

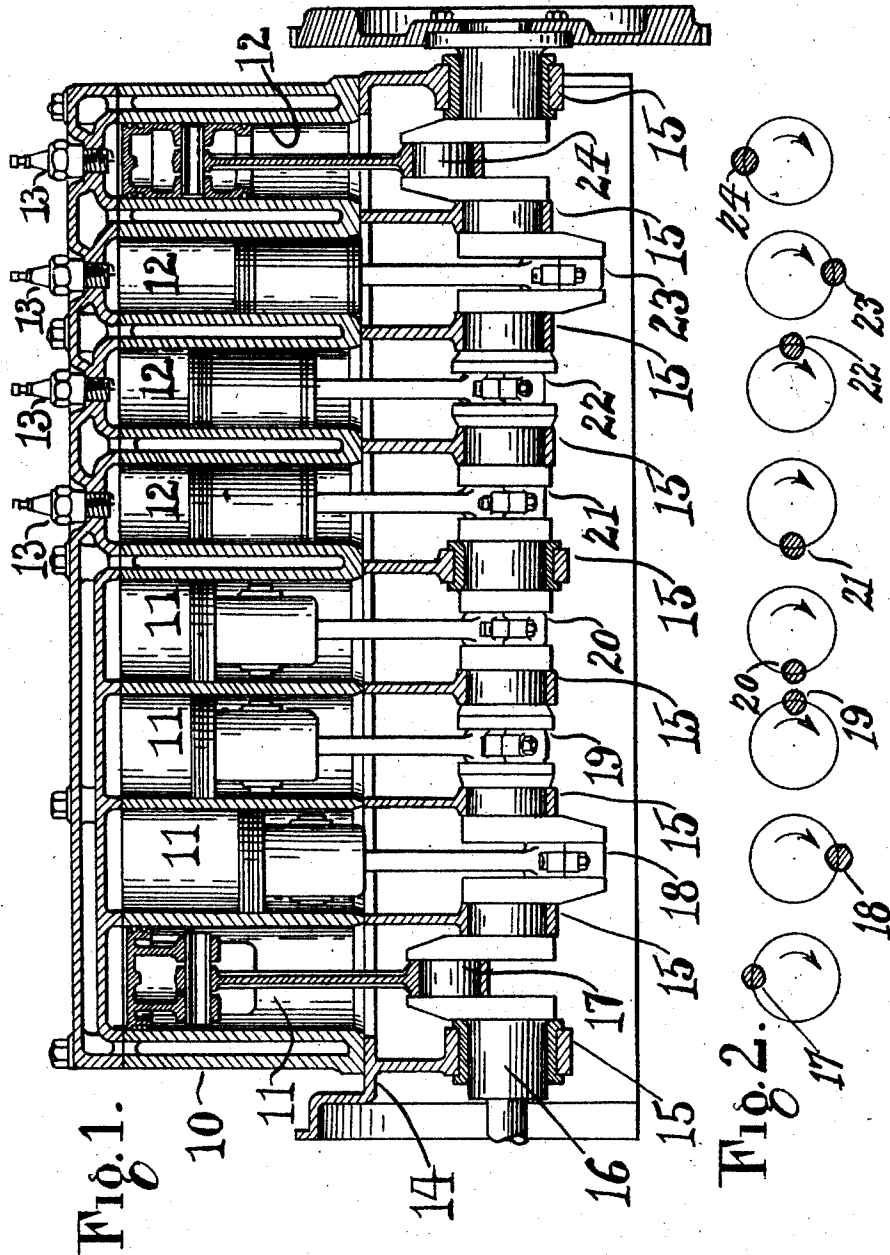
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E. R. BURTNETT

INTERNAL COMBUSTION ENGINE

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INVENTOR

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UNITED STATES PATENT OFFICE.

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INTERNAL-COMBUSTION ENGINE.

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My invention relates to an internal combustion engine of the two stroke cycle principle, and has for its principal objects, the provision of an engine of four combustion cylinders and four charge pumping cylinders arranged in a line with the four combustion cylinders arranged on the end of the engine from which the power is taken off to effect a reduction in the twisting of the crank shaft and reduce torsional vibration.

Further, it is the object of my invention to provide, in combination with an engine having four combustion cylinders on the power take off end and four charge pumping cylinders on the opposite end, an eight crank pin crank shaft which will impart a balanced reciprocatory movement to the pistons within the eight cylinders in line.

In an internal combustion engine of eight cylinders there is an over-lap of power impulses transmitted to the crank shaft and there is a constant torque developed through the end of the crank shaft to which the load is applied, the nature of the power impulse developed by internal combustion is creative of shock, since the combustion is very rapid and the period of high pressure short which results in a series of shocks being transmitted to the crank shaft alternately at different points along the axis of the crank shaft, each power impulse has a tendency to twist the crank shaft or wind it up against the load which is opposing the torque developed at the power take off end of the crank shaft and when the force of each combustion charge is spent the shaft unwinds, this winding and unwinding develops vibration and it is to accomplish a reduction of this action that I arrange four combustion cylinders at the power take off end of the crank shaft and four charge pumping cylinders at the opposite end of the crank shaft, so that the power impulses will only be exerted against the load through one-half as much of the crank shaft.

With the foregoing and other objects in view, my invention consists of certain novel features of construction and arrangement of parts that will be hereinafter more fully described and claimed and illustrated in the accompanying drawings in which:—

Fig. 1 is a vertical section taken length-

wise through an engine of my improved construction.

Fig. 2 is a diagrammatic view which graphically illustrates the relative positions of the eight crank pins of the crank shaft of my improved engine.

Referring by numerals to the accompanying drawings which illustrate a practical embodiment of my invention, 10 designates a cylinder block in which are formed eight cylinders in line, four charge pumping cylinders 11, which function as the charge inductors to four combustion cylinders 12, in which combustion and expansion takes place, spark plugs 13, are located, one in the wall of the clearance chamber of each of the four combustion chambers 12.

For the purpose of providing in each charge pump cylinder of a greater piston displacement than is the case of the piston displacement of each combustion cylinder to accomplish supercharging of the combustion chambers, I provide the four charge pump cylinders of greater bore than the combustion cylinders and since there is very little piston thrust in the charge pump cylinders, I provide the charge pump cylinders with skeleton or slipper type pistons, so as to maintain an equality of weight of the eight reciprocating members.

I prefer to gain the increase of displacement in the four charge pump cylinders arranged at one end of the row of eight cylinders by increasing the bore of the cylinder rather than increasing the stroke, because to increase the stroke would throw the crank shaft out of balance when a crank shaft of like section axially was used.

Surmounting the cylinder block 10, is a crank case 14 in which is suitably journaled by main bearings 15 a crank shaft 16. There are eight crank pins 17—18—19—20—21—22—23 and 24 of the crank shaft, the first crank pins 17 and 24 from each end being of the same axes, the second crank pins 18 and 23 from each end of the crank shaft are of the same axis, the third crank pins 19 and 22 from each end of the crank shaft are of the same axis and the fourth crank pins 20 and 21 from each end of the crank shaft are of the same axis. The eight cylinders in line are spaced apart an equal distance, regardless of

cylinder bore diameter and the eight crank pins of the crank shaft are spaced apart with respect to the axis of the crank shaft equally to provide balanced reciprocative and rotary forces on each side of the center of the forces.

When the charge pump piston within the first cylinder from one end of the engine moves upwardly, the piston within the first combustion cylinder from the opposite end will also move simultaneously in the same direction, likewise with the second charge pump piston from one end and the second combustion piston from the opposite end, likewise will the third charge pump piston from one end and the third combustion piston from the opposite end, and likewise will the two center pistons the fourth charge pump piston from the end and the fourth combustion piston from the opposite end of the row of eight cylinders.

Any practical means of providing valvular function to the charge pump and combustion cylinders may be adapted to the four charge pump and four combustion chambers as may be desired.

Thus it will be seen that I have provided a two stroke cycle internal combustion engine of eight cylinders in a line which will operate with reciprocative and rotary mass balance, and in which the power is transmitted to and through one end of the crank shaft only.

Minor changes in size, form and construction of my improved engine may be made and substituted for those herein shown and described without departing from the spirit of the invention, the scope of which is set forth in the appended claims.

I claim as my invention:

1. In a two-stroke cycle internal combustion engine, eight cylinders arranged in a row with their axes parallel, the four cylinders at the forward end of the row functioning as charge pumping cylinders, the four cylinders at the rear end of the row and from which the power is taken, functioning

as combustion cylinders, pistons arranged for operation within the eight cylinders, a crankshaft having eight separate throws to which the eight pistons are respectively connected, the first and second crank throws of the crankshaft from each end thereof, being arranged 180° apart and occupying the same relative radial positions, the third and fourth crank throws from each end of the crankshaft being disposed 180° apart and occupying the same relative radial positions, and said second and third crank throws from each end of the crankshaft being disposed 90° from the first and second crank throws from each end of said crankshaft.

2. In a two-stroke cycle internal combustion engine, a series of four combustion cylinders arranged in line at the forward or power take-off end of the engine, a series of four charge pumping cylinders arranged at the rear of and in line with the four combustion cylinders, the axes of the eight cylinders being parallel with each other and in the same plane, pistons arranged for operation within the eight cylinders, a crankshaft having eight separate throws to which the eight pistons are separately and respectively connected, the first cranks from the ends of the crankshaft occupying the same radial position, the second cranks from the ends of the crankshaft occupying the same radial position and being disposed 180° from the first cranks from each end of the crankshaft, the third cranks from each end of the crankshaft occupying the same radial position and being disposed 90° from the first and second crank throws from each end of the crankshaft, and the fourth crank throws from both ends of the crankshaft occupying the same radial position and being disposed 180° from the third crank throws from each end and 90° from the first and second throws from each end of the crankshaft.

In testimony whereof, I hereto affix my signature.

EVERETT R. BURTNETT.