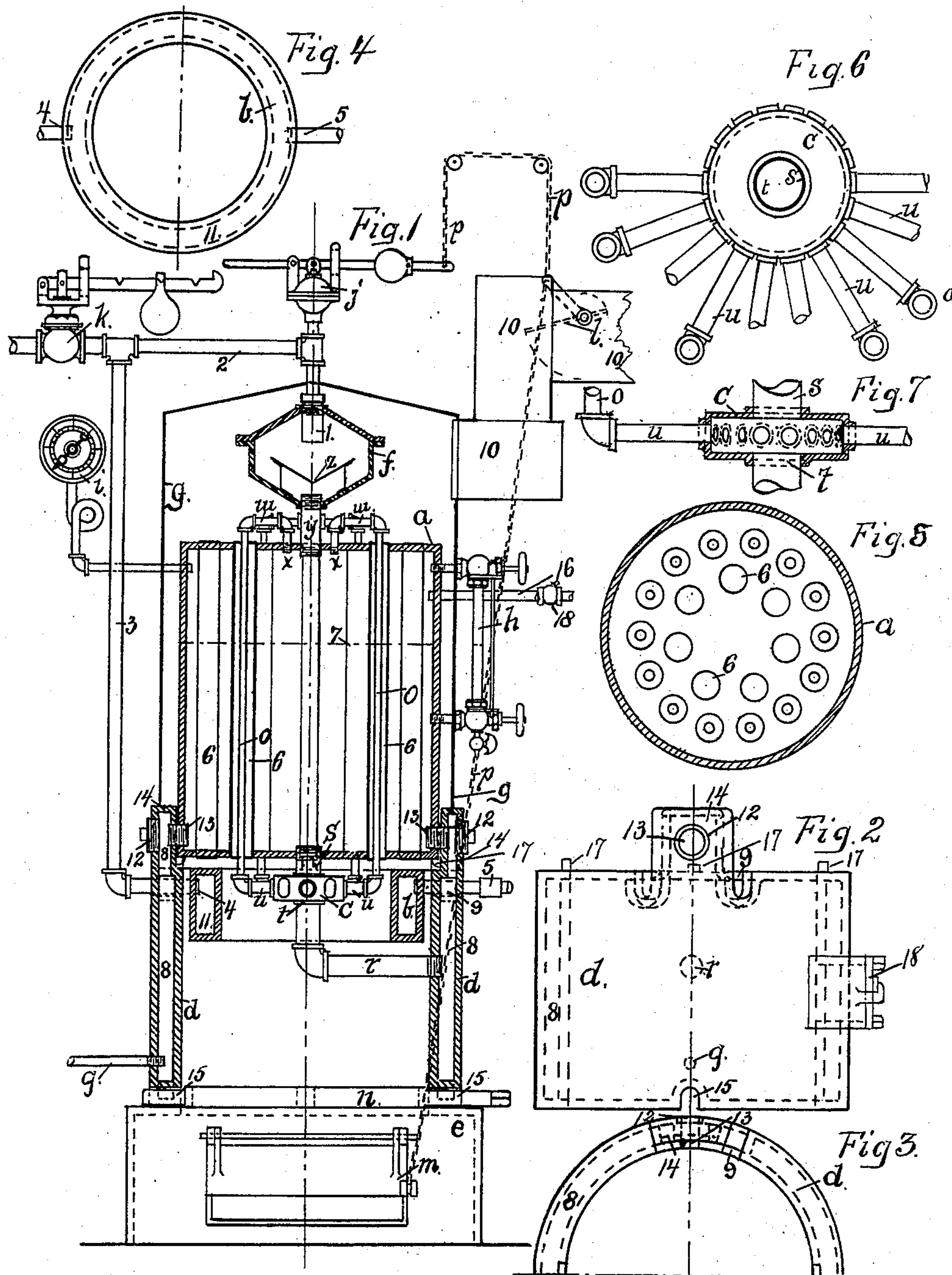


(No Model.)

H. HENNIG.
STEAM GENERATING APPARATUS.

No. 601,793.

Patented Apr. 5, 1898.



WITNESSES:

W. J. Douglas
B. K. Douglas

INVENTOR.

Henry Hennig
BY J. Irving Perkins
his ATTORNEY.

UNITED STATES PATENT OFFICE.

HENRY HENNIG, OF PATERSON, NEW JERSEY.

STEAM-GENERATING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 601,793, dated April 5, 1898.

Application filed December 3, 1897. Serial No. 660,685. (No model.)

To all whom it may concern:

Be it known that I, HENRY HENNIG, a citizen of the United States, residing at Paterson, in the county of Passaic and State of New Jersey, have invented a new and useful Improvement in Steam Heating Apparatus, of which the following is a specification.

My invention relates to improvements in steam-heaters and steam-generators in which there is placed in the fire-box a metal case containing water, with pipes connected and running through the tubes of a boiler in such a way that the water in the case and tubes can be very quickly heated and passed into steam and the steam conducted to and in a metal coil, ring, or chamber, which is also placed in the fire-box for superheating this steam before passing it into the radiators; and the objects of my improvement are, first, to provide a very rapid steam-generator auxiliary to a boiler; second, to provide for a means of separating and superheating this steam thus quickly generated, and, third, to produce a fuel-saving and rapid-heat-generating boiler which is especially adapted for steam-heating. I attain these objects by the mechanism illustrated in the accompanying drawings, in which—

Figure 1 represents a vertical section of a complete boiler with the appliances. Figs. 2 and 3 represent two different views in detail of water-back which also serves the purpose of a furnace. Fig. 4 is a detail plan of a ring used for superheating the steam. A coil or any chamber can be used in its place. Fig. 5 is a cross-section of an ordinary steam-boiler. Figs. 6 and 7 are two views in detail of case or chamber from which a number of small pipes run.

Similar letters and numerals refer to similar parts throughout the several views.

A boiler *a*, incased by jacket *g*, supported by a water-back *d*, (which incases the furnace,) standing on the base *e*, a case of water *c*, from which run small pipes *u*, *o*, and *w*, which are connected to the top of the boiler, the separator *f*, and its connections with coil, ring, or chamber *k* constitute the general idea of the apparatus. The base *e* receives ashes and supports the water-back *d* and the dump-

ing-grate *n*, which turns in spaces in water-back *l*5. The base *e* has also a door *m*, through which the draft passes and opens and closes at the same time by means of the same chain *p* as damper *l* in smoke-pipe 10 does, which is operated by damper-regulator *j*. The water-gage *h*, steam-gage *i*, and safety-valve *k* are same as used on any ordinary boiler. The furnace-walls are hollow, forming a water-space 8. This constitutes a water-back entirely surrounding the furnace. The water is supplied from a reservoir by pipe *g*. This space 8 runs up in two opposite arms 14 on top of the water-back. An ordinary vertical flue-boiler *a* rests on a number of lugs 17 on top of water-back and between the arms 14, which are for the purpose of making the connections for the admission into the boiler and for the free circulation of water between the water-back and boiler. This is made by drilling and tapping through the two walls of the arm and the shell of the boiler and inserting a nipple or a piece of pipe 13 and then screwing a plug 12 in outside hole. There is a space between the bottom of the boiler and the top of the water-back, except where lugs and arms are, so that the heat may circulate around the outside of the boiler.

Below the boiler in the fire-box at a distance somewhat more than is shown in the drawings is a case *c* or chamber, which contains water and is supplied by a pipe *r*, running from the water-back *d*, and also by a connection with the boiler by a pipe *s*. The heat from the furnace passes entirely around *c* and then through flues 6, and the pipe connections add to its heating-surface. From this case there are a number of small pipes *u*, connected to pipes *o*, running through a number of the flues 6 of the boiler. These pipes *o* are filled with water to the height of the water-line 7 in the boiler. The steam generated in these pipes *o* passes up from the pipes *o* and through the pipes *w* into the top of the boiler at *x*.

At the top of the boiler there is a pipe *y*, through which the steam can pass from the boiler into the separator *f* and then through the pipes 1, 2, 3, and 4 to the superheater *d*.

The superheating metal coil, chamber, or, in this case, ring *k* is placed inside of the fire-

box, and the size is such that there is a space between it and the wall of the water-back *d*, so that the heat may pass entirely around it.

The steam is received into the ring or superheater through the pipe 4 in the space 11, and when the steam is heated passes through the pipe 5 to the radiators. These pipe, resting in the spaces 9 in the water-back *d*, support the ring.

10 Either a ring, coil, or metal chamber can be used in the furnace for superheating, but a metal hollow ring is preferred, giving the space for the steam more compact. The object and advantage derived by this ring is 15 that the steam in it is made very hot and dry, as much so as probably could be acquired by twenty (20) or thirty (30) pounds pressure, while not over five (5) pounds are on the boiler.

20 The jacket *g* is placed around the outside of the boiler *a* at a distance from it which allows the heat to pass around the outside of the boiler between the jacket *g*, which increases the heating-surface on boiler. From 25 this jacket the pipe 10 carries the smoke away.

16 is a return-pipe from the radiators and empties back into the boiler above the water-line, which is represented at 7. In this pipe 30 there is a check-valve 18 to prevent steam from passing into the radiator from the boiler. When the water is to the required height in the boiler and the fire is started, there is an immediate effect on the water. The heat 35 surrounding the pipe *r* and the case *c* and the small pipes *u* and *o*, as the heat passes through the large flues 6 in the boiler, causes the water in the pipes *o*, &c., to at once boil and pass into steam. These small pipes are con- 40 stantly supplied from the water-back *d* and from the bottom of the boiler. This steam passes into the space in boiler between the water and the top of the boiler. The steam then passes from the top of the boiler through 45 the pipe *y* in the separator *f*, (which is heated from the furnace-fire,) striking against the diaphragm *z* and passing around it and then into the pipe 1. The condensed steam or water falls back around the outside of pipe 50 1 and the diaphragm *z* and back into the boiler. The steam then passes into the pipes 2, 3, and 4 and into the superheating-ring *b* in the furnace, where the steam is made alive (as it were) and then sent through the pipe 55 5 to the radiators. The drip condensation and finally the steam is returned to the boiler by pipe 16. When the stock-water in the boiler is boiling, the steam passes to the radiators from the superheating-ring *b* and re- 60 turns to the boiler as hot live steam and not partially condensed. This is caused by the quick and high addition of heat to the steam while in the ring *b*. This is one of the features for fuel saving.

65 It is a noticeable fact that the radiators are

warm and have steam in them before the stock-water in the boiler is to the boiling-point.

The heating-surface for water is as follows: the inside of water-back *d*, pipe *r*, case *c*, pipes 70 *u* and *o*, boiler-tubes, and the outside of boiler, and for steam the upper ends of boiler and pipes *o*, pipe *w*, separator *f*, and superheater *b*. It can thus be seen that the greater heat possible in the least time can be obtained from 75 a given amount of fuel; hence the economy. When the fire is low, to the superheater condensed steam finds its way. This acts as a small independent boiler and passes and keeps steam in radiators when there is not 80 enough heat in the furnace to heat the water in the boiler *a*, and radiators remain warm until the fire is out. This is a great advantage over other steam-heaters. This device 85 is an improvement and an appliance resembling somewhat my application for improvement in closed continuous system for generating steam, filed August 11, 1897, Serial No. 647,811, and allowed October 18, 1897.

What I claim as my invention, and desire 90 to secure by Letters Patent, is—

1. The combination, in a steam-generating device of a water-holding case *c*, pipes *u*, connected to pipes *o*, running through boiler- 95 tubes 6, the pipe *w*, the pipes *r* and *s* for supplying case *c* from water-back and boiler; and the water-back *d*, the boiler *a* and their connections together substantially as described.

2. The combination in a steam heating device of an annular superheating-chamber, and 100 its connection with a separator *f*, and the water-back *d*, the boiler *a*, and their connection with each other; substantially as described.

3. In a steam heating apparatus the annular superheating-chamber, in combination 105 with the case *c*, and pipes *u*, *o*, and *w*, for the purpose of making steam quickly and superheating steam, all substantially as set forth.

4. In a closed-circulation and steam heating device the superheating device placed in- 110 side of the fire-box; consisting of an annular chamber in connection with a separator *f*, in combination with the water-back *d*, boiler *a*, water-heating case *c*, the water-tube connection *r*, pipes *u* and *o*, substantially for the 115 purpose set forth.

5. In a steam heating and closed circulating device a water-back *d*, and boiler connected; heating-case *c*, water-tube *r*, small pipes *u*, *o*, and *w*, in combination with steam- 120 separating case *f*; jacket *g*, an annular superheating-chamber *b*, and pipes adapted for radiator connections, completing a closed circulation, substantially as described.

In testimony whereof I affix my signature 125 in presence of two witnesses.

HENRY HENNIG.

Witnesses:

W. S. DOUGLAS,
B. K. DOUGLAS.