No. 646,030. Patented Mar. 27, 1900.

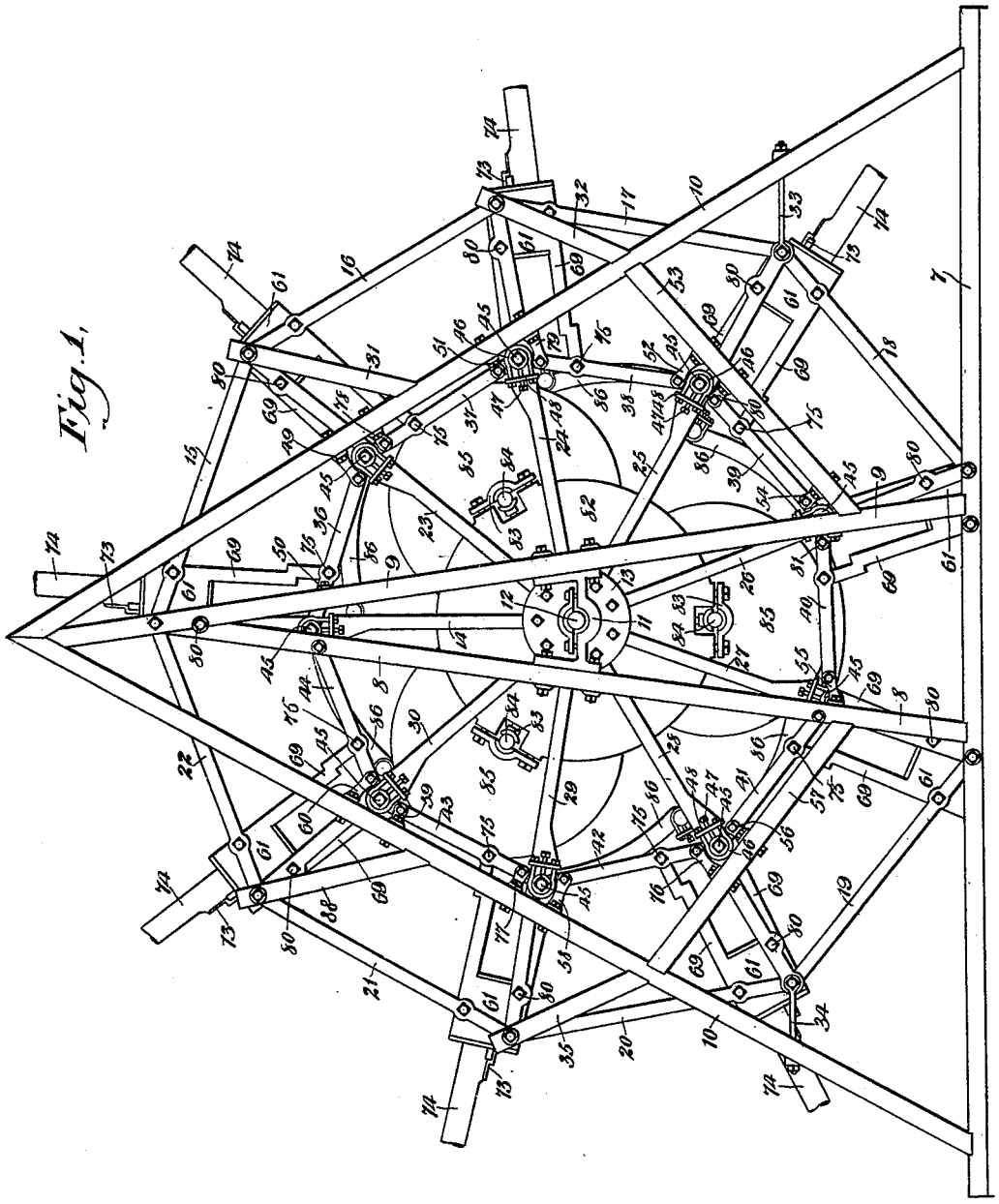
J. D. McKINNON.

AIR COMPRESSOR.

(Application filed Apr. 5, 1897.

(No Model.) 2 Sheets—Sheet 1.

Fig. 1.



WITNESSES:

Edward Thorpe.

Isaac Bloom

INVENTOR

J. D. McKinnon

BY

ATTORNEYS.

No. 646,030. Patented Mar. 27, 1900.

J. D. McKINNON.

AIR COMPRESSOR.

(Application filed Apr. 5, 1897.)

(No Model.) 2 Sheets—Sheet 2.

Fig. 6.

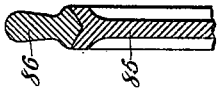


Fig. 3.

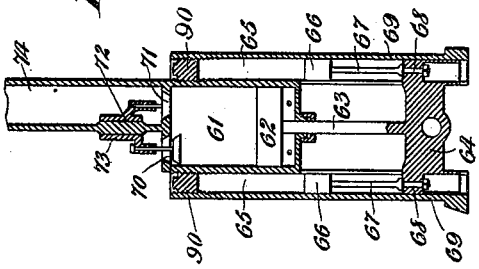


Fig. 5.

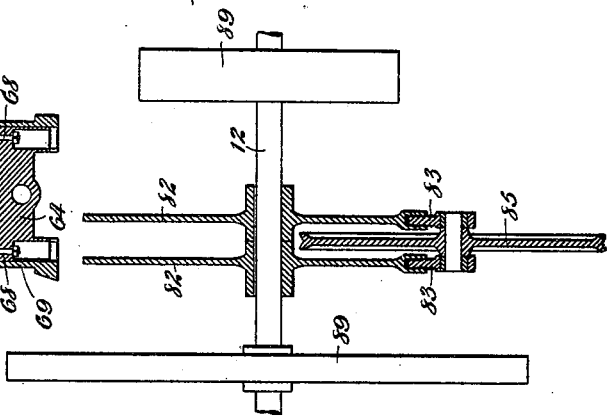


Fig. 2.

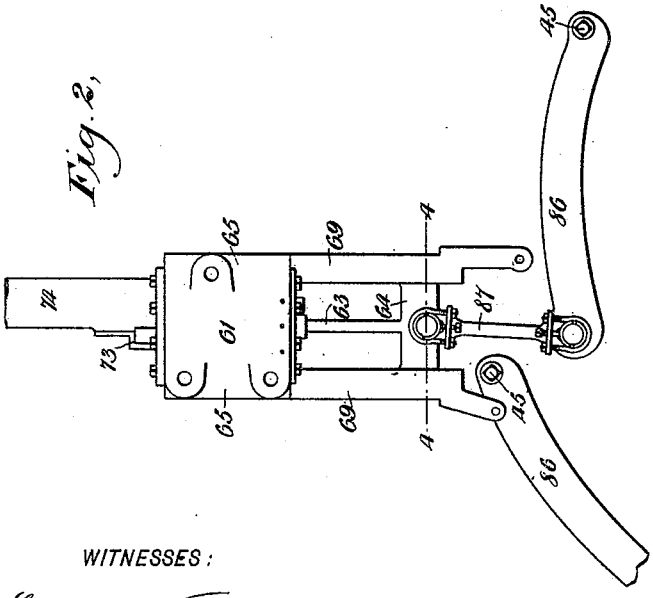
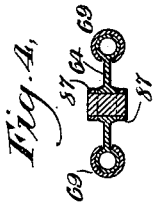


Fig. 4.



WITNESSES:

Edward Thorpe

Isaac B Orrmz

INVENTOR

J. D. McKinnon.

BY

ATTORNEYS.

UNITED STATES PATENT OFFICE.

JAMES DANIEL McKINNON, OF PORTLAND, OREGON.

AIR-COMPRESSOR.

SPECIFICATION forming part of Letters Patent No. 646,030, dated March 27, 1900.

Application filed April 5, 1897. Serial No. 630,767. (No model.)

To all whom it may concern:

Be it known that I, JAMES DANIEL McKINNON, of Portland, in the county of Multnomah and State of Oregon, have invented a new and Improved Air-Compressor, of which the following is a full, clear, and exact description.

This invention is an air-compressor of that class in which a number of air-cylinders are arranged around a shaft and operated by means driven from the shaft.

The specification is the disclosure of one form of my invention, while the claims define the actual scope of the conception.

Reference is to be had to the accompanying drawings, forming a part of this specification, in which similar characters of reference indicate corresponding parts in all the figures.

Figure 1 is a side elevation of my invention. Fig. 2 is an exterior view of one of the compressor-cylinders and its immediately-coacting parts. Fig. 3 is a sectional view of the cylinder. Fig. 4 is a detail section on the line 4 4 of Fig. 2. Fig. 5 is a fragmentary section showing the wheels for operating the compressor-cylinders, and Fig. 6 is a detail section of the piston-operating arm and of a fragment of the wheel that engages the same.

Fig. 1 shows one side of the frame of the invention, the construction shown in Fig. 1 being duplicated at each side of the machine. Each side of the frame consists in a base-rail 7, on the middle portion of which two standards 8 and 9 run upwardly and inwardly toward each other. The upper end of the standard 8 is secured to the standard 9 at a point near the upper end of the standard 9, and the upper end of the standard 9 is seated between the joined upper ends of two standards 10. The standards 10 are respectively rested on the end portions of the base-rail 7 and run upwardly and inwardly. Secured rigidly between the standards 8 and 9 is a bearing-plate 11, the bearing-plates 11 of each side portion of the frame carrying a shaft 12, on which mechanism, to be hereinafter described, is fixed.

Fixed to the inner side of each bearing-plate 11 is a disk 13, and each disk has bolted thereto arms 14, 23, 24, 25, 26, 27, 28, 29, and 30. These arms run out radially at equidistant points from each other. The outer ends of said arms, at each side of the frame, are joined to each other by braces 15, 16, 17, 18, 19, 20, 21, and 22. The brace 15 has its left-hand end bolted to the outer end of the arm 14 and also to the standard 9. The right-hand end of the brace 15 is bolted to the outer end of the arm 23. The parts 23 and 15 are also bolted to a strut 31, standing approximately vertically on the right-hand standard 10. The brace 16 is bolted to the outer end of the arm 23 and the outer end of the arm 24. The brace 17 is bolted to the outer end of the arm 24 and to the outer end of the arm 25. The connection between the parts 16, 24, and 17 is also connected to a strut 32, standing on the right-hand standard 10 and projecting approximately vertically. The lower end of the brace 17 is attached to the lower end of the arm 25. The outer end of the arm 25 is also connected with a rod 33, running inward to the right-hand standard 10. The brace 18 has its upper end connected to the outer end of the arm 25 and its lower end connected to the lower end of the arm 26, and the lower end of the arm 26 is connected to the base-rail 7. The lower end of the arm 27 is connected to the base-rail 7. The base-rail 7 at each side of the machine serves to hold together the corresponding arms 26 27, thus avoiding the necessity of an additional brace, though one may be used, if desired. The lower end of the brace 19 is attached to the lower end of the arm 27. The upper end of the brace 19 is connected by a rod 34 with the left-hand standard 10. The upper end of the brace 19 is also connected to the lower end of the arm 28. The brace 20 is attached to the outer end of the arm 28 and also to the outer end of the arm 29. At the point of connection between the parts 20 and 29 a strut 35 is also attached. The strut 35 stands on the left-hand standard 10. The brace 21 is attached to the outer end of the arm 29 and to the outer end of the arm 30. A strut 88 is connected to the outer end of the arm 30 and stands on the left-hand standard 10, and, finally, the brace 22 is attached to the outer end of the arm 30 and to the left-hand end of the brace 15, as well as to the standard 9 and to the outer end of the arm 14, by the same means which connects the brace 15 with the brace 22.

The intermediate portions of the arms 14,

23, 24, 25, 26, 27, 28, 29, and 30 are braced to each other by means of braces 36, 37, 38, 39, 40, 41, 42, 43, and 44. The radial arms of each side frame are respectively in transverse alinement with each other, and each pair of transversely-alined arms carry a shaft 45 by means of bearings on each of said radial arms, which bearings each consist in clips 46, embracing the shafts and pressing them against set-screws 47, both clips and set-screws being respectively carried in lugs 48, projecting outward from the faces of the radial arms. The brace 36 has its ends held, respectively, by the shafts 45 on the arms 14 and 23. The brace 36 is also fixed to brackets 49 and 50, respectively secured to the standard 10 and to the standard 9. The brace 37 has its upper end held by the shaft 45 on the arm 23 and its lower end held by the shaft 45 on the arm 24. The brace 37 is also held by brackets 51 and 78, carried on the standard 10. The brace 38 has its upper end held by the shaft 45 on the arm 24 and its lower end held by the shaft 45 on the arm 25. The brace 38 is also held by brackets 52 and 79, projecting, respectively, from the right-hand standard 10 and from a strut 53, running diagonally between the right-hand standard 10 and the standard 9. The brace 39 has its upper end held by the shaft 45 of the arm 25 and its lower end held by the shaft 45 of the arm 26. The brace 39 is also held by brackets 54 and 80, projecting from the strut 53. The brace 40 has its right-hand end held by the shaft 45 of the arm 26 and its left-hand end held by the shaft 45 of the arm 27. The brace 40 is also held by brackets 55 and 81, respectively, projecting from the standards 8 and 9. The brace 41 has its ends respectively held by the shafts 45 of the arms 27 and 28 and has its right-hand end bolted to the standard 8 in addition. The brace 41 is further held by a bracket 56, projecting from a strut 57, running between the standard 8 and the left-hand standard 10. The brace 42 has its ends respectively held by the shafts 45 of the arms 28 and 29 and is also held by brackets 58 and 76, respectively, projecting from the strut 57 and from the left-hand standard 10. The brace 43 has its ends respectively held by the shafts 45 of the arms 29 and 30 and is also held by brackets 59 and 77, carried on the left-hand standard 10. Finally the brace 44 has its left-hand end held by the shaft 45 of the arm 30 and its right-hand end held by the shaft 45 of the arm 14. The right-hand end of the brace 44 is bolted to the standard 8, and the left-hand end is strengthened by a bracket 60, carried on the left-hand standard 10. The frame constructed as thus described is very rigid and secure and holds the cylinders and the cylinder-operating devices, as will now be described.

For each radial arm there is a compressor-cylinder. Each compressor-cylinder consists in a cylindrical compression-chamber 61, wherein operates a piston 62, attached to a rod 63. The rod 63 has rigid connection with a cross-head 64. Located at opposite sides of each compression-chamber 61 are two cylindrical chambers 65, wherein the plungers 66 respectively operate. The cylinders or chambers 65 are closed at their outer ends by screw-plugs 90, adjustable to regulate the capacities of the cylinders. The plungers 66 are respectively attached to rods 67, which are in turn attached to the circular ends 68 of the cross-heads 64. The ends 68 of the cross-heads 64 run in extensions 69 of the cylinders 65, which form guides for the cross-heads. The outer end of each compression-chamber 61 has a check-valve-controlled air-inlet opening 70 and a check-valve-controlled air-outlet opening 71. The stems of both valves for the openings 70 and 71 at each cylinder are respectively carried in guides 72 and 73, held on the pipes 74 for carrying off the compressed air. The guide 72 is located within the pipe 74 and the guide 73 outside the same. The extensions 69 of the cylinders 65 have their ends respectively connected one to an intermediate portion of each brace 36, 37, 38, 39, 40, 41, 42, 43, and 44 by means of bolts 75. The end of the remaining extension 69 on each compressor-cylinder is attached to a brace of the series 36, 37, 38, 39, 40, 41, 42, 43, and 44 other than the brace to which the companion extension 69 is connected and, respectively, by means of the bolts which connect such braces to the brackets 49 51 52 54 55 56 58 59 and to the standard 8. The compressor-cylinders, in addition to the connections described, are further respectively connected to the radial arms 14, 23, 24, 25, 26, 27, 28, 29, and 30 by means of bolts 80.

Fixed on the shaft 12, between the plates 13, are two disks 82. The disks 82 jointly carry three bearings 83, in which the trunnions 84 of the three disks 85 are respectively revolubly mounted. Each disk 85, as best shown in Fig. 6, has a concave periphery. Nine links 86 are respectively pivoted to swing on the nine shafts 45. The free end of each link 86 is connected to a pitman 87, respectively pivoted to the cross-heads 64. The links 86 are arranged in the same plane, which plane is also that occupied by the disks 85. Consequently as the shaft 12 turns in its bearings the disks 85 swing orbitally around the shaft 12 and successively engage the links 86, swinging the links and operating the pistons 62 of the compressor-chambers 61. The inner edges of the links 86 are ribbed to conform to the grooves in the peripheries of the disks 85, as shown best in Fig. 6. The movement of the pistons 62 within the respective compressor-chamber 61 causes the air to be first drawn into the chambers and then expelled through the pipes 74. The operation of the plungers 66 within the cylinders 65 causes an automatic return of the pistons 62 and their connected parts when the outstroke has been finished, which return is due to the compression of the air within the cylinders 65,

such cylinders being closed at their outer ends, as shown in Fig. 3. The shaft 12 is provided at one end with a balance-wheel 88 and at the second end with a drive-pulley 89. Slight perforations at the inner end of the cylinder 61 allow the gradual escape of air from the inner ends of the cylinders as the pistons move inward. This produces an air-cushion serving to neutralize the actions of the machinery and insure a perfectly-balanced operation.

Having thus described my invention, I claim as new and desire to secure by Letters Patent—

1. The combination with a frame, of a plurality of air-compressors mounted thereon and held in a circular line, each compressor having a piston arranged to be separately actuated, a shaft centrally located to said circular line, two plates fixed and spaced apart on the shaft, and a wheel carried between and extending slightly beyond the plates and moving with the same to operate the pistons of the air-compressors independently and successively.

2. The combination with a frame, of a plurality of cylinders arranged circularly thereon, a revoluble shaft mounted in the frame and centrally with reference to the line of cylinders, two plates fixed on the shaft, a wheel revolubly mounted between the plates and projecting beyond the same, pistons within the cylinders, and means held by the frame and in connection with the pistons, such means being successively and independently engaged by the wheel as it turns within the plates, whereby to operate the pistons, substantially as described.

3. The combination of a revoluble shaft, two plates fixed thereon, a wheel revolubly mounted between the plates and projecting beyond the same, a fixed cylinder, a piston working in the cylinder, and a pivoted arm the free portion of which is in connection with the piston, the said arm being arranged in the path of the wheel, so that as the wheel moves orbitally around the shaft the wheel will engage with the arm and move the same outward, whereby to operate the piston, substantially as described.

4. The combination of a revoluble shaft, a wheel eccentric to the shaft and carried by the shaft so as to move orbitally around the shaft, a fixed cylinder, a piston working in the cylinder, and a pivoted arm the free portion of which is in connection with the piston, and the arm being in the path of the wheel so that as the wheel swings around the shaft the wheel will engage the arm and move the same outward to operate the piston, substantially as described.

5. In an air-compressor, a series of cylinders arranged in an endless line, an arm rigidly attached to each cylinder and projecting inward to a central point, means for rigidly joining the inner ends of the arms, two endless lines of braces respectively attached to the outer and inner ends of the cylinders and to the arms, whereby to rigidly hold the cylinders, and main beams to which the arms and braces are attached and by which they are supported, substantially as described.

6. The combination with a shaft and a series of devices to be operated, of two disks secured to said shaft and a series of wheels having their journals mounted in the peripheral portions of said disks, all the wheels of said series of wheels coöperating with each device of the series of devices to be operated and arranged to operate said devices successively.

7. The combination with a series of cylinders, a piston in each cylinder and a shaft mounted intermediate of the cylinders, of a series of disks secured to said shaft, a series of wheels mounted in the peripheral portions of said disks, each of said wheels coöperating successively with all the pistons to independently force each of them outwardly through the cylinders.

8. The combination with a series of cylinders, a plunger in each cylinder and a shaft intermediate of said cylinders, of a series of pivoted arms connected with the plungers, a series of disks secured to said intermediate shaft, and a series of wheels disposed between said disks and having their journals mounted in the peripheral portions thereof, each of said wheels adapted to successively move all of said pivoted arms to operate the plungers in the cylinders.

9. The combination with framework and an annular series of compressors secured to said framework, of a centrally-located driving-shaft, a series of disks secured to said shaft, and a series of wheels having their journals mounted in the peripheral portions of said disks and projecting beyond the same, each of said wheels operating to actuate said compressors successively and independently.

JAMES DANIEL McKINNON.

Witnesses:
F. CLARNO,
ALEX. BERNSTEIN.