

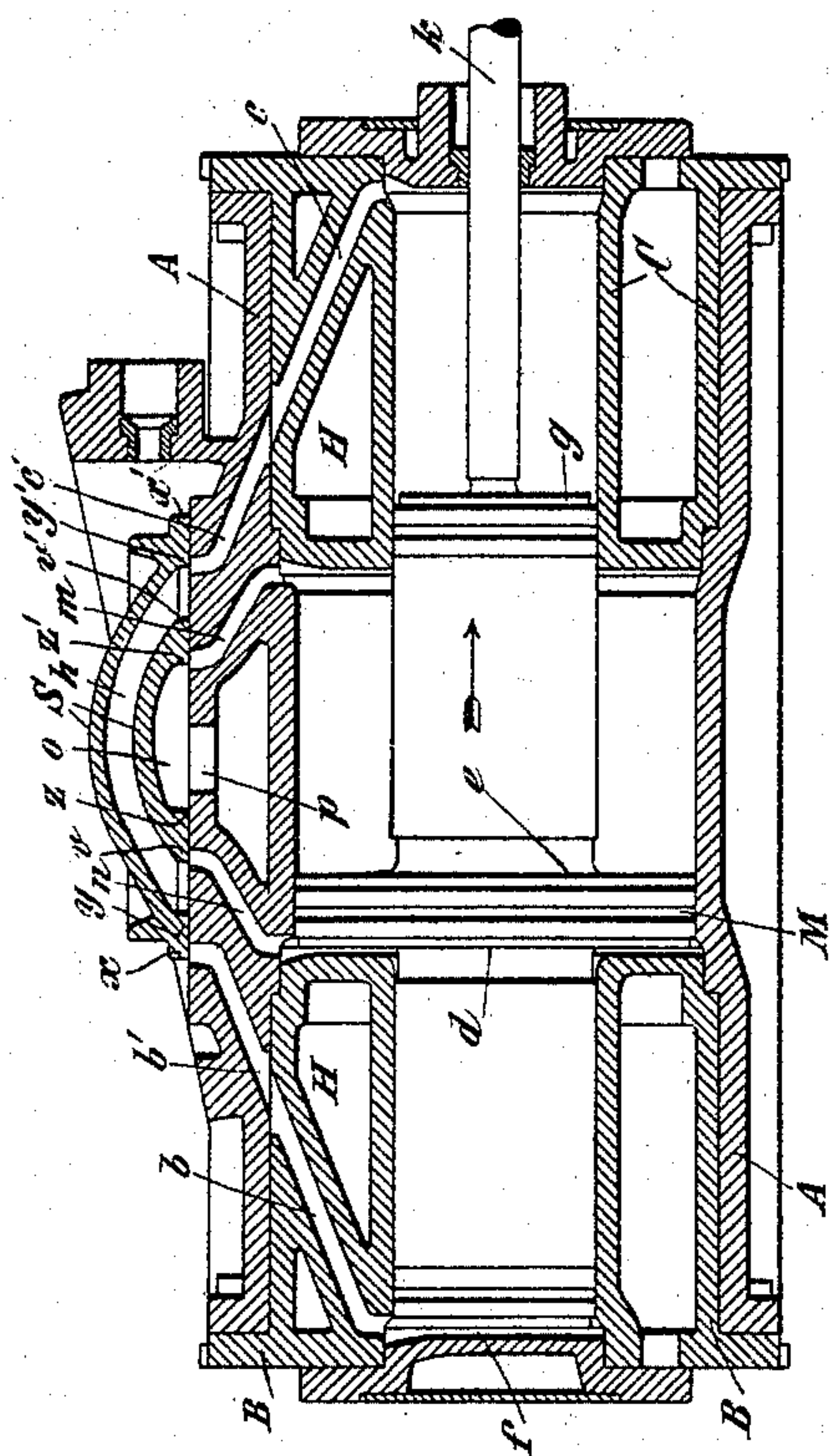
(No Model.)

C. SONDERMANN.

CYLINDER FOR ENGINES, MOTORS, OR COMPRESSORS.

No. 533,240.

Patented Jan. 29, 1895.



Witnesses.

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# UNITED STATES PATENT OFFICE.

CONRAD SONDERMANN, OF LANDSBERG, GERMANY.

## CYLINDER FOR ENGINES, MOTORS, OR COMPRESSORS.

SPECIFICATION forming part of Letters Patent No. 533,240, dated January 29, 1895.

Application filed June 29, 1894. Serial No. 516,098. (No model.)

*To all whom it may concern:*

Be it known that I, CONRAD SONDERMANN, engineer, of 34<sup>d</sup> Katherinenvorsdt, Landsberg-on-the-Lech, in the German Empire, have invented new and useful Improvements in and Connected with the Cylinders of Engines, Motors, or Compressors, of which the following is a specification, reference being had therein to the accompanying drawings.

This invention relates to the construction and arrangement of a compound cylinder fitted with a piston having four working faces and capable of use as part of a steam engine petroleum or gas engine or of a gas or air compressor.

I will describe my improvements with reference to the accompanying drawing which represents a longitudinal section of the cylinder and piston together with the ports and valve as used in a steam engine.

A represents the main shell or casing, the central portion of which is accurately bored and forms the low pressure cylinder. In each end of the shell or casing A is placed one of the end sections B, C each of which is provided with a central bored chamber forming one of the high pressure cylinders. I prefer to form the end sections B and C as shown with air spaces H between their inner and outer walls, the said air spaces acting to prevent to a certain extent, the loss of heat from the high pressure cylinders by radiation. The end sections B, C, extend within the main shell or casing A to the bored portion which forms the low pressure cylinder and said end sections are secured to the main shell by bolts or screws or in any other desired manner.

The piston has a central portion M working in the low pressure cylinder, and end portions working in the two high pressure cylinders. The two end sections B, C are provided with suitable ports corresponding with ports  $b'c'$  with which the main shell A is provided. The slide valve S is of the Hicks type and provides for the passage of the exhaust steam from the high pressure cylinders to the low pressure cylinder, the final exhaust taking place from the low pressure cylinder through exhaust port  $b$ . By making the cylinder in this way it can be con-

veniently constructed and its several chambers may be accurately bored.

The cycle of movements in the working engine is as follows: In the position shown by the drawing, the piston has completed its return stroke and is now required to move in the direction indicated by the arrow. By the linear motion of the slide S, the edge X opens the port  $b b'$ , to live steam and at the same time the edge  $y'$  opens the port  $c c'$  and allows the exhaust steam from the front high pressure part of the cylinder to pass the edge  $v$  and through the ports  $c c' h n$  to the surface  $d$  of the piston in the low pressure part of the cylinder. By the combined forces of the steam the piston and piston rod  $k$  are moved forward, the live steam acting on the surface  $f$ , and the low pressure steam upon the surface  $d$ . At the same time the edge  $z'$ , of the slide valve opens the port  $m$  to allow the final exhaust to leave the low pressure part of the cylinder. In doing so it passes under the shell  $o$  of the valve and escapes through the outlet  $p$ . The exhaust from the front high pressure part is prevented from passing from the passages  $c c'$  to the passage  $m$  by the edge  $v'$  of the slide valve. When the piston has completed its stroke, the slide valve has advanced and opened the ports  $c c'$  by the edge  $x'$  having passed the port  $c'$  so that the live steam may pass in, and the passage  $m$  is opened between the edges  $y$  and  $v'$  to exhaust the steam from the back high pressure part, while the edge  $z$  permits the escape of the exhaust steam from the low pressure part through the passages  $n$  and  $m$ . This construction of cylinder may be adapted with advantage to locomotives and traction engines.

With gas and petroleum motors the low pressure part is used as a pump and the two high pressure parts to develop the power, the spaces H in the shells of the high pressure parts B and C being connected with a water supply for cooling purposes. If it be desired to use the construction in an air or gas compressor, the air or gas is drawn in through the passage  $p$  and brought alternately through the front and back high pressure ports.

What I claim, and desire to secure by Letters Patent of the United States, is—

In an engine cylinder the combination with the main shell or casing having its central portion bored to form a low pressure cylinder, of separate end sections, located entirely  
5 within said shell or casing, provided each with a high pressure cylinder, and transversely disposed faces forming one end of the low pressure cylinder, the said main shell or

casing entirely surrounding and reinforcing said end sections, substantially as described. 10

In witness whereof I have hereunto set my hand in presence of two witnesses.

CONRAD SONDERMANN.

Witnesses:

EMIL HENZEL,  
T. WIMELBAKER.