International Fertilizer Industry Association

ISMA* Technical Meetings

Paris, France
25-27 September 1951

*In 1982, the name of the International Superphosphate Manufacturers' Associations (ISMA) was changed to International Fertilizer Industry Association (IFA).

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THE INTERNATIONAL
SUPERPHOSPHATE MANUFACTURERS' ASSOCIATION

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LE 298. September 1951.

TECHNICAL MEETINGS 1951.

Paper No. 3. CONFIDENTIAL.

COOLING APPARATUS - OLEUM ABSORBER.

by P. Ferry. (Cie. de Saint-Gobain).

Generally speaking, the manufacture of oleum is carried out by bringing together the gases, emerging from the converter section, and of oleum of a lower grade than that which it is desired to manufacture.

It is a well known fact that sulphuric anhydride combines all the more readily with oleum, the richer the gases in sulphuric anhydride and the lower the temperature of the oleum; for a given gas concentration and strength of oleum, the fixation of SO_3 is only possible below a maximum temperature, corresponding to the equilibrium of the tension of SO_3 between the gaseous and liquid phase; it is, therefore, necessary to keep the temperature of the oleum sufficiently low, by eliminating the heat, liberated by the fixation of SO_3 and the sensible heat of the converter gases.

Very often, production is carried out in two phases; first the gases pass through a cooling apparatus, where the flowing cooling agent consists, generally, of natural or forced air circulation, the gases entering the absorption apparatus in the circuit of which the oleum passes through a water cooler.

The cooling of the gases by air, leads to very extensive exchange surfaces, necessitated by the poor or low coefficient of heat transmission. The cooling of oleum is easier, seeing that the exchange coefficient is approximately ten times greater than the former coefficient, but the absorption apparatus, consisting very often of one column and its accessories, is rather voluminous.

The apparatus, which we describe, deals with both the absorption of SO_3 and the elimination of heat.

It consists of a number of identical elements, mounted in parallel on the gas circuit, each consisting of

1 vertical tube with a total diameter of 250 to 500 mm
1 oleum atomiser, mounted in the interior at the top of the tube.

The whole of these elements are mounted on a reservoir, fitted with a circulating pump.

The apparatus functions as follows:

The gases coming from the converter enter at the top of the

tube, pass into the reservoir and leave it by a series of tubes with holes in the upper portion.

The oleum which fills almost half of the reservoir is taken up by the pump and sent towards the vaporisers, where it comes into close contact with the gases. The grading of the oleum is carried out in the reservoir itself by means of 98% H_2SO_4.

Each tube is effectively cooled by water, running down on the outside, which absorbs the heat of the oleum circulating on the inside; thus very high heat transmission coefficients are obtained, which may exceed 500 cal/m^2.hr.^oC, as between the oleum and the water; the reservoir itself can be sprinkled so that almost the entire surface of the apparatus is utilised for cooling purposes.

The whole apparatus is made of soft MARTIN steel, whilst the vaporiser can be made of 18 : 8 stainless steel.

ADVANTAGES OF THE APPARATUS

Apart from its flexible working, resulting from the small quantity of circulating liquid, the main advantage of the appa - ratus lies, no doubt, in its simplicity and low cost.

Thus, for an installation, producing 100 tons of SO_3 a day, a tower 4 metres in diameter and 6 metres high is generally used, requiring approximately 100 square metres of M.S. plate, and a cooling apparatus for oleum with a surface of 200 square metres, making altogether 300 square metres; the surface of the apparatus described above does not exceed 75 square metres under identical working conditions.

In addition, seeing that the normal apparatus requires a considerable surface, the column must be filled with rings; thus the foundation of this column and of the cooling apparatus must be stronger than that of the absorbing cooler.

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Réfrigérant - Absorbeur à oleum.

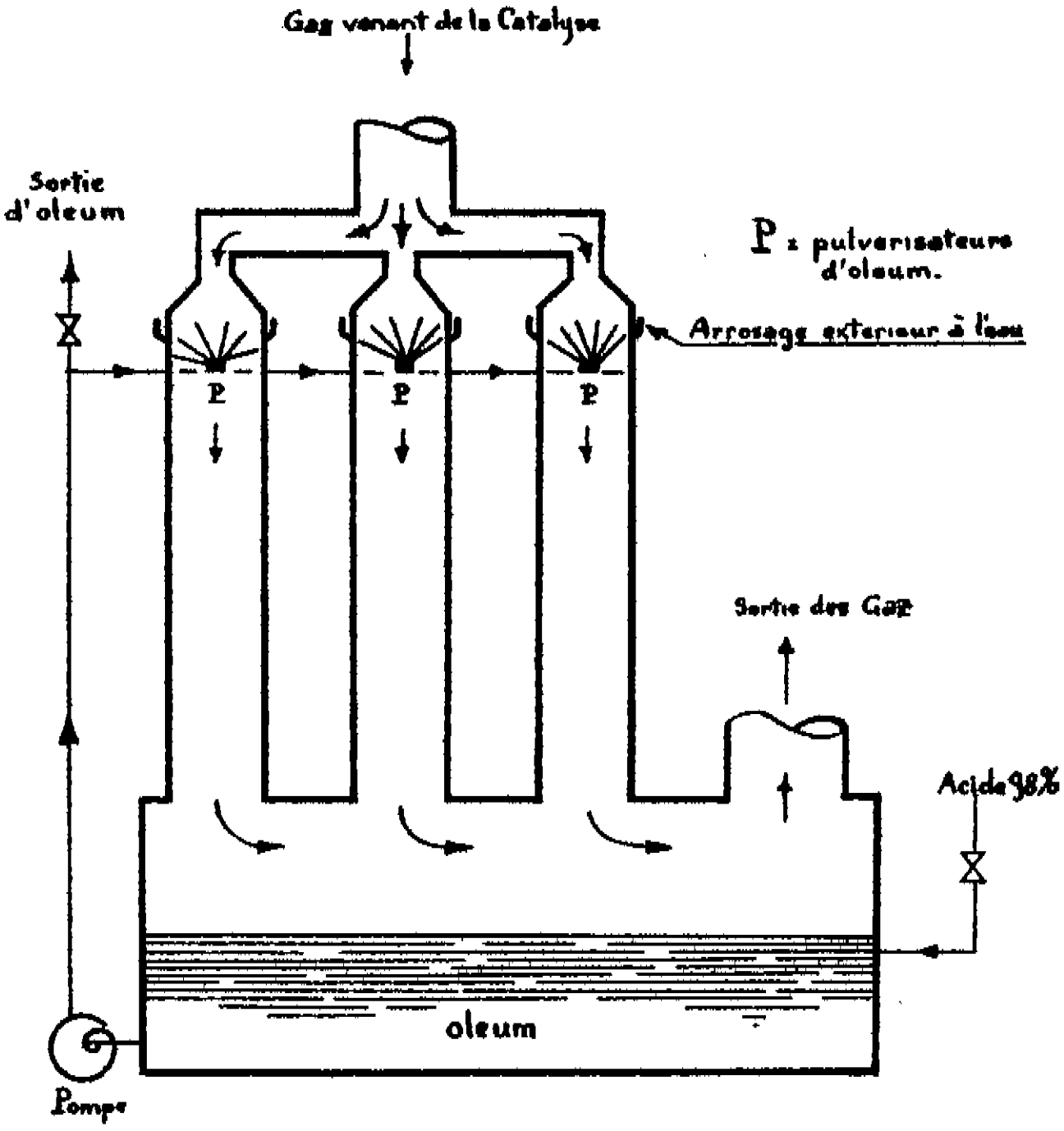

Schéma de principe de l'appareillage.

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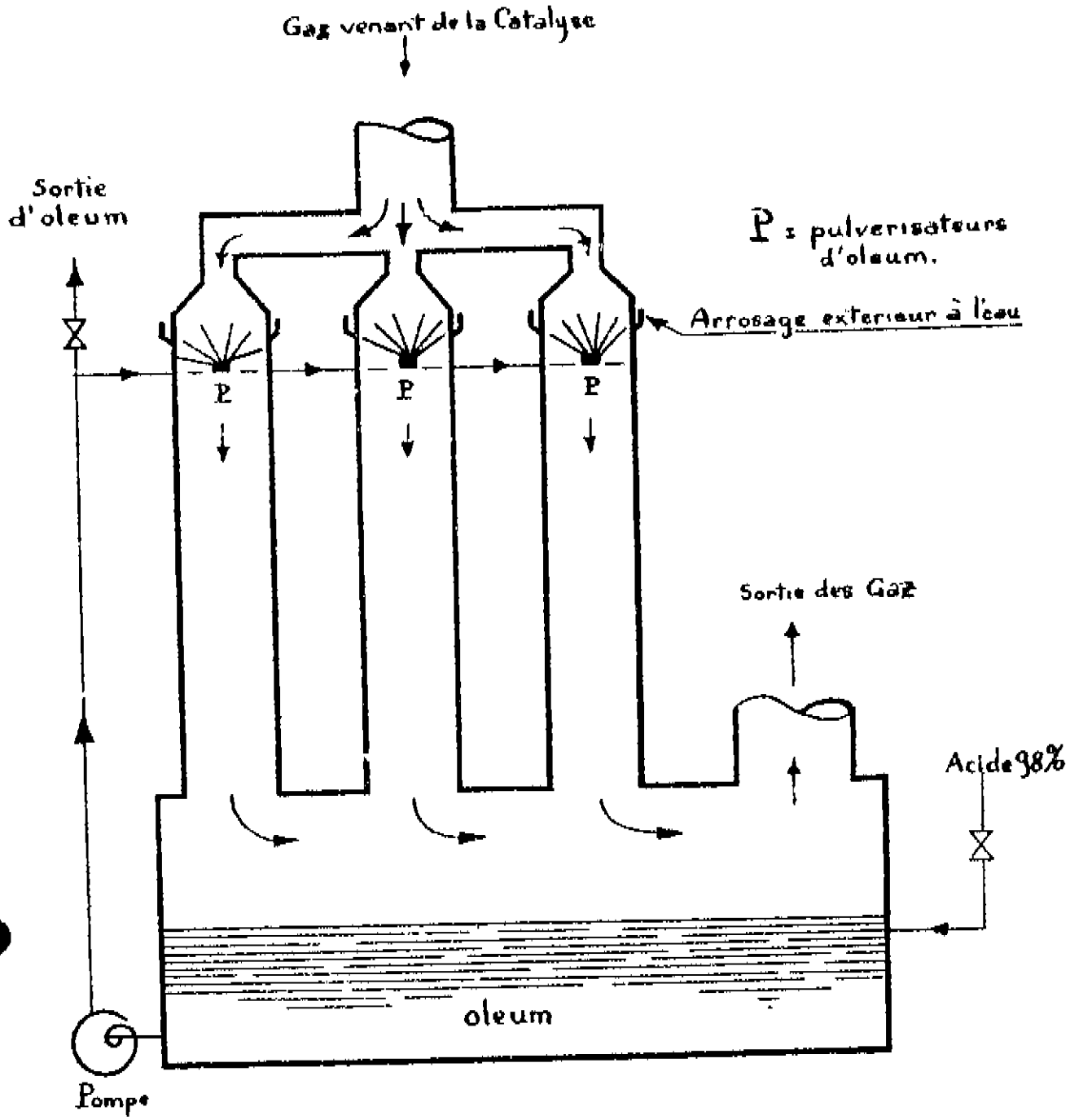

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