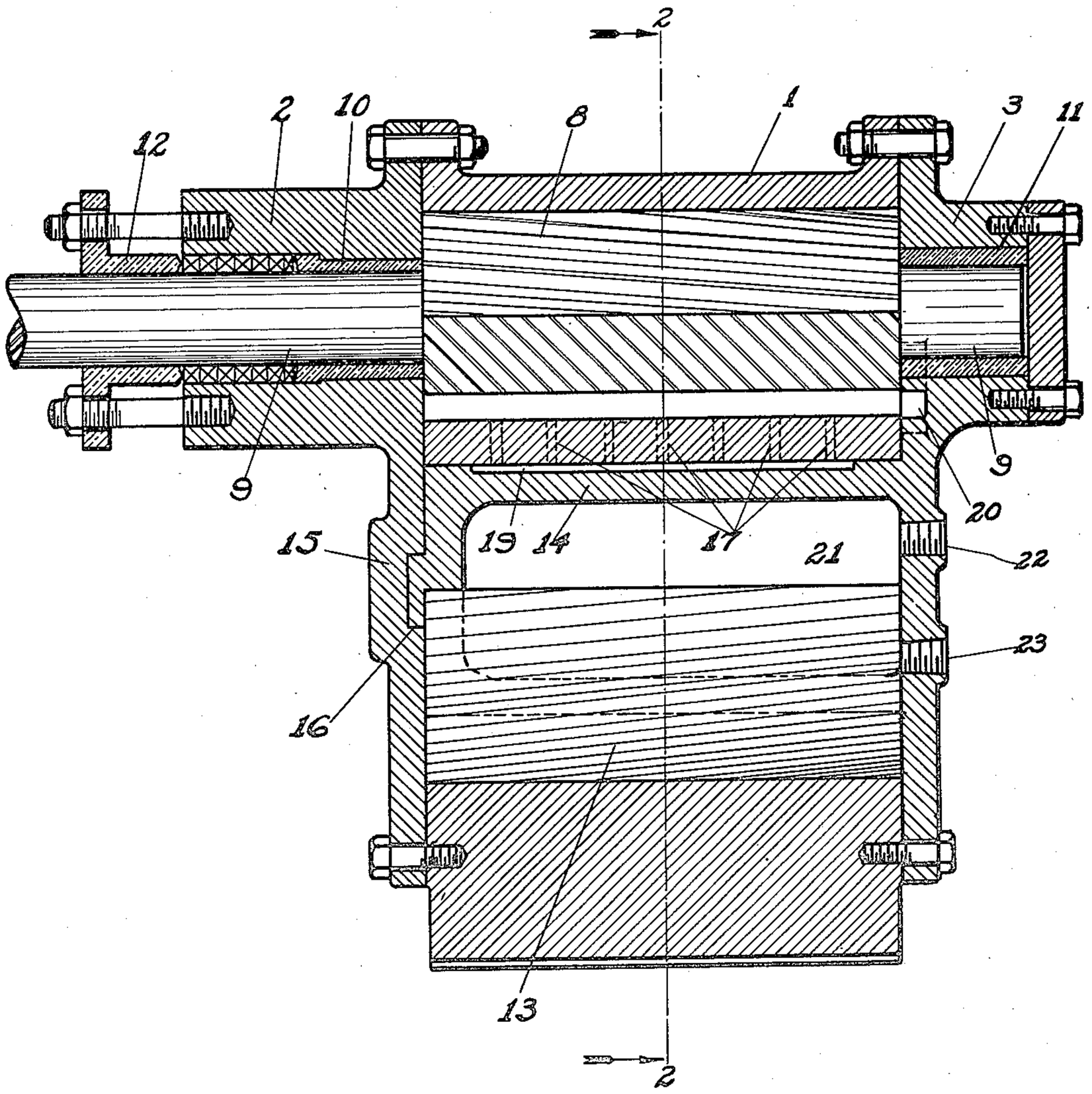
June 19, 1923. 1,459,552

G. RATHMAN

ROTARY PUMP

Filed March 14, 1921 2 Sheets-Sheet 1

Fig-1.



Gilbert Rathman

INVENTOR

BY Wm B. Whitney

ATTORNEY

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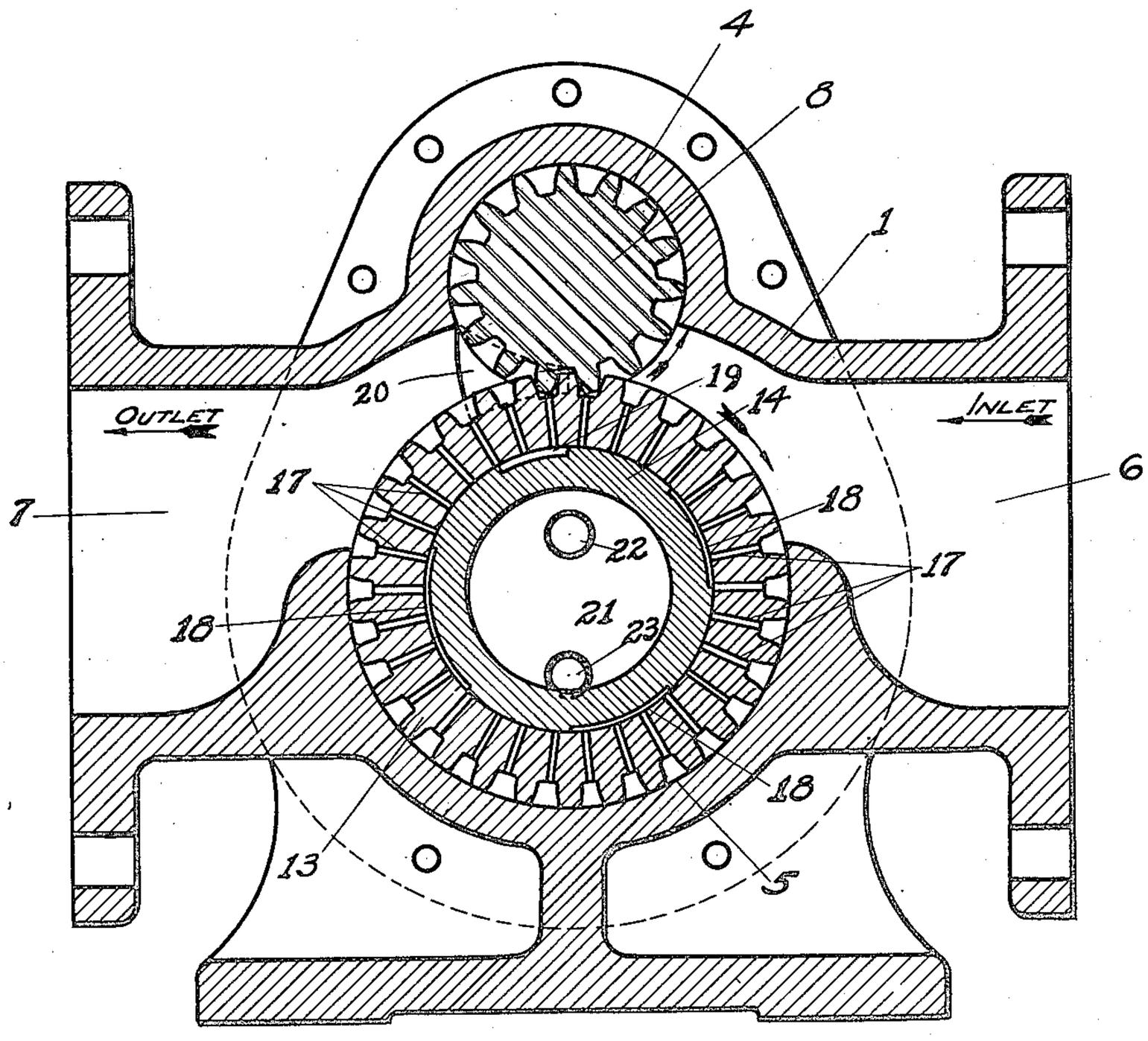
FIG.-2.



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UNITED STATES PATENT OFFICE.

GILBERT RATHMAN, OF NEW YORK, N. Y., ASSIGNOR TO WILLIAM E. QUIMBY, INC., OF NEW YORK, N. Y., A CORPORATION OF NEW YORK.

ROTARY PUMP.

Application filed March 14, 1921. Serial No. 451,960.

To all whom it may concern:

Be it known that I, GILBERT RATHMAN, a citizen of the United States, and a resident of the city of New York, in the county and State of New York, have invented certain new and useful Improvements in Rotary Pumps, of which the following is a specification.

This invention relates to a rotary pump of the type in which two gear wheels or rolls with teeth meshed rotate in a close-fitted case; and the object thereof is to increase the efficiency and otherwise to improve the operation of such a pump.

It has been found in practice that, in handling lubricating oils or other similar viscous fluids, the rotary gear-pumps as heretofore constructed are noisy in operation and cannot be run at a speed much above four hundred and fifty revolutions per minute, owing largely, or principally, to the fact that the oil which fills the grooves formed between the adjoining teeth of a gear is more or less trapped therein as the teeth of the two gears intermesh and, since it must be forced out between the rapidly approaching sides of such teeth, or around their ends, acts as a heavy brake upon the pump.

By my present improvements, I have obviated these defects and have produced a smooth light-running pump in which, when pumping oils of high viscosity—although by no means limited to such, or to any particular, use—the drive gear can be run at a speed of from twelve hundred to eighteen hundred revolutions per minute, without appreciable noise and with practically no backward slip or leakage of the oil. I have, therefore, not only succeeded in increasing the efficiency of the pump itself, thereby reducing the power required to operate it, but am also able to couple its drive gear directly to the rotor-shaft of a steam turbine or the armature of a high-speed electric motor, thus avoiding the usual intermediate speed-reducing gearing, or in the latter case, the relatively high cost of a low-speed motor.

The invention will be understood by reference to the accompanying drawings, in which—

Figure 1 is a view, in vertical section, of a pump embodying in the form preferred the several features of my improvements, and Fig. 2 is a vertical section on the line 2 2 of Fig. 1, looking in the direction of the arrows.

As here shown, by way of illustration merely, the pump case is made up of a shell 1 and two heads 2 and 3, which provide, as usual, the partial cylindrical housings 4 and 5 for the two gears and the inlet and outlet chambers 6 and 7. The gears, instead of having the usual straight teeth, are preferably spiral gears with teeth of low pitch, about six degrees for example. The upper or drive gear 8 is formed integral with, or otherwise suitably fixed upon, a drive shaft 9, which is journaled in suitable bearings 10 and 11 in the respective heads of the case and at one end extends through a stuffing-box provided, as shown, by a gland 12 in connection with the bearing in the head 2. The lower gear 13, of greater diameter than the drive gear, is cylindrical, and is mounted to rotate upon a hollow drum or hub 14, which is, or may be, formed integral with the head 3 and firmly supported at its outer end, as shown, by a reduced axial projection 15 fitting within a corresponding recess 16 formed in the head 2. The walls of this cylindrical gear are pierced, between adjoining teeth, by series of radial openings 17, or by longitudinal slots as the equivalent thereof, while the drum is recessed longitudinally at intervals, as at 18 18, to reduce the area of its frictional bearing surface and along the top to form a shallow chamber 19, extending from substantially the plane of the axes of the two gears towards the outlet chamber and of a width sufficient to connect the lower ends of two or more of the series of radial openings, thus providing an open passage to the outlet chamber for the oil which otherwise would be trapped therein by the intermeshing of the teeth of the gears. As the teeth of the spiral gears tend to force the oil towards one end of the case, the head at that end, the head 3 as shown, is recessed to provide a relief passage 20 around the end of the intermeshing teeth and open to the outlet chamber. The hollow drum upon which the lower gear is mounted provides a steam chamber 21, having inlet and outlet ports 22 and 23 in the head 3 to which pipes are attached, which serves for heating the oil.

It is obvious that the braking effect of the oil or other fluid caught between the intermeshing teeth of the gears is largely, if not wholly, eliminated by the free outlet

provided therefor, and that, as this relief is to the outlet side of the pump and as it permits the parts to be very closely fitted, the leakage is reduced to a minimum. When gears with straight teeth are used there will be little if any need for an outlet around the ends of the teeth, or, for most uses of the pump, the outlets through the walls of the lower gear may be omitted and all the relief necessary provided by forming similar outlet chambers in both heads of the casing. It is also obvious that, where the upper or drive gear is of smaller diameter it will rotate more rapidly than the lower gear, thus facilitating the coupling of its shaft directly to a turbine or high-speed motor, while the increased size and reduced speed of the lower gear not only make possible the more efficient relief of the fluid through the walls of this gear but also afford the space for a steam-heating chamber of substantial size.

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

1. A rotary gear-pump comprising, in combination, a case, a drive gear of relatively small diameter, a second cylindrical gear of larger diameter with teeth intermeshing with the teeth of the drive gear and mounted to rotate on a fixed drum, radially disposed passages extending through the walls of the cylindrical gear between adjoining teeth, and, co-operating with said passages, a longitudinal recess in the upper surface of the drum of a width and so located as to connect the inner end of a radial passage when substantially at the plane of the axes of the two gears with the inner end of one or more other radial passages on the outlet side of the pump.

2. A rotary gear-pump comprising, in combination, a case, two intermeshing low-pitched spiral gears with drive gear of relatively small diameter adapted to be connected directly to the shaft of a high-speed motor and a cylindrical driven gear of larger diameter mounted to rotate upon a fixed drum, and means comprising radially disposed passages through the walls of the larger gear between its teeth, a co-operating recess between the inner surface of the gear and the outer surface of the drum and a passage around that end of the teeth of both gears towards which the pitch of the teeth tends to force the fluid providing an outlet to the discharge side of the pump for the fluid entrapped between the teeth of the two gears.

3. A rotary gear-pump comprising, in combination, a case, two intermeshing gears with drive-gear of relatively small diameter, and means for heating the larger driven gear.

4. A rotary gear-pump comprising, in combination, a case, two intermeshing spiral gears with drive-gear of relatively small diameter adapted to be connected directly to the shaft of a high-speed motor, means providing an outlet to the discharge side of the pump for the fluid entrapped between the teeth of the two gears, and means for heating the larger driven gear.

5. A rotary gear-pump comprising, in combination, a case, a drive gear of relatively small diameter, a second cylindrical gear of larger diameter intermeshing with the drive gear and mounted to rotate upon a fixed hollow drum, and means for introducing a heating medium to the interior of the drum.

6. A rotary gear-pump comprising, in combination, a case, a drive gear of relatively small diameter, a second cylindrical gear of larger diameter intermeshing with the drive gear and mounted to rotate upon a fixed hollow drum, a passage connecting the grooves of one of the gears successively with the outlet chamber of the case through several degrees of their movement while approaching and substantially at the plane of the axes of the gears, and means for introducing a heating medium to the interior of the drum.

7. A rotary gear-pump comprising, in combination, a case, a spiral drive gear of relatively small diameter and with teeth of low pitch, a second cylindrical spiral gear of larger diameter with teeth of the same pitch intermeshing with the teeth of the drive-gear and mounted upon a fixed hollow drum, radially disposed passages through the walls of the cylindrical gear between adjoining teeth and, co-operating therewith a longitudinal recess in the upper surface of the drum of a width and so located as to connect one radial passage when substantially at the plane of the axes of the gears with one or more other radial passages on the outlet side of the pump, a recess in one head of the case so shaped and located as to form a passage extending from substantially the plane of the axes of the two gears around the ends of several teeth of both gears on the outlet side of the pump, and means for supplying a heating medium to the interior of the drum.

GILBERT RATHMAN.