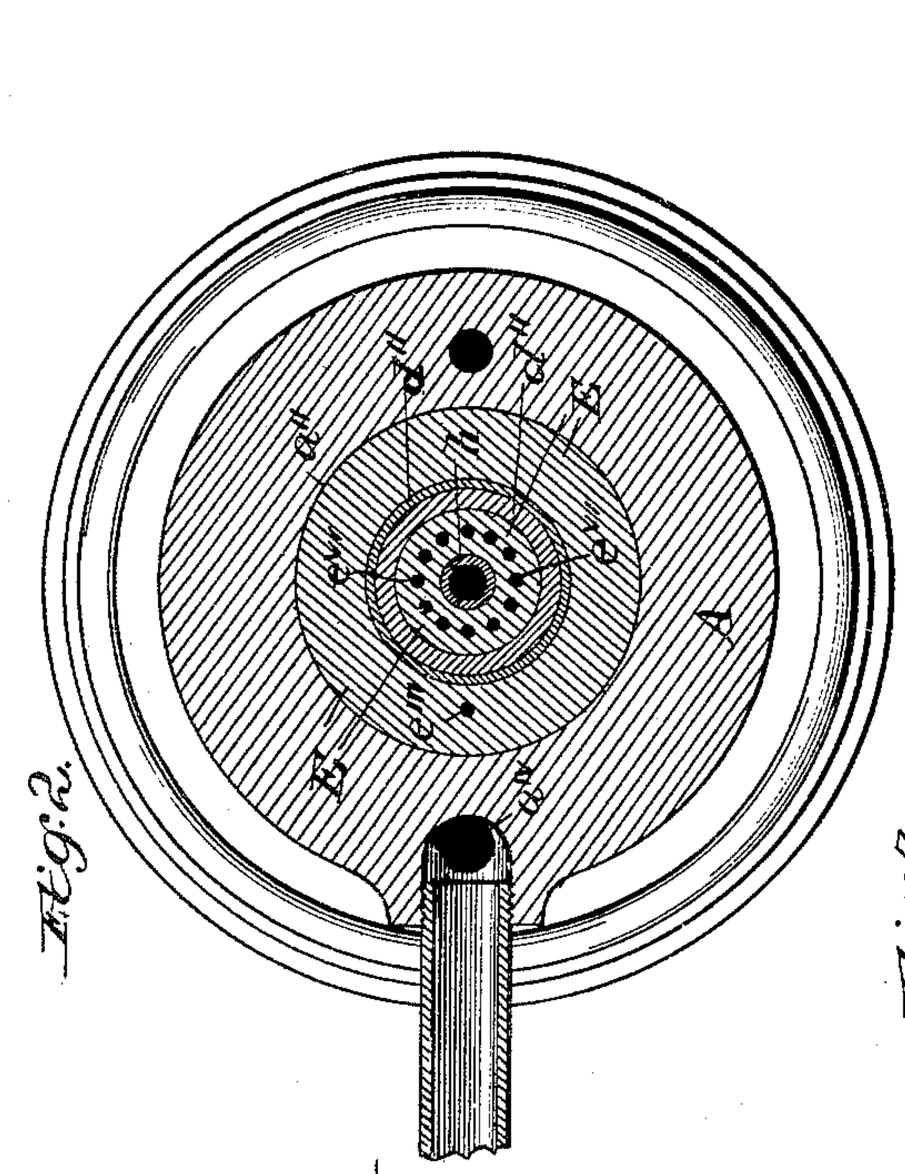
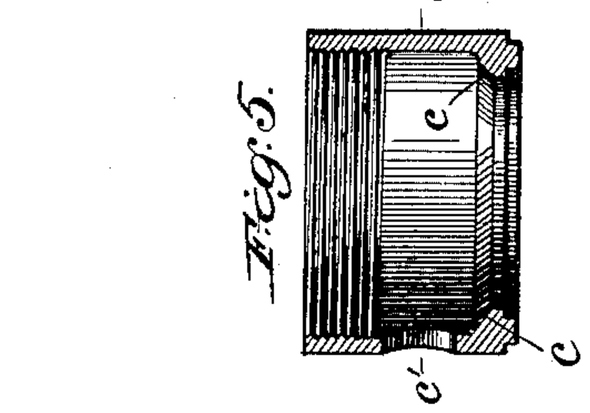
(No Model.)

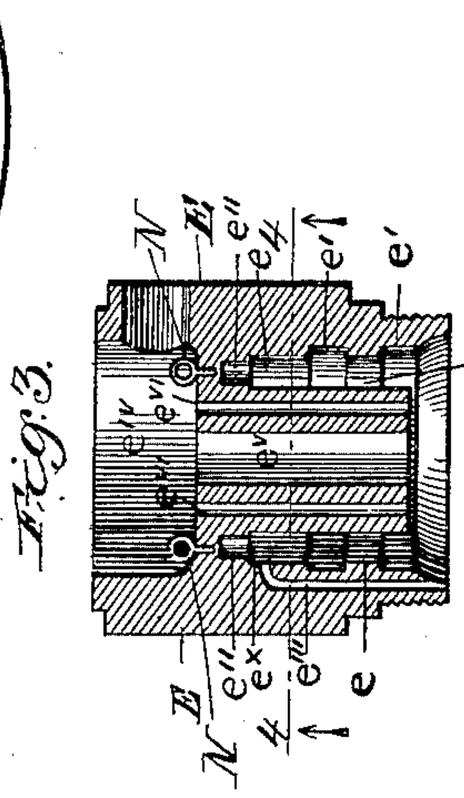
G. F. KNOX.

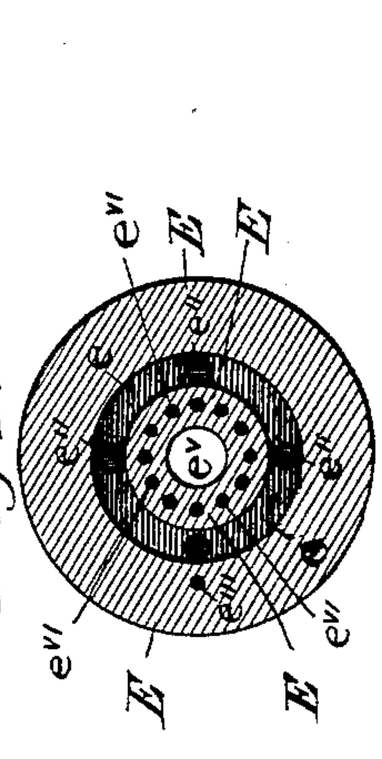
GAS COMPRESSOR.

No. 461,080. Patented Oct. 13, 1891.









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UNITED STATES PATENT OFFICE.

GEORGE F. KNOX, OF CHICAGO, ILLINOIS.

GAS-COMPRESSOR.

SPECIFICATION forming part of Letters Patent No. 461,080, dated October 13, 1891.

Application filed May 2, 1890. Serial No. 350,289. (No model.)

To all whom it may concern:

Be it known that I, GEORGE F. KNOX, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Gas-Compressors, of which the following is a specification.

The present invention relates to a compressor in which the eduction-valve seats directly against the end of the compression-cylinder so that when raised the whole end of the cylinder will be open for the eduction of gas, the induction-opening being formed through and induction-valve seated against said eduction-valve.

The object of the said invention is to improve this valve mechanism; and to this end it consists in certain features of novelty that are particularly pointed out in the claims hereinafter.

Of the accompanying drawings, which form a part of this specification, Figure 1 is an axial section of a compressor embodying the invention. Fig. 2 is a transverse section thereof on the line 2 2, Fig. 1. Fig. 3 is an axial section of the block which affords bearings for the valve-stems and guides them in their movement. Fig. 4 is a transverse section thereof on the line 4 4, Fig. 3. Fig. 5 is an axial section of the seat for the eduction-valve and of the ring upon which it is formed.

A represents a heavy casting of any desired external shape, having a cylindrical bore $a\,a'\,a''$ extending quite through it. The portion a of the bore constitutes the compression-chamber, in which works the compression-piston B. The portion a' of the bore is somewhat larger than the portion a, thus forming a shoulder a''', upon which rests a short cylinder or ring C, having at its lower end a flange c, which projects inward and forms a flaring seat for the eduction-valve D. The opening left by this flange is not less in diameter than the compression-chamber a, and it constitutes the eduction-port thereof. Through the side of the ring C is a port c', through which the compressed gas escapes into a duct a^{IV}, whence it is carried off by a suitable pipe. The portion a'' of the bore is larger than the portion a', and has a second shoulder a^{V}, upon which rests a heavy casting or block E, the principal objects of which are to afford suitable bearings for the stems of both the valves and for the springs which tend to hold said valves on their seats.

The valve D is annular and has upon its under side a flaring seat d for the induction-valve. Its stem d' is tubular and fits in a corresponding annular groove e, formed in the under side of the block E. Let into the outer surface of the said stem so that their outer faces are flush with it are a number of steel packing-rings d'', and cut in the outer wall of the annular groove e so as to alternate with said rings are a number of grooves e', which prevent the formation of shoulders. Extending upward from the groove e are any desired number (four are shown) of bores or sockets e'', in each of which is placed a coiled spring F, which bears upward against the end of its socket and downward against the end of the valve-stem d', thereby serving to cushion the upward stroke of the valve and tending to hold it normally seated. The space $e^{\times}$ left between the end of the stem d' and the top of the groove e is slightly more than is required for the play of the valve, and with this space communicates one end of a duct e''', the other end of which communicates with the gas-outlet. The upper end of this duct is so situated that its upper end will be closed by the stem d' before the valve has completed its upward stroke, thereby confining in the space $e^{\times}$ (which is the upper part of the groove e) a quantity of gas which also acts to cushion the upstroke and assist in reseating the valve. In the top of block E is formed a chamber e^{IV}, with which the gas-supply pipe G communicates, and through the center of the block is a bore e^{V}, through which passes the hollow stem h of the induction-valve H. The upper end of this stem is open and communicates with the chamber e^{IV}, and its lower portion is provided with one or more perforations h', which communicate with the chamber d''' of the valve D. In addition to this channel for the passage of gas the block E is provided between the annular groove e and the bore e^{V} with a number of perforations e^{VI}, which also communicate at their lower ends with the chamber d'''. The lower extremity of the block E

and the upper end of valve-ring C are provided with corresponding threads and screwed together, as shown in Fig. 1.

Encircling the valve-stem *h* and resting upon the top of the block E is a washer I, having an upturned marginal flange, and screwed onto the upper end of said steam is a nut J, having a downturned marginal flange.

K is a coiled spring, which surrounds the stem between this washer and nut and exerts its force downward upon the former and upward upon the latter, thus tending to hold the valve H upon its seat when no suction is being exerted upon it by the piston B. The flanges of the washer and nut serve to confine the ends of the spring.

L is a sleeve surrounding the stem *h* within the spring K and extending (when valve H is seated) from washer I nearly up to the nut J. This tube is for the purpose of preventing the spring K from being worn by contact with the valve-stem and for the further purpose of limiting the stroke of the valve H.

M is the cylinder-head, which is secured by bolts *m* and engages the block E for holding it in place. It is provided with an opening opposite the chamber e^{IV} large enough to afford access to said chamber for inspecting and repairing the parts situated within it, said opening being closed by a screw-cap *m'*. By removing the cylinder-head M the block E may be lifted out of its socket, (for which purpose it is provided with eye-bolts N,) and with it will be removed all of the valve mechanism.

Having thus described my invention, the following is what I claim as new therein and desire to secure by Letters Patent:

1. In a gas-compressor, the combination, with the compression-chamber and piston, of a valve having a tubular stem, a block having an annular socket in which said stem fits, and a duct communicating with said socket a short distance away from its closed end, so as to be closed by the valve-stem before it completes its stroke, whereby the valve is cushioned by air confined in the socket of its stem, substantially as set forth.

2. In a gas-compressor, the combination, with the compression-chamber and piston, of a valve D, having a suitable stem, the block E, having a socket for said stem, and the ring C, having the valve-seat *c*, said block and ring being detachably secured together, substantially as set forth.

3. In a gas-compressor, the combination, with the compression-chamber and piston, of an induction-valve having a hollow stem communicating at one end with the gas-supply and having outlet-openings *h'* back of the valve, and an eduction-valve carrying the seat for said induction-valve and having a chamber back of said seat with which said outlet-opening communicates, substantially as set forth.

4. In a gas-compressor, the combination, with the compression-chamber and piston, of the induction-valve H, having hollow stem *h*, with perforations *h'*, and the block E, having the perforations e^{V} for the passage of said stem and the perforations e^{VI}, extending through it, substantially as set forth.

5. In a gas-compressor, the combination, with the induction and eduction valves having stems, of the block E, having sockets for the stems of both of said valves, and springs bearing against said block and against the valve-stems for seating the valves, substantially as set forth.

6. In a gas-compressor, the combination, with the compression-chamber and piston, of the induction-valve H, having a stem *h*, the annular eduction-valve D, having a tubular stem *d'* and the chamber *d'''*, and the block E, having sockets for both valve-stems and a suitable passage for the gas from the supply-pipe to chamber *d'''*, substantially as set forth.

7. In a gas-compressor, the combination, with the induction-valve H, having stem *h*, and the annular eduction-valve D, having chamber *d'''* and tubular stem *d'*, of the block E, having annular socket *e*, the perforation e^{V}, and the perforations e^{VI}, substantially as set forth.

8. In a gas-compressor, the combination, with the induction-valve H, having hollow stem *h* and the perforation *h'*, of the annular eduction-valve D, having chamber *d'''* and tubular stem, and the block E, having annular socket *e* for stem *d'*, perforation e^{V} for stem *h*, and the perforations e^{VI} between the socket *e* and perforation e^{V}, substantially as set forth.

9. In a gas-compressor, the combination, with the cylinder A, having inlet G and outlet a^{IV}, of the removable block E, the induction and eduction valves carried thereby, and means for holding said block in place, substantially as set forth.

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