(No Model.) 2 Sheets—Sheet 1.

C. H. ROBINSON.

CRANK PIN BOX CONNECTION.

No. 560,650. Patented May 26, 1896.

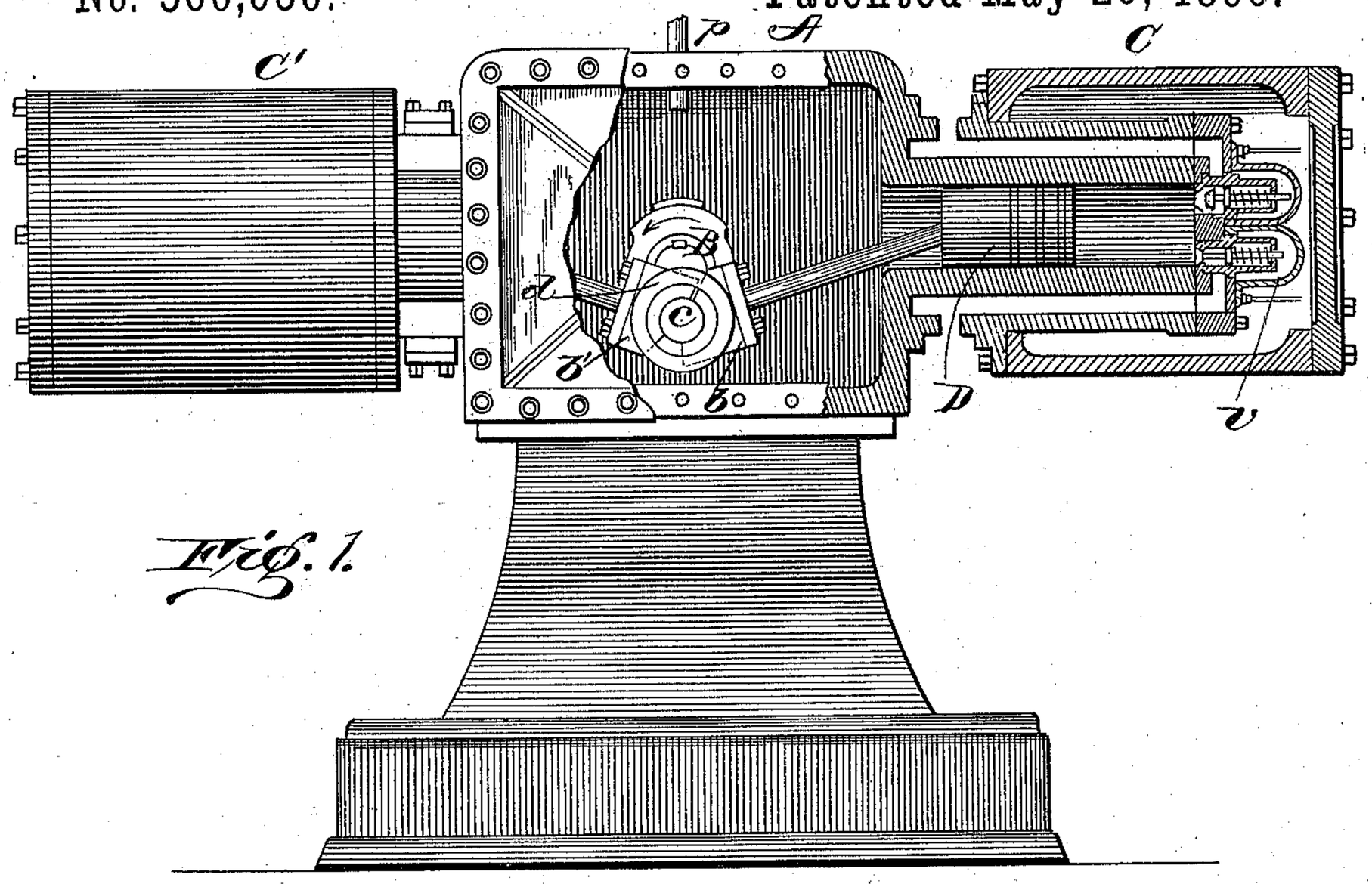


Fig. 1.

Fig. 2.

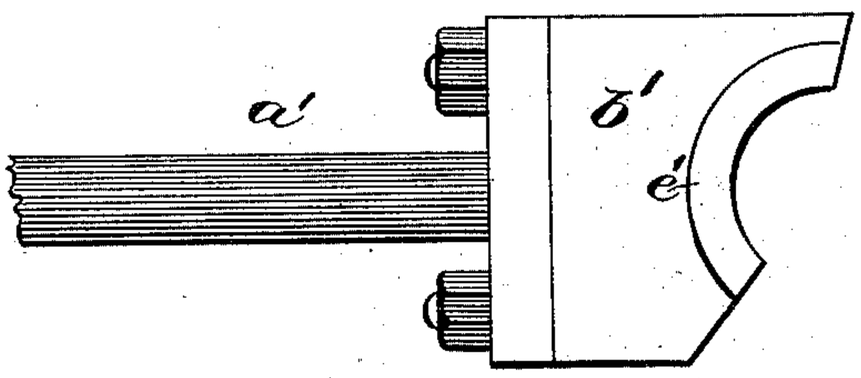
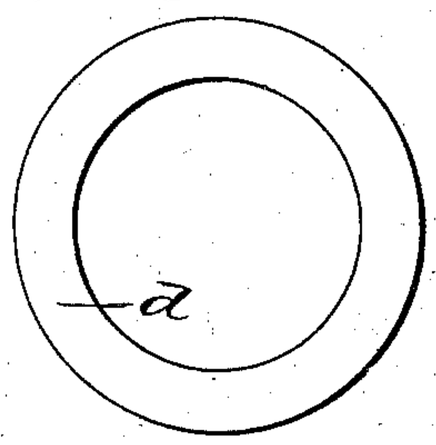


Fig. 2a.



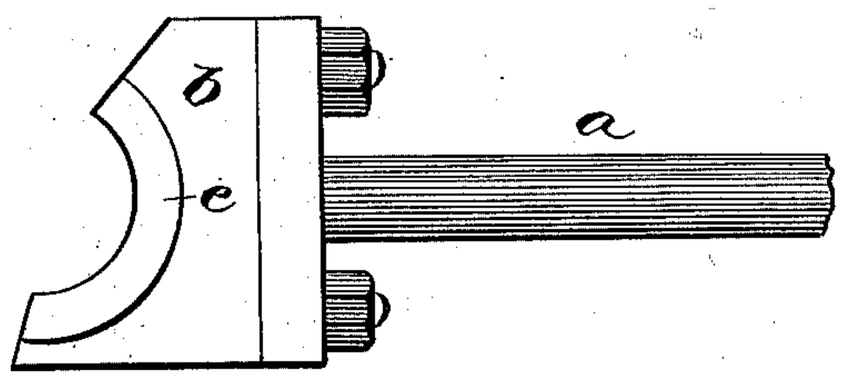
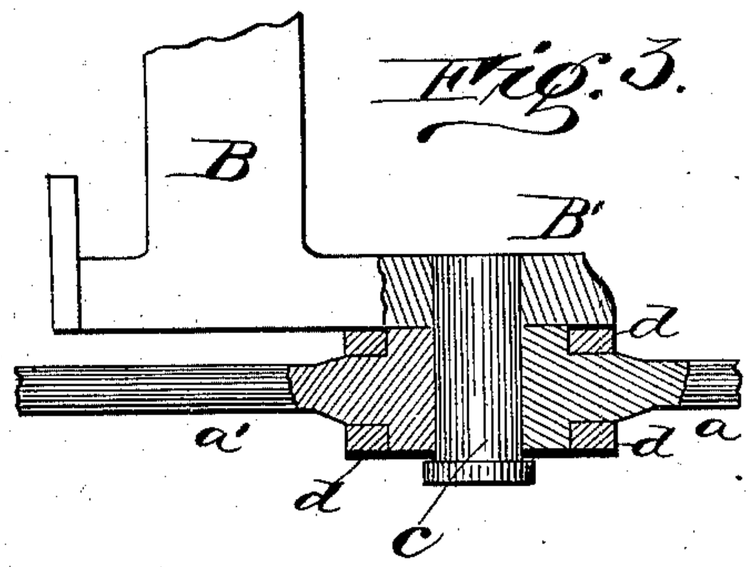


Fig. 3.



Witnesses:
J. M. Fowler Jr.
Wm P. Churchill.

Inventor:
Charles H. Robinson
by Henry H. Bates
his Attorney.

(No Model.) 2 Sheets—Sheet 2.

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Fig. 4.

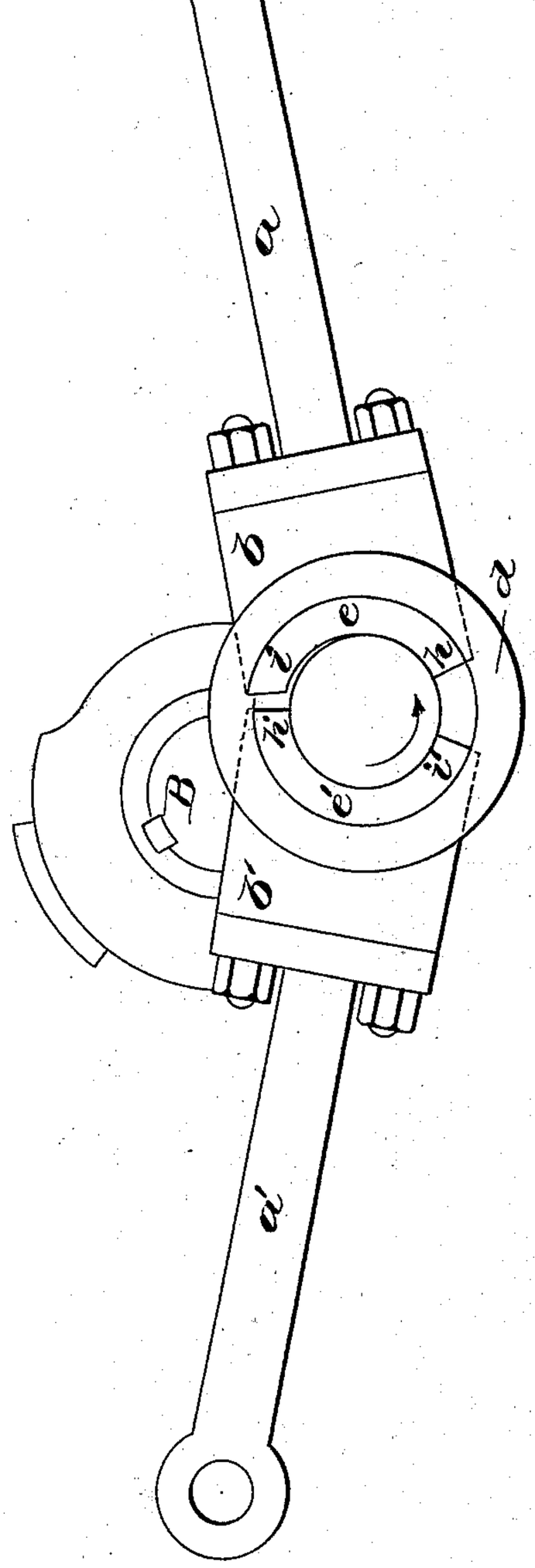
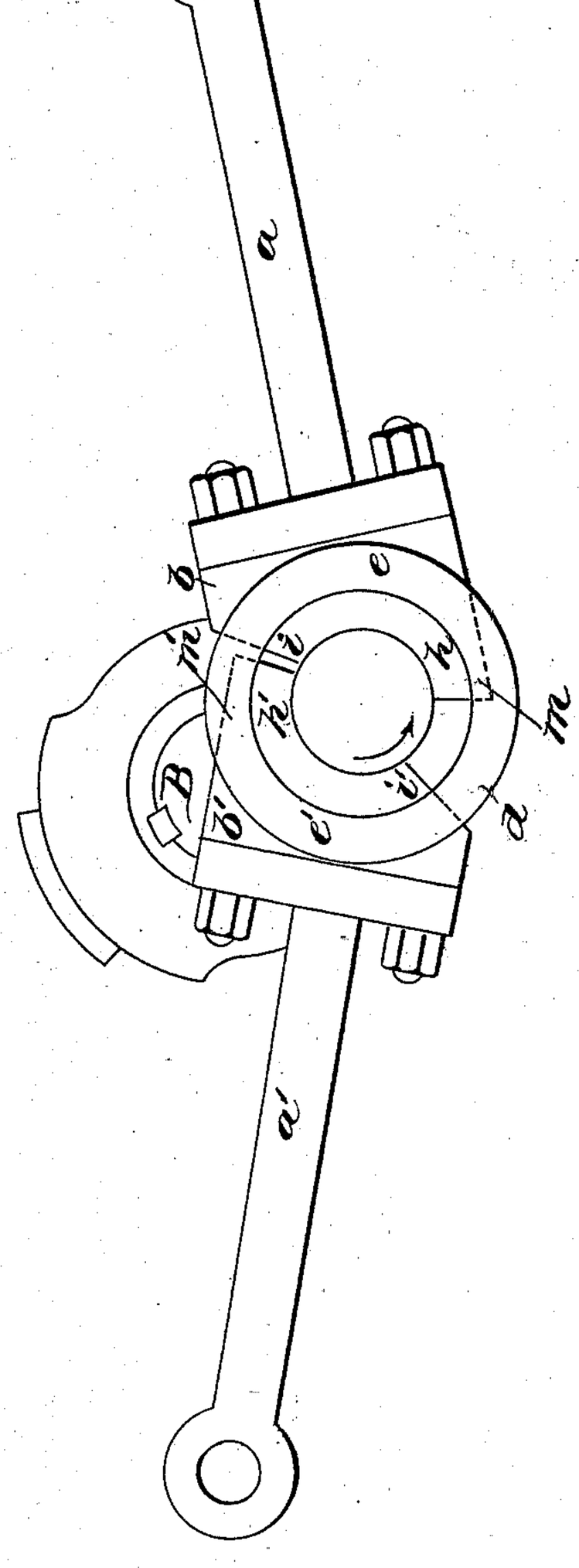


Fig. 5.



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his Attorney.

UNITED STATES PATENT OFFICE.

CHARLES H. ROBINSON, OF HUNTSVILLE, TEXAS.

CRANK-PIN-BOX CONNECTION.

SPECIFICATION forming part of Letters Patent No. 560,650, dated May 26, 1896.

Application filed March 19, 1896. Serial No. 583,944. (No model.)

To all whom it may concern:

Be it known that I, CHARLES H. ROBINSON, a citizen of the United States of America, residing at Huntsville, in the county of Walker and State of Texas, have invented certain new and useful Improvements in Crank-Pin-Box Connections for Multiple Pistons of Single-Acting Engines; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to improvements in the connections of single-acting pistons of compressor-engines and other engines of like character with one common crank-pin of the main shaft where two or more cylinders and pistons are employed; and it consists in the improved construction of the crank-pin boxes for the same, and in the combination thereof with the coöperating parts, as hereinafter specified.

In the accompanying drawings, forming a part of this specification, Figure 1 illustrates a two-cylinder compressor-engine containing my improvement, the right-hand compressor-cylinder being shown in section and the crank-pin boxes being shown in the center at half-stroke. Fig. 2 is a detail view of the improved crank-pin boxes detached. Fig. 2^a is a view of one of the rings belonging thereto. Fig. 3 is a sectional view of the boxes assembled, taken through the axis of the crank-pin, and showing the rings, the flanges, the crank, and the juncture of the latter with the main shaft. Fig. 4 shows the boxes as formerly made with pistons attached, taken at half-stroke, illustrating the crowding of the rings under undue friction and consequent wear on the boxes at the points *h h'*. Fig. 5 shows the boxes as now made by my improved construction, also at half-stroke, illustrating how the wear on the boxes at the points *h h'* is obviated.

Like letters of reference indicate like parts on the several figures.

Proceeding to particulars, A is the oil-tight casing; B, the crank-shaft; B', the crank; *c*, the crank-pin; C C', the cylinders; D, one of the pistons. *a a'* are the piston-rods, *b b'* the crank-pin boxes, and *d* one of the retaining-rings.

e e' are the flanges of the boxes, over which the rings are adjusted, one on each side, the function of the said rings being to hold the boxes and the crank-pin in contact, especially on the return or withdrawal stroke.

v indicates the valve mechanism.

p is a pipe from the oil-trap, supplying oil to the case, the oil standing in the latter at a sufficient height to immerse the boxes at each revolution, the oil-level being capable of inspection by means of a sight-gage. (Not shown.)

In Figs. 4 and 5 the same letters of reference indicate the same parts already described.

In Fig. 4 the boxes and their flanges are shown symmetrical, or alike on each side of the crank-pin. The arrow indicates the direction in which the crank and crank-pin are turning, the right-hand piston exerting compression, and the point of greatest friction and wear being indicated at *h*. On the return stroke, during the compression of the left-hand piston, the point of greatest friction will be at the corresponding point *h'* opposite. At *i* I have indicated the effect of the undue friction at *h* in crowding the flange and ring at that point and tending to leave a gap at the point of least friction *i*. A similar result occurs at *i'*, opposite, on the return stroke.

In Fig. 5, illustrating my improved mode of construction, I have shown at *m m'* the extension or overhang of the boxes toward the advancing frictional surface of the crank-pin on both sides, so as to cover the points of greatest friction with a sufficient bearing-surface, the parts being correspondingly reduced on the opposite or retreating sides *i i'*, where the least friction and wear occur. This reduction in covering area of the box is to allow room for oscillation, since where two or more boxes are employed on one common crank-pin the box cannot wholly surround the pin, as in a single-cylinder engine. Heretofore the reduction has been alike on both sides, whereas I now make the reduction where it can be best spared and retain the frictional bearing-surface where it is most required.

The mode of operation is as follows: In engines of this character, when used for compression purposes, the power is derived from a single rotary crank-shaft and transmitted through a crank-pin to a plurality of pistons,

each of which is connected to the said crank-pin by rods and suitable boxes, by which arrangement the pistons are alternately advanced and retracted within their respective cylinders in succession, with a varying strain upon the crank-pin proportioned to the amount of resistance encountered. In a double-cylinder engine such as I have illustrated the maximum thrust and pressure on one piston coincide with the extreme retraction and relief of the other, the maximum of the pressure occurring when the piston-rods are in a straight line. The pressure varies from practically nothing up to as much as one hundred and eighty pounds to the square inch or more at the maximum point of the stroke. This alternation of force produces great strain on the crank-pin and a proportionate degree of wear on the boxes unless the parts are correctly designed and kept constantly lubricated. I have alluded to the mode of lubrication; but this forms no part of my present claim to invention.

In the double-cylinder engine illustrated the two piston-rods with their boxes and the crank-pin and connections form a species of toggle-joint or knee-joint, giving a very great force against resistance on one of the pistons at dead-center, or when the piston-rods are in line. This force is transmitted to the piston through the crank-pin, occasioning great friction on the boxes at the points *h* and *h'* alternately as the crank-pin constantly revolves toward those points and during the period approaching maximum strain. In Fig. 4, where the boxes are shown symmetrically designed in the old way, it is seen that the bearing at *h* is too short to distribute the great friction occurring at that point and a scraping action takes place upon the crank-pin, which results principally in wear upon the box at *h* and a tendency to throw the same up, as shown at *i*, and crowd the ring. The same effects occur at *h'* and *i'* on the opposite box on the next half-revolution as the piston on that side approaches its maximum of stroke. I entirely obviate this tendency by the modification of the boxes shown in Fig. 5, where the lip of the box is shown extended forward beyond the points of maximum wear *h h'*, as indicated at *m* and *m'*. The wear and strain are thus properly distributed over a larger area, with no tendency to scrape and little or no strain upon the rings, as experience has demonstrated. The same improvement is also valuable in engines of opposite function, as steam-motors, where the power is transmitted from the cylinders and pistons to the crank-pin and rotary shaft instead of reversely, as in compressor-engines. In fact, the same difficulty must occur in such engines whenever a pressure in the cylinders is used approximating the pressure attained in compression-cylinders, as above stated.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. In a multiple-cylinder engine, the combination of the oil-tight case, the cylinders, the pistons, the rotary main shaft, the crank and crank-pin, with boxes *b b'* having projecting curved flanges *e e'*, rings *d* surrounding the said flanges, and piston-rods *a a'* connecting the boxes with the pistons working in the cylinders, the said boxes being each extended on one side more than on the other respectively toward the advancing surface of the rotating crank-pin and beyond the line of greatest wear, substantially as and for the purpose specified.

2. In a multiple-cylinder engine the connecting-rods *a a'*, and boxes *b b'* having curved flanges *e e'*, in combination with rotary crank-pin *c* and rings *d* surrounding the said flanges on each side, for holding the parts in contact, said boxes being asymmetrical or truncated on the side of least wear, and prolonged on the side of greatest wear, substantially as and for the purpose specified.

In testimony whereof I affix my signature in presence of two witnesses.

CHARLES H. ROBINSON.

Witnesses:

ARCHER LEIGH,

JACK P. LEE.