

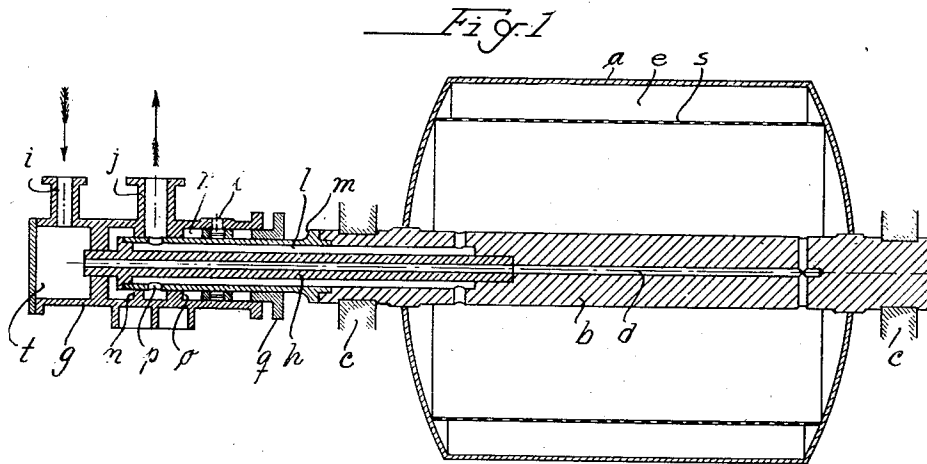
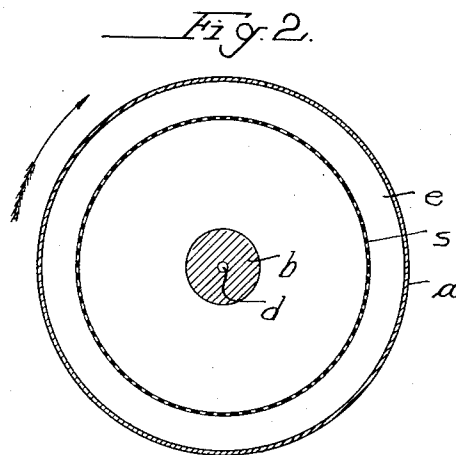
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COOLING DRUM FOR COOLING OF LIQUID AND MOLTEN SUBSTANCES

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COOLING DRUM FOR COOLING OF LIQUID
AND MOLTEN SUBSTANCES

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In the cooling or crystallization of liquid and molten substances, for instance fatty substances and fatty emulsions, on rotary cooling drums, it has formerly been proposed to let the cooling drum operate as an evaporator in a cooling plant, in which a condensed gas, such as liquid ammonia, carbon dioxide, sulphuric oxide or the like, is used and is directed centrally into the drum, where it produces the desired cooling effect by evaporation, the vapours being then exhausted from the drum, condensed and re-used.

With the heretofore known cooling drums of this kind, liquid impurities such as lubricating oil and sometimes also solid impurities such as mill scales deposited on the inside of the pipes of which the system of the plant is formed, will gradually be carried with the cooling medium into the drum and deposited on the inside wall thereof. This deposition on the drum walls forms a heat insulating layer, which decreases the cooling efficiency. Especially does any oil deposition on the inside of the drum wall have a considerable heat insulating effect, causing irregular cooling results.

The present invention has for its purpose to prevent impurities from being deposited on the inside of the cooling drum. Now oil, which penetrates through leakages in stuffing boxes etc. around the supply pipe from the cooling drum may originate from several parts of the cooling plant. Some of the oil may enter the supply channel for cooling medium from the stuffing boxes, through which the supply and discharge pipe for the cooling medium extends into the drum. These stuffing boxes of course have to be lubricated with oil, and in order that the latter may be forced into the stuffing boxes, the lubrication has to be effected at a pressure exceeding the pressure of the cooling medium. It will therefore be impossible to prevent the oil from penetrating into the medium, as in order to secure sufficient tightness, more oil has generally to be supplied than is used for the lubrication. Oil penetrating into the said supply pipe from the stuffing box, by means of which the supply pipe for the cooling medium is connected tightly to the shaft, will therefore be carried along with cooling medium into the cooling drum.

According to the present invention, this drawback is avoided by reason of the fact that the cooling medium is introduced into the cooling drum and removed from the latter through one and the same stuffing-box casing fitting tightly about one end of the drum shaft, within which casing the opening or openings in the shaft by way of

which the discharged cooling medium leaves the latter, is or are situated between the oil chamber thereof and the part of the stuffing-box casing, where the cooling medium is introduced into the shaft. Thus the oil is prevented from penetrating from the oil chamber into the cooling drum together with the cooling medium flowing thereto, because the oil, before being able to penetrate forward to the incoming medium, will meet the escaping medium and be carried along with the latter.

Lubricating oil may, however, also penetrate forward to the cooling medium in other portions of the plant than in the stuffing boxes about the shaft of the rotary drum, as for instance into the compressor, if such is not carefully controlled and oiled, and oil which in this manner is mixed with the cooling medium would be carried to the cooling drum.

In order to avoid such oil and solid impurities such as mill scales from the cooling pipes being deposited on the inside of the cooling drum, there is according to the invention inserted a sieve in the drum, through which sieve the cooling medium has to flow in order to reach the said wall or walls. For cylindrical cooling drums this sieve is suitably constructed as a cylinder surface fitting tightly to both ends of the drum. Between the cylindrical wall, on which the substance is cooled down, and this sieve, an annular space is formed, into which the liquid cooling medium penetrates through the sieve, and from which it is exhausted in any suitable manner after having been evaporated. Most of the oil, which should enter the cooling drum, would together with solid impurities be retained by the sieve and adhere to the same without preventing the cooling medium from entering the annular space between the sieve and the outer wall of the drum.

In the drawing, which shows one construction of the invention:

Fig. 1 is a longitudinal section of a cooling drum with a stuffing box connected thereto around the supply and discharge pipes for the cooling medium and with a sieve for retaining the solid impurities, and

Fig. 2 a cross-section of the drum.

In this illustrative construction, *a* is a mainly cylindrical cooling drum, *b* the shaft of the same and *c* the bearings supporting the shaft *b*. The shaft is rotated by a driving motor or driving shaft not shown.

The cooling medium, which may for instance be liquid ammonia, liquid carbon dioxide or some other suitable substance which in known manner

evaporates in the cooling drum *a* and thereby provides the desired cooling effect, is directed through a nipple *i* into a chamber *t* at the end of a stuffing box facing away from the cooling drum, the casing *g* of which box encloses one end *m* of the drum shaft *b*. The other end of the casing *g* fits tightly around the shaft end *m* by means of a stuffing box *q*. From the chamber *t*, the cooling medium flows to the cooling drum *a* by way of a pipe *h* disposed in a central bore *l* in the shaft end *m*, and a channel *d* disposed in the shaft *b* as an extension of the pipe *h*.

The outside diameter of the pipe *h* is smaller than the diameter of the bore *l*. By way of the annular space between the pipe *h* and the shaft end *m*, the evaporated cooling medium leaves the cooling drum and flows through radial bores *p* in the part of the shaft end *m* situated in the stuffing-box casing and thence to a discharge nipple *j*. The latter enters between two annular flanges *n* and *o*, which fit tightly about the shaft end *m*. The bores *p* open into the space between the said flanges.

The cavity *r* formed between the stuffing box *q*, the shaft end *m* and the stuffing-box casing *g* forms an oil chamber, to which the oil is supplied by way of a lubricating hole *x*. As appears from Fig. 1, the discharge openings *p* are situated between the oil chamber *r* and the supply chamber *t* for the cooling medium.

Any oil happening to penetrate between the flanges *n* and *o* will be carried away by the escaping cooling medium, and does not penetrate forward to the arriving cooling medium. Between the flange *n* and the supply nipple *i*, packing devices of known kind, but not shown, are provided, which prevent any leakage, in the packing-box casing, of the arriving cooling medium to the outgoing cooling medium owing to the difference between the pressures of the arriving and the leaving cooling medium.

The drum *a* is filled with liquid cooling medium to a suitable level, and the said cooling medium penetrates through a cylindrical sieve *s* inserted in the drum, to the inside of the cylindrical wall of the drum, whereby the latter will be cooled together with the substance spread on the outside thereof, which substance in ordinary known manner is deposited on to the cooling surface and, after the cooling, is scraped away therefrom. The sieve *s* retains any solid impurities that by the cooling medium are carried into the drum from the not shown pipe system of the cooling plant. The annular space between the sieve *s* and the cylindrical wall of the drum may have any suitable radial width. The sieve, however, should not be in contact with the inside of the cylindrical wall of the drum.

Although the invention has been above described in connection with cylindrical cooling drums with horizontal shaft, it may also be used in connection with cooling drums with vertical shaft and in connection with cooling drums, the cooling surfaces of which are not cylindrical, but of some other shape such for instance as conical or may be plane.

Having now particularly described and ascertained the nature of my invention and in what manner the same is to be performed I declare that what I claim is:—

1. A rotary cooling drum for cooling liquid

and fatty substances, comprising a cylindrical shell, a shaft extending through said shell coaxially therewith, means supporting the shell on the shaft and together therewith forming a closed hollow drum, a channel extending through one end of the shaft for introducing to the drum a liquid cooling medium adapted to be evaporated therein, a second channel annularly surrounding the first named channel and serving for the discharge of the evaporated cooling medium from the drum, a single stuffing box surrounding said end of the shaft and having means for sealing the introducing channel and also the discharge channel from the outer air, and means for connecting said channels respectively with supply and discharge pipes.

2. A rotary cooling drum for cooling liquid and fatty substances comprising a cylindrical shell, a shaft extending through said shell coaxially therewith, means for supporting the shell on the shaft and together therewith forming a closed hollow drum, a channel extending through one end of the shaft for introducing to the drum a liquid cooling medium adapted to be evaporated therein, a second channel annularly surrounding the first-named channel and serving for the discharge of the evaporated cooling medium from the drum, a single stuffing box surrounding said end of the shaft, an inlet chamber in one end of the stuffing box opening to the introductory channel and a lubricating chamber in the other end of said box, means connecting the inlet chamber with a supply pipe, and means connecting the discharge channel of the shaft with a discharge pipe at a point within the stuffing box between said inlet and lubricating chambers by which arrangement the lubricant in the lubricating chamber is prevented from penetrating into the passages through which the liquid cooling medium is fed through the stuffing box and shaft end into the drum.

3. A double-walled rotary cooling drum according to claim 1 characterized by the fact that the inner wall of the drum is perforated.

4. In combination with a rotary cooling drum for cooling or crystallizing liquid and molten substances such as fatty substances and fatty emulsions which are spread onto the surface of the drum and cooled by evaporation of a liquid cooling medium in the interior of the drum, means for preventing the deposition of impurities on the inside wall or walls of the drum comprising a cylindric sieve disposed therein through which the cooling medium must flow to reach said wall or walls.

5. A rotary cooling drum according to claim 4, wherein the sieve is so disposed as to form an annular space between it and the drum wall, into which space the cooling medium is directed through the sieve, the latter being fitted tightly to the ends of the drum.

6. A cooling apparatus according to claim 1, characterized by the fact that the channel by way of which the cooling medium is introduced to the drum, and the channel by way of which the medium is discharged from the same, are both disposed in the same end of the drum shaft and are closed against the outer air by means of the common stuffing box surrounding the shaft end.

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