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TURBOCOMPRESSOR

Filed March 31, 1921.

Fig. 1

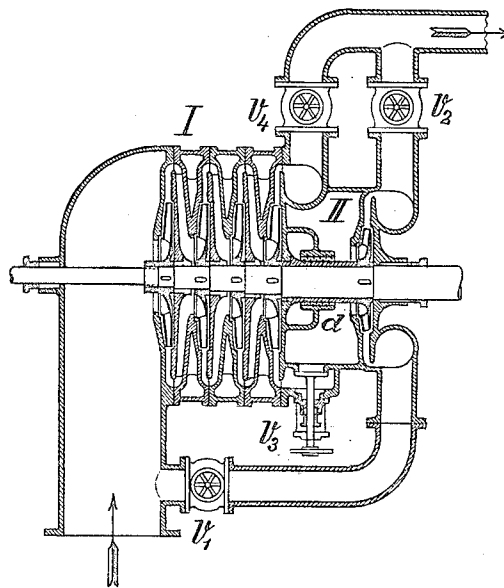
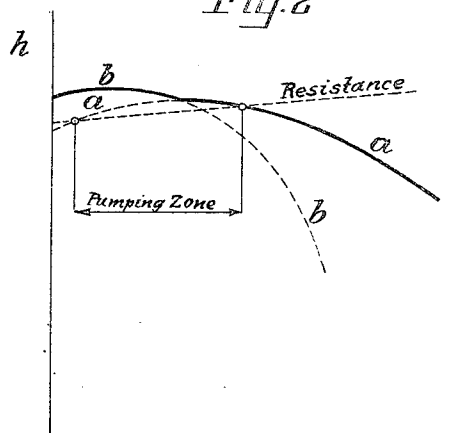


Fig. 2



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TURBOCOMPRESSOR.

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To all whom it may concern:

Be it known that I, FRANZ LÖSEL, a citizen of the Czechoslovak Republic, residing at Brunn, Czechoslovakia, have invented certain new and useful Improvements in Turbocompressors, of which the following is a specification.

My invention refers to centrifugal compressor such as turbo-compressors and blowers and to centrifugal pumps, and its particular object is to increase the efficiency of such devices.

As is well known to those skilled in the art, centrifugal compressors (turbo-compressors and turbo-blowers) as well as centrifugal pumps are known to possess the property of "pumping" when working in the vicinity of the highest point of their characteristics. The eddies which originate in connection with this phenomenon, give rise to shocks; besides, the consumption of power is unstable, i. e. it permanently fluctuates between two values without ever becoming constant within the "pumping zone". The reason for this is found in the form of the characteristic of the compressor or the like, inasmuch as under certain circumstances two widely different deliveries may belong to one and the same back-pressure in the characteristic, in consequence of which the two cases must also differ widely in regard to the consumption of power.

Three ways are customary for obviating or reducing this phenomenon which is exceedingly troublesome in practical work:

1. Alteration of the number of revolutions on reaching the vicinity of the "pumping zone", thus raising the characteristic.
2. "Blowing off" through a no-load passage, resulting in the total resistance decreasing, whilst the useful pressure increases, the compressor thus being caused to work at a greater distance from the "pumping zone".
3. Throttling of the suction pipe which also causes the characteristic to be transferred on account of the delivery being reduced.

According to the present invention, now, the "pumping" action spoken of is prevented from arising by superposing two characteristics above one another, thereby shifting the "pumping zone" correspondingly with regard to the zero point of the characteristic. I effect this by arranging on the shaft of the main compressor or the like, but separated therefrom an auxiliary single-stage com-

pressor serving to further compress the medium acted upon by the main compressor within the dangerous zone, thus obtaining a characteristic corresponding to the combined effect of both compressors and rendering "pumping" impossible.

In the drawings affixed to this specification and forming part thereof, a turbo compressor embodying my invention is illustrated diagrammatically by way of example. In the drawings

Fig. 1 is an elevation of the compressor, whilst

Fig. 2 is a diagram of the pertinent characteristics.

Referring to the drawings, I is a normal multiple-stage turbo-compressor, having a characteristic represented for instance by the curve marked *a* (Fig. 2). On the shaft of the compressor *I* there is fixed an auxiliary single-stage turbo-compressor II which is separated from I by a partition and a labyrinth packing *d*, the characteristic of this second compressor II being predetermined in such a manner that the quantity of the medium undergoing compression, which is delivered by I at any given moment, is subjected to a certain additional compression, the characteristic of this auxiliary compressor having for instance the shape of the curve *b* (Fig. 2).

In normal working the pressure chamber of the auxiliary compressor II communicates with the suction piping of the main compressor I through the agency of the sluice valve *V*₁, whilst the valve *V*₃ remains closed. Thus the auxiliary compressor II runs in the suction pressure of the main compressor and only delivers the small quantity of air penetrating through the packing *d*, the power consumed by the auxiliary compressor being quite insignificant. During this time the sluice valve *V*₄ is open, whilst *V*₂ is shut off all these valves being arranged to be manually operated, and the main compressor is working normally.

When however the main compressor reaches the vicinity of the "pumping zone," valve *V*₂ and *V*₃ are opened, whilst *V*₁ and *V*₄ are shut off. The compressed medium, delivered by the main compressor is now subjected to further compression by the auxiliary compressor II, thus raising the characteristic of the main compressor so as to make the characteristic *a* of the whole compressor set pass over in the original

"pumping zone" into *b* by superposition as will be observed in Fig. 2.

Although in the foregoing I have described what I consider at present to be the preferred form of a device embodying my invention, I do not wish to be limited to the exact details thereof. The term "compressor" used in the claims appended to this specification is meant to include pumps and blowers.

I claim:—

1. The combination, with a centrifugal compressor, of means for raising its characteristic in the vicinity of the zone where "pumping" is likely to occur.

2. The combination, with a centrifugal compressor, of an auxiliary centrifugal compressor arranged to raise the characteristic

of said first compressor in the vicinity of the zone where "pumping" is likely to occur.

3. In a device of the kind described in combination, a main centrifugal compressor, an auxiliary centrifugal compressor arranged on the pressure side but separated from said main compressor and means for connecting said compressors in series.

4. In a device of the kind described in combination, a multi-stage and a single-stage compressor on one shaft, a partition between said compressors, a valve in said partition, an inlet in front of said auxiliary compressor, a separate outlet to the rear of each compressor, and means for closing said inlet and said outlets.

In testimony whereof I affix my signature.

FRANZ LÖSEL.