F. M. GREEN AND S. D. HERON.
LUBRICATION OF CRANK SHAFTS.
APPLICATION FILED OCT. 3, 1918.

1,331,638.

Patented Feb. 24, 1920.

2 SHEETS—SHEET 1.

FIG. 1.

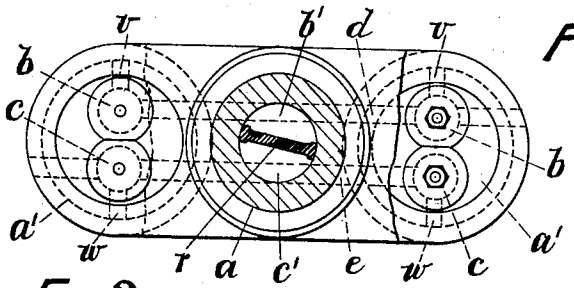


FIG. 2.

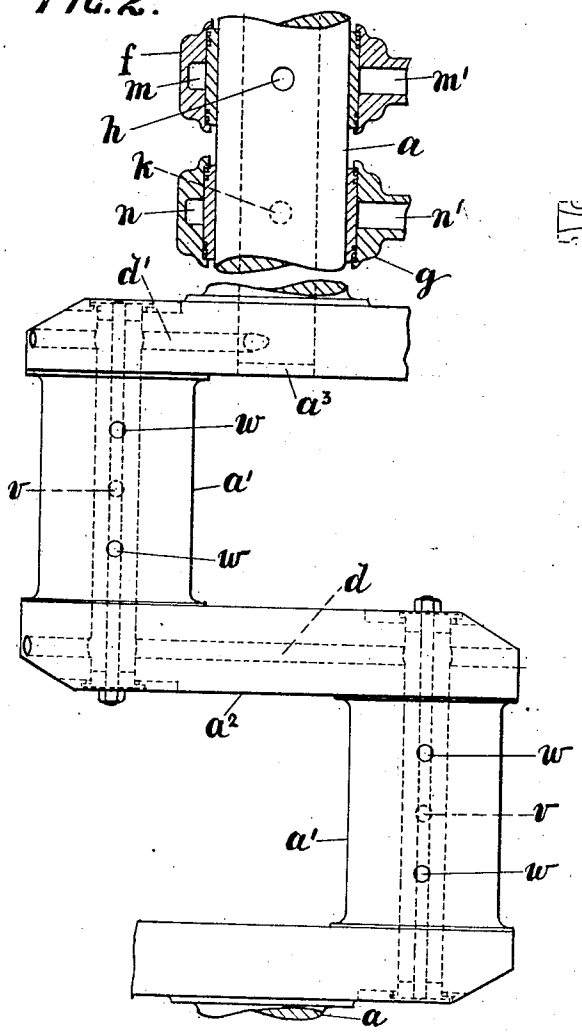
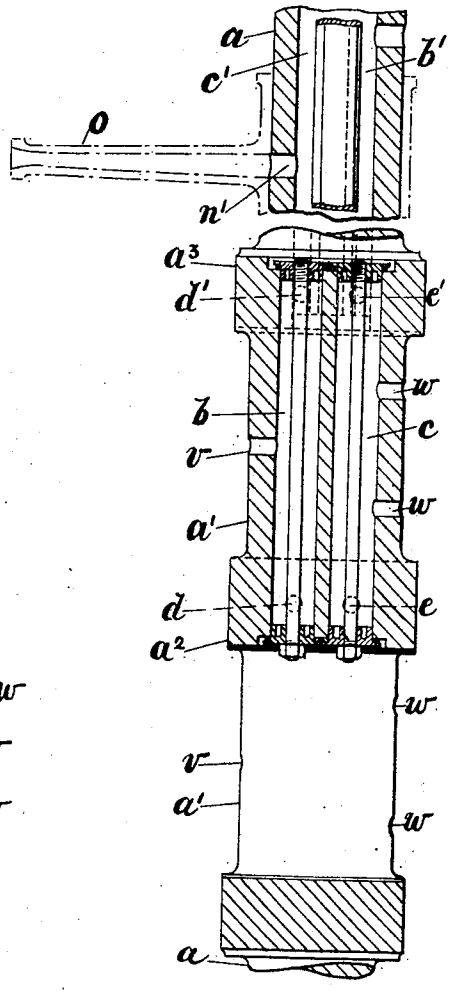


FIG. 3.



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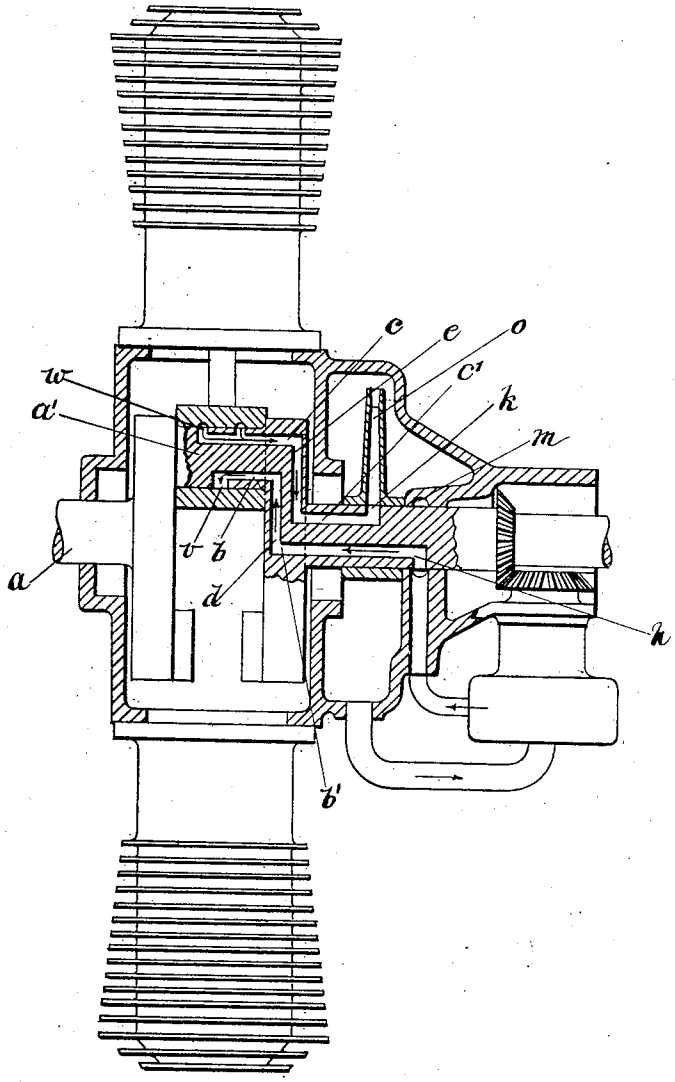
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2 SHEETS—SHEET 2.

Fig. 4.



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UNITED STATES PATENT OFFICE.

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LUBRICATION OF CRANK-SHAFTS.

1,331,638. Specification of Letters Patent. Patented Feb. 24, 1920.

Application filed October 3, 1918. Serial No. 256,702.

To all whom it may concern:

Be it known that we, FREDERICK MICHAEL GREEN and SAM DALZIEL HERON, both subjects of the King of Great Britain and Ireland, residing at Parkside, Coventry, in the county of Warwick, England, have invented certain new and useful Improvements in the Lubrication of Crank-Shafts, of which the following is a full and complete specification.

This invention relates to improvements in the lubrication of crank-shafts and particularly to such as are employed in engines intended for use in aircraft, and it has for its object to supply the bearings with a sufficiency of lubricant for all conditions of running without any waste arising from leakage.

We attain this end by the construction illustrated in the accompanying drawing which shows the invention applied to the crank pins of a two-throw crank-shaft and in which:—

Figure 1 is a view in plan of the crank-shaft.

Fig. 2, is a view in end elevation thereof,

Fig. 3, is a bastard sectional view in plan partly through one end of the shaft and partly through one of the crank pins, and Fig. 4 is a view partly in section showing a convenient application of this invention to a multi-cylinder engine of the radial type.

Throughout the views similar parts are marked with like letters of reference.

Through each of the crank pins a^1 of the crank-shaft a are two passages b and c each of which is in communication with the bearing surface of the pin by means of one or more radially arranged ports v and w respectively, said two series of ports being arranged diametrically or approximately diametrically opposite to one another so as to keep them as far apart as possible, and said ports are preferably arranged at right angles to the webs or arms a^2 of the cranks. The passages b and c in each of the crank pins are respectively connected to one another by means of passages d and e which run through the central web a^2 of the crank. In one end of the crank-shaft a are two passages b^1 and c^1 which are in communication with the passages b and c in the adjacent crank pin a^1 by means of passages d^1 and e^1 in the adjacent crank arm or web a^3. The passages b^1 and c^1 are connected with the outer surface of the crank-shaft by means of radially arranged ports h and k the former for the introduction of and the latter for the exhaustion of the lubricant. Surrounding the crank-shaft a and encircling the ports h and k are two stationary sleeves or collars f and g having annular recesses m and n which are in constant communication with the ports h and k, and in said sleeves are ports m^1 and n^1 by means of which said annular recesses m and n are put into communication with any suitable system of pressure feed and suction exhaust lubrication.

The passages b^1 and c^1 through the crank-shaft and the passages b and d through the crank pins may either be made by drilling two separate holes as shown in the crank pins in Figs. 2 and 3, or by drilling or forming a single hole and dividing said hole by a diaphragm r as shown in the crank-shaft in Fig. 2, and the passages d and e and d^1 and e^1 through the arms or webs of the crank-shaft are independently formed by drilling, the ends of said holes subsequently being closed by suitable plugs as shown.

A convenient system of pressure feed device is that shown in Fig. 4 in which a small centrifugal pump x draws the lubricant from a sump y in connection with the crank chamber of the engine and delivers it to the feed passages b^1, d and b in the crank shaft.

A convenient device for exhausting the lubricant is that shown in dot and dash lines in Fig. 3, which operates by centrifugal action. This consists of a tube o fixed radially on the shaft a and in communication with the port k, the orifice of said tube at its free end being relatively restricted in relation to the port k either by making the bore of said tube of double conical form as shown or by any other convenient formation.

The amount of lubricant used for lubricating purposes may be defined or limited either by varying the number or relative sizes of the ports v and w, or by varying the output of the feed and suction exhaust devices respectively.

It will be seen that by this lubricating system an unlimited supply of oil can be supplied to a bearing without leakage at the ends of same. This is of special importance in some types of aeroplane engines as it

overcomes the trouble of over lubrication of the cylinders from the oil escaping from the crank-shaft.

What we claim as our invention and desire to secure by Letters Patent is:—

1. The combination with a crank-shaft, of flow and return passages running through the main part of the shaft, of flow, and return passages running through the webs or crank arms and of flow and return passages running through the crank pins, said passages through the crank pins being in communication with the bearing surfaces of said pins by independent radially arranged ports, and said passages through the main part of the shaft being in communication with the surface of said part of the shaft by independent radially arranged ports.

2. In a crank-shaft the combination of independent flow and return passages through the main part of said shaft, of similar passages through the crank pins, of one or more ports placing the flow passage in each crank pin in communication with the bearing surface of said pin, of one or more ports placing the return passage in each crank pin in communication with the bearing surface of said pin, of ports placing the flow and return passages in the crank-shaft in communication with the surface of said shaft, of sleeves taking a bearing on the crank-shaft and having annular passages which are open to the ports in said shaft, and of ports in said sleeves by which the pressure feed and suction exhaust devices of the lubricating system are put into communication with said annular passages.

3. In a crank-shaft the combination of independent flow and return passages through said shaft of similar passages through the arms or webs carrying the crank pins and similar passages through the crank pins, of one or more ports placing the flow passage in each crank pin in communication with the bearing surface of said pin, of one or more ports placing the return passage in each crank pin in communication with the bearing surface of said pin said ports being arranged in diametrical opposition to one another, of ports placing the flow and return passages in the main part of the crank-shaft in communication with the surface of said shaft said ports being arranged in diametrical opposition to one another, of sleeves taking a bearing on the main part of the crank-shaft and having annular passages which are open to the ports in said shaft, and of ports in said sleeves by which the pressure feed and suction exhaust devices of the lubricating system are put in communication with said annular passages.

4. In a crank-shaft the combination of independent flow and return passages through said shaft, of similar passages through the webs carrying the crank pins and similar passages through the crank pins, of one or more ports placing the flow passage in each crank pin in communication with the bearing surface of said pin, of one or more ports placing the return passage in each crank pin in communication with the bearing surface of said pin said ports being arranged in diametrical opposition to one another and located at right angles to the arms or webs of the cranks, of ports placing the flow and return passages in the crank-shaft in communication with the surface of said shaft said ports being arranged in diametrical opposition to one another, of sleeves taking a bearing on the crank-shaft and having annular passages which are open to the ports in said shaft, and of ports in said sleeves for putting the annular passages into communication with the pressure feed and suction exhaust devices of the lubricating system.

5. In a crank-shaft the combination of independent flow and return passages through the main part of said shaft through the crank pins and through the arms or webs carrying said crank pins, of one or more ports placing the flow passage in each crank pin in communication with the bearing surface of said pin, of one or more ports placing the return passage in each crank pin in communication with the bearing surface of said pin the size and (or) number of said flow and return ports being different to one another, of ports placing the flow and return passages in the main parts of the shaft in communication with the surface of said shaft of sleeves taking a bearing on the main part of the shaft and having annular passages open to the ports in said shaft, and of ports in said sleeves for putting the annular passages into communication with the pressure feed and suction exhaust devices of the lubricating system.

6. In a crank-shaft the combination of independent flow and return passages through the main part of said shaft through the crank pins and through the arms or webs carrying said crank pins, of one or more ports placing the flow passage in each crank pin in communication with the bearing surface of said pin, of one or more ports placing the return passage in each crank pin in communication with the bearing surface of said pin the size and (or) number of said flow and return ports being different to one another said ports being arranged in diametrical opposition to one another, of ports placing the flow and return passages in the main parts of the shaft in communication with the surface of said shaft said ports being arranged in diametrical opposition to one another, of sleeves taking a bearing on the main part of the shaft and having annular passages open to the ports in said

shaft, and of ports in said sleeves for putting the annular passages into communication with the pressure feed and suction exhaust devices of the lubricating system.

7. In a crank-shaft the combination of independent flow and return passages through the main part of said shaft through the crank pins and through the arms or webs carrying said crank pins, of one or more ports placing the flow passage in each crank pin in communication with the bearing surface of said pin, of one or more ports placing the return passage in each crank pin in communication with the bearing surface of said pin the size and (or) number of said flow and return ports being different to one another said ports being located at right angles to the arms or webs of the crank, of ports placing the flow and return passages in the main parts of the shaft in communication with the surface of said shaft, of sleeves taking a bearing on the main part of the shaft and having annular passages open to the ports in said shaft, and of ports in said sleeves for putting the annular passages into communication with the pressure feed and suction exhaust devices of the lubricating system.

8. In a crank-shaft the combination of independent flow and return passages through the main part of said shaft through the crank pins and through the arms or webs carrying said crank pins, of one or more ports placing the flow passage in each crank pin into communication with the bearing surface of said pin, of one or more ports placing the return passage in each crank pins in communication with the bearing surface of said pin the size and (or) number of said flow and return ports being different to one another said ports being arranged in diametrical opposition to one another and located at right angles to the arms or webs of the crank, or ports placing the flow and return passages in the main parts of the shaft in communication with the surface of said shaft said ports being arranged in diametrical opposition to one another, of sleeves taking a bearing on the main part of the shaft and having annular passages open to the ports in said shaft, and of ports in said sleeves for putting the annular passages into communication with the pressure feed and suction exhaust devices of the lubricating system.

9. In a crank-shaft the combination of independent flow and return passages through said shaft through the crank pins and through the arms or webs carrying said crank pins, of one or more ports placing the flow passage in each of the crank pins in communication with the bearing surface of said pin, of one or more ports placing the return passage in each of the crank pins in communication with the bearing surface of said pin said two series of ports being located as far apart as possible, of ports placing the flow and return passages in the shaft in communication with the surface of said shaft, of a sleeve taking a bearing on the shaft and having an annular passage open to the flow port in said shaft, of a port in said sleeve for putting its annular passage into communication with the pressure feed devices of the lubricating system, and of a radially arranged tube fixed to the shaft over the return port therein the orifice of said tube being restricted relative to the flow port in the shaft.

10. In a crank-shaft the combination of independent flow and return passages through said shaft through the crank pins and through the arms or webs carrying said crank pins, of one or more ports placing the flow passage in each of the crank pins in communication with the bearing surface of said pin, of one or more ports placing the return passage in each of the crank pins in communication with the bearing surface of said pin said two series of ports being located as far apart as possible, of ports placing the flow and return passages in the shaft in communication with the surface of said shaft, of a sleeve taking a bearing on the shaft and having an annular passage open to the flow port in said shaft, of a port in said sleeve for putting its annular passage into communication with the pressure feed devices of the lubricating system, and of a radially arranged tube forming a continuation of the return port in the shaft the orifice of said tube being smaller than the return in the shaft.

11. The combination with a crank-shaft a, of two passages b^1 and c^1 through said shaft, two passages b and d through each of the crank pins a^1 of said shaft, passages d and e through the arm or webs carrying said crank pins putting the passages b^1 and c^1 in the shaft in communication with the passages b and d in the crank pins, ports v and w putting said passages b and d in the crank pins in communication with the bearing surfaces of said pins the ports v being diametrically opposed to the ports w, ports h and k putting the passages b^1 and c^1 in the crank-shaft in communication with the outer surface of said shaft, stationary sleeves f and g surrounding the shaft, annular passages m and n in said sleeves said passages being continuously open to the ports h and k, and ports m^1 and n^1 in the sleeves f and g.

12. The combination with a crank-shaft a, of two passages b^1 and c^1 through said shaft, two passages b and d through each of the crank pins a^1 of said shaft, passages d and e through the arms or webs carrying said crank pins putting the passages b^1 and c^1 in the shaft in communication with the passages b and d in the crank pins, ports v and

w putting said passages b and d in the crank pins in communication with the bearing surfaces of said pins the ports v being diametrically opposed to the ports w, ports h and k putting the passages b^1 and c^1 in the crankshaft in communication with the outer surface of said shaft, stationary sleeves f and g surrounding the shaft, annular passages m and n in said sleeves, port m^1 in the sleeve f leading to the annular passage m said port being adapted to be connected to the pressure feed of the lubricating system, a port n^1 in the sleeve g leading to the annular passage n, and a radially arranged tube o forming an extension of the port n^1.

In testimony we have signed our names.

FREDERICK MICHAEL GREEN.
SAM DALZIEL HERON.