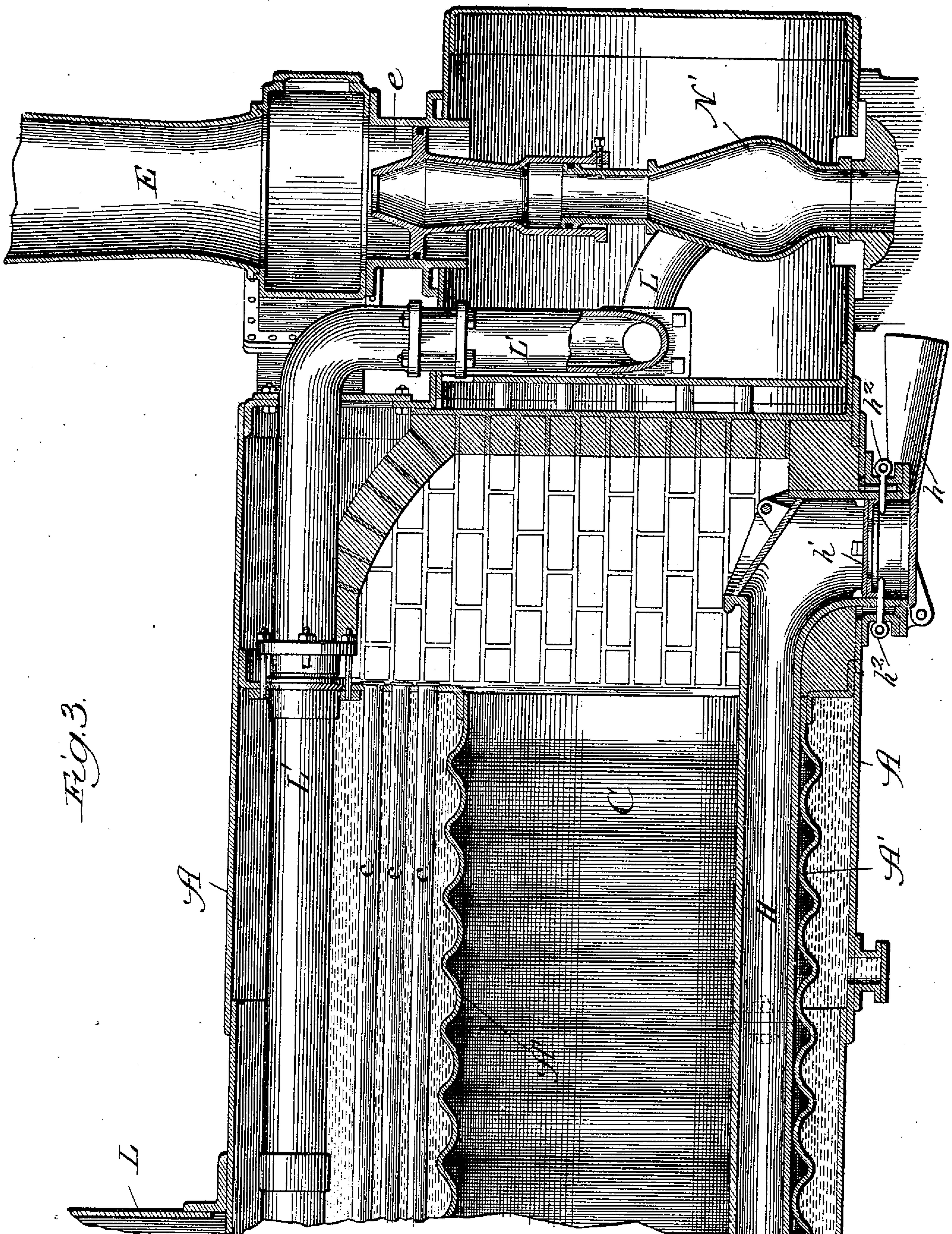

Fig. 3.

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THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

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(No Model.) 7 Sheets—Sheet 4.

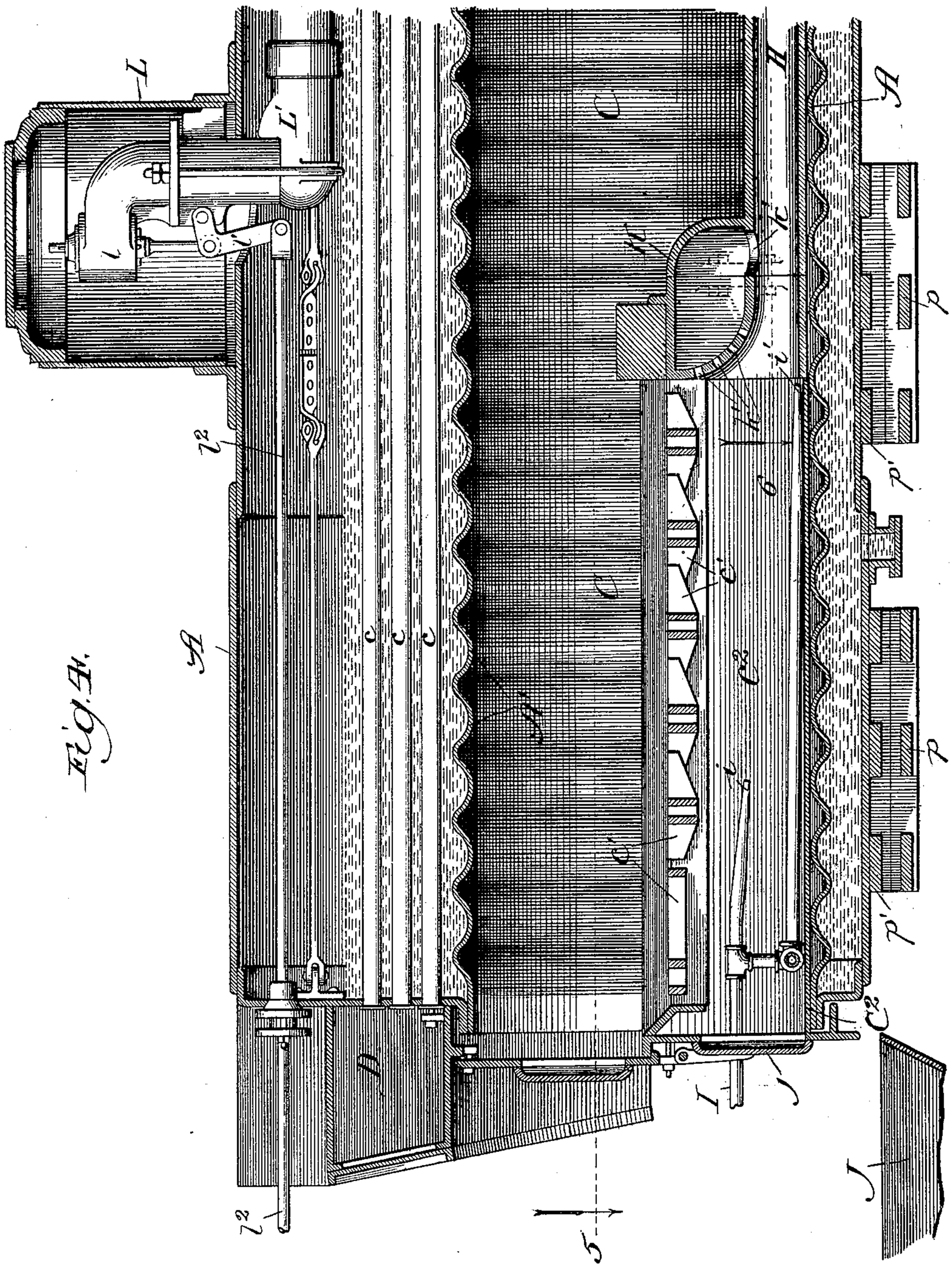

Fig. 4.

Witnesses,
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Fig. 5.

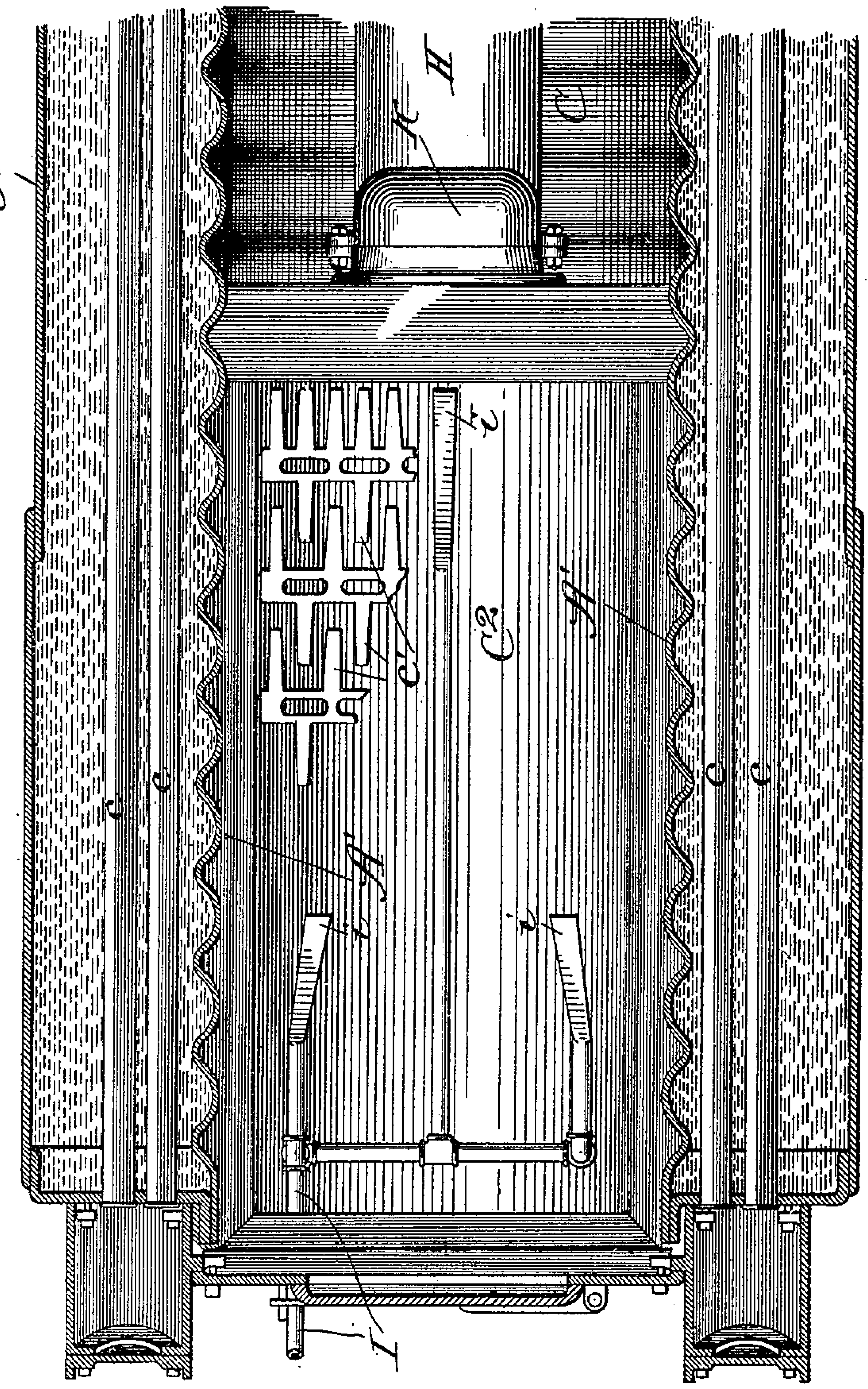
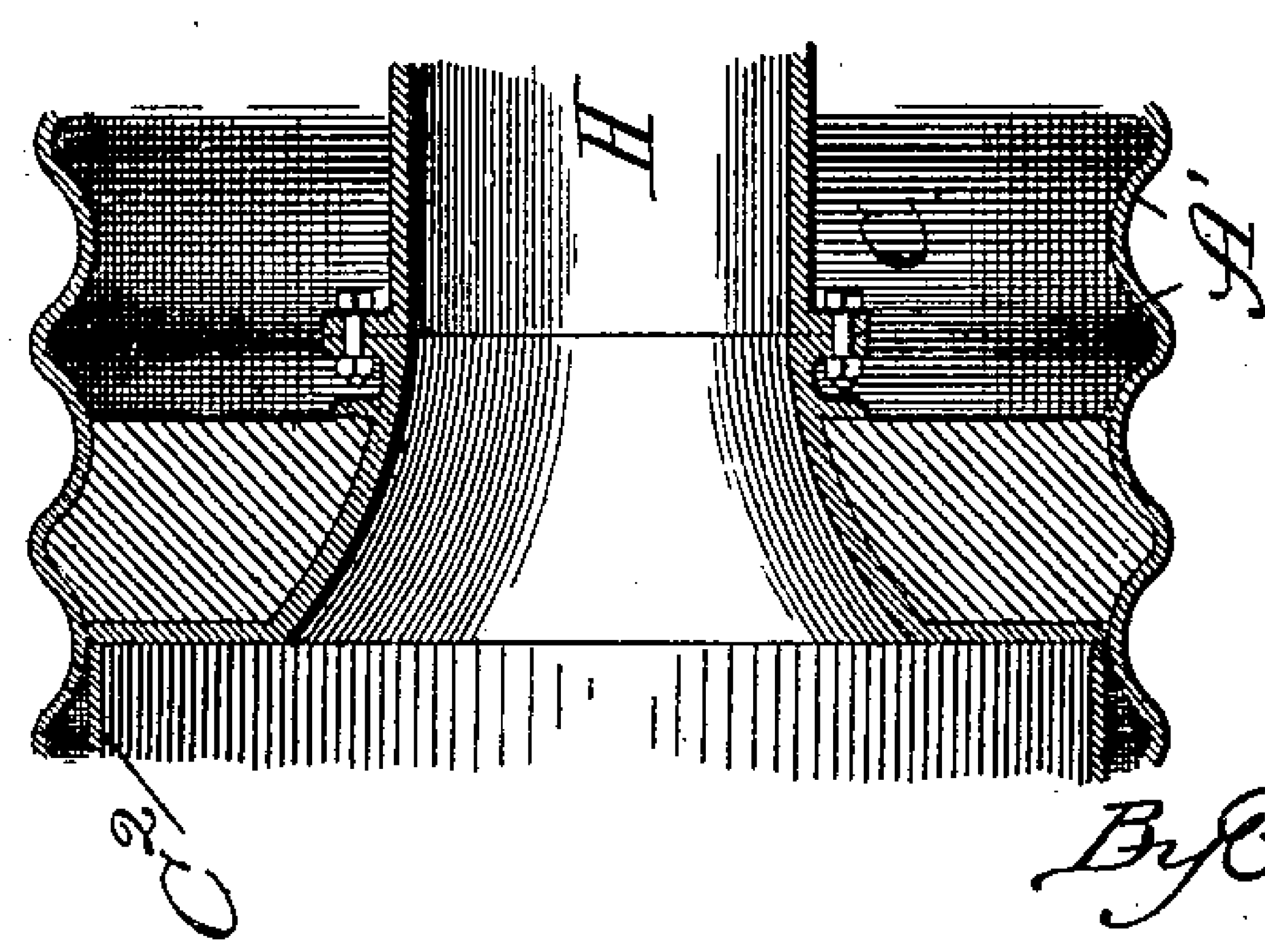


Fig. 6.



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(Application filed Apr. 25, 1900.)

(No Model.)

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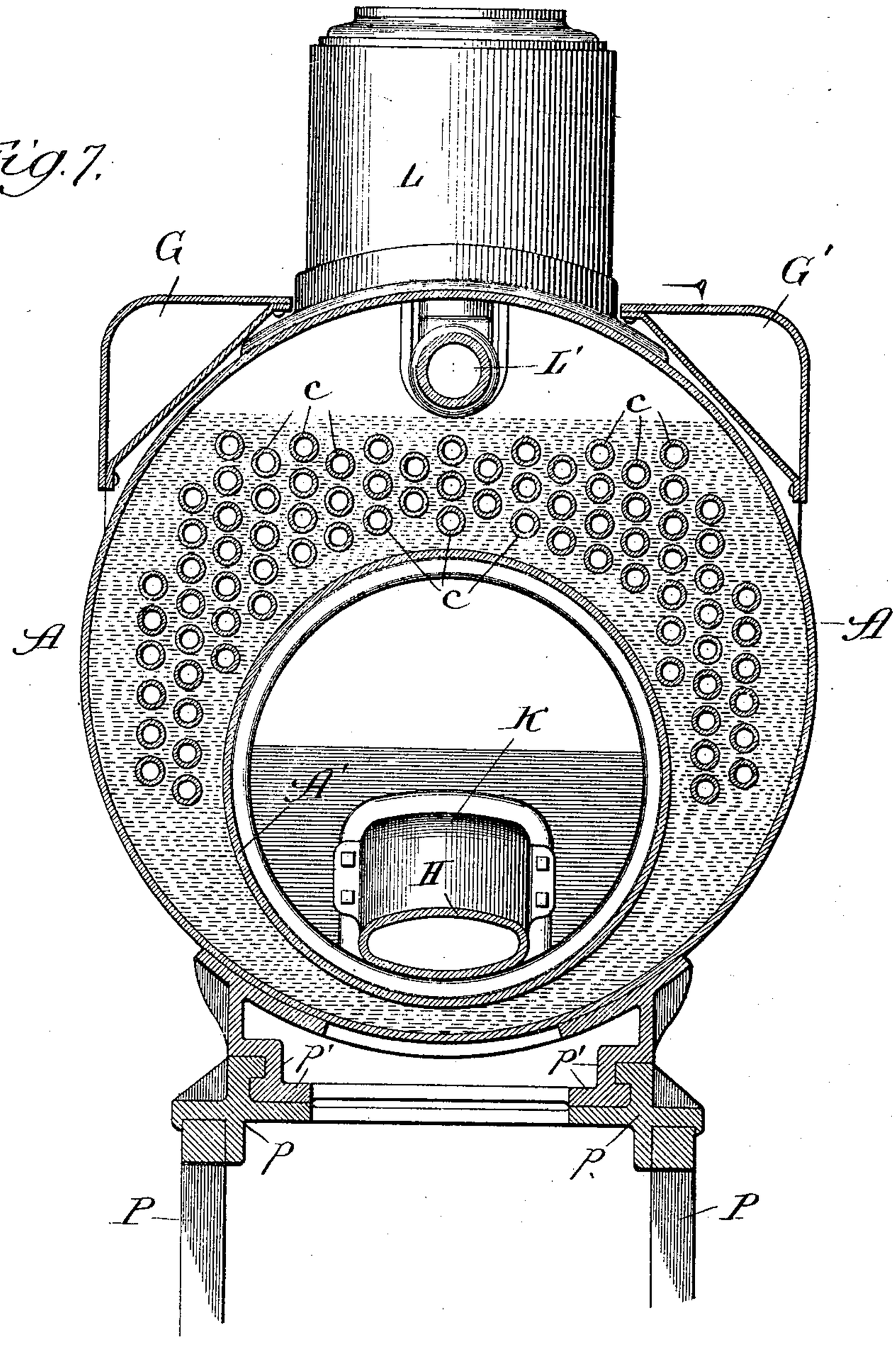
Fig. 7.



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(Application filed Apr. 25, 1900.)

(No Model.) 7 Sheets—Sheet 7.

Fig. 8.

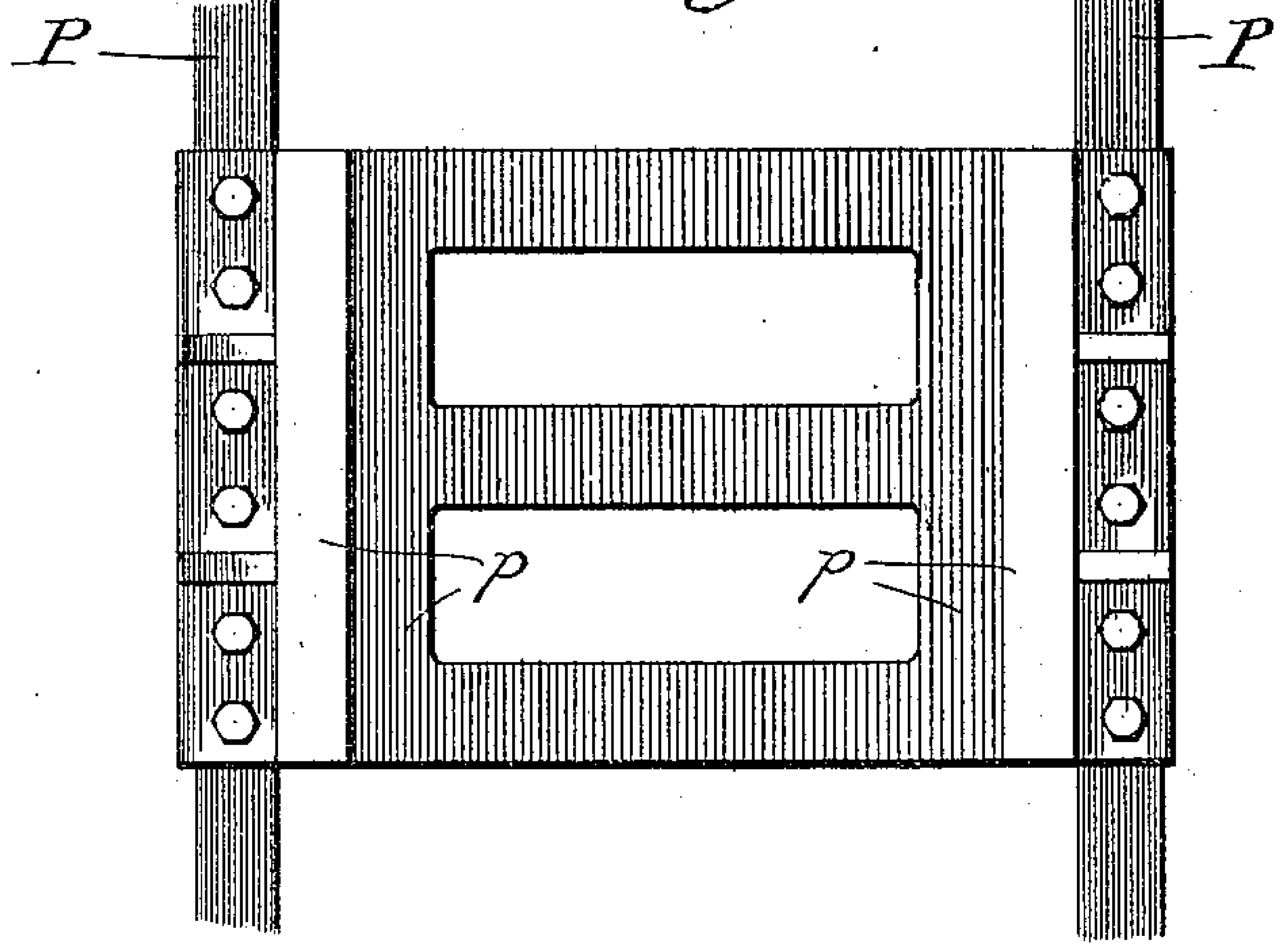
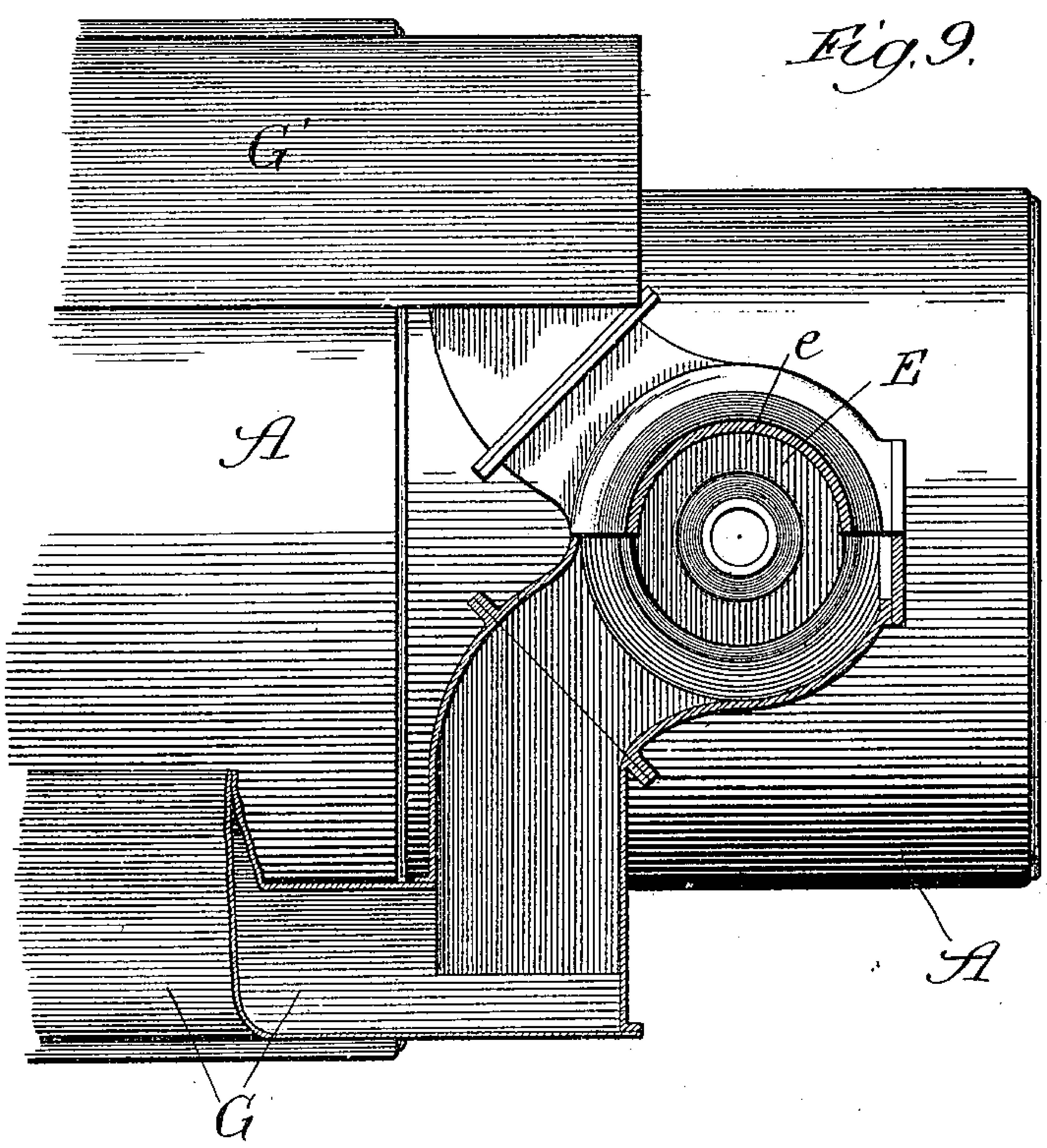


Fig. 9.



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Chas. E. Gaylord,
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UNITED STATES PATENT OFFICE.

JOHN PLAYER, OF TOPEKA, KANSAS.

LOCOMOTIVE-BOILER.

SPECIFICATION forming part of Letters Patent No. 666,392, dated January 22, 1901.

Application filed April 25, 1900. Serial No. 14,212. (No model.)

To all whom it may concern:

Be it known that I, JOHN PLAYER, a citizen of the United States, residing at Topeka, in the county of Shawnee and State of Kansas, have invented certain new and useful Improvements in Locomotives, of which the following is a specification.

The invention relates to that class of locomotives in which steam is generated for the purpose of furnishing the required energy to drive the same.

It relates, further, to the particular construction and arrangement of the boiler.

The principal object of the invention is to provide a simple, economical, and efficient locomotive.

A further object of the invention is to provide a locomotive-boiler of such construction and arrangement as to obtain the greatest efficiency in the generation of steam from the amount of fuel consumed.

Further objects will appear from an examination of the drawings and the following description and claims.

The invention consists principally in the combination, with a locomotive, of a boiler provided with a substantial axial combustion-chamber extending from end to end and through the water-space thereof, one end of which is provided with a fire-chamber.

The invention consists, further, in the combination, with a locomotive, of a boiler provided with a substantial axial combustion-chamber extending from end to end through the water-space thereof, one end of which is provided with a fire-chamber and with a large return flue or flues extending lengthwise of the boiler and outside of the same.

The invention consists, further, in the combination, with a locomotive, of a boiler having a substantial axial combustion-chamber extending from end to end through the water-space thereof, one end—the front—of which forms the fire-chamber, fire-tubes extending lengthwise through the water and steam space of the boiler to carry the heated gases and products of combustion back through such space to the front of the boiler, and a large return flue or flues extending lengthwise of the boiler, outside of the same, and connecting all of the fire-tubes with the smoke-stack.

The invention consists, further and finally, in the combinations, features, and details of construction hereinafter described and claimed.

In the accompanying drawings, Figure 1 is a side elevation, partly in section, of a locomotive constructed in accordance with my improvements. Fig. 2 is a cross-sectional elevation taken on line 2 of Fig. 1 looking in the direction of the arrow. Fig. 3 is an enlarged longitudinal sectional view of a portion of the boiler, taken on line 3 of Fig. 2, looking in the direction of the arrow. Fig. 4 is a similar view to Fig. 3 and forming a continuation of the same. Fig. 5 is a plan sectional view of the fire box or chamber and other parts, taken on line 5 of Fig 4, looking at it from above. Fig. 6 is a sectional detail of the combined draft and ash-discharging tube, taken on line 6 of Fig. 4, looking in the direction of the arrow. Fig. 7 is an enlarged cross-sectional view taken on line 7 of Fig. 1 looking in the direction of the arrow. Fig. 8 is a detail plan view of the compensating-saddle mechanism which supports the boiler in operative position and permits the expansion and contraction of the same along parallel longitudinal lines; and Fig. 9 is an enlarged plan sectional detail of the large return-flues for the heated gases and products of combustion, showing their connection with the smoke-stack and taken in two different horizontal planes, as shown by line 9 of Fig. 1, looking from above.

In the art to which this invention relates it is well known that the American locomotive of this day is the result of a step-by-step building-up process—that is, it has attained its present splendid condition as the result of a multitude of step-by-step improvements extending over a comparatively long period of time. In this art the type of boiler in present use has practically become recognized as the only type of boiler fit for use in connection with a locomotive and is also the resultant product of many improvements by many men.

Without desiring to detract in the least from the splendid results now shown in one of the latest American locomotives, it is still well known that there are some objections to the same. The first and most serious objec-

tion is the position and size of the fire-box, limiting the location of the drive-wheels and the distribution of the weight of the parts. The second is the construction of the boiler and its combination with the fire-box or chamber, which produces the most heat practically outside of the boiler or against a small crown-sheet, which as a consequence is liable to disruption under boiler-pressure and the loss of some of the evaporative energy of combustion. Without dilating on other minor objections which are and always will be found in all classes of mechanisms, I will say that my improved locomotive has been designed with the view of removing the principal objections inherent in the present type of locomotive and which have been demonstrated by practical locomotive tests. I have accomplished this by providing a locomotive which is a radical departure in construction and arrangement from the present well-known type, as will appear from the following description and a careful examination of the drawings.

In illustrating and describing my improvements I have only shown and described those parts which I consider new, in connection with so much as is old as will properly disclose the invention and enable those skilled in the art to practice the same, leaving out of consideration other and well-known mechanisms which, if shown and described herein, would only tend to confusion, prolixity, and ambiguity.

In the construction of a locomotive in accordance with my improvements I use a boiler A, which is practically a long continuous cylindrical shell from one end to the other and which does not have in its objectionable sense the low-depending fire-box so commonly and uniformly used at the present date. This construction permits of the use of the drive-wheels B, B′, B^2, and B^3 of any desired size and the arrangement thereof at the desired places to suit all of the circumstances and conditions. An inspection of Fig. 1 will show that the drive-wheels are so arranged as to take care of the even distribution of the weight of the engine, merely using the small wheels *b* to support the pilot-frame *a* and act as a guide to the drive-wheels. It will also be seen that the drive-wheels B^2 and B^3 are arranged at about the space usually occupied by the old fire-box and that not only is the distribution of the weight obtained in a more efficient manner, but that a steadier-running and neater appearance may also be obtained.

To provide for the maximum results from the combustion of the fuel and a greater consequent steam generation per pound of fuel used, a second cylindrical shell A′ is used and inserted axially through the boiler from end to end. This second shell is inserted with its axis eccentric to the main shell and preferably corrugated circumferentially, so as to greatly strengthen it and enable it to withstand high boiler-pressure with little or no staying. An inspection of Figs. 3 and 4 will show that this second shell forms a substantial axial opening or combustion-chamber through the water-space of the boiler from end to end thereof and that the fire-box C is located at the back end of the same. The combustion-chamber is entirely encircled by the water-space throughout its length; but the ends thereof are not enveloped within the water-space longitudinally. This is shown in Figs. 3, 4, and 5. The corrugated surface of this inner second shell, while greatly strengthening resistance to high boiler-pressure, also presents a greater surface for contact by the heated gases and products of combustion, and thus enables a high efficiency of fuel to be obtained. The heated gases pass forward through this axial opening to the front of the boiler and thence rearwardly through the fire-tubes *c* to the front of the boiler into a smoke-box D, which connects the front end of the fire-tubes together.

The locomotive is provided with the usual smoke-stack E at the front end, out through which the heated gases and products of combustion should pass with the exhaust-steam. In order to accomplish this result, the smoke-box of the locomotive is connected with the smoke-stack by means of two large return-flues G and G′, which extend lengthwise of the boiler in the outer upper side thereof, one to each side of the longitudinal center. These large return "smoke-flues" are placed practically in contact with the outer shell of the boiler, so that heat may be exhausted from the gases and products of combustion before they pass out through the stack.

From the foregoing description and an examination of the drawings it will be seen that a greater amount of the heat resulting from the combustion of the fuel can be utilized to generate steam than in the locomotive now in use, and, further, that as a consequence there is less of the objectionable features of sparking, to the danger of the adjacent country.

The front end of the boiler is provided with a fire-brick lining c^3 to enable it to withstand the high temperatures resultant from perfect combustion and also retain a large amount of heat which would otherwise pass out through the stack. The fire-box hereinbefore referred to is provided with the usual grate-bars *c*′, upon which the fuel is placed, and these bars are supported upon a frame portion C′, which is secured to or supported in a semicylindrical shell C^2 at the upper part thereof. The space formed between the lower part of this semicylindrical shell and the under surface of the grate-bars forms the ash-pit c^2, and the shell furnishes a smooth surface, over which the ashes may be forced or scraped.

It is highly desirable to furnish means by which an artificial draft may be obtained, and that by the movement of the train, and also to provide means for discharging the ashes when the engine is in motion or standing still. In order to accomplish this result, a combined draft and ash-discharging tube H is

provided. This tube is arranged lengthwise of the boiler on the inside of the inner shell and opens into the ash-pit below the grate-bars, as shown in Fig. 4. It is dropped down at the rear end of the boiler, so as to extend out through the same, and its outer end is provided with a scoop h, hinged thereto, so that it can swing open any desired amount and obtain the desired amount of draft. A closing-plate h' may be used and held in place by the pins h^2, (shown in Fig. 3,) so as to cut off the artificial draft entirely. The scoop may be operated from the cab of the locomotive by using rods and bell-cranks, all of which is easily understood.

The discharge of the ashes is effected by using a pipe I, connected with a suitable source of fluid-pressure, such as steam or water, and providing it with several nozzles i, arranged to force the ashes into and through the discharge-tube, as shown in Figs. 4 and 5.

It is possible that the ashes might choke the throat or opening in the discharge-tube, and thus prevent the obtaining of the artificial draft above described. To prevent this objectionable feature, a hollow cross-bar K is used having one or more openings k inside the ash-pit and another opening or set of openings K′ in the passage, so that should the "throat" be choked the draft could still pass through these openings, around the obstruction, and into the ash-pit, and then up into the fire-box to assist in the combustion of the coal. The brick-lined space of the boiler is connected with the ash-discharging tube directly in line with the outlet thereof and is provided with a gate h^3, which may be operated from the outside by means of a bell-crank h^4.

It is often desired to dump the ashes by manual labor, and for this purpose an ash-hopper J is provided (see Figs. 3 and 4) and arranged in the back of the ash-pit, so that a door j may be opened and the ashes drawn out of the pit to fall in the hopper. A lever J′ extends from the cab downwardly and connects with a slide j' at the bottom of the hopper, so that the fireman can dump the same whenever it is necessary.

The boiler is furnished with the usual steam-dome L, in which the throttle-valve l is located and from which the steam-supply pipe or pipes L′ lead to the engine-cylinder. (Not shown.) The throttle-valve is of the usual construction and is operated from the cab M by means of the bell-crank l', rod l^2, and usual throttle-lever. (Not shown.)

The exhaust-nozzle, which leads from the engine-cylinders, (not shown,) is made in two parts N and N′, arranged in axial alinement with the smoke-stack. The upper part is adjustably mounted on the lower part and is snugly, as well as adjustably, fitted in the smooth cylindrical bore e of the lower part of the stack, all of which will be appreciated by those skilled in the art.

It is well known that the locomotive-boiler is liable to contract and expand under radical changes in temperature, and to provide means for taking care of this, and thus preserve the efficiency of the parts, the frame P of the engine has one or more saddles p secured thereto, in which slides p', secured to the boiler, are movably or slidingly mounted. By this means it will be seen that the boiler is permitted to expand or contract along parallel longitudinal lines.

The description above given contains the description of a complete locomotive constructed in accordance with my improvements, and this full description is for the purpose of disclosing the complete invention to those skilled in the art and enabling them to practice the same. An examination of the claims, however, will show that all of the mechanisms described herein are not claimed in this application, but form the subject-matter of three separate applications, which are subdivisions hereof and which were filed on the 30th day of June, A. D. 1900, Serial Nos. 22,121, 22,122, and 22,123.

I claim—

1. In a locomotive, the combination of a boiler provided with a substantial axial combustion-chamber extending through the water-space and from end to end thereof and encircled thereby, the front end of which combustion-chamber forms a fire-chamber and the remainder a passage for the products of combustion, and fire-tubes extending through the water-space and connecting with the smoke-stack to furnish a continuation of the passage for the products of combustion, substantially as described.

2. In a locomotive, the combination of a boiler provided with a substantial axial combustion-chamber extending through the water-space from end to end thereof and encircled thereby and with a fire box or chamber located in the front end thereof, a smoke-stack arranged at the rear or other end of the boiler, fire-tubes extending lengthwise of the boiler through the water-space thereof connected together with a smoke-box at their front ends and connected with the axial opening at their rear ends, and flue mechanism connecting the smoke-box with the stack outside the water-space of the boiler, substantially as described.

3. In a locomotive, the combination of a boiler provided with an axial combustion-chamber extending through the water-space of the boiler from end to end thereof and encircled thereby and with a fire-box located in the back end of the same, a smoke-box on the front end of the boiler, fire-tubes extending through the water-space of the boiler and connecting the front end of the combustion-chamber with the smoke-box, a smoke-stack on the front or end of the locomotive or end opposite the smoke-box, and two flues arranged outside of and on the upper side of the boiler—

one each side of a longitudinal line—connecting the smoke-box with the smoke-stack, substantially as described.

4. In a locomotive, the combination of a boiler composed of an outer cylindrical shell, an inner cylindrical shell extending longitudinally through it, the axial opening of which forms the combustion-chamber and the space between the shells forming the water and steam space of the boiler, a fire-box formed in and partly by the walls of the combustion-chamber, a smoke-box in the front end of the boiler, fire-tubes extending through the water-space and connecting the rear end of the combustion-chamber with the smoke-box, a stack on the end of the locomotive opposite the smoke-box, and flue mechanism connecting the smoke box and stack together, substantially as described.

5. In a locomotive, the combination of a boiler composed of an outer cylindrical shell, an inner corrugated cylindrical shell extending longitudinally through it, the axial opening of which forms the combustion-chamber and the space between the shells forming the water and steam space of the boiler, a fire-box formed in and partly by the walls of the front end of the combustion-chamber, a smoke-box on the front end of the boiler, fire-tubes extending through the water-space of the boiler and connecting the rear end of the combustion-chamber with the smoke-box, a stack on the end of the locomotive opposite the smoke-box, and flue mechanism connecting the smoke box and stack together, substantially as described.

6. In a locomotive, the combination of a cylindrical inner shell forming a combustion and fire chamber, an outer cylindrical shell encircling the combustion-chamber forming a water-chamber which encircles the combustion-chamber, and tubes extending through the water-chamber between the outer and inner shells forming passages through the water-chamber and connecting the combustion-chamber with the space outside of the water-chamber, substantially as described.

7. In a locomotive, the combination of a cylindrical inner shell forming a combustion and fire chamber, an outer cylindrical shell inclosing the combustion and fire chamber forming a water-chamber which encircles the combustion and fire chamber, a smoke-box, tubes extending through the water-chamber forming passages therethrough and connecting the combustion-chamber with the smoke-box, a smoke-stack, and flues connected with the smoke-box and smoke-stack arranged adjacent to the outer shell forming outlet-passages from the smoke-box to the smoke-stack, substantially as described.

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