C. M. TURSKY.

AIR COMPRESSOR.

APPLICATION FILED APR. 17, 1920.

1,371,824.

Patented Mar. 15, 1921.

2 SHEETS—SHEET 1.

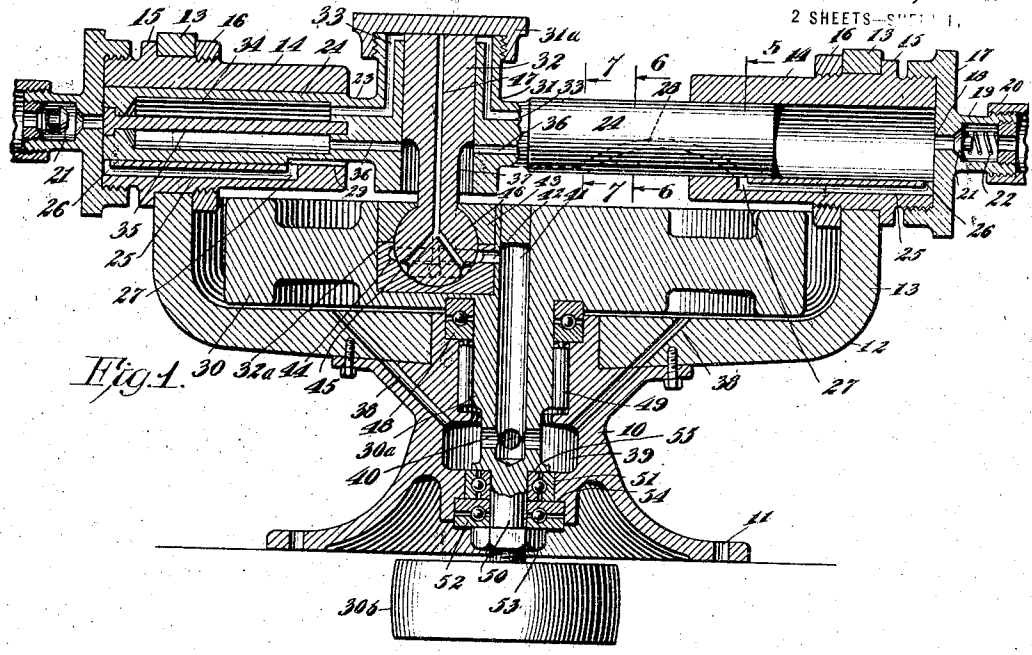
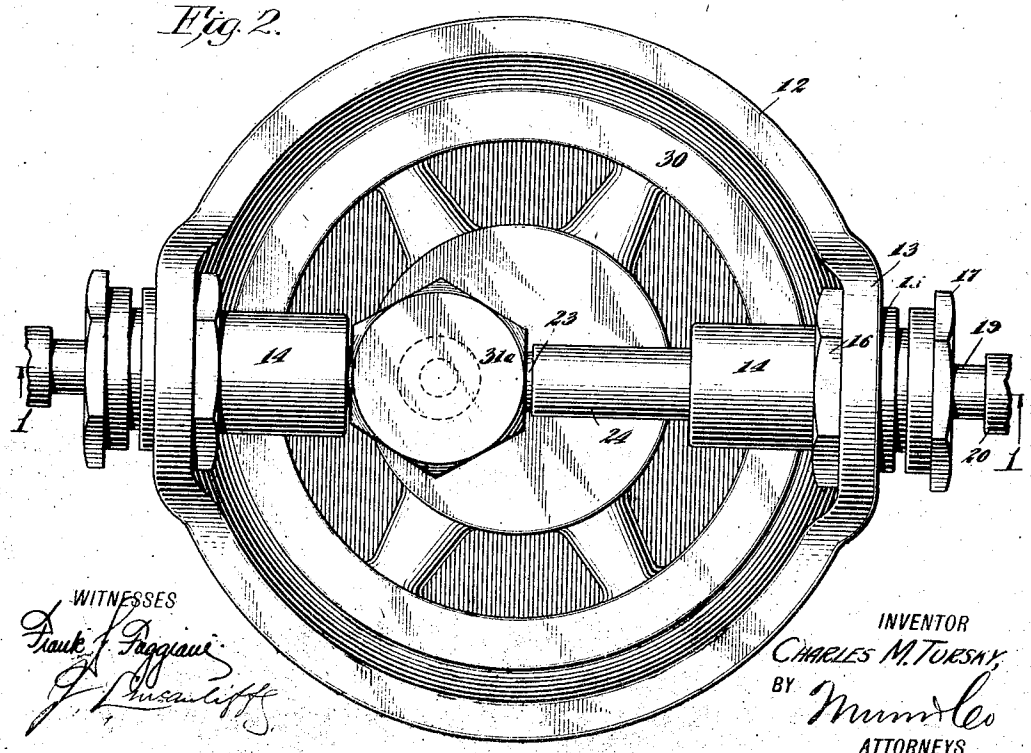


Fig. 1.

Fig. 2.



WITNESSES

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Fig. 3.

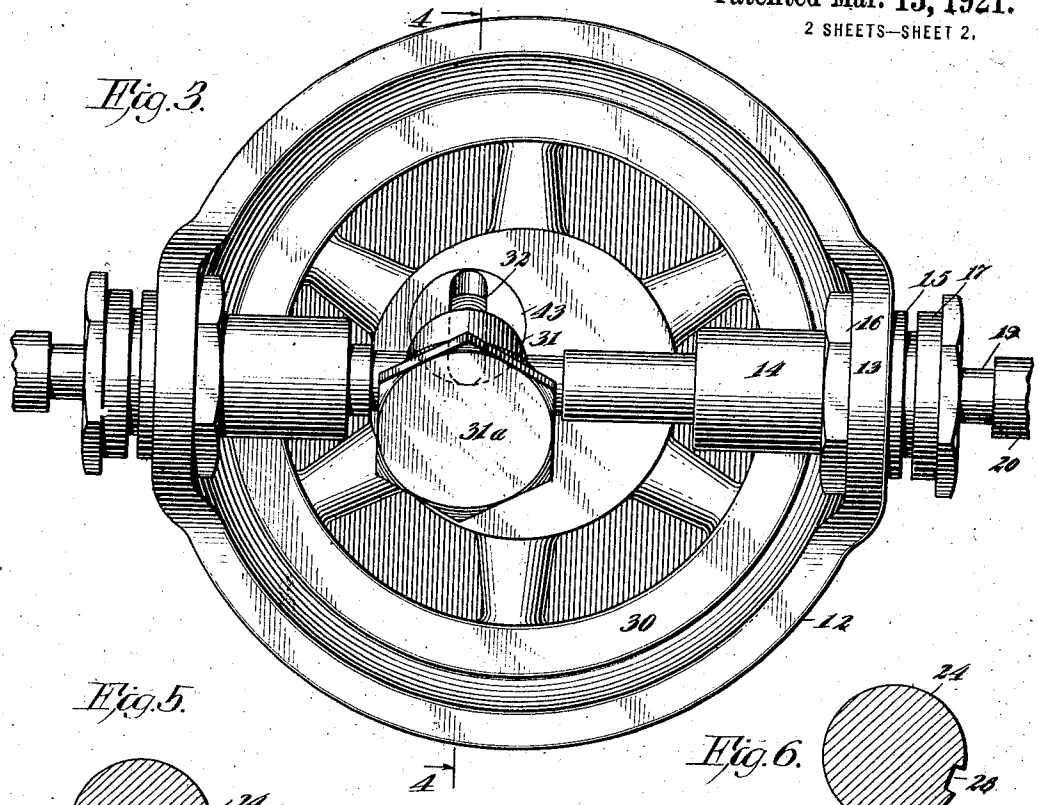


Fig. 5.

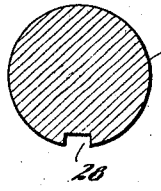


Fig. 6.

Fig. 4.

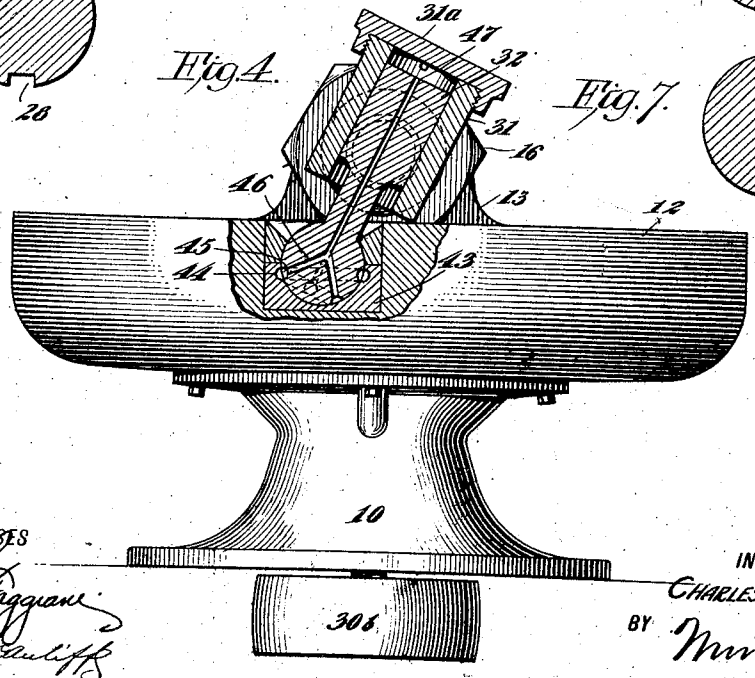
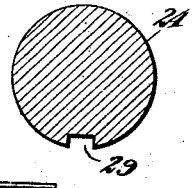


Fig. 7.



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UNITED STATES PATENT OFFICE.

CHARLES M. TURSKY, OF NEW YORK, N. Y.

AIR-COMPRESSOR.

1,371,824. Specification of Letters Patent. Patented Mar. 15, 1921.

Application filed April 17, 1920. Serial No. 374,605.

To all whom it may concern:

Be it known that I, CHARLES M. TURSKY, a citizen of Hungary, and a resident of the city of New York, borough of the Bronx, in the county of Bronx and State of New York, have invented a new and Improved Air-Compressor, of which the following is a description.

My invention relates to an air compressor embodying a revolving element and a double-ended floating piston, and the invention resides in various novel features including the air ports, the means for actuating the piston and a novel system of lubrication, whereby the lubricant is circulated through the piston for cooling, and effectively distributed to the bearings.

The invention has in view also the embodiment of the invention in a simple and compact form.

Reference is to be had to the accompanying drawings forming a part of this specification, it being understood that the drawings are merely illustrative of one example of the invention.

Figure 1 is a vertical section of an air compressor, embodying my invention, the section being indicated by the line 1—1, Fig. 2;

Fig. 2 is a plan view thereof;

Fig. 3 is a view similar to Fig. 2 but with the piston and other movable parts in the positions occupied thereby after a movement of the revolving actuating device through 90°;

Fig. 4 is a side elevation with parts in section in a plane corresponding with the line 4—4, Fig. 3;

Figs. 5, 6 and 7 are cross sections respectively on the line 5—5, 6—6, and 7—7, Fig. 1.

In carrying out my invention in accordance with the illustrated example an upright base or frame 10 is provided, here shown as having bolt holes 11 for fastening the base to a suitable support. Rigid with the base 10 at the top is a cup-shaped casing or pan 12 and supported on diametrically opposite upstanding members 13 on said casing 12 are two fixed cylinders 14, here shown as fitted in said upstanding members, the fastening means in the illustrated example being an annular flange 15 on each cylinder at one side of said member and a nut 16 threaded on the cylinder at the opposite side. As both cylinders and appurtenances are alike, it will suffice to refer to one. The cylinder head 17 has a discharge port 18 leading to a nipple 19 for receiving a pipe 20 or other connection to a reservoir (not shown) or leading to any other desired point of delivery. The discharge port 18 is shown as controlled by a check valve 21 having a spring 22.

A double-ended floating piston 23 has its piston heads 24 working in the respective cylinders 14. The air ports and passages of a cylinder and its piston are as follows: A longitudinal air passage 25 is formed in the cylinder 14, the one end 26 of which communicates with the cylinder adjacent to the head 17 and the other end 27 of which communicates with the cylinder near the opposite end. An air passage 28 is provided longitudinally in the piston head 24 and is curved for its major portion, that end of said passage 28 adjacent to the rear or inner end of the piston head being extended straight as at 29 as best seen at the left of Fig. 1 and opens to the atmosphere for the inlet of air. The curved air passages 28 of the respective piston heads 24 are on opposite sides, that is to say, considering Fig. 1, the passage 28 on the right hand piston head 24 is at the far side and is therefore indicated in dotted lines while the corresponding curved passage of the left hand piston head 24 is at the near side and therefore only the longitudinal straight end 29 thereof appears.

A rotary element 30 is provided when actuating the piston and is here shown in the form of a wheel, rigid with which is a short vertical shaft 30^a turning in the base 10 and carrying at its lower end any suitable means for receiving power, a belt pulley 30^b being shown. An actuating connection between the piston 23 at the approximate center and the revolving actuating element 30 off the center of the latter is provided and is so formed and arranged that the piston will be reciprocated and at the same time it will be given a turning movement back and forth for establishing and disestablishing at the proper times the communication between the piston air passages 28, 29 and the cylinder air passages, 25, 26, 27. At the same time the means connecting the piston with its revolving actuating element is made to constitute elements of an oil pump for circulating

the lubricant for which purpose the arrangement is as follows: The piston 23 is provided centrally with a laterally disposed cylinder 31 having a cap or head 31ª at one end and operating in said cylinder is a piston 32. Each piston head 24 is formed with a longitudinal oil chamber 34 preferably annular and outside of a core or solid center 35. An oil passage 33 establishes communication between the chamber 34 and the cylinder 31 in front of piston 32, so that oil may pass from said cylinder in front of said piston 32 to the oil chamber 34 of piston 24. An oil discharge passage 36 leads from the chamber 34 longitudinally in the piston 24 and laterally into the cylinder 32 adjacent to the rear end of piston 32, said piston having a reduced diameter as at 37 that the oil may flow from passage 36 through cylinder 31 and drop into cup-shaped casing 12. From the bottom of the casing 12 oil passages 38 run to an oil chamber 39 in the base 10. From chamber 39 lateral oil passages 40 in the shaft 30ª lead to an axial oil passage 41 formed in said shaft and in the rotary element 30 rigid therewith. From near the upper end of the auxiliary passage 41 a lateral oil passage 42 leads to an annular oil groove 44 formed in a bearing block 43 in the upper face of the rotary element 30 to provide a universal bearing for the ball head 32ª on the lower end of the piston 32. The ball head 32ª has an annular oil groove 45 from which oblique oil passages 46 lead upwardly in said head to a central oil passage 47 formed in the piston 32 and leading to the front end of the piston to communicate with the cylinder 31.

With the described arrangement a complete revolution of the revolving element 30 will cause a complete forward and return stroke of the float piston 23, that is to say, the rotary drive element 30 in turning through 180° will effect a complete compression stroke of one piston head 24 and a suction stroke of the opposite piston head 24 in their respective cylinders 14. At the same time the oil piston 32 will make a complete suction and discharge stroke, or a forward and return stroke, by a turning of drive element 30 through 180°, the suction stroke being completed in 90° and the discharge stroke in the next 90° in the turning of drive element 30. Thus, in operation, the revolving drive element 30 when turned from the position shown in Figs. 1 and 2 through 90° to the position shown in Figs. 3 and 4 will have given one-half a compression stroke to the right hand piston 24 and one-half a suction stroke to the left hand piston 24 and the remaining half of said compression and suction strokes will be completed in the next 90° movement of the drive element 30. In Fig. 1 the floating piston 23 is shown with the right hand piston head 24 after having just completed its suction stroke and the left hand piston head 24 as just about to begin its suction stroke. At this time the air passage 28 in the right hand piston head 24 will communicate at its outer end with the adjacent end 27 of the cylinder air passage 25 to thus admit air as at 26 to the right hand cylinder 14 in front of said piston head 2 it being understood that the curved air passages 28 of the respective piston heads 24 are respectively at the near side of the one piston head and the far side of the other piston head. In a complete suction stroke of the right hand piston head 24, said piston head will be given a turning movement about its own axis in a direction to maintain its curved passage 28 always in communication with the end 27 of air passage 25, for continued inlet of air to the right hand cylinder 14, and this will be true also of the left hand piston head 24 in making a suction stroke since although it turns in the same direction as the right hand piston its curved passage 28 is on the near side of the left hand piston head and therefore during the complete suction stroke, said air passage 28 like the corresponding right hand passage will be maintained in communication with the adjacent end 27 of the cylinder passage 25. On the compression stroke of the right hand piston head 24 the floating piston, 23, will be turned in the opposite direction about its axis and in so turning the right hand curved passage 28 will, upon the start of the compression stroke, be turned out of communication with the end 27 of the adjacent air passage 25 and with respect to the left hand piston head 24, the same thing will occur on the compression stroke due to the relative positions of the respective curved air passages 28 in the right and left hand piston heads 24.

In the movement of the ball head 32ª of piston 32 through 180° about the center of the revolving element 10, the oil piston 32 will have been given a complete forward and return stroke. On the suction stroke of piston 32 due to the ball head 32ª moving through 90° to the position of Figs. 3 and 4, said piston 32 will first close and cut off the outlet oil passages 36 leading from the oil chambers 34 of the respective piston heads 24 and the continued suction stroke of said piston 32 will draw oil from chamber 39 to the cylinder 31 in front of said piston because simultaneously with the cutting off of the passages 36 the annular groove 45 of ball head 32ª will be placed in communication with the annular groove 44 in the bearing block 43 so that oil may be drawn by the suction stroke of piston 32 from chamber 39 through ports 40 to and through an axial passage 41, lateral passage 42, grooves 44, 45 oblique passages 46, and the axial passage 47 of piston 32 to

the cylinder 31. In the next 90° movement of the ball head 32ª about the axis of the revolving element 30, the piston 32 will be given a compression stroke during which oil will be forced from the cylinder 31 in front of the piston 32 through the passages 33, oil chambers 34 and passages 36, and will gravitate to the casing 12 to find its way by passages 38 to return to the oil chamber 39. At the same time the oil from casing 12 will reach bearings provided for revolving element 30 and its shaft 30ª, said bearings in the illustrated example being as follows: An annular ball bearing and race 48 are provided for the element 30 beneath the same adjacent to the shaft 30ª and below said bearing 48 an annular series of vertical bearing rollers 49 is provided about the shaft 30ª. Near the lower end the shaft 30ª is of reduced diameter as at 50 providing thereby a shoulder 54 resting on an annular ball bearing 51, the elements forming the race of which are divided vertically and said bearing rests on a second ball bearing 52, the elements forming the race of which are divided horizontally and embrace the reduced end 50. Said reduced end 50 is threaded to receive a nut 53 to clamp the bearings 52, 51 against shoulder 54 on base 10, and shoulder 55 on shaft 30ª.

It will be seen that the passage 28, 29 of each piston head 24 has inlet end always at the exterior of the cylinder 14 and constantly open to the atmosphere, the cutting off and the making and breaking of the communication with the longitudinal cylinder passages 25 being due to the turning of the piston head while the constant communication with the atmosphere is maintained.

I would state in conclusion that while the illustrated example constitutes a practical embodiment of my invention, I do not limit myself strictly to the mechanical details herein illustrated, since manifestly the same can be considerably varied without departure from the spirit of the invention as defined in the appended claims.

Having thus described my invention, I claim:

1. An air compressor including a cylinder having a discharge port and an air inlet passage, together with a piston operating in said cylinder and actuating means therefor, said piston having an air passage constantly open to the atmosphere and adapted to make and break communication with the air passage of the cylinder by the movements of the piston.

2. An air compressor including a cylinder having a discharge port, and a longitudinal air passage leading to the front end of the cylinder, together with a piston operating in said cylinder and actuating means for said piston, said piston extending rearwardly through the cylinder and having a longitudinal air inlet passage, the rear end of which is exterior of the cylinder.

3. An air compressor including a cylinder having a discharge port, and a longitudinal air passage leading to the front end of the cylinder, together with a piston operating in said cylinder and actuating means for said piston, said piston having a longitudinal air passage at the periphery and extending longitudinally of the piston, the inlet end of said last-mentioned air passage being constantly open to the atmosphere.

4. An air compressor comprising a cylinder having a discharge port and a longitudinal air passage communicating with the cylinder near the front end and adjacent to the rear end, a piston operating in said cylinder, a revoluble drive element, and means to reciprocate and turn the piston by said revolving element, said piston having a curved air passage longitudinally of the piston at the exterior and provided with an inlet outside of the cylinder and open for the inlet of air at the exterior of the cylinder.

5. An air compressor including a compression cylinder, an air compressing piston operating in said cylinder, said piston having an oil chamber therein, a casing presenting an oil chamber, drive means for said piston, an oil pump forming a connection between said drive means and said piston, and means forming with said oil pump an oil circulating circuit including said chambers.

6. An air compressor including a compression cylinder, an air compressing piston reciprocating in said cylinder and turnable about its own axis, a revoluble drive element for said piston, and a pump cylinder and a piston therein, said last-mentioned piston having a universal connection with the drive element and constituting with the cylinder in which it operates a drive connection between said rotary drive element and said air compressing piston.

7. An air compressor including a compression cylinder, an air compressing piston reciprocating in said cylinder and turnable about its own axis, a revoluble drive element for said piston, and a piston establishing a drive connection between said drive element and compression piston and universally connected with one of the same and having a reciprocating engagement with the other.

8. An air compressor including a compression cylinder, an air compressing piston operating in said cylinder, said piston having an oil chamber therein, a casing presenting an oil chamber, drive means for said piston, and means including an oil pump and forming an oil circulating circuit between said chambers, said oil pump including a cylinder and a piston therein forming a drive connection between said revoluble drive ele-

ment and said air compressing piston for actuating the latter.

9. An air compressor including a revoluble drive element, a floating piston disposed in a plane approximately parallel with the plane of rotation of said element, a cylinder in which said piston operates, and means forming a drive connection between said piston and said element, said drive connection including a cylinder on said piston, and a second piston operating in said last-mentioned cylinder and having an off-center universal connection with said revoluble drive element.

10. An air compressor including a frame, a revoluble drive element turning in said frame, a double-ended floating piston disposed approximately in a plane parallel with the plane of rotation of said revoluble element, cylinders in which the ends of said piston operate, a cylinder transversely disposed on said piston, and a second piston operating in said last-mentioned cylinder and having an off-center universal connection with said revoluble drive element, said frame having an oil chamber and there being oil chambers in both ends of said double-ended piston, said chambers in the piston and said chamber in the frame being in communication through passages extending through said revoluble element and through the piston connected therewith and the transversely disposed cylinder.

11. An air compressor including a base, a casing on said base and adapted to catch oil, a revoluble element turning in said casing, bearings in said base for said revoluble element and in comunication with the casing, a floating piston disposed in a plane approximately parallel with the plane of rotation of said revoluble element, and presenting piston heads at each end, said piston heads having oil chambers therein and there being outlets from said chambers discharging in a postion for the oil to gravitate in to said casing, a transversely disposed cylinder on said piston between the heads thereof, a second piston operating in said last-mentioned cylinder and having a ball head, an off-center bearing for said ball head in said revoluble element, means establishing oil communication between said casing and the second mentioned cylinder and between the latter and the oil chambers in said piston heads.

12. An air compressor including a cylinder having a discharge port, and an air inlet passage leading into said cylinder, an air compressing piston operating in said cylinder, said piston having an air inlet passage curved for its major portion and presenting an approximately straight inlet end at the rear end of the piston and constantly open to the atmosphere and means to reciprocate said piston for air compression, and to turn said piston for making and breaking communication between the air passage of the piston and the air passage of the cylinder for admitting air to the cylinder during the suction stroke of the piston and cutting off the air on the compression stroke of the piston.

CHARLES M. TURSKY.