No. 828,060. PATENTED AUG. 7, 1906.

J. SCHWAGER.

CONDENSER.

APPLICATION FILED APR. 7, 1904.

2 SHEETS—SHEET 1.

Fig. 1.

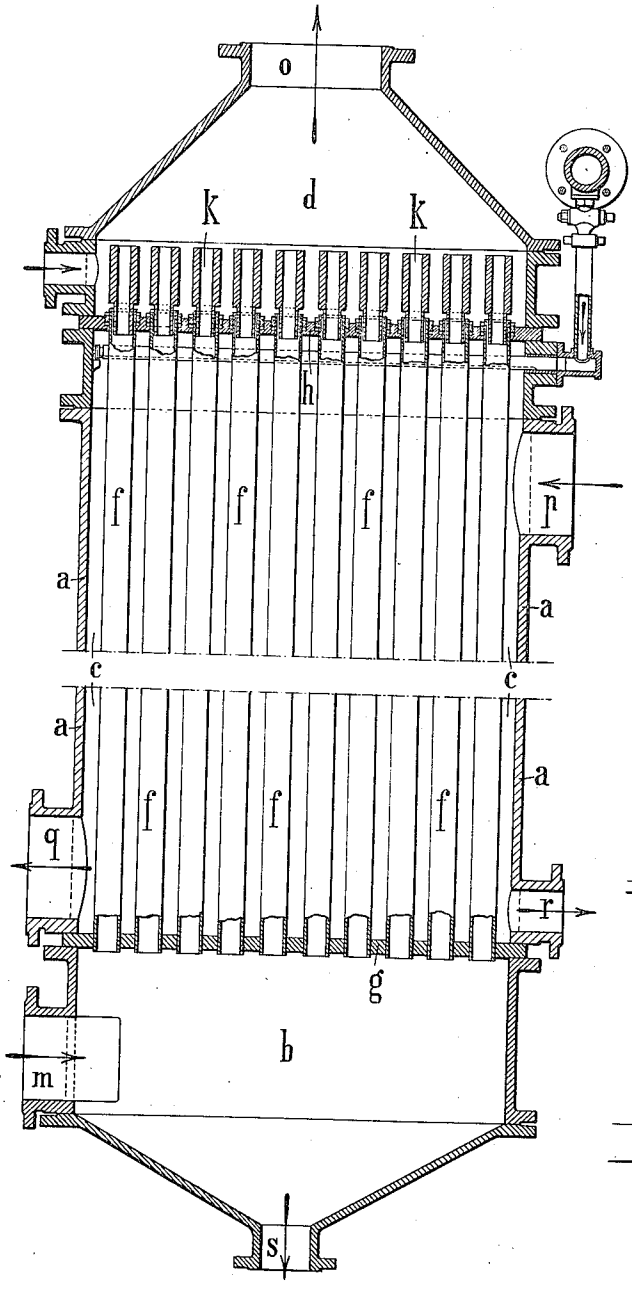


Fig. 2.

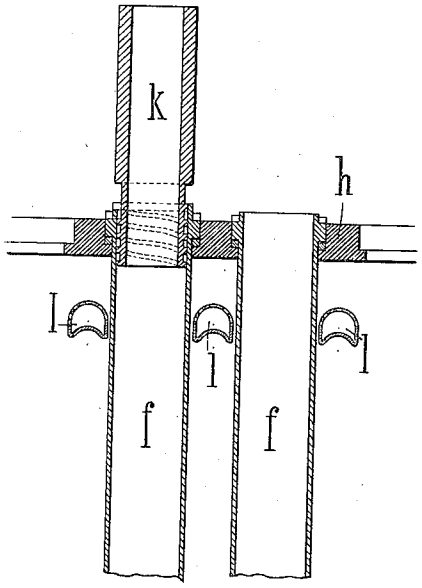
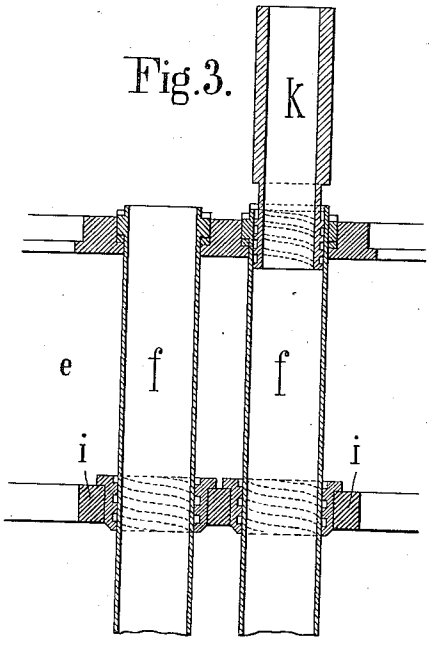


Fig. 3.



WITNESSES

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INVENTOR

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2 SHEETS—SHEET 2.

Fig. 4.

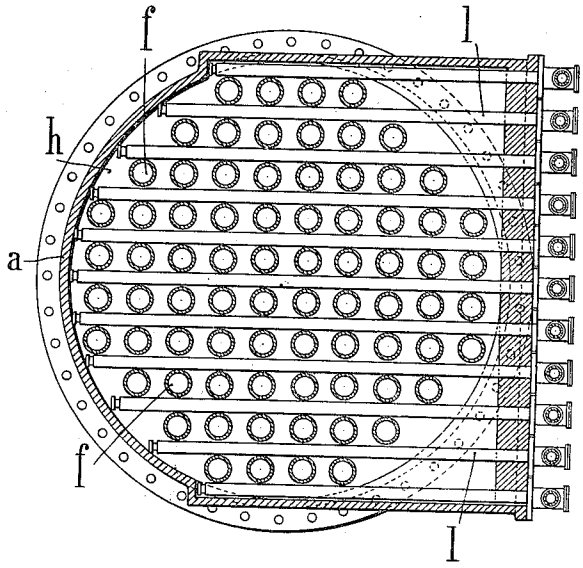
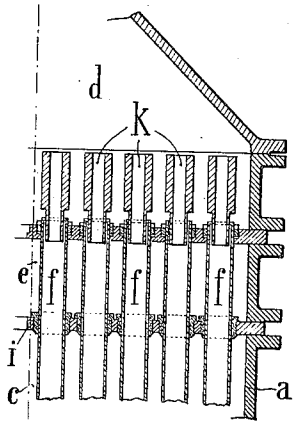


Fig. 5.



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UNITED STATES PATENT OFFICE.

JULIUS SCHWAGER, OF BERLIN, GERMANY.

CONDENSER.

No. 828,060. Specification of Letters Patent. Patented Aug. 7, 1906.

Application filed April 7, 1904. Serial No. 201,953.

To all whom it may concern:

Be it known that I, JULIUS SCHWAGER, engineer, a subject of the German Emperor, and a resident of 29 Grossbeerenstrasse, Berlin, S. W., Germany, have invented certain new and useful Improvements in Condensers, of which the following is a specification.

My invention relates to irrigating apparatus such as is used in chemical industries for a variety of purposes, as for the manufacture of cellulose, or generally where heat is to be transferred from one fluid to another, as in condensers or the like. It may also be advantageously used for the evaporation of lyes. In existing apparatus of this type the liquid either passes through the tubes which are surrounded by the gas or vapor or the liquid is brought into contact with the outer surface of the tubes, while the heated gases pass therethrough.

The subject of the present invention is a device by means of which the pipes of an irrigating apparatus are at the same time irrigated by liquids on the inside and outside and charged with gases on the inside and outside and are thus used in two ways, so that the pipes of one and the same apparatus can serve at the same time for different purposes—for instance, evaporation, vaporization, condensation, absorption, and saturation.

The apparatus is illustrated on the accompanying drawings, wherein—

Figure 1 shows a vertical section of the whole apparatus; Figs. 2 to 5, partial sections of various modifications thereof.

Similar letters refer to similar parts throughout the several views.

The apparatus, as shown in Fig. 1, consists of a shell or casing *a*, divided, by means of heads *g* and *h*, into three chambers or compartments *b*, *c*, and *d*. Secured in the heads *g* and *h* and passing through the compartment *c* are pipes *f*, by which the compartments *b* and *d* communicate. Secured in the upper ends of the pipes *f* are small pipes *k*, open at their upper ends.

The gases and vapors are conducted through the apparatus either in the direction of the arrow or in the opposite direction, so that the collar *m* serves as the entrance to the distributing-chamber *b*, from which the gases ascend, through the pipes *f* and *k*, into the upper space *d*, which they leave through the socket *o* for further use, or otherwise they enter through *o* into *d* and leave through *k f b* and the collar *m*. The collar *p* serves to let the gases and vapors into the middle space *c* and collar *q* to let them out, or vice versa. Collar *r* serves to let off from the middle space *c* the liquid irrigating the pipes *f* on the outside, and the collar *s* leads off from the space *b* the irrigating liquid which has irrigated the pipes *f* on the inside.

In Figs. 2 and 4 of the drawings I have shown transverse pipes *l*, in the present instance crescent-shaped and provided with apertures in their upper sides for supplying liquid for irrigating the outer surfaces of the pipes *f*. It is evident that the liquid flowing out of the apertures in the pipes *l* will surround the outer sides of the vertical pipes *f* and flow by gravity down this outer surface. In Figs. 3 and 5 of the drawings I have shown an additional head *i* in the chamber *c* intermediate of the heads *g* and *h*. The tubes *f* are firmly secured in this head *i;* but, as shown, a helical passage is left between them through which the irrigating liquid may flow, so that the lower portions of the pipes *f* will be surrounded by a mantle of the liquid, as well as the upper portions. If, for instance, lyes are to be evaporated which bear the contact with gaseous products of combustion or the like and if the above-described apparatus is used, in which the pipes are irrigated on the inside and outside with lye and are charged on the inside and outside with waste gases from fire places, the heating-surface is doubly utilized, and the evaporation is therefore twice as great. In both cases the gases absorb vapor, the heat of which they give off and make useful at another place. The double irrigation also allows of evaporating on the outside of the pipes with an overpressure and in the inside with a partial vacuum. If hot air is used, the double quantities are saturated with vapor and are thereby made in a high degree suitable for generator and water-gas heating. If the apparatus is to be used as a gas washer and absorber, it may serve this purpose with the inner as well as with the outer surfaces of the pipes, no matter whether ammonia gases or other vapors and gases are to be absorbed. In all these cases this apparatus, irrigated at the same time on the inside and outside and charged with gases or vapors, does double the work of

an ordinary apparatus, for which reason it deserves the name of "double irrigator," which has been given to it.

What I claim as my invention, and desire to secure by United States Letters Patent, is—

1. The combination in an irrigating apparatus of a casing, pipes *f* with the pipes *k* and *l* within said casing, means for admitting a liquid for irrigating said pipes *f* simultaneously on the inside and on the outside and for admitting gaseous fluids to said chamber around said pipes *f* and within said pipes *f* for the purpose of producing evaporation, condensation or absorption simultaneously on the inside and outside of said pipes *f*, substantially as set forth.

2. The combination in an irrigating apparatus of the pipes *f* with the pipes *k* and *l*, and means for distributing a liquid on the interior and exterior surfaces of said pipes *f*, substantially as set forth.

3. An apparatus of the class described comprising a casing divided into a plurality of compartments, tubes extending through one of said compartments and communicating with the compartments adjacent thereto, means for distributing a liquid both on the interior and exterior surfaces of said tubes, and means for admitting a gaseous fluid simultaneously to the interior of said tubes and to the compartment through which they pass.

4. An apparatus of the class described comprising a casing divided into a plurality of compartments, tubes extending through one of said compartments and communicating with the compartments adjacent thereto, separate means for admitting a liquid and a gaseous fluid to the compartment with which the upper ends of said tubes communicate, separate means for emitting such liquid and such gaseous fluid from the compartment with which the lower ends of the said tubes communicate, and means within the compartment through which the tubes extend for distributing liquid over the outer surfaces of said tubes.

5. An apparatus of the class described comprising a casing divided into a plurality of compartments, tubes extending through one of said compartments and communicating with the compartments adjacent thereto, separate means for admitting a liquid and a gaseous fluid to the compartment with which the upper ends of said tubes communicate, separate means for emitting such liquid and such gaseous fluid from the compartment with which the lower ends of said tubes communicate, and perforated tubes within the compartment through which said tubes extend and adjacent the upper ends of said first-named tubes for distributing a liquid over their outer surfaces.

6. An apparatus of the class described comprising a casing divided into a plurality of compartments, a plurality of tubes arranged in approximately parallel rows extending through one of said compartments and communicating with the compartments adjacent thereto, separate means for admitting a liquid and a gaseous fluid to the compartment with which the upper ends of said tubes communicate, separate means for emitting such liquid and such gaseous fluid from the compartment with which the lower ends of said compartment communicate, and a plurality of perforated tubes within the compartment through which said first-named tubes extend and crossing the rows of said first-named tubes for distributing a liquid over the outer surfaces thereof.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

JULIUS SCHWAGER.

Witnesses:
HENRY HASPER,
WOLDEMAR HAUPT.