No. 863,556. PATENTED AUG. 13, 1907.

E. D. PRIEST & E. J. BRING.

MOTOR DRIVEN AIR COMPRESSOR.

APPLICATION FILED NOV. 26, 1904.

2 SHEETS—SHEET 1.

Fig. 1.

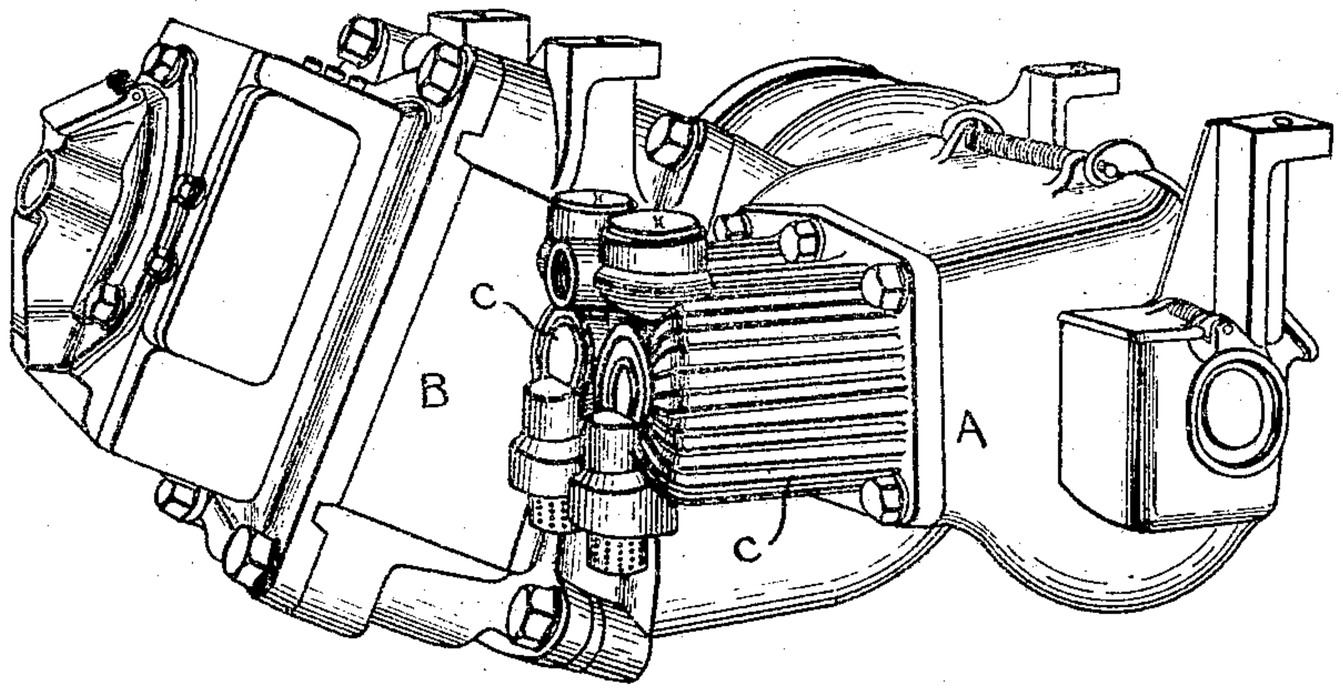
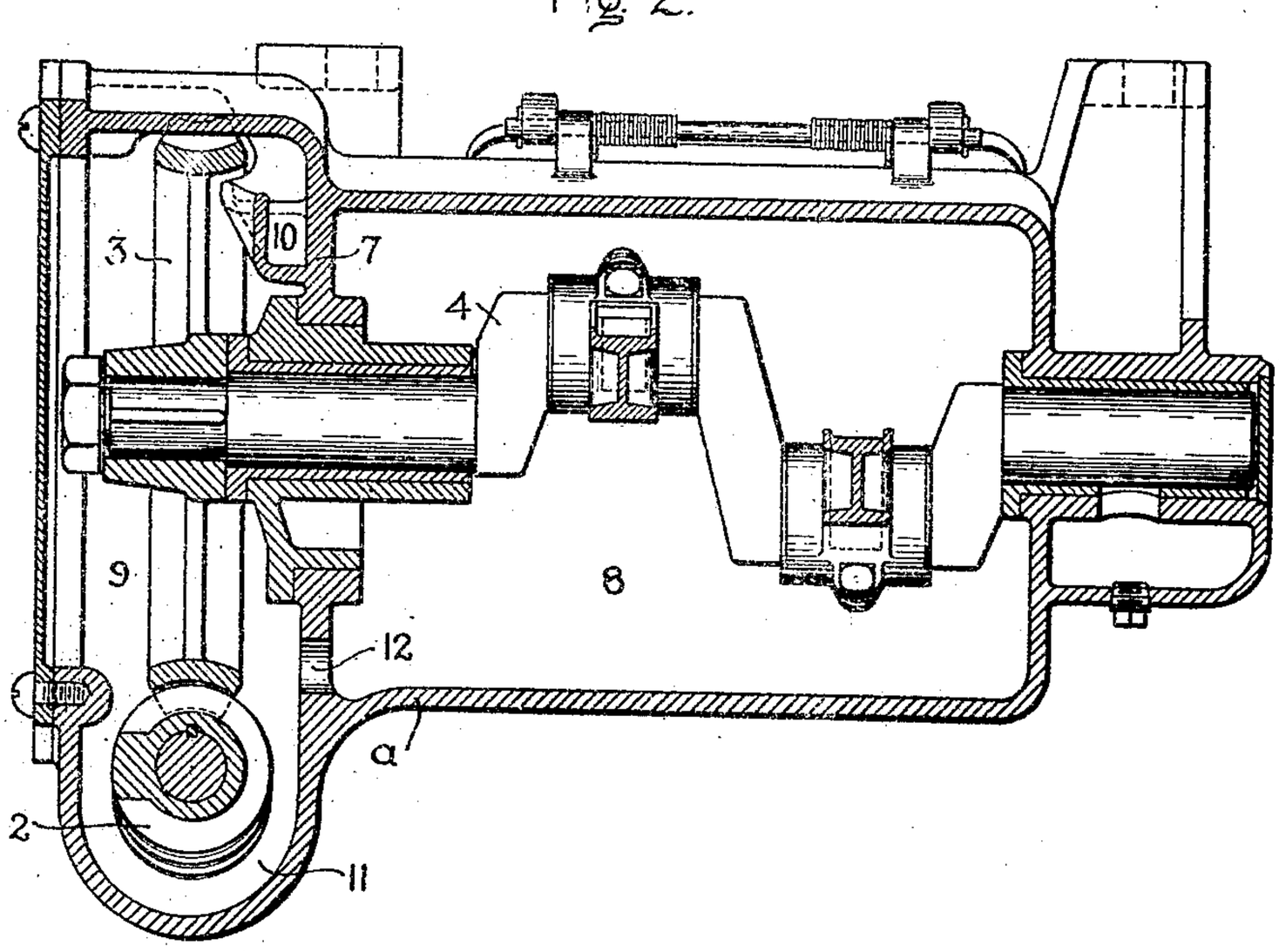


Fig. 2.



Witnesses.
Ethathan E. Briggo.
Helen Alford

Inventors:
Edward D. Priest,
Einar J. Bring.
by Albert G. Davis Atty

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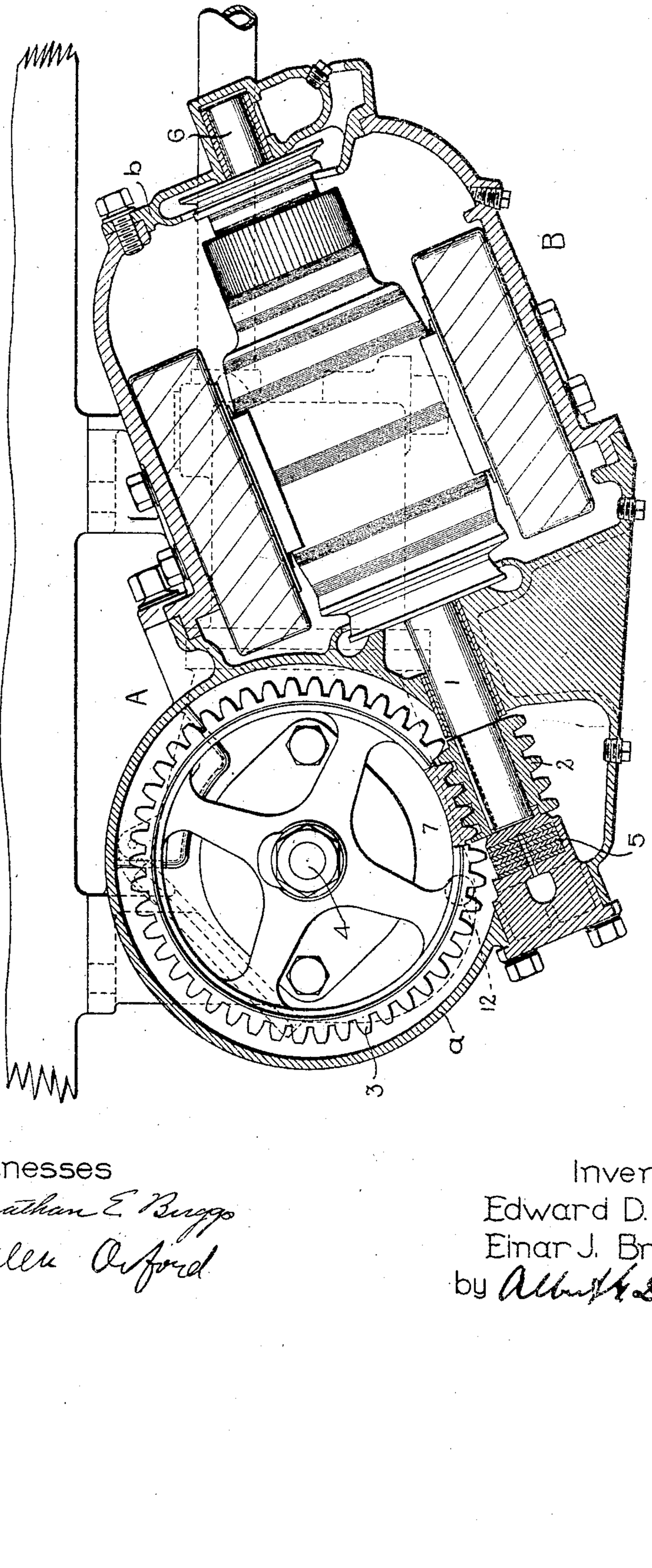

Fig. 2.

Witnesses
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UNITED STATES PATENT OFFICE.

EDWARD D. PRIEST AND EINAR J. BRING, OF SCHENECTADY, NEW YORK, ASSIGNORS TO GENERAL ELECTRIC COMPANY, A CORPORATION OF NEW YORK.

MOTOR-DRIVEN AIR-COMPRESSOR.

No. 863,556. Specification of Letters Patent. Patented Aug. 13, 1907.

Application filed November 26, 1904. Serial No. 234,378.

To all whom it may concern:

Be it known that we, EDWARD D. PRIEST, a citizen of the United States, and EINAR J. BRING, a subject of the King of Sweden and Norway, both residing at Schenectady, county of Schenectady, State of New York, have invented certain new and useful Improvements in Motor-Driven Air-Compressors, of which the following is a specification.

The present invention relates to motor driven air compressors or pumps.

Particular attention must be given to the design of units of this character in order to render them as compact as possible where they are employed upon railway cars or in other situations affording but little space for their reception; and where the motor is geared to the compressor or pump in order to cause the compressor to be driven at a considerably lower speed than the speed of the motor the difficulty of securing compactness is increased.

One of the objects of the present invention is to so arrange the motor relatively to the compressor that they are encompassed within a minimum space.

In compressors of any character it is impracticable to expel all of the compressed air from the cylinder or cylinders at the end of the stroke of the piston and consequently at the instant the operating crank of the compressor passes the center and the piston is at the end of its compressing stroke, the pressure of the fluid is exerted, not in opposition to the motor as before, but in unison therewith. Therefore, if the connection between the motor and the compressor consists for example, of worm gearing, and the motor shaft possesses any material axial play, this sudden reversal of the relative directions of pressure between the compressed fluid and the motor will tend to shift the motor shaft forcibly from one extreme position to the other, thereby producing a noisy and injurious hammer blow. This blow will of course be repeated when the back pressure upon the piston has been diminished sufficiently to enable the worm to again overhaul the teeth of the worm wheel; making two such blows during each cycle of the piston.

In one of its aspects the present invention contemplates means for preventing the occurrence of noisy blows due to the reversal of the relative pressure between the fluid within the compressor cylinder and the motor.

Further objects of the present invention will be apparent from the following description of one embodiment thereof.

In the accompanying drawings, Figure 1 shows in perspective a compressor arranged in accordance with the present invention; Fig. 2 is a transverse section showing the crank shaft and driving gearing; and Fig. 3 is a longitudinal section showing the location of the motor.

Similar reference characters will be used throughout the specification and drawings to indicate corresponding parts.

The air compressor and motor may be of any usual or preferred types, since the details thereof form no part of the present invention.

A is the air-compressor and B the motor. The shaft 1 of the motor is provided with a worm 2 which meshes with a worm wheel 3 connected directly with the crank-shaft 4 of the air compressor. The relative proportions of the worm and worm-wheel are such that the actual speeds of the motor and the compressor may be the most efficient. Since the most efficient speed for the motor is much higher than the most efficient speed of the compressor, a comparatively large worm wheel is required, causing a considerable displacement of the point of application of the driving force from the axis of the crank-shaft. In order to limit the extreme dimensions as much as possible the shaft of the motor is arranged at an incline with respect to the axis of the compressor cylinder or cylinders *c c*, the inclination being such that the motor casing *b* does not project to any great extent beyond the top or bottom of the casing *a* containing the worm-wheel and the crank-shaft. The lower end of the motor shaft 1 is seated upon a thrust bearing 5 of any suitable character and the upper end within a bearing 6. By this arrangement the compressor is arranged in a compact form and may be supported beneath a car body, as indicated in Fig. 3, with the cylinders horizontal without bringing any portion too near the ground. Furthermore by placing the motor shaft upon an incline, the back pressure of the fluid is opposed by the weight of the motor armature and, in order to move the motor shaft axially when the crank-shaft passes the center, the back pressure must be great enough to lift the armature and shaft of the motor,—a condition which may readily be prevented.

A partition 7 divides the interior of the casing *a* into two chambers, 8 and 9, within which are arranged the crank-shaft and the worm gearing, respectively. Within the chamber 9, and near the top thereof, there is provided a receptacle 10 which projects beneath the rim of the worm-wheel, while in the bottom of the chamber an oil well 11 is formed. In operation, well 11 is filled with lubricating oil which is carried upwardly by worm 2 to bearing 5 and to worm-wheel 3; and from the worm wheel some of the oil drops into receptacle 10 as the wheel revolves. The oil may be distributed by gravity from the receptacle to any point at which lubrication is required. As the lubricant drops from the moving parts into chamber 8 it flows back into well 11 through a hole 12 in partition 7. The inclination of the motor axis performs a further purpose: if the axis were horizontal, the lubricant

would be free to flow along the shaft and into the armature of the motor; but by raising the armature end of the shaft this is prevented.

By the present invention a compact and noiseless construction is obtained and one particularly adapted for use in street railway work where the vertical space within which the compressor must be placed is extremely limited.

Although one form of the present invention is illustrated in detail, we do not wish to limit the present invention to the details of construction shown, except to the extent indicated in the appended claims.

What we claim as new and desire to secure by Letters Patent of the United States, is,—

1. A motor driven air compressor comprising a casing, compressor cylinders and pistons, a crank shaft from which the pistons are driven, bearings for said crank shaft in said casing, a motor in said casing having its axis arranged at an angle to the axes of the cylinders, a worm wheel on the crank shaft, and a worm on the motor shaft meshing with the worm wheel, the angle at which the motor shaft and the axes of the cylinders are arranged being such that the back pressure of the compressor is opposed by the weight of the armature.

2. In a motor driven air compressor, a casing having lugs thereon by which it may be supported, compressor cylinders and pistons therein supported by said casing, a crank shaft from which the pistons are driven, journal bearings in said casing for supporting said crank shaft, a motor in said casing having its axis arranged at an angle to the axes of the cylinders, a worm wheel on said crank shaft, a worm on the motor shaft meshing with said worm wheel, the angle at which the motor shaft and axes of the cylinders are arranged being such that the back pressure of the compresso at the end of the stroke is opposed by the weight of the armature.

3. A motor driven air compressor comprising a casing, compressor cylinders and pistons mounted therein, a crank shaft from which the pistons are driven, a motor in said casing having its axis arranged at an angle to the axes of the cylinders, a worm wheel on the crank shaft, a worm on the motor shaft meshing with said worm wheel, a step bearing in which the lower end of the motor shaft rests, an oil chamber surrounding said worm, an oil receptacle adjacent the upper portion of said worm wheel with a passage leading from said receptacle to the step bearing whereby oil carried up by said worm wheel will irrigate said step bearing.

In witness whereof, we have hereunto set our hands this 25th day of November, 1904.

EDWARD D. PRIEST.
EINAR J. BRING.

Witnesses:
BENJAMIN B. HULL,
HELEN ORFORD.