C. W. WEISS.

CRANK CASING FOR INTERNAL COMBUSTION ENGINES.

APPLICATION FILED JUNE 1, 1916.

1,291,313.

Patented Jan. 14, 1919.

2 SHEETS—SHEET 1.

Fig. 1.

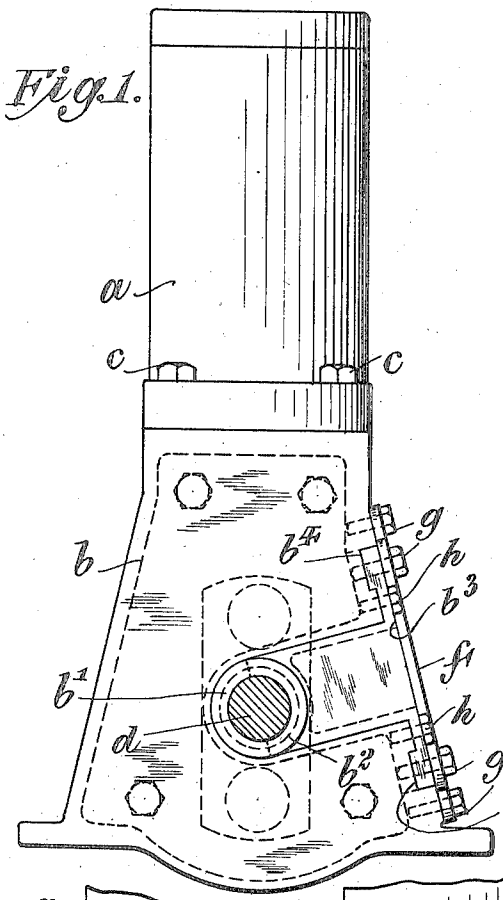



Fig. 3.

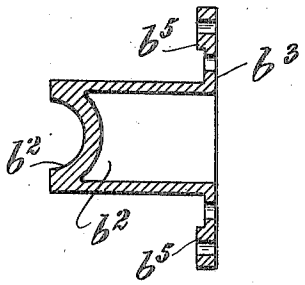
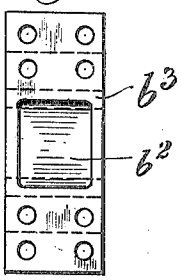



Fig. 4.



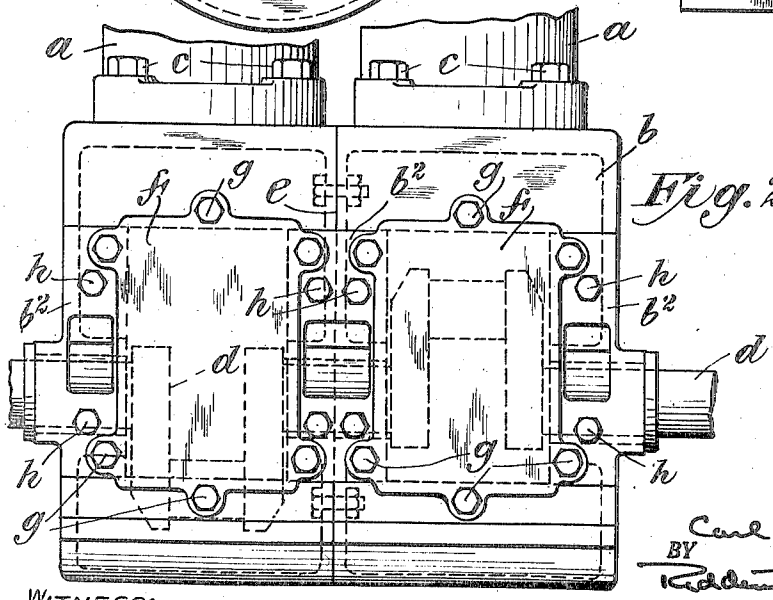




Fig. 2.

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2 SHEETS—SHEET 2.

Fig. 5.

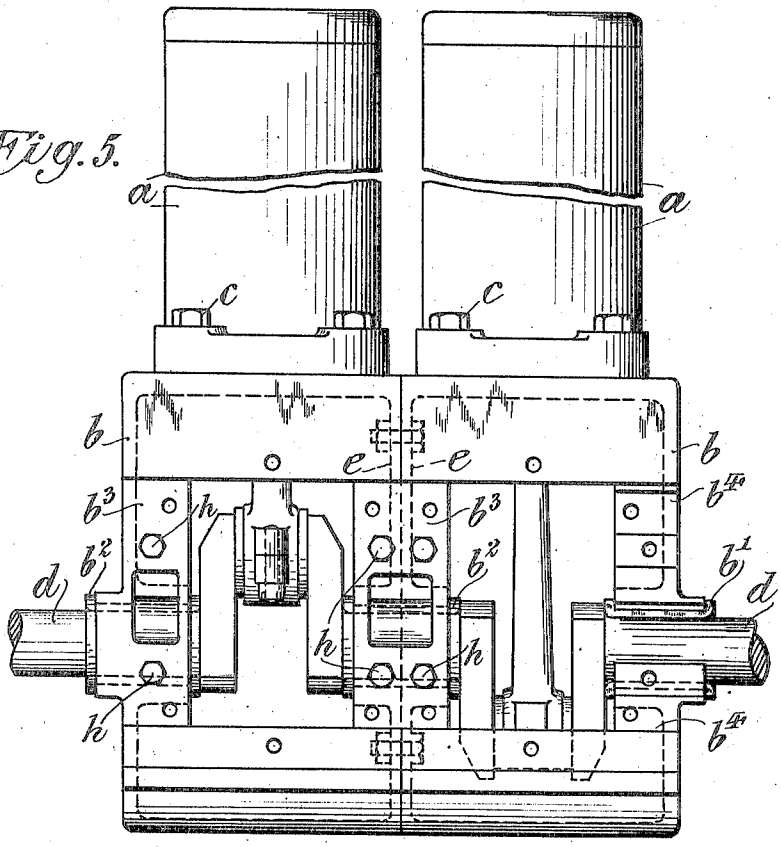
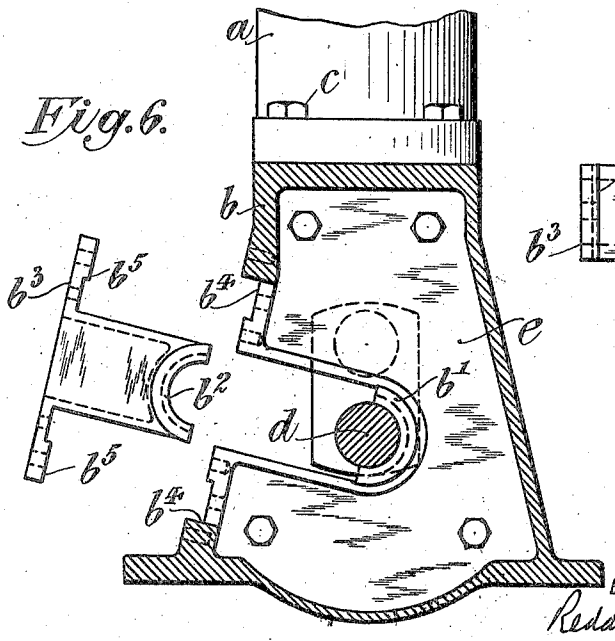



Fig. 6.



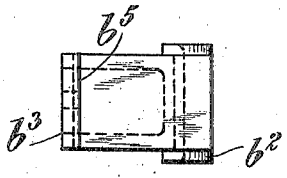




Fig. 7.

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# UNITED STATES PATENT OFFICE.

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## CRANK-CASING FOR INTERNAL-COMBUSTION ENGINES.

1,291,313. Specification of Letters Patent. Patented Jan. 14, 1919.

Application filed June 1, 1916. Serial No. 101,131.

*To all whom it may concern:*

Be it known that I, CARL W. WEISS, a citizen of the United States, and a resident of the borough of Brooklyn of the city of New York, in the State of New York, have invented certain new and useful Improvements in Crank-Casings for Internal-Combustion Engines, of which the following is a specification, reference being had to the accompanying drawings, forming a part hereof.

This invention relates generally to crank casings for internal combustion engines and has for its general objects to improve the construction of such crank casings by affording greater accessibility to the bearings, permitting the removal of the crank shaft through the side wall of the crank casing, increasing the rigidity of the entire engine and decreasing both the initial cost and the cost of repair for engines embodying the invention. More particularly, the invention is concerned with two cycle internal combustion engines of the crank-case compression type. As heretofore known, such engines have been constructed of two sections meeting along the line of the bearings for the crank shaft and bolted together, so that access to the bearings for inspection or removal could only be effected by separating the two sections of the engine. The skill required in such separation and the expense in time and labor are well known to those skilled in the art.

In the preferred embodiment of the present invention removable plates in the side walls of the crank-case carry sections of the bearings for the crank shaft so that the removal of the plates involves a removal of a portion of each bearing and exposes the other section of the corresponding bearing to free inspection. The invention further contemplates the provision of relatively light, hollow bearing caps of such form as to permit the temperature of the bearing surface to be determined by the hand. Other objects of the invention will appear hereinafter in connection with the description of the accompanying drawings, in which—

Figure 1 is a view in end elevation of an internal combustion engine having a crank case formed in accordance with the present invention.

Fig. 2 is a fragmentary view in side elevation of the engine shown in Fig. 1.

Fig. 3 is a detail view in section taken through one of the improved removable bearing caps.

Fig. 4 is a view in elevation of the cap shown in Fig. 3.

Fig. 5 is a view of the engine in front elevation, with the removable plates of the casing removed.

Fig. 6 is a view in transverse section through the casing, showing one of the removable caps withdrawn from its operative position.

Fig. 7 is a top view of the removable cap shown in Fig. 6.

As this description proceeds, it will be evident that the invention, in its broad aspect, will be adapted for application to internal combustion engines of any type, since it may be desirable in any such engine to remove the crank shaft from the crank case by lateral displacement through the side wall of the case. However, for the purposes of this application, there has been shown a multi-cylinder engine of the two cycle crank case compression type, since there are phases of the invention which make it of especial importance in engines of this type.

The cylinders *a* of the engine may be secured to the crank case *b* as by bolts *c* in the usual manner and the crank case will have formed therein suitable bearings *b'* for the crank shaft *d*. In an engine of the crank case compression type, the compression chamber for each cylinder must be separated from the other chambers by a substantially gas tight partition, indicated as formed of plates *e*, in Fig. 2. The bearings in such separating walls *e* must also be substantially gas tight in order that the operations of the engine may be carried on in the intended manner, as will be understood.

In accordance with the present invention, the bearings of the crank shaft *d* are formed of two sections, one of which *b'* is formed in the stationary end plates and partitions of the crank case, and the other of which $b^2$ is formed as a removable cap of such shape and dimensions as to supplement the fixed bearing portion *b'*. This cap is preferably formed integral with a plate $b^3$, the outer surface of which is adapted to lie flush with the outer surface of the side wall of the crank case *b* when the cap is properly positioned. The cap $b^2$ is formed hollow so as to constitute a hollow wall in which the hand may be placed readily in order to feel the temperature of the bearing cap,

when the engine is in use, as is evidently highly desirable. The wall of the cap $b^2$ is of such shape and dimensions as to engage snugly the proximate edges of the walls and partitions of the crank case along the openings formed to receive the caps. For instance, as shown in Fig. 2, the cap for the center partition $e$ between the chambers of the two cylinders, is substantially rectangular in outline and its upper and lower walls lie snugly against the edges of the partitions $e$ to form a gas tight union therewith and thereby hold the compression in the two chambers. The cap itself embraces the crank shaft $d$ and coöperates with the other section $b'$ of the bearing in such a manner as to maintain the same gas tight separation of the two chambers. The other bearing caps at the ends of the crank case may be of slightly different form to conform to the lines of the crank case itself, but such caps are, structurally, identical with the cap used for the center bearing. The exposed side walls of the end caps may serve as portions of the end walls of the crank case while the exposed faces of the plates $b^3$ will maintain the continuity of the exposed surface of the side walls of the crank case. Between the removable caps $b^2$ in the side wall of the crank case $b$ are left manholes which may be covered, when the caps are in position, by suitable plates $f$ which are preferably of such form and dimensions as to lap over the edges of the caps in such manner as to permit the use of common securing bolts $g$ for the cover plates and the caps. In this connection, it is of importance to note the desirable construction indicated in Fig. 1 for insuring a firm gas tight union between the plates $b^3$ and the wall of the crank case without sacrificing that rigidity which is essential. The side wall of the crank case upon its outer surface is channeled, as at $b^4$, to provide shouldered grooves to receive in snug locking engagement corresponding shouldered bosses $b^5$ formed on the rear face of the removable plates $b^3$. As stated hereinbefore, when the plates are in position, the outer surfaces thereof lie flush with the outer surface of the wall of the crank case.

The continuous opening in the side wall of the crank case $b$ is of sufficient width to permit the bodily movement therethrough of the crank shaft $d$. Accordingly, in assembling the parts, with the cover plates $f$ and bearing caps $b^2$ removed, the crank shaft may be inserted laterally through the side wall of the crank case and placed in position in the stationary walls of the crank case. The bearing caps $b^2$ may then be placed in position to supplement completely the other portions $b'$ of the bearings and complete the transverse walls in the crank case. When the bearing caps are properly positioned, the bosses $b^5$ will rest within the shouldered grooves $b^4$ and the outer faces of the plates will lie flush with the outer surface of the wall of the crank case. The caps will be held in position by means of bolts $h$ which pass therethrough into the wall of the crank case $b$. The manholes remaining may then be closed by securing the cover plates $f$ in position. In securing these cover plates, common bolts $g$ may be used which will pass through them and through the plates $b^3$ of the bearing caps $b^2$. The edges of these cover plates $f$ will overlap the edges of the plates $b^3$ and the edges of the openings in the wall of the crank case, so as to close this crank case completely. With the parts thus positioned, it will be evident that the rigidity of the engine has been enhanced rather than lessened by the provision of the removable bearing caps, since these caps constitute the only removable elements and the other portions $b'$ of the bearings and the transverse walls in the crank case may both be formed in the most advantageous manner. Again, the intimate union between the bearing caps and their plates $b^3$ with the proximate sections of the crank case serves to insure additional rigidity and to absorb entirely all lateral thrust imposed upon the bearing caps of the crank shaft. The openings in the hollow walls of the cap serve to permit ready determination of the condition of the bearings. Such removal may be followed by replacement of the cap or by ready inspection of the other portion $b'$ of the bearings as well as of the crank shaft. If desirable, the cover plates $f$ and all of the bearing caps $b^2$ may be removed and the crank shaft $d$ then displaced laterally from the portions $b'$ of the bearings and removed bodily through the side wall of the crank case.

While the illustrated embodiment has been described with some particularity, it is to be understood that the invention is not to be limited in its application to any particular type of engine nor to the precise form or disposition of the elements, as disclosed. The scope of the invention will appear from the appended claims.

I claim as my invention:

1. In an internal combustion engine having a crank case and a crank shaft, a continuous opening in the side and end wall of the case extending from the shaft through which the crank shaft may be passed, sectional bearings for the shaft, plates detachably secured over said openings, bearing caps formed with said plates and constituting one section of the bearing, and independent cover plates detachably secured to the crank case with the first named plates to close the opening completely.

2. In a multi-cylinder two-cycle crank case compression internal combustion engine having a crank shaft, a continuous opening

in the side wall and end walls of each crank chamber, sectional bearings for the shaft, plates having inwardly extending walls detachably secured in the opening in each end wall of each crank chamber to provide gas tight end walls for each chamber, bearing caps formed with each of said plates and constituting one section of the bearing to coöperate with the portion of the bearing in the end wall of each chamber, and plates to close the opening in the side wall of the crank case.

This specification signed this 26th day of May, A. D. 1916.

CARL W. WEISS.