F. WOLF.

PROCESS OF MAKING AMMONIUM SULFATE AND SULFITE.

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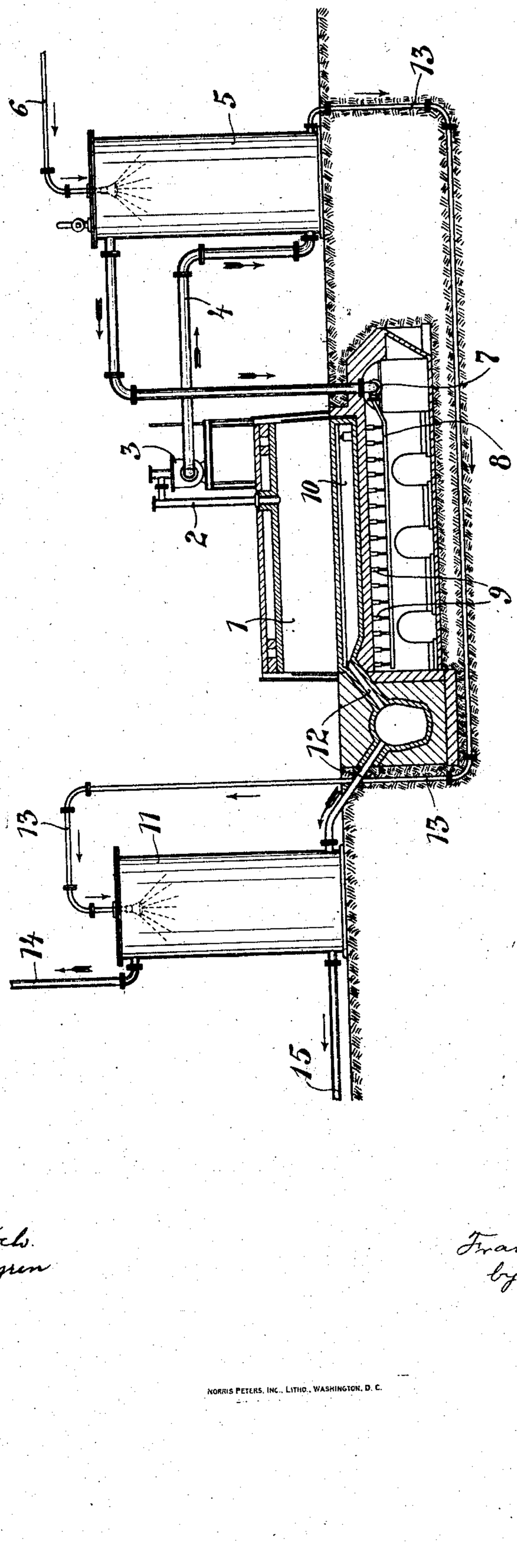

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PROCESS OF MAKING AMMONIUM SULFATE AND SULFITE.

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To all whom it may concern:

Be it known that I, FRANZ WOLF, a citizen of Germany, and resident of Bochum, Germany, have invented certain new and useful Improvements in Processes of Making Ammonium Sulfate and Sulfite, of which the following is a specification.

Efforts have been made to utilize the admixture of sulfur contained in the coal in form of sulfuric acid during the distilling processes of the coal, in order to render the manufacture of sulfate of ammonium possible in connection with the ammonia also contained in the coal. This is accomplished by passing the gases of distillation of the coal through gas-washers charged with oxid of iron and utilizing the sulfur which is won thereby in the purifying-mass, for the manufacture of sulfuric acid in the calcining-furnaces of the sulfuric acid factories. The sulfuric acid is then employed in a subsequent process for the saturation of ammonia gases for producing sulfate of ammonium. Recently it has also been proposed to expose these gases, which contain the sulfur in form of sulfureted hydrogen to an oxidation by the aid of a contact-process and thus win the sulfite of ammonium or the sulfate of ammonium by a direct union with the ammonia likewise contained in the gases. The first-named process has the disadvantage that the gas purifying-mass must be repeatedly renewed and that the subsequent complicated calcining-process of this mass must be carried out in sulfuric acid factories, thus requiring an additional plant and comparatively expensive labor. The other process is not practicable on account of the great danger incurred by the necessity of admitting air to the explosive gases for oxidizing the sulfur, so that in view of the always complicated working of a coke-oven plant explosions through carelessness can hardly be avoided. The present process avoids all these disadvantages in a simple manner by leaving the sulfurous combination in the gases of distillation and treating the waste-gases, generated by burning the gases of dry distillation in the coke-ovens themselves and containing sulfur-dioxid with gaseous or hydrous ammonia, in which manner a combination of these two components for forming sulfite of ammonium and sulfate of ammonium is obtained.

According to my process the sulfur combinations contained in the gases emanating from the coking chambers of the coke oven are not separated therefrom and the purification of said gases prior to their combustion needs therefore not be extended beyond the washing-out of the tar and ammonia. The gases thus still containing all their sulfur are then burned in the heating chambers of the coke oven whereby sulfur-dioxid is formed. The ammoniacal liquor previously obtained is then caused to drizzle through the rising products of combustion formed by heating the coke oven and containing sulfur-dioxid, thereby forming a solution of ammonium sulfate and ammonium sulfite, while the considerable heat still contained in these burned gases may be utilized for concentrating said solution. It is obvious that in lieu of bringing said burned gases in contact with drizzling ammoniacal liquor, they may be brought in contact with the gases of distillation produced in an ammonia distilling column, thereby obtaining the same result. After the reaction between the burned gases and the ammoniacal liquor or vapor has taken place, the residual gases may be passed through water sprays in order to completely precipitate the ammonia which may have been occasionally carried along. This new treatment of the waste-gases of coke-ovens with ammonia combinations can be carried into effect in accordance with the construction of a coke-oven at the point where the utilization of the heat of the gases permits it. In case the draft of the chimney should be reduced too much by this treatment of the waste-gases, a ventilator may be employed to overcome this difficulty.

From the above description it will be seen that by means of my invention the execution of the coal-distilling process proper needs not be altered in any way, but that the treatment of the hitherto worthless waste-gases has only to take place in the manner above described before the waste-gases are discharged into the chimney. The peculiarity of this new process is therefore particularly characterized by the fact, that not a single phase in the treatment of the coke-oven gases is to be considered, but that by the combination of several phases, a process complete in itself, is obtained consisting in first separating the ammonia from the gases, then burning the gas while still containing the hydrogen sulfid thereby forming waste

gases, still hot, and containing sulfur dioxid and then treating the ammonia liquor with said waste gases to obtain the desired final product, whereby at the same time a further utilization of the heat of the waste-gases for evaporating the water takes place.

The accompanying drawing illustrates diagrammatically a plant for carrying out my new process.

The gases generated in the coke-oven 1 are led by means of a pipe 2 to the hydraulic main 3 for the removal of the tarry matter. The gases of distillation are then led through the pipe 4 to the ammonia-washer 5, the water being supplied through a pipe 6 at the top of said washer. The amount of gas necessary for heating the coke oven, still containing all its sulfur, is then led to the header 7 from which distributing pipes 8 lead the gases to the mixers 9 to be mixed with the necessary quantity of air, which charge is then ignited. The gases and the sulfur contained therein are now burned and the heat generated thereby is imparted to the coke-oven, the fire-gases being led around the latter to the bottom-chamber 10, from whence they are directed through pipes 12 to the tower 11. To the latter is also led the ammoniacal liquor of washer 5 through pipe 13 connected to the top of the tower wherein it drizzles through the ascending waste-gases which are finally discharged through pipe 14 into a chimney (not shown). While this liquor comes into contact with the waste-gases, the ammonia combines with the sulfur trioxid and sulfur dioxid whereby a solution is formed which contains sulfate of ammonium and sulfite of ammonium respectively. The solution is finally removed from the tower by means of pipe 15 for further treatment.

I claim:

Process of obtaining ammonium sulfate and sulfite from the gases of dry distillation of fuel which consists in separating the tar from said gases, washing the gases freed from tar to obtain an ammoniacal liquor, burning the gases freed from tar and ammonia to transform the sulfur contained therein into sulfur trioxid and sulfur dioxid, and treating the gaseous products of combustion with said ammoniacal liquor to form ammonium sulfate and sulfite.

Signed by me at Barmen, Germany, this 21st day of January, 1911.

FRANZ WOLF. [L. S.]

Witnesses:
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