A. GRIESSMANN & O. GOTTSCHLING.

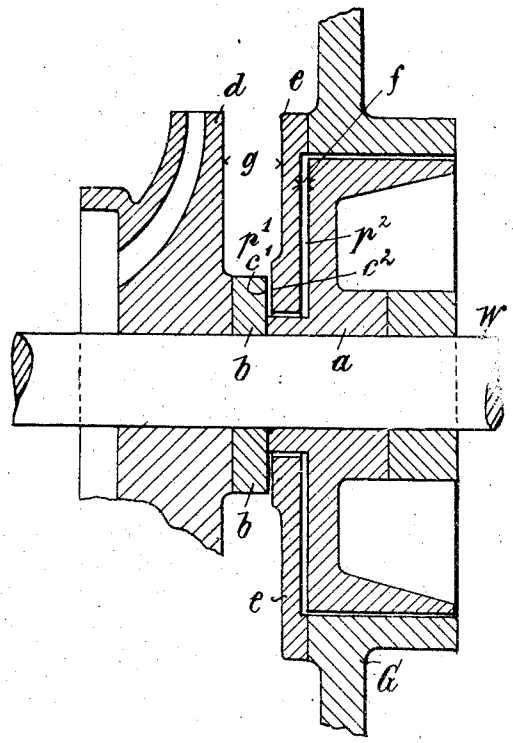
EQUALIZING DEVICE FOR PUMPS, TURBINES, AND THE LIKE.

APPLICATION FILED MAR. 20, 1907.

**907,343.** Patented Dec. 22, 1908.

2 SHEETS—SHEET 1.

*Fig. 1.*




WITNESSES

W. P. Burke

INVENTORS

Arno Griessmann

Otto Gottschling

By Kerr Wallace White

ATT'Y.

A. GRIESSMANN & O. GOTTSCHLING.

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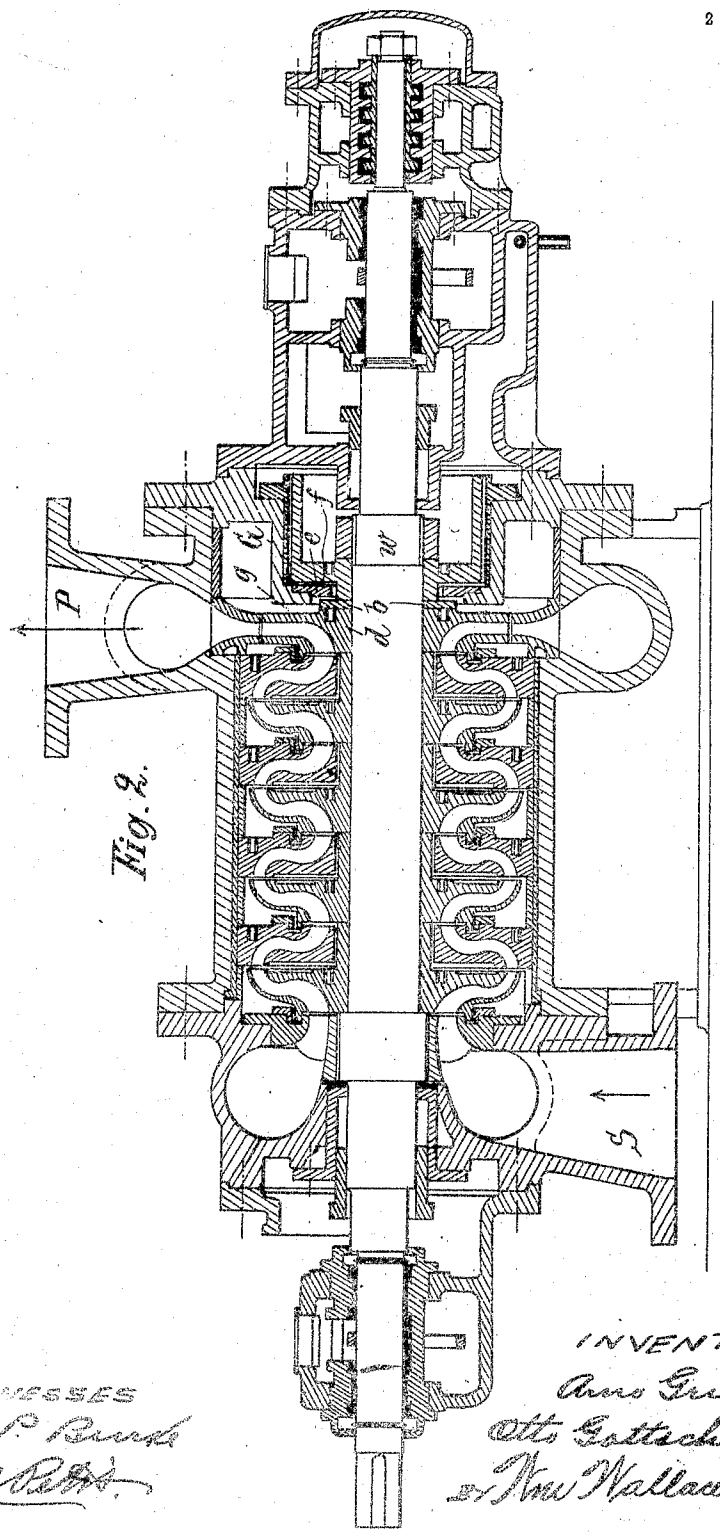



Fig. 2.

INVENTORS

Arno Griessmann

Otto Gottschling.

by New Wallace & White

Attys.

WITNESSES

W. P. Burd

M. Peck.

# UNITED STATES PATENT OFFICE.

ARNO GRIESSMANN AND OTTO GOTTSCHLING, OF BERLIN, GERMANY

## EQUALIZING DEVICE FOR PUMPS, TURBINES, AND THE LIKE.

No. 907,343. Specification of Letters Patent. Patented Dec. 22, 1908.

Application filed March 20, 1907. Serial No. 363,492.

*To all whom it may concern:*

Be it known that we, ARNO GRIESSMANN and OTTO GOTTSCHLING, subjects of the German Emperor, and residents of Berlin, Germany, have invented certain new and useful Improvements in Equalizing Devices for Pumps, Turbines, and the Like, of which the following is a specification.

In high pressure centrifugal pumps, steam and gas turbines, ventilators and the like the axial pressure has been overcome by the provision of an equalizing-piston on the pressure side of the pump. Such pistons are constructed either as simple smooth cylindrical pistons or as step-pistons. The disadvantage of such pistons, which are only able to take up a definite axial pressure, while the pressure produced by the pump varies by a certain amount in one or other direction during working, is overcome by the employment of automatic equalizing pistons. These pistons are able to take up more or less pressure, depending upon whether the pressure produced in the pump has become higher or lower. According to one method there are two regulating, closely adjacent surfaces near the outside periphery of the piston; the drawback of this arrangement is, however, that there is excessive wear and tear, in consequence of the high speed with which the surfaces pass each other. This proves a very serious matter, particularly when sandy water is to be pumped, additional resistance to motion being caused in the pump through grains of sand getting jammed between the regulating-surfaces.

These disadvantages are all overcome according to our invention, the essential feature of which is that the regulating-surfaces are transferred toward the center, that is the neighborhood of the shaft, so that the resistance to motion acts on a but short lever arm, being therefore less serious than were the latter longer.

One form of construction of the new device is illustrated in the accompanying drawing, in which

Figure 1 is a section of the parts effecting equalization, and Fig. 2 a longitudinal section through a pump fitted with the new device.

The automatic equalizing device has a cylindrical piston $a$ on the shaft $w$ and a ring $b$ fitting directly against it, the one surface $c^1$ of this ring rotating past the surface $c^2$ of the plate $e$ secured to the casing G. The piston $a$ rotates in the casing, there being the usual space of about 0.1—0.2 mm. left at the periphery for play. Between piston face and plate $e$ there is an annular space $f$, which communicates through the vertical gap between the surfaces $c^1$ $c^2$ with the pressure space $g$ behind the part $d$, and through the cylindrical gap between piston-periphery and casing with the atmosphere.

In Fig. 2, S is the flanged connection for the suction pipe and P that for the delivery pipe of the centrifugal pump, which may be of any ordinary construction.

The manner of operation of the new equalizing device is as follows: In the space $g$ the pressure $p^1$ is that produced by the pump, in the space $f$ there is a pressure $p^2$ which is less than $p^1$, since in the gap $c^1$ $c^2$ there must be a resistance to flow. This resistance arises owing to the surfaces $c^1$ $c^2$ being approached to each other to a certain degree. If, now, for any reason the balance is disturbed the equalizing device will adjust itself to the new condition immediately. Assume, for instance, that the pressure produced in the pump increases, the shaft will move from right to left, since the equalizing device will now have become too weak. The two surfaces $c^1$ $c^1$, will, however, now separate from each other and the resistance to flow at $c^1$ $c^2$ due to these surfaces decreases, The result is that the pressure $p^2$ increases and the piston can, therefore, equalize a higher pressure, the effective surface of the piston remaining the same. Assume, again, that the axial pressure produced in the pump becomes less, the equalizing device will then become too powerful and the shaft will move from left to right. In this manner, however, the surfaces $c^1$ $c^2$ approach each other, the resistance to motion will be increased and the pressure $p^2$ diminishes so that the pressure, corresponding to the decreased axial pressure of the pump, will now equalize a lower pressure.

The feature of the new device is not only that the resistance to motion is reduced and proper working of the whole apparatus insured, but the invention offers also a great advantage, in that renewal of the parts subject to wear and tear is essentially facilitated, inasmuch as this wear and tear is taken up by the ring $b$, that is to say, by a readily changeable member having a small circumference.

Having thus described our invention, we claim as new:

1. Means for preventing end thrust of shafts of centrifugal pumps, turbines and ventilators comprising a piston secured upon the shaft, a cylinder having its walls forming inner and outer pressure chambers, in one of which the piston is located, a vertical throttle passage having one end connected to one of the chambers and a horizontal passage connecting its other end to the other chamber.

2. In an apparatus of the class described, a casing and a rotary shaft therein, said casing having inwardly extending walls providing inner and outer pressure chambers, a cylindrical piston member fast on said shaft and filling the outer chamber, said piston and the casing wall between the chambers having abutting faces, and said casing wall having an automatically adjustable passage leading to the space between the said abutting faces, substantially as described.

In witness whereof we have hereunto signed our names this 6th day of March, 1907, in the presence of two subscribing witnesses.

ARNO GRIESSMANN.
OTTO GOTTSCHLING.

Witnesses:
HANS HEIMANN,
HENRY HASPER