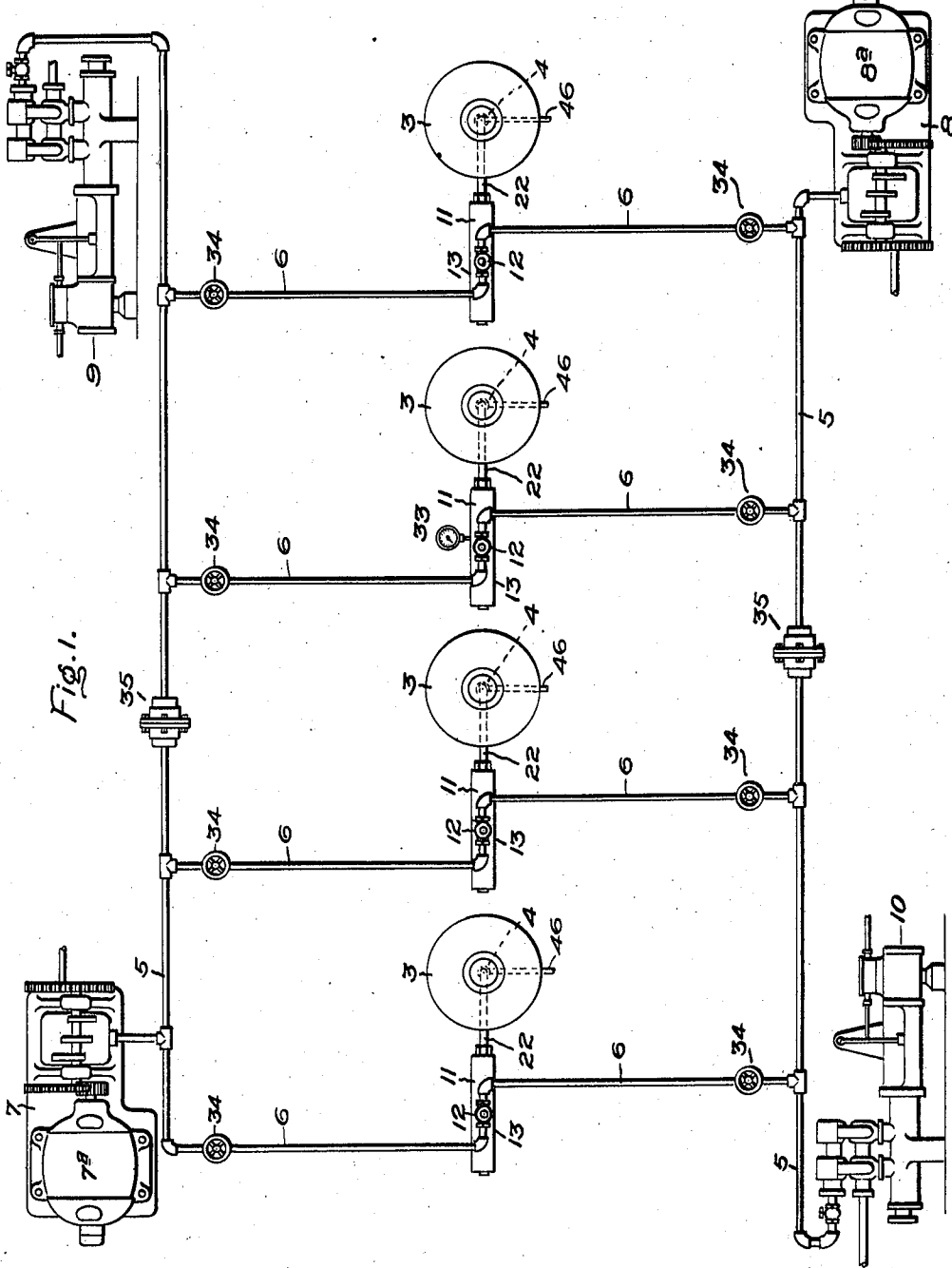


J. F. KEY.
SYSTEM OF FORCED LUBRICATION.
APPLICATION FILED NOV. 12, 1907.

1,013,180.

Patented Jan. 2, 1912.

2 SHEETS-SHEET 1.



Witnesses:
Marcus L. Byng.
J. Ellis Allen.

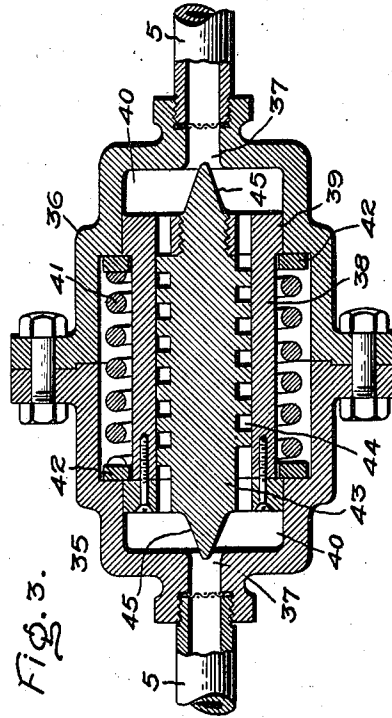
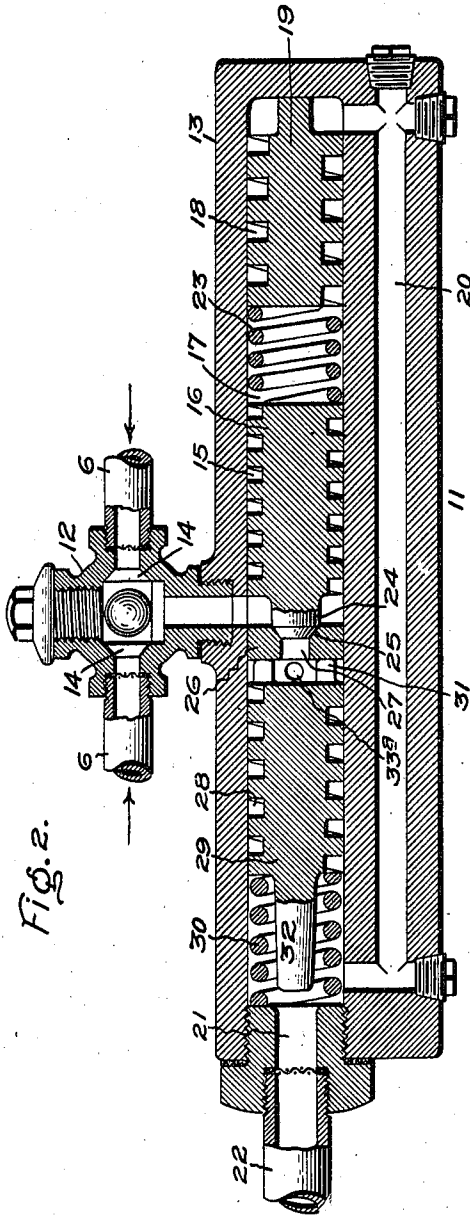
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James F. Key,
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2 SHEETS—SHEET 2.



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UNITED STATES PATENT OFFICE.

JAMES F. KEY, OF SAN FRANCISCO, CALIFORNIA, ASSIGNOR TO GENERAL ELECTRIC COMPANY, A CORPORATION OF NEW YORK.

SYSTEM OF FORCED LUBRICATION.

1,013,180.

Specification of Letters Patent.

Patented Jan. 2, 1912.

Application filed November 12, 1907. Serial No. 401,792.

To all whom it may concern:

Be it known that I, JAMES F. KEY, a citizen of the United States, residing at San Francisco, California, have invented certain new and useful Improvements in Systems of Forced Lubrication, of which the following is a specification.

My invention relates to systems of forced lubrication for prime movers such as steam turbines and its object is to safeguard the system against loss of lubricant and interruptions of its functions due to accidents and other disturbing influences, by the provision of mechanism which is automatically brought into operation when such disturbances occur.

In the accompanying drawings illustrating one embodiment of my invention, Figure 1 is a diagrammatic view of a system of forced lubrication as applied to a battery of turbines; Fig. 2 is a section through an automatic baffle forming a part of this system; and Fig. 3 is a section through a baffle check employed in the system.

A battery of four vertical shaft turbines is illustrated in Fig. 1, having step bearings 4 in which a film of lubricant under pressure is employed to support the rotating parts, but the invention may be applied to other types of machines and to a larger or smaller number of turbines. Lubricant from some suitable source of supply (not shown) is forced by pumps 7, 8 or 9, 10 through supply piping 5 having branches 6 leading to each turbine. The pumps 7, 8 are driven by electric motors 7^a, 8^a. Pumps 9, 10 are steam pumps. But one pair of pumps is intended to be in service at one time. The means for driving the pumps may be varied from those illustrated if desired. The pairs of pumps are driven by different means so that in case one source of motive power should fail another would ordinarily be available for use. If desired, an accumulator may be connected with the system to furnish an additional source of supply when the pumps are all idle. Suitable return conduits 46 may convey lubricant from the bearings 4 and any other parts of the machine requiring lubrication, back to the pumps for continuous use in the system.

Between each branch 6 and the turbine it supplies in an automatic baffle 11 which reduces the pressure of the fluid from that

imparted to it by the pumps to that required for the particular conditions existing in the turbine supplied and maintains a regular flow of lubricant to the bearings. The reduction in pressure is secured by forcing the lubricating fluid through a tortuous passage in the baffle. This passage is preferably made in the form of a helical groove or passage of uniform area. By varying the length of the passage different resistances to the flow and corresponding variations in pressure are secured. The construction shown in the drawings is only illustrative and it is to be understood that the length and cross-section of the passage may be varied to suit operating conditions.

The branches 6 lead to ball check valves 12 mounted on the casings 13 of the bafflers 11. If there is a sudden reduction of pressure in one branch due to a break in the piping or some other cause, the flow or rush of liquid from the other branch carries the ball over and by closing an opening 14 stops the flow and consequent waste of lubricant from the undamaged branch and also the loss of pressure in the system. From the check valve the flow is normally through the service baffle comprising a groove 15 in the cylindrical plug 16 slidably mounted in the bore of the casing 13. From this groove the lubricant passes to a chamber 17 and thence through a baffle comprising a groove 18 in the cylindrical plug 19 to a conduit 20 leading to a passage 21 at the opposite end of the casing which opens into a pipe 22 connected with a step-bearing 4. The plug 19 is fixed in position. The plug 16 is forced toward the left, Fig. 2, by a spring 23 located in the chamber 17 to normally hold the valve 24 on the end of the plug against the seat 25 formed in the fixed partition 26. A passage 27 controlled by the valve leads to an emergency baffle comprising a groove or passage 28 in the plug 29. The plug 29 is slidably mounted in the bore of the casing 13 and is forced toward the partition 26 by a spring 30. Lugs 31 are provided on the end of the plug adjacent the partition to space the two apart and permit flow from the opening 27 into the beginning of the passage 28. The projection 32 on the outlet end of the plug may, under certain conditions such as a reduction of pressure in the pipe beyond the baffle due to a break or some other cause, be moved against the ac-

tion of the spring 30 into the passage 21 to reduce the flow through it. A suitable pressure gage 33 of any well-known construction may be connected to the flow space at the left of the partition, as for example to the opening 33^a. Under normal conditions this gage will indicate the pressure existing in pipe 22 and the step bearing supplied by said pipe. Should the flow through the passage 15 be stopped or checked in a large degree by foreign matter obstructing the passage, the cylindrical plug 16 will be forced to the right, Fig. 2, against the pressure of the spring 23 and will open the valve 24. The lubricant then flows through the emergency baffler to the bearing and the gage will by indicating pump pressure, instead of step-bearing pressure, warn the attendant of trouble in the baffler system for him to remedy. The object of the baffler 18, 19 is to permit a reduction of pressure in the cylinder 17 without lowering the step-bearing pressure. Stop valves 34 are located in each branch 6 for shutting off the flow through it when desired.

The baffler check 35, Figs. 1 and 3, consists of a casing 36 provided with openings 37 at either end connected with the piping 5. Within the casing is a cylinder 38 having enlarged ends 39 sliding in the chambers 40. Surrounding the reduced middle portion of the cylinder is a spring 41 confined between two rings 42 bearing against shoulders formed on the cylinder 38 and the casing 36. Fixed in the bore of the cylinder 38 is a baffler comprising a cylindrical plug 43 having a helical groove or passage 44 in its periphery. On each end of the plug 43 is a conical projection or valve 45 in line with the adjacent opening 37. If the pressure on one side of the baffler check is reduced by a serious leak or break in the piping, or by some other cause, the pressure of the liquid in the piping at the opposite side will force the baffler and the cylinder 38 in the direction of the lower pressure against the action of the spring 41 and the valve 45 will close the opening 37 and stop the loss of lubricant. When the damage has been repaired and the pressure restored in the previously broken section, the spring 41 returns the parts to their normal position. The number of baffler checks in the system may be made greater than that shown in the drawings if desired.

From an examination of the system and its operation as above described, it will be seen that no one cause, such as the disabling of a pump, a pipe breaking, or a baffler being obstructed will ordinarily interfere with the operation of a battery of turbines or at most will only necessitate the shutting down of but one of them.

In accordance with the provisions of the patent statutes, I have described the princi-

ple of operation of my invention, together with the apparatus which I now consider to represent the best embodiment thereof; but I desire to have it understood that the apparatus shown is only illustrative, and that the invention can be carried out by other means.

What I claim as new and desire to secure by Letters Patent of the United States, is,—

1. In a system of forced lubrication, the combination of a device for imparting service pressure to the lubricant, and a conduit conveying lubricant to the part to be lubricated, comprising a service baffler and an emergency baffler which is brought into operation when the flow through the service baffler is obstructed.

2. In a system of forced lubrication, the combination of a device for imparting service pressure to the lubricant, a conduit conveying lubricant to the part to be lubricated, a service baffler, an emergency baffler, and means for automatically bringing the emergency baffler into operation when the flow through the service baffler is obstructed.

3. In a system of forced lubrication, the combination of a device for imparting service pressure to the lubricant, a conduit for conveying lubricant to the part to be lubricated, comprising a service baffler having a tortuous passage, an emergency baffler having a tortuous passage, and a valve controlling the flow through the emergency baffler which is normally closed but which is opened automatically when the flow through the service baffler is obstructed.

4. In a system of forced lubrication, the combination of a device for imparting service pressure to the lubricant, a conduit for conveying lubricant to the part to be lubricated, comprising a movable service baffler having a helical passage for the lubricant, an emergency baffler having a helical passage for the lubricant, and a valve controlled by the movement of the service baffler which is normally closed but is opened automatically to bring the emergency baffler into operation when the passage in the service baffler is obstructed.

5. In a system of forced lubrication, the combination of a device for imparting service pressure to the lubricant, conduits for conveying lubricant to the different parts of the system including an automatic baffling device comprising a casing, a service baffler having a helical passage for the lubricant and slidably mounted in the casing, an emergency baffler, a valve controlling the flow through the emergency baffler, and a spring tending to move the service baffler in one direction to close the valve but which permits the pressure in the system to open the valve to bring the emergency baffler into operation when the passage in the service baffler is obstructed.

6. In a system of forced lubrication, an

automatic baffling device comprising a casing having a cylindrical bore, a partition across said bore, a valve seat in the partition, a service baffler having a helical passage and slidably mounted in the bore on one side of the partition, an emergency baffler on the opposite side of the partition, a valve on the end of the service baffler adjacent the partition, and a spring acting on said baffler to hold the valve against its seat to prevent flow through the emergency baffler under normal condition but which permits the pressure in the system to move the service baffler to open the valve when its passage is obstructed.

7. In a system of forced lubrication, an automatic baffling device comprising a casing having a cylindrical bore provided with an inlet and an outlet, a partition extending across the bore at one side of the inlet and provided with an opening, a helically-grooved baffler on the inlet side of the partition mounted for longitudinal movement in the bore, a valve moving with said baffler, a helically-grooved baffler fixed in the bore beyond the first baffler, a third helically-grooved baffler on the opposite side of the partition and between it and the outlet, a spring between the first and second bafflers which forces the first baffler and the valve toward the partition to normally close the opening therein but which permits the pressure in the system to move the first baffler and open the valve when the flow through it is obstructed, and a conduit leading from the end of the second baffler to the outlet.

8. In a system of forced lubrication, the combination of a device for imparting service pressure to the lubricant, a conduit conveying lubricant to part of the system including a movable helically-grooved baffler, a valve for checking the flow of liquid through the conduit, and a spring which normally holds the baffler against movement and prevents the valve from operating but which permits the baffler to move to operate

it when the pressure in the conduit beyond the baffler is reduced by a break or some other cause.

9. In a system of forced lubrication, the combination of a device for imparting service pressure to the lubricant, a conduit for conveying lubricant to a part of the system including a movable baffler, means actuated by the movement of the baffler which checks the flow of liquid through the conduit, and a spring which tends to hold the baffler against movement but permits it to move to actuate said means when the pressure in the conduit beyond the baffler is reduced by a break or some other cause.

10. In a system of forced lubrication, the combination of a service baffler, an emergency baffler, means for automatically bringing the emergency baffler into operation when the flow through the service baffler is interrupted, and a device for indicating to the attendant when the emergency baffler is operating.

11. In a system of forced lubrication, the combination of a device for imparting service pressure to the lubricant, and conduit means for conveying lubricant from said device to the different parts of the system to be lubricated, including service bafflers for normally reducing the pressure of the lubricant delivered to said parts, emergency bafflers which are brought into operation when the flow through said service bafflers is obstructed, and baffler checks between adjacent sections of the conduit means which automatically check the flow from one of said sections to another when the pressure in one of them is reduced by a break or some other cause.

In witness whereof, I have hereunto set my hand this 12th day of October, 1907.

JAMES F. KEY.

Witnesses:

FLORA HALL,
T. F. TAYLOR.