Nov. 1, 1932. A. A. SCHELL 1,885,298

INTERNAL COMBUSTION ENGINE

Filed Feb. 27, 1932 3 Sheets-Sheet 1

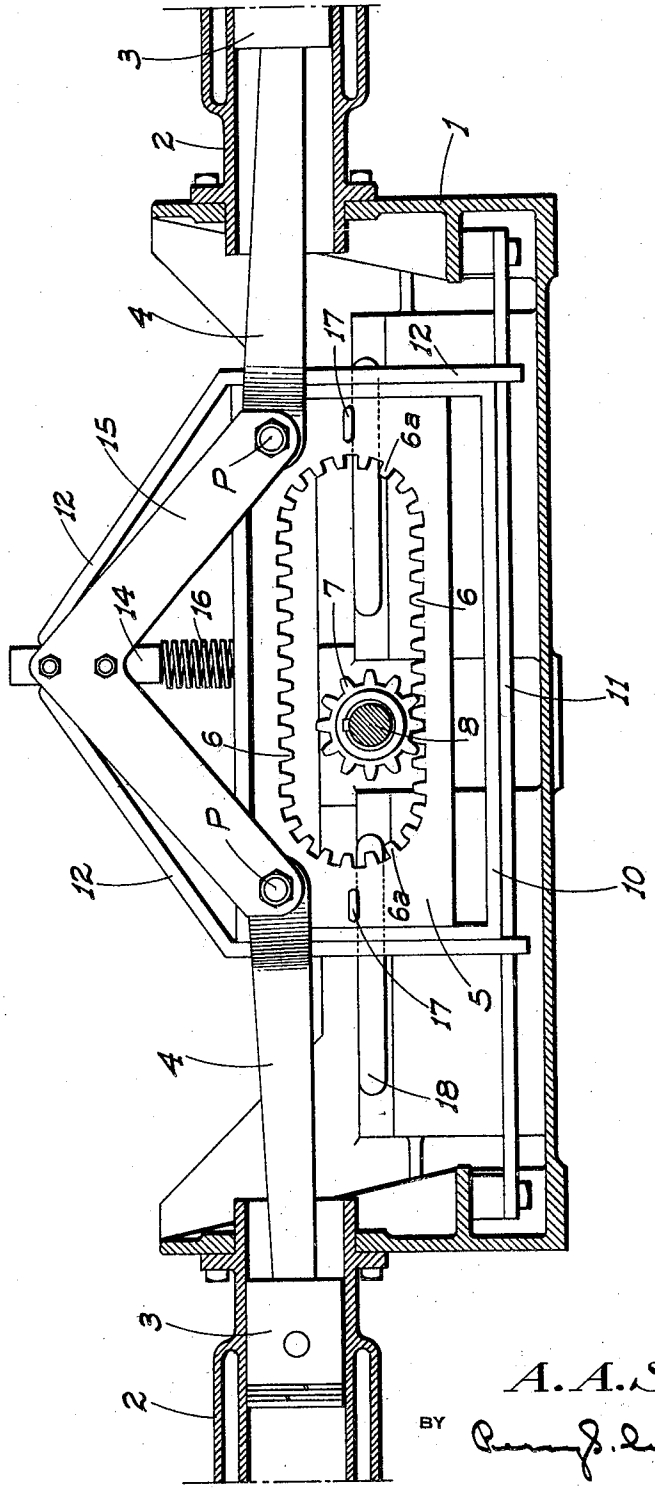


Fig. 1

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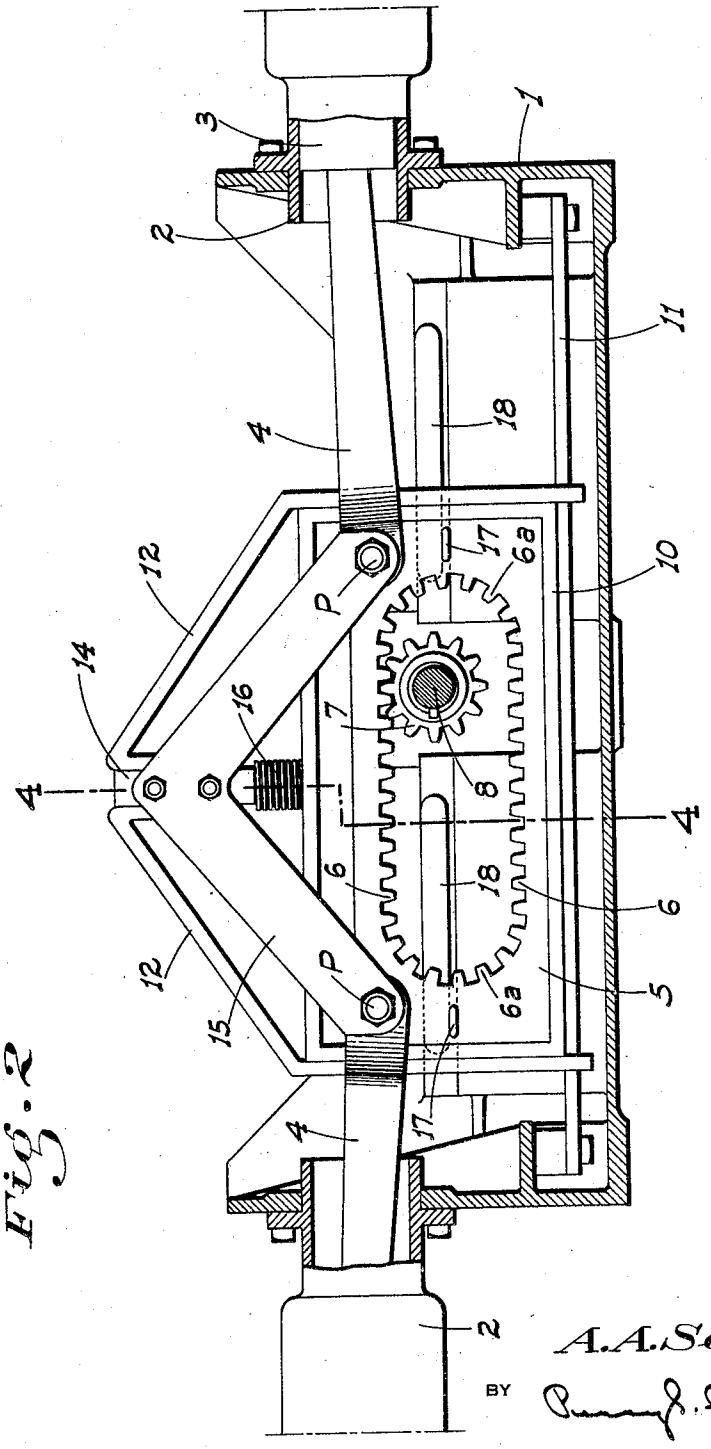


Fig. 2

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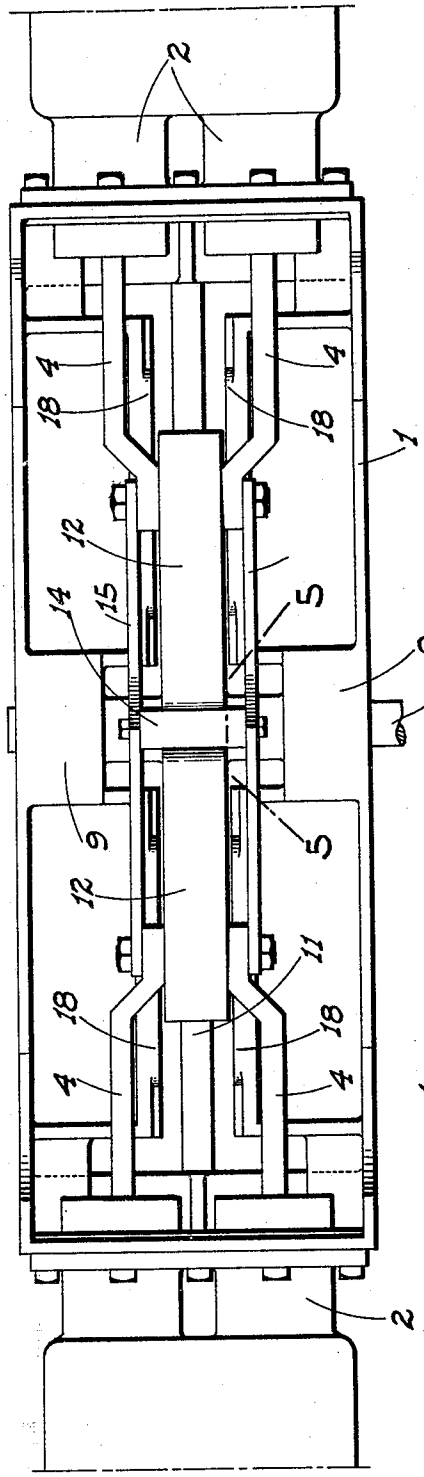


Fig. 3

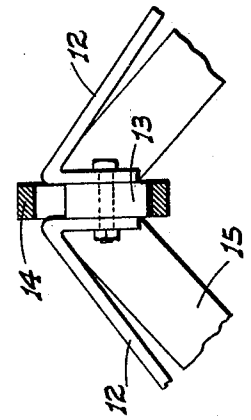


Fig. 5

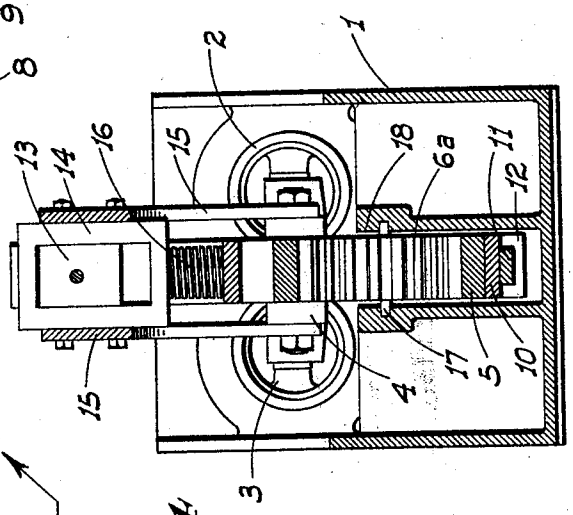


Fig. 4

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Patented Nov. 1, 1932 1,885,298

UNITED STATES PATENT OFFICE

ARTHUR A. SCHELL, OF MARYSVILLE, CALIFORNIA

INTERNAL COMBUSTION ENGINE

Application filed February 27, 1932. Serial No. 595,513.

This invention relates to internal combustion engines, my principal object being to provide an engine of this general character having what I believe to be a novel form of connection between the reciprocating pistons of the engine and the rotating drive shaft, which eliminates the need of the usual crank shaft. A crank shaft, as is well known, is both an expensive unit to manufacture and is a source of considerable vibration especially if not accurately machined and counterbalanced. My improved construction cuts down the manufacturing cost considerably and also practically eliminates vibration. Also the possibility of burning out connecting rod bearings, which is frequent in ordinary engines, is also eliminated.

A further object of the invention is to construct the engine so that a high shaft speed will be obtained with a relatively low piston speed so that the wear on the reciprocating parts is correspondingly reduced.

Another object is to arrange the power producing units of the engine relative to the drive shaft so that the power impulses are imparted to the shaft from above and below the same alternately, and along parallel lines tangent to the shaft, so that the utmost power is obtained from the explosions.

These objects I accomplish by means of such structure and relative arrangement of parts as will fully appear by a perusal of the following specification and claims.

In the drawings similar characters of reference indicate corresponding parts in the several views:

Fig. 1 is a sectional elevation of the engine showing the internal gear block in one position relative to the shaft pinion.

Fig. 2 is a similar view showing the block in its opposite position relative to the pinion.

Fig. 3 is a top plan view of the engine.

Fig. 4 is a transverse section on the line 4—4 of Fig. 2.

Fig. 5 is a fragmentary longitudinal section on the line 5—5 of Fig. 3.

Referring now more particularly to the characters of reference on the drawings, the numeral 1 denotes the frame or case of the engine—a rectangular box-like member. Mounted in the end walls of the case in opposed relation to each other are transversely spaced pairs of cylinders 2, which project outwardly from the ends of the case and are open to the interior of the same. Pistons 3 of ordinary character are slidable in the cylinder, from which pistons connecting rods 4 project. The rods of the two pairs of cylinders extend on opposite sides of and are pivotally secured to a slide block 5 adjacent its ends by pins P.

The block is formed with an internal gear which comprises parallel and horizontal rack portions 6 and semi-circular end portions 6*a*; the length between said end portions corresponding to the stroke of the pistons. The internal gears are engaged by a pinion 7 mounted on a transverse drive shaft 8 journaled in bearing blocks 9 formed in the case 1. The pinion is the same width as the block 5 but its diameter is sufficiently smaller than the space between the top and bottom rack portions of the gear, so that when the pinion is engaged with one rack portion it is well clear of the other.

The block 5 is mounted for vertical sliding movement in a surrounding cage 10 which is slidably supported on a longitudinal bar 11 mounted in the case. The cage is secured to an auxiliary frame which comprises arms 12 diverging from above and centrally of the cage to and down the ends of the same. The arms project below the cage to receive the bar 11 in sliding relation.

The arms are secured at their upper ends to a block 13 disposed therebetween, and which is slidably mounted for vertical movement in a cage 14 which projects to the sides of the arms, as shown in Fig. 3. Rigid connecting arm units 15 are secured to the cage 14 on its opposite sides and extend to the gear block to which they are connected by the pins P. A spring 16 to counterbalance the weight of the gear block extends between the bottom of the case 14 and the top of the cage 10.

Projecting laterally from the gear block on opposite sides toward its ends are lugs 17 which automatically engage the upper and lower surfaces of horizontal guide bars 18

mounted rigid with the case 1. These lugs are arranged so that when riding on top of the bars the pinion 7 is then engaged with the lower rack portion of the internal gear, as shown in Fig. 1; and when the lugs engage the under side of said bars the pinion engages the upper rack portion of the gear, as shown in Fig. 2. The length of the guide bars relative to the length of the gear and the stroke of the pistons is such that as the pinion engages one of the rounded portions 6a of the internal gear, the lugs pass about the rounded ends of the corresponding guide bars.

In operation it will therefore be seen that an explosion in either pair of cylinders will cause the gear block to be moved lengthwise, rotating the pinion and shaft; the block 5, the cage 10, the auxiliary frame 12 and connected parts moving as a unit. When the end of a stroke is reached the pinion moves about the round gear portion without being disengaged from the gear or altering its diriction of rotation until said pinion engages the other rack portion; such movement being accompanied by a shifting in the level of the gear box. The explosive effort in the other pair of cylinders then forces the gear block in the opposite direction until the corresponding end of the stroke is reached, whereupon the level of the gear block is again altered. With such changing in level of the gear block the connecting rods have a certain turning action on the pins P and on the piston wrist pins, but this movement is so small that there is no tendency of the pin bearings ever burning out.

The engine frame or case is formed with a longitudinal oil well into which the gear block and adjacent parts are disposed and which is deep enough to keep the lower portion of the internal gear and pinion immersed in a path of oil so that all moving parts may be thoroughly lubricated. While I have not shown any valve or timing mechanisms it will be obvious that such mechanism may be of the ordinary character and operated as usual by reason of the rotation of the drive shaft.

From the foregoing description it will be readily seen that I have produced such a device as substantially fulfills the objects of the invention as set forth herein.

While this specification sets forth in detail the present and preferred construction of the device, still in practice such deviations from such detail may be resorted to as do not form a departure from the spirit of the invention, as defined by the appended claims.

Having thus described my invention what I claim as new and useful and desire to secure by Letters Patent is:

1. In a mechanism for converting reciprocatory to rotary motion, a shaft having a pinion thereon, a reciprocatory cage mounted for movement in a rectilinear path, an internal oblong gear shiftable transversely within the cage an engaging the pinion, means to shift the gear transversely at the ends of the reciprocatory stroke thereof, and means to counterbalance the weight of the gear comprising a compression spring supported on and upstanding from the cage centrally of its ends, a block overhanging and engaging the top of the spring, and arm units secured to the opposite sides of the block and extending thence to and secured to the sides of the gear adjacent its ends.

2. A structure as in claim 1, with means rigid with the cage slidably engaging the block.

In testimony whereof I affix my signature.

ARTHUR A. SCHELL.