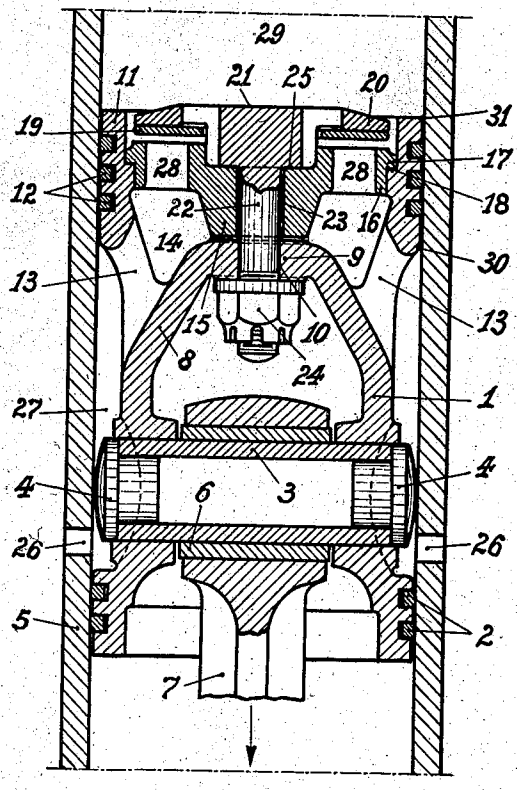
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WORKING PISTON FOR HIGH SPEED RECIPROCATING COMPRESSORS

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WORKING PISTON FOR HIGH-SPEED RECIPROCATING COMPRESSORS

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There are reciprocating compressors known, wherein the inlet of the gaseous fluid, generally air, is effected by means of an inlet-valve arranged in a cylindrical piston-head, to which the air is led through recesses provided in the piston-body. When this kind of fluid-regulation is utilized in high-speed compressors the considerable momentum due to the comparatively heavy valve-seat and valve-stop, between which the inlet valve is aranged, imposes a very high tensile stress not only on the usually thin-walled piston-head but also on the ribs which separate said piston-recesses and connect the piston-head to said piston-body. This tensile stress involves a very considerable risk and will become all the more dangerous if the piston, as it is usually the case, is made of a material, such as cast-iron, electron-metal, aluminum-alloy or the like, which gives a good sliding-surface but is of moderate tensile strength.

According to my present invention this risk is removed by attaching the valve-seat and valve-stop of the inlet-valve arranged in an annular piston-head by means of an especial connecting-member to the piston-body in proximity to the gudgeon and preferably exactly in line with the axis of the piston so as to relieve the piston-head and the ribs which connect said piston-head to the piston-body of the stress referred to and thus transmit the inertial stress due to said valve-seat and valve stop by the shortest path to the gudgeon. This connecting-member preferably consists of a screw-threaded shank which projects from the centrally arranged boss of the valve stop and passes through the valve-seat to be finally fixed to the piston-body by screwing, that is to say that it may be screwed directly into said piston-body or secured thereto in any suitable manner by means of a nut. This threaded shank may, of course, form an integral part of said valve-stop, or it may form a separate piece and be secured thereto. The piston-head is preferably provided with an inner ring-shoulder or ledge upon which the valve-seat is placed and against which it is drawn and held in place by said connecting-member.

By means of this novel arrangement it is made possible to make even the working-piston of exceptionally high-speeded compressors of cast-iron, electron-metal, aluminum-alloy and other such materials without any undue risk, whereas the valve-seat, the valve-stop and the connecting-member are made of a material of a far higher tensile strength, i. e. of a high-grade steel, such as chrome-nickel steel or the like. This novel arrangement further offers the important advantage that the valve-stop as well as the valve-seat can be mounted and dismounted with the greatest ease, which is impossible in the known compressors of this class, wherein the valve-seat is generally practically permanently fixed.

To further simplify the embodiment of my invention, to transmit the inertial stress due to the valve-seat and valve-stop by the shortest path to the gudgeon the valve-body is constructed so as to merge above said gudgeon into a truncated cone whose centre line coincides with the axis of the cylinder and into the centre of whose minor-base the threaded end of said connecting-member penetrates.

In the accompanying drawing the improved working-piston and an adjacent part of the cylinder of a high-speed compressor are shown in longitudinal section in which compressor a preliminary admission of the fluid to be compressed is effected by means of inlet-ports arranged in the cylinder-wall and of an inlet-valve arranged in the piston-head.

In the piston-body 1 provided with piston-rings 2 a tubular gudgeon 3 is seated and closed at each end by a headed plug 4 adapted to prevent an accidental longitudinal displacement of the gudgeon within the cylinder 5. The gudgeon 3 is snugly journalled in the bushing 6 of a connecting-rod 7 of suitable construction. The piston-body 1 terminates above said gudgeon in a hollow truncated cone 8 whose minor-base 9 serves as an attaching-member and is therefore provided with a hole 10 situated exact-

ly in line with the axis of said piston-body. Above said truncated-cone is arranged an annular piston-head 11 provided with piston-rings 12 and connected by a plurality of ribs 13 to the piston-body 1. Encircled by these ribs is an annular recess 14 into which the centrally bored hub 15 of a valve-seat 16 projects. This valve-seat rests by means of its ring-shoulder 17 on an annular ledge 18 of said piston-head. Arranged on the valve-seat 16 is a flat annular inlet-valve 19 whose upward movement is limited by an annular flange 20 of a mushroom-shaped valve-stop 21 with the central boss of which a connecting-member 22 preferably forms an integral part. This connecting-member has the form of a screw-threaded shank for which

inder-space 29 will be directly filled with air. The piston is then reversed and simultaneously herewith the inlet valve will be closed so that the compression of the air contained in the cylinder-space 29 can take place.

I claim:—

1. A working-piston for high-speed reciprocating compressors comprising a piston-body, a gudgeon seated in said piston-body, a piston-head, ribs connecting said piston-head to said piston-body, a valve-seat provided in said piston-head, an inlet-valve arranged on said valve-seat, a valve-stop for limiting the valve-movement and a connecting-member for

stop limiting the movement of said valve, a connecting-member forming an integral part of said valve-stop and held in engagement with said piston-body for releasably attaching said valve-seat and valve-stop to said valve-body in proximity to said gudgeon so as to transmit the inertial stress due to said valve-seat and valve-stop by the shortest path to said gudgeon.

5. A working-piston for high-speed reciprocating compressors comprising a piston-body, a tubular gudgeon seated in said piston-body, an annular piston-head, a plurality of ribs connecting said piston-head to said piston-body, an internal annular ledge in said piston-head, a valve-seat seated on said annular ledge and provided with a perforated hub, an annular inlet-valve arranged on said valve-seat, a valve-stop having an annular flange for limiting the movement of said inlet-valve and a bottom face for contacting with the top face of the hub of said valve-seat, a connecting-member provided on said valve-stop to press the valve-seat against and retain it on said internal annular ledge when engaging said piston-body for releasably attaching said valve-seat and valve-stop to said valve-body in proximity to said gudgeon so as to transmit the inertial stress due to said valve-seat and valve-stop by the shortest path to said gudgeon.

6. A working-piston for high-speed reciprocating compressors comprising a piston-body, a tubular gudgeon seated in said piston-body, an attaching-member arranged on said piston-body above said gudgeon in line with the axis of the cylinder and resembling a truncated cone with upwardly directed minor-base, an annular piston-head, a plurality of ribs connecting said piston-head to said truncated cone, a valve-seat provided in said piston-head, an annular inlet-valve arranged on said valve-seat, a valve-stop having an annular flange for limiting the movement of said inlet-valve, a connecting-member projecting from the bottom-face of said valve-stop and secured in the centre of the minor-base of the truncated cone of said attaching-member for releasably attaching said valve-seat and valve-stop to said valve-body in proximity to said gudgeon so as to transmit the inertial stress due to said valve-seat and valve-stop by the shortest path to said gudgeon.

7. A working-piston for high-speed reciprocating compressors comprising a piston-body, piston-rings in said piston-body, a tubular gudgeon seated in said piston-body, a hollow attaching-member arranged on said piston-body above said gudgeon in line with the axis of the cylinder and resembling a hollow truncated cone having a centrally perforated minor-base, an annular piston-head, piston-rings in said piston-head, a plurality of single ribs connecting said piston-head to the mantle of said hollow truncated cone, a valve-seat provided in said annular piston-head, a flat annular inlet-valve arranged on said valve-seat, a valve-stop having an annular flange for limiting the movement of said inlet-valve, and a shank-shaped connecting-member integrally connected with the boss of said valve-stop and passing through said valve-seat and the perforated minor-base of the truncated cone of said attaching-member when secured to said piston-body by a nut arranged within said hollow truncated cone to be screwed against the inner face of said minor-base for releasably attaching said valve-seat and valve-stop to said valve-body in proximity to said gudgeon so as to transmit the inertial stress due to said valve-seat and valve-stop by the shortest path to said gudgeon.

8. A piston for high-speed reciprocating compressors comprising a piston body, a piston head, a plurality of ribs connecting said piston head to said piston body, a valve seat provided in said piston head, an inlet valve arranged on said valve seat, a valve stop for limiting the movement of the valve, and means for releasably attaching said valve seat and stop to said piston body.

9. A piston for high-speed reciprocating compressors comprising a piston body, a piston head, a valve seat provided in said piston head, an inlet valve arranged on said valve seat, a valve stop for limiting the movement of the valve, and means for releasably attaching said valve seat and stop to said piston body.

In testimony whereof, I affix my signature.

GERHARD ROTHMANN.