

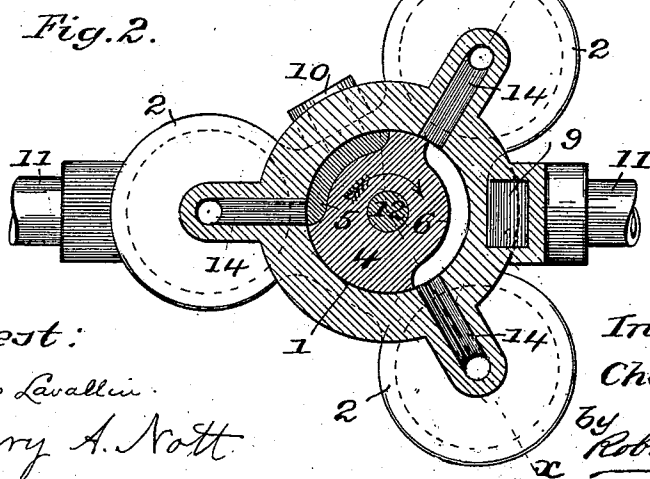
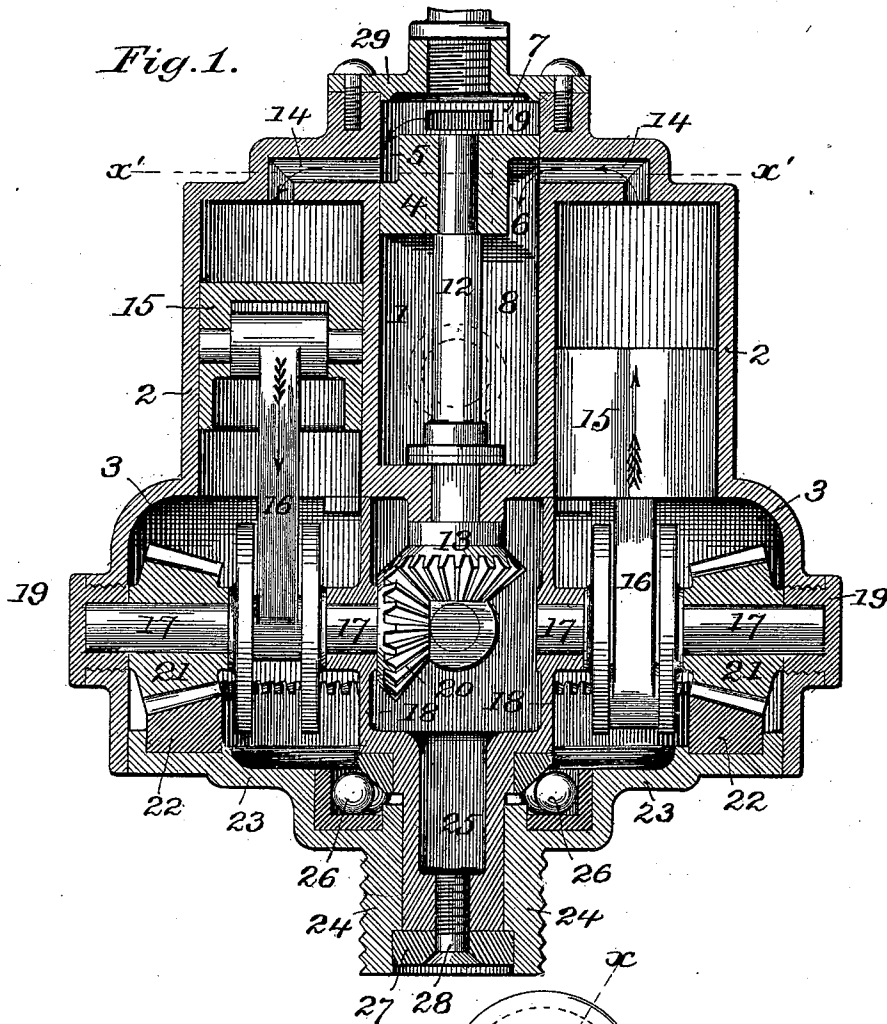
No. 666,690.

Patented Jan. 29, 1901.

C. K. PICKLES.
ENGINE.

(Application filed Feb. 6, 1899.)

(No Model.)



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UNITED STATES PATENT OFFICE.

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ENGINE.

SPECIFICATION forming part of Letters Patent No. 666,690, dated January 29, 1901.

Application filed February 6, 1899. Serial No. 704,715. (No model.)

To all whom it may concern:

Be it known that I, CHARLES K. PICKLES, a citizen of the United States, residing at St. Louis, in the State of Missouri, have invented certain new and useful Improvements in Pneumatic Engines; and I do hereby declare the following to be a full, clear, and exact description of the same, reference being had to the accompanying drawings, forming a part of this specification.

The present invention relates to that type of pneumatic drills in which a multiple series of pistons and cylinders actuate, through a proper speed-reducing mechanism, the centrally-arranged drill-carrying arbor of the apparatus.

The objects of the present improvement are, in the main, to provide a simple, light, compact, and efficient construction and arrangement of parts that with a proportionate size and weight will afford a maximum amount of power and which is especially suitable to the type of manually-handled rotary drills to which the present invention more especially relates and as will hereinafter more fully appear in the description and claims.

In the accompanying drawings, illustrating the present invention, Figure 1 is a vertical sectional elevation taken on the irregular line *x x*, Fig. 2; Fig. 2, a horizontal sectional elevation at line *x' x'*, Fig. 1, illustrating the valve mechanism.

Similar numerals of reference indicate like parts in both views.

In the present improved construction, as shown in the drawings, the main housing comprises an integral casting divided into an upper and lower portion, the upper portion being divided in turn into a centrally-arranged valve-chamber 1 and a cluster of engine or piston cylinders 2, equidistantly arranged around said central valve-chamber. The lower portion of the housing forms an open-bottomed chamber 3, in which the series of radially-arranged crank-shafts and their different connections, as hereinafter set forth, are arranged and housed. The valve-chamber 1 is of a cylindrical nature, with its axis parallel with the axis of the cluster of engine-cylinders 2.

4 is a rotary valve by which the induction

and eduction of the motive fluid to the different engine-cylinders are controlled and regulated. Said valve is of rotary cylindrical cut-off type and is formed with an open-topped peripheral supply or induction port or passage 5 and an open-bottomed peripheral exhaust or eduction port or passage 6, arranged at opposite sides of its perimeter, as shown in Figs. 1 and 2. The valve 4 is of the same diameter as the valve-chamber 1 and is located intermediate the height of said chamber, so as to divide the same into an upper pressure-supply chamber 7 and a lower exhaust-chamber 8.

9 is the supply or induction passage communicating with the supply-chamber 7, and such passage is preferably extended down the wall of the valve-chamber, so as to have communication with one of the tubular supporting-handles 11 of the pneumatic drill, and which handle, at its outer end, will have the usual attachment to the hose or other flexible connection through which the compressed air or other motive fluid is conducted to the drill from a suitable source of supply.

10 is the exhaust or eduction port passing through the wall of the valve-chamber and connecting the exhaust-chamber 8 directly with the atmosphere.

12 is an axially-arranged shaft or stem carrying the rotary valve 4 and journaled near its lower end in the lower head of the valve-chamber 1, as shown. On its extreme lower end said shaft carries a miter-gear 13, through which it receives positive rotation in unison with the movement of the engine-pistons, &c., as hereinafter set forth.

14 represents the series of radial ports that connect the upper ends of the cluster of engine-cylinders 2 with the valve-chamber 1.

The cluster of engine-cylinders 2 are of the single-acting open-bottomed type, their pistons 15 being connected directly to their individual pitmen 16, that in turn have connection with the individual crank-shafts 17. The series of individual crank-shafts 17 have journal-bearing at their inner ends in a stationary annular sleeve 18, that is fixedly secured or forms a part of the main housing of the apparatus.

19 represents a series of radially-arranged bushings screwed into the outer wall or hous-

ing of the chamber 3 and forming bearings for the outer ends of the series of individual crank-shafts 17, as shown.

20 is a miter-gear on the inner end of the crank-shafts 17, gearing with the miter-gear 13 of the valve-stem 12 and adapted to impart uniform and concurrent movement to the main engine-valve 4 in unison with the movement of the engines.

21 represents a series of bevel-pinions, preferably of a toothed nature, as shown, secured to the series of crank-shafts 17, and are adapted to engage in common with a bevel gear or annulus 22, also preferably of a toothed nature, and which annulus is carried by or forms a part of a revolving head 23 at the lower end of the apparatus.

With the above-described construction the series of engines are positively coupled together, so as to operate in unison, and in addition thereto the said construction affords a ready means for converting the high speed of the engine into a slower and more powerful speed of the drill-arbor, in that by a proper proportioning of the series of bevel-pinions 21 with relation to the bevel gear or annulus 22 any required degree of reduction can be obtained.

The revolving head or gear 22 23 in the construction shown closes the open bottom of the chamber 3, that contains the engine crank-shafts and connections, and such head is formed with a depending central arbor 24 to receive a chuck or suitable drill-holder. In the operation of the drill the flanged outer rim of the head 23 turns freely and in close relation to the inner surface of the housing of the chamber 3, so as to exclude dust, &c., from the operative parts of the series of engines. The revolving head 23 is held in axial alinement by means of a central extension 25 of the main housing or of the stationary sleeve 18 thereof, upon which the tubular arbor 24 has bearing, as indicated in Fig. 1.

26 is a ball or other suitable friction-reducing bearing interposed between the upper end of the head 23 and arbor 24 and the lower end of the extension 25 to withstand the upper thrust of said head and arbor in the actual use of the pneumatic drill.

27 is a confining-disk fitting an enlarged counterbore in the lower end of the arbor 24 and secured to the central extension 25 by a screw-bolt 26, the arrangement being such as to hold the revolving head and its tool-carrying arbor against any downward displacement.

29 is a removable head closing the upper end of the valve-chamber 1 to admit of ready access to the valve and ports for the purpose of oiling, cleaning, &c.

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

1. In a portable pneumatic engine of the character herein described, the combination of a cluster of three or more engines having

parallel relation with the axis of the drill, a series of crank-shafts radially arranged, connections between the crank-shafts and the pistons of the engines, and connections between said crank-shafts imposing isochronal movement upon the same, substantially as set forth.

2. In a portable pneumatic engine of the character herein described, the combination of a cluster of three or more engines having parallel relation with the axis of the drill, a series of crank-shafts radially arranged, each shaft individual to an engine and operatively connected thereto in an individual manner, and intermediate connections between said crank-shafts imposing isochronal movement upon the same, substantially as set forth.

3. In a portable pneumatic engine of the character herein described, the combination of a cluster of three or more engines having parallel relation with the axis of the drill, a centrally-arranged valve-chamber, a series of crank-shafts radially arranged each shaft individual to an engine and operatively connected thereto in an individual manner, and intermediate connections between said crank-shafts imposing isochronal movement upon the same, substantially as set forth.

4. In a portable pneumatic engine of the character herein described, the combination of a cluster of three or more engines having parallel relation with the axis of the drill, a centrally-arranged valve-chamber, a series of crank-shafts radially arranged each shaft individual to an engine and operatively connected thereto, connections between said crank-shafts imposing isochronal movement upon the same, a rotary valve arranged in the valve-chamber and common to the cluster of engines, a valve-stem, and miter-gear connections between the valve-stem and one of the crank-shafts, substantially as set forth.

5. In a portable pneumatic engine of the character herein described, the combination of a cluster of three or more engines having parallel relation with the axis of the drill, a series of crank-shafts radially arranged, connections between the crank-shafts and the pistons of the engines, a series of bevel-pinions on the crank-shafts, and a bevel-annulus common to the series of pinions and imposing isochronal movement upon the same, substantially as set forth.

6. A multiple-cylinder engine for rotary pneumatic drills and the like, comprising a central valve-chamber, a cluster of engine-cylinders in parallel relation with the valve-chamber and provided with piston, pitman and crank-shaft connections, a rotary valve arranged in said valve-chamber and common to the cluster of engines, means for imparting movement to the valve, a series of individual bevel-pinions on the crank-shafts, and a revolving bevel-annulus common to the series of pinions, substantially as set forth.

7. A multiple-cylinder engine for rotary pneumatic drills and the like, comprising a

central valve-chamber, a cluster of engine-cylinders in parallel relation with the valve-chamber and provided with piston, pitman and crank-shaft connections, a rotary valve arranged in said valve-chamber and common to the cluster of engines, means for imparting rotary movement to the valve, a series of individual beveled and toothed pinions on the crank-shafts, and a revolving beveled and toothed annulus common to the series of pinions, substantially as set forth.

8. A multiple-cylinder engine for rotary pneumatic drills and the like, comprising a central valve-chamber, a cluster of engine-cylinders in parallel relation with the valve-chamber and provided with piston, pitman and crank-shaft connections, a rotary valve arranged in said valve-chamber and common to the cluster of engines, a valve-stem, miter-gear connections between the valve-stem and one of the crank-shafts, a series of individual bevel-pinions on the crank-shafts, and a revolving bevel-annulus common to the series of pinions, substantially as set forth.

9. A multiple-cylinder engine for rotary pneumatic drills and the like, comprising a central valve-chamber, a cluster of engine-cylinders in parallel relation with the valve-chamber and provided with piston, pitman and crank-shaft connections, a rotary valve arranged in said valve-chamber and common to the cluster of engines, means for imparting rotary movement to the valve, a series of individual bevel-pinions on the central shafts, and a revolving bevel-annulus common to the series of pinions, and provided with a central depending arbor, substantially as set forth.

10. A multiple-cylinder engine for rotary pneumatic drills and the like, comprising a central valve-chamber, a cluster of engine-cylinders in parallel relation with the valve-chamber and provided with piston, pitman and crank-shaft connections, a rotary valve arranged in said valve-chamber and common to the cluster of engines, means for imparting rotary movement to the valve, a series of individual beveled and toothed pinions on the crank-shafts, and a revolving beveled and toothed annulus common to the series of pinions and provided with a central depending arbor, substantially as set forth.

11. A rotary pneumatic drill, comprising a cluster of engines, a series of individual crank-shafts, pitman connections between the crank-shafts and the pistons of the engines, a series of bevel-pinions on the crank-shafts, a revolving bevel-annulus common to the series of pinions, a head carrying said annulus, and a central tool-carrying arbor on said head, substantially as set forth.

12. A rotary pneumatic drill, comprising a cluster of engines, a series of individual crank-shafts radially arranged, pitman connections between the crank-shafts and the pistons of the engines, a series of beveled and toothed pinions on the crank-shafts, a revolving beveled and toothed annulus common to the series of pinions, a head carrying said annulus, and a central tool-carrying arbor on said head, substantially as set forth.

eled and toothed annulus common to the series of pinions, a head carrying said annulus and a central tool-carrying arbor on said head, substantially as set forth.

13. A rotary pneumatic drill, comprising a main housing formed with a central valve-chamber, a cluster of engine-cylinders in parallel relation therewith, and a lower inclosing chamber or casing, pistons individual to the cylinders, a series of individual crank-shafts, pitman connections between the pistons and the crank-shafts, bevel-pinions on the crank-shafts, a revolving bevel annulus or head common to the series of pinions, and adapted to close the lower head of the inclosing casing or chamber, a rotary valve arranged in the valve-chamber, means for operating said valve, and a tool-carrying arbor on the revolving head, substantially as set forth.

14. A rotary pneumatic drill, comprising a main housing formed with a central valve-chamber, a cluster of engine-cylinders in parallel relation therewith, and a lower inclosing casing or chamber, pistons individual to the cylinders, a series of individual crank-shafts, pitman connections between the pistons and the crank-shafts, bevel-pinions on the crank-shafts, a revolving bevel annulus or head common to the series of pinions, and adapted to close the lower end of the inclosing casing or chamber, a tool-carrying arbor on the revolving head, a rotary valve in the valve-chamber, a valve-stem, and miter-gear connection between the valve-stem and one of the crank-shafts, and a tool-carrying arbor on the revolving head, substantially as set forth.

15. A rotary pneumatic drill, comprising a main housing formed with a central valve-chamber, a cluster of engine-cylinders in parallel relation therewith, and a cylindrical extension, a series of individual crank-shafts having their inner bearings in said extension, pistons, pitman connections between the pistons and the crank-shafts, bevel-pinions on the crank-shafts, a revolving bevel annulus or head common to the series of pinions, a rotary valve arranged in the valve-chamber, a valve-stem, miter-gear connections between the valve-stem and one of the crank-shafts, and a tool-carrying arbor on the revolving head, substantially as set forth.

16. A rotary pneumatic drill, comprising a main housing formed with a central valve-chamber, a cluster of engine-cylinders in parallel relation therewith, and a cylindrical extension, a series of individual crank-shafts having their inner bearings in said extension and their outer bearings in bushings in the housing, pistons, pitman connections between the pistons and the crank-shafts, bevel-pinions on the crank-shafts, a revolving bevel annulus or head common to the series of pinions, a rotary valve arranged in the valve-chamber, a valve-stem, miter-gear connections between the valve and one of the crank-

shafts, and a tool-carrying arbor on the revolving head, substantially as set forth.

17. A rotary pneumatic drill, comprising a main housing formed with a central valve-chamber, a cluster of engine-cylinders in parallel relation therewith, and a cylindrical extension, a series of individual crank-shafts, pistons, pitman connections between the pistons and the crank-shafts, bevel-pinions on the crank-shafts, a revolving bevel annulus or head common to the series of pinions and having bearing upon said cylindrical extension of the housing, a rotary valve arranged in the valve-chamber, a valve-stem, miter-gear connections between the valve-stem and one of the crank-shafts, and a tool-carrying arbor on the revolving head, substantially as set forth.

18. A rotary pneumatic drill, comprising a main housing formed with a central valve-chamber, a cluster of engine-cylinders in parallel relation therewith, and a cylindrical extension, a series of individual crank-shafts, pistons, pitman connections between the pistons and the crank-shafts, bevel-pinions on the crank-shafts, a revolving bevel annulus or head common to the series of pinions and having bearing upon said cylindrical extension of the housing, a friction-reducing bearing between the upper end of the revolving head and said extension, a rotary valve ar-

ranged in the valve-chamber, a valve-stem, miter-gear connections between the valve-stem and one of the crank-shafts, and a tool-carrying arbor on the revolving head, substantially as set forth.

19. A rotary pneumatic drill, comprising a main housing formed with a central valve-chamber, a cluster of engine-cylinders in parallel relation therewith, and a cylindrical extension, a series of individual crank-shafts, pistons, pitman connections between the pistons and the crank-shafts, bevel-pinions on the crank-shafts, a revolving bevel annulus or head common to the series of pinions, and having bearing upon said cylindrical extension of the housing, a friction-reducing bearing between the upper end of the revolving head and said extension, a confining-disk fitting an enlarged counterbore of the revolving head, a tool-carrying arbor on said revolving head, a rotary valve arranged in the valve-chamber, a valve-stem, and miter-gear connections between the valve-stem and one of the crank-shafts, substantially as set forth.

In testimony whereof witness my hand this 1st day of September, 1898.

CHARLES K. PICKLES.

In presence of—

ROBERT BURNS,
JAMES LAVALLIN.