May 20, 1941. J. NAAB 2,242,368

COMPRESSOR

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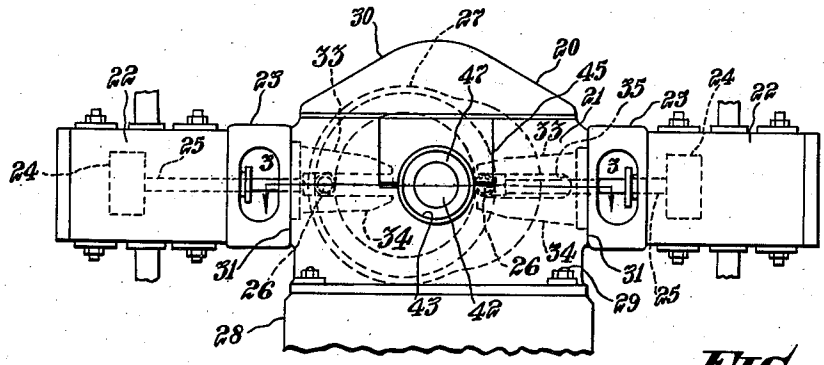


FIG.-1.

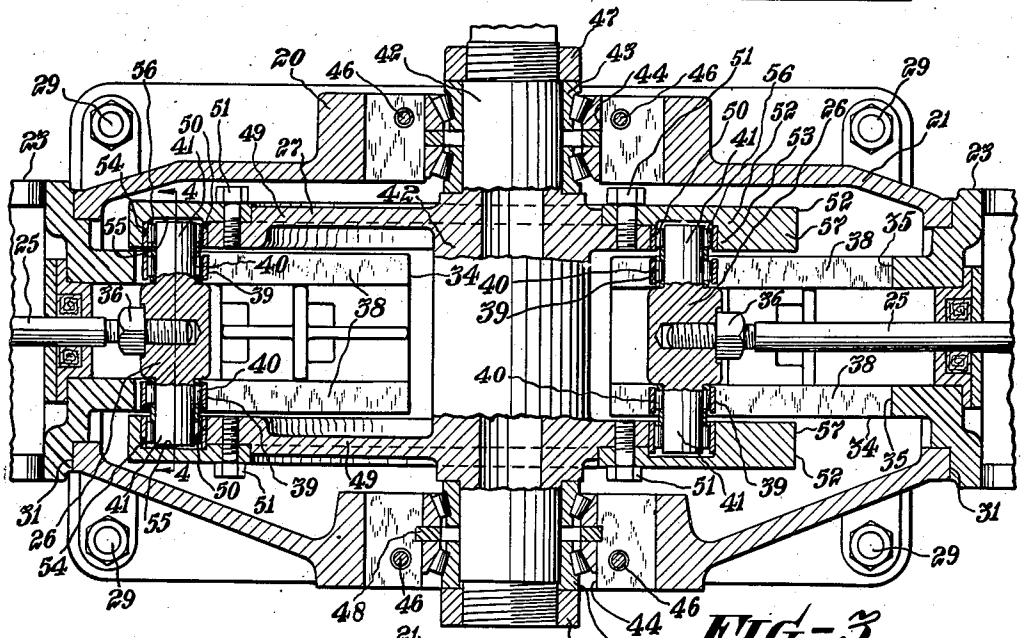


FIG.-3.

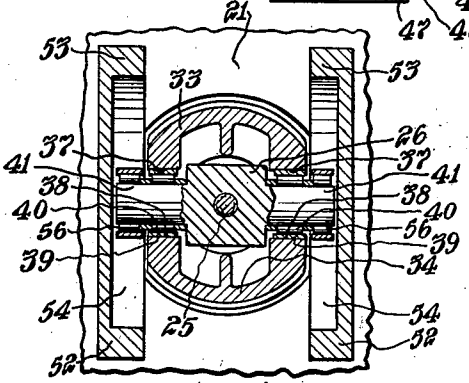


FIG.-4.

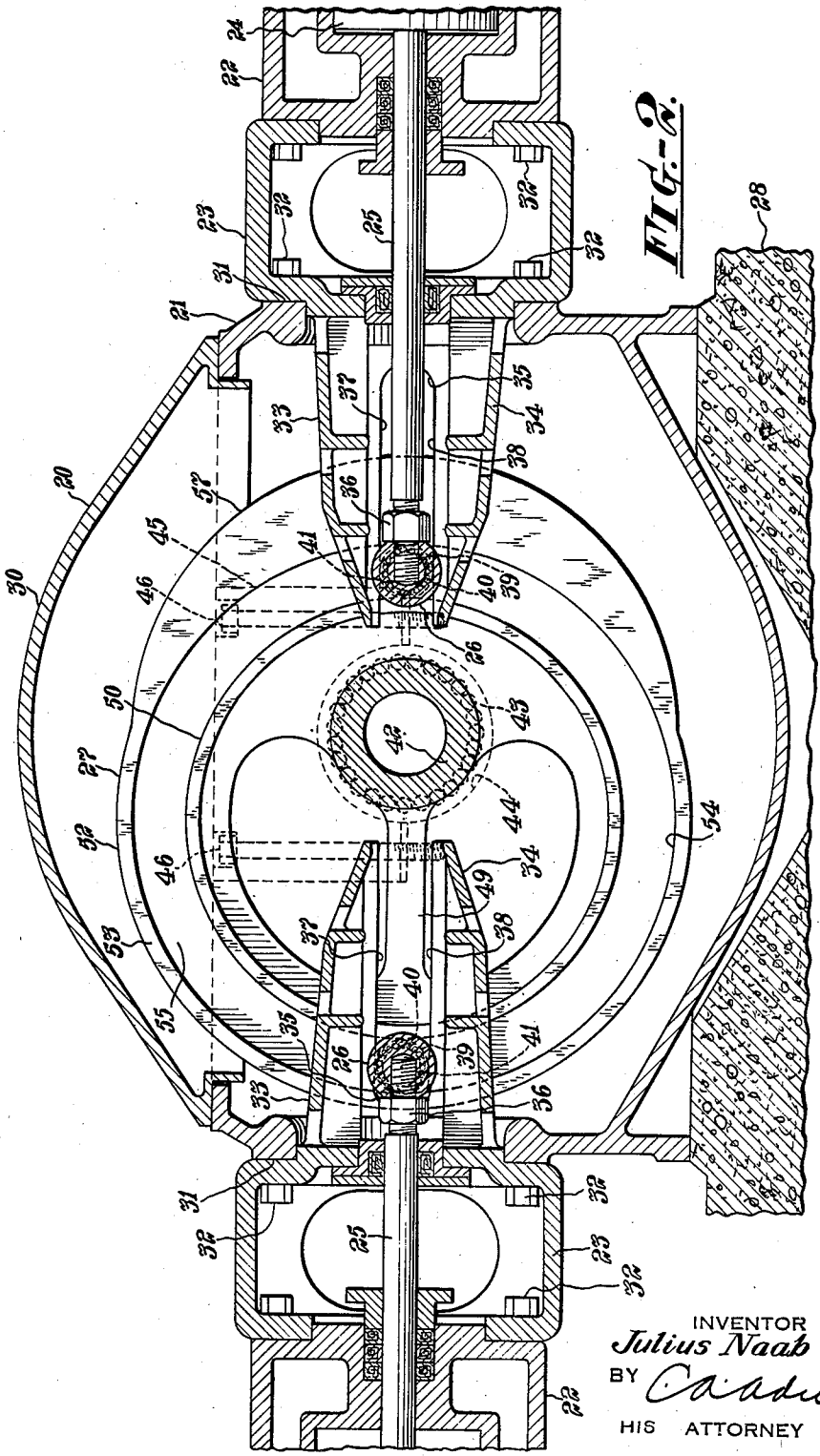
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COMPRESSOR

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FIG. 2.



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UNITED STATES PATENT OFFICE

2,242,368

COMPRESSOR

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Application July 11, 1939, Serial No. 283,834

7 Claims. (Cl. 230—217)

This invention relates to pumping mechanisms, and more particularly to a compressor of the reciprocatory piston type in which the cylinders containing the pistons may be conveniently arranged in radial fashion to be driven by a single rotary driving element.

A few of the objects of the invention are to assure a compact structure that may be operated with a minimum of friction between the driving elements and of which the parts are readily accessible for inspection and repairs.

Other objects will be in part obvious and in part pointed out hereinafter.

In the drawings accompanying this specification and in which similar reference numerals refer to similar parts,

Figure 1 is a side elevation of a compressor constructed in accordance with the practice of the invention,

Figure 2 is an elevation, in section, showing the interior of the casing of the compressor and fragmentary portions of the compressing elements,

Figure 3 is a plan view, in section, taken through Figure 1 on the line 3—3, and

Figure 4 is a transverse view taken through Figure 3 on the line 4—4.

Referring to the drawings, and at first more particularly to Figure 1, 20 designates the compressor in its entirety and 21 a main casing carrying on opposite sides thereof cylinders 22 and distance pieces 23 interposed between the casing 21 and the cylinders.

Each cylinder contains a piston 24, having a piston rod 25 which is connected, by means of a crosshead 26, to a driving element 27, within the casing 21, for actuating the piston 24.

The casing 21, which rests upon a foundation 28 and is secured thereto by bolts 29, has a cover 30 on its top to admit of ready access to the driving element 27. At the opposite ends of the casing are seating surfaces 31 for the distance pieces 23 and bolts 32 serve to secure the distance pieces to the casing 21 and the cylinders 22 to the distance pieces.

In the form of the invention illustrated, the axes of the cylinders, arranged on opposite sides of the casing 21, are in coincidence and extend through the axis of the driving element 27. In order to avoid deflection of the free ends of the rod 25, each distance piece 23 is provided with a pair of arms 33 and 34 which extend into the casing 21 to guide the crossheads 26. The arms 33 and 34 lie, respectively, above and below the crossheads and define slots 35 on opposite sides of the rod 25 to receive the crossheads which, in the present instance, are threadedly connected to the ends of the rods 25 and locked in position by nuts 36 threaded on the rods 25.

The upper and lower surfaces of the slots 35 constitute guiding surfaces 37 and 38, respectively, for roller sleeves 39 encasing groups of rollers 40 arranged about the projecting ends of trunnions 41 of the crossheads. The space between the surfaces 37 and 38 is preferably only slightly greater than the diameter of the roller sleeve so that the latter may roll along one surface 37 or 38 with only a slight degree of clearance between itself and the opposite guiding surface. This clearance need only be sufficient to avoid simultaneous contact of the roller sleeve 39 with both guilding surfaces 37 and 38.

The driving element 27 comprises a rotary shaft 42 which extends transversely through the casing and has anti-friction thrust bearings 43 seated in recesses 44 in the casing and secured in position by a cap 45 and bolts 46 extending through the cap and threaded into the casing. The anti-friction bearings 43 are held in the correct assembled relationship upon the shaft 42 by nuts 47 threaded on the shaft and, in order to prevent endwise thrust of the shaft and the bearings 43 with respect to the casing, a ring 48 is interposed between the outer races of one of the anti-friction bearings 43 and partly embedded in the wall defining the recess 44.

On the portion of the shaft 42 lying between the bearings 43 are a pair of webs 49 having cylindrical surfaces 50 on their peripheries located eccentrically with respect to the shaft. On the outer sides of the webs 49 are secured, as by bolts 51, rings 52 having flange portions 53 that encircle the surfaces 50 and the inner surfaces 54 of the flanges are spaced equi-distantly from the surfaces 50 and cooperate therewith to define annular grooves 55 adjacent the outer sides of the slots 35 to receive the ends of the trunnions 41. The grooves 55 are of such depth that there is ample clearance between the bottoms thereof and the ends of the trunnions 41, and on the trunnions are anti-friction bearings 56 to minimize friction between the crossheads 26 and the driving element.

The outer races of the bearings 56 fit loosely in the grooves 55 to assure contact of the outer races with only one of the surfaces 50 or 54 at a time. This clearance, however, is only very slight in order to enable the outer races of the bearings 56 to be quickly shifted out of and into contacting relation from one bearing sur-

face to another of the grooves **55** at the instant of reversal of the pistons **24**.

Preferably, weighted portions **57** are provided on the low sides of the rings **52** to assure a nice balance of the rotative element of the compressor. The weighted portions may be formed integrally with the rings, as shown, or as separate elements and suitably secured to the rings.

In the operation of the device, the rotary movement of the driving element **27** will cause the pistons **24** to be reciprocated in the cylinders **22** for drawing fluid medium into the cylinders and compressing it. Thus, in the position of the driving element and the pistons shown in Figure 2 of the drawings, the anti-friction bearings on the crosshead of the left hand piston will roll upon the surfaces **54** and the bearings **56** associated with the right hand piston will bear upon the inner surface **50** of the annular grooves. Hence, if the driving element rotates, say in a clockwise direction, the left hand piston will be drawn toward the shaft **42** and the opposite hand piston **24** will be thrust outwardly.

The pistons will continue to move in these directions through one half the revolution of the driving element and when the driving element has reached a position in which the initial contacting portions of the guiding surfaces with the bearings **56** have been reversed, and at which time the pistons will be in their other extreme positions, the loads will be transferred from one driving surface to the other of the annular grooves. More specifically, the outer race of the anti-friction bearing on the crosshead carried by the left hand piston will seat against the surface **50** and will roll upon said surface during the following half revolution of the driving element and the corresponding element of the right hand piston will then bear against the surface **54** to return said piston to its initial position.

During these movements of the pistons the roller sleeves **39** will roll along either the surfaces **37** or **38**, accordingly as the load is shifted from one driving surface to the other of the grooves **55** and, by reason of the slight clearance between the roller sleeves **39** and the surfaces of the slots **35**, only a very slight degree of deflection of the rods is caused at the instant the load is shifted from one driving surface to the other.

I claim:

1. A compressor, comprising a stationary casing, a cylinder on the exterior of and supported only by the casing, a reciprocatory piston in the cylinder having a crosshead, a guide on the casing for the crosshead extending into the casing, and a rotary member in the casing for actuating the piston and having an annular way eccentric to the axis of rotation of the member to receive the crosshead.

2. A compressor, comprising a stationary casing, a cylinder on the exterior of and supported only by the casing, a reciprocatory piston in the cylinder having a crosshead, a guide on the casing extending into the casing and having opposed guiding surfaces for the crosshead, and a rotary member in the casing having an annular way eccentric to the axis of rotation of the member to slidably receive the crosshead.

3. A compressor, comprising a stationary casing, a cylinder on the exterior of and supported only by the casing, a reciprocatory piston in the cylinder having a crosshead, a guide on the casing for the crosshead extending into the casing and having opposed guiding surfaces, an anti-friction bearing on the crosshead rotatable along the guiding surfaces, a rotary member for driving the piston having an annular way eccentric to the axis of rotation of the member, and an anti-friction bearing on the crosshead lying within the annular way.

4. A compressor, comprising a stationary casing, a cylinder on the exterior of and supported only by the casing, a reciprocatory piston, a crosshead for the piston, guide means on and extending into the casing presenting pairs of opposed guiding surfaces for the crosshead, and rotary means for driving the piston having annular ways eccentric to the axis of rotation of the rotary means to receive the end portions of the crosshead.

5. A compressor, comprising a stationary casing, a cylinder on the exterior of and supported only by the casing, a reciprocatory piston, a crosshead for the piston, guide means on and extending into the casing presenting opposed pairs of guiding surfaces for the crosshead, and rotary means for driving the piston having annular ways on the opposite sides of the guide means and eccentric to the axis of rotation of the rotary means to receive the end portions of the crosshead.

6. A compressor, comprising a stationary casing, a cylinder on the exterior of and supported only by the casing, a piston in the cylinder having a rod, a crosshead on the rod, guide means in the casing for the crosshead having pairs of opposed guiding surfaces, means for securing the guide means to the casing, trunnions on the crosshead extending between the pairs of guiding surfaces and having ends projecting beyond the guiding surfaces, anti-friction bearings on the trunnions rotatable along the guiding surfaces, rotary means for driving the piston having annular ways eccentric to the axis of rotation of the rotary means, and anti-friction bearings on the ends of the trunnion lying within the annular ways.

7. A compressor, comprising a casing, a rotary shaft therein, a plurality of cylinders on the exterior of the casing arranged in radial fashion with respect to the shaft, reciprocatory pistons in the cylinders, crossheads for the pistons, a plurality of guide means in the casing terminating near the shaft and each guide means having opposed pairs of guiding surfaces on opposite sides of the axes of the pistons, means for securing the guide means to the casing, and means on the shaft rotatable on the opposite sides of the guide means and having annular ways eccentric to the axis of the shaft to receive the ends of the crossheads.

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