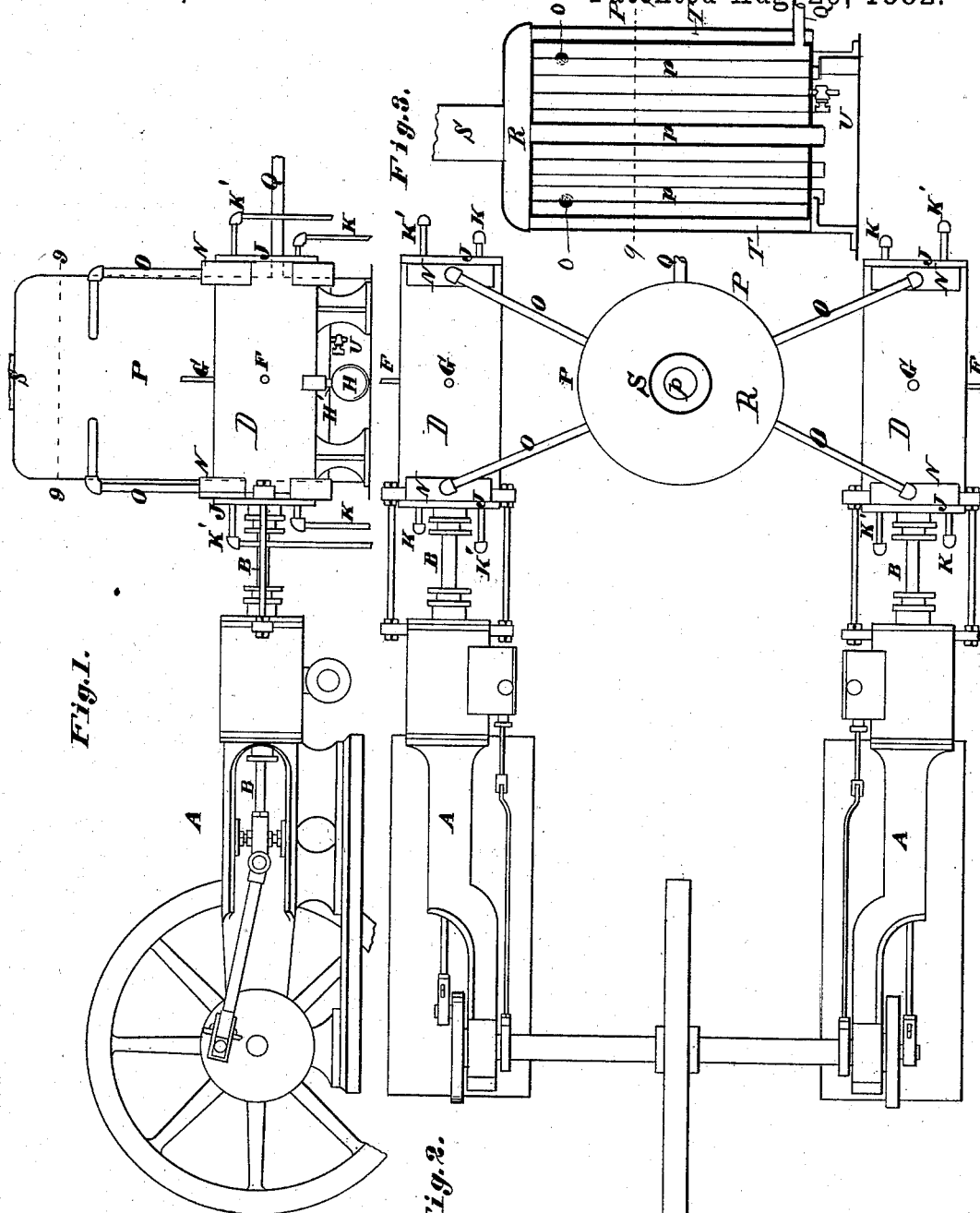


B. YOCH.  
AIR COMPRESSOR.

No. 263,646.

Patented Aug. 29, 1882.



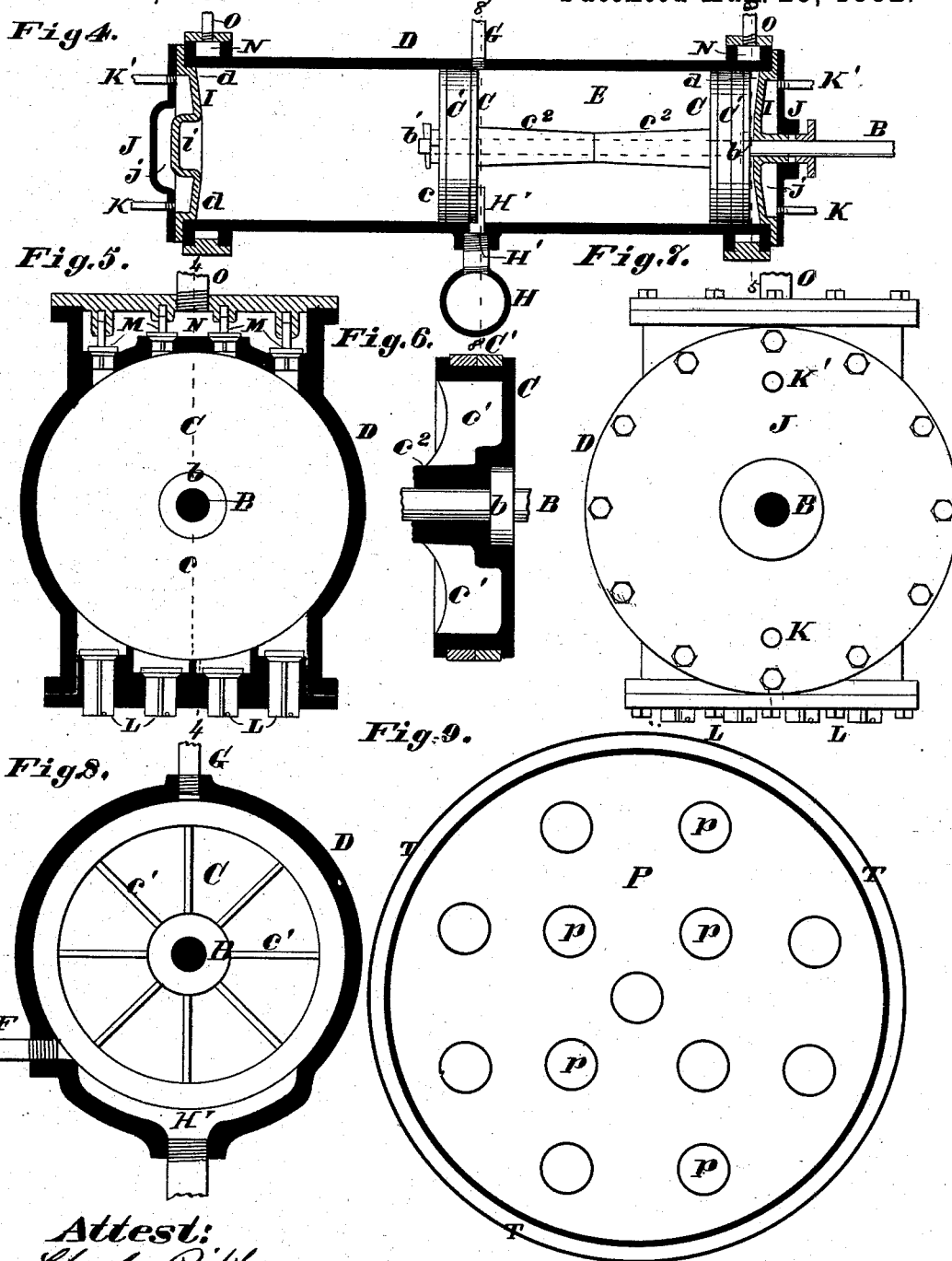
*Attest:*  
*Charles Pickles*  
*Geo. A. Knight.*

*Inventor:*  
*Bernhard Yoch*  
*By Knight Bro.*  
*Atty's*

B. YOCH.  
AIR COMPRESSOR.

No. 263,646.

Patented Aug. 29, 1882.



*Attest:*  
Charles Pickles  
Geo. H. Knight.

*Inventor:*  
Benhard Yoch  
By Knight & Bro.  
Atty

# UNITED STATES PATENT OFFICE.

BENHARD YOCH, OF ST. LOUIS, MISSOURI.

## AIR-COMPRESSOR.

SPECIFICATION forming part of Letters Patent No. 263,646, dated August 29, 1882.

Application filed April 20, 1882. (No model.)

*To all whom it may concern:*

Be it known that I, BENHARD YOCH, of the city of St. Louis, in the State of Missouri, have invented certain new and useful Improvements in Air-Compressors, of which the following is a specification, reference being had to the accompanying drawings, forming part of the same.

This is an engine intended more especially for the compression of air for use in driving an engine at a distance.

My invention applies to the described means for cooling the compression-cylinder, to a device for the discharge of the settlings from the water-chamber within the cylinder, and to the other features of construction, as described and specifically claimed hereinafter.

In the drawings, Figure 1 is a side elevation of the apparatus. Fig. 2 is a top view of the machine or apparatus. Fig. 3 is a vertical axial section of the receiver of the compressed air. Fig. 4 is a vertical axial section of the compression-cylinder, with side view of the pistons. Fig. 5 is an enlarged transverse section at 5 5, Fig. 4. Fig. 6 is an axial section of one of the pistons. Fig. 7 is an end view of the compressor-cylinder. Fig. 8 is an enlarged transverse section at 8 8, Fig. 4. Fig. 9 is an enlarged transverse section of the air-receiver at 9 9, Fig. 3.

I show the compressor in duplicate. The compressor engines or machines may be worked by any suitable motor. I show steam-engines A. As no novelty is claimed in these engines, no detailed description is needed.

B is the piston-rod of the steam-engine, this rod being also the piston-rod of the compressor-pistons C C.

C' are packing-rings on the pistons. The pistons C C work in a cylinder, D. They are secured on the piston-rod at a distance asunder. Thus a chamber, E, is formed between them. The chamber E contains water which circulates through it from bottom to top. Water enters the chamber through a passage, F, and flows out through the pipe or passage G at top, so that the warmest water is the first to escape, the cold water entering below and taking its place. The water is introduced into the cylinder chiefly for the purpose of cooling

the same, and thus cooling the air contained in the cylinder between the pistons and the heads. The water also cools the pistons and the air in contact with them. (It will be understood that the air becomes heated by compression.) The water also serves as a lubricant for the packing rings C'. Another advantage of the body of water is that it adds to the momentum of the pistons, the inertia of the same being overcome at the beginning of the stroke, when the air offers but little, if any, resistance to the movement of the piston, and the momentum being available to overcome the resistance of the air when it is at the greatest density at the last part of the stroke.

H' is an opening through the lower part of the cylinder, extending transversely so as to receive any mud or settlings that may be in the chamber E, the mud being scraped directly into the receiver-opening by the pistons as they move in the cylinder.

H is a mud drum or receptacle in connection with the opening H', having a discharge-valve or other means for the discharge of the mud, as may be required.

The outer sides, *c*, of the pistons are flat, or nearly so, so that they may closely approach the ends I of the cylinder, and their inner sides (the sides presented to the water-chamber) are recessed or made with strengthening-ribs *c'*, that radiate from the hubs *c''*, so that the cool water comes in direct contact with the metal forming the outer side, *c*, and serves to keep the same cool, and thus the air upon the other side of the metal is cooled.

The piston-hubs *c''* are shown elongated, and having end bearings against each other to keep the pistons the required distance assunder. The pistons are held upon the outer sides between a fixed collar, *b*, upon the piston-rod at one piston-head and a collar and key, *b'*, at the other piston-head. The collar *b* is recessed into the piston-head, so that the piston-head may approach close to the cylinder-head I, and the cylinder-head at the other end is recessed at *i* to receive the pin and collar *b'* as the piston-head approaches the cylinder-head. The cylinder-heads I are made somewhat convex upon the inner sides, so that there remains an annular chamber, *d*, between the piston C and

the head I, even when the piston touches the center of the head. Thus there is always a passage for the air in passing out of the eduction-valves and passing into the cylinder through the induction-valves. Outside each head is a cover, J, forming, with the head, a water-chamber, j, for the purpose of keeping the head cool. The water enters the chamber j through an induction-pipe, K, at the bottom of the chamber and leaves the chamber through an eduction-pipe, K', at the upper part of the chamber, so that the heated water passes out first.

Air enters the cylinder through puppet-valves L, opening below (freely) to the atmosphere or to a supply of cold air, and the air escapes from the cylinder through puppet-valves M into a chamber, N, at each end of the cylinder, (the arrangement of valves being similar at both ends.) The induction-valves L and eduction-valves M are in transverse series, in close proximity to the heads of the cylinder, so that the pistons do not close the valve-ducts, and the air in passing through the valve-ducts is brought near the cold heads I, and is cooled by the same, the heads being cooled by the water circulating in the chamber j.

O O are pipes extending from the chambers N to the air receiver or cooler P. The pipes O enter the upper part of the receiver, and the air leaves the receiver through a pipe, Q, leading from the lower part of the receiver to the engine or engines that are driven by air from the compressor. The receiver P is traversed by vertical cooling-pipes p, that are shown open to the atmosphere at bottom, and opening at the upper ends into a chamber, R, from which ascends a flue, S. The ascent of the air in the pipe or flue S may be accelerated by a fan or any other means to increase the movement of the air through the pipes p.

T is an annular air-flue surrounding the sides of the receiver, said flue being open to the atmosphere below and in communication with the chamber R at top, the purpose of the an-

nular flue being to cool the side of the receiver, and consequently the air therein.

It will be seen that the compressed air enters the body of the receiver near the top and leaves it near the bottom, so that the cooler air is first to leave the receiver. U is a cock to allow the escape of water from the receiver in case any should collect therein.

I claim as my invention—

1. In an air-compressor, the pistons C C, having ribs  $c'$ , and provided with the hollow inwardly-extending hubs  $c^2$   $c^2$ , in combination with the piston-rod B, provided with fixed collar b and key  $b'$ , substantially as and for the purpose described.

2. In an air compressor or blower, the combination of a double piston inclosing a water-chamber with the cylinder provided with a mud-drum or sediment-receiver, located beneath said cylinder and communicating therewith through a channel opening into the under side of the cylinder midway of the length thereof, substantially as and for the purposes set forth.

3. The two piston-heads C C, inclosing between them a water-space, and being recessed or ribbed upon their inner sides,  $c'$ , substantially as and for the purpose set forth.

4. The combination, with the pistons C, with flat ends c, of the convex cylinder-heads I, substantially as and for the purpose set forth.

5. In an air-compressor, the combination of cooling-chamber I J and the transverse series of induction and eduction valves L M in close proximity to the heads I.

6. The combination of vertical pipes p with the air-receiver provided with jacket T, chamber R, flue S, induction-pipes O, eduction-pipes Q, and drip-cock V, substantially as and for the purposes set forth.

BENHARD YOCH.

Witnesses:

SAML. KNIGHT,  
A. GRABLE.