No. 885,877. PATENTED APR. 28, 1908.

J. T. SIMPSON & T. LISHMAN.

AIR COMPRESSOR.

APPLICATION FILED MAR. 7, 1907.

2 SHEETS—SHEET 1.

Fig 1

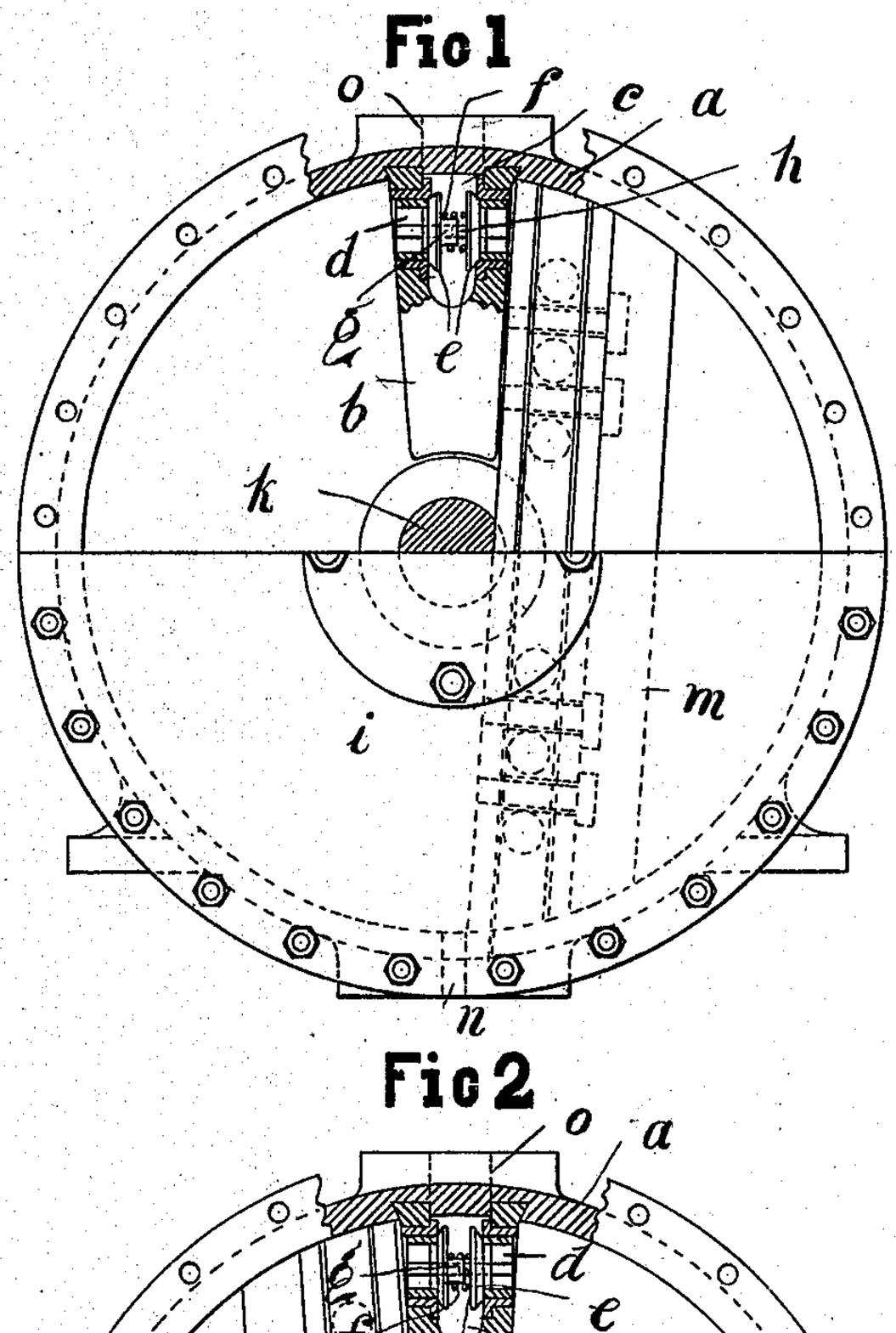
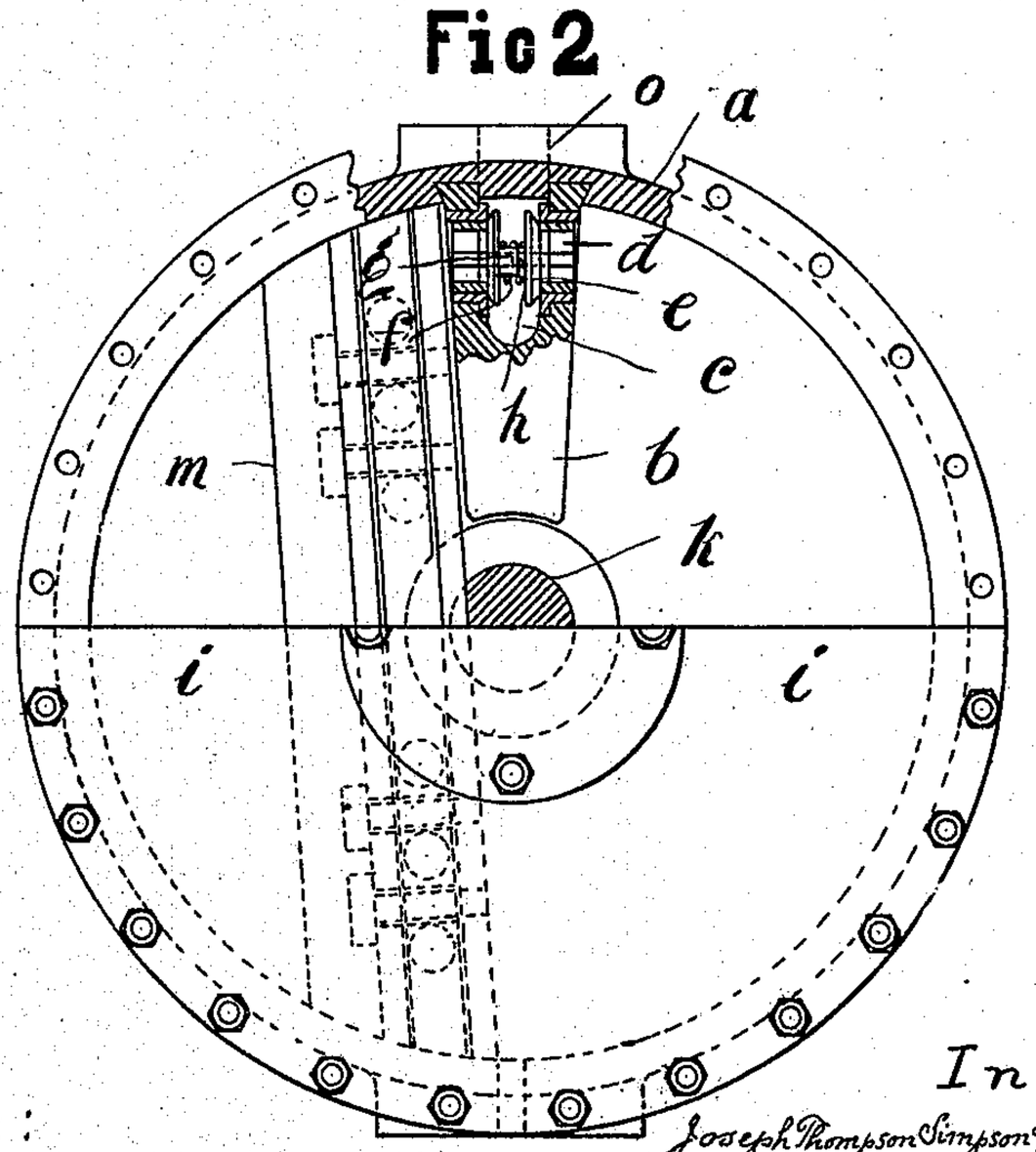


Fig 2



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2 SHEETS—SHEET 2.

Fig 3

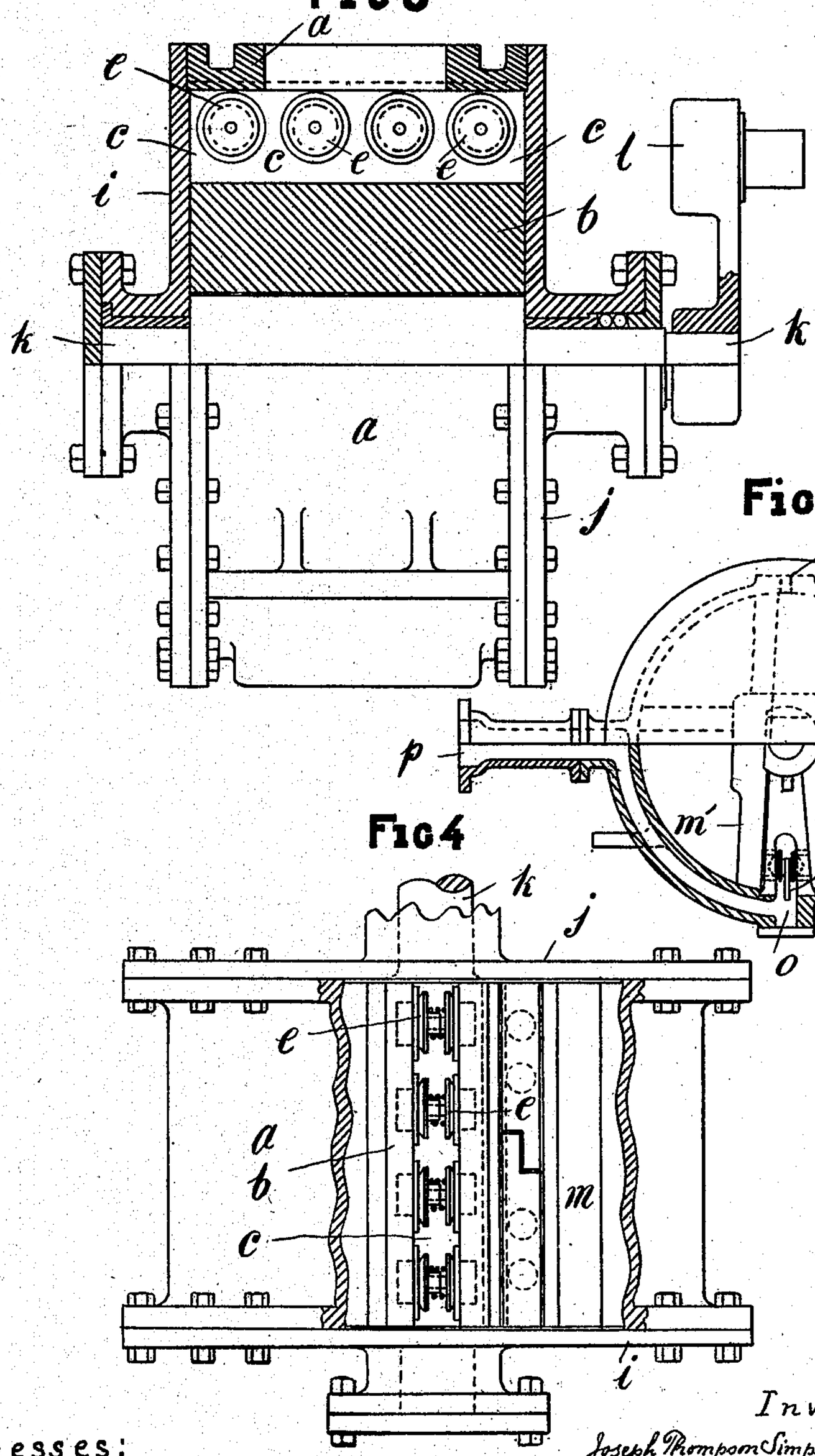

Fig 5

Fig 4

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UNITED STATES PATENT OFFICE.

JOSEPH THOMPSON SIMPSON AND THOMAS LISHMAN, OF DURHAM, ENGLAND.

AIR-COMPRESSOR.

No. 885,877. Specification of Letters Patent. Patented April 28, 1908.

Application filed March 7, 1907. Serial No. 361,174.

To all whom it may concern:

Be it known that we, JOSEPH THOMPSON SIMPSON, a subject of His Majesty the King of Great Britain, and resident of The Lyons, Hetton-le-Hole, R. S. O. Durham, England, and THOMAS LISHMAN, a subject of His Majesty the King of Great Britain, and resident of Eppleton Hall, Hetton-le-Hole, R. S. O. Durham, England, have invented certain new and useful Improvements in Air-Compressors, and of which the following is a specification.

This invention relates to an improved air compressor, and has for its object to provide an air compressor having a very high efficiency, whereby the size of the compressor compared with those of the reciprocating type can be considerably reduced, thereby permitting it, for example, to be taken into a mine, and to work in the smallest coal seams, and, on account of its light weight, to be easily moved to any part of a mine, and secondly will have the walls thereof kept cool in working.

In order that our invention may be clearly and readily understood, we will describe with reference to the accompanying drawings a constructional form which we have found to work well.

In the drawings, Figures 1 and 2 represent part sectional front elevations; Fig. 3 a part sectional side elevation and Fig. 4 a part sectional plan of a two-stroke compressor constructed under our invention. Fig. 5 illustrates a four stroke compressor arranged as hereinafter described.

Referring to Figs. 1—4 we provide a casing or cylinder *a* in which is fitted a valve chamber containing a number of delivery valves on each side. Preferably as shown, such chamber (*c*) is formed in a transverse wall *b* fixed to the casing *a* and extending from side to side thereof transversely and from the inner surface to near the center of the casing axially, a sufficient distance being left between the inner end of the wall and the center of the casing, to permit of the provision of a centrally disposed rotatable shaft carrying an arm to work within the casing.

While any suitable type of delivery valves may be employed, a convenient arrangement of controlling communication between the interior of the casing *a* and the valve chamber *c* consists in forming coincidental circular openings *d* in the portions constituting the divided outer part of the wall *b* and adapting the walls of such openings to provide seatings for coned disk valves such as *e*, each pair of which (taking the valves opposite each other as a pair) are normally retained in position close against their seatings by a suitable type of spring. As shown in Figs. 1, 2 and 5 we may provide a spiral spring such as *f* bearing at both ends upon the outer faces of the valves and surrounding a socket *g* and pin *h* with which the valves may be respectively provided, the pin *h* of the one as shown working in the socket *g* of the other and thus serving to guide either valve as it moves away from or towards its seating.

The valve covers or sides *i* and *j* of the casing *a* are fitted in suitable manner with air tight glands and stuffing boxes which carry a rotatable shaft *k*. One end of this shaft *k* is provided with a crank such as *l* which receives a reciprocating motion from a rocking arm or other convenient means driven by a motor or otherwise. To the said rotatable shaft *k* is attached, within the casing so as to work therein, an arm or vane such for instance as that designated by *m* in the accompanying drawings, such arm being made air tight both circumferentially and at its ends, as by self adjusting plates. As shown we may provide the arm with L shaped pieces m^1 overlapping at the ends and mounted on springs adapted to press the same against the sides and inner circumferential surface of the casing. The arm *m* is so positioned relative to the rotatable shaft *k*, that at the end of the movement or stroke of the arm in one direction, one side thereof is in close proximity to the delivery valves on one side of the valve chamber *c*, and the other side is just clear of the suction port *n*, which in the particular construction shown, is located opposite the delivery opening *o*. Thereby air is freely admitted into the casing or cylinder between the wall *b* and the arm *m* as will be clearly understood on reference to Fig. 1. On the return stroke of the arm *m*, the suction port *n* is cut off by the arm *m* and the air in the casing *a* is compressed through the openings *d* past the delivery valves *e* at one side of the valve chamber and flows by way of the delivery opening *o* to where required. When the stroke is completed, the suction port is opened to the other side of the arm *m* as shown in Fig. 2 and by the next stroke of the arm the air is compressed through the openings *d* past the delivery valves *e* at the other side of the valve chamber, and so on as will now be fully

clear from the foregoing, as well as that the arm *m* works substantially semi-rotary in the casing *a*.

A compressor constructed substantially as herein described has a very high efficiency and is of greatly reduced bulk relatively to reciprocating compressors of equal capacity. It can be run at high speeds, and by reason of its reduced size and light weight, it can, for example be taken into a mine to be worked in the smallest coal seam and be easily moved to any part of a mine. Further another important result attained is the cooling of the casing which is secured, as will be seen, owing to the air, which is delivered from the casing under compression, not being admitted thereto during the delivery stroke of such arm or vane, and consequently the return stroke of the arm or vane being made under vacuum, the cylinder walls are kept cool. The compressor can be arranged with efficient cooling, or it can be adapted to heat the air by compression so that any machine driven by the compressor can be worked expansively, while, as the size of the compressor permits it, for example, to be placed close to the coal face in a coal mine, the nearer can the driven machine be got to the compressor and the better therefore is the efficiency.

By altering the arm working in the casing, single, double or quadruple strokes can be obtained, for instance by halving the arm *m* and giving it the whole sweep of the casing, a single stroke compressor can be provided. A quadruple stroke compressor substantially comprising a pair of compressors as shown in Figs. 1—4 is illustrated by Fig. 5. In this case we arrange the delivery openings *o* of each compressor common to one delivery pipe *p* and divide the rotatable shaft *k* and drive each divided portion independently.

A bow spring *q* is shown in Fig. 5 for connecting the valves *e* and may be employed instead of the spiral spring *f* and pin *h* and socket *g*.

We desire it understood that our invention, as comprising an air compressor having a part or semi-rotary or oscillating arm or arms, or vane or vanes, is not limited to the particular embodiment hereof herein described as this may be considerably modified without departing from the principle herein involved or presenting difficulty to those skilled in the art.

Having now described our invention what we desire to secure by Letters Patent is:—

1. An air compressor including in combination a casing having inlet and outlet passages for air, means comprising a valved radial partition for controlling the outlet passage or passages, an oscillating arm or vane working in the casing for compressing out therefrom air which is admitted thereto by way of the air inlet opening or openings, such admission of the air which is to be delivered under compression out of the casing not taking place during the delivery stroke of the arm or vane, substantially as described.

2. An air compressor including in combination a casing having inlet and outlet passages for air, means for controlling the outlet passage or passages, comprising a radial partition provided with a number of delivery valves; and an oscillating arm or vane working in the casing for compressing out therefrom air which is admitted thereto by way of the air inlet opening or openings, such admission of the air which is to be delivered under compression out of the casing not taking place during the delivery stroke of the arm or vane, substantially as described.

3. An air compressor including in combination a casing having inlet and outlet passages for air, means for controlling the outlet passage or passages, comprising a radial partition, a number of delivery valves provided on each side of said partitions, each valve on one side being co-incidental with a valve on the opposite side and the co-incidental valves coöperating with each other under the influence of a spring; and an oscillating arm or vane working in the casing for compressing out therefrom air which is admitted thereto by way of the air inlet opening or openings, such admission of the air which is to be delivered under compression out of the casing not taking place during the delivery stroke of the arm or vane, substantially as described.

4. An air compressor including in combination a casing having inlet and outlet passages for air; means comprising a valved radial partition for controlling the outlet passage or passages, and an oscillating arm or vane working in the casing for compressing out from the casing the air which is admitted thereto at or substantially at the end of each stroke of the oscillating arm or vane, substantially as herein described.

In witness whereof we have hereunto set our hands in presence of two witnesses.

JOSEPH THOMPSON SIMPSON.
THOMAS LISHMAN.

Witnesses:
E. D. NIXON,
FRED SCOTT.