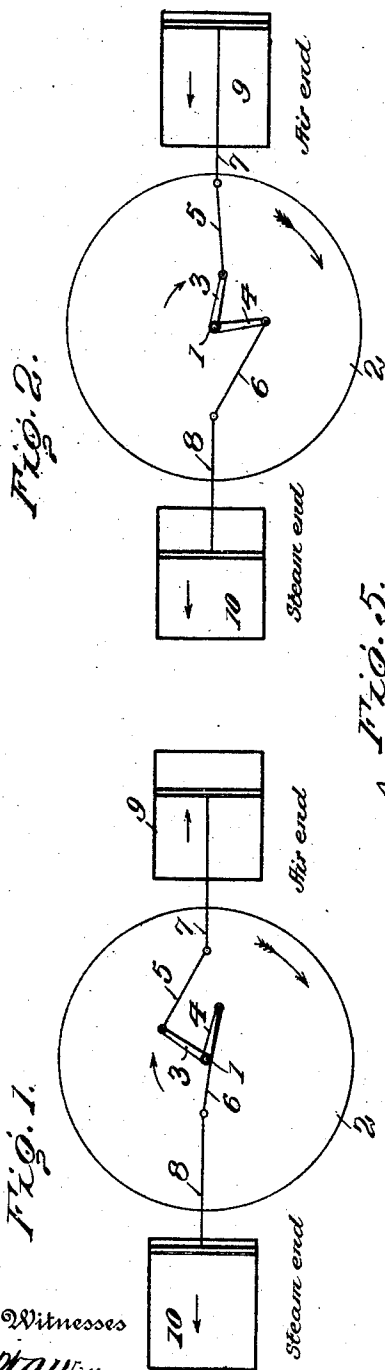


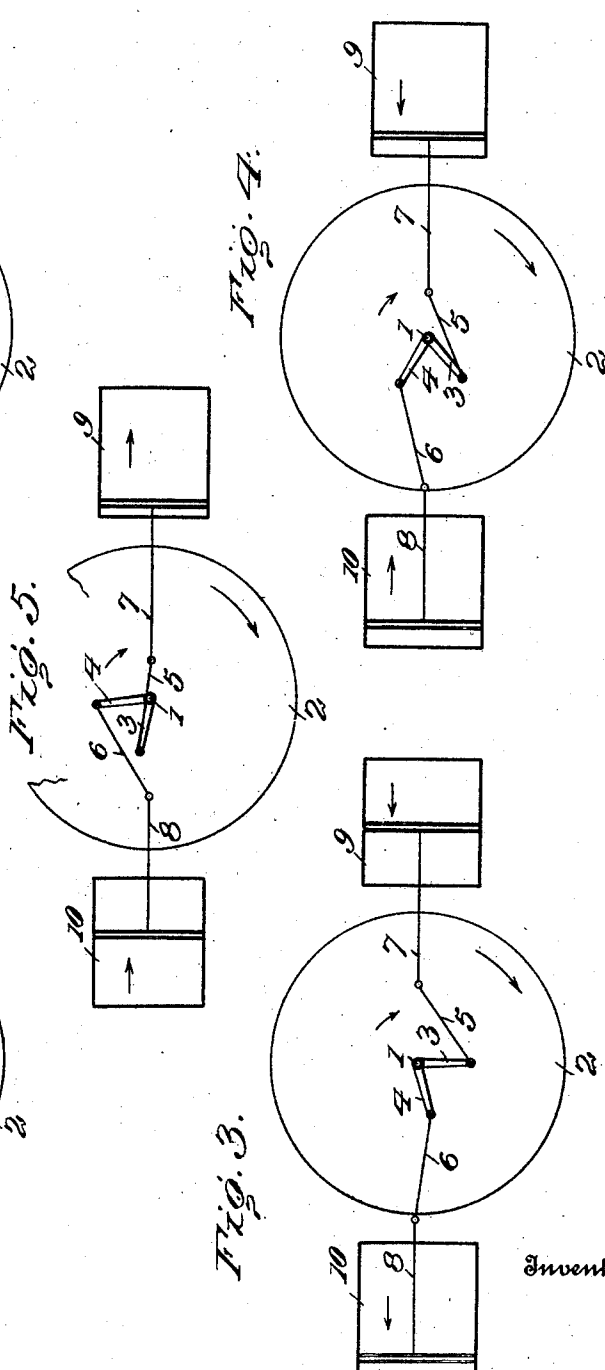
972,163.

Patented Oct. 11, 1910.



Witnesses

W. A. Williams
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Inventor

By

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UNITED STATES PATENT OFFICE.

WALTER L. CRANE, OF DENVER, COLORADO.

AIR-COMPRESSOR.

972,163.

Specification of Letters Patent. Patented Oct. 11, 1910.

Application filed October 18, 1909. Serial No. 523,358.

To all whom it may concern:

Be it known that I, WALTER L. CRANE, of Denver, in the county of Denver and State of Colorado, have invented certain new and useful Improvements in Air-Compressors; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

The object of this invention is to avoid the difficulties heretofore experienced in overcoming dead centers in the operation of air compressors, and at the same time obviate the necessity of depending upon the momentum of a fly wheel to carry the crank shaft over such centers. And a further object is to provide simple and highly efficient means for connecting the rods of the pistons of an air compressor and steam engine in such manner that the highest efficiency of the steam against the engine piston will exist synchronously with the greatest resistance in the air-compressor.

The invention will be hereinafter fully set forth and particularly pointed out in the claims.

In the accompanying drawings, Figures 1, 2, 3, 4 and 5 are diagrammatic views showing the piston and other parts of a straight-line air-compressor and engine in different positions.

Referring to the drawings, 1 designates a shaft carrying a fly wheel 2 and two cranks 3 and 4. The latter are at an acute angle to each other, that is, they are set upon the shaft at a relative angle of approximately 87°. At their outer ends these cranks are connected by pitmen 5 and 6 to the piston rods 7 and 8 of two pistons, the former working in an air compressing cylinder 9 and the latter in a steam cylinder 10 of an engine for operating the compressor.

By thus connecting the two piston rods, which are in line with each other, or substantially so the maximum efficiency of the steam against the engine piston is exerted to meet the highest resistance in the air-compressor. In other words, the air is subjected to the maximum compression when live steam is acting against the engine piston at the commencement of the stroke thereof to move it in the direction away from the air-compressor. This will be better understood

by reference to the drawings. In Fig. 1 the engine piston is beginning its stroke under the action of live steam as the air compressor piston is approaching the limit of its compression stroke, which limit is reached, as shown in Fig. 2, after the engine piston has made but a small excursion under the action of the live steam, and, as shown in Fig. 3, the engine piston has about reached the end of its outward stroke, under the expansive action of the steam, as the air-compressor piston is on its return stroke. The engine piston begins its return stroke, under a second head of live steam, before the air compressing piston has completed its return stroke, as shown in Fig. 4, and the second out stroke of the air-compressor piston, as shown in Fig. 5, is accelerated up to near the point of highest compression, while the engine piston is completing its return stroke under the expansive action of the steam. Before the point of highest resistance is reached by the air-compressor piston the engine piston will have completed its return stroke and be started on its outward travel under a fresh charge of live steam which is always available when the air compressor piston is under greatest resistance.

By means of my invention a great economy in steam may be effected, since it is manifest that as the compression stroke of the compressor piston is completed almost immediately after the beginning of the stroke of the engine piston the steam may be cut off at an early stage in the excursion of such piston. Another advantage resulting from my improvement lies in the fact that I am enabled to obviate the necessity of "bar-ring" or manually moving the compressor over dead centers should its operation be discontinued while air is under compression.

I claim as my invention:—

1. An air compressor comprising, in combination, an air cylinder and its piston, a steam cylinder and its piston, said cylinders and pistons being substantially in line with each other, and a shaft having two crank arms set relatively to each other at a degree slightly less than a right angle, and pitmen connecting said cranks to said pistons.

2. An air compressor comprising, in combination, an air cylinder and its piston, a steam cylinder and its piston, said cylinders and pistons being substantially in line with

each other, a crank shaft to which the rods
of both pistons are connected, the connec-
tions between such rods and said crank shaft
being so arranged relatively that the steam
5 engine piston will be subjected to the initial
action of steam when the piston of the air
compressor is under greatest resistance.

In testimony whereof, I have signed this
specification in the presence of two subscrib-
ing witnesses.

WALTER L. CRANE.

Witnesses:

F. J. CRANE,
J. W. BIVENS.