Feb. 5, 1929.

T. DE C. TIFFT

1,701,166

HOT OIL PUMP

Filed June 7, 1927

Fig. 1.

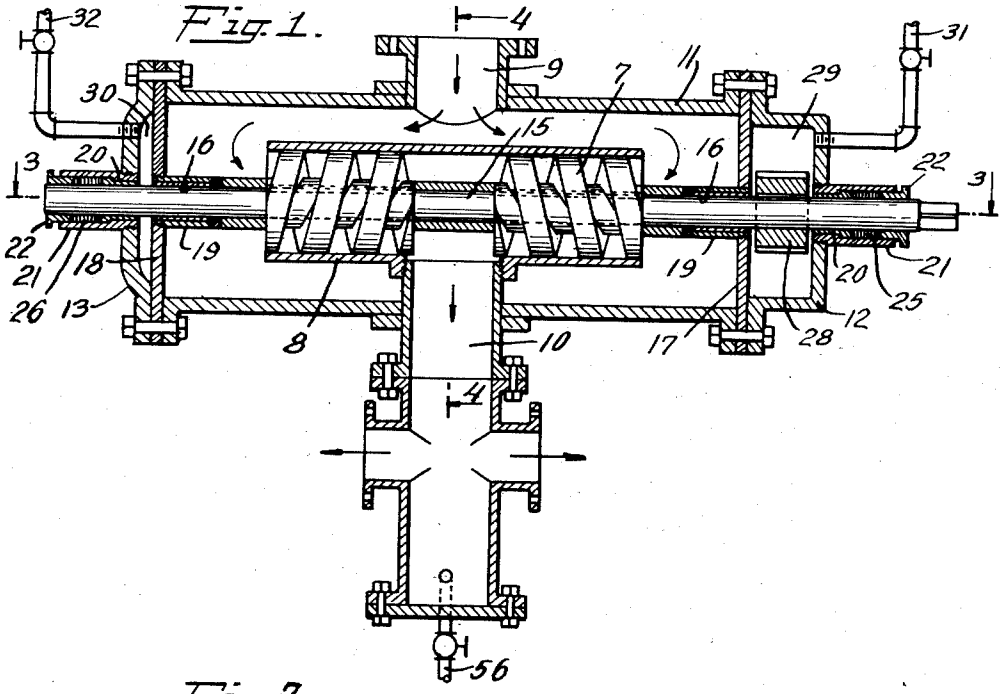


Fig. 2.

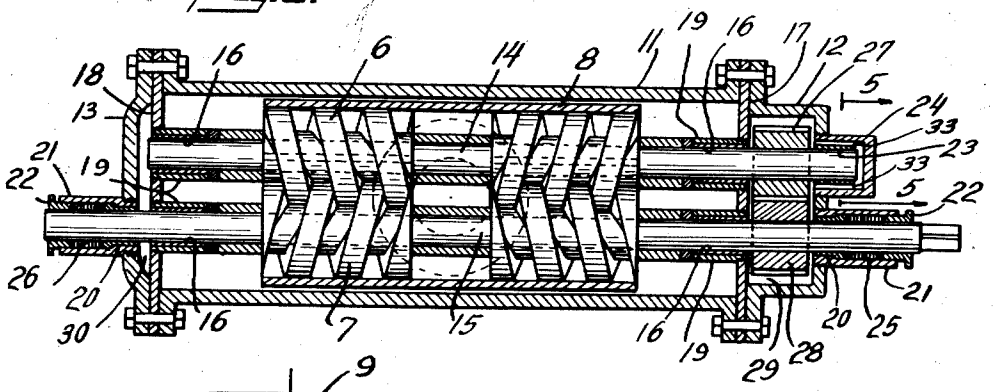


Fig. 3.

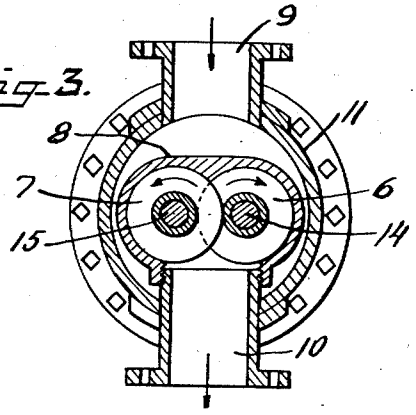
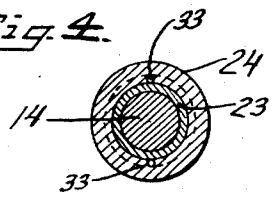


Fig. 4.



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UNITED STATES PATENT OFFICE.

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HOT-OIL PUMP.

Application filed June 7, 1927. Serial No. 197,210.

This invention relates to improvements in pumps intended for handling hydrocarbon oils at or near a cracking temperature and under high pressure. In such service, pumps are subjected to peculiarly severe operating conditions yet must be dependable in operation and safe in operation. This invention provides an improved pump which meets the requirements of such operating conditions, which is dependable and safe in operation, and which nevertheless is relatively inexpensive in construction. The improved pump of the invention is of positive displacement type and the construction is such that single units of large capacity can be built.

In the improved pump of the present invention, the working parts of the pump are enclosed within a housing which is constructed to withstand high pressures at high temperatures and the working parts are relieved of all stresses except those involved in forcing oil through the pump, and the housing and working parts are each constructed to serve best its particular function.

A pump embodying the invention is illustrated in the accompanying drawings, and the invention will be described in connection therewith. In the drawings; Fig. 1 represents a vertical section through the improved pump of the invention. Fig. 2 is a section on line 3—3 of Fig. 1. Fig. 3 is a fragmentary section on line 4—4 of Fig. 1, and Fig. 4 is a section on line 5—5 of Fig. 2.

Referring to Figs. 1 to 4 of the accompanying drawings, the working parts of the pump comprise a pair of driven members 6 and 7 arranged within a working chamber 8. Each end of each driven member is in the form of a helical screw thread adapted to intermesh with and closely fit the screw thread on the adjacent end of the other driven member, the screw threads on opposite ends of each driven member being arranged in opposite helixes. The working chamber 8 closely fits the periphery of the screw threads on the driven members 6 and 7 outside of the zone in which the screw threads intermesh, and in that zone the intermeshing screw threads form a complete closure between the axes of the driven members, (see Fig. 3). In operation, the driven members are rotated in opposite directions (see arrows in Fig. 3) and this rotation forces oil from the open ends of the working chamber 8 to the central space therein between the intermeshing pairs of screw threads in a succession of pockets formed between the screw threads on each of the driven members 6 and 7, the walls of the working chamber 8 and the intermeshing screw thread on the other driven member. Oil is thus drawn from the interior of the housing through supply connection 9 and forced out through discharge connection 10.

The housing in which the working parts of the pump are arranged comprises a central member 11 and end covers 12 and 13. The working parts of the pump, the working chamber 8 and the actuating elements 6 and 7, are arranged entirely within this housing and an operating extension for the actuating elements is carried out through the housing. The working parts of the pump form no part of the housing. The construction is such that bearings, stuffing boxes, etc., are afforded a maximum of protection against hot oil circulating through the pump to which the working parts of the pump are exposed.

Each of the driven members 6 and 7 is mounted upon a shaft, 14 and 15 respectively, carried in bearings beyond the ends of the driven member. These bearings are located outside of the working chamber of the pump and are supported independently of the working chamber of the pump. Each of the shafts is carried in two inner bearings 16, all of which are alike. These inner bearings are supported by plates 17 and 18 bolted between the face of the central housing member 11 and the end covers 12 and 13. The inner bearings 16 are bushings mounted in collars 19 which are secured in the plates 17 and 18. Outer bearings 20 are also provided on shaft 15. These outer bearings are bushings mounted in sockets 21 which are secured in the end covers 12 and 13. The outer ends of the sockets 21 are open and are fitted with glands 22 to form stuffing boxes. An outer bearing 23 is also shown as provided on one end of shaft 14. This outer bearing 23 is a bushing mounted in a socket 24 the outer end of which is closed and which is secured in the end cover 12. A similar outer bearing, supported by the end cover 13, may be provided on the other end of shaft 14. Operating extensions of the shaft 15 project through the stuffing boxes 25 and 26 in the respective end covers 12 and 13. Either or both of these operating extensions is connected to some suitable driving means, such as an electric motor or a steam engine. The maintenance

of a hydraulic balance within the pump is promoted by carrying both ends of the driving shaft through stuffing boxes, as illustrated, but this shaft may be driven from one end only.

Shaft 14 is driven from shaft 15 by gears 27 and 28 arranged within the end cover 12. These gears are arranged to maintain the two driven members 6 and 7 in fixed relation and to effect rotation of the two driven members in opposite directions at equal speeds. A pair of gears similar to gears 27 and 28 may be provided at the other ends of the shafts 14 and 15. The several inner bearings 16 are arranged to fit the shafts 14 and 15 relatively loosely and the outer bearings 20 and 23 to fit the shafts more closely. The plates 17 and 18 form compartments 29 and 30 within the end covers 12 and 13 respectively which by these plates are separated from the interior of the central housing member 11 through which hot oil passes. Connections 31 and 32 are provided for supplying to the compartments 29 and 30 respectively oil under pressure somewhat greater than that prevailing on the other side of the plates 17 and 18. Apertures 33 are provided in the closed socket 24 to establish communication between the space between the closed end of the socket and the end of the shaft 14 and the compartment 29.

In operation the shaft 15 is rotated (counter-clockwise facing Fig. 3) forcing oil from the space within the central housing member 11 into the central space within the working chamber 8 and out through connection 10, and cool oil is supplied through connections 31 and 32 under pressure somewhat exceeding that prevailing within the central housing member 11 to establish a flow of oil inwardly through the inner relatively loosely fitting bearings 16 into the chamber within the central housing member 11 and the plates 17 and 18. This inward flow of cool oil assists in cooling and lubricating these bearings and in preventing escape of hot oil through the bearings, and also makes it possible to have the inner bearings 16 of loose enough fit to avoid sticking or binding over the wide range of temperatures to which such pumps are commonly subjected, say from ordinary atmospheric temperature up to 800° F. or more, without interference with satisfactory operation. The apertures 33 assist in lubricating the outer bearing 23.

The construction just described makes it possible to use cast iron from the driven members 6 and 7 and for the working chamber 8 of the pump, a particularly advantageous and economical material for these working parts of the pump, without any prejudice to safety, as the elements of the external housing may be made of steel forgings. Steel shafts may be used and the plates 17 and 18 may be of sheet steel. This construction makes it possible to use forgings where required for safety and involves but a minimum of machine work on such forgings. The driven members 6 and 7 and the working chamber 8 are readily machined from cast iron. The various fittings attached to the housing elements may also with advantage be of forged steel. It will be noted that in the construction shown the passage within the housing and on the discharge side of the working chamber is of minimum length.

The outer more closely fitting bearings 20 and 23 are rigidly supported in the end covers 12 and 13 and the inner relatively loosely fitting bearings 16 are supported with a substantial measure of flexibility in the plates 17 and 18. In operation, the outer more closely fitting bearings are exposed only to the relatively low temperature of cool oil supplied to the compartments 29 and 30 while the inner bearings 16 exposed to the higher temperature of hot oil circulating through the pump fit relatively loosely and are further protected by cool oil forced through the bearings into the interior of the pump from the compartments 29 and 30.

The improved pump of the invention is of special value and application in connection with pressure stills for cracking hydrocarbon oils of the general type described and illustrated in Letters Patent No. 1,285,200 granted to the Sinclair Refining Company, November 19, 1918, on an application of Edward W. Isom, and has further special advantages in connection with the modified pressure still of this general type illustrated in application Serial No. 197,035, filed June 7, 1927. This modified pressure still, and the oil heater embodied in it, are the invention, in so far as they are novel, of Harry L. Pelzer, a resident of Highland, in the county of Lake and State of Indiana.

While the invention has been described in detail in connection with one particular pump illustrated in the drawings, and its special utility in connection with one type of pressure still system particularly emphasized, it will be understood that this detailed and specific description and showing of the invention is intended to illustrate and exemplify the invention and that the improved pump of the invention may be embodied in other forms and used to special advantage in connection with other cracking systems.

I claim:

1. An improved hot oil pump comprising a housing made up of a central housing member, end covers therefor and plates arranged between the end covers and the central housing members forming compartments within the end covers separated by the plates from the space within the central housing member, a working chamber independent of the housing and arranged within the central housing member, a shaft extending through the working chamber and into the compartments in the

end covers through bearings supported by the plates arranged between the end covers and the central housing member, and means arranged within the working chamber and on said shaft adapted to force oil through the working chamber.

2. An improved hot oil pump comprising a housing made up of a central housing member, end covers therefor and plates arranged between the end covers and the central housing member forming compartments within the end covers separated by the plates from the space within the central housing member, a working chamber independent of the housing and arranged within the central housing member, a shaft extending through the working chamber and into the compartments in the end covers through bearings supported by the plates arranged between the end covers and the central housing member, and means arranged within the working chamber and on said shaft adapted to force oil through the working chamber, said central housing member being of forged steel and said working chamber and the coacting forcing means being of cast iron.

3. An improved hot oil pump comprising a housing made up of a central housing member, end covers therefor and plates arranged between the end covers and the central housing member forming compartments within the end covers separated by the plates from the space within the central housing member, a working chamber independent of the housing and arranged within and opening into the central housing member, a shaft extending through the working chamber and into the compartments in the end covers through bearings supported by the plates arranged between the end covers and the central housing member, means arranged within the working chamber and on said shaft adapted to force oil through the working chamber, a supply connection communicating with the space within the central housing member and a discharge connection extending through the central housing member and communicating with the working chamber.

4. An improved hot oil pump comprising a housing made up of a central housing member, end covers therefor and plates arranged between the end covers and the central housing member forming compartments within the end covers separated by the plates from the space within the central housing member, a working chamber independent of the housing and arranged within the central housing member, a pair of shafts extending through the working chamber and into the compartments in the end covers through bearings supported by the plates arranged between the end covers and the central housing member, one of said shafts having an operating extension projecting through one of the end covers, and a pair of coacting driven members arranged within the working chamber and on said shafts and adapted by rotation to force oil through the working chamber.

In testimony whereof, I have subscribed my name.

THOMAS DE COLON TIFFT.