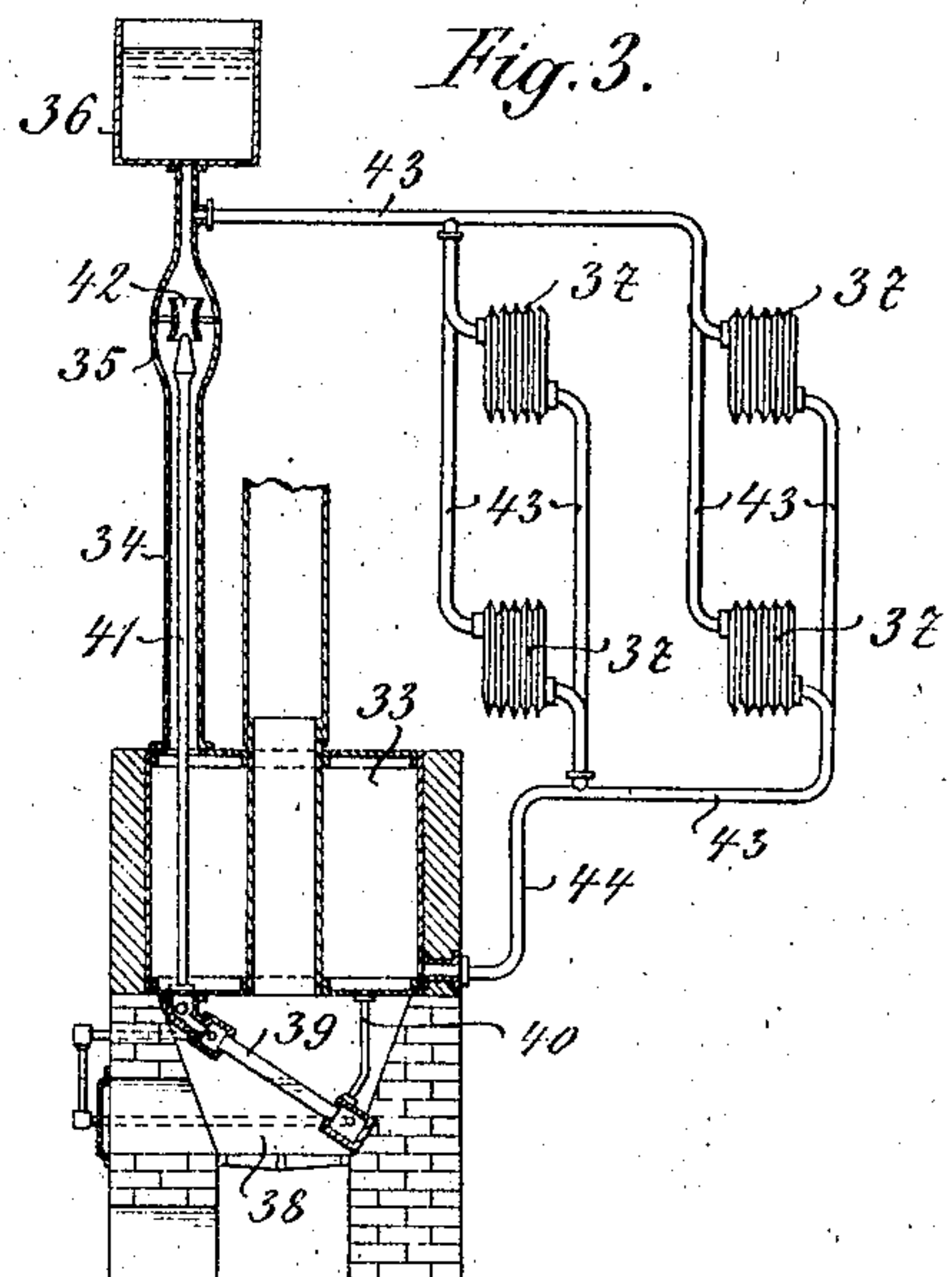
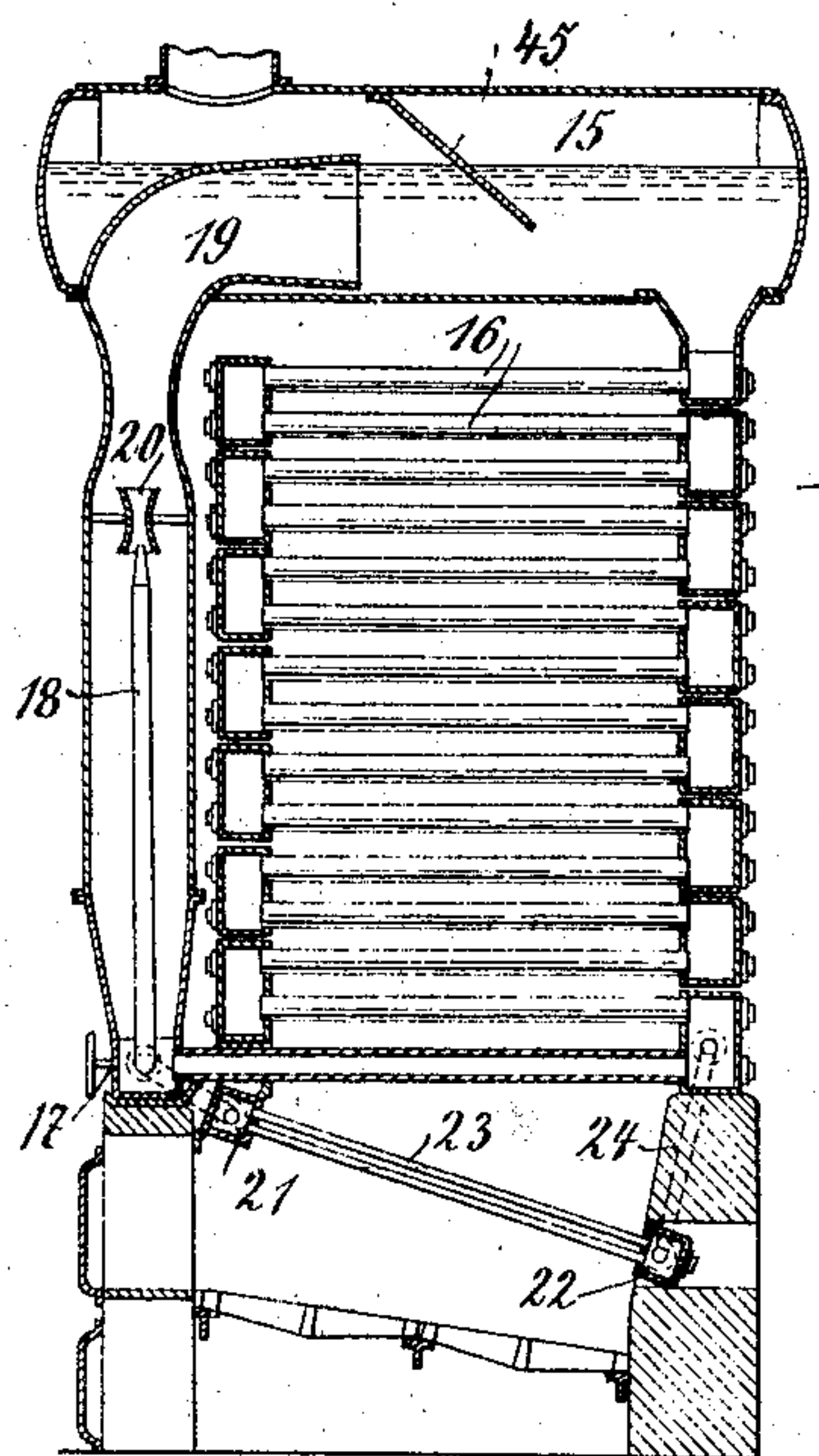
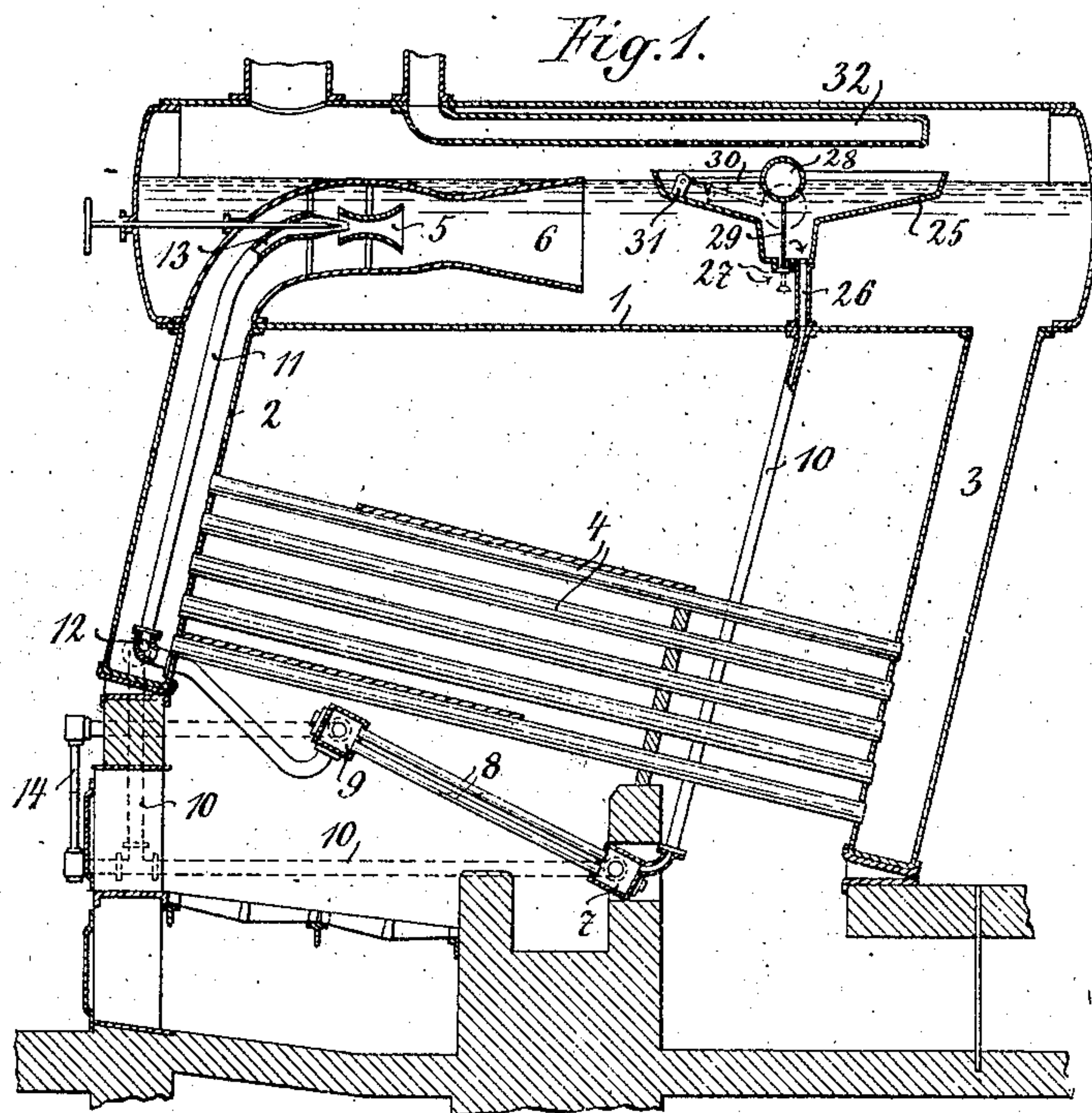


C. TÖBELMANN.
WATER CIRCULATING DEVICE.
APPLICATION FILED JULY 26, 1904.



Witnesses:
Robert Add.
C. C. Fuss

Inventor:
Carl Töbelmann,
By his Attorney,
J. W. Richards

UNITED STATES PATENT OFFICE.

CARL TÖBELMANN, OF BERLIN, GERMANY.

WATER-CIRCULATING DEVICE

SPECIFICATION forming part of Letters Patent No. 791,230, dated May 30, 1905

Application filed July 28, 1904. Serial No. 218,208

To all whom it may concern:

Be it known that I, CARL TÖBELMANN, a citizen of the Empire of Germany, residing at Berlin, in the Kingdom of Prussia, Germany, have invented a new and Improved Water-Circulating Device, of which the following is a specification.

It is well known to draw in or inject water by means of steam-injectors and to convey it further by pressure if one or more steam-injectors be arranged in an installation or apparatus—such as, for instance, a steam-boiler in conducting-pipes—in such manner as to force all the water of the boiler to pass through the said pipes, then by using steam of a higher pressure than that hitherto used in boilers it will be possible to produce a very thorough circulation, and consequently to obtain a much greater transmission of heat at the heating-surfaces of the boiler, and thus a better utilization of the fuel.

This invention relates to the working of such injectors in steam-generators and also in installations for heating by hot water by means of steam at higher pressure than that of the boiler or generator, but without introduction of any other foreign steam, a secondary steam-generator being used which is in direct communication with the water-space of the main boiler or with an apparatus arranged in the main boiler and taking up the water of condensation. By means of this secondary steam-generator the effective heating-surface is increased and the fuel utilized in a better manner.

The arrangement according to this invention can be applied to boilers or heating-installation of any kind in which a current of water can be caused to flow through passages, either owing to the construction itself of the main apparatus or by the addition of suitable pipes. The only condition is that the heating-surface of the secondary generating apparatus, which must be made very large compared to its water-space, must be exposed as much as possible to the action of hot gases and that the steam-space of the secondary generator must be arranged so far below the level of water in the main boiler as is necessary in order to obtain sufficient pressure of steam for working the injectors.

The invention is illustrated in the accompanying drawings, in which—

Figure 1 is a sectional elevation of a water-tube boiler provided with apparatus according to the present invention. Fig. 2 is a sectional elevation of a water-tube boiler having horizontal tubes and provided with apparatus according to the present invention. Fig. 3 represents in part sectional side elevation a hot-water system to which an apparatus according to the present invention is applied.

The apparatus will be first described as applied to an ordinary water-tube boiler. (Shown in Fig. 1.) 1 2 3 4 represent a boiler with an upper boiler 1, chambers 2 and 3, and tubes 4. The construction of the boiler in this case is such that circulation of water takes place from 1 through 3 to 4, from 4 to 2, and thence back again to 1. Water passing through 2 on again entering the upper boiler is caught up by a pipe 6, provided with an injector 5. In the zone where the flames are very strong under the tubes 4 is arranged a secondary steam-generator 7 8 9 of any desired construction, but so as to get as large a heating-surface as possible and a small water-space with chambers 7 and 9 and the narrow series of tubes 8.

The oblique position of the water-tubes facilitates circulation, more particularly at starting; but the tubes need not be arranged at an angle, and the boiler could be built with horizontal tubes and a perfect counter-circulation could be attained. Such a construction is shown by way of example in Fig. 2. The working will be clearly understood from the drawings. Comparatively cold water entering through the chambers arranged in series and connected by tubes 16 is heated more and more, passes into the chamber 17, and then through a pipe with a bend 19, returning to the main boiler. Water flows into the auxiliary boiler through the pipe 24. The water on leaving the pipe 24 enters the chamber 22 and flows into the tubes 23. The steam generated in the tubes 23 flows through the chamber 21 and the tube 18 to the injector 20.

The chamber 7 of Fig. 1 or chamber 22 of Fig. 2 could be directly connected to the water-space of the main boiler by means of a pipe 10 or 24 not exposed to the action of

fire. In order to avoid formation of scale in the auxiliary steam-generator, the removal of which would be attended with great difficulties on account of the narrow arrangement of its separate parts, it is advisable to feed the said secondary steam-generator with perfectly pure water and only use the water from the main boiler in the case of absolute necessity. In order, during the working of the main boiler, to obtain perfectly pure water for the purposes of feeding the secondary steam-generator, an apparatus is used arranged in the main boiler and hereinafter more fully described. Said apparatus is illustrated, by way of example, in the accompanying drawings in Fig. 1, where it forms part of the main boiler. The lower steam-outlet pipe 32, projecting into the boiler and having a bell-mouth at the lower end, if desired, is perforated for the purpose of providing a convenient discharge for water that may get condensed therein. Under this perforated sieve-like part of this discharge-pipe is arranged a cup-shaped vessel 25, narrowing downward and intended to take up water of condensation discharged from the pipe 32. This water of condensation is then conveyed into the secondary steam-generator by means of a branch pipe 26 and of a feed-pipe 10 connected thereto.

As it may happen that in starting the main boiler after a certain period of rest there will be no water of condensation in the cup or pan 25, there is provided a small auxiliary inlet for the purpose of effecting the first feed of the secondary generator mechanically with water from the main boiler, if it should be necessary. This auxiliary inlet can be constituted, say, by a float-lever 28, pivoted about the point 31 and operating by means of a rod 29 a small valve 27, which when there is no water in the cup or pan is depressed by the sinking of the float 28, whereupon water from the main boiler will be admitted to the branch 26 or pipe 10 and into the secondary steam-generator, the valve closing again as soon as the level of water is the same in both boilers. When the main boiler is working at a full pressure and sufficient water of condensation is produced, the valve remains permanently closed, and the feeding of the secondary steam-generator is effected merely by the perfectly pure condensed water. The chamber 9 is provided with a steam-outlet pipe 11, passing through the chamber 2 and provided at 12 with a check-valve and also with a regulating device 13 and with a water-gage 14.

The working of the whole apparatus is as follows: When the fire is lighted in the main boiler, the steam-inlet valve 13 of the injector is closed and steam quickly produced in it. As soon as steam has produced a medium level-water in the secondary steam-generator the inlet-valve 13 is slowly opened. The steam,

the pressure of which is greater than that of the steam in the main boiler, passes into the injector 5 and forces water through the pipe 6 at first a little and then stronger and stronger, this steam thus drawing water from 2 through 4 and 3. As the water in the boiler gets hotter and hotter the inlet-valve 13 is opened more and more until finally, when the boiler is working at full pressure, the circulation reaches its permanent maximum speed. Owing to the direct connection of the water-spaces of the two boilers, there is no risk of explosion. The steam generated must, as will be readily understood, assist the generation of heat in the main boiler as its heat is communicated to the water of the said main boiler.

In boilers constructed so that the water is not circulated naturally circulation could be produced by a guide-plate 45 in the interior of the boiler and by arranging guide-pipes with injectors.

Instead of using a secondary steam-generator it is possible to utilize the lower portions of the main boiler by separating the steam and conveying it upward to the injectors, the same result thus being attained. Thus, for instance, in water-tube boilers certain of the lower tubes can be utilized by closing the upper ends and conveying the steam for the above purpose, only in that case the injectors would be operated more slowly than when a special generator adapted for quickly producing steam is used.

As will be seen from Fig. 3 of the drawings, the process and the apparatus can be advantageously applied to heating installations of any kind by liquids, whether it be for hygienic, industrial, domestic, or other purposes.

In the case of embodiment shown in Fig. 3, 33 is the boiler supplying the system consisting of the vertical pipe 34, having the widened portion 35, the cistern 36, the connecting-pipes 43, and the heaters 37. In the stove 38 the secondary steam-generator 39 is arranged, said generator being connected with the boiler 33 by means of the pipe 40. The steam from the generator passes through the pipe 41, partially situated in the vertical pipe 34, to the injector 42, arranged in the widened portion 35 of said pipe.

The injector could be equally well arranged in the discharge-pipe 44, as this would also insure perfect circulation of the water in the installation. It is obvious that this device could also be connected with a condensed water-feed apparatus, such as that shown in Fig. 1.

It is to be understood that the scope of the present invention is not restricted to the applications and embodiments shown in the drawings and described, but that the scope is as indicated by the following claims.

Having now particularly described and ascertained the nature of my said invention and

in what manner the same is to be performed,
I declare that what I claim is—

1. The combination of a circulating hot-
water system, a boiler for heating the water,
5 means for heating said boiler, an auxiliary
boiler heated by said means, means for feed-
ing said auxiliary boiler from the main boiler,
means for collecting condensed water in the
main boiler, and means for introducing the
10 steam from said auxiliary boiler into the cir-
culating system.

2. The combination of a boiler having a cir-
culating water system, means for heating said
boiler, an auxiliary boiler heated by said heat-
15 ing means, means for collecting condensed
water in the main boiler, means for supply-
ing said condensed water as feed-water to the
auxiliary boiler, and means for introducing
the steam from said auxiliary boiler into the
20 circulating system.

3. The combination of a boiler having a cir-
culating water system, means for heating said
boiler, an auxiliary boiler heated by said heat-
ing means, means for collecting condensed
25 water in the main boiler, means for supply-
ing said condensed water as feed-water to the
auxiliary boiler, means for automatically ad-

mitting water from the main boiler as feed-
water to the auxiliary boiler in case of the
supply of condensed water being insufficient, 30
and means for introducing the steam from
said auxiliary boiler into the circulating sys-
tem of the main boiler.

4. The combination of a water-tube boiler
having an upper boiler 1, a chamber 3, tubes 35
4, and a chamber 2, means for heating said
boiler, an auxiliary boiler heated by said heat-
ing means and having a pipe 10, a chamber 7,
tubes 8, a chamber 9, and a pipe 11, an in-
jector 5 at the end of said pipe 11, the steam- 40
outlet pipe 32 provided with perforations,
the condensation vessel 25 arranged under
said pipe 32 and connected with the pipe 10,
the float 28, the float-lever 30, the valve 29 in
said vessel 25, and the rod 29 operating said 45
valve from said float.

In witness whereof I have hereunto signed
my name, this 14th day of July, 1904, in the
presence of two subscribing witnesses.

CARL TÖBELMANN.

Witnesses:

HENRY HASPER,
WILLIAM MAYNER.