W. ZACHARIAS.

CIRCULATING PUMP.

APPLICATION FILED APR. 12, 1915.

1,304,843. Patented May 27, 1919.

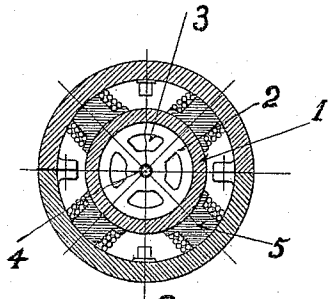


FIG. 3

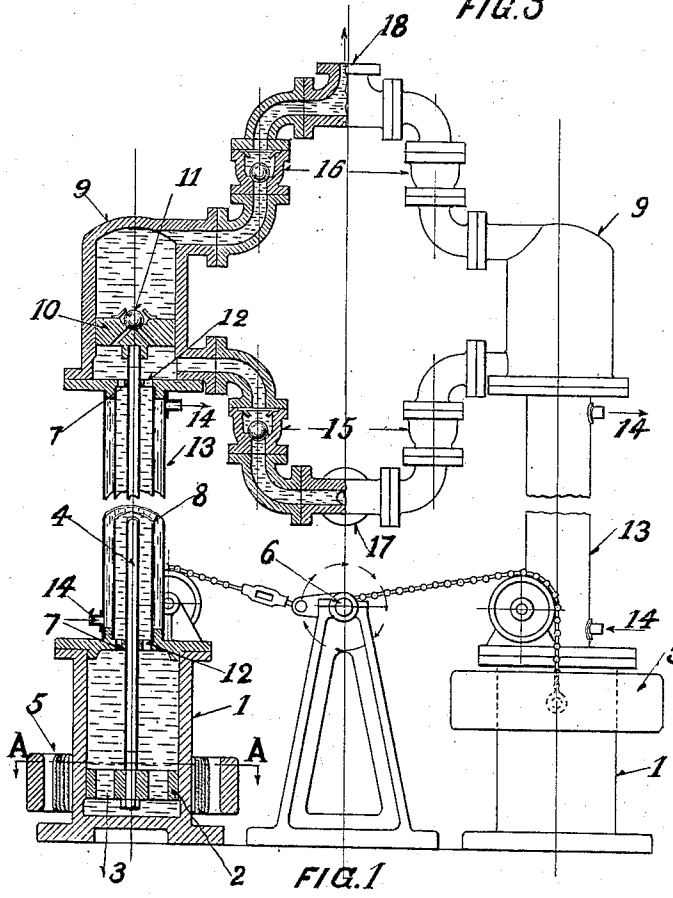


FIG. 1

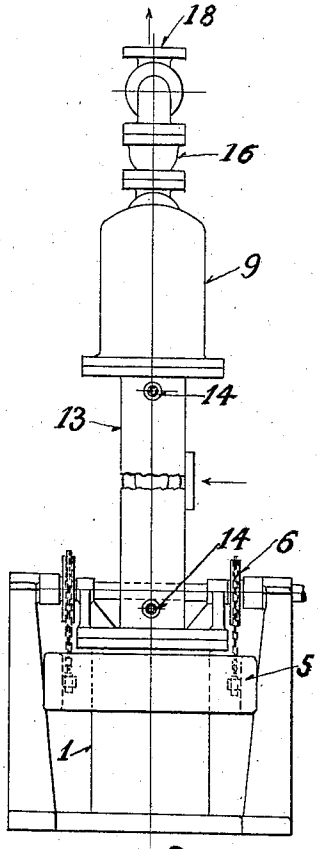


FIG 2

WITNESSES:

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UNITED STATES PATENT OFFICE.

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CIRCULATING-PUMP.

1,304,843. Specification of Letters Patent. Patented May 27, 1919.

Application filed April 12, 1915. Serial No. 20,867.

To all whom it may concern:

Be it known that I, WALTHER ZACHARIAS, a subject of the German Empire, residing at 3003 Kennet Square, in the city of Pittsburgh, in the county of Allegheny and the State of Pennsylvania, have invented certain new, useful, and important Improvements on Circulating-Pumps, of which the following is a specification.

It is a fact, that wherever circulating pumps are used for circulating hot liquids, be it piston or rotary pumps, the material in the stuffing boxes around the rods or the shaftings is rapidly worn out and has to be renewed constantly, thereby causing considerable expenses as to time, labor and power, not to mention the considerable cost of the packing material itself.

These expenditures increase the more, if the fluids to be pumped are of such nature and in such condition, that no packing material would resist for any longer time the chemical action as well as the physical conditions of said fluids.

In certain cases it has even been found that the efficiency of the whole arrangement became reduced and the installation of one, two or more spare units became necessary to guarantee a satisfactory running.

For instance in a series of evaporators the liquid to be concentrated has to be pumped in some arrangements from one evaporator unit to another and so on, which creates the necessity for constantly circulating this liquid, until it is at the desired concentration. This can be done by means of steam-pumps and spare units thereof, and everybody, who ever handled pumps for such purposes, knows very well the difficulties which then arise, causing stops of considerable time and thereby losses of labor, heat and power, mechanical wear and tear, not to mention the sometimes valuable liquids lost through the repeatedly occurring leakages of stuffing boxes.

Furthermore there is the very important objection, that the operatives around such machinery are exposed to much danger to their health, not to say their lives, whenever such leakages happen especially of hot caustic liquids, and statistics abound with such deplorable instances.

In other cases for instance a leaking stuffing box on a pump is liable to put out of commission the whole arrangement of machinery and this especially happens, when superheated water under high pressure is used in an apparatus known as Frederking-apparatus.

These are very effective apparatus, by the use of which chemical processes have been carried out, which formerly could not be carried out either at all or at least not in a satisfactory manner.

Besides the already heavy manufacturing expenses of such apparatus, heavier expenses had to be incurred by the necessity of additional constructural work, needed to operate the apparatus, which latter had to be installed on a high platform of very solid and therefore expensive construction to allow a satisfactory circulation of the superheated water from the heating furnace to the apparatus on the platform and vice versa, this platform not to be lower than 13 to 14 or more feet above the furnace.

So it was an obvious procedure to apply a pump to circulate the superheated water quicker and more readily through the pipe line system of such a kind of apparatus making the operation more reliable.

Such a pump made with a stuffing box could never be kept really tight even at the expense of unusual power needed to overcome the friction in a stuffing box which was to stand a pressure of 3000 or more pounds, such high pressures being generally in use in the pipe system of a Frederking apparatus. A loss, for instance, of 300 ccm. water through the stuffing box would cause a considerable loss of pressure in the system and thereby a drop of temperature with all its unpleasant consequences, and all attempts to construct a pump for these special purposes proved to be failures.

This construction might also be found valuable for house-heating apparatus, where hot water is used in radiators and this allows to diminish the radiating surfaces in the rooms, and also the diameter of the pipes, materially decreasing cost of installation without any loss in efficiency of the system, and allowing a perfect control of the velocity of the circulating hot water. Of course, it is understood that for this purpose any other ordinary pump might be used, but in such a case the presence of stuffing boxes would render the operation un-

safe, a trouble which is entirely avoided by the elimination of stuffing boxes, according to my construction.

For instance in a piston pump I arrange in a casing an iron core, which is actuated by an electromagnet, movably arranged around the outside of the casing, which iron core by its motion, produces motion of a separate device with the features of a pump and actuates the rods and pistons and thereby the valves of said pumping device in such a manner, that rods and pistons move within the fluids to be pumped, but that the cores and other actuating parts are not touched by the circulating hot fluids, thereby avoiding the necessity of providing any stuffing boxes at all, and allowing to keep the actuating parts like core casing and electromagnetic means cool and thereby protecting these parts against the detrimental influence of the hot liquids, as will be more fully understood from the sample arrangement illustrated in the accompanying drawing, which hereby is made part of this specification.

In this drawing same numbers in all the views shown denote same parts.

Figure 1 illustrates in elevation one instance of a practical execution of my apparatus, such as would be suitable for the circulating pumping of superheated water through the pipe system of a Frederking-apparatus or for the circulation of liquids through a series of evaporators.

The left side of Fig. 1 shows the apparatus in cross-section, Fig. 2 is the outside side view of the arrangement and Fig. 3 is a horizontal cross-section (at line A A of Fig. 1.)

In all views #1 designates a casing, in which an iron core #2 is movably arranged, provided with holes #3 and connected to a rod #4, which core #2 is actuated by the electromagnets #5, which can be moved up and down as shown by the arrangement #6. Rod #4 slides through the guiding supports #7 and a tube #8 into a cylinder #9, there carrying a piston head #10 with valve #11. Said tube #8 allows free admission of the fluids, to be pumped, to all parts of casing #1 through the holes #12 in guiding supports #7 and through the holes #3 in core #2, thereby avoiding a stuffing box. Tube #8 is surrounded by a jacket #13 with inlet and outlet #14 for admission of means for cooling. Valve #11 in piston head #10 in connection with valves #15 and #16 actuates the pumping of the fluids into the circulation pipe systems, which are attached at #17 and #18.

As will be seen from the foregoing description of the drawing, means are provided for regulating the action of essential parts of the whole appliance, whereby the efficiency of the pump is controlled by the skill and will of the operator according to the requirements.

For instance: By the reducing or the increasing of the speed of the moving arrangement #6 the efficiency of the pump can easily be reduced or increased.

As it is necessary and an essential feature of my invention to keep casing 1, core 2, and electromagnet 5 cool, jacket 13 is provided for cooling purposes, and also serves for keeping the efficiency of the electromagnetic means constant. And this is a very important point, as in some cases the temperature of the liquid to be pumped may run very high up to the neighborhood of 450, 500 or more degrees centigrade.

It is of course understood, that if instead of a piston pump a rotary or a centrifugal pump be provided, this my construction may be adapted to actuate the rotary mechanism also in any way known to any mechanical or electrical engineer, which construction furthermore allows to dispense with stuffing boxes around the shaftings.

Anyhow I do not limit myself to the special case illustrated by the drawing, nor to any material or construction, nor to a vertical or horizontal or any slanting position of any parts used, nor to any number of units, nor to any dimensions or size relations, that might be inferred from the drawing, nor to any construction of valves, pistons, piston-rods, cores, magnets, jackets, cylinders, etc., but desire to accommodate the principles of this my construction of an apparatus according to the requirements of the special case in hand.

Having thus fully described this my invention, what I claim and desire to secure by Letters Patent is:

Claims:

1. In a pump of the character described, an electro-magnetic motor including a casing, an electro-magnet adapted to be reciprocated outside of the casing, means for moving the electro-magnet, a core member within said casing adapted to be reciprocated by the electro-magnet, a pump chamber spaced from the said casing having inlet and discharge connections, means forming an open communication between the interior of the casing and the pump chamber and coöperating with the casing to form a reservoir for a maintained body of fluid, and means for cooling the maintained body of fluid.

2. In an electro-motor-driven pump, the combination comprising a core casing, a pump casing, a piston in the pump casing, a core member within the core casing, means connecting the piston and core member, means surrounding the said connecting means and forming a communication between said casings and coöperating with the core casing to form a reservoir for a main-

tained body of fluid, said connecting means and core member arranged to move in the maintained fluid, and a reciprocating electro-magnet without said core casing for reciprocating said core member and piston.

3. In an electro-motor-driven pump, the combination comprising a closed core casing, a pump casing, a piston in the pump casing, a core member within the core casing, a rod directly connecting the piston and core member, a rod casing, means inclosing said rod and connecting said pump and core casings, whereby a free passage for fluid is provided between said casings, and a reciprocating electro-magnet without said core casing for reciprocating said core member and piston.

4. A high pressure pump for hot liquids comprising in combination an electro-magnetic motor including a closed casing, and an electro-magnet adapted to be reciprocated outside of said casing, a core member within said casing adapted to be reciprocated thereby, and means for reciprocating said electro-magnet, a pump casing including inlet and discharge connections, a rod connecting said pump piston and the core member, and a rod casing connecting the pump casing and the core casing to form a free fluid passage between the pump casing and the core casing.

In witness whereof I have hereunto set my hand in the presence of the witnesses named below.

WALTHER ZACHARIAS.

Witnesses:
CHARLES ZABEL,
GRETE ZACHARIAS.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."