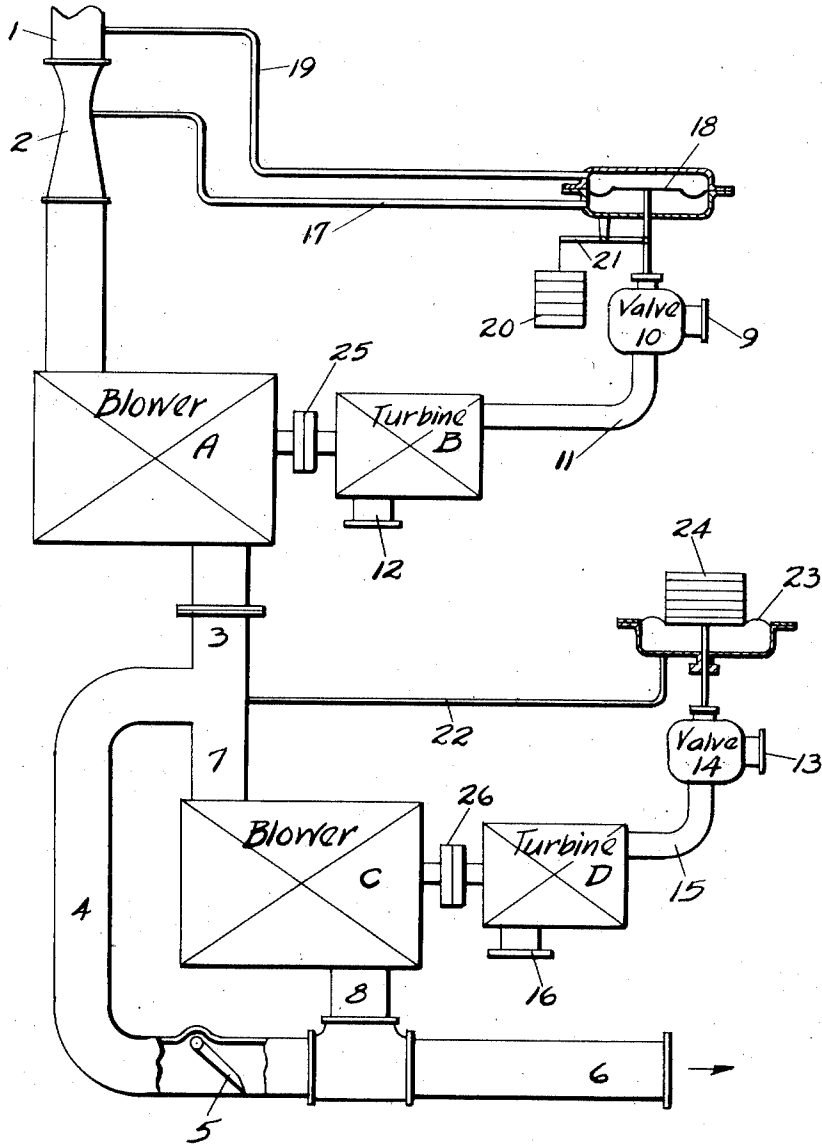


C. H. SMOOT.
METHOD OF REGULATING BLOWING ENGINES.
APPLICATION FILED OCT. 25, 1920.

1,390,829.

Patented Sept. 13, 1921.



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UNITED STATES PATENT OFFICE.

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METHOD OF REGULATING BLOWING-ENGINES.

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To all whom it may concern:

Be it known that I, CHARLES H. SMOOT, a citizen of the United States, and resident of South Orange, State of New Jersey, have invented certain new and useful Improvements in Methods of Regulating Blowing-Engines, of which the following is a specification.

My invention relates in general to improved means adapted to regulate blowers operating in series.

One object of my invention is to provide a method of regulation for a blast of air varying in volume and pressure, such, for instance, as supplies the air necessary for the proper operation of a blast furnace.

The figure is a diagrammatic vertical view of one embodiment of my invention.

A is a blower, driven by steam turbine B. C is a second blower, acting as a booster for blower A. C is driven by steam turbine D. Air enters conduit 1, passes through Venturi element 2, is compressed in blower A and discharged through conduit 3. From conduit 3 the air flows through by-pass 4, check valve 5 and discharge conduit 6 to the point of use. 7 is a conduit leading from conduit 3 to inlet of blower C. 8 is the discharge conduit of blower C to discharge conduit 6. The steam operating turbine B is admitted through inlet 9, valve 10 and pipe 11. The exhaust of the steam operating turbine B is shown at 12. 13 is the inlet of steam operating turbine D. Valve 14 controls the passage of steam to turbine D through pipe 15. 16 is the exhaust of turbine D. 17 is a pipe allowing the passage of the air flowing through Venturi element 2 to act upon diaphragm 18. 19 is a pipe allowing pressure of air inlet in conduit 1 to operate on diaphragm 18. 20 are weights opposing the effort of diaphragm 18 through lever 21.

To those skilled in the art, the regulator operating valve 10 is well known and known as a "constant volume regulator", the differential pressure applied to diaphragm 18 through pipes 17 and 19 being in direct ratio to the square of the volume entering blower A. No effort has been made to show this regulator other than diagrammatically, as it is a well known standard apparatus.

Pipe 22 allows the pressure of blower discharge in conduit 3 to bear on diaphragm 23,

this diaphragm being loaded by weights 24. The pressure prevailing in conduit 3 lifts diaphragm 23 and its loading 24, and opens valve 14. In other words, the greater the pressure in conduit 3 the more valve 14 will allow steam to pass into turbine D.

The regulator operating valve 14 is a standard piece of apparatus, known as a "pressure regulator", and has only been illustrated and described diagrammatically, as it is well known in the art.

25 and 26 are the couplings connecting turbine B and blower A, and turbine D and blower C, respectively.

It is well known that the volumes and pressures necessary for the proper operation of blast furnaces, for instance, vary greatly. It will be seen that to generate a flow of air meeting with the average requirements of pressure the power generated by turbine B may be so selected that turbo blower AB will operate very frequently at full load. In order to obtain the greater pressure necessary for the proper operation of the blast furnace from time to time the volume of air discharged by blower A must be compressed further, and for this purpose it is brought into blower C and its pressure increased before the blast is discharged through conduit 6 to the point of use.

It will be seen that I have provided means to operate a blower in such a manner that the blower will handle a predetermined volume of air until a certain pressure is reached. This air is delivered to the point of use and when the pressure of the air delivered by the blower A is not sufficient to overcome the resistance at the point of use for the passage of said air, then a rise in pressure will take place at the discharge of blower A, the pressure regulator of turbine D will allow steam to flow and operate the turbine, which in turn drives blower C, check valve 5 will close and the pressure delivered at the point of use will be increased by the action of said blower C.

It will be seen that I have provided means to have a predetermined volume of air compressed to the pressure required at the point of use.

The speed of turbo blower AB is controlled by a constant volume regulator and the speed of turbo blower acting as booster

CD is controlled in such a way that it will increase when increased pressures are required at the point of use.

The regulation I have described above is well adapted to the operation of blast furnaces.

It has also a large number of applications in chemical works, for instance, where a certain gas in known quantities has to be introduced at varying pressures in a given apparatus.

Referring once more to blast furnace work, if turbo blower AB can deliver at full load 50,000 cubic feet of free air per minute at 20 pounds gage pressure at times when the furnace required this amount of air at pressures ranging from 20 to 30 pounds, turbo blower booster CD will make up the pressure

from 20 to 30 pounds, the increase of power required being obtained independently of 20 turbo blower AB.

I claim:—

1. The method of regulating turbo blowers operating in series which consists in regulating the first turbo blower for constant predetermined volume and regulating the second turbo blower for constant predetermined inlet pressure.

2. The method of regulating turbo-blowers operating in series which consists in regulating the first turbo-blower for constant predetermined volume and regulating the second turbo-blower in such a manner as to increase its speed for increasing pressures at its inlet.

CHARLES H. SMOOT.