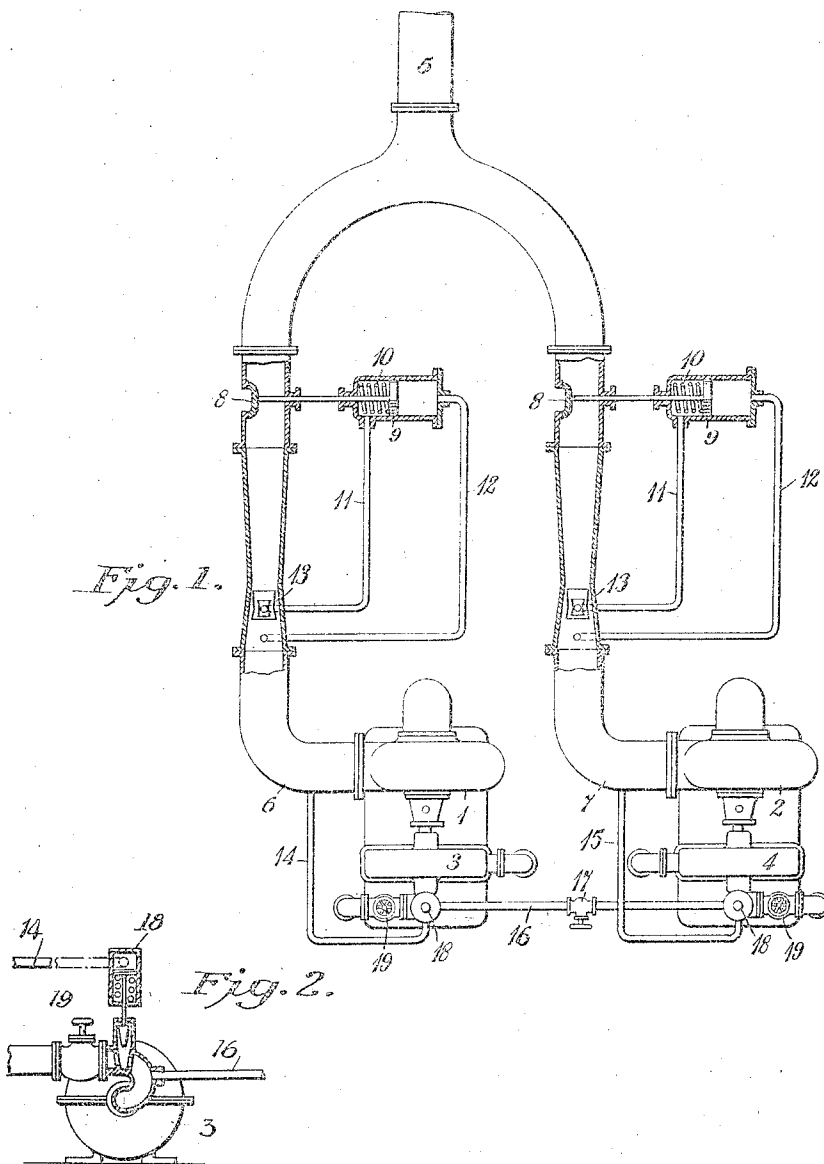


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WITNESSES:

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BLOWER SYSTEM.

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To all whom it may concern:

Be it known that I, KARL BAUMANN, a subject of the King of England, and a resident of Chorlton cum Hardy, in the county of Lancaster, England, have invented a new and useful Improvement in Blower Systems, of which the following is a specification.

This invention relates to centrifugal pumps, blowers and compressors and has for its object to provide improved arrangements for driving two or more of such machines which are arranged to deliver air, or other gas or liquid into a common main, that is, to run in parallel, and which are automatically governed for constant pressures.

It is well known that, when a centrifugal machine of this kind is run at constant speed, the characteristic curve shows, as the output is increased, a gradually rising pressure which reaches a maximum at a certain fraction of normal output and then a gradually diminishing pressure which falls to zero at maximum output.

If, in working, the output falls to the point of maximum pressure, the conditions become unstable and the output may suddenly drop to zero, unless a valve, commonly called a surging valve, is automatically opened to discharge a proportional part of the output direct to atmosphere, or back into the suction. Such discharge through the surging valve lowers the economy of working and is to be avoided if possible.

If two or more pumps, blowers or compressors of equal or unequal powers are running in parallel, the automatic governors, which are operated by the pressure in the common main, are not capable of assigning to each machine its proportional amount of work and although, in the aggregate, the governing is effective, the output of the individual machine may oscillate to such an extent, as not only to fall below the critical point and thus cause wasteful blowing off but also to cause danger to the apparatus. In considering this question, it will be seen that, if the machines are arranged so that they always give the same fraction of total or aggregate output, the dangerous and wasteful action is prevented except in the case when the total output of the machines falls below the fraction of the output at which the surging valves act and blowing off takes place.

To insure the above equality of fractional output, it is only necessary that the motors driving the machines be arranged to work at similar fractions of the load.

The present invention is designed to attain this result and, according thereto, each machine is mounted on a separate shaft and provided with its own driving engine. Where steam turbines are used for driving, each turbine, pump and blower, or compressor being upon an independent shaft, it is only necessary to adopt turbines suited for the same working pressures, then, at any given reduced pressure, the turbines work at the same fractional load. To obtain equality of inlet pressure, the following method is adopted: The parts of the steam chests lying between the governor valve and the cylinder inlet are connected by an equalizing pipe, each steam supply pipe carrying a stop valve so that it may be isolated in case of being shut down.

My invention is illustrated in the accompanying drawings in which—

Figure 1 is a diagrammatic view in plan of a pair of turbine driven blowers with my invention applied thereto. Fig. 2 is a view, partially in elevation and partially in section, of a regulator and a portion of its related mechanism.

The blowers are indicated at 1, 2 being driven respectively by the turbine 3, 4 and delivering air into the common main 5, through the outlet pipes 6, 7. Each outlet pipe is furnished with the usual surging valve 8 which may be operated in the manner already described by Professor Rateau, by means of a piston 9 controlled by a spring 10 which is actuated in accordance with the pressure of the air conveyed through the pipes 11, 12, the former of which is connected with the throat of a venturimeter 13, the latter communicating with the main pipe 5. The governors 14 of the turbines are operated through pipes 14, 15 respectively connected to the outlets 6, 7. The equalizing pipe 16 is connected between the governor valve and the steam inlet of each turbine. A stop valve 17 is provided in the equalizing pipe so that either turbine can be isolated in case it is necessary to withdraw it from service.

It will be readily seen that, by means of the equalizing pipe 16, each of the two turbines will be supplied with steam at the

same pressure, so that if for any reason one blower or compressor tends to drop its load the turbine driving it will increase in speed and thereby increase the pressure of this blower, so that it will again take its load. At the same time, the other turbine, being overloaded, will tend to slow down and the pressure of its blower will tend to drop and so shift the load to the first named machine. Thus, the tendency is always for the two blowers to divide the load in proportion to their rated outputs.

To insure safety, it is necessary that the valve operated by the emergency governor (not shown) should be placed between the equalizing pipe connection and the cylinder inlet.

I claim as my invention:

1. In combination, a plurality of prime movers operating in parallel and means for insuring the equality of the fractional outputs of the several prime movers, said means comprising a plurality of regulators and an equalizing pipe connecting the inlets of said prime movers.

2. In combination, a plurality of prime movers operating in parallel and adapted to be actuated by fluid pressure, and means for equalizing the pressures of the fluid supplied to the several prime movers, said means comprising a regulator for each of said prime movers and a pipe connecting the respective inlets of said prime movers.

3. In combination, a plurality of devices for supplying fluid under pressure to a common main, a separate prime mover for actuating each of said devices, and means for supplying motive fluid to each of said prime movers at equal pressures, said means comprising a regulator for each of said prime movers and controlled by the pressure generated by the corresponding device, and means for equalizing the pressures of the motive fluid between the regulators and the inlets of said prime movers.

4. In combination, a plurality of devices for supplying fluid under pressure to a common main, a separate prime mover for actuating each of said devices, and means for maintaining an equality between the outputs of the several prime movers, said means comprising a regulator for each of said prime movers controlled by the pressure generated by the corresponding device and an equalizing pipe connected between the fluid inlets of said prime movers.

5. In combination, a plurality of centrifugal pumps adapted to supply fluid under pressure to a common main, a separate fluid-operated prime mover for actuating each pump, and means comprising an equalizing pipe connected between the fluid inlets of the said prime movers for maintaining an equality between the fractional outputs of the several prime movers, said means being con-

trolled by the pressures generated by the several pumps.

6. In combination, a plurality of devices for supplying fluid under pressure to a common main, a separate prime mover for each device, said prime movers being operated by fluid pressure, an equalizing pipe between the inlets of the several prime movers, and a regulator for each of said prime movers, each of the said regulators being actuated by the pressure generated by its corresponding prime mover.

7. In combination, two centrifugal pumps or blowers adapted to supply fluid under pressure, a separate fluid pressure engine to actuate each pump or blower, an independent governing device for each engine, and an equalizing pipe connecting the fluid inlets of the two engines to insure the operation under equal pressures.

8. In combination, a plurality of devices for supplying fluid under pressure, operating in parallel, a fluid pressure engine for each of said devices, a governor for each engine controlled by the pressure generated by its respective device, and a pipe connecting the fluid inlets of said engines for equalizing the pressures of the motive fluid for said engines.

9. In combination, a plurality of devices for supplying fluid under pressure to a common main, a separate prime mover actuated by fluid pressure for each of said devices, a governor for each of said prime movers, said governor being controlled by the pressure of the fluid between said device and said main, and a pipe connecting the inlets of the several prime movers for equalizing the pressures of the motive fluid.

10. In combination, a plurality of devices for supplying fluid under pressure to a common main, branch pipes connecting said devices and said main, a separate prime mover actuated by fluid pressure operating each of said devices, a regulator for each prime mover controlled by the pressure in its respective branch pipe, and a pipe connecting the inlets of the several prime movers to equalize the pressures of the motive fluid.

11. In a blower system, a main pipe, a plurality of devices for supplying fluid under pressure, branch pipes connecting said main pipe and said devices, a fluid pressure engine for operating each of said devices, a regulator for each engine, said regulator being controlled by the pressure in its respective branch pipe, a pipe connecting the inlets of the several engines between the regulator and the cylinder to equalize the pressures of the motive fluid.

12. In a blower system, two blowers operating in parallel, a main pipe, branch pipes connecting the main pipe with each blower, a safety device in each branch pipe, a steam

5 turbine for actuating each blower, a regulator for each turbine controlled by the pressure in its respective branch pipe, and an equalizing pipe connecting said turbines between the regulator and the cylinder.

10 13. In a blower system, two centrifugal blowers, a main pipe, a branch pipe connecting each blower with the main pipe, a safety valve in each branch pipe, a steam turbine actuating each blower, a regulator for each turbine, controlled by the pressure in its re-

spective branch pipe, and a pipe connecting said turbines between the regulator and the cylinder of each turbine to equalize the pressures of the steam supplied.

15 In testimony whereof, I have hereunto subscribed my name this eighth day of November, 1912.

KARL BAUMANN.

Witnesses:

D. S. PECK;

P. L. PLEVIN.