

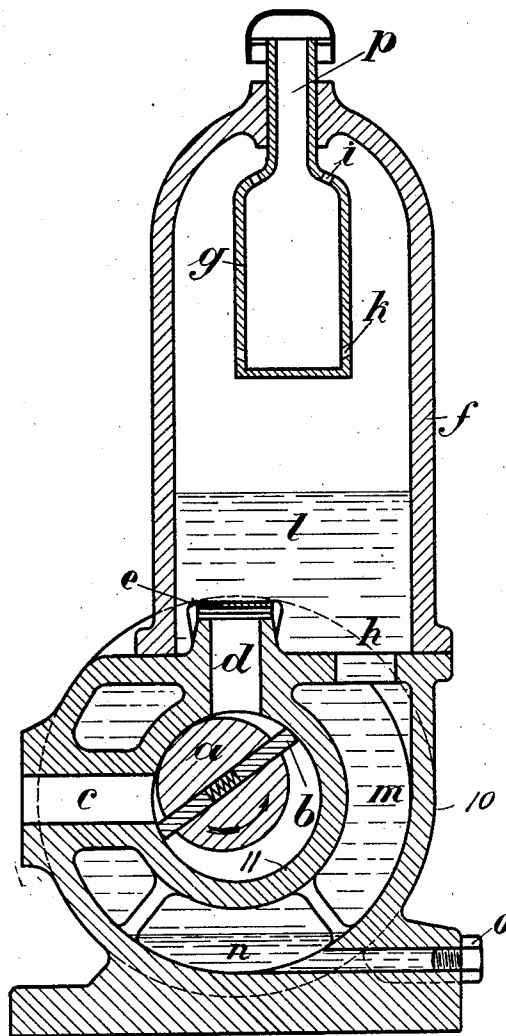
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VACUUM PUMP

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UNITED STATES PATENT OFFICE.

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VACUUM PUMP.

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This invention relates to vacuum pumps of the mechanical type in which a body of oil is employed as a sealing medium for the compression chamber and as a source of supply for working parts in the compression chamber.

The general object of the invention is the provision of a construction which will contribute to the efficiency of the pump.

A more specific object is the provision of a pump construction of the sort indicated in which provision is made for the separation of water and other foreign substances from the working oil incident to the operation of the pump.

Another object is the provision of a construction which will contribute to the separation from the oil of gases discharged by the pump and prevent discharge of the oil or its loss from the chamber wherein it is employed as a medium for preventing back flow of gas into the pump chamber.

Other and further objects will be pointed out or indicated hereinafter, or will appear to one skilled in the art upon an understanding of the invention or its employment in practice.

In the accompanying drawing forming a part of this specification, I illustrate, in diagrammatic fashion, one arrangement of apparatus constituting an embodiment of the invention, but it is to be understood that this is presented for purpose of illustration only and is not to be construed in any fashion for the purpose of limiting the claims short of the true and most comprehensive scope of the invention in the art.

In the drawing, the figure is a diagrammatic illustration of a vacuum pump in sectional elevation.

The invention has to do with vacuum pumps, such as of the rotary or gear types, in which a body or bodies of oil are employed for providing working parts in the pump chamber with a suitable sealing lubricant and for providing a seal at the outlet of the pump chamber for preventing back flow of gases therinto. In some designs of pumps of this type, it has been customary to surround the pump chamber itself with a body of oil for the purpose of sealing the working chamber against ingress of atmosphere or surrounding gases. For purpose of convenient differentiation, the par-

ticular portion of the oil body employed for the last mentioned use may be designated the sealing oil, while the portion of the oil body which is employed for furnishing lubricant to the working parts in the compression chamber and for sealing the outlet of the compression chamber against back flow, may be designated the working oil.

In operation of pumps of this description, particularly in evacuating apparatus containing vapors, or in installations in which such pump is employed as a preliminary pump ahead of another vacuum pump of the vapor jet or diffusion type, it has been observed that the volumetric efficiency is adversely affected by the presence of water or other foreign liquid in the working oil.

The air coming from the suction pipe contains a greater or less quantity of water vapour in solution. This vapour is condensed, by compression in the pump chamber to fine drops of water which mingle with the working oil and may be again evaporated in the low pressure side of the pump if re-introduced into the pump chamber with the working oil. This has the result that the vacuum is reduced by the vapour pressure of the water acting as a partial pressure of the mixture of oil and water in the pump. Further, foreign bodies of any kind, if introduced into the working chamber with the oil, may also interfere with the internal moving parts in such a degree as to diminish the vacuum and the volumetric output.

Experience has shown that this drawback can generally be counteracted only by a thorough cleaning of the pump and renewal of the oil.

In the improved construction of rotary pumps according to this invention the arrangement is such that the dome, containing the working oil, is in direct communication with the oil chamber of the pump casing which is situated below the said dome and contains the sealing oil, in such a manner that the space in the pump casing serves as a separating chamber for the water that passes from the pump into the working oil, and also for other impurities which may settle out of the oil in the dome; such water and impurities being permitted to collect on the bottom of the casing whence they can be discharged through a discharge orifice with-

out interfering with the operation of the pump.

The construction is illustrated in the embodiment shown in the drawing. In this, the reference numeral 10 designates the pump casing which houses the pump cylinder 11, forming a jacket about the latter which affords an intervening chamber *m* wherein the sealing oil is confined about the pump cylinder.

The rotor *a* with the sliding abutment *b* revolving in the direction of the arrow shown in the figure, sucks the air from the intake passage *c* and forces it through the discharge passage *d* and the non-return valve *e* into the exhaust dome *f*. In its course, the mixture that has been carried over is condensed by the compression of the air and mingles in the form of fine drops of water with the working oil that lubricates the pump, and is driven out, together with the air, through the non-return valve *e* into the working oil in the dome *f*, which surrounds the outlet valve and supplies the working parts of the pump, by way of the passage *d*, with the necessary lubricant.

The air expelled through the discharge passage *d* passes through the body of sealing oil *l* and escapes at the top of the dome through the chimney *p*. The water and the other impurities discharge into the body of sealing oil *l* settle to the bottom of the dome and pass through the aperture *h* into the chamber *m* of the sealing oil and finally collect on the bottom of the casing at *n*.

Here in the sealing oil chamber the separated foreign matter can remain safely without influencing the working of the pump, as the sealing oil is not subject to agitation, and can be discharged at any time on removal of the blow-off screw *o*.

Further, a separating vessel *g* may be provided in the exhaust dome *f*, said vessel being so constructed that the air can escape, whilst, in the case of an increased delivery of air such as occurs during the starting with atmospheric air or by reason of leakage, oil is prevented from being ejected into the atmosphere by the exhaust.

In such an operation, especially in pumps with a large output, or a high speed of revolution, a mixture of oil and air boils very strongly in the exhaust dome *f*. By the insertion of the separating vessel *g* having downwardly directed openings *i* and *k*, the oil remains behind in the said vessel, whereas the air is able to escape through the chimney *p* into the atmosphere.

As the vacuum increases, the boiling diminishes in violence owing to the decreasing delivery of air in relation to the atmospheric pressure, and then the oil that is collected in the separating vessel flows gradually back through the drainage apertures *h* in the chamber *l*.

This construction of the exhaust dome allows of making the latter of small dimensions because it prevents a portion of the working oil being ejected from the dome on starting, and returns the oil to the proper location to function as a sealing covering for the discharge passage *d*.

What I claim is:—

1. In a vacuum pump, in combination, a pump cylinder provided with an intake passage and a discharge passage, pump mechanism operating in the cylinder, a sealing oil chamber for confining a body of oil about the pump cylinder, an exhaust chamber for confining a body of oil about the outlet of the discharge passage, said exhaust chamber being located above the sealing oil chamber and being in open communication therewith at a level below the outlet end of the discharge passage.

2. In a vacuum pump, in combination, a pump casing affording an exhaust chamber and a sealing oil chamber, a pump cylinder located within the sealing oil chamber and having a discharge passage with its outlet in the exhaust chamber, said chambers arranged to confine a body of oil about the pump cylinder and its outlet, pump mechanism operable in the pump cylinder to discharge fluid into the body of oil in the exhaust chamber, said exhaust chamber having communication at its bottom with the sealing oil chamber at a level below the outlet end of the discharge passage, and the sealing oil chamber being provided with a clean-out passage in its lower portion.

3. In a vacuum pump, in combination, a pump cylinder having a discharge passage, pump mechanism operable in said pump cylinder to discharge gases through said passage, an exhaust chamber into which said discharge passage opens, said exhaust chamber arranged to hold a body of oil covering the outlet of the discharge passage, and a casing affording a sealing oil chamber for confining a body of oil about the pump cylinder, said sealing oil chamber and exhaust chamber having communication through an opening below the outlet end of the discharge passage, said opening arranged to permit settling of material from the body of oil in the exhaust chamber into the sealing oil chamber.

4. In a vacuum pump, in combination, an exhaust chamber, a sealing oil chamber, a pump cylinder in the sealing oil chamber and having a passage communicating with the exhaust chamber, said exhaust chamber arranged to hold a body of oil covering said communicating passage, the sealing oil chamber arranged to hold a body of oil about the pump cylinder, said sealing oil chamber and exhaust chamber communicating by way of an opening arranged below that of the communicating passage in the exhaust chamber,

said opening arranged to permit settling of material from oil in the exhaust chamber into the sealing oil chamber.

- 5 In a vacuum pump, in combination, an exhaust chamber arranged to hold a body of oil, a pump cylinder having a communicating passage opening in the exhaust chamber above the bottom thereof, pump mechanism operable in said pump cylinder, a sealing
10 oil chamber about the pump cylinder, said sealing oil chamber and exhaust chamber being in open communication at the bottom of the latter, and a clean-out passage communicating with the bottom of the oil chamber.
15 6. In a vacuum pump, in combination, a pump cylinder having a discharge passage, pump mechanism operable in said pump cyl-

inder to discharge gases through said passage, an exhaust chamber into which said discharge passage has an outlet, said exhaust
20 chamber arranged to hold a body of oil covering the outlet of the discharge passage, a separating vessel disposed in the upper portion of the exhaust chamber and having communication exteriorly thereof, said vessel
25 being provided with restricted apertures at its upper portion having communication with the interior of said exhaust chamber and an aperture at its lower portion for
30 draining into the exhaust chamber.

In testimony whereof I have signed my name to this specification.

OSKAR SEITZ.