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F. W. BOWDITCH ET AL
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2 Sheets-Sheet 1

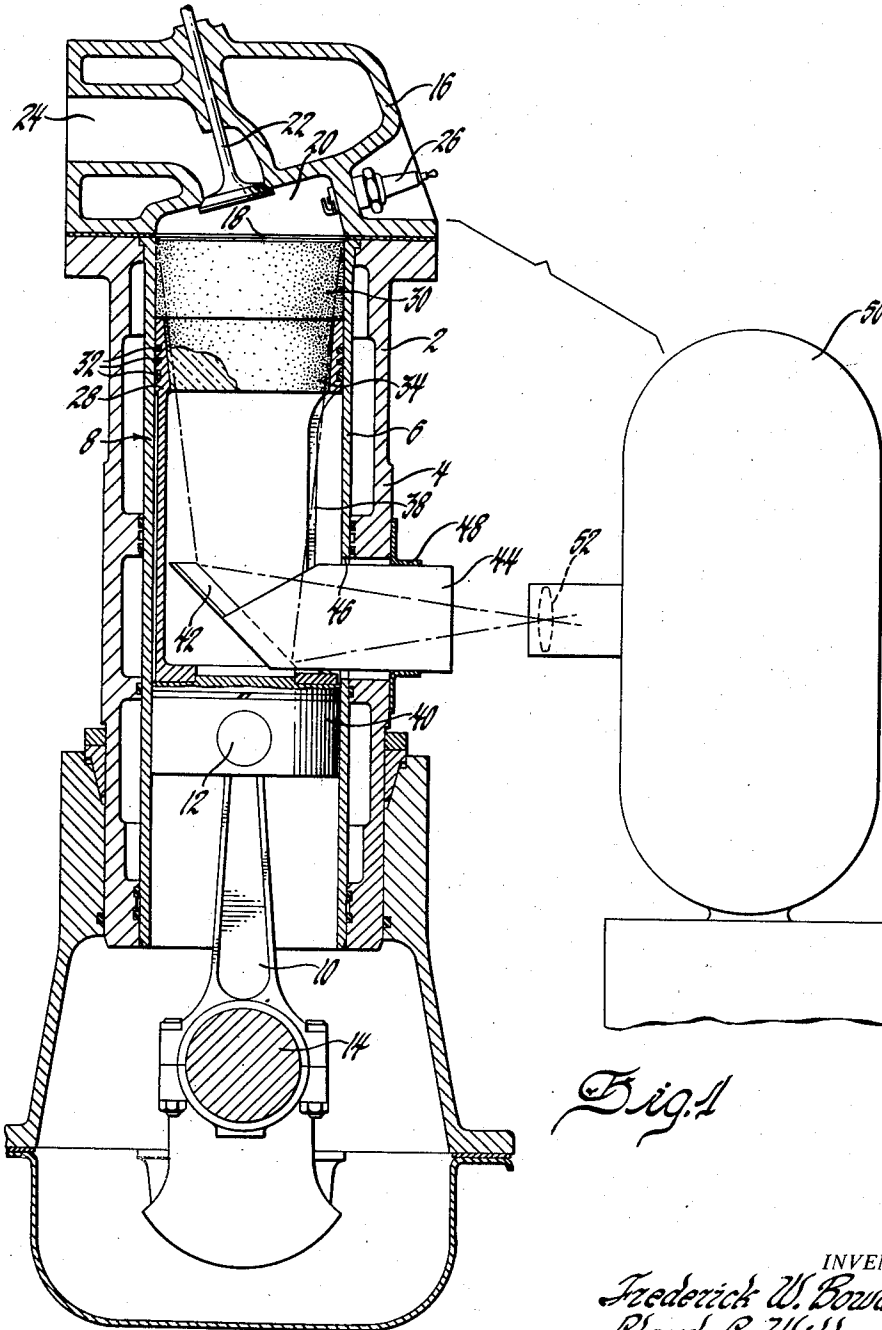


Fig. 1

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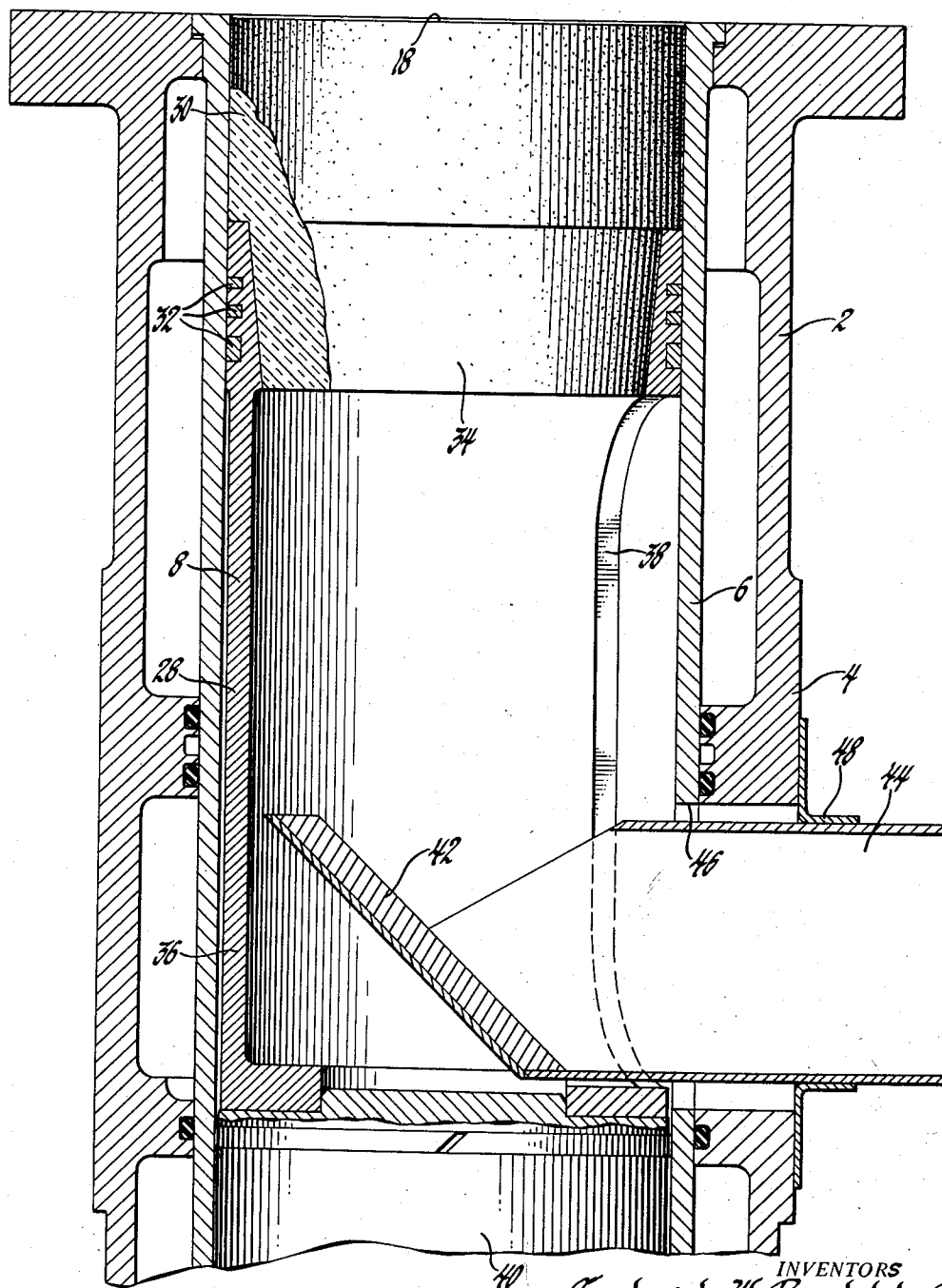


Fig. 2

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CYLINDER AND PISTON ASSEMBLY

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5 Claims. (Cl. 123—193)

This invention relates generally to piston and cylinder assemblies wherein it is desired to view the action of the fluids in the expansible chambers formed by said piston cylinder assemblies and more particularly to means for viewing the combustion chambers of reciprocating internal combustion engines in order to study the effects of compression ratio and combustion chamber design during hot starting, deposit induced surface ignition and the various other phenomena which occur therein.

Means such as windows in the cylinder heads previously have been provided for the viewing of expansible combustion chambers. Such devices, while reasonably satisfactory, make viewing quite costly and time consuming inasmuch as each time it is desired to test and view a differently shaped combustion chamber a new window must be built into the particular head.

The present invention has been proposed so that the expansible chamber may be viewed through the piston from the underside thereof thereby allowing the action in any combustion chamber to be seen without the need of adding a window to the head forming such chamber.

For a fuller understanding of the invention and the objects thereof, reference may be made to the accompanying detailed description and the drawings in which:

Figure 1 is a sectional view in elevation of a piston cylinder assembly of an internal combustion engine having the novel engine combustion chamber viewing means applied thereto;

Figure 2 is an enlargement of a portion of Figure 1 showing in more detail the unique construction of the novel piston assembly.

Referring now to the drawings a portion of an internal combustion engine 2 is shown which includes an engine block 4 in which there is provided an engine cylinder 6. Located within the cylinder 6 is an engine piston assembly 8 which is reciprocated in a normal manner by a connecting rod 10 connected thereto by the piston pin 12 and to an engine crankshaft 14. The upper end of cylinder 6 is closed by the usual cylinder head 16 forming with the upper end 18 of piston 8 and walls of cylinder 6 a combustion chamber 20. Chamber 20 may be charged by opening of the valve 22 connecting an intake 24 therewith. The charge in the combustion chamber 20 may be fired in the usual manner by spark plug 26. The structure so far described is typical of most reciprocating internal combustion engines and is felt to need no further elaboration here since the general operation and construction of such engines is very well known.

As previously emphasized earlier in the specification, however, in order to improve the operation of internal combustion engines, it is necessary or desirable to observe the activity which takes place in the combustion chambers of such engines. It is deemed that the present invention enables such activity to be viewed in a unique manner made possible by a specialized piston and cylinder construction which will now be described in detail.

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It will be noted that the piston 8 which reciprocates in the cylinder 6 is provided with an elongated trunk 28 in which is mounted at the upper end thereof a transparent quartz crystal 30. The upper part of the trunk 28 may be provided with the usual compression and oil rings 32. The quartz crystal 30 may be secured in any suitable manner in the trunk 28 as for example by resin bonding and has a lower portion 34 which is slightly tapered for a reason which will appear shortly. The trunk 28 includes an elongated skirt portion 36 which is provided with at least one prolonged slot 38 in a side surface thereof. Fixed to a lower end of the skirt portion 36 is the remaining part of a piston assembly constituting a piston pin carrier 40 which is connected as previously described by the piston pin 12 to a connecting rod 10 which in turn is connected to the crankshaft 14. Located within the skirt portion 36 of the piston 8 and inclined or tipped with respect to the upper and lower parts of the pistons is a mirror or reflector 42. The reflector 42 is supported by tubular scopic means 44 extending through an opening 46 of cylinder 6 and supported by the flanged member 48 mounted on the block 4. Suitable viewing or camera means 50 may be positioned so that the lens 52 thereof faces or is in alignment with the scopic means 44. Such viewing or camera means receives the light rays emanating from the combustion chamber 20 through the quartz window 30 and reflected by the mirror 42 through the scopic means 44 extending through the slot 38 and opening 46.

It may now be appreciated that the lower part of the quartz window 30 has been tapered in order that the maximum number of light rays to obtain complete observation of the combustion chamber 20 may be utilized. In operation then the camera or other observation means 50 may be directed into the scopic means 44 so as to receive from the mirror 42 the reflected image of the combustion chamber 20. Because of the special construction of the piston 36 firing of the engine may occur and the piston be moved up and down without interference from the mirror or scopic means which, however, enables a full view of the combustion chamber.

From the foregoing it will be observed that various shapes of combustion chambers in different cylinder heads may be tested with the same device merely by the substitution of the different cylinder heads.

We claim:

1. In combination with a cylinder having a piston reciprocable therein and forming an expansible chamber therewith, a window of transparent material in said piston enabling viewing into said chamber through said piston.

2. A cylinder and piston assembly together forming an expansible chamber and means for viewing the interior of said chamber comprising a window of transparent material in the head of said piston.

3. In an internal combustion engine including an engine cylinder and a piston reciprocable therein together defining an expansible combustion chamber, means for viewing the interior of said chamber comprising a window of transparent material in the head of said piston.

4. The combination of claim 3 wherein the said material is quartz.

5. In an internal combustion engine, an engine block having a cylinder therein, a piston reciprocable in said cylinder forming an expansible combustion chamber therewith, and means for viewing the interior of said chamber comprising a window of transparent material in the head of said piston, said piston having a skirt portion with an elongated slot in a sidewall thereof, a piston pin carrier fastened to the bottom of said skirt portion and connected by a connecting rod to a crankshaft of said engine, said cylinder having an opening therein below said piston head in alignment with said

slot, a mirror, scopic means fixed to said block and extending through said opening and slot and supporting said mirror in said skirt portion at an angle whereby light from said combustion chamber passing through said window is directed by said mirror through said scopic means so that said combustion chamber may be viewed from beside of said cylinder.

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