No. 632,756. Patented Sept. 12, 1899.

C. F. & H. L. SCHNEIDER.

FLUID COMPRESSOR.

(Application filed Mar. 17, 1898.)

(No Model.) 4 Sheets—Sheet 1.

FIG. 1.

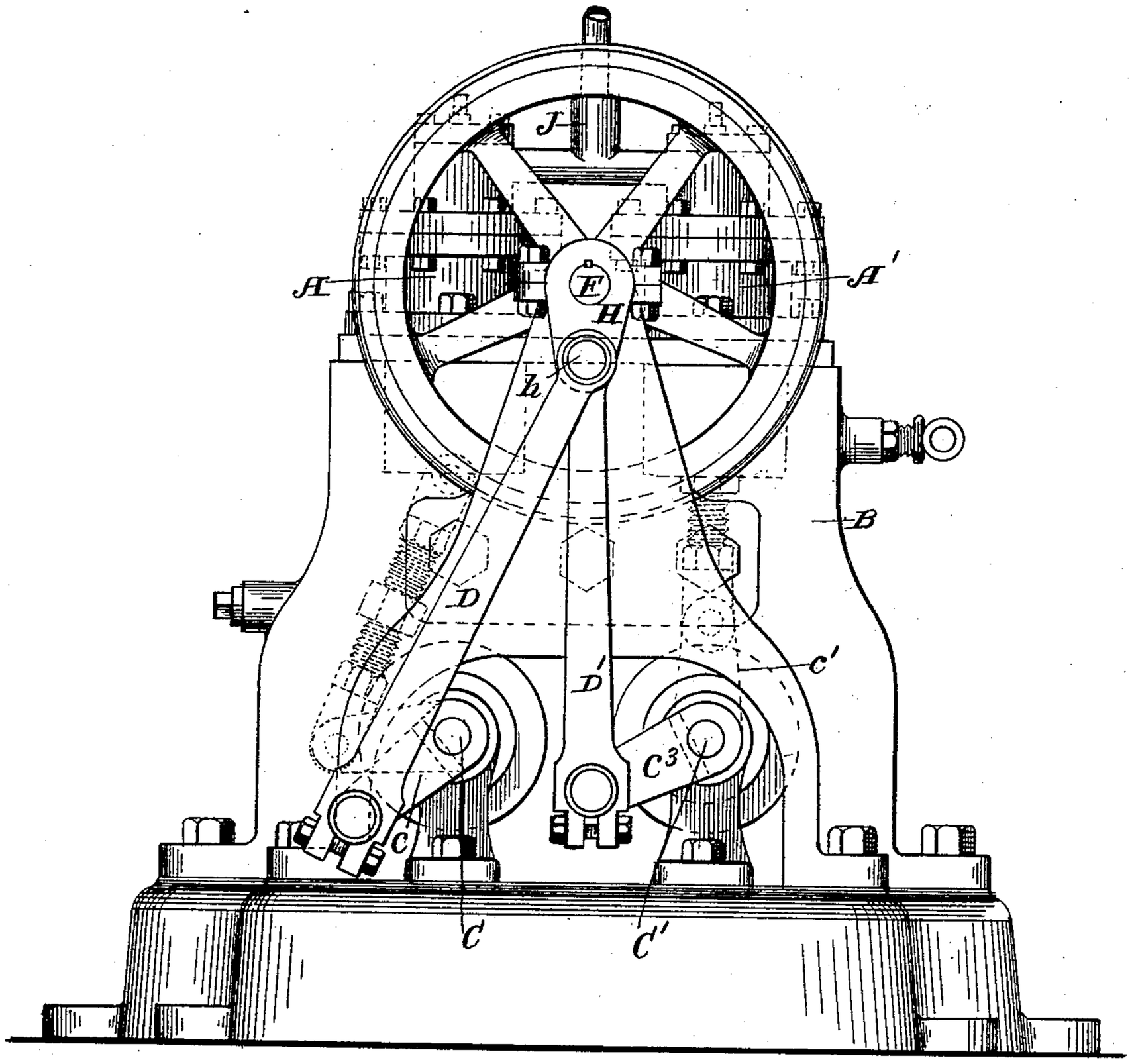

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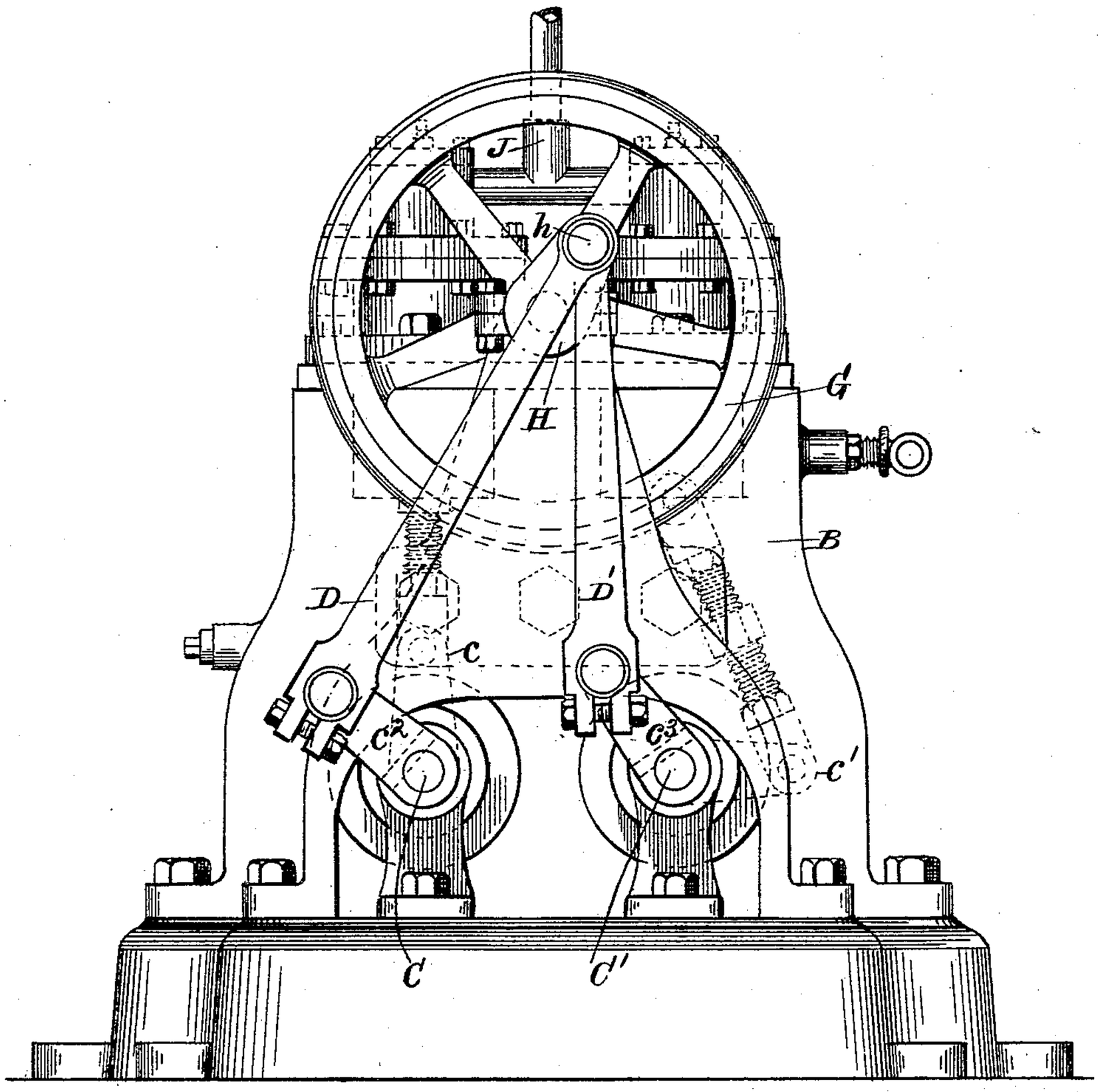
FIG. II.



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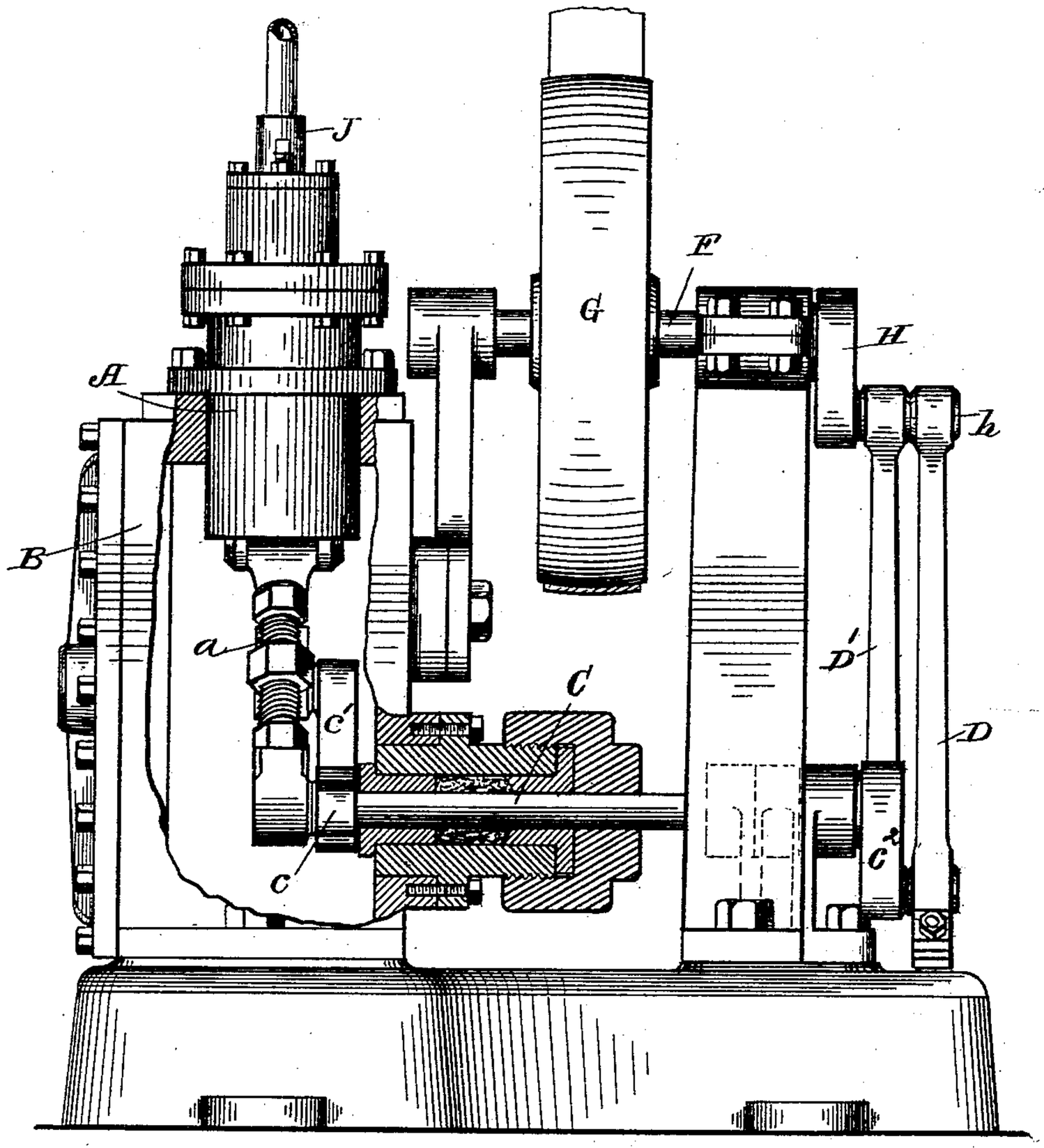
(No Model.) 4 Sheets—Sheet 3.

FIG. III



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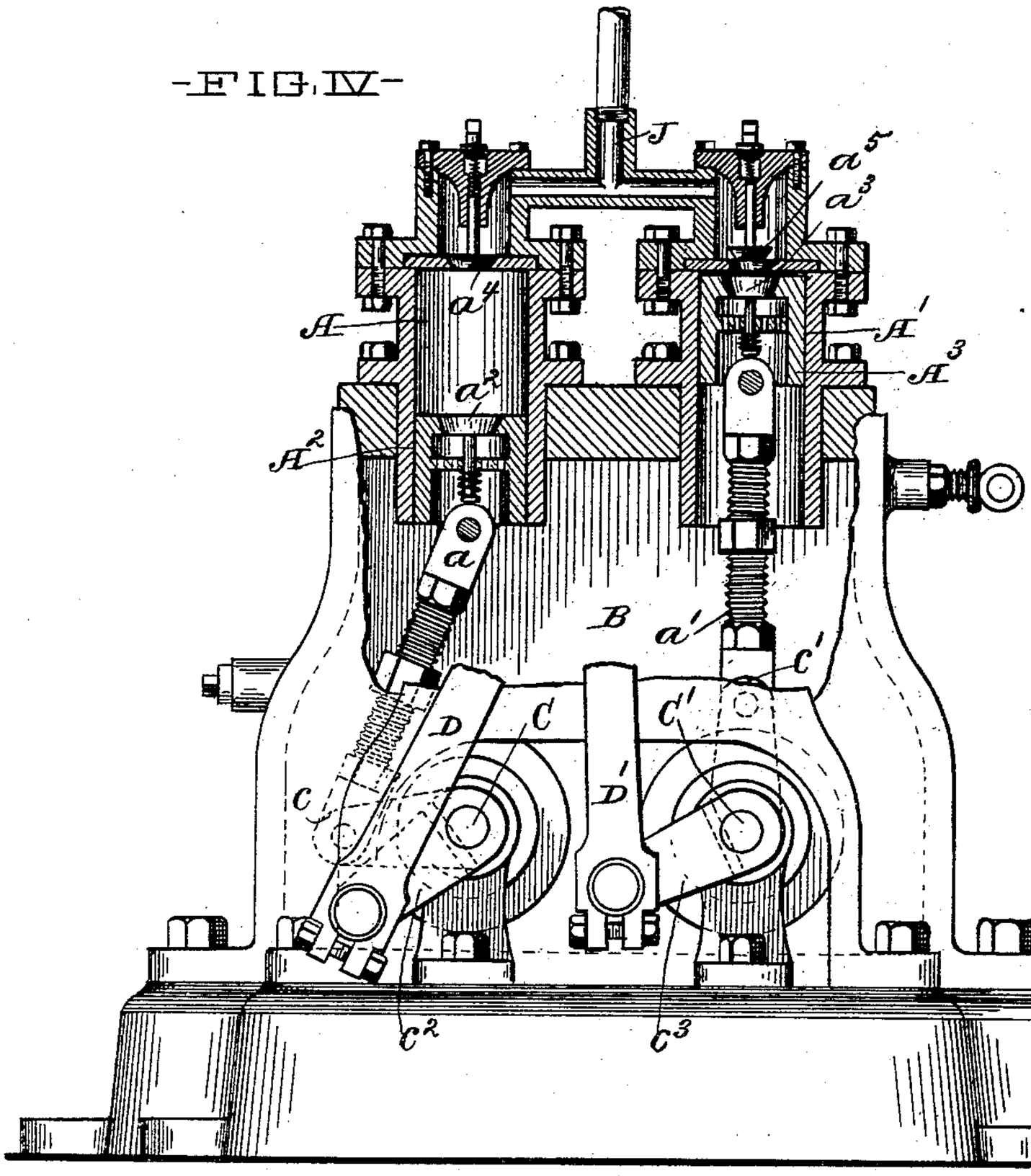
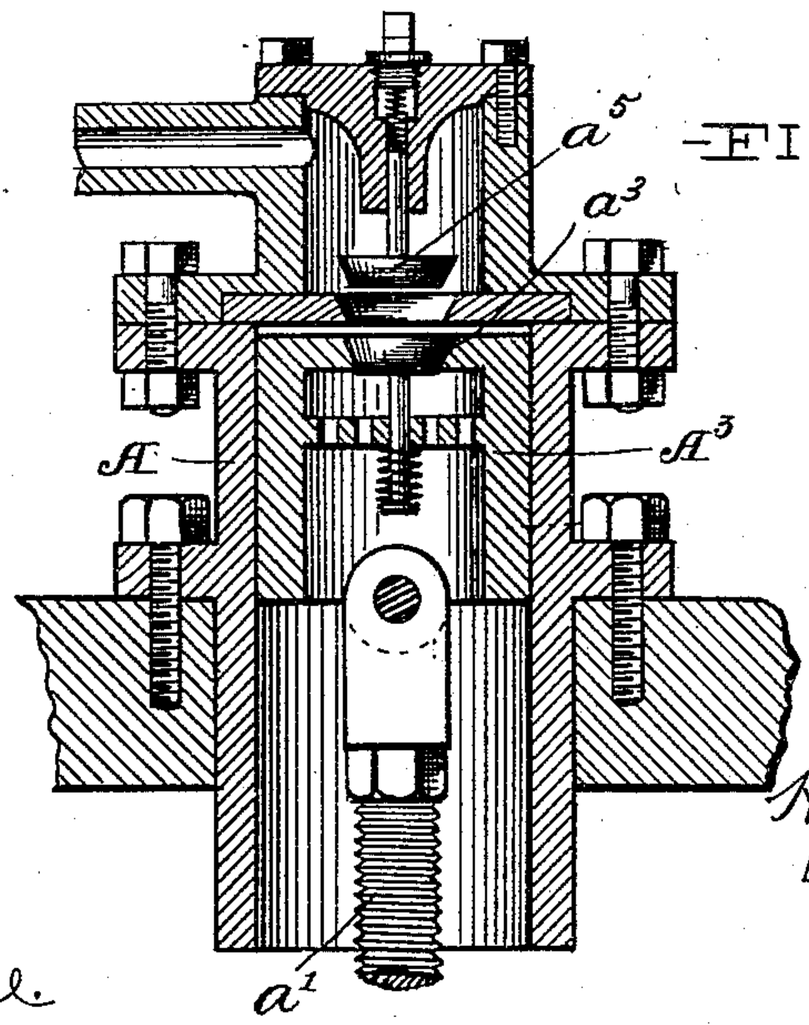
-FIG. IV-



-FIG. V-



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UNITED STATES PATENT OFFICE.

CARL F. SCHNEIDER AND HOMER L. SCHNEIDER, OF CLEVELAND, OHIO; SAID CARL F. SCHNEIDER ASSIGNOR OF HIS RIGHT AND SAID HOMER L. SCHNEIDER ASSIGNOR OF ONE-HALF OF HIS RIGHT TO ALEXANDER E. WILLIAMS, OF SAME PLACE.

FLUID-COMPRESSOR.

SPECIFICATION forming part of Letters Patent No. 632,756, dated September 12, 1899.

Application filed March 17, 1898. Serial No. 674,164. (No model.)

To all whom it may concern:

Be it known that we, CARL F. SCHNEIDER and HOMER L. SCHNEIDER, citizens of the United States, and residents of Cleveland, county of Cuyahoga, and State of Ohio, have invented a new and useful Improvement in Fluid-Compressors, of which the following is a specification, the principle of the invention being herein explained and the best mode in which we have contemplated applying that principle so as to distinguish it from other inventions.

The annexed drawings and the following description set forth in detail certain mechanism embodying the invention, such disclosed means constituting but one of various mechanical forms in which the principle of the invention may be used.

In said annexed drawings, Figure I represents a front elevation of our improved compressor as applied to a refrigerating-plant. Fig. II represents a front elevation illustrating the relation of the parts in a second position. Fig. III represents a broken side elevation showing one of the shaft-bearings in vertical longitudinal cross-section. Fig. IV represents a broken front elevation showing a vertical cross-section of the cylinders and their pistons and valve, said section taken upon a plane determined by the cylinder-axes; and Fig. V represents an enlarged detail vertical central cross-sectional view of one cylinder, showing portions thereof in elevation.

Two parallel pumping-cylinders A and A′ for pumping the ammonia-gas are mounted in the upper part of a sealed ammonia-receiver B, Figs. III and IV. Two parallel shafts C and C′ are each journaled in suitable packed bearings D, secured in the front wall *b* of the receiver B. The inner end of each shaft is provided with a crank *c* and *c*′, respectively, each journaled in the end of one of the connecting-rods *a* and *a*′, each of which latter is connected with one of the pistons A^2 and A^3. Each outer end of each shaft is provided with a crank c^2 and c^3, respectively, whose crank-pins are each journaled in the end of a pitman D and D′, respectively, Figs. I and II. A shaft F, parallel with shafts C and C′, is journaled in suitable bearings and has secured to it a driving-pulley G. The outer end of the shaft has secured to it a driving-crank H, provided with a long crank-pin *h*, which is journaled in the upper end of each of the pitmen D and D′, Fig. III.

Each piston A^4 and A^5 is provided with a valve a^2 and a^3, respectively, opening upwardly and establishing communication between the piston-chamber between the upper end of the cylinder and the piston. Each cylinder is provided with an outlet-valve a^4 and a^5, respectively, opening upwardly and establishing communication with said cylinder-chamber and outlet J, Fig. IV, communicating with the refrigerating system. Each valve is held seated by means of a suitable spring.

The machine operates as follows: The driving-pulley is driven by means of a suitable belt and rotates the driving-shaft and the driving-crank H. The lengths of the pitmen D and D′ and the cranks c^2 and c^3 are such that such rotation of the crank will effect the oscillation of said cranks c^2 and c^3, and hence also the oscillation of cranks *c* and *c*′. The lengths are further arranged so that when one pitman D′, as illustrated, is on the inner dead-center with respect to the driving-crank H said pitman and crank c^3 assume a right-angular position, as shown in Fig. I. By "right-angular position," we mean a position such that the angle formed by the pitman and crank c^3 will be from sixty to ninety degrees. While the crank end is traversing the arc between the angles of sixty and ninety degrees the variation of the effective lever-arm is so small as to be practically constant. Crank *a*′ at the opposite end of said shaft is angularly arranged relatively to the crank a^3 so that it will be at or near the point at which the piston is at the upper end of its stroke—that is, it will be at or near its inner dead-center. The greatest compression taking place at the upper end of the stroke of the piston A^3, it is seen that the operating pitman and cranks are in a position in which they are most advantageously situated to perform the work required at such point of greatest compression—that is, crank *c*′ and connecting-rod *a*′

form a toggle capable of exerting great pressure with a small amount of power applied. Crank c^3 and pitman D′ being substantially at right angles are in the position in which the greatest amount of leverage is obtained in its arc of oscillation, and driving-crank H and pitman D′ form a toggle also capable of exerting great force by the application of a small amount of power. The above arrangement hence is one in which the points of great compression in cylinder A^3 are passed by the application of a small amount of power. The lengths of crank c^2 and pitman D and the angular relationship of cranks c and c^2 are such that when the parts are in the positions shown in Fig. I the piston A^2 is traversing the downward part of its stroke, during which the driving power is acting only against the pressure of the ammonia-gas in the receiver B, said pressure being comparatively small, and also against the spring actuating the piston-valve a^2, which is opened during said downward stroke, thus reducing the pressure against which the piston is acting. Consequently the resistance of said piston on its downward stroke is comparatively small. The lengths of the crank c^2 and pitman D and the angular relationship of cranks c and c^2 are further such that when pitman D is at its outer dead-center it forms an angle of substantially ninety degrees with crank c^2 and crank c is at or near its inner dead-center, at which point piston A^2 is at the upper end of its stroke, the relation of the various parts in such position being illustrated in Fig. II. Piston A^3 has just begun its upward stroke at this point, and hence the resistance offered by it is small. The above-described arrangement is hence productive of very economical results, as the leverage increases as the pressure in each cylinder increases until the outlet-valves open and the compressed gas passes out of the cylinders, and the power-arm of the levers being so great at these points and increasing rapidly as the pressure increases a comparatively small amount of power is required to pass the point of greatest compression.

Other modes of applying the principle of our invention may be employed instead of the one explained, change being made as regards the mechanism herein disclosed, provided the means covered by any one of the following claims be employed.

We therefore particularly point out and distinctly claim as our invention—

1. In a compressor, the combination of two parallel cylinders, two shafts for actuating the cylinder-pistons, two pitmen for operating said shafts, and a driving-crank, said crank journaled on one end of each pitman, substantially as set forth.

2. In a compressor, the combination of two parallel cylinders, two shafts each provided at each end with a crank, a connecting-rod for driving each of the cylinder-pistons, a crank being journaled in one end of each of said connecting-rods, two pitmen, and a driving-crank, a crank being journaled in one end of each of said pitmen, said driving-crank journaled in the other end of each of said pitmen, substantially as set forth.

3. In a compressor, the combination of two parallel cylinders, two shafts provided at each end with a crank, a connecting-rod for driving each of the cylinder-pistons, a crank being journaled in one end of each of said rods, two pitmen, and a rotating driving-crank, a crank being journaled in the one end of each of said pitmen, said driving-crank being journaled in the other ends of said pitmen, the lengths of the cranks journaled in the pitman ends being such as to cause said shaft to oscillate on the rotation of said driving-crank, substantially as set forth.

4. In a compressor, the combination of two shafts each provided at one end with a crank, a driving-crank, and two pitmen, each crank provided with a journal, each shaft-crank journal bearing in one end of one of said pitmen, the journal of said driving-crank bearing in the other ends of both pitmen, the lengths of said crank and pitmen being such that each shaft-crank assumes with its respective pitman when the latter is on a dead-center with respect to said driving-crank, an angle of from sixty to ninety degrees, substantially as set forth.

5. In a compressor, the combination of two shafts each provided at one end with a crank, a driving-crank and two pitmen, each crank provided with a journal, each shaft-crank journal bearing in one end of said pitmen, the journal of said driving-crank bearing in the other ends of both pitmen, the length of the cranks and pitmen being such that one crank assumes an angle of from sixty to ninety degrees with its respective pitman when on its outer dead-center with respect to said driving-crank, the other crank assuming a similar position when its respective pitman is on its inner dead-center with respect to said driving-crank, substantially as set forth.

6. In a compressor, the combination of two compressor-cylinders, two shafts each provided at each end with a crank, a driving-crank, and two pitmen, two of said shaft-cranks each connected with an end of a pitman, the driving-crank connected with the opposite ends of said pitmen, the shaft-cranks on the other ends of said shafts each connected with a compressor-cylinder connecting-rod, the length of said cranks, pitmen and connecting-rods being such that each pitman shaft-crank assumes an angle of from sixty to ninety degrees with its respective pitman when latter is on a dead-center with respect to said driving-crank, the connecting-rod crank on the same shaft being at the same time at or near its inner dead-center, substantially as set forth.

7. In a compressor, the combination of two compressor-cylinders, two shafts each provided at each end with a crank, a driving-

crank and two pitmen, two of said shaft-cranks each connected with an end of a pitman, the driving-crank connected with the opposite ends of said pitmen, the shaft-cranks on the other end of said shafts each connected with a compressor-cylinder connecting-rod, the lengths of said cranks, pitmen and connecting-rods being such that one pitman shaft-crank assumes an angle of from sixty to ninety degrees with its respective pitman on the outer dead-center with respect to the driving-crank, the other pitman-crank forming a similar angle when its respective pitman is on its inner dead-center with respect to said driving-crank, each connecting-rod crank being at or near its inner dead-center at such dead-center of its corresponding pitman-crank, substantially as set forth.

Signed by us this 11th day of March, 1898.

CARL F. SCHNEIDER.
HOMER L. SCHNEIDER.

Attest:
D. T. DAVIES,
A. E. MERKEL.