(No Model.)

E. LEDIG.

GAS WASHING APPARATUS.

No. 407,936. Patented July 30, 1889.

Fig. 1.

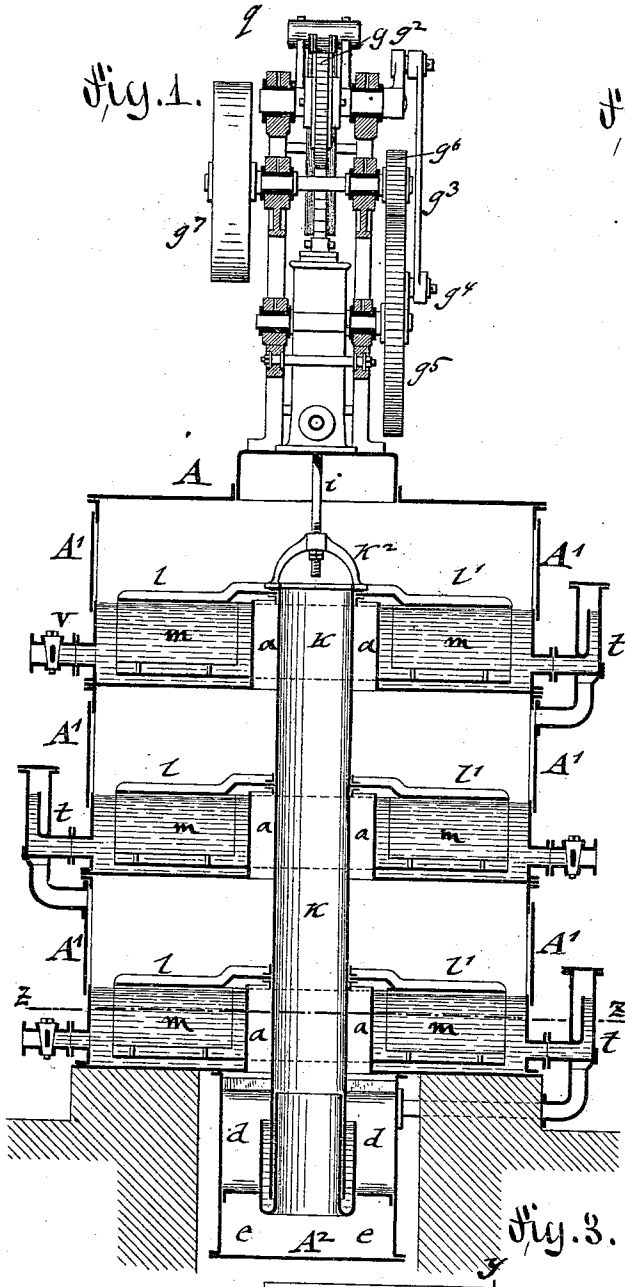


Fig. 2.

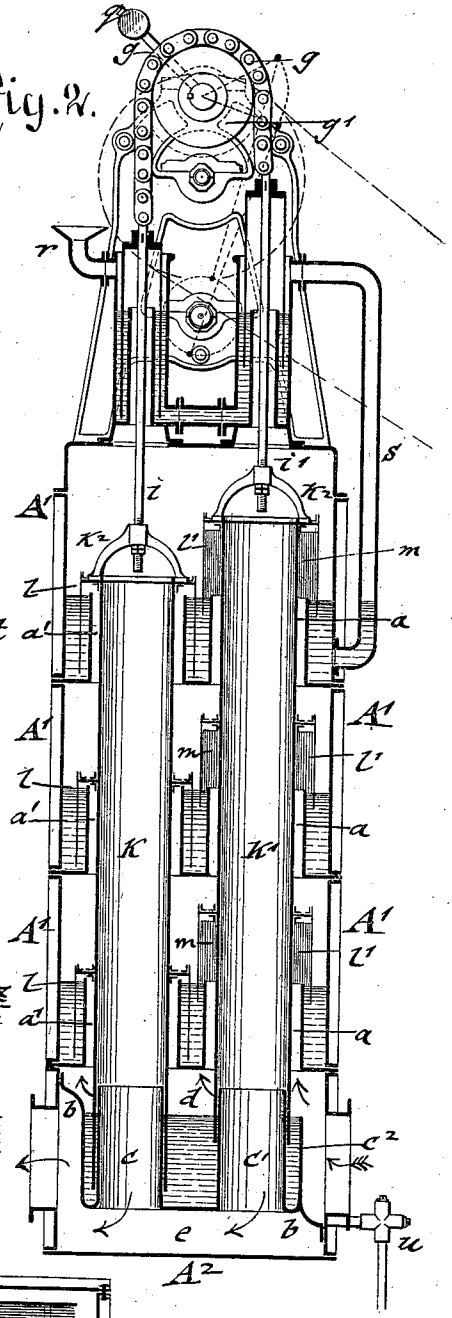
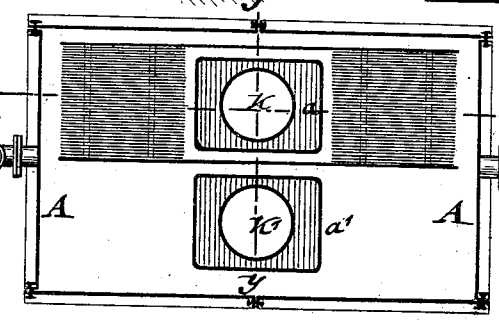


Fig. 3.



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GAS-WASHING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 407,936, dated July 30, 1889.

Application filed August 27, 1888. Serial No. 283,910. (No model.) Patented in Germany October 23, 1884, No. 31,196, and January 11, 1887, No. 40,070.

To all whom it may concern:

Be it known that I, ERNST LEDIG, of Chemnitz, in the Kingdom of Saxony and Empire of Germany, have invented certain new and useful Improvements in Gas-Washing Apparatus, (which was patented to me in Germany by Letters Patent Nos. 31,196 and 40,070, dated, respectively, October 23, 1884, and January 11, 1887,) of which the following is a specification.

This invention relates to an improved apparatus for washing or scrubbing illuminating-gas, so as to remove the ammonia contained in the same; and the invention consists of an apparatus for washing illuminating-gas, which comprises a closed casing formed of a superimposed section having gas-channels, a gas inlet and outlet, vertically-reciprocating boxes having closely-arranged parallel plates, and mechanism for imparting reciprocating motion to said boxes, as will be fully described hereinafter, and finally pointed out in the claims.

In the accompanying drawings, Figure 1 represents a vertical longitudinal section of my improved gas-washing apparatus on line *x x*, Fig. 3. Fig. 2 is a vertical transverse section of the same on line *y y*, Fig. 3; and Fig. 3 is a horizontal section on line *z z*, Fig. 1.

Similar letters of reference indicate corresponding parts.

Referring to the drawings, A represents the casing of my improved gas-washing apparatus, which is formed of a number of superimposed sections A′, of oblong shape, of which each is provided with two central vertical gas-channels *a a′*, also of oblong cross-section. The sections A′ are filled with water nearly to the edge of the gas-channels *a a′*. At the base of the apparatus is arranged the gas-distributing section A^2, which is divided by a diagonal wall *b* into two parts, of which the upper part serves as the gas-induction chamber *d*, while the lower part serves as the gas-eduction chamber *e*. The diagonal wall *b* is provided with two vertical guide-tubes C C′, which are surrounded by a vertical casing C^2, that is filled with water, so as to form a hydraulic seal for the lower ends of the gas-conducting tubes K K′, as shown in Figs. 1 and 2. The gas-conducting tubes K K′ extend from the short guide-tubes *c c* through the oblong gas-channels *a a′*, and are connected at their upper ends by fixed bails or yokes K^2 with the suspension-rods *i i′* and a suitable motion-transmitting mechanism at the top of the apparatus A, which latter imparts vertically-reciprocating motion to the gas-conducting tubes K K′. The motion-transmitting mechanism is composed of a link chain *g*, which is passed over a suitable sprocket-wheel *g′*, said link chain being connected to the upper ends of the suspension-rods *i i′*. The shaft of the sprocket-wheel *g′* is provided with a crank g^2, which is connected by a pivot-rod g^3 with a crank-pin g^4 on a gear-wheel g^5, which turns in bearings of the supporting-standards of the transmitting apparatus. The gear-wheel g^5 meshes with a pinion g^6, to which rotary motion is imparted by a pulley g^7 on the shaft of the pinion and a belt applied to the pulley. The gear-wheel g^5 and the connecting-rod g^3, applied to the cranks g^2 g^4, impart to the sprocket-wheel *g′* a rotary reciprocating motion, and by the link chain *g* a vertically-reciprocating motion to the gas-conducting tubes K K′, as shown clearly in Fig. 1.

To each gas-conducting tube K and K′ is secured in each section A′ of the apparatus an oblong sheet-metal box *l l′*, which are formed of a horizontal top sheet and two vertical side sheets. These side sheets form in each section of the apparatus, at both sides of the gas-conducting tubes K K′, channels of rectangular cross-section, which are closed at the open lower ends by the water in said sections, which forms a hydraulic seal for the sheet-metal boxes *l l′*. The boxes *l l′* are provided with a large number of sheet-metal plates *m*, which are arranged closely to each other parallel to the side walls of the boxes *l l′*, so as to form a large number of narrow passages between them. In each section of the apparatus are arranged sidewise of each other two pairs of sheet-metal boxes *l l′*, which are so arranged on the gas-conducting tubes K K′ that when the boxes of one tube are entirely submerged into the water of the section the sheet-metal boxes of the other tube

are lifted almost entirely above the level of the water in the section. When, therefore, the gas-conducting tubes, with their coupled sheet-metal boxes *l l'*, receive an alternating up-and-down motion by the motion-transmitting mechanism described, it is obvious that the submersion and washing off of the plates in the boxes takes place at regular intervals, while the gas passes in a free and unobstructed manner through between the plates, as the cross-sectional area of the passages in each box is equal to that of the other box in the same section of the casing.

The gas which is introduced into the lower part of the apparatus is compelled to pass in upward direction from the lower to the upper part, so that it takes its course successively through the channels *a a'* and the passages between the plates of the sheet-metal boxes *l l'* of all the sections A'. As the sheets are kept moist by the repeated submersion into the water in the sections of the apparatus, the ammonia-gas contained in the illuminating-gas is thereby washed out of and absorbed by the water in said sections. When the gas has arrived in the uppermost section, it is returned through the two conducting-tubes K K' to the eduction-chamber *e* and conducted off from the same perfectly free of ammonia-gas. As the weight of the submerged boxes is reduced during the submersion, while the unsubmerged boxes are increased in weight, owing to the water adhering to the plates of the same, it is necessary to apply to the crank-shaft of the sprocket-wheel *g'* a balance-weight *q*, which is applied in such a manner that it does not act on the crank-shaft when vertically above the same in the intermediate position of the alternating rising and falling tubes K K', but that it exerts only an action on the crank-shaft while the tubes K K' are in their lowered positions, in which the balance-weight serves to balance the submerged boxes and their gas-conducting tube.

The water used for washing the gas is conducted into the apparatus through a funnel *r* to the hydraulic seals of the suspension-rods *i i'*, and from the same, through a connecting-tube *s*, into the uppermost section of the apparatus. The water is then conducted from section to section by means of overflow-pipes *t*, which are located at the outside of the apparatus, the overflow-pipes being arranged in such a manner that the specifically heavier solutions of ammonia salts are drawn off first. From the lowermost section of the apparatus the water used for washing is conducted into the chamber which is formed by the wall c^2 of the hydraulic seal of the tubes K K', and is then conducted off through the valved discharge-pipe *u*.

In each section of the apparatus is arranged a discharge-faucet *v*, for the purpose of removing the dirt collecting at the bottom of each section.

The supply of water is regulated in proportion to the quantity of gas to be washed in such a manner that it remains nearly free of ammonia in the uppermost section, while the quantity of ammonia is gradually increased as the water passes through one section after the other, until the water, when finally discharged, contains about from 6° to 7° Baumé.

The escape of gas from the apparatus is impossible, as the same is closed entirely up to the hydraulic seals of the suspension-rods at the top of the apparatus. The hydraulic seals are tested for a certain maximum pressure, so that there is no possibility for the escape of gas.

If the apparatus is once in regular operation, it is hardly necessary to ever open the same, as the choking of the same is not possible if a sufficient quantity of water is constantly supplied.

From time to time it is necessary to draw off the dirt deposited at the bottoms of the sections, so as to keep the apparatus in good working order. If desired, the apparatus may be cleaned from time to time by forcing an extra quantity of water through the same.

The advantages of my improved gas-scrubber are, first, that the ammonia contained in the gas obtained from the retorts is entirely removed from the same; secondly, that a comparatively small quantity of water is required for washing; thirdly, that a large quantity of ammonia-water of from 6° to 7° Baumé is obtained; fourthly, that little or no increase of pressure in the apparatus takes place, and, fifthly, that the apparatus takes up a comparatively small space, as all the parts are very compactly arranged relatively to each other.

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

1. The combination of a closed casing comprising a number of superimposed sections for containing water, said casing being provided at its lower end with inlet and outlet chambers for the passage of gas, each of said sections having two vertical gas-channels, gas-conducting tubes passing through said vertical gas-channels of the sections and opening at their lower ends into one of said chambers, means for vertically reciprocating said tubes, and boxes attached to said tubes, said boxes being provided with a series of plates, substantially as set forth.

2. The combination of a closed casing comprising a number of superimposed sections for containing water, said casing being provided at its lower end with inlet and outlet chambers for the passage of gas, each of said sections having two vertical gas-channels, gas-conducting tubes passing through said vertical gas-channels of the sections and opening at their lower ends into one of said chambers, water seals at the lower ends of said tubes, means for vertically reciprocating said tubes, and boxes attached to said tubes, said boxes being provided with a series of plates, substantially as set forth.

3. The combination of a closed casing comprising a number of superimposed sections for containing water, said casing being provided at its lower end with inlet and outlet chambers for the passage of gas, each of said sections having two vertical gas-channels, gas-conducting tubes passing through said vertical gas-channels of the sections and opening at their lower ends into one of said chambers, boxes attached to said tubes, said boxes being provided with a series of plates, suspension-rods for said tubes, a link chain connected to said rods, a sprocket-wheel for said link chain, and a crank-motion for imparting oscillating motion to the sprocket-wheel and vertically-reciprocating motion to the gas tubes and boxes, substantially as set forth.

4. The combination of a closed casing comprising a number of superimposed sections for containing water, said casing being provided at its lower end with inlet and outlet chambers for the passage of gas, each of said sections having two vertical gas-chambers, gas-conducting tubes passing through said vertical gas-channels of the sections and opening at their lower ends into one of said chambers, boxes attached to said tubes, said boxes being provided with a series of plates, suspension-rods for said tubes, a link chain connected to said rods, a sprocket-wheel for said link chain, a crank-motion for imparting oscillating motion to the sprocket-wheel and vertically-reciprocating motion to the gas tubes and boxes, and water seals for said suspension-rods, substantially as set forth.

In testimony that I claim the foregoing as my invention I have signed my name in presence of two subscribing witnesses.

E. LEDIG.

Witnesses:
ATTWILL SCHILLING,
WILLIAM R. MATTHES.