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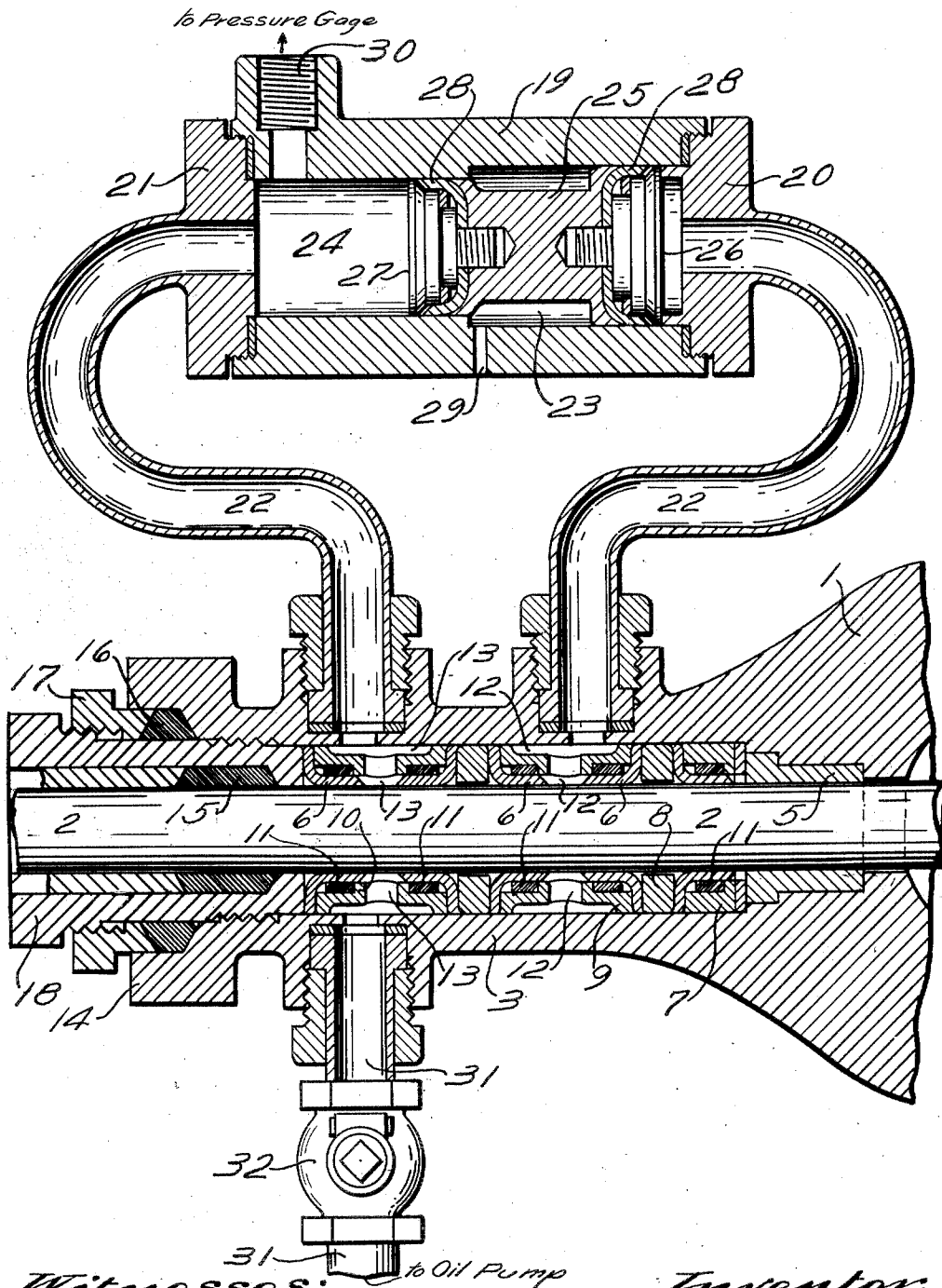
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G. BRAUNGART, JR.

STUFFING BOX FOR GAS COMPRESSORS.

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. NO MODEL.



Witnesses:
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UNITED STATES PATENT OFFICE.

GEORGE BRAUNGART, JR., OF CHICAGO, ILLINOIS.

STUFFING-BOX FOR GAS-COMPRESSORS.

SPECIFICATION forming part of Letters Patent No. 759,659, dated May 10, 1904.

Application filed September 12, 1903. Serial No. 172,894. (No model.)

To all whom it may concern:

Be it known that I, GEORGE BRAUNGART, JR., a citizen of the United States of America, and a resident of Chicago, in the county of Cook, State of Illinois, have invented certain new and useful Improvements in Stuffing-Boxes for Gas-Compressors, of which the following is a specification.

My invention relates to stuffing-boxes for gas-compressors, and is especially useful for preventing the leakage of gas along the piston-rods of high-pressure gas-compressors.

The main objects of my invention are to provide efficient means for preventing loss of gas through leakage along the piston-rod of a gas-compressor, to provide means for lubricating the piston-rod, to provide means for causing a liquid under pressure to resist the leakage of gas from the stuffing-box of a gas-compressor, and to provide means for automatically varying the pressure on said liquid so that same will always be proportionately more intense than the pressure of the gas leaking from said compressor, to avoid the necessity of having such liquid pressure unnecessarily high, and to provide means for maintaining such liquid-pressure with the least expenditure of mechanical energy. I accomplish these objects by the device shown in the accompanying drawing, which represents a longitudinal section, partly broken away, of one end of the gas-compressing cylinder of a refrigerating-machine having thereon a stuffing-box and oil-pressure device constructed according to my invention.

In the construction shown the cylinder-head 1 of the gas-compressor has a piston-rod 2 extending longitudinally through the middle of same and is provided with a stuffing-box of special form, as will be hereinafter described. The remainder of the cylinder and the piston are not shown, since my invention applies more particularly to the stuffing-box and the means for preventing leakage along the piston-rod. The casing or shell 3 of the stuffing-box is preferably made integral with the head 1. Within the counterbore of the shell of the stuffing-box are seated a bushing 5, which serves as a guide to the piston-rod

2, and a plurality of cup-leather packing-rings 6, preferably arranged as shown. The leather packing-rings are secured in position by means of a plurality of metal rings 7, 8, 9, and 10, and the cylindrical flaps of the leather cups 6 are urged into close contact with the piston-rod 2 by means of the rubber rings 11.

Two of the rings 9 and 10 are preferably formed as shown, so as to provide annular chambers 12 and 13 around the piston-rod 2. The outer end 14 of the stuffing-box is provided with packing-rings 15 and 16, which are compressed by glands 17 and 18, as is usual in devices of this class.

An auxiliary cylinder 19 is secured to the stuffing-box and has its heads 20 and 21 connected, respectively, with the chambers 12 and 13 by means of the pipes 22. One half, 23, of the interior of the cylinder is bored to a considerably greater diameter than the other half, 24, and a piston 25 is slidably mounted within the cylinder. Each of the ends 26 and 27 of the piston, respectively, fits the bore of the corresponding part of the cylinder. The piston 25 is also provided with cup-leather packing-rings 28 for preventing the leakage of the contents of the cylinder between its respective ends, and the middle part of the cylinder communicates at 29 with the air, so that the piston 25 will be free to move in the cylinder 19 when the pressure upon its opposite ends are not in equilibrium. The clearance-space at the left-hand end of the cylinder 19 communicates with a pressure-gage at 30, the pressure-gage being omitted in the drawing. The end 27 of the piston 25 is of considerably less area than the end 26, so that the piston 25 will be in equilibrium only when the contents of the chamber 13 are at considerably higher pressure than the contents of the chamber 12. The chamber 13 also communicates by means of a pipe 31 with an oil-supply, which is not shown in the drawing and which is adapted to supply oil at a certain constant pressure to the chamber 13. A check-valve 32 is provided in the pipe 31 to prevent a return flow of liquid from the chamber 13 toward the oil-supply and permit the pressure in the cham-

ber 13 to rise above that of the oil-supply. The oil-supply is preferably a pump provided with a by-pass, which may be set to open at a predetermined oil-pressure, and thereby prevent wasting of power at the oil-pump. This oil-pressure is slightly greater than the low pressure (suction-pressure) of the gas in the compressor and is sufficient to prevent a leakage of gas while the piston is on its back stroke.

It will be understood that the oil-pump maintains a constant pressure on the oil in the pipe 31 and causes oil to flow into the chamber 13 whenever the pressure on the oil in said chamber is below the pressure at which the by-pass of the oil-pump is set. As soon as the pressure in the chamber 13 becomes equal to or greater than the pressure to which the by-pass is set the by-pass valve opens, and the pump merely expends the amount of energy which is necessary for overcoming its own friction and maintaining the fixed pressure in the pipe 31.

The operation of the device shown is as follows: As it is almost impossible to prevent some leakage of gas along the piston-rod of a gas-compressor working under high pressure, the leather packings will become sufficiently worn after a few strokes of the piston to allow a small leakage of gas along the piston-rod and into the chamber 12. For reasons which will be hereinafter explained the pressure on the oil in the chamber 13 is always greater than the pressure of the gas in the chamber 12. The piston-rod moving through the chamber 13 in contact with the oil carries with it a film of oil, and thus thoroughly lubricates itself. The oil used is preferably one which will not absorb the gas, and the film of oil surrounding the piston-rod between the chambers 12 and 13, being under greater pressure than the gas in the chamber 12, effectually prevents such gas from working its way along the piston-rod and toward the chamber 13. Since there is a slight leakage between the compression-cylinder and the chamber 12, the pressure of the gas in the chamber 12 will be variable, being at any instant approximately the same as the prevailing pressure in the compression-cylinder.

The oil-pump is regulated to supply oil at a pressure greater than the exhausting-pressure in the gas-compressing cylinder, and the oil-pressure at the pump is therefore normally higher than the lowest pressure in the gas-leakage chamber 12. During the forward stroke of the piston-rod 2 the pressure in the gas-compression cylinder increases and correspondingly causes an increase of the pressure in the gas-leakage chamber 12. This causes a greater pressure on the end 26 of the piston 25 in the auxiliary cylinder 19 than is caused by the oil on the smaller end 27 of said piston, and the piston therefore moves to the

left until the resultant pressures on its ends 26 and 27 balance each other. Since the end 27 of the piston 26 is smaller in area than the end 26, equilibrium will occur only when the movement of the piston has increased the oil-pressure in the chamber 13 to a pressure somewhat greater than that of the gas in the chamber 12. The opposing pressures on the piston 25 will cause same to move until equilibrium is established, and the pressure on the oil in the chamber 13 will therefore automatically change as the pressure in the gas-leakage chamber 12 changes and will therefore always be somewhat greater than the pressure on said gas. The pressure on the oil in the chamber 13 will, however, never be excessively greater than that on the gas in the chamber 12, but will be maintained at an intensity just sufficiently greater to prevent leakage of gas between the two chambers.

The work required of the oil-pump is just sufficient to supply at a pressure equal to the lowest pressure of oil required in the chamber 13 the amount of oil required for lubricating the piston-rod 2. The work, it will be seen, is very much less than the work which would be required of the oil-pump if the pressure of oil in the chamber 13 were constantly maintained at an intensity greater than the highest pressure in the cylinder of the gas-compressor, as has been already done in devices of this class. It will be seen that the auxiliary cylinder forms an oil-pressure regulator and results in a great saving of mechanical energy.

The pressure-gage serves to indicate the varying pressures on the oil in the chamber 13, and thus assists in the adjustment of the by-pass on the oil-pump.

It will be seen that numerous details of the construction shown may be altered without departing from the spirit of my invention. I therefore do not confine myself to such details except as hereinafter limited in the claims.

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

1. In a device of the class described, the combination of a gas-compressing cylinder having a piston-rod extending through one end of same; a stuffing-box surrounding said piston-rod; a chamber in said stuffing-box, extending around said piston-rod and adapted to receive gaseous leakage from said cylinder; a second chamber in said stuffing-box, extending around said piston-rod, at the side of said first chamber which is away from the gas-compressing cylinder, and adapted to contain a liquid under pressure; and means operated by the pressure of the gas in said first chamber and adapted to exert on the liquid in said second chamber a pressure greater than that of the gas in said first chamber, substantially as described.

2. In a device of the class described, the

combination of a gas-compressing cylinder having a piston-rod extending through one end of same; a stuffing-box surrounding said piston-rod; a chamber in said stuffing-box extending around said piston-rod and adapted to receive gaseous leakage from said cylinder; a second chamber in said stuffing-box extending around said piston-rod, at the side of said first chamber which is away from the gas-compressing cylinder, and adapted to contain a liquid under pressure; and means connected with both of said chambers and adapted to automatically maintain said liquid at a proportionately higher pressure than the gas in said first chamber, substantially as described.

3. In a device of the class described, the combination of a gas-compressing cylinder having a piston-rod extending through one end of same; a stuffing-box surrounding said piston-rod; a chamber in said stuffing-box extending around said piston-rod and adapted to receive gaseous leakage from said cylinder; a second chamber in said stuffing-box extending around said piston-rod at the side of said first chamber which is away from the gas-compressing chamber, and adapted to contain a liquid under pressure; means for supplying liquid at constant pressure to said second chamber; and means for automatically changing the pressure on said liquid and maintain-

ing same at a proportionately higher pressure than the gas in said gas-chamber, substantially as described.

4. In a device of the class described, the combination of a gas-compressing cylinder having a piston-rod extending through one end of same; a stuffing-box surrounding said piston-rod; a gas-chamber in said stuffing-box extending around said piston-rod and adapted to receive gaseous leakage from said cylinder; a second chamber in said stuffing-box extending around said piston-rod, at the side of said first chamber which is away from the gas-compressing cylinder, and adapted to contain a liquid under pressure; an auxiliary cylinder having its ends connected respectively to said gas and liquid chambers; and a differential piston slidably mounted in said auxiliary cylinder and having its large end exposed to the gas so as to maintain a pressure on said liquid proportionately greater than the pressure on the gas in said gas-chamber, substantially as described.

Signed at Chicago, Illinois, this 5th day of September, 1903.

GEORGE BRAUNGART, JR.

Witnesses:

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EUGENE A. RUMMLER.