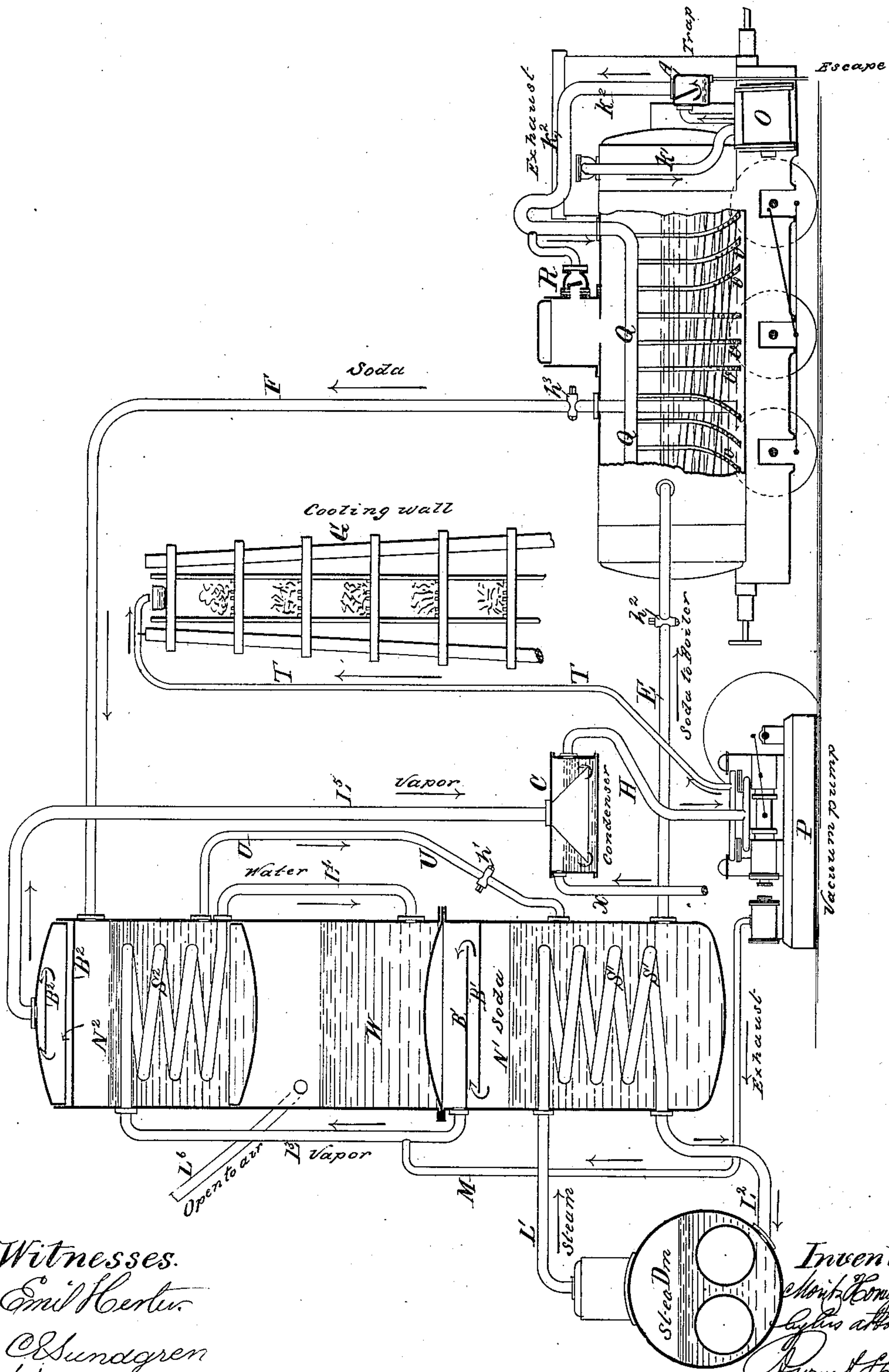


(No Model.)

M. HONIGMANN.
FIRELESS STEAM ENGINE.

No. 337,062.

Patented Mar. 2, 1886.



Witnesses.
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MORITZ HONIGMANN, OF AIX-LA-CHAPELLE, GERMANY.

FIRELESS STEAM-ENGINE.

SPECIFICATION forming part of Letters Patent No. 337,062, dated March 2, 1886.

Application filed July 24, 1885. Serial No. 172,523. (No model.)

To all whom it may concern:

Be it known that I, MORITZ HONIGMANN, of Aix-la-Chapelle, Germany, have invented new and useful Improvements in Fireless Steam-Engines, of which the following is a specification.

This invention relates to improvements in the fireless working of steam-engines by means of soda-lye or other liquids having a high boiling-point.

The invention consists in certain means, hereinafter described and claimed, for preventing the soda-lye or other heat-absorbing liquid from being drawn from the boiler in which it is contained into the engine; also, in a certain combination, hereinafter described and claimed, for providing for the transference of the diluted soda-lye or other heat-absorbing liquid to a vessel in which it is to be reconcentrated by evaporation; also, in a certain combination, hereinafter described and claimed, for the reconcentration of the soda-lye or heat-absorbing liquid; and it further consists in the novel combination, hereinafter described and claimed, of a fireless steam-engine and a lye-concentrating apparatus and condenser.

The invention is illustrated in the accompanying drawing, which represents its application to a locomotive-engine, all the apparatus except the engine being stationary, and the engine being simply connected with the other apparatus by means of two pipes, which are only connected for the purpose of discharging the diluted heat-absorbing liquid from the boiler and refilling the boiler with concentrated liquid.

Referring to the accompanying drawing: (a) The pipe k^2 , which conducts the exhaust-steam into the soda-lye is to be carried up to a point at least half a meter higher than the highest level of the soda-lye. (b) A self-acting valve, R, is placed in a pipe connecting the dome over the soda-lye with the highest point of the exhaust-pipe in such manner that the valve will open as soon as the pressure in the exhaust-pipe falls below that in the vessel containing the soda-lye, so as to draw the vapors and gases from said vessel, instead of the soda-lye. It would not answer to connect such a valve with the outer atmosphere, as the

pressure in the soda-boiler might happen to be greater than that of the atmosphere.

The exhaust-steam is introduced into the soda-lye by means of perforated vertical or oblique branch pipes v , leading down from a horizontal one at the upper part of the soda-lye vessel in order to avoid the vibrations or shocks caused by the presence of cold water in the perforated horizontal pipe near the bottom of the soda-boiler as heretofore used.

A steam-trap, A, is represented as connected with the exhaust-pipe to permit the water contained in the steam to escape. This arrangement can also be used as a means of drawing off a part of the exhaust-steam, instead of leading the whole of it into the concentrated soda-lye, the result of which is too great an elevation of temperature and pressure, necessitating the addition of cold water. By drawing off the condensed water and a part of the exhaust-steam an economy of ten to fifteen per cent. can be obtained.

The forcing out of the diluted or spent soda-lye from the soda-boiler of the steam-engine through the pipe F into the concentrating-vessel N^2 can be effected by the pressure of the soda steam-boiler itself, as toward the end of the process, when the lye has become sufficiently diluted there is an excess of pressure in the soda-lye. A further economy in the working of the apparatus is thus effected.

The soda steam-boiler may be made of wrought or cast iron, and the tubes and other parts of copper or brass.

I propose to employ in the exhaust-pipe of the engine a valve which is connected with the throttle-valve in the steam-pipe in such manner that the two valves will be opened and closed together, and that therefore the cylinder of the engine will be cut off from the soda-vessel when the engine is working without pressure.

Instead of effecting the concentration of the diluted liquids by the direct action of fire, I use a steam-boiler, D, whence steam under pressure is conducted through coils of pipe S' , immersed in the soda-lye to be concentrated in the concentrating-vessel N' , the steam becoming condensed during the concentration of the soda-lye and the condensed water returned to the steam-boiler through a pipe, I^2 .

The coils of pipe and the steam-boiler may be variously constructed; but, inasmuch as the same water is used over and over again in the boiler no incrustation will be formed, and it is therefore preferable to use a circulating tubulous boiler. By this method of evaporating the soda-lye is obtained which obviates the difficulties of evaporation by direct heat. With this process the soda-boiler can be made of cast-iron and the tubes of copper or brass.

The steam generated by the evaporation of the soda-lye by indirect heat, as last described, is used for the concentration of a further quantity of diluted soda-lye. This is effected by conducting the steam generated in the vessel N' by a pipe, L³, through another coil of pipes, S², immersed in diluted soda-lye in a vessel, N². Considerable economy of fuel is thus obtained. In this vessel a constant vacuum of about one-tenth of an atmosphere is maintained by means of a pump, P, drawing water and gases out of a condenser, C, through pipe H. The condenser is constructed in such manner that the vapor coming through pipe L³ must, on entering the condenser, pass through water about ten centimeters deep, whereby the vapors become entirely absorbed. In consequence of the vacuum in the condenser the cold water necessary for the condensation is drawn into the condenser through pipe x.

The condenser and the pump are connected by the pipe H in such manner that the water entering the pump will fill up all dead spaces. In consequence of this and of the total absorption of the vapors the pump works very economically.

The exhaust-steam from the vacuum-pump is led into the second coil of pipes, S², and is utilized for concentrating the soda-lye. In places where there is a scarcity of water the water can be cooled by being pumped over a thorn-wall, G.

The herein-described vaporization process can be used for any steam-engine, and an economy in fuel of forty to forty-five per cent. is obtained, as the steam generated in the first soda-concentrator is used for concentrating the lye in the second one, which, in consequence of the vacuum, has a boiling-point lower than 100° centigrade. There the steam is condensed in the coil S², and the condensed water runs into the vessel W, situated between the upper and lower soda-concentrating vessels, and is used for the feeding of the soda-boiler.

The pipe L⁴, which conveys the water and uncondensed vapors into the vessel W, can be connected to the latter a few meters under the surface of the water, whereby a back-pressure up to six-tenths of an atmosphere is obtained in the coil S² and in the concentrator N', in consequence of which the temperature of the steam in the coil S² is from 105° to 115° centigrade. The water-vessel W is open to the atmosphere by means of a pipe, L⁵.

The whole arrangement of the apparatus described is most advantageous, as it is made

of one cylinder. The lower part can be made of cast-iron, which resists the action of the soda-lye. The middle W and upper part, N², are made of wrought-iron, which effectually resists the action of the soda-lye, owing to its low temperature *in vacuo*.

The vessel N² is placed at such a height that the pump cannot draw off the soda-lye, which flows into the lower vessel by gravity through pipe U and cock h'. The filling of the soda steam-boiler with concentrated soda-lye is effected through pipe E and cock h².

During the concentration of the soda-lye it is necessary to provide means to prevent the escaping vapors carrying off any soda-lye with them. For this purpose I use baffle-plates B' and B², which arrest the soda-lye mingled with the vapor.

In consequence of the action of metals on soda, it is desirable not to concentrate the soda by the direct action of fire, but with the steam from a common steam-boiler. The concentrating-vessel can be made of cast-iron and the coils of pipe of copper.

Wrought-iron vessels can be lined with thin plates of copper, whereby the iron is protected from being attacked by the soda; but iron coated with copper by electro deposition cannot be used.

Having now particularly described and ascertained the nature of the said invention, and in what manner the same is to be performed, I declare that what I claim is—

1. The combination, with the steam-engine and the vessel containing the lye, into which the steam from the engine is to be exhausted, of an exhaust-pipe, a portion of which is elevated considerably above the highest level of the lye in said vessel, a communication between said pipe and the upper part of the said vessel, and a valve in said communication, which opens when the pressure in said vessel is above that in the exhaust-pipe, but is closed when the pressure is greater in the exhaust-pipe, substantially as and for the purpose herein set forth.

2. The combination, with the lye-vessel and a concentrator for the concentration of the diluted lye, of a simple pipe-connection, through which the diluted lye may be forced from the said vessel to be concentrated by the pressure within said vessel.

3. The combination, with the lye-concentrator for a fireless steam-engine, of a steam-boiler and a coil of pipe arranged within the concentrator, and having one end connected with the steam-space and the other with the water-space of said boiler, substantially as and for the purpose herein set forth.

4. The combination, with a fireless steam-engine, of a concentrating and condensing apparatus, consisting of an upright cylinder having three chambers, the upper and lower of which are lye-concentrating vessels and the interposed one is a receiver for condensed water, a steam-boiler, a steam-circulating coil within the lower concentrating vessel having

both ends connected with the boiler, and a
steam-circulating coil within the upper con-
centrating-vessel having one end in communi-
cation with the lower concentrating-vessel and
5 the other end in communication with the inter-
posed receiver, substantially as and for the
purpose herein described.

In testimony whereof I have signed my name
to this specification in the presence of two sub-
scribing witnesses.

MORITZ HONIGMANN.

Witnesses:

PETER HEEKMANNS,
GE. V. LINCLO.