No. 782,597. PATENTED FEB. 14, 1905.

E. CHESHIRE.

EQUALIZING MECHANISM FOR AIR COMPRESSORS.

APPLICATION FILED APR. 15, 1904.

2 SHEETS—SHEET 1.

Fig. 1.

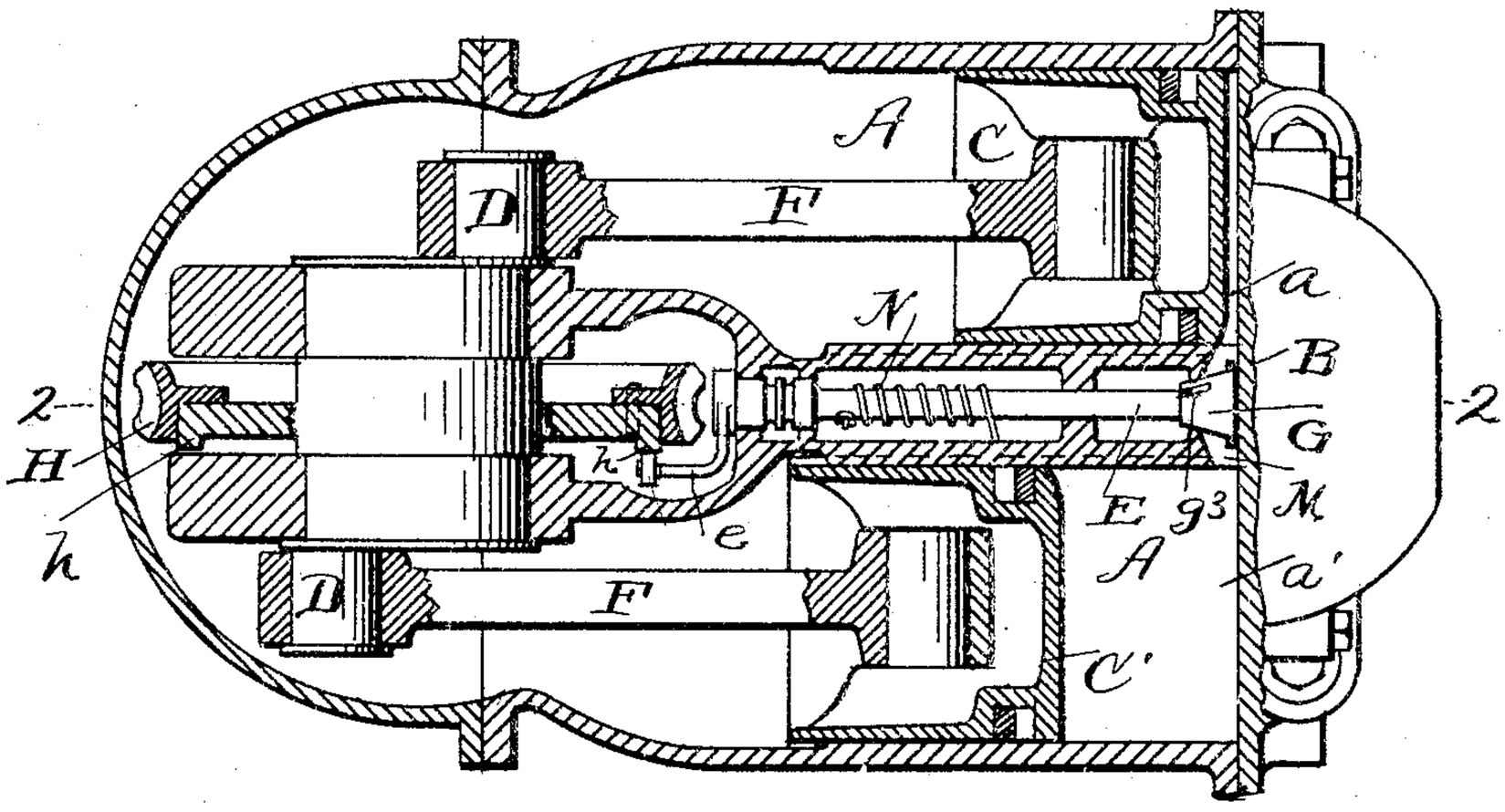
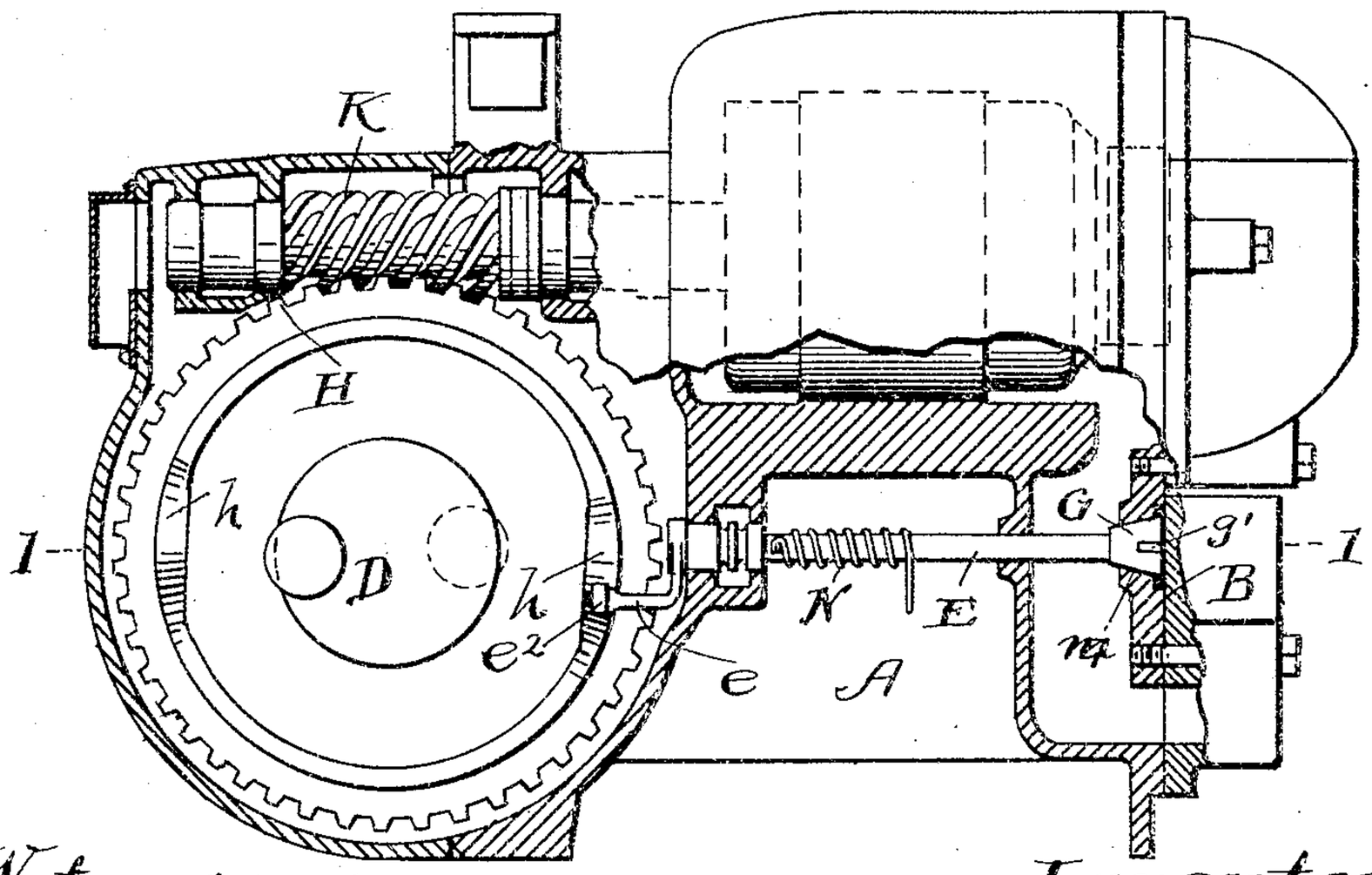


Fig. 2.



Witnesses.
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2 SHEETS—SHEET 2.

Fig. 3.

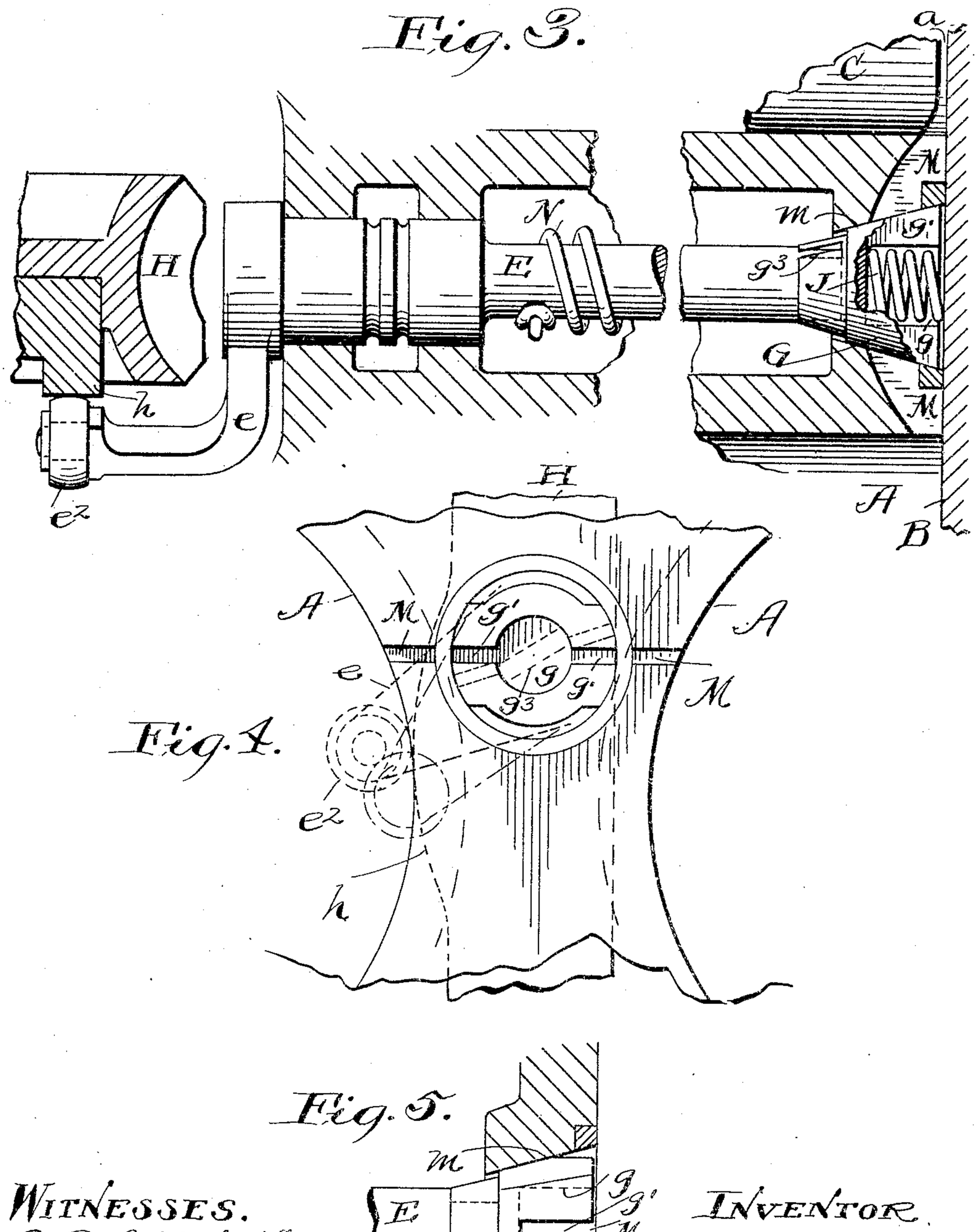

Fig. 4.

Fig. 5.

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UNITED STATES PATENT OFFICE.

EDWARD CHESHIRE, OF MILWAUKEE, WISCONSIN.

EQUALIZING MECHANISM FOR AIR-COMPRESSORS.

SPECIFICATION forming part of Letters Patent No. 782,597, dated February 14, 1905.

Application filed April 15, 1904. Serial No. 203,268.

To all whom it may concern:

Be it known that I, EDWARD CHESHIRE, a citizen of the United States, residing at Milwaukee, in the county of Milwaukee and State of Wisconsin, have invented a certain new and useful Improvement in Equalizing Mechanism for Air-Compressors, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings.

This invention is an improvement in double-cylinder air-compressors, and is of especial value in those double-cylinder air-compressors whose pistons are directly connected with and driven concurrently in opposite directions by the same crank-shaft. In the precise form in which the invention is shown it is especially adapted to the motor air-compressor which is disclosed in my pending application, Serial No. 193,361. Such motor-driven air-compressors have no fly-wheel, and consequently when each piston concludes its compression-stroke and the crank-shaft passes the dead-center the compressed air in the clearance-space expands and the piston is pushed backward, so as to take up all the backlash or lost motion with a hammer-blow. This causes objectionable noise and wear and tear.

The object of this invention is to prevent the described action and its objectionable results and to increase the volumetric efficiency of the machine, and these results are effected by opening up an air-passage between the clearance-spaces in the two cylinders just as the crank-shaft is passing the dead-center, whereby the air compressed in the clearance-space in one cylinder will flow into the opposite cylinder, thereby equalizing the pressure against both pistons.

In the drawings, Figure 1 is a sectional plan view of a double-cylinder air-compressor equipped with my invention, said section being partly in the plane indicated by line 1 1 of Fig. 2. Fig. 2 is a side view for most part in central vertical section in the plane indicated by line 2 2 of Fig. 1. Fig. 3 is an enlargement of the rock-shaft and adjacent parts in the same plane as Fig. 1. Fig. 4 is an enlarged front view of that part of the mechanism which is between the two air-cylinders when the cylinder-head plate is removed. Fig. 5 is an enlarged side elevation, partly in section, of the mechanism shown in Fig. 4.

Referring to the parts by letters, A represents the two air-compressor cylinders, which are preferably formed in a single casting.

B represents the head-plate, by which both cylinders may be closed at their front ends.

C C′ are the pistons, which are moved in reverse directions by the crank-shaft D, to which they are connected by the connecting-rods F F. A worm-wheel H, attached to the crank-shaft, is turned by the motor-driven worm K, thereby turning the crank-shaft.

The above-named parts are substantially like the corresponding parts as shown and fully described in my prior application referred to.

The present invention is not, of course, limited to the specific construction above described; but in the specific form in which said invention is shown it was especially designed for use with that particular mechanism.

The clearance-spaces *a a′* at the front end of the two cylinders are connected by a port M, which, as shown, is a narrow groove milled in the front end of the metal between the two cylinders. This groove crosses a tapered valve-seat *m*, to which the tapered valve G is fitted. This valve normally prevents communication between the two ends of this port M. The valve has an axial recess *g* in its front end, in which is a spring J, and this spring when the head-plate B is secured in place is compressed, so that it will hold the valve snugly against its seat. In the front end of this valve is a cross-port *g′*, which when the valve is in the position shown in Fig. 4 connects the two ends of the port M. When turned into the position indicated by the dotted lines, communication between the two ends of said port is effectually closed. A rock-shaft E is mounted in suitable bearings substantially parallel with the axes of the cylinders. The flattened front end of this shaft enters a groove *g³* in the rear end of the valve G. On the rear end of this rock-shaft is a crank-arm *e*, which carries a friction-roller *e²*, adapted to bear against one side of the worm-wheel H. A rat-trap spring N upon this rock-

shaft tends to turn it so as to always hold said friction-roller in contact with said worm-wheel. On that face of the worm-wheel with which said friction-roller engages are two short and rather quick cams *h*, located at diametrically opposite points. When these cams engage with said friction-roller, they rock this rock-shaft, and thereby turn valve G, so that the cross-groove *g'* therein connects the two ends of the port M. This engagement takes place just before the crank-shaft reaches the dead-center, and thus the two cylinders are connected through the port M and the air-pressure in them is equalized while the crank-shaft is passing said dead-center. When the worm-wheel has turned to carry these cams out of contact with said friction-roller, the spring N turns the rock-shaft, which turns the valve G and closes the port connecting the two cylinders, this port having been open only for a very brief time, as described.

As a result of the above-described construction the lost motion is taken up gradually and without substantial noise or jar. In addition, the flow of the compressed air into the suction-cylinder from the clearance-space in the compression-cylinder increases the volumetric efficiency of the compressor, because this transference of air takes place at about the time when the piston in the suction-cylinder has completed its suction-stroke. The volume of air in the suction-cylinder is therefore increased by the volume of air which flows into it from the clearance-space of the other cylinder. Except for this transference of air from one cylinder to the other the air left in the clearance would represent a loss of efficiency, while with the construction described it results in an increase of efficiency.

Substantially the same mechanism would apply to the opposite ends of single-cylinder double-acting compressors.

Having described my invention, I claim—

1. In a two-cylinder air-compressor, the combination with the two cylinders, their pistons, and means for concurrently moving said pistons in opposite directions, of a port connecting the clearance-spaces in said cylinders, a valve in said port, and means for moving said valve so as to temporarily open it just as each piston is about to terminate its compression-stroke.

2. In a two-cylinder air-compressor, the combination with the two cylinders, their pistons, and a single crank-shaft having diametrically-disposed crank-pins which are respectively connected with said pistons, of a port connecting the clearance-spaces in said cylinders, a valve in said port, and mechanism operated by said crank-shaft, for operating said valve.

3. In a two-cylinder air-compressor, the combination with the two cylinders, their pistons, and a crank-shaft having diametrically-opposed crank-pins which are respectively connected with said pistons, of a port connecting the clearance-spaces in said cylinders, a valve in said port, a rock-shaft operatively engaging said valve, and cams secured to the crank-shaft for operating said rock-shaft.

4. In a two-cylinder air-compressor, the combination with the two cylinders, their pistons, and a crank-shaft having diametrically-opposed crank-pins which are respectively connected with said pistons, of a port connecting the clearance-spaces in said cylinders, an oscillating valve in said port, a rock-shaft operatively connected with said valve and having a crank-arm, a spring operating to turn said rock-shaft in one direction, and a wheel secured to the crank-shaft and having two cam-surfaces engaging with said crank-arm to turn the rock-shaft in the opposite direction.

5. In a two-cylinder air-compressor, the combination with two parallel cylinders formed in the same casting, there being in the metal between said cylinders a groove connecting the front open ends of said cylinders, and there being also a conical valve-seat across said groove, a tapered valve fitted to said seat and having a transverse port and a substantially axial recess in its front end, with a head-plate closing the front ends of said cylinders and of said connecting-groove, a rock-shaft which engages with the notch in the rear end of said valve and which has at its opposite end a crank-arm, a spring tending to turn said shaft in one direction, the pump-pistons, a crank-shaft having diametrically-opposed crank-pins which are respectively connected with said pistons, and a wheel secured to said crank-shaft having diametrically-opposed cams which engage with the crank-arm on the rock-shaft and thereby rock it in opposition to its spring.

In testimony whereof I hereunto affix my signature in the presence of two witnesses.

EDWARD CHESHIRE.

Witnesses:
W. A. NUSSBAUMER,
J. P. BEUSCHER.