

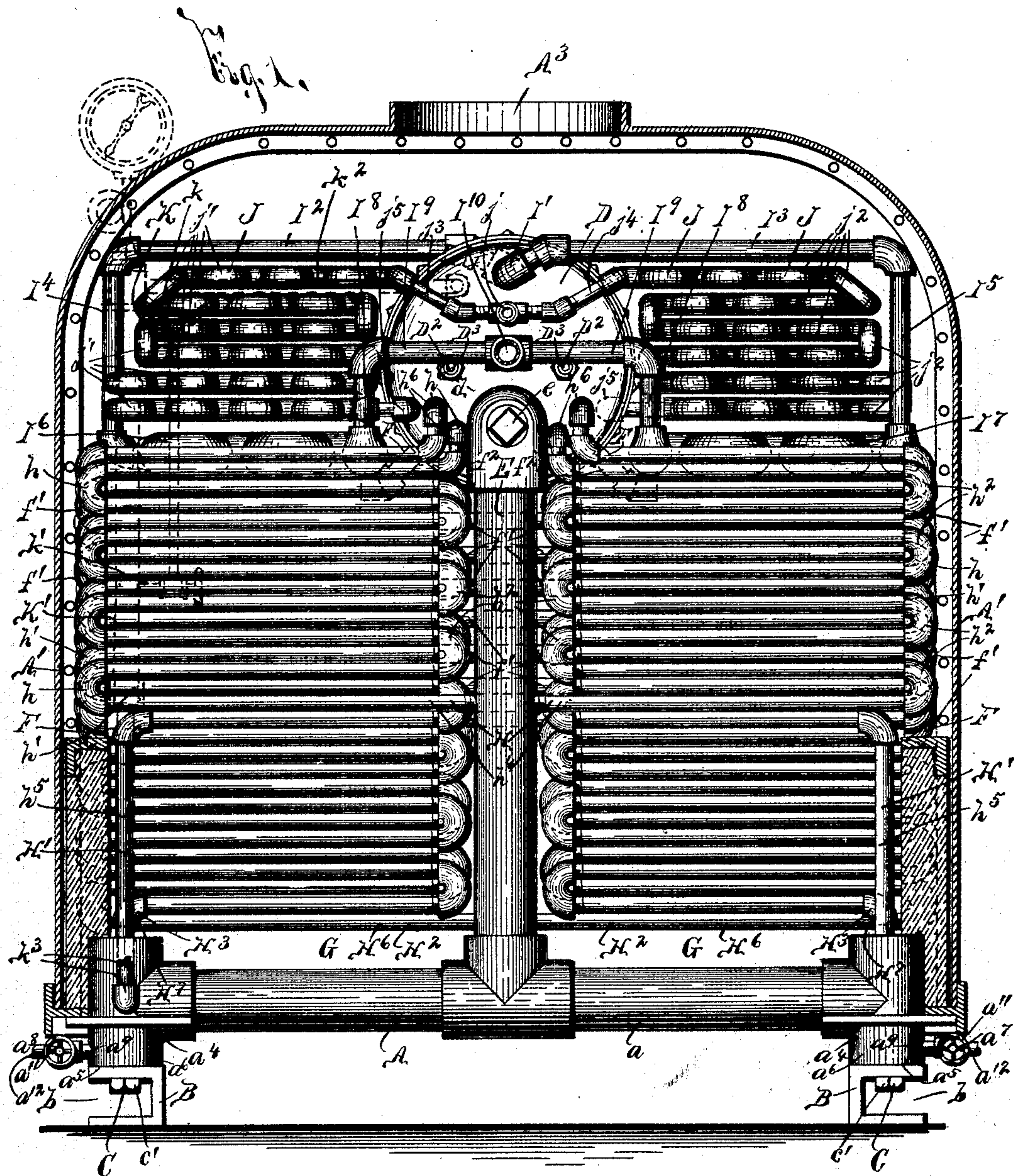
(No Model.)

5 Sheets—Sheet 1.

H. HYDE.
STEAM GENERATOR.

No. 497,881.

Patented May 23, 1893.



WITNESSES:

W. C. Chase,
E. A. Weiborg.

INVENTOR

Hampton Hyde

BY

Wm. Wilkinson Parsons
ATTORNEYS.

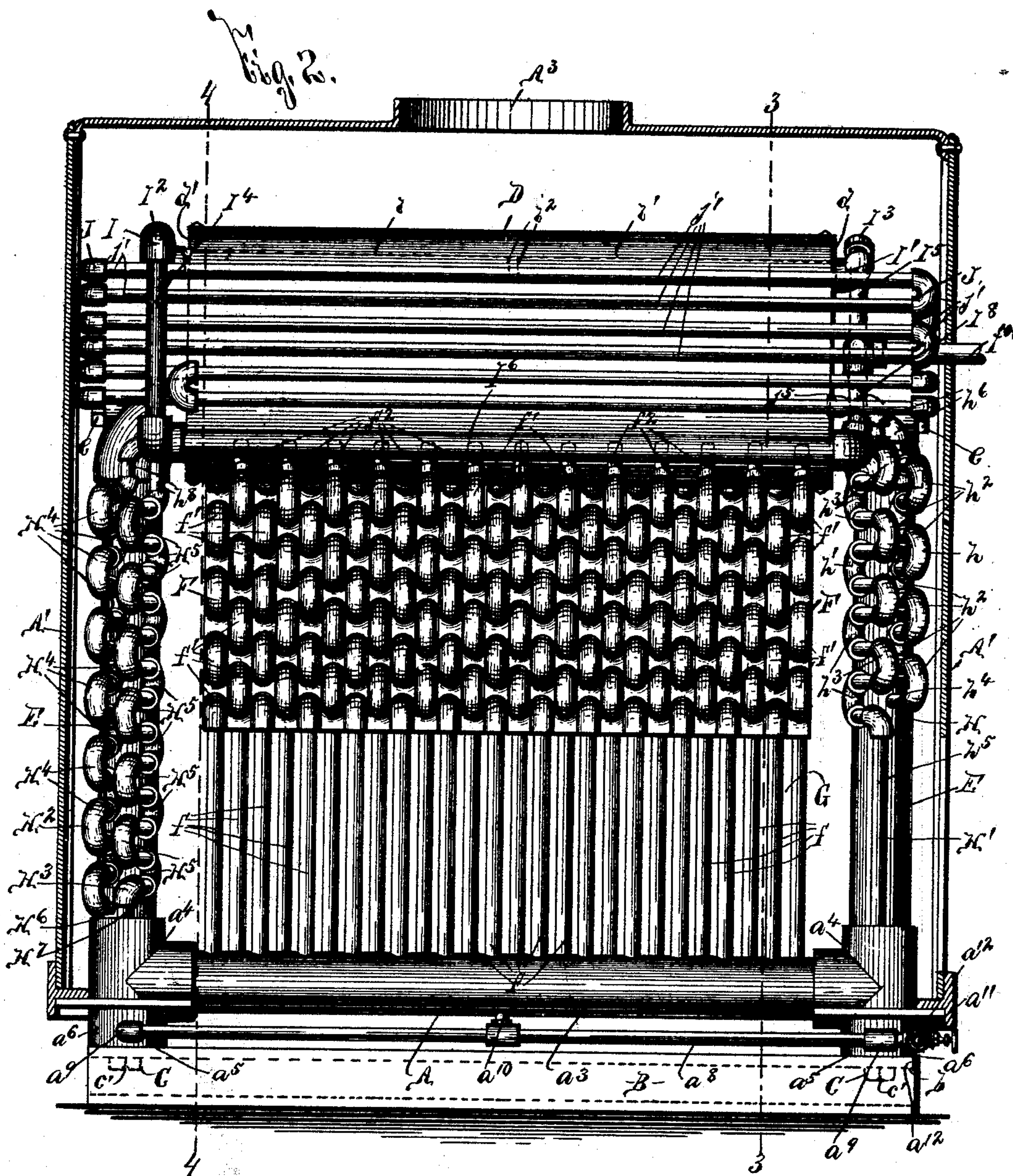
(No Model.)

5 Sheets—Sheet 2.

H. HYDE.
STEAM GENERATOR.

No. 497,881.

Patented May 23, 1893.



WITNESSES:

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INVENTOR

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(No Model.)

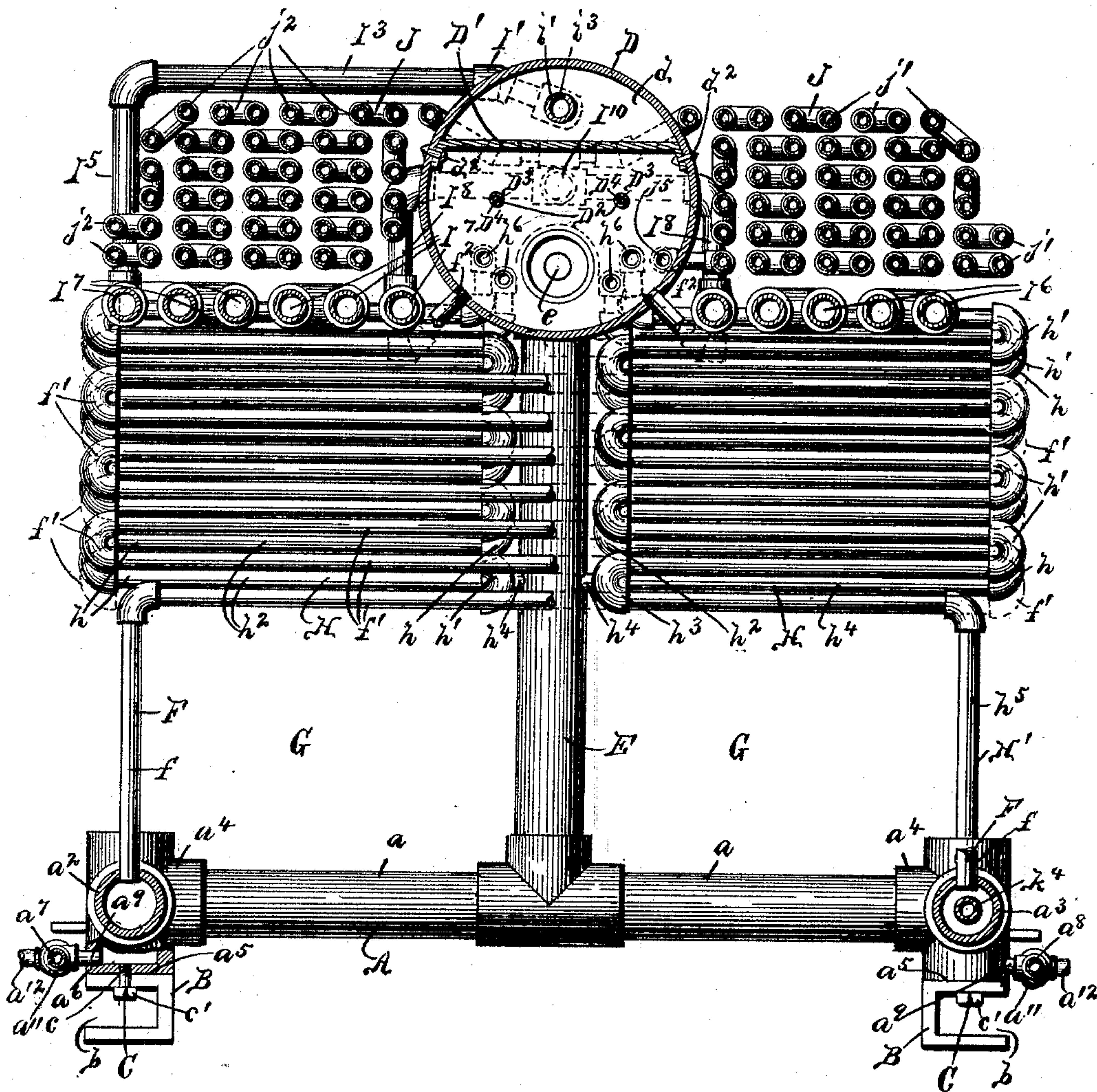
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H. HYDE.
STEAM GENERATOR.

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Patented May 23, 1893.

Fig. 3.



WITNESSES:

W. C. Chase,
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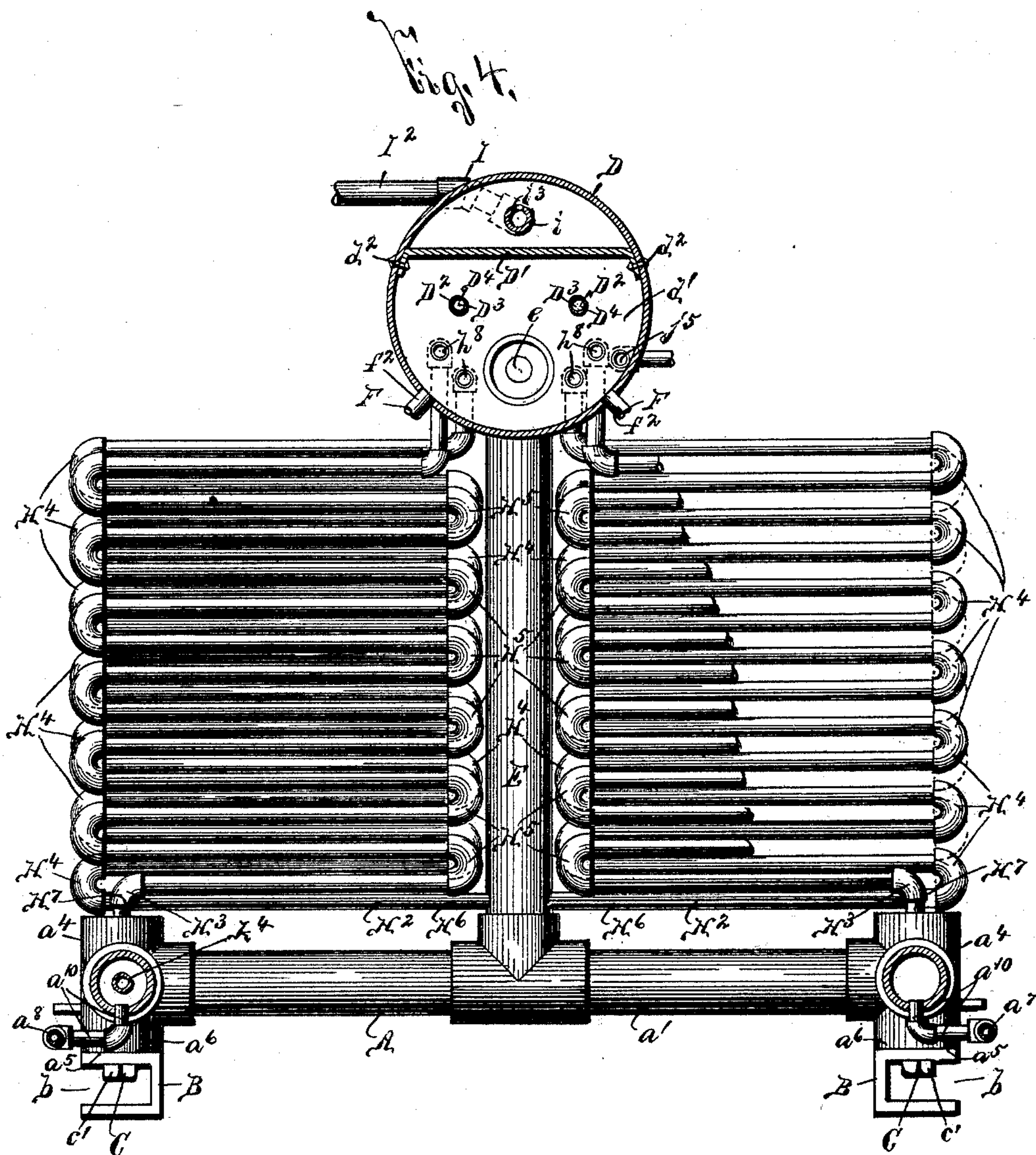
(No Model.)

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H. HYDE.
STEAM GENERATOR.

No. 497,881.

Patented May 23, 1893.



WITNESSES:

H. C. Chase,
E. A. Weiburg.

INVENTOR

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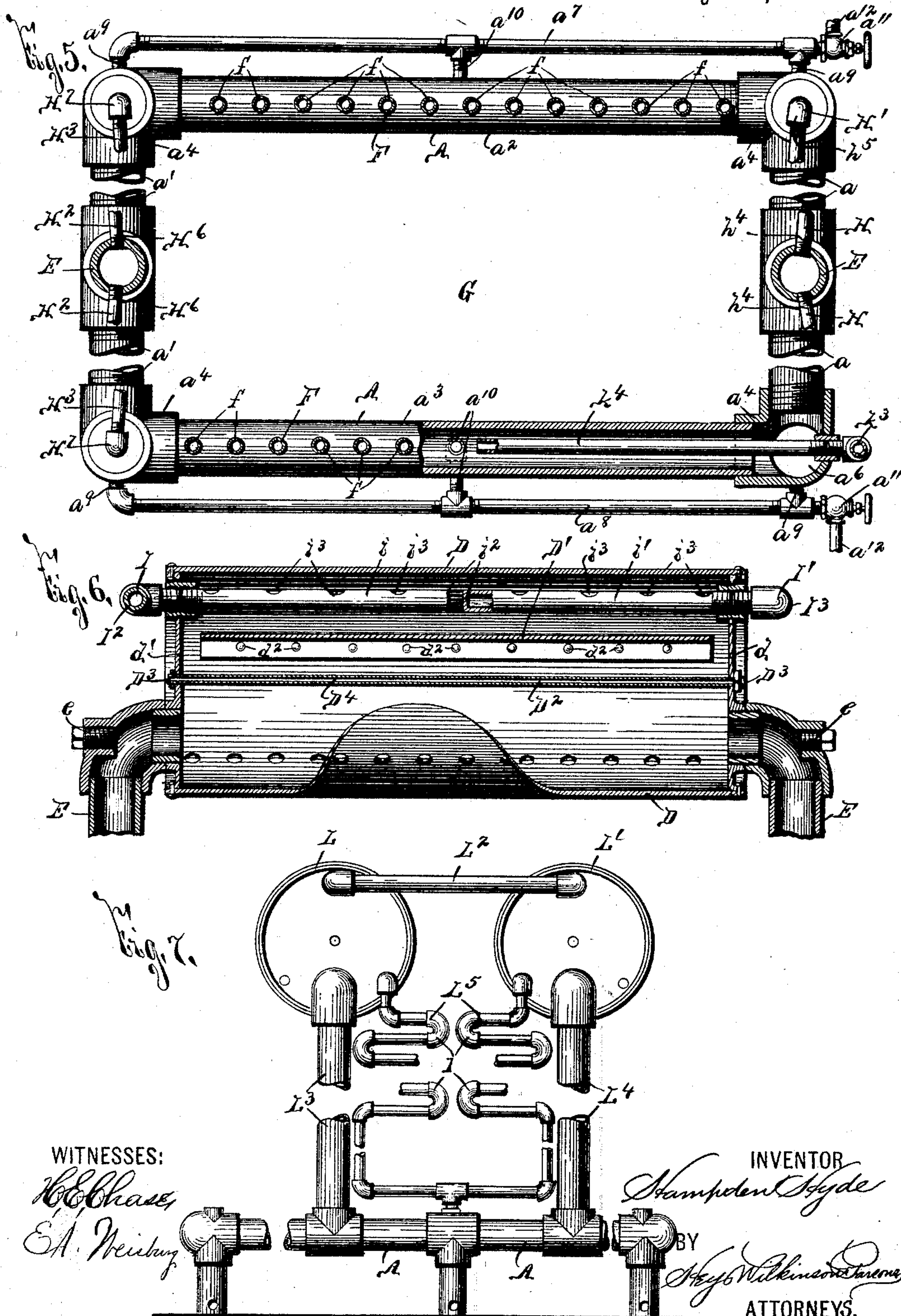
BY

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H. HYDE.
STEAM GENERATOR.

No. 497,881.

Patented May 23, 1893.



WITNESSES:

W. C. Chase
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INVENTOR

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UNITED STATES PATENT OFFICE.

HAMPDEN HYDE, OF ROCHESTER, NEW YORK.

STEAM-GENERATOR.

SPECIFICATION forming part of Letters Patent No. 497,881, dated May 23, 1893.

Application filed March 21, 1892. Serial No. 425,697. (No model.)

To all whom it may concern:

Be it known that I, HAMPDEN HYDE, of Rochester, in the county of Monroe, in the State of New York, have invented new and useful Improvements in Steam-Generators, of which the following, taken in connection with the accompanying drawings, is a full, clear, and exact description.

My invention relates to an improved steam generator, and has for its object the production of a simple, durable, and highly efficient construction, which produces a maximum degree of steam with a minimum amount of fuel, and is readily and thoroughly cleaned from sediment or quickly repaired without the exercise of great skill or the necessity of special fittings.

To this end the invention consists, essentially, in a rectangular water containing base or shell, a steam drum arranged above the base between the sides thereof, and extending from front to rear of the generator, downflow pipes between opposite ends of the drum and the front and rear pipes of the base, and in the detail construction and arrangement of the parts, all as hereinafter more particularly described and pointed out in the claims.

In describing this invention, reference is had to the accompanying drawings, forming a part of this specification, in which like letters indicate corresponding parts in all the views.

Figures 1 and 2 are respectively front and side elevations of my improved generator, the outer casing being shown in section for illustrating the general construction and arrangement of the internal parts. Fig. 3 is a transverse vertical sectional view, taken on line —3—3—, Fig. 2, representing particularly the construction and arrangement of the main generating pipes having coils extending above the combustion chamber, and the front end generating pipes having coils extending laterally from the downflow pipes. Fig. 4 is a similar transverse vertical sectional view, taken on line —4—4—, Fig. 3, for clearly illustrating the generating pipes at the rear side of the combustion chamber. Fig. 5 is a top plan view of the detached water containing base and the connecting pipes between the mud pockets, portions of the front and rear pipes of the base being broken away. Fig. 6

is a longitudinal vertical sectional view of the detached steam drum and the upper portion of the downflow pipes, and Fig. 7 is an end elevation of a modified form of my invention having two steam drums instead of one.

It is well known that at present great difficulty is experienced in repairing steam generators, owing to the use in their construction of special fittings usually procurable only at the manufacturer's place of business or agency. It is also well known that it is extremely desirable to make a boiler as low down efficient and simple as possible for rendering it capable of practical use in steam vessels, launches, &c., and to present to the outgoing products of combustion the greatest possible amount of heating surface and prevent to the greatest possible extent the radiation of heat from the boiler shell.

My invention is designed to meet the above requirements, possesses but few special fittings, is readily assembled or repaired by an ordinary unskilled laborer, and is provided with feed water heating and super-heating coils so arranged as to derive the greatest possible efficiency from the outgoing products of combustion. Each heating coil is independently removable, the pipes composing the base are strongly secured and tied together for permitting shipment without undue strain, the mud is permitted to settle at the quietest portions of the heater, and may be withdrawn from two or more pockets simultaneously, and radiation of heat is prevented from the ends of the boiler by generating coils arranged at the end of the combustion chamber. The water-containing base —A— is preferably rectangular, and composed of the front and rear pipes —a—a'—, the side pipes —a²—a³— and T's —a⁴—.

Beneath the side pipes —a²—a³— of the base —A— are supporting bars —B—B— having their outer faces provided with inwardly extending slots or grooves —b—b—. These bars —B—B— are preferably composed of angle iron, and are secured firmly to the water containing base —A— by bolts or screws —C— having their shanks —c— engaged with the adjacent faces —a⁵— of depending hubs —a⁶— formed upon the elbows —a⁴— and their heads —c'— bearing against the top wall of the grooves —b—. This rectangular

form of base is very rigid and strong, although capable of expansion and contraction, and the bars —B—B— form a practical and efficient support for said base, which may be placed on skids or rollers in moving the generator to its desired location.

The steam drum —D—, best seen at Figs. 1, 2, 3, 4, and 6, is arranged centrally between the side pipes — a^2 — a^3 —, extends from front to rear of the generator, and is supported by downflow pipes —E— having their lower ends discharging into the central portion of the front and rear pipes — a — a' — and their upper ends opening from the lower portion of the front and rear heads — d — d' — of the drum —D—.

As it sometimes may be desirable to inspect the steam drum I provide the upper ends of the downflow pipes —E—E— with removable plugs — e — e —, but it will be evident that, if desired, the downflow pipes may be unprovided with such plugs.

It is very desirable to provide a steam generator with mud pockets for the accumulation of sediment, and to so arrange these mud pockets that the greatest possible amount of sediment is deposited therein and readily removed. In my invention the mud pockets consist of depressed seats — a^6 — a^6 — a^6 — a^6 — at the base of the elbows — a^4 —, which, as is evident upon an inspection of the drawings, are arranged at one side of the downflow pipes —E—, and at the extreme ends of the side pipes — a^2 — a^3 —. A right-hand pipe — a^7 — and a left-hand pipe — a^8 — are connected by branches — a^9 — to the corresponding pockets — a^6 — at opposite ends of the adjacent side pipes, and by branches — a^{10} — a^{10} — to the central portion of the adjacent side pipes — a^2 — a^3 — for removing any sediment deposited within the pockets — a^6 — by the constantly passing circulation of water or carried beyond any one of the pockets within one of said side pipes and deposited in the central portion thereof when met by the opposing current entering from the opposite end of said pipe. These pipes — a^7 — and — a^8 — are each provided at their outer ends with valves — a^{11} — leading to the respective discharge pipes — a^{12} — a^{12} —, whereby the sediment is drawn simultaneously by a single connection from two of the mud pockets and from the central portion of the adjacent side pipe. This is an essential feature of my invention, and adds greatly to its practicability, as the sediment is deposited with great certainty at the most quiet portion of the water-containing base, and is withdrawn simultaneously from several points of the base without materially lessening the height of the water within the generator.

The generating pipes —F— interposed between the water-containing base —A— and the steam drum —D— are of desirable construction and arrangement; the preferable form being indicated in the exemplification of my invention illustrated in the drawings.

The pipe illustrated consists of the upright leg — f — at the outer side of the combustion chamber —G—, substantially horizontal coils — f' — extending laterally above the combustion chamber —G—, and the diagonally extending outlet end — f^2 — discharging into one side of the drum —D—. It will be particularly noted, upon reference to the drawings, that the outer ends of the generating coils — f' — extend beyond the legs — f — to the outer casing —A'— for shutting off the upward passage of the products of combustion along the sides of said casing, and thus further utilizing the products of combustion and increasing the efficiency of my generator.

The pipes —F— opening from one side of the frame —A— are arranged alternately with the pipes opening from the other side in order that their generating coils — f' — may be lapped one with the other, and the ends — f^2 — of the pipes extending from one side of the base —A— discharge into one side of the drum —D— at points at one side of a perpendicular to the points where the corresponding ends of the adjacent opposite pipes discharge into the opposite side of the drum.

As clearly shown in the drawings the generating pipes —F— extend only from the side pipes — a^2 — a^3 — of the water-containing base —A—, and, as the drum —D— is necessarily somewhat shorter than the water-containing base —A—, considerable efficiency is lost if the generating pipes, just described, are the only ones used, since no pipes or coils are then arranged on opposite sides of the downflow pipes, and more or less heat is transmitted to the front and rear ends of the outer shell —A'— of the generator. To obviate this undesirable result the pipes —H—H'— are arranged at the front of the generator, and are formed with lapping generating coils — h — h' — having their corresponding arms — h^2 — h^3 — staggered or arranged in alternate horizontal planes for preventing the ready escape of the gases or products of combustion between said coils to the shell —A'—. The respective bases — h^4 — and — h^5 — of the pipes —H— and —H'— open respectively from the front downflow pipe —E— and the front elbows — a^4 — and the upper ends — h^6 — thereof discharge into the front end of the drum —D—.

The pipes —H²— and —H³— are arranged at the rear side of the generator, and are formed with lapping coils —H⁴— and —H⁵— staggered in the same manner as the coils — h — h' —.

The respective bases —H⁶— and —H⁷— of the pipes —H²— and —H³— open from the extreme lower end of the rear downflow pipes —E—, and the upper extremity of the rear elbows — a^4 —, and the upper ends — h^8 — of said pipes discharge into the rear end of the drum —D—. It will be noted, however, that the generating coils —H⁴— and —H⁵— of the rear generating pipes —H²— and —H³— start from a point in close proximity to the adja-

cent pipe —*a'*— of the water-containing base —*A*—, and that considerable space intervenes between the front pipe —*a*— and the lowest coil of the front generating pipes —*H*—*H'*— so as to permit the inlet of fuel to the combustion chamber —*G*—. This peculiar arrangement of the ends —*f*²— of the main generating coils —*F*— and the construction and arrangement of the end generating pipes —*H*—*H'*—*H*²— and —*H*³— form an essential feature of my invention and add greatly to its practicability. It is evident, however, that the generating coils —*f'*— of the main generating pipes —*F*— may be otherwise arranged than illustrated and described, as, for instance, they also may be staggered or may extend only part way across the combustion chamber, that, if desired, the corresponding arms of the generating coils —*h*—*h'*— and —*H*⁴—*H*⁵— may be disposed in the same horizontal plane instead of being staggered as described, and that said generating pipes may be composed of tubing if desired. Moreover the rear end generating coils may be separated from the rear cross pipe —*a'*— so as to permit the generator to be fired from both ends if desired.

The steam drum —*D*— is of suitable size with reference to the area of the generating pipes to permit of ready separation of the steam from the hot water discharged thereinto by said generating pipes, and, at the upper end of the drum, is a partition —*D'*—, which is suitably secured thereto as by rivets —*d*²—, and is formed of less length than the inside length of the drum in order that the liberated steam may pass from the ends of the drum to the upper side of the partition —*D'*—. As this drum is of considerable size I prefer to tie the heads —*d*—*d'*— together, and for this purpose use one or more hollow tie bars or bolts —*D*²— formed with open extremities —*D*³— whereby, should the bolt be fractured or become corroded so as to permit the passage of steam to its inside chamber —*D*⁴—, the attendant is at once notified of the fact by the escape of steam, and the operation of the generator checked until the bolt is repaired.

The steam is withdrawn from upper portion of the drum —*D*— by a pair of steam pipes —*I*—*I'*— having their inner extremities —*i*—*i'*— arranged above the partition —*D*— and formed with closed ends —*i*²— and peripheral perforations —*i*³—. These pipes —*I*—*I'*— are formed with the laterally extending arms —*I*²—*I*³—, depending extremities —*I*⁴—*I*⁵—, and the respective super-heating coils —*I*⁶— and —*I*⁷—, which are arranged directly above the generating coils —*f'*— on opposite sides of the steam drum —*D*—, and are formed with upturned ends —*I*⁸— connected together by a pipe —*I*⁹— from which extends the steam supply pipe —*I*¹⁰— for conducting the steam to the desired locality.

—*J*— represents the feed water heater, which consists of the conducting pipe —*j*—,

and the coils —*j'*—*j*²—, which extend from the branches —*j*³—*j*⁴— of the pipe —*j*— and are arranged on opposite sides of the drum —*D*— directly above the super-heating coils —*I*⁶—*I*⁷— with their ends —*j*⁵— discharging into the lower portion of the opposite extremities of the drum —*D*—. The front and rear ends of the feed water heating coils —*j'*—*j*²— extend above the end generating pipes —*H*—*H'*—*H*²— and —*H*³— beyond the super-heater coils —*I*⁶—*I*⁷— into close proximity to the adjacent inner sides of the front and rear walls of the outer shell —*A'*—. This arrangement of generating coils —*f'*—, super-heating coils —*I*⁶—*I*⁷— and feed water heating coils —*j'*—*j*²— is very practical, and enables the greatest possible utilization of the heat in the escaping products of combustion for super-heating the steam and raising the temperature of the incoming feed water. The outer case —*A'*—, previously mentioned, is of any desirable form, size, and construction, and is provided with an exit —*A*³— for the products of combustion.

My improved invention is preferably provided with any suitable construction of water gage —*K*—, which as shown by dotted lines at Fig. 1, is connected by pipes —*k*—*k'*— to a head —*K'*— having one end suitably connected by a pipe —*k*²— to the upper portion of the steam drum. The lower end of the head —*K'*— is connected by a pipe —*k*³— to a pipe —*k*⁴—, Figs. 1 and 5, extending through the left hand front elbow —*a*⁴— and longitudinally within the pipe —*a*³— so as to prevent to the utmost the circulation from varying the level of the water in the gage —*K*—. It will be noted that the downflow pipes are within the vertical planes of the sides of the drum, and that consequently they form a strong and rigid support therefor.

At Fig. 7 I have shown a modified form of my invention, provided with two steam drums —*L*—*L'*— connected together by a pipe —*L*²— and supported at their corresponding ends by the separate upright pipes —*L*³— and —*L*⁴— secured to the water-containing base —*A*—. The end generating pipes —*L*⁵— are in this case interposed between the downflow pipes —*L*³—*L*⁴—, and I have shown these pipes as provided with coils —*l*—*l*— extending but part way across the space interposed between the downflow pipes. Suitable end heating coils may be arranged at the outside of the downflow pipes —*L*³—*L*⁴—, and any desirable form of main generating pipes may be used with this modified construction of heater, but I have thought it unnecessary to illustrate said end or main generating pipes.

My invention may also be used for a hot water heater, and it is evident that the parts are simple and readily assembled; that its construction is strong and practical, and its operation highly efficient, and its circulation positive and rapid.

The operation of my invention will be readily perceived from the foregoing description

and upon reference to the drawings, and it is evident that considerable change may be made in the detail construction and arrangement of the parts without departing from the spirit of my invention.

Having thus fully described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In a steam generator, the combination of a water-containing base composed of the continuous pipes a — a' — a^2 — and a^3 — arranged in a rectangle with their adjacent ends connected together, whereby the base is strongly braced and permits a circulation therethrough, a steam drum arranged above the base between two opposite side pipes thereof, and a downflow pipe opening from each end of the central steam drum and discharging into the adjacent side pipe of the base, said downflow pipe being arranged within the vertical planes of the sides of the drum for firmly supporting said drum, substantially as described.

2. In a steam generator, the combination of a water-containing base composed of the continuous pipes a — a' — a^2 — and a^3 — arranged in a rectangle with their adjacent ends connected together, whereby the base is strongly braced and permits a circulation therethrough, a steam drum arranged above the base between two opposite side pipes thereof, a downflow pipe opening from each end of the central steam drum and discharging into the adjacent side pipe of the base, said downflow pipe being arranged within the vertical planes of the sides of the drum for firmly supporting said drum, and a removable plug in the upper end of one of the downflow pipes for permitting inspection of the steam, substantially as and for the purpose set forth.

3. In a steam generator, the combination of a water containing base, a steam drum arranged above the base and extending from front to rear of the generator, downflow pipes between the opposite ends of the drum and the base, and a generating pipe opening from the downflow pipe and discharging into the steam drum, substantially as and for the purpose described.

4. In a steam generator, the combination of a water containing base, a steam drum arranged above the base between the sides thereof and extending from front to rear of the generator, downflow pipes between the opposite ends of the drum and the base, and a generating pipe opening from the corner of the base and discharging into the steam drum, substantially as set forth.

5. In a steam generator, the combination of a water containing base, a steam drum arranged above the base between the sides thereof and extending from front to rear of the generator, downflow pipes between the opposite ends of the drum and the base, a generating pipe opening from the downflow pipe and discharging into the steam drum, and a generating pipe opening from the cor-

ner of the base and discharging into the steam drum, substantially as set forth.

6. In a steam generator, the combination of a water containing base, a steam drum arranged above the base between the sides thereof and extending from front to rear of the generator, downflow pipes between the opposite ends of the drum and the base, a generating pipe opening from the downflow pipe and formed with substantially horizontal U-shaped coils, and a second generating pipe opening from the base and formed of substantially U-shaped coils lapping with the former coils, substantially as and for the purpose set forth.

7. In a steam generator, the combination of a water containing base, a central steam drum extending from front to rear of the generator, a downflow pipe opening from each end of the central steam drum and discharging into the adjacent side of the base, a generating pipe opening from the downflow pipe and discharging into the steam drum and formed with substantially horizontal U-shaped coils, a second generating pipe opening from the corner of the base and discharging into the steam drum and formed with substantially horizontal U-shaped coils lapping with the former coils and having their arms staggered with respect to the corresponding arms of the former coils, substantially as specified.

8. In a steam generator, the combination of a water containing base and a combustion chamber above the base; with a steam drum arranged above the base between the sides thereof and extending from front to rear of the generator, downflow pipes between the opposite ends of the drum and the base, generating pipes having projecting coils extending above the combustion chamber, and generating pipes having coils arranged at the end of the combustion chamber, substantially as described.

9. In a steam generator, the combination of a water containing base and a combustion chamber above the base; with a steam drum arranged above the base between the sides thereof and extending from front to rear of the generator, downflow pipes between the opposite ends of the drum and the base, generating pipes having projecting coils extending above the combustion chamber, generating pipes having coils arranged at the rear end of the combustion chamber, and a generating pipe at the front end of the generator having coils extending laterally beyond the side of the downflow pipe, substantially as specified.

10. The combination with a water-containing base of a generator; of a supporting bar arranged beneath the base and provided with a slot extending inwardly from its side, and a bolt or screw having one end engaged with the water-containing base and the other arranged within said slot, substantially as set forth.

11. In a generator, the combination of a rectangular base, bars arranged beneath the

side pipes of said base and formed with inwardly extending slots or cut-outs in their outer side faces, and bolts or screws having their head engaged with the upper wall of said slot and their shank with the adjacent surface of the elbows of said base, substantially as and for the purpose set forth.

12. In a steam generator, the combination of a water containing base, a steam drum arranged above the base beneath the sides thereof and extending from front to rear of the generator, downflow pipes between the opposite ends of the drum and the base, generating pipes opening from the water-containing base and discharging into one side of the steam drum and provided with coils extending laterally above the combustion chamber, a second generating pipe arranged at one side of the vertical plane of the former pipe opening from the water-containing base and discharging into the opposite side of the drum at a point at one side of the vertical plane of the corresponding end of the former pipe and provided with coils lapping with the former coils, substantially as specified.

13. In a steam generator, the combination of a water-containing base, a steam drum connected to the water-containing base, a continuous partition of less length than the distance between the inner faces of the heads of said drum arranged longitudinally within the drum with one of its ends separated from the inner face of the adjacent head, and a steam outlet pipe for the drum having its opening for receiving the steam arranged above said partition and between the extremities of said partition, substantially as and for the purpose set forth.

14. In a steam generator, the combination of a rectangular base, a steam drum arranged above the base between the sides thereof and extending from front to rear of the generator, downflow pipes between the opposite ends of the drum and the front and rear pipes of the base and arranged within the vertical planes of the sides of the drum, a continuous partition of less length than the distance between the inner faces of the heads of said drum arranged longitudinally within the drum with one of its ends separated from the inner face of the adjacent head, and a steam outlet pipe for the drum having its opening for receiving the steam arranged above said partition and between the extremities of said partition, substantially as and for the purpose specified.

15. In a steam generator, the combination of a rectangular base, a steam drum arranged above the base between the sides thereof and extending from front to rear of the generator, downflow pipes between the opposite ends of the drum and the front and rear pipes of the base and arranged within the vertical planes of the sides of the drum, a continuous partition of less length than the distance between the inner faces of the heads of said drum arranged longitudinally within the drum with its opposite ends separated from the inner

faces of the adjacent heads, and a steam outlet pipe for the drum extending above the central portion of said partition and provided with peripheral openings for receiving the steam, substantially as and for the purpose set forth.

16. In a steam generator, the combination of a water-containing base, a steam drum connected to the water containing base, a partition arranged longitudinally within the steam drum, and a pair of steam outlet pipes extending inwardly from the ends of the drum and formed with closed ends and peripheral openings at their inner extremities, substantially as specified.

17. In a steam generator, the combination of a water-containing base, a steam drum arranged above the base between the sides thereof and extending from front to rear of the generator, downflow pipes between the opposite ends of the drum and the base; upflow pipes having generating coils, feed water heating coils arranged at opposite sides of the steam drum above the generating coils, and superheating coils interposed between the generating and feed water heating coils, substantially as specified.

18. In a steam generator, the combination of a water-containing base composed of the continuous pipes— a — a' — a^2 — and — a^3 — arranged in a rectangle with their adjacent ends connected together, whereby the base is strongly braced and permits a circulation therethrough, a steam drum arranged above the base between two opposite side pipes thereof, a downflow pipe opening from each end of the central steam drum and discharging into the adjacent side pipe of the base, said downflow pipe being arranged within the vertical planes of the sides of the drum for firmly supporting said drum, upflow pipes having generating coils extending laterally across the fire, feed-water heating coils arranged above the generating coils, and superheating coils connected to the drum and interposed between the generating and the feed water heating coils, substantially as and for the purpose described.

19. In a steam generator, the combination of a water-containing base, a steam drum arranged above the base between the sides thereof and extending from front to rear of the generator, downflow pipes between the opposite ends of the drum and the base, main generating pipes having coils extending laterally above the combustion chamber auxiliary generating pipes having coils arranged at the ends of the combustion chamber, and feed water heating coils above the main generating coils having their ends extending above the auxiliary generating coil, substantially as described.

20. In a steam generator, the combination of a water-containing base, a steam drum arranged above the base between the sides thereof and extending from front to rear of the generator, downflow pipes between the

opposite ends of the drum and the base, main
generating pipes having coils extending lat-
erally above the combustion chamber and
feed water heating coils above the main gen-
erating coils having their ends extending be-
yond the vertical plane of the outermost gen-
erating coil, and end generating coils beneath
the projecting ends of the feed water heating
coils connected to the water-containing base
and to the steam drum, substantially as and
for the purpose specified.

21. In a steam generator, the combination
of a water-containing base, a steam drum,
downflow pipes between the base and the
steam drum, a pair of mud pockets arranged
at one side of the downflow pipes, and a
connecting pipe between said mud pockets
whereby they are discharged simultaneously,
substantially as set forth.

22. In a steam generator, the combination
of a water-containing base composed of an-
gularly arranged pipes connected together, a
steam drum above the base, downflow pipes
between the base and the steam drum, and a
mud pocket opening downwardly from the
lower wall of one of the base pipes in a ver-
tical plane at one side of the vertical plane
of the adjacent downflow pipe, substantially
as and for the purpose specified.

23. In a steam generator, the combination
of a water-containing base composed of an-
gularly arranged pipes connected together, a
steam drum arranged above the base between
the side pipes thereof, upright downflow pipes
between the opposite ends of the drum and
the end pipes of the base, and a mud pocket
extending downwardly from the bottom wall
of one of the side pipes of the base in a ver-
tical plane at one side of the vertical plane
of the adjacent downflow pipe, substantially
as and for the purpose described.

24. In a steam generator, the combination
of a water-containing base and a steam drum
connected to the base; with a pipe extending
longitudinally within one of the base pipes,
and a water gage connected to said pipe and
to the steam drum, substantially as specified.

In testimony whereof I have hereunto
signed my name, in the presence of two at-
testing witnesses, at Rochester, in the county
of Monroe, in the State of New York, this 7th
day of February, 1892.

HAMPDEN HYDE.

Witnesses:

J. B. EDMONDS,
A. E. LYKE.