

No. 704,914.

Patented July 15, 1902.

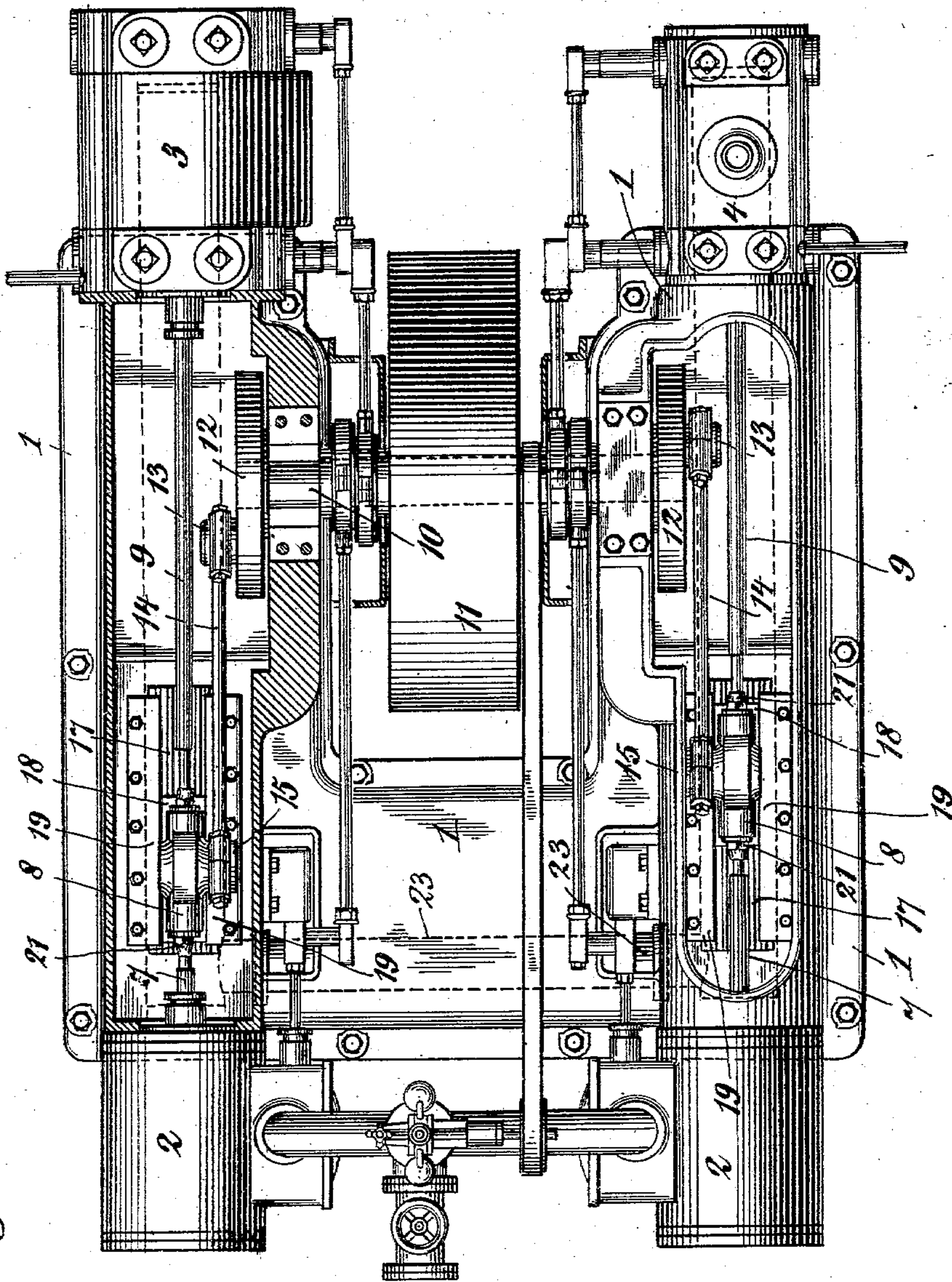
F. W. PARSONS.  
COMPRESSOR.

(Application filed Apr. 16, 1901.)

(No Model.)

2 Sheets—Sheet 1.

Fig. 1.



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2 Sheets—Sheet 2.

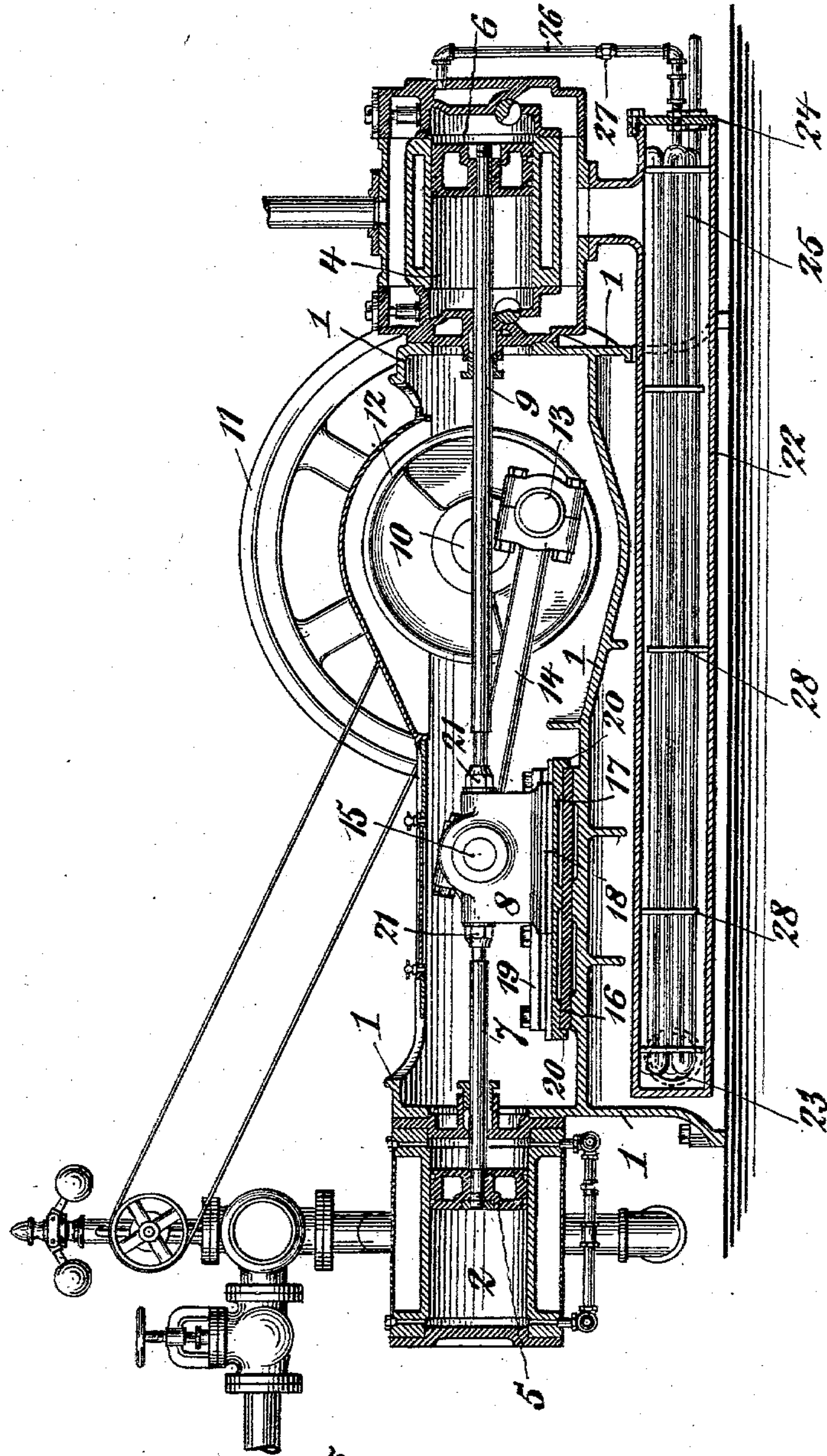


Fig. 2.

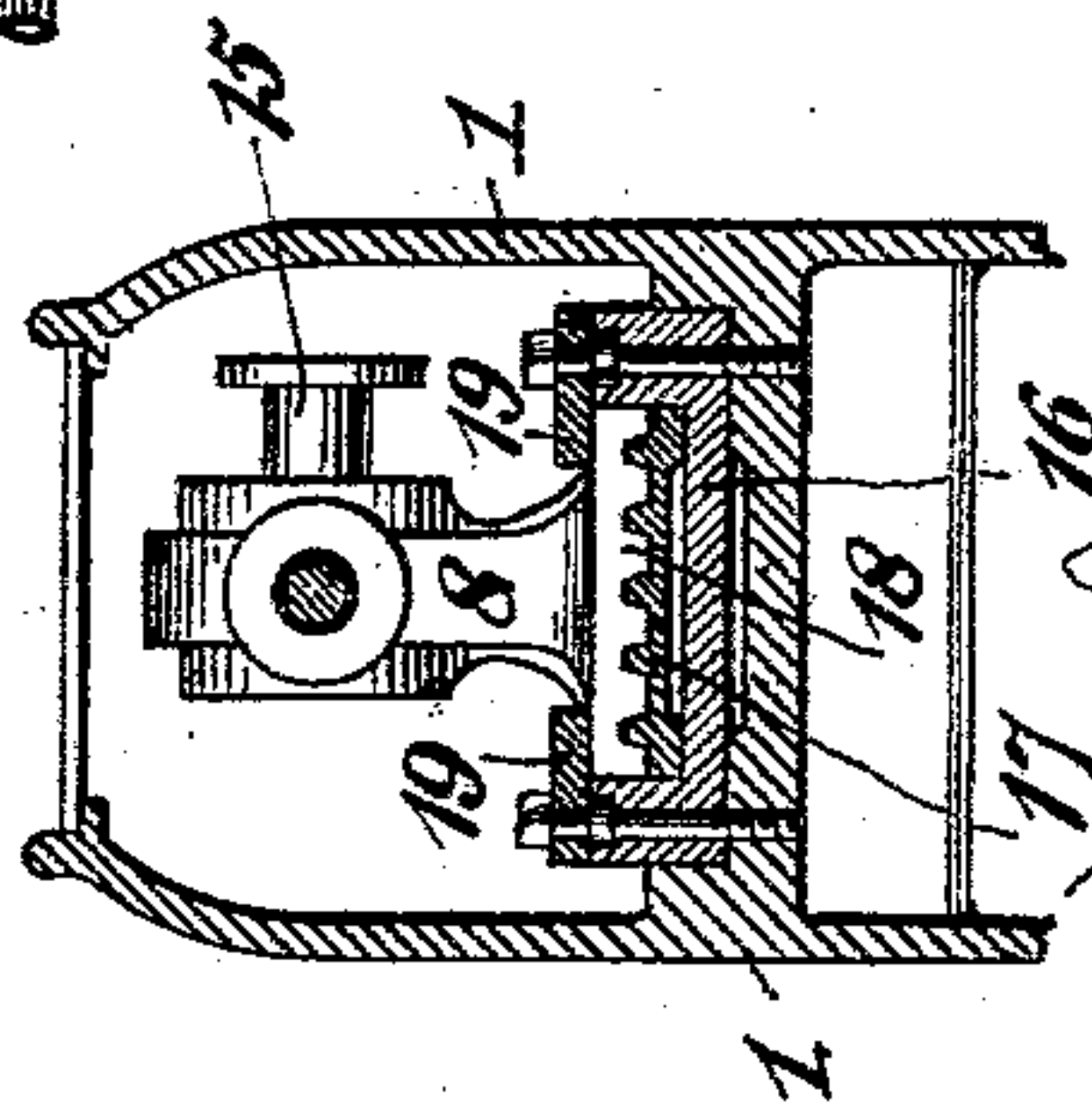


Fig. 3.

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# UNITED STATES PATENT OFFICE.

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## COMPRESSOR.

SPECIFICATION forming part of Letters Patent No. 704,914, dated July 15, 1902.

Application filed April 16, 1901. Serial No. 56,163. (No model.)

*To all whom it may concern:*

Be it known that I, FREDERICK W. PARSONS, a citizen of the United States of America, and a resident of Elmira, in the county of Chemung and State of New York, have invented certain new and useful Improvements in Compressors, of which the following is a specification, reference being had to the accompanying drawings, forming a part thereof.

My invention relates to fluid-compressors, and particularly to steam-actuated fluid-compressors; and it consists in the combination, with two power-cylinders arranged side by side, two compression-cylinders also arranged side by side and each in line with one of the said power-cylinders, pistons arranged in the said cylinders, piston-rods connecting the pistons in opposite cylinders, sliding cross-heads connected to said piston-rods, and a wrist-pin for each cross-head laterally projecting from the inner side thereof, of cross-head guides in which the said cross-heads are permitted to reciprocate and which have means independent of the connection of said cross-heads with their piston-rods for preventing torsional or lateral movement of the cross-heads, together with a transverse shaft mounted intermediate of all of said cylinders and provided with crank-pins and a fly-wheel and two connecting-rods connecting said crank-pins and wrist-pins.

My invention also consists in the provision of a combined bed-plate and duplex engine-frame formed in one piece and having a space in the center for the fly-wheel, the power-cylinders and compression-cylinders being secured to said bed-plate and engine-frame and overhanging same; and my invention also consists in the provision of an intercooler comprising two shells connected together at their inner ends and arranged longitudinally within the base beneath the compression-cylinders, the shells having caps at their outer ends upon the removal of which the circulating-pipes provided within the shells may be withdrawn therefrom.

My invention further consists in an improved form of sliding cross-head and guide therefor and in certain details of construction

thereof and combination of parts, as will hereinafter be more fully set forth.

The objects of my invention are generally to improve the construction of compressors of this type; to provide a simple form of power-compressor in which the power side thereof may be readily disconnected and the compressor thus converted into a belt-driven machine and in which the compression side of the apparatus may be disconnected from the engine, so that the engine may be employed for other work at such times as it is not desired to utilize the power for compressing air; to provide a base for the compressor which requires a minimum of floor-space, but which supports all parts of the apparatus, so that the entire apparatus is a self-contained integral structure; to so arrange the various parts of the apparatus that the weight shall as nearly as possible be balanced upon the base-plate; to improve the intercooler employed and to provide for the ready removal of the circulating-pipes therefrom, and to improve the cross-heads and guides, so that a single connecting-rod may be employed therewith out of line with the axes of the cylinders and operating at one side of the piston-rods in conjunction therewith.

My invention further consists in certain details of construction and combination of parts, as will be hereinafter more fully set forth, and other advantages will also more fully appear hereinafter.

I will now proceed to describe a compressor embodying my invention and will then point out the novel features in claims.

In the drawings forming a part of this specification, Figure 1 is a top view, partially in horizontal section, of a compressor embodying my invention. Fig. 2 is a longitudinal sectional elevation through one of the steam-cylinders and through the high-pressure compression-cylinder. Fig. 3 is a transverse sectional elevation through one of the cross-head guides, showing also an end view of one of the cross-heads.

In the embodiment of my invention illustrated in the drawings the combined bed-plate and duplex engine-frame is in one in-



tegral piece and is designated by the reference character 1. The said bed-plate 1 has a space at the center for receiving a fly-wheel. Steam-cylinders 2 2 are secured to the said bed-plate and engine-frame and overhang same at one end thereof. Compression-cylinders 3 and 4 are secured to the said bed-plate and engine-frame and overhang the other end thereof. The compression-cylinder 3 is shown herein as a low-pressure cylinder and the compression-cylinder 4 as a high-pressure cylinder, the compression-cylinders being compounded. It will of course be understood that, if desired, these cylinders may both be low-pressure cylinders, and, similarly, although the steam-cylinders 2 2 are herein illustrated as duplex high-pressure cylinders, they may be compounded. Each steam-cylinder is provided with a piston 5 and the compression-cylinders each with a piston 6. Piston-rods 7, connected to the pistons 5, connect each with a cross-head 8, and similar piston-rods 9, secured to the pistons 6 in the opposite compression-cylinders, are also connected with the said cross-heads. Opposite pistons 5 and 6 are hence connected together and to one of the sliding cross-heads 8, the two piston-rods connecting each pair of opposing pistons in effect constituting one piston-rod. A shaft 10 is mounted in suitable bearings upon the combined bed-plate and duplex engine-frame intermediate of all of the said cylinders, and a fly-wheel 11 is secured upon the said shaft within the space provided therefor in the said engine-frame and bed.

The shaft 10 carries two crank-disks 12, each provided with a crank-pin 13. Connecting-rods 14 are provided which are mounted at one end upon the said crank-pins 13 and at the other end upon wrist-pins 15, which project at the inner side of each of the said sliding cross-heads. By such arrangement the connecting-rods 14 will operate eccentrically of the axes of the cylinders, and by reason of the fact that the fly-wheel 11 is provided, from which power may be taken off or to which it may be applied, it is necessary that some means shall be provided independent of the connection of said cross-heads with their piston-rods for preventing torsional or lateral movement of the said cross-heads. I have provided such means in specially-constructed cross-heads and guides, which I will now proceed to describe. The cross-head guides comprise each a guide-block 16, which is securely bolted to the bed-plate, and a removable slipper 17, supported on such guide-block and held in place thereby, the said slipper being longitudinally tongued and adapted to receive a longitudinally-grooved shoe 18, with which the cross-head 8 is provided, and retaining-plates 19, adapted to retain the cross-head shoe in place in the said guide. The cross-heads therefore slide between upper, side, and lower bearing-surfaces of the

cross-head and are thus confined, so that any lateral stress upon the cross-head, such as may be produced by thrust through the connecting-rod, is resisted.

The retaining-plates 19 are held in place by means of bolts or nuts suitably provided, and the removable slipper 17 is held in place longitudinally on the bearing-block by overhanging lips 20, with which it is provided and which engage with the ends of the said bearing-block. Transversely in one direction the said slipper is held in place laterally by up-rising side walls of the guide-blocks 16, as will be readily understood by reference to Fig. 3, and in a direction at right angles thereto by fitting accurately between the longitudinally-tongued shoe of the cross-head and the base of the guide-block.

The slipper 17 is readily removable and replaceable when worn, and the cross-head guide just described forms an efficient means whereby free reciprocating movement of the cross-head is provided, but whereby any other movement is absolutely prevented independent of its connection with the piston-rods. The piston-rods 7 and 9 are removably secured to the said cross-heads, as by screw-threading them therein, and lock-nuts 21 serve to prevent accidental disconnection. If desired, either the piston-rods 7 or the piston-rods 9 may be disconnected from the said cross-heads, and the apparatus may be used as a belt-compressor or as an engine, or, if desired, the apparatus may be used as a compressor, while surplus power is at the same time taken off through a belt upon the fly-wheel 11.

The fly-wheel 11 may of course have gear-teeth thereon or other means provided whereby power may be taken therefrom or applied thereto, the term "fly-wheel" being used in a generic sense to include any form of power and balance wheel which may be employed.

My improved form of cross-heads and guides will permit power to be applied to or taken from the said fly-wheel without undue strain being put upon the piston-rods.

Suitable eccentrics are mounted upon the shaft 10 to operate the distributing-valves for the power-cylinders 2, and other eccentrics are provided for controlling the inlet-valves of the compression-cylinders 3 and 4.

The intercooler comprises two shells 22, which are connected the one to the discharge side of the low-pressure compression-cylinder 3 and the other to the intake side of the high-pressure compression-cylinder 4. The said shells 22 are arranged longitudinally within the bed plate or base and beneath the said compression-cylinders, and a transverse connection 23 connects the inner ends of the said shells 22 with each other. The outer ends of the said shells are provided with caps 24, which close the said ends, and a plurality of circulating-pipes 25 for circulating the cooling medium, as water, are provided in the



shells and may be readily withdrawn therefrom upon the removal of the caps 24. The circulating-pipes are connected with any suitable source of supply and for convenience  
5 may be connected with the water-jackets of the compression-cylinders through a pipe 26. In such case a union 27 may be provided which will readily permit the joint to be broken when it is desired to remove the circulating-pipes in a manner heretofore described.

Baffle-plates 28 may be provided within the shells 22 for the better circulation of the compressed fluid passing through the intercooler.

15 By the foregoing arrangement the intercooler is located in such a position as to be well out of the way, while at the same time the circulating-pipes therein are extremely accessible.

20 It is obvious, of course, that modifications of the construction and combination of parts herein set forth may be resorted to within the spirit and scope of my invention.

What I claim is—

25 1. In a fluid-compressor, the combination with two power-cylinders arranged side by side, two compression-cylinders also arranged side by side, and each in line with one of the power-cylinders, pistons for said cylinders,  
30 piston-rods connecting the pistons in opposite cylinders, and a sliding cross-head for each of said piston-rods, located between the corresponding cylinders, and each provided with an inwardly-projecting wrist-pin, of a  
35 cross-head guide for each of said cross-heads, having upper, side and lower bearing portions coacting with corresponding portions of its cross-head, whereby lateral stress upon the cross-head, in every direction, is resisted,  
40 a transverse crank-shaft intermediate of said cylinders, a fly-wheel thereon, and a connecting-rod connecting each said wrist-pin with said crank-shaft, said connecting-rods each arranged eccentrically of the axis of its corresponding pistons and piston-rod, and to have  
45 a path of movement to one side of the path of movement of the said piston-rod.

2. In a fluid-compressor, the combination with a suitable base, of a power-cylinder and  
50 a compression-cylinder arranged axially in line with each other, pistons within said cylinders, piston-rods connected to said pistons, a cross-head to which both said piston-rods are connected, said cross-head having a longitudinally-grooved shoe adapted to slide over  
55 a corresponding surface in a cross-head guide, of a cross-head guide comprising a longitudinally-tongued slipper adapted to receive the said cross-head shoe, and retaining-plates  
60 adapted to retain the said cross-head shoe in place; the said cross-head having a wrist-pin extending laterally upon one side thereof, and adapted to receive one end of a pitman or connecting-rod.

65 3. In a fluid-compressor, the combination with a suitable base, of a power-cylinder and

a compression-cylinder arranged axially in line with each other, pistons within said cylinders, piston-rods connected to said pistons, a cross-head having a longitudinally-grooved  
70 shoe adapted to slide over a corresponding surface in a cross-head guide, of a cross-head guide comprising a guide-block secured to the base, a removable slipper supported thereon, and held in place thereby, said slipper longitudinally tongued and adapted to receive the  
75 said cross-head, and retaining-plates to retain the said cross-head shoe in place; the said cross-head having a wrist-pin extending laterally upon one side thereof, and adapted  
80 to receive one end of a pitman or connecting-rod.

4. In a fluid-compressor, the combination with two power-cylinders arranged side by side, two compression-cylinders also arranged  
85 side by side, and each in line with one of the said power-cylinders, pistons arranged in said cylinders, piston-rods connecting the pistons in opposite cylinders, cross-heads connected to said piston-rods, and a wrist-pin, for each  
90 cross-head, laterally projecting from the inner side thereof, said cross-heads having each a longitudinally-grooved shoe adapted to slide over a corresponding surface in a cross-head guide, of cross-head guides each comprising  
95 a longitudinally-tongued slipper adapted to receive one of the said cross-head shoes, and retaining-plates adapted to retain the said cross-head shoe in place, a transverse shaft mounted intermediate of all of said cylinders,  
100 and in the plane of the piston-rods, and provided with crank-pins, a fly-wheel upon said shaft, and two connecting-rods, connecting said crank-pins and wrist-pins.

5. In a fluid-compressor, the combination  
105 with two power-cylinders arranged side by side, two compression-cylinders also arranged side by side, and each in line with one of the power-cylinders, pistons for said cylinders, sectional piston-rods connecting the pistons  
110 in opposite cylinders, one section of each such piston-rods being connected to one of said pistons, and the sections of said piston-rods being separable from each other, and a cross-head for each such piston-rod, located between the corresponding cylinders, and each  
115 provided with an inwardly-projecting wrist-pin, of a cross-head guide for each of said cross-heads having means for resisting lateral stress upon the cross-head, a transverse  
120 crank-shaft, intermediate of said cylinders, a fly-wheel thereon, and a connecting-rod connecting each said wrist-pin with said crank-shaft, said connecting-rods each arranged eccentrically of the axis of its corresponding pistons and piston-rod, and to have a path of  
125 movement to one side of the path of movement of the said piston-rod.

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Witnesses:

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