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W. E. BRILL ET AL
COMPRESSOR APPARATUS

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4 Sheets-Sheet 1

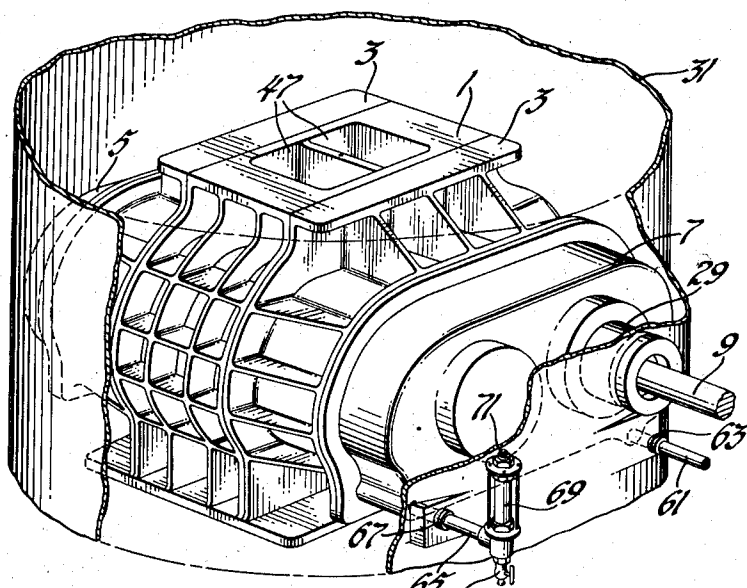


Fig. 1

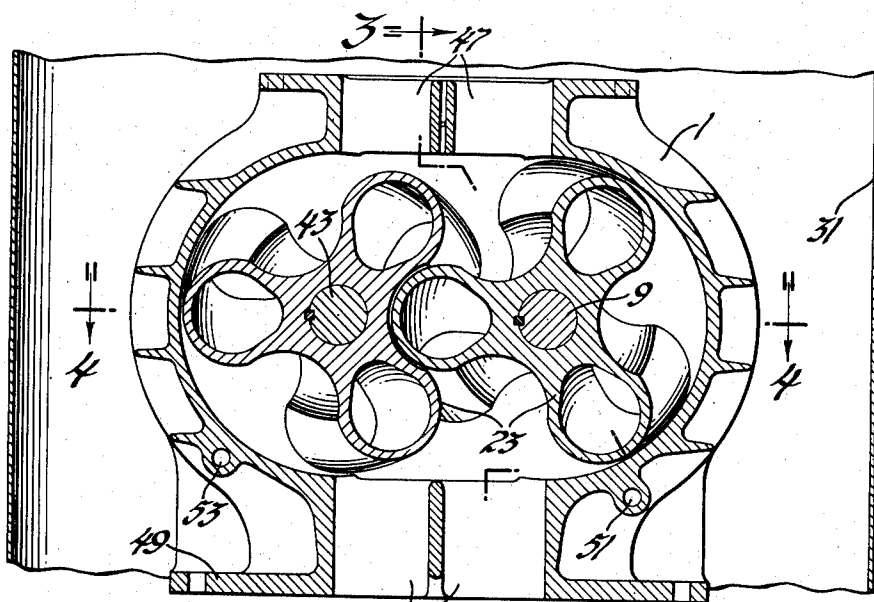


Fig. 2

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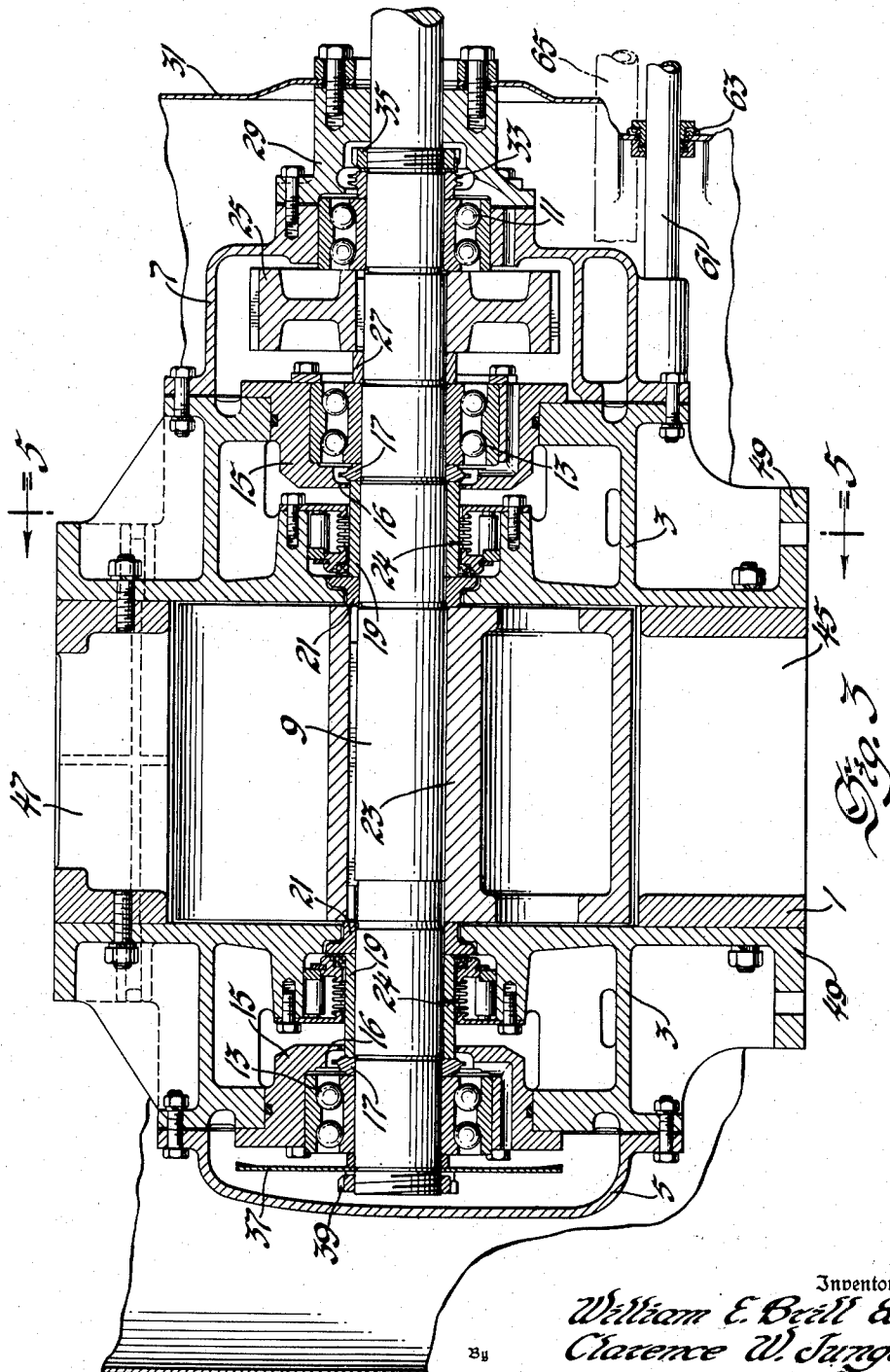
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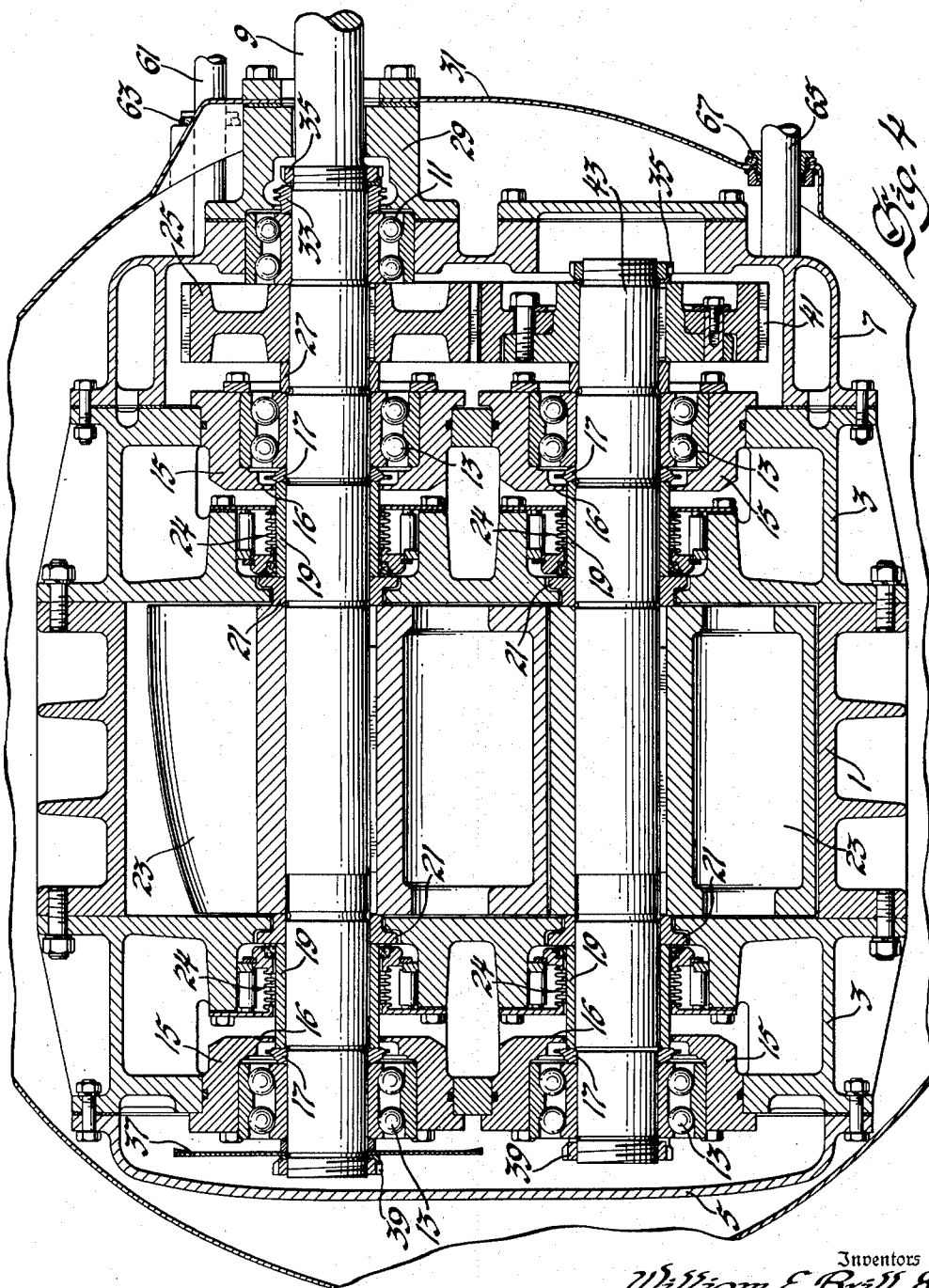
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COMPRESSOR APPARATUS

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The present invention relates to stills and more particularly to improvements therein whereby a compressor may be located within a vapor pressure chamber of the still.

Where the compressors of the Roots type are used on distilling units the usual practice is to locate the compressor and driving machinery adjacent the still and provide inlet and pressure outlet connections therebetween to prevent contamination of the distillate by leakage of lubricating oil from the compressor. With the compressor located outside the still suitable exterior heating passages connected with the still are required in the compressor housing to reduce the heat loss.

The object of the present invention is to provide a compressor housing which may be located within the steam chamber of the still to decrease the heat loss and to provide drain and lubricating passages in the housing which may be connected by pipes leading outwardly of the steam chamber to indicate and carry away leakage of vapor and lubricating oil from the compressor bearings and to maintain the lubricant at proper level.

The means by which this object is accomplished will become apparent by reference to the following detailed description and drawings illustrating these improvements.

Figure 1 is a perspective view of the steam chamber of a still with parts broken away to show the compressor within this chamber.

Figure 2 is a central transverse cross sectional view of the still and compressor.

Figure 3 is a sectional view taken on line 3—3 of Figure 2.

Figure 4 is a sectional view taken on line 4—4 of Figure 3.

Figure 5 is a sectional view taken on line 5—5 of Figure 3.

Figure 6 is a sectional view taken on line 6—6 of Figure 5.

Figure 7 is a sectional view taken on line 7—7 of Figure 5.

As best illustrated in Figures 1 to 4, the compressor comprises a central pressure or rotor housing 1 having interchangeable bearing and seal housings 3 secured on opposite end faces thereof, a housing cap 5 secured to the outer face of one of the housings 3 and a timing gear or drive housing 7 is secured to the outer face of the other housing 3.

Each of the bearing and seal housings 3 have a pair of axially aligned shaft openings in the inner and outer web portions thereof and the driving

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or timing gear housing 7 also has a bearing opening in the outer web in axial alignment with one opening in each housing 3. A driving shaft 9 is supported for rotation in antifriction bearings 11 and 13 in the openings in the housings 1 and 3. The bearings 13 are located in housings 15 having an inner annular lip 16 and an oil slinger ring 17 is located on the shaft 9 between the inner bearing race of the bearings 13 and within this lip 16 and a collar 19 secured on the shaft. A flanged collar 21 is located on the shaft between the collar and a three lobe helical rotor 23 also secured to the shaft and running with slight clearance between the pressure housing 1 and the inner surfaces of the inner webs of the bearing and seal housings 3. Suitable seals, shown generally at 24, are secured in cavities in the inner webs of the housings 3 and bear on the flanged collars 21 on the shafts. A timing gear 25 and collar 27 are secured on the shaft 9 between one of the bearings and the antifriction bearing 11 in the bearing opening in the driving housing 7 and a bearing cap 29 is secured between the housing 7 and the inner surface of the pressure housing 31 of the still with one end of the driving shaft projecting outwardly of the cap and still housing 31. The cap 29 is provided with a cavity and an oil slinger ring 33 is secured to the shaft 9 by a nut 35 and located in this cavity. An oil slinger disc 37 is also secured by means of a nut 39 on the inner end of the driving shaft within the housing cap 5 for distributing the lubricant therein.

The timing gear 25 meshes with a similar gear 41 secured on a driven shaft 43 supported in a similar manner to that described above by means of identical bearing means in the other openings in the housings 3. An identical three lobe helical rotor 23 is secured to the driven shaft 43 for rotation with slight clearance with respect to the other rotor and with respect to the housings 1 and 3. The pressure housing 1 is provided with vapor inlet openings 45 and vapor pressure openings 47 to and from the rotors 23. The compressor assembly is secured to still apparatus, not shown, by means of the mounting flanges provided on the housings 3, which flanges are shown at 49.

In order to indicate the level of lubricant in the drive and timing gear housing 7 and end cap 5 and also to provide means for draining leakage of vapor through the seals 24 and lubricant past the slinger rings 17 and lip portions 16 of the bearing housings 15 into the bearing and seal housings from outside the still housing

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31 suitable interconnecting passages are provided in the housings 1 and 3.

As best shown in Figures 2, 6 and 7 the pressure or rotor housing 1 is provided with two longitudinal passages 51—53 located at different levels with respect to the bottom face thereof. The lower level passage serves as a drain passage between the bearing and seal housings 3 and the upper passage serves as a lubricant passage between the housing cap 5 and driving and gear housing 7. Each of the interchangeable bearing and seal housings are provided with a pair of lower longitudinal passages 55 on either side and opening into the bottom of the cavity between the inner and outer webs of the bearing and seal housings and a pair of upper longitudinal through passages 57 located above the lower pair of passages 55 and closer to the outside of the housings 3, as best illustrated in Figure 5.

As best illustrated in Figure 6, when the housings 3 are secured to opposite ends of the rotor or pressure housing 1 the lower passages 51 therein and lower passages 55 of the housings 3 on the same side are in alignment to provide a through drain passage between the bottom of the bearing and seal housings 3. The driving or gear housing 7 is also provided with lower drain passages 59 on one side which is also in alignment with the lower drain passages 51—55 in the housings 1 and 3. The passage 59 is tapped and a drain pipe 61 is screwed therein and extends outward of the still housing 31, suitable sealing means, generally indicated at 63, being provided to prevent leakage between the pipe 59 and seal housing 31, as best shown in Figures 3 and 4.

Also when the housings 3 are secured to the housing 1 the upper passages 57 on the opposite sides of the housings 3 are shown in Figure 7 in alignment with the upper passage 53 on the same side of the pressure or rotor housing 1 to provide a through lubricant passage between the bottom of the spaces within the end cap 5 and driving and gear housing 7. The lower portion of the housing 7 is also tapped and a pipe 65 is threaded therein and also extends outwardly through an opening in the still housing with suitable sealing means generally indicated at 67 in Figures 3 and 4 to prevent leakage between the pipe 65 and sealing housing 31.

As best shown in Figure 1, a lubricant gauge glass fitting 69 is threaded on the outer end of the pipe 65. This gauge glass fitting is provided with an upper filler plug 71 and a lower drain cock 73 whereby lubricant may be supplied to the proper level for distribution by the timing gears 25 and 41 and the slinger disc 37 on to the bearings 11 and 13 and for draining the lubricant from outside the still housing. The end of the drainpipe extending outwardly of the still housing provides the means whereby leakage of vapor through any of the seals 24 or leakage of lubricant from the bearings may be readily detected. By reason of this arrangement of drain and lubricant passages in the compressor it may be located in the still to conserve space and reduce the heat loss when located without the still and the pipes connected to the compressor passages provides means for lubrication and also draining leakage of vapor in the compressor externally of the still.

We claim:

1. In an apparatus which includes a steam chamber, a steam compressor of the Roots type located within the steam chamber for uniform

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heating thereof in order to decrease the heat loss therein, said compressor including a rotor housing having a steam inlet port opening into the steam chamber and a steam pressure discharge port, bearing seal housings on the ends of said rotor housing and including shaft seals adjacent the inner ends and shaft bearings adjacent the outer ends, a cap closing the outer end of one bearing and seal housing, a timing gear housing closing the outer end of the other bearing and seal housing and including a shaft bearing and a shaft seal in the outer end thereof, driving and driven shafts rotatable in the shaft bearings and seals, said driving shaft extending outwardly through said shaft seal and bearing in said gear housing, timing gears interconnecting said shafts and located in the gear housing, an oil slinger disk located inside said closure cap and secured to one of said shafts, said housings having lubricating supply passages for supplying lubricant to said oil slinger disk and said gears to lubricate the bearings, said housings also having connected fluid leakage passages extending to spaces between the shaft seals and bearings adjacent the rotor housing for collecting any steam and lubricant passing said seals, separate lubricant supply and fluid drain pipes connected respectively to the lubricant supply passages and drain passages of said housings and extending outwardly of said chamber, said chamber having an opening for the driving shaft, and means for connecting said gear housing to the interior of said chamber to prevent leakage of steam past the seal therein.

2. A fluid compressor of the Roots type including a rotor housing having a fluid inlet port, a mounting flange including an outlet port and enclosing rotors having cooperating helical lobes thereon, bearing and seal housings on the ends of said rotor housing, each including shaft bearings adjacent the outer ends and shaft seals adjacent in inner ends, rotor driving and driven shafts rotatably supported in the bearings and seals, a cap closing the outer end of one bearing and seal housing, a timing gear housing secured to the outer end of the other bearing and seal housing and enclosing intermeshing timing gears on the respective rotor shafts, said timing gear housing having a bearing for the driving shaft and a shaft seal located outwardly therefrom and including exterior sealing surface surrounding the outer end of said driving shaft, said housings having outwardly opening lubricating supply passages leading to the interior of the gear housing and interior of the closure cap and outwardly opening drain passages leading to the spaces between the seals and bearings in the bearing and seal housings to drain any fluid passing said seals.

3. Fluid compressor apparatus comprising a fluid compressor including a compressor housing having a fluid inlet opening, a fluid pressure discharge opening, axially spaced compressor driving shaft bearings and fluid seals, a compressor driving shaft opening, a bearing lubricating passage communicating with one side of the shaft bearings, a fluid leakage drain passage communicating with the other side of the shaft bearings adjacent the shaft seals, and a compressor driving shaft supported in the shaft bearings and in sealing relation with the shaft seals and projecting outwardly from the shaft opening, a wall forming a steam heating and supply chamber around the compressor housing and having an opening for the compressor driving shaft and

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lubricating supply and leakage fluid drain openings, a wall forming a steam heating and supply chamber enclosing the compressor housing, said chamber wall having an opening for the compressor driving shaft, a lubricating supply opening and a fluid drain opening, means interconnecting the portions of the compressor housing and the chamber wall in fluid tight relation adjacent the compressor driving shaft openings therein and separate means interconnecting the lubricant supply passage and fluid leakage drain opening of the compressor housing with the lubricant supply and fluid leakage drain openings in the chamber wall for supplying lubricant to the bearings and for draining leakage fluid from the compressor housing outside the steam chamber.

4. A fluid compressor including a rotor housing enclosing a compressor rotor and having a fluid inlet opening, a fluid pressure outlet opening and separate longitudinal lubricant supply and leakage fluid drain passages spaced transversely apart and at different levels and end bearings and rotor seal housings secured to the ends of the compressor housing, each end bearing and seal housing having a pair of lubricant supply and a pair of leakage fluid drain openings spaced transversely apart, said pair of lubricant supply

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openings being located at a different level from said pair of leakage fluid drain openings whereby one lubricating supply opening and one leakage drain opening in each end bearing and sealing housings registers with one end of a corresponding rotor housing passage thereby providing interchangeable end bearing and seal housings.

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