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R. PFLOCK

APPARATUS FOR THE ABSORPTION OF GASES IN LIQUIDS

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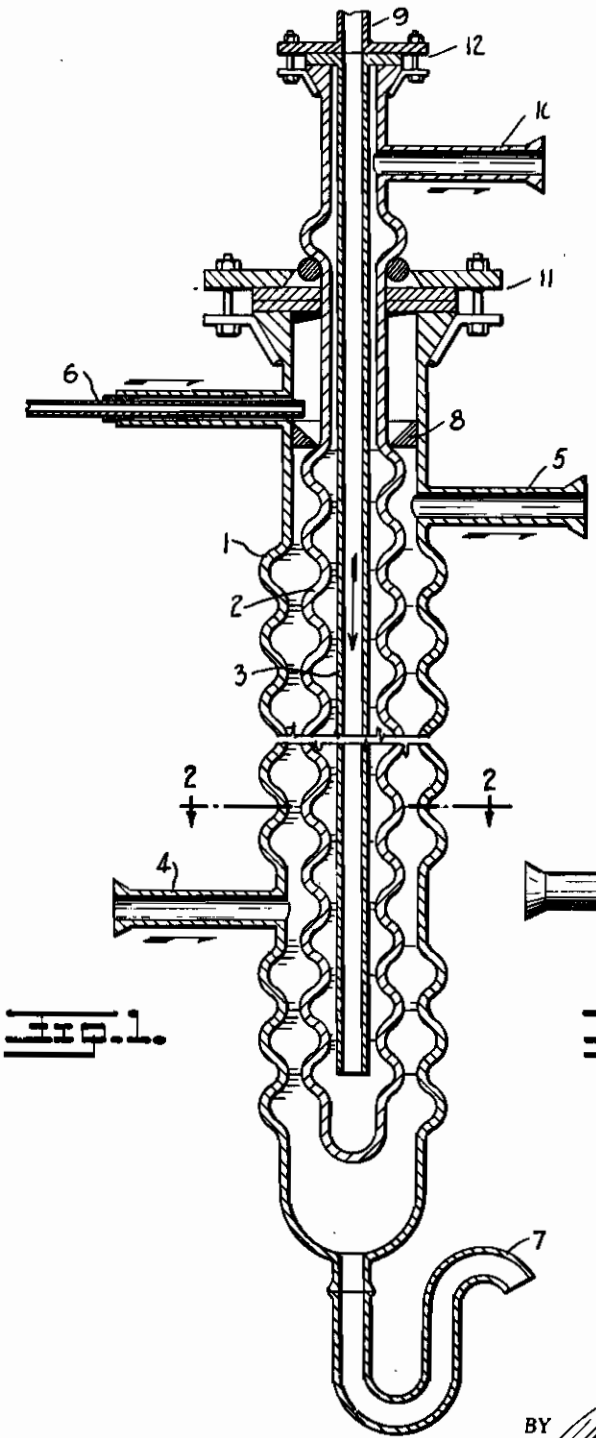


Fig. 1.

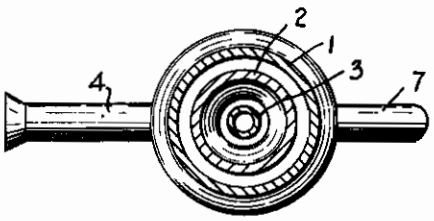


Fig. 2.

INVENTOR.
RUDOLF PFLOCK.

BY

his ATTORNEY.

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## APPARATUS FOR THE ABSORPTION OF GASES IN LIQUIDS

Rudolf Pflock, Nunchritz, near Grossenhain, Germany; vested in the Alien Property Custodian

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My invention relates to an apparatus for absorbing gases in liquids, and in particular it also relates to the absorption of gases in liquids, wherein heat is developed by the absorption.

Heretofore, the absorption of gases in liquids was effected in towers or pipes charged with filling material, in absorption systems with cellarius vessels and similar devices. Such apparatus generally have considerable deficiencies. Above all, the distribution of gas and liquid is difficult in apparatus of a larger diameter, since the liquids are known to have a tendency of trickling down along the walls of the absorption towers. Also the cooling of such apparatus is difficult and only to be effected by a large amount of cooling water. Consequently, relatively large systems of apparatus were required heretofore. The efficiency of such systems was small when compared with their dimension. This happened especially, when gases had to be dealt with, which were diluted with large quantities of foreign gases, for instance in the case of the absorption of hydrochloric acid gas diluted with plenty of hydrogen or other gases.

The packing of such apparatus was relatively difficult, the number of the different places of packing mostly being quite large. This had an especially unfavourable effect when dealing with gases which corrode the packing material. In high towers of absorption charged with filling material, there were also great resistances disturbing the passage of the gas through the apparatus.

All these difficulties are overcome by my invention. The apparatus I have found, essentially consists of two parts which may easily be packed. It allows a thorough contact between the gas and the absorption liquid. The gas passes easily through the apparatus I have designed, and there are no such resistances to be met with as in towers charged with filling material. Absorption heat liable to occur, may easily be eliminated by cooling. The apparatus is quite small compared to its efficiency. The room needed for it is very small and the expenses for fitting it up are very low. On account of its simplicity it can be made from the most varying material, especially also from material which is cheap and may be easily supplied, for instance it may be made from glass.

An apparatus according to the present invention is illustrated by the accompanying drawing. This drawing is only meant to illustrate the scope of my invention. Details may be changed of course in different ways without departing from my invention. In Figure 1, the drawing shows a longitudinal section, Figure 2 a cross section of the absorption apparatus. The apparatus consists of an undulated pipe 2, which is put in an outer jacket pipe 1 by means of a packing or grinding. The pipe 2 is closed at the bottom; it has a distributor 8 in its upper part. This may have the shape of a hopper forming a ring around pipe 2. By a feeding pipe 6, the absorption liquid is supplied and uniformly distributed by the hopper so as to trickle down the surface of pipe 2. It collects at the bottom of pipe 1 which has an opening at its lowest point. This opening is closed by a suitable water seal or, as indicated in the drawing, by a socalled swan neck 7. Down at the jacket pipe 1 there is a side pipe 4 by which the gases to be absorbed are introduced. At the upper end of the jacket pipe 1 there is a pipe 3 through which the gases leave. For eliminating the absorption heat, a pipe 9 leading down to the bottom of the inner pipe 2 is used for supplying a cooling liquid, e. g. water, or only a cooling gas, e. g. air. The cooling liquid or gas ascends inside the pipe 2 and leaves by the socket 10.

It is fit to the purpose to put the notches (constrictions and enlargements) of the inner pipe 2 and of the outer pipe 1 against each other so as to enforce an alternate acceleration and slowing up of the gas flow. This causes a guided whirling movement of the gases, by which every single particle of the gas is always brought again in contact with the surface of the liquid. This increases the efficiency of the apparatus essentially. The wave-like outer pipe 1 may be surrounded entirely or partly by a cooling device for removing a part of the reaction-heat at the outer surface of the apparatus. The absorption of a gas by a liquid by means of the apparatus I have invented, shall be illustrated by the absorption of hydrochloric acid gas in water, though any other gas and any other liquid may be used too; for instance carbonic acid, sulphurous acid, ammonia gas, gases containing chlorine or bromine and many other gas-like products may be absorbed or caused to react in liquids. As liquids, water or aqueous solutions of acids, bases or salts, also organic liquids like alcohols, ketones, esters or hydrocarbons etc. may be used.

The absorption of hydrogen chloride from gases containing the same by means of water in my apparatus takes place in the following way:

The gas containing hydrogen chloride is introduced into the apparatus through pipe 4. Here it ascends and leaves the apparatus through pipe 5. At the same time, water is introduced into the apparatus through pipe 6; it distributes on the plate or ring 8 and trickles down along the

outer surface of pipe 2; (it may also partly trickle along the inner surface of pipe 1). Thus, an intimate contact is effected between the gas and the liquid. The water gets more and more saturated with hydrogen chloride and finally collects at the bottom of pipe 1, where it may flow off through the swan neck 7, which also shuts off the apparatus. Since much heat is developed by the absorption of the hydrogen chloride in the water, water is led through the pipe 9; this water distributes at the bottom of pipe 2 and rises until it leaves by the pipe 10. By means of a cock not shown in the drawing, the amount of water introduced through 6 is regulated so as to allow the best possible cooling and consequently a sufficient absorption of the gas. The pipe 4 may be fixed quite near the bottom of the apparatus. Then however, it is difficult to make the aqueous hydrochloric acid formed leave the apparatus sufficiently cold. Therefore it is suitable as I have found, to place the socket 14 somewhat higher up. Thus, the hydrochloric acid formed is further cooled before leaving the apparatus, without getting in contact with fresh gas.

The supply of gas is regulated so, that practically all hydrogen chloride is absorbed. However, the flow of gas may also be kept up as strong as to allow only part of the hydrogen chloride to be absorbed. For complete absorption, the gas leaving through 5 is then led to a second apparatus of the same built, adding more such apparatus if wanted. But even then, considering the small diameter and the efficiency of my apparatus, the room needed is very small when compared with the generally known apparatus of absorption, likewise the prime cost is very low. The construction of each single apparatus being very plain, even a larger set composed of several single elements requires only little attendance and supervision.

RUDOLF PFLOCK.