H. V. HAIGHT

BACK PRESSURE VALVE

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INVENTOR.

Harry HAIGHT

BY

HIS ATTORNEY.
This invention relates to compressors, but more particularly to a back pressure valve adapted to be interposed in the discharge line of compressors actuated by propelling elements unprovided with means for controlling the speed thereof, as for instance, tangential or impulse water wheels.

The object of the invention is to maintain a suitable back pressure in the discharge line of a compressor, thus insuring against overspeeding of the compressor during the starting thereof or in the event that a break should occur in the discharge line.

Other objects will be in part obvious and in part pointed out hereinafter.

The invention consists of the combination of elements and arrangement of parts having the general mode of operation substantially as hereinafter described and claimed and illustrated in the accompanying drawing, in which is shown a compressor system, in elevation, having the invention applied thereto.

Referring more particularly to the drawing, A designates a portion of a compressor of any well known type and B a discharge line leading therefrom through which the pressure fluid is conveyed to a storage receiver C connected to the opposite end of the discharge line B.

In accordance with the present invention, means are provided for preventing overspeeding of the compressor during the starting thereof against an empty system or in the event that a break should occur in the discharge line B. To that end a back pressure valve designated generally by D is interposed in the discharge line B, preferably at a point near the compressor A so that that section of the discharge line B between the compressor A and the back pressure valve D may be of as short a length as possible.

The back pressure valve D in the present instance comprises a casing F having suitable flanges G at its ends or other suitable means for attaching the casing F to the discharge line B. The casing F in the present instance is provided with a U-shaped wall H which divides the casing into a pair of chambers J and K.

Communication between the chambers J and K is afforded through suitable ports L and O in the wall H. The port L is of larger diameter than the port O and is preferably located in the upper portion of the wall H.

In order to control communication between the chambers J and K a valve designated generally by P is disposed in the casing F and comprises in this instance a stem Q having a head R to control the port L and a smaller head S to control the port O. The stem Q is preferably of a diameter substantially equaling the difference in area between the heads R and S and projects with its uppermost end T beyond the top portion of the casing F while the lowermost end U of the stem Q is disposed slidably in a recess V in a cover W located in the bottom of the casing F.

A somewhat similar cover X forms a closure for an aperture Y in the top of the casing and in this cover X is formed a bore Z to slidably guide the stem Q of the valve. Communication between the chamber K and the recess V is in this instance afforded through a passage δ leading to the lowermost end of the recess V.

Suitable means are provided for holding the valve P closed until the pressure in the discharge line B between the compressor A and the back pressure valve D reaches a certain predetermined value. To that end a cross head or yoke e is attached to the uppermost end of the valve stem Q and at the opposite ends of the yoke c are supported rods or bolts d which in turn support at their lowermost ends a block e. The yoke c is preferably so disposed with respect to the casing F that the bolts d are located on opposite sides of the casing F. The block e is intended to be of such proportions that its weight, together with the weights of the valve and the elements whereby the block will be attached to the valve, will substantially equal the value of the pressure which it is intended to attain between the compressor and the back pressure valve D before permitting any pressure fluid to escape into the system beyond the back pressure valve D.

For the sake of simplicity of illustration, the block e is shown as being a single piece. It will be obvious however, that the block may be divided into a plurality of members of known weight so that whenever it is
desired to open the valve \( P \) at other pressures, other weights may be added or removed to or from the block \( e \).

The operation of the device is as follows:

Let it be assumed that it be desired to obtain a pressure in the discharge line \( B \) between the compressor and the back pressure valve of, say, sixty pounds, and that the difference in the areas of the heads \( R \) and \( S \) is approximately one square inch. The stem \( Q \) may then be made of such diameter that its area will also substantially equal the difference in area between the heads \( R \) and \( S \). If then the block \( e \) of a weight which, together with the weights of the associated elements, totaling sixty pounds is attached to the valve, the said valve \( P \) will remain closed until the pressure in the chamber \( J \) slightly exceeds the weight of the block \( e \).

After the pressure in the chamber \( J \) reaches a value sufficient to open the valve \( P \), pressure fluid will pass through the ports \( L \) and \( O \) into the chamber \( K \) and thus, of course, into the system beyond the back pressure valve \( D \). After the valve has been opened pressure fluid flowing into the chamber \( K \) will pass through the passage \( b \) and acting against the lowermost end \( U \) of the valve stem, together with the pressure fluid acting against the head \( R \), will open the valve \( P \) to wide limits and will hold the valve in this position as long as the pressure in the chambers \( J \) and \( K \) exceeds the weights of the block \( e \) and the valve \( P \).

If for any reason the pressure in the discharge line should drop below the weight of the block and the valve, the valve will again be closed until the pressure between the compressor and the valve \( P \) reaches the value at which the valve may again be opened.

The device described herein has been found to be particularly useful when attached to the discharge line of a compressor actuated by propelling mechanism in which such mechanism is unprovided with means for controlling the speed thereof, as for instance, a tangential or impulse water wheel. As will be readily understood, a compressor thus driven will, when operating against an empty system, run at excessively high speeds which occasionally prove injurious to the compressor.

The present invention has also proven to be an excellent means for preventing overspeeding of the compressor in the event of a break in the discharge line between the valve \( D \) and receiver \( C \). In such case, of course, the pressure in the system immediately drops, possibly to nearly atmospheric pressure, and the compressor speed increases to a rate considerably in excess of the rated speed.

By means of the present invention occurrences of the kind described will be averted and the compressor will at all times be actuated at safe speeds.

I claim:

1. A back pressure valve, comprising a casing adapted to be interposed in the discharge line of a compressor, a wall dividing the casing into two chambers, said wall having ports of different diameters affording communication between the chambers, a differential valve controlling the ports, a stem on the valve of a cross-sectional area substantially equaling the differential of the valve, said stem extending beyond the casing, and a block supported by the stem holding the valve closed until the pressure between the compressor and the valve reaches a value substantially equal to the weight of the block.

2. A back pressure valve adapted to be interposed in the discharge line of a compressor driven by an impulse propelling element, comprising a casing, a wall dividing the casing into two chambers, said wall having ports of different diameters affording communication between the chambers, a valve having two heads of different diameter controlling the ports, a stem of a cross-sectional diameter equalizing the differential of the heads connecting the heads and extending beyond the casing, and a block supported by the stem holding the valve closed until the pressure in the chambers substantially equals the weight of the block.

3. A back pressure valve adapted to be interposed in the discharge line of a compressor driven by an impulse propelling element, comprising a casing having a bore at one end and a coaxial recess at the other end, a wall dividing the casing into a pair of chambers having ports of different diameter affording communication between the chambers, a differential valve controlling the ports having a stem of a cross-sectional area substantially equaling the differential of the valve, said stem being slideable in the bore and the recess and extending with one end beyond the casing, a block carried by the valve exerting a constant pull thereon for holding the valve closed until the pressure between the compressor and the valve attains a value sufficient to open the valve, and a passage in the casing conveying pressure fluid into the recess to act against the end of the stem for holding the valve open after the pressure in the chambers reaches a value exceeding the weights of the valve and the block.

In testimony whereof I have signed this specification.

HARRY V. HAIGHT.