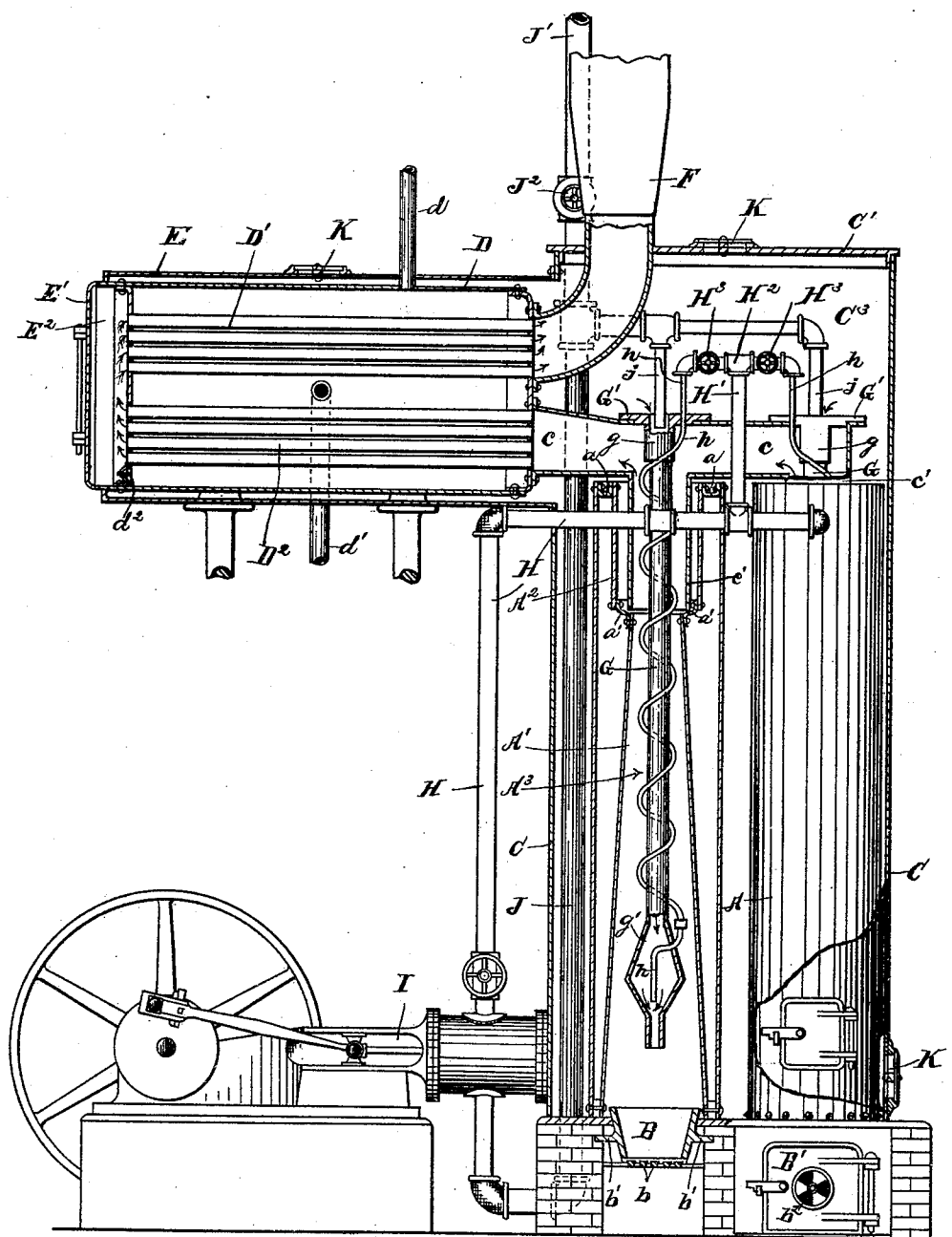


D. HURST.
STEAM GENERATOR.

Patented Nov. 4, 1890.



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© Hoover

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UNITED STATES PATENT OFFICE.

DAVID HURST, OF MANSFIELD, OHIO.

STEAM-GENERATOR.

SPECIFICATION forming part of Letters Patent No. 439,663, dated November 4, 1890.

Application filed February 19, 1890. Serial No. 341,037. (No model.)

To all whom it may concern:

Be it known that I, DAVID HURST, of Mansfield, in the county of Richland and State of Ohio, have invented certain new and useful Improvements in Steam-Generators; and I do hereby 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 pertains to make and use the same.

My invention relates to improvements in steam-generators; and it consists in certain features of construction, and in combination of parts hereinafter described, and pointed out in the claim.

The accompanying drawing is a side elevation, partly in section.

A A represent upright steam-boilers arranged side by side and supported, preferably, by mason-work, as shown. At the lower extremes of these boilers are located fire-pots B, provided with grates *b* and with flanges *b'* for engaging the mason-work, whereby the fire-pots are supported. Ash-pit doors *B'* are provided with dampers *b²*. Each boiler is provided internally with a large upright conical tube *A'*, inclosing a combustion-chamber *A³*. Tubes *A'* are flanged outward, as shown at *a'*, and connect, respectively, with cylindrical tube *A²*, the latter joining the top boiler-heads *a*. A jacket C incloses the two boilers and extends some distance above the boilers for inclosing an air-chamber *C³*, the top wall or head of the jacket being shown at *C'*.

D is a horizontal tubular heater, the tubes thereof being arranged in upper and lower series, as shown at *D'* and *D²*. The heater is provided with a hand-hole *d²* and with induction and eduction pipes, respectively, *d* and *d'*. A jacket E incloses the heater, this jacket connecting with the upright jacket C and a door being provided at *E'* for cleaning the tubes of the heater and for giving access to the hand-hole *d²* in cleaning the shell of the heater. A smoke-box *c* has depending legs *c'*, that connect with the upper end of tubes *A'*. This smoke-box joins the heater surrounding the ends of the lower series of tubes *D²*. The products of combustion, therefore, pass through the smoke-box, and from thence through the lower tubes of the heater into return-chamber *E²*, and from thence through

the upperseries of tubes, and from thence escape into the smoke pipe or chimney F.

G G are air-tubes, these tubes above opening into chamber *C³*. These air-tubes extend down centrally into the respective combustion-chambers and discharge above and toward the fuel, these tubes having enlarged heads *g*, preferably of the form shown, and having, preferably, detachable discharging-nozzles *g'*, that may be renewed from time to time. Tubes G above are provided with flanges *G'*, that rest on the top wall of the smoke-box *c* around the holes that receive these air-tubes, these flanges being large enough, and are provided with holes to accommodate steam-pipe *h*. These steam-pipes are of thin copper, and are coiled around tubes G, as shown, and enter head *g'* and discharge downward therein.

H is a steam-pipe connecting with boilers A A, this steam-pipe having a branch *H'*, provided with lateral branches *H²*, the latter being provided with valves *H³*, and outside of these valves are attached the copper pipes *h h* aforesaid. The valve-stems of valves *H³* should extend outside the jacket, so that these valves may at any time be manipulated in regulating the flow of steam through the copper pipes. Pipe H leads to the engine I, and the exhaust-pipe J of the engine may lead inside jacket C and extend up into chamber *C³* and there provided with nozzles *j*, discharging, respectively, into the upper end of air-tubes G G, in which case the exhaust-pipe should have an extension *J'* opening into the atmosphere, but provided with a back-pressure valve *J²* or a valve of some kind to regulate the discharge of exhaust-steam through nozzles *j*. The jackets C and E are provided with dampers K for admitting air. The air inside of these jackets becomes heated and accumulates in chamber *C³*, from whence the air-supply for supporting combustion is drawn through tubes G G by means of the steam-blast from pipe *h*, the steam in these pipes being superheated by reason of their exposure in the combustion-chamber. On starting a fire dampers *b²* are opened to admit air under the grates; but after a sufficient steam-pressure is produced in the boilers dampers *b²* are closed, after which the air-supply is had only through pipes G G, these pipes, as afore-

said, discharging on top of the fuel. With such construction such perfect combustion is obtained that little or no smoke escapes through the chimney. Meantime what would
5 otherwise be waste heat from the boiler is utilized in heating the feed-water passing through the heater, a pump being used to force the water into the boiler, such pump being in the line of the induction or eduction
10 water-pipe, as may be preferred.

What I claim is—

The combination, with steam-boilers, feed-water heater, and mechanism, substantially as indicated, for passing the products of com-
15 bustion from the boilers through the heater

and return, of jackets surrounding, respectively, the heater and boilers, inclosing an air-space in common, air-tubes leading from such air-space and extending thence through the combustion-chamber and discharging above 20 and toward the fuel steam-pipes coiled around such air-tubes, discharging inside the latter, substantially as set forth.

In testimony whereof I sign this specification, in the presence of two witnesses, this 10th 25 day of February, 1890.

DAVID HURST.

Witnesses:

FLORA M. KERR,
S. S. HOUT.