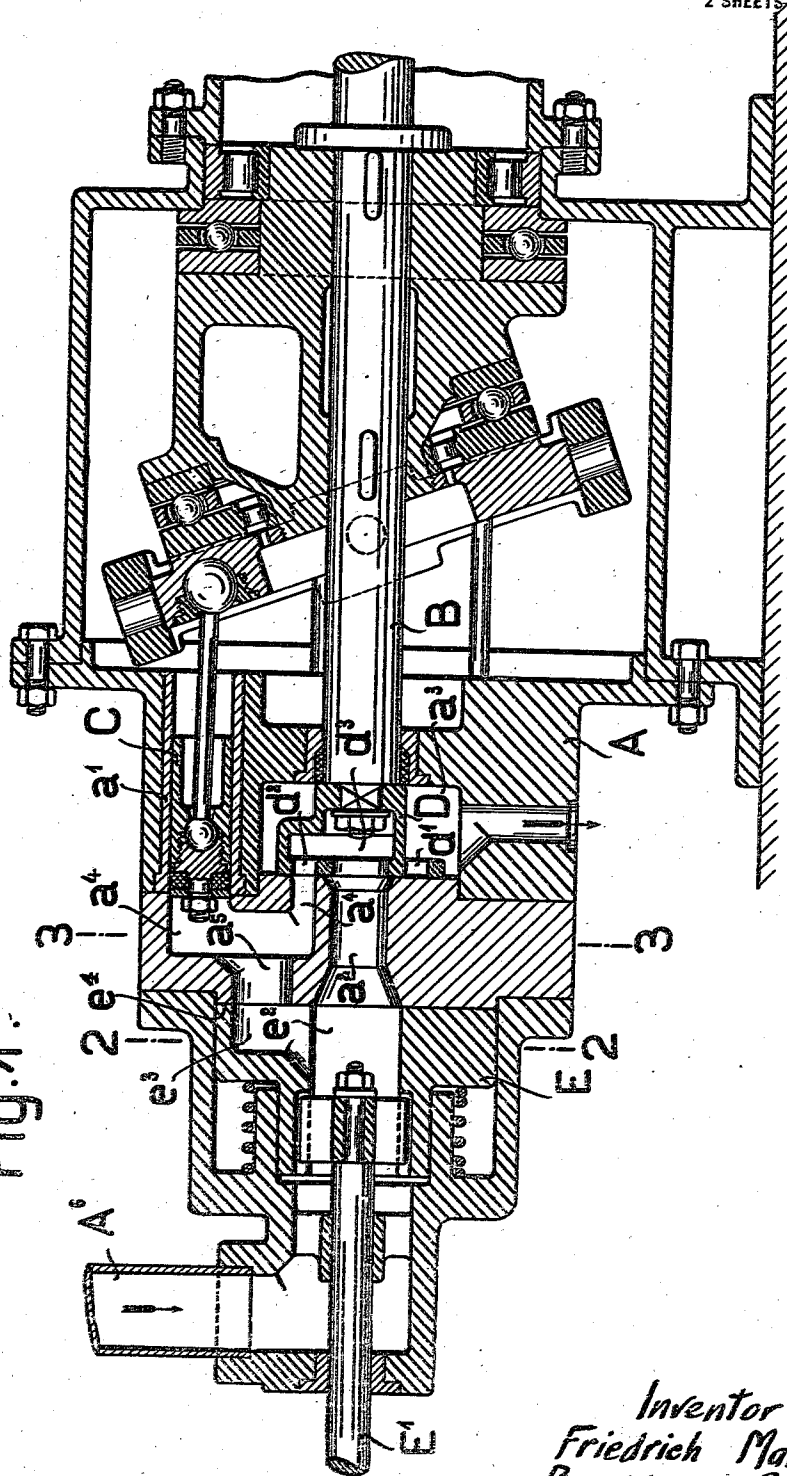


1,416,731.

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BY-PASS SYSTEM FOR PISTON PUMPS.
APPLICATION FILED SEPT. 25, 1920.

Patented May 23, 1922.
2 SHEETS-SHEET 1.

Fig. 1.



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2 SHEETS—SHEET 2.

Fig. 2

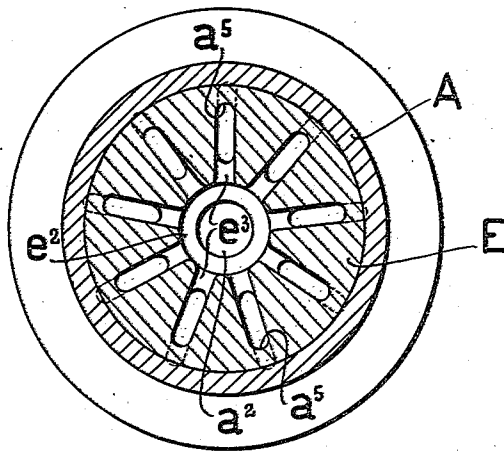
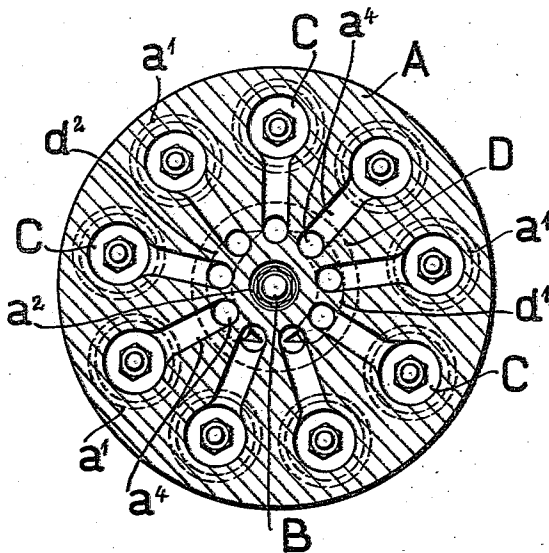


Fig. 3.



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BY-PASS SYSTEM FOR PISTON PUMPS.

1,416,731.

Specification of Letters Patent.

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To all whom it may concern:

Be it known that I, FRIEDRICH MARTIN, residing at Essen, Germany, a citizen of the German Republic, have invented a certain new and useful Improvement in By-Pass Systems for Piston Pumps, (for which I have filed an application in Germany May 3rd, 1917,) of which the following is a specification.

The present invention relates to a by-pass system for piston pumps. Such systems have, as is well known, the purpose of avoiding a stoppage of the engine serving to drive the pump, when the latter is no longer required to deliver liquid under pressure into the line. The fluid in by-pass systems of the known art flows from the pressure chamber of the pump through the by-pass system into the suction chamber and from the latter through the pump cylinder back to the pressure chamber. But by-pass systems of that kind are not suitable for multiple cylinder piston pumps with driven shafts and provided with a starting or distribution valve slide, common for all the pump cylinders and partaking in the revolution of the driving shaft during the operation of the pump. The reason being that when such a valve slide is used, the valve passages can naturally be constructed with only comparatively small cross section. As a consequence, the fluid experiences a fairly great heating when it passes from the suction chamber to the pressure chamber through the valve passages. As now, during circulation, the same fluid particles have to repeatedly pass through the valve passages, the temperature of the circulating fluid must at last rise to an unpermissible high temperature. The present invention has now for its object to produce a by-pass system of simple construction for pumps of the described art. On the accompanying drawing a pump is illustrated with a by-pass system representing one embodiment of the present invention, in which—

Fig. 1 shows a longitudinal section of the pump;

Fig. 2 a cross section of Fig. 1 along line 2—2 seen from the left and

Fig. 3 a cross section of Fig. 1 along the line 3—3, also seen from the left.

The pump is provided with a stationary cylinder housing A, with nine cylinders a' arranged parallel to each other and at the

same distance from the driving shaft B. In each of the cylinders a' runs a piston C, which is in positive connection with the driving shaft B through the intermediary of a so-called inclined disc gear, and in such a manner that the piston receives a reciprocative movement of constant stroke length from the rotation of the shaft. The housing A is provided with cylindrical suction passage a^2 arranged coaxially with the shaft B and a pressure chamber a^3 likewise cylindrical and coaxial with the shaft B and surrounding the valve slide D which is fixedly attached to the shaft B. The valve slide is provided with two ports d' and d^2 of crescent shape and symmetrically arranged on the contact face of the slide, see Fig. 3, the one port d' being in constant communication with the pressure chamber a^3 , while the other d^2 leads to a suction passage a^2 which is in constant communication with an inner chamber d^3 of the starting slide. From each of the cylinders a' a passage a^4 leads to the slide surface through which the working chamber of the cylinder during the rotation of the slide D can alternatively get into communication with one of the two crescent-shaped passages d' and d^2 . A by-pass port a^5 branches off from each of the passages a^4 towards the side that is situated away from the valve slide D. All the by-pass ports a^5 open against the surface e^4 of a rotary slide E which is movable by means of a shaft E' carried in the housing A coaxially with the shaft B. The rotary slide E is provided with a central chamber e^2 which is in constant connection with the suction pipe A⁶ and the suction passage a^2 and from this chamber e^2 radiates the same number of open passages or grooves as there are by-pass ports a^5 , these grooves being open in the direction of the slide surface e^4 .

It is now so arranged that on the one hand, with certain angular position of the rotary slide, as shown on the drawing, each one of the by-pass ports a^5 stands in connection with the central chamber e^2 through a corresponding passage e^3 , while on the other hand, after the slide has been turned a certain angle each by-pass port a^5 becomes closed by a bridge between the passages e^3 .

During the correct running of the pumps, the rotary slide E is so adjusted that it closes the by-pass port a^5 . The fluid then flows from the suction pipe A⁶ through the

central chamber e^2 of the rotary slide E and the suction passage a^2 into the inner chamber d^3 of the starting slide D and from there through the crescent-shaped passage d^2 into the pump cylinders a' through the passages a^4 in connection therewith. Simultaneously herewith, fluid passes from the cylinders a' which are in connection with the crescent-shaped passages d' , and flows into the pressure chamber a^3 . The fluid then becomes heated during its passage through the comparatively narrow valve passages. But as the same fluid particles, during the proper running of the pump only once flow through the empty valve passages by entering and leaving, the rise in temperature remains below the permissible limit.

If the pump has to work with a movement of the fluid through the by-pass system, then the rotary slide E has to be adjusted so that the passages e^3 , as shown on the drawing, make connection between the by-pass ports a^5 and the central chamber e^2 of the rotary slide. The main portion of the fluid then enters the cylinders a' during the suction stroke on the path e^3 , the ports a^5 , a^4 , and all the fluid returns the same way to the suction chamber, during the pressure stroke.

As there is no difficulty in making the orifice cross section sufficiently large both of the passages e^3 and a^5 and the portions of passages a^4 which are situated between the ports a^5 and the cylinders a' , there will be no difficulty in avoiding any unpermissible increase in temperature during the movement of the fluid through the by-pass system.

Having thus described my invention, what I claim is:

1. A device of the class described comprising a driving shaft, a multiplicity of

cylinders, a starting slide common to all cylinders and partaking in the rotary movement of the driving shaft, a suction chamber, a control member provided with ports for providing independent communication between the cylinders and the suction chamber and, said control member being rotatable for closing said independent communications.

2. A device of the class described, comprising a driving shaft, a multiplicity of cylinders, a rotary slide valve common to all the cylinders, said valve being operatively connected to the driving shaft and partaking in its rotary movement, a suction chamber, a second slide member provided with a multiplicity of ports for providing independent communication between said suction chambers and the cylinders, said second slide member being rotatable for controlling said independent communications.

3. In a pump having a multiplicity of cylinders and pistons working therein, a shaft for driving the pistons, a suction chamber and a pressure chamber common to all the cylinders and a rotary slide valve positively connected to said driving shaft for controlling the communication between said cylinders and the suction chamber and the pressure chamber alternatively, a by-pass system comprising a plurality of ports for providing communication between the suction chamber and each of said cylinders independently of said rotary slide valve and an adjustable valve common to all said ports for closing them.

The foregoing specification signed at Essen, Germany, this 17th day of June, 1920.

FRIEDRICH MARTIN.

In presence of—

HANS GOTTMANN,
JOHANN DECKERS.