No. 679,344. Patented July 30, 1901.

# W. F. SINGER.

## ROD PACKING.

(Application filed Nov. 15, 1900.)

(No Model.)

Fig. I.

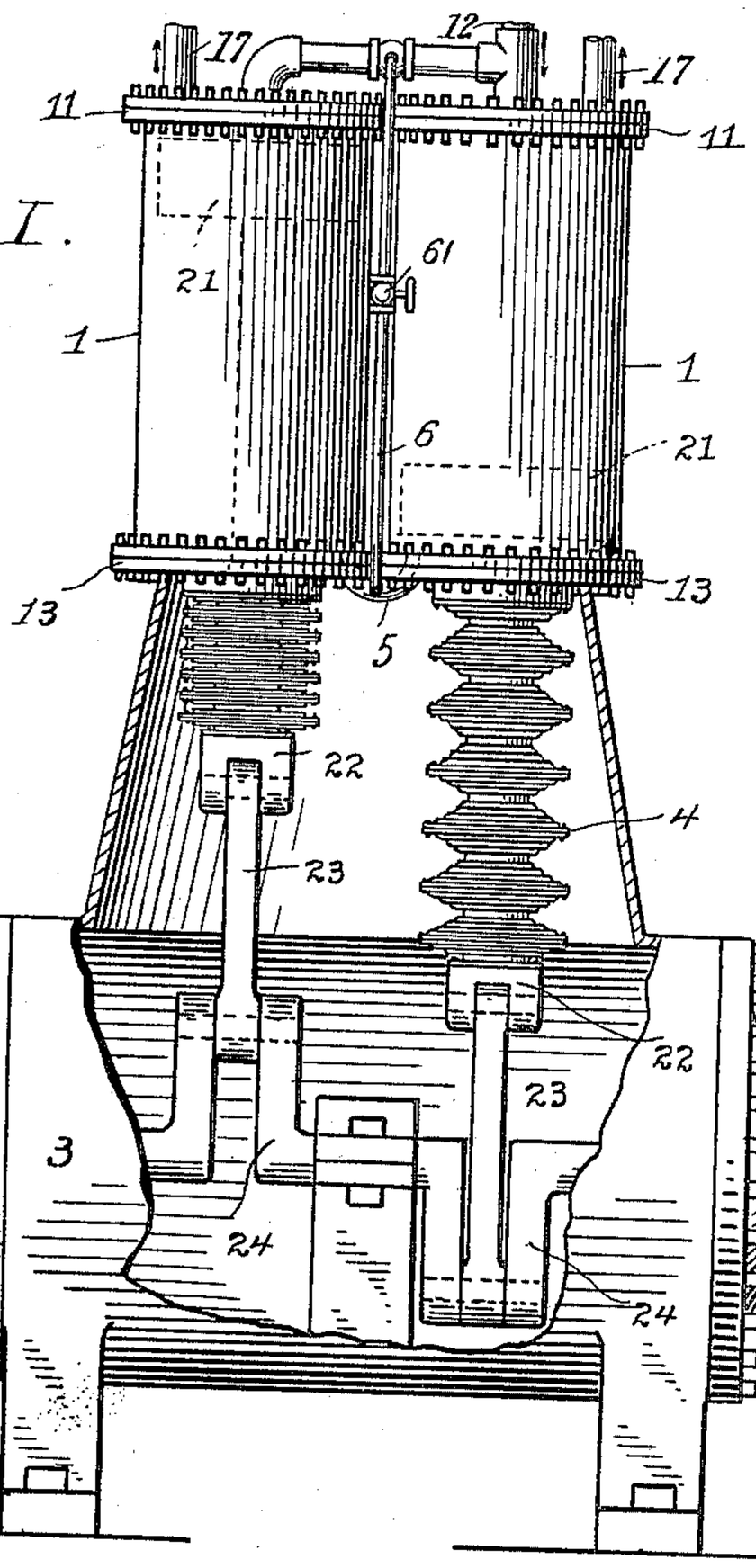



Fig. I.a

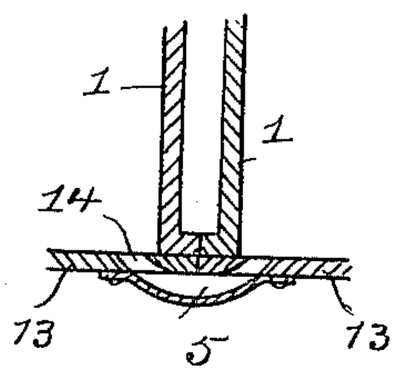



Fig. II.

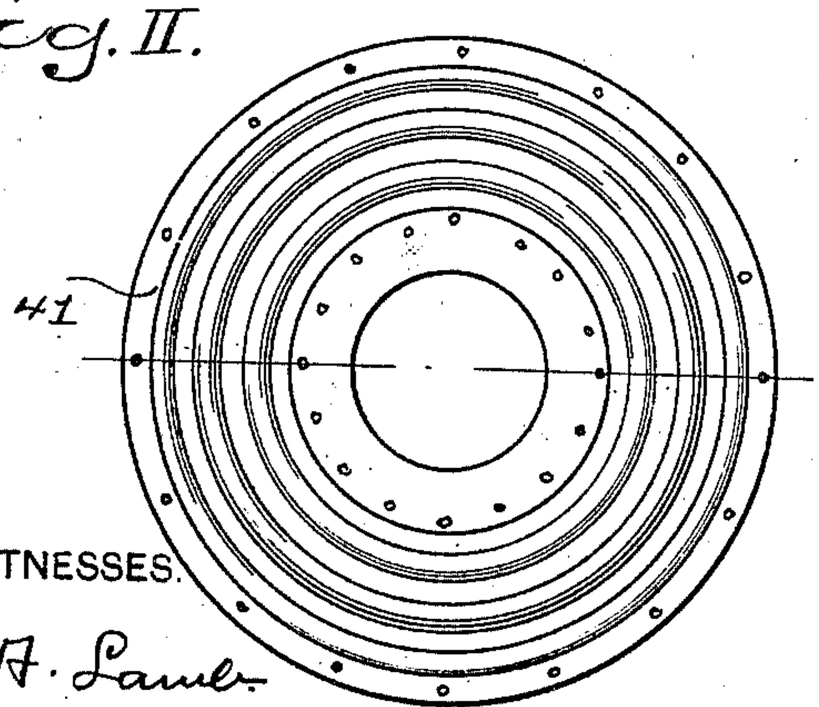
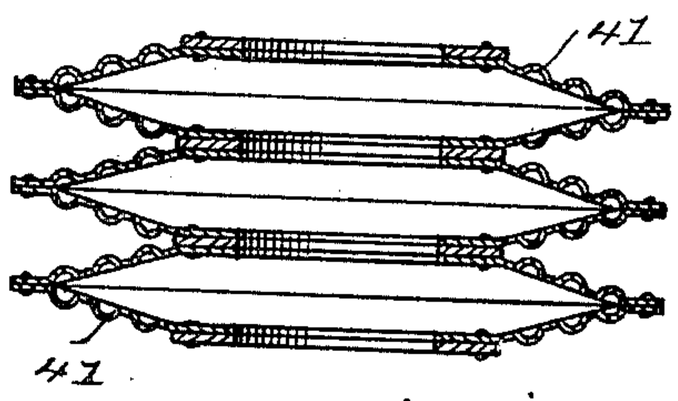



Fig. III.

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## ROD-PACKING.

SPECIFICATION forming part of Letters Patent No. 679,344, dated July 30, 1901.

Application filed November 15, 1900. Serial No. 36,613. (No model.)

*To all whom it may concern:*

Be it known that I, WILLIAM F. SINGER, a citizen of the United States, residing at Fourth avenue and Twenty-eighth street, borough of Manhattan, city and State of New York, have invented a new and useful Improvement in Rod-Packings for Compressors and Similar Devices, of which the following is a specification.

My invention relates particularly to the class of pumps used to compress or liquefy gases, especially for purposes of refrigeration, with the object of improving such pumps by providing means for preventing the escape of gases into the atmosphere at the place where the piston-rod passes through the head of the cylinder.

In the drawings, Figure 1 is an elevation and partial section showing a twin-cylinder pump embracing the features of my invention. Fig. 1ª shows in vertical section a detail. Fig. 2 is a plan of one of the disks of the extensible packing, and Fig. 3 is a vertical section of a plurality of said disks or annuli forming part of a sleeve. Figs. 1ª, 2, and 3 are shown of large size for clearness.

The twin cylinders 1 1 are placed side by side, and they are provided at one end with heads 11 and at the other end with heads 13. To the heads 11 of each cylinder is connected an inlet or suction pipe 12 and also outlet-pipes 17, communicating with a suitable reservoir or supply of gas as a refrigerant. Each cylinder is provided with a piston 21 and a piston-rod 2, passing through the head 13, and upon the outer or free ends of the piston-rods are cross-heads 22. These cross-heads 22 are connected by rods 23 to cranks 24 on a common shaft, which shaft is shown in bearings in an inclosed casing 3, the said shaft being provided with an ordinary driving-pulley at one end by which the shaft is turned. The cranks 24, connecting-rods 23, piston-rods 2, and pistons 21 are operated for the compression of the refrigerating-gas with the alternate movements of the pistons.

I prefer to use an inclosed casing 3, so that the crank-bearings may run in an oil-bath. I employ extensible sleeves 4, inclosing the portions of the piston-rods 2 that project from the cylinders. These sleeves 4 are made up of a plurality of resilient metallic disks or annuli of dishing form and corrugated, as shown in the drawings. These resilient disks of dishing form are each made with flat inner and outer edge portions that are parallel to one another, the intermediate portion being inclined.

I employ packing-rings, interposed between the metallic disks, and the sleeve is conveniently built up by first riveting or bolting the disks 41 together in pairs at the inner flat portions, with the convex sides together and a packing-ring intervening. These pairs of connected disks are then bolted together, with the intervening packing-rings at their flat outer flanges or portions, and the end flanges of the connected series are then securely bolted at one end to the cylinder-head and at the other end to a head or flange provided on the piston-rod. In this way a gas-tight envelop is provided around each piston-rod, adapted to contain and hold any gas that may leak from either cylinder around the piston-rod where the same passes through the heads 13, the said envelop holding the gas and preventing the same from further leakage into the atmosphere or into any case which may surround and contain the mechanism. These metallic disks 41 are corrugated, the corrugations being preferably pressed from the concave face outward. These corrugations provide for an elastic or springing movement of the disks as the same change from a compacted condition to an extensible condition, the two extremes being illustrated in the drawings, Fig. 1.

The cylinder-heads 13 are provided with apertures 14, pierced through the same at adjacent central points, and the passages thus formed are connected by a cover-plate 5, making, with the cylinder-heads, a gas-tight connection extending from one cylinder to the next, and from this plate 5 extends a relief-tube 6, the upper end of which forms a connection with the suction inlet-pipe 12, and in the relief-tube 6 there is a check-valve 61.

In the operation of the device the apertures 14 and the plate 5 provide for the passage of gas within the cylinder that has leaked by the pistons passing from one cylin-

der to the next with the movement of the pistons, so as to equalize the pressure within the cylinder, and the relief-tube 6 and check-valve 61 provide for the escape of this gas into the suction-pipe 12 when the pressure exceeds the limit for which the check-valve 61 is set. This structure, however, forms the subject of a separate and concurrently-filed application herewith, and while shown and described herein does not form any part of the present invention.

In the operation of the device and with the rearward movement of the pistons gas is sucked into the cylinder through the suction-pipe 12, and with the outward movement of the cylinder the gas is compressed and forced by the outlet-pipes 17 to a suitable container, from which the compressed gases are drawn for expansion and refrigeration. In practice I prefer to employ a relatively large number of the resilient metallic disks 41, so that the extent of movement or distortion of each is comparatively small.

In machines of this class it is practically impossible to make the contacting surfaces of the piston and piston-rod in the cylinders and heads so tight and the fit so close as to prevent leakage of gas. It is also essential that the gas that escapes to the rear of the piston and through the head with the movement of the piston-rod should be retained within the cylinders and further escape prevented; also, that the gas should have free passage as between the cylinders with the opposite moving pistons. The further escape is prevented by the resilient metallic disks heretofore described, and the movement of the gas from one cylinder to another to equalize the pressure is provided for by the plate 5 and the apertures 14, also heretofore described, the communicating passage established thereby not only preventing back pressure, but equalizing the pressure behind the pistons. The resilient metallic disks, together forming the sleeves about the piston-rods, not only confine the gas leaking through the heads with the outward movement of the piston-rods, but act with the return movement to force the gas back into the cylinders.

What I claim is—

1. A rod-packing consisting of a plurality of resilient corrugated disks each having flat parallel inner and outer edge flanges and inclined intermediate portions in which are the corrugations and secured together alternately and at said flat inner and outer edges and together forming an extensible sleeve, substantially as described.

2. A rod-packing consisting of a plurality of resilient corrugated disks each having flat parallel inner and outer edge flanges and inclined intermediate portions in which are the corrugations all alike and extending from the concave surface outward and secured together alternately and at said flat inner and outer edges and together forming an extensible sleeve, substantially as described.

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