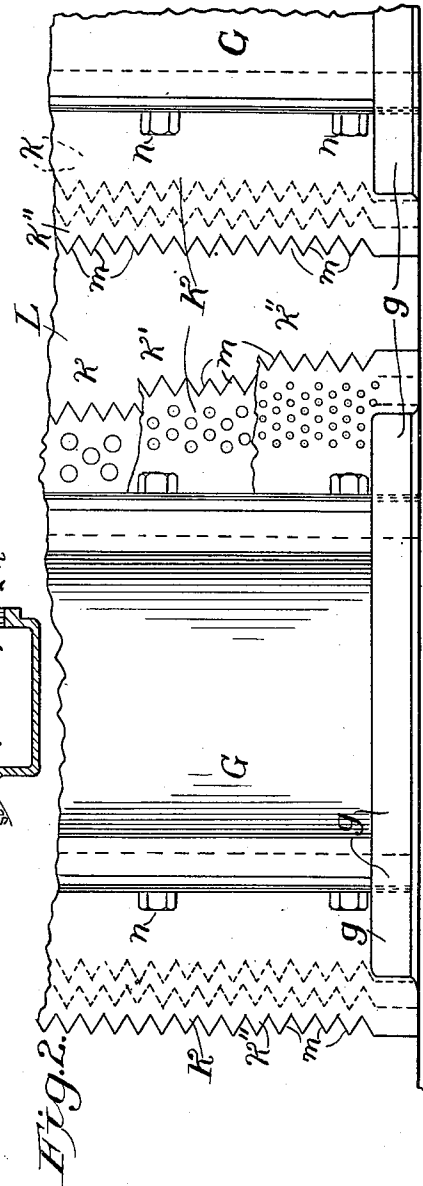


GAS WASHER.

Patented May 26, 1914.

2 SHEETS—SHEET 1.



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GAS WASHER.

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2 SHEETS-SHEET 2.

1,098,190.

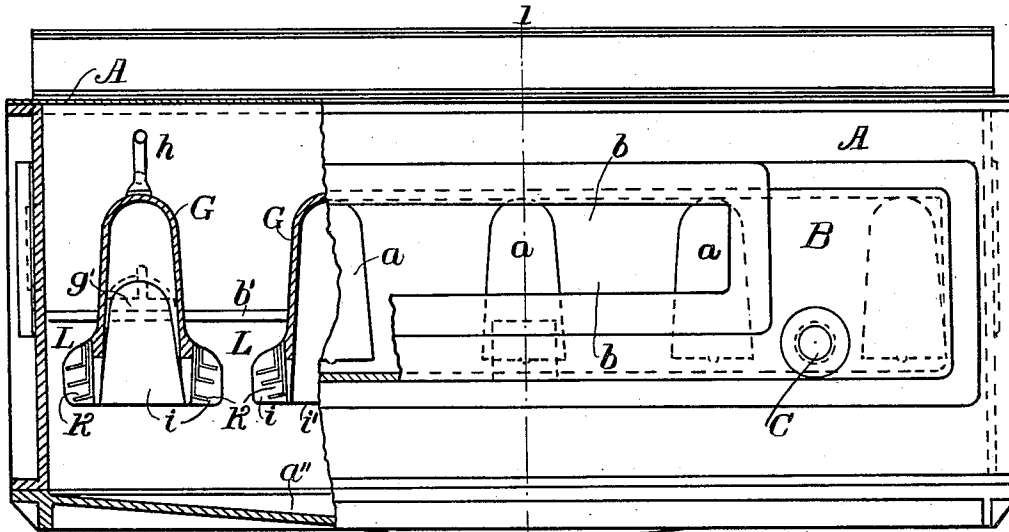


Fig. 3.

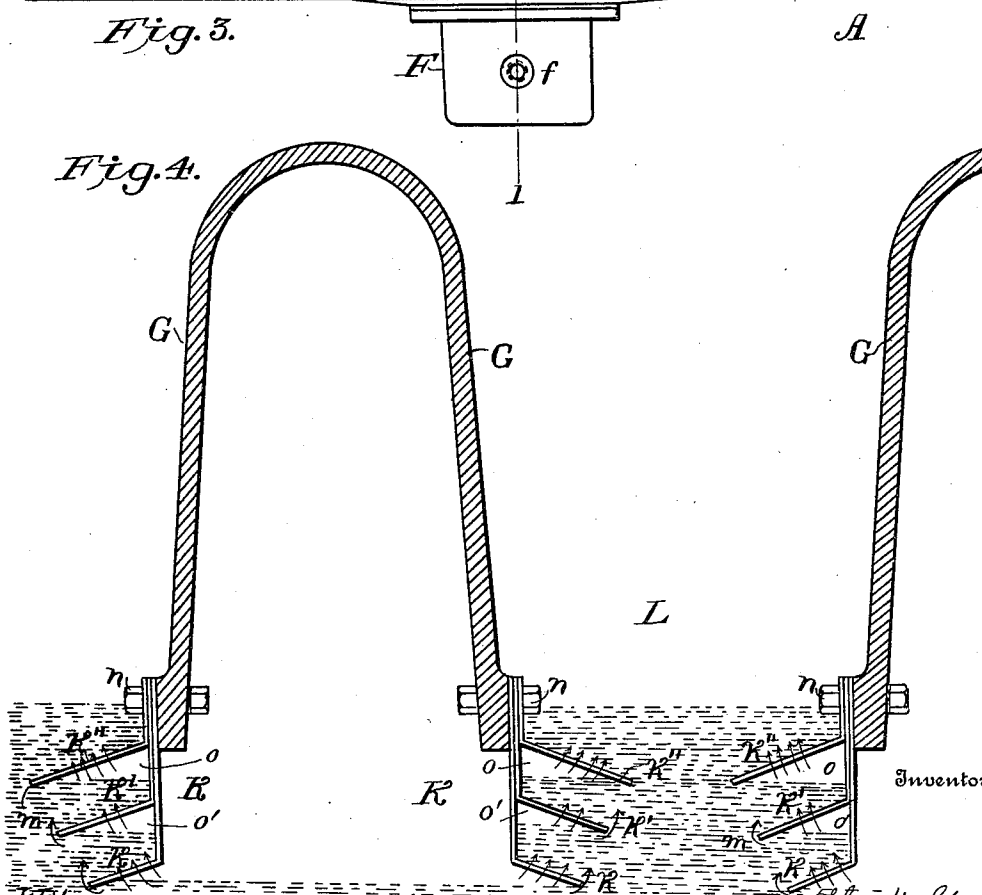


Fig. 4.

Witnesses.

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GAS-WASHER.

1,098,190.

Specification of Letters Patent.

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To all whom it may concern:

Be it known that I, THOMAS W. STONE, a citizen of the United States, residing at Fort Wayne, in the county of Allen and State of Indiana, have invented certain new and useful Improvements in Gas-Washers, of which the following is a specification.

This invention relates to apparatus for washing and purifying gas and other purposes, and more particularly to improvements in that type of gas-washer covered by Letters Patent, numbered 677,865 and 764,049, in which gas is divided into numerous small streams or bubbles by perforated plates and passed through the wash-water or ammoniacal liquor for freeing it from ammonia and other impurities, such as lamp black, naphthalene and tarry matter.

The object of my invention is to simplify the construction of this type of washer, provide for a multiple washing operation and make it more effective in operation, more readily cleanable; and further to overcome the danger of the perforated plates becoming clogged or plugged up with naphthalene, tar, soot and other obstructive impurities, thereby objectionably increasing back pressure on the retorts and other parts of the apparatus which intervene between the retorts and the washer, and thus materially interfere with the effective and uniform operation of the plant.

In washers constructed in accordance with the above mentioned patents the spaces between the gas-induction channels or ducts is bridged over by perforated crown plates in the washing channels. These perforated plates, during the washing operation, become clogged, so that the gas cannot pass through them, or only to a limited extent, causing the objectionable back pressure above mentioned, and uneven distribution of gas in the washer, thereby greatly decreasing the efficient washing surface and uniformity of action. By my improved construction these difficulties are overcome and greatly improved results secured.

One of the special objects of my invention is to provide for the reestablishment in the washer of uniform gas distribution, so as to secure uniform and effective washing, by providing a series of longitudinal gas pockets, one above another below perforated screen plates, along the lower edges of the gas inlet ducts. By means of these

pockets the flow of gas is equalized and made uniform in distribution through a series of perforated plates and intervening wash-liquor, thereby producing uniform and complete washing and purifying results. This even and uniform gas distribution within the wash box is quite important and valuable in practical operation.

By my present improved construction also, the operation of cleaning the plates is greatly facilitated, such operation being conveniently and quickly performed without removing the perforated plates from the wash-box, as heretofore required.

Other advantages of my improved construction will more fully appear after a detailed description in connection with the accompanying drawings, in which—

Figure 1 represents a vertical longitudinal section of a washer on line 1—1, Fig. 3. Fig. 2 represents a top plan view, on enlarged scale, of portions of two adjacent gas-inlet ducts and an intermediate open washing channel. Fig. 3 represents a front end elevation, partly in transverse section. Fig. 4 represents a transverse section of portions of adjacent gas inlet ducts and washing channels, corresponding in scale to the same parts shown in Fig. 2.

The gas-washer box A is preferably constructed of cast iron plates bolted together by their flanges in a well-known manner, the front end having a series of inlet openings *a* at which the gas inlet ducts *G* are bolted. To the inlet end of the box is also bolted a wide rectangular and flaring gas inlet chamber B having a rectangular opening *b* at which is connected the gas supply pipe. The top plate *a'* of the box may be of thin metal as shown and the bottom plate *a''* is dish-shape and provided with a central opening at which is connected a well or receptacle F for receiving tar and other heavy impurities. This well is provided with a comparatively small opening *f* which is tapped for attaching a steam pipe, and a larger opening *f'*, which is also tapped for connection of a drain pipe. The rear end wall of the box is provided with a transverse inwardly projecting supporting flange *b'*, and below the same with a liquor discharge opening *c*. At the outside of this opening an overflow chamber D is secured to the end wall and is provided in its bottom with an upwardly projecting screw

threaded overflow liquor pipe E. To the screw-threaded end of this pipe is connected an adjustable overflow pipe section *d* having a stem *e* which projects through a stuffing box at the top of chamber D.

The inverted gas inlet ducts G are provided at their front ends with flanges *g* by means of which they are bolted to the front end wall of the box, and at their rear ends they are provided with horizontal flanges *g'* which rest upon the supporting flange *b'*. These ducts are also provided at their rear ends with downward and lateral extensions *i* for receiving the abutting ends of the groups K, of perforated plates. The upper surfaces of these ducts are also longitudinally inclined from the inlet ends to their rear ends as clearly shown in Fig. 1, and are provided with eyes *h* to which may be applied hooks and chains for raising or lowering the ducts.

In order to provide for more uniform distribution and flow of gas and overcome the ill effects of clogging or plugging of the perforated plates connecting with the longitudinal edges of adjacent ducts, I herein provide groups K of perforated wing-plates secured by bolts and nuts *n*, to the inverted gas inlet ducts G at their sides and near their lower edges as shown in Fig. 4. The plates *k*, *k'*, and *k''*, forming these groups, are bent as shown to form vertical portions and the outwardly projecting perforated portions which are slightly inclined downward and project outward from the opposite edges of the duct G into the washing channel L. The plates are so bent that the outwardly turned portion of the lower plate *k* is narrowest, the plate *k'* a little wider, and the plate *k''*, still wider, so that the successive plates overhang one another. They are spaced apart, one above another, as shown in Fig. 4. The lower plate *k* is provided with comparatively large perforations, the next succeeding plate *k'* above, with smaller perforations and the plate *k''*, with still smaller perforations, and all are made with serrated edges *m*, as clearly shown in Fig. 2.

It is to be noted that the wing-plates *k'* and *k''* are not perforated up to the bends, but that a portion of metal, equal to one-fourth to one-third of the width of the plate, is left plain adjacent to the vertical part, as indicated in Figs. 2 and 4, for the purpose of more effectively establishing longitudinal gas-pockets *o*, *o'* below the upper and middle plate, by reason of the gas displacing the wash liquor. In multiple washers of this class the tendency of the gas is to uneven distribution, that is, to pass from under the edges of the ducts and through the perforated screen plate as heretofore constructed, in excessive quantity in one or more places, and thus escape without uni-

form and thorough division and washing. In my improved construction this defective operation is overcome by reason of the fact that the successive gas pockets reestablish uniformity of pressure along the whole length of the duct. In case an excessive quantity of gas passes under, and rises above, the bottom screen plate at any one point, this gas is caught in the lower gas-pocket *o'*, where the pressure is uniform and where it will again be distributed in a uniform flow along the entire length of the duct and thence in fine streams or bubbles up through the plate *k'*. The gas will again be collected in the upper pocket *o* at a uniform pressure and again distributed in numerous streams up through the wash liquor. Evidently a multiple washing effect will be produced by the three lines of perforated plates, and the gas will be uniformly distributed, by the pockets, through the wash liquor, so that the operation is thorough and highly effective. The outer longitudinal free edges of the plates in chambers L provide for the escape of gas up through the wash liquor in case the perforations become clogged with impurities.

The construction and assembling of the wing-plates is very simple, since it is only necessary to bend each plate longitudinally at the proper distance from its outer edge and at the proper angle, and then connect all the vertical portions thereof together and to the channel G by bolts and nuts *n*. The plates *k*, *k'*, *k''* may be cut off from stock lengths of material and bolted on to the inverted channels without requiring any special fitting or forming and, at the front or inlet end of the washer, the ends of the plates are simply butted up close against the front end plate. At the rear end of the box the ends of these plates are also butted up against the side extensions *i* of ducts G, as shown in Fig. 3. This construction is very simple and economical in practice and is also quite effective in operation. Longitudinal washing channels L, having a clear open space between the outer free edges of the opposite perforated plates, will be provided between the gas inlet ducts G, and the water or liquor by reason of the gas pressure will rise a short distance above the surface of the upper plate *k''*, as shown in Fig. 4, the outlet opening *c* into the overflow chamber D, Fig. 1, being about at the water level shown in Fig. 4. The main gas outlet opening P is preferably made of rectangular shape in the side-wall of the box as shown in Fig. 1.

In operation gas, flowing through the inverted ducts G and outward therefrom, will first pass through the large perforations of the lower plate *k* which are less liable to be clogged up by the contained particles of carbon and naphthaline. The gas having

been partially cleaned and divided into numerous streams and bubbles, will collect in pockets *o'*, where it is again distributed and passed through the smaller holes of plate *k'* so as to be more finely divided and will collect in pocket *o* and finally passed through the smallest holes in the upper plate where a finer division is effected, and the fine streams or bubbles are again subjected to the action of the washing liquor. In case the perforations in the plate *k*, *k'*, *k''*, become partially plugged up, the gas will be forced around the outer free edge of the plate and between the serrations *m* which will serve to further divide it into numerous streams, and the streams so flowing around the outer free edge of a lower plate will be caught by the succeeding overhanging plate and diverted through the perforations thereof. By providing plates with outer free edges between the ducts, the gas may always be diverted around said edges in the washing chambers *L*, causing only a very small increase in back pressure, say about one-eighth of an inch, as indicated by a gage. In case, also, gas is forced around the edge of any one plate, it will be divided by the serrations about as effectively as though it was passed through the perforations in the plate, and the streams of gas produced by such division would again be caught by a plate above and further divided by passage through the perforations thereof. When it happens that the perforated plates become more or less clogged with impurities such as naphthaline, tar, soot or other matter, they may be readily cleaned by inserting a properly bent steam or water pipe into the channels or passages left between the outer free edges of opposite plates, and then forcing in jets of steam or water for cleaning the plates. Wooden or steel scrapers may also be used for cleaning the plates without removing them from the washer box. This facility of cleaning the plates is quite an important feature of improvement in my gas washer, since such operation can be quickly performed with very little interruption to the operation of washing gas. Another advantage of my invention is that the gas will be effectively washed and cleaned without materially increasing back pressure upon the retorts or other parts of the apparatus between the retorts and the washer, even when all perforations are clogged up and the serrated edges must be depended upon entirely for subdivision of the gas.

This washer may be applied with marked beneficial results to various industrial arts; and instead of applying it simply as an ammonia washer, it may be successfully used for subjecting gas to the chemical action of certain substances carried in solution in water. In this connection it has been found particularly effective for obtaining the de-

sired intimate contact of gas with the water without the possible difficulty of back pressure. My washer may also be applied with economy as a condensing steam exhaust system or inversely for heating water. It is my intention to apply it for obtaining various economical results wherever it can be used to advantage, and I wish it understood that the invention is not confined to washing gas.

I claim:

1. In a gas-washer, the combination with a series of inverted gas-inlet ducts, spaced apart to form intermediate washing channels, of two or more outwardly extending perforated plates secured to the side walls of said ducts, spaced apart, one above another, and having successively smaller perforations from the lower one upward, said plates having free outer longitudinal edges open between adjacent ducts, substantially as described.

2. In a gas-washer, the combination with a series of inverted gas-inlet ducts, spaced apart to form intermediate washing channels, of groups of perforated plates secured to the side walls of said ducts, spaced apart, one above another, and of successively greater width from the lower one upward, said groups of plates having free outer longitudinal edges open between adjacent ducts, substantially as described.

3. In a gas washer, the combination with two longitudinal inverted gas-inlet ducts, spaced apart to form an intermediate washing channel, of two or more outwardly extending perforated plates, spaced apart, one above another, and inclined outward and downward from the lower edges of the inlet-ducts to form longitudinal gas distributing pockets, whereby gas will be more uniformly distributed through the wash liquor and more thoroughly and uniformly washed.

4. In a gas-washer, the combination with two longitudinal inverted gas inlet ducts, spaced apart to form an intermediate washing channel, of a group of downwardly and outwardly inclined perforated plates, of successively greater width from the lower one upward and spaced apart, one above another, to form longitudinal gas-distributing pockets, for producing multiple washing effects and uniformly distributing the gas through the wash liquor.

5. The combination with a gas-washer box having at the rear end an inwardly projecting supporting flange, of longitudinal inverted gas inlet ducts having flanges at the front ends secured directly to the end wall of the box and having at the rear ends horizontal flanges resting upon said supporting flange, and downward lateral extensions, and perforated plates secured to the longitudinal lower edges of said gas ducts and abutting at their front ends against the end

wall of the box and at their rear ends against said lateral extensions of the ducts, substantially as described.

6. In a gas washer, the combination with
5 a pair of longitudinal inverted gas-inlet ducts, spaced apart to form an intermediate washing channel, of groups of inclined perforated plates, spaced apart one above another, to form gas pockets, said plates being
10 successively wider from below upward, having comparatively large perforations in the

lower plate and successively smaller perforations in plates above, and also having free serrated edges in the washing channels, and connected to the inlet ducts, substantially 15 as described.

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

THOMAS W. STONE.

Witnesses:

SHERMAN FAY,
A. J. WOHLFROM.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."