Sept. 15, 1925. 1,554,157

A. DEANS

PISTON

Filed March 2, 1925

Fig. 1.

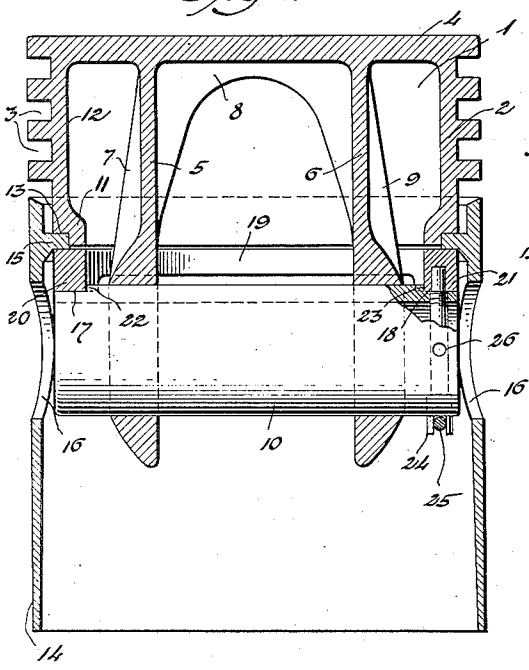
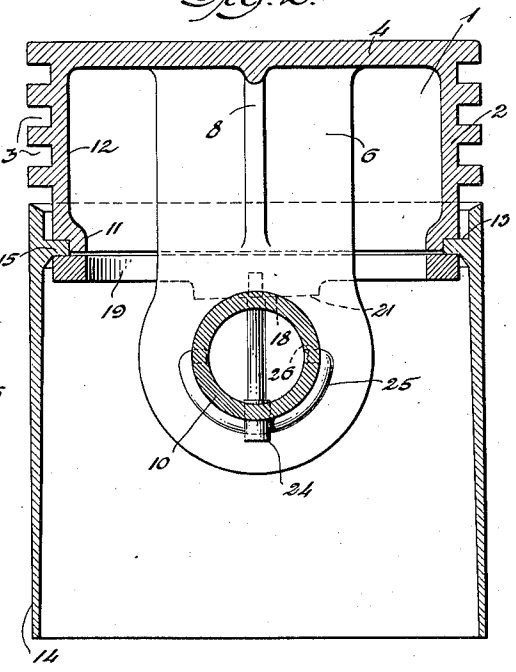


Fig. 2.



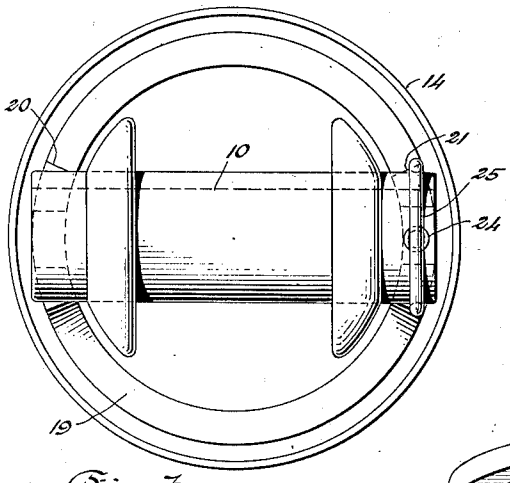


Fig. 3.

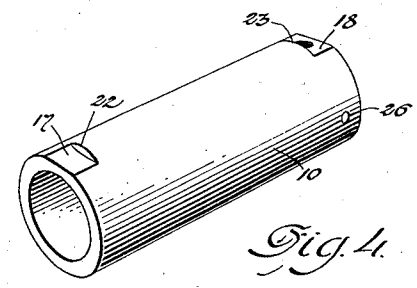


Fig. 4.

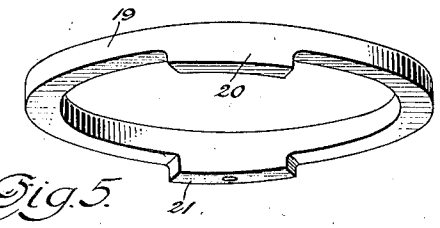


Fig. 5.

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UNITED STATES PATENT OFFICE.

ALFRED DEANS, OF DETROIT, MICHIGAN.

PISTON.

Application filed March 2, 1925. Serial No. 12,649.

To all whom it may concern:

Be it known that I, ALFRED DEANS, a citizen of the United States, residing at Detroit, in the county of Wayne and State of Michigan, have invented certain new and useful Improvements in Pistons, of which the following is a specification, reference being had therein to the accompanying drawings.

This invention relates to the pistons of internal combustion engines wherein it is desirable that lightness shall be combined with strength and durability for which reason it has often been proposed to make such pistons of materials differing in weight and wearing qualities so that reduction in the weight of the piston as a whole may be effected by the incorporation therein of the lighter weight material. Sometimes this has been effected by casting a light upper part piston in a skirt of heavier material, or vice-versa, and sometimes by mechanically securing a part of one material to a part of another material, but such constructions have usually been attended with various objectionable features which prevented or operated against their general adoption in internal combustion engine practice.

This invention has for its objects to more completely meet the requirements of a piston from the standpoint of lightness, durability, mechanical simplicity and ease of assembling the parts thereof, as well as the ready renewal or rotary adjustment of the skirt or, in some cases, of the upper part of the piston when thought necessary or desirable, irrespective of whether the upper part and skirt are of differing or similar materials; and to provide a piston constructed of two differing materials adapted to meet certain desired conditions or requirements in such material wherein freedom from protuberances or metallic masses on the inner walls of the piston which would otherwise tend to result in uneven expansion thereof are avoided.

The invention further aims to provide a piston having an upper part of light weight material from which upper part a skirt of a material having substantial wearing qualities is suspended in such manner that the said skirt is not required to effect the supporting of the gudgeon pin or other parts of the piston permitting the said skirt to be constructed in the lightest feasible form.

A still further object is to provide for the suspension or support of the gudgeon pin from the said upper part of the piston and the utilizing of the said pin for the securing of the said skirt to the upper part of the piston in a novel and efficient manner and also to provide a simple form of locking device capable of ready adjustment for the locking or unlocking of the said skirt to or from the upper part of the piston; the said invention still further providing for cooperation between the gudgeon pin and the said device in effecting the securing of the skirt to the head of the piston.

Still further objects subsidiary to or resulting from the aforesaid objects or from the construction or operation of the invention as it may be carried into effect, will become apparent as the said invention is hereinafter further disclosed.

In carrying the said invention into effect, I may provide the upper ring-carrying part of a piston of a light metal such as aluminum with a skirt of, say, cast iron, having an internal web or flange adapted to seat in a suitably provided groove in the lower margin of the upper part of the piston, means depending from the head of the said piston receiving the gudgeon pin which may be inserted into such means through suitably provided orifices in the skirt, a wedge ring adapted to be interposed between the end portions of the gudgeon pin and the seated flange of the skirt in such manner that upon rotation the said wedge ring may effect the locking of the said flange against the contiguous margin of the upper part of the piston, and means preventing undesired rotation of the said ring.

All of which is more particularly described and ascertained hereinafter, by way of example, having reference to the accompanying drawing wherein—

Figure 1 is a vertical section of a piston embodying the said invention;

Figure 2 is also a vertical section of the same taken in a plane at right angles to that shown in Figure 1;

Figure 3 is a plan of underside of the said piston;

Figure 4 is a detail perspective view of the gudgeon pin removed; and

Figure 5 is a detail perspective view of the locking ring.

Similar characters of reference indicate similar parts in the several figures of the drawing.

The upper part 1 of the piston is intended to be constructed of a light metal such as aluminum or aluminum alloy, the side walls 2 thereof are provided with the usual grooves 3 for the reception of piston rings in a well known manner, and the head 4 thereof has depending therefrom members 5 and 6 suitably braced as by webs 7, 8 and 9, which members are bored to receive and form supports for a gudgeon pin 10, the said members extend substantially below the lower marginal portion 11 of the said upper part of the piston.

It will be noted that the inner annular face 12 of the upper part of the piston is truly circular and free from projections, so that the said side wall 2 is capable of even expansion in all radial directions, and the lower marginal portion thereof is provided with a recess 13.

14 is a piston skirt which may be of cast iron having an internal annular flange 15 thereon adapted to seat in the said recess 13 and be of such thickness that when it is so seated it will project slightly below the said marginal portion 11 of the upper part of the piston, the said skirt being also provided with orifices 16 through either of which the said gudgeon pin 10 may be passed into the supporting members 5 and 6.

It will be noted that this gudgeon pin when in position extends endwise substantially beyond the supporting members 5 and 6 and beneath the marginal portion 11 of the piston head and the flange 15 of the skirt; and furthermore these projecting portions of the said gudgeon pin have flats 17 and 18 machined thereon, which flats are somewhat inclined in opposite directions so that when the said pin is in position with the flats uppermost they will form seats for a rotatable locking ring 19 inserted between the said flats and the parts 11 and 15 of the piston.

In assembling the parts described together the skirt is applied to the upper part of the piston so that its flange 15 seats in the recess 13 of the said head, the orifices 16 being so located that the gudgeon pin 10 may be passed into place in the supporting members 7 and 9 after the ring 19 has been passed upwardly over the said supporting members into contact with the underside of the said flange 15 of the skirt.

It will be noted that this ring is substantially thicker at 20 and 21 than at points intermediate thereof and that these thicker portions are beveled to correspond with the beveled flats of the gudgeon pin, and to permit the insertion of the pin 10 into the supporting members the ring is turned until the thinner portions thereof are adjacent the openings 16 of the skirt. After the said gudgeon pin is properly positioned with the flats thereof disposed towards the ring, the said ring is rotated in the direction of the upward inclination of the said flats whereupon the beveled surfaces of the said ring seat thereon, lifting the ring into tight contact with the flange 15, in which position the said flange is pressed by the upper surface of the ring firmly into position in the recess 13 so that the said skirt is rigidly locked to the head of the piston.

To prevent undesired reverse rotation of the ring, and consequent release or loosening of the skirt from the upper part of the piston, a set screw 24 may be passed through the gudgeon pin into the ring as shown. 25 is a bail-like spring, the ends of which may be passed through the slotted head of the set screw and have its ends bent into engagement with orifices 26 in the gudgeon pin.

The gudgeon pin may also be provided with shoulders 22 and 23 adapted to engage the inner wall of the ring so that the said pin will be thereby supported against endwise movement in its supporting members if considered necessary or desirable.

It is obvious that such a device may be quickly taken apart upon the removal of the said set screw and the rotation of the ring in the opposite direction to that described, when the gudgeon pin may then be withdrawn from its supports and a new skirt readily substituted if desired. Thus in case of wear such renewal of the skirt may be quickly effected whereupon a practically new piston results at very small expense, and as this skirt is not encumbered by any means for the supporting of the gudgeon pin or irregular means for its connection to the upper part of the piston, it may be of a simple circular nature free from projections or inequalities which would otherwise increase its weight, affect its balance or result in unequal expansion of the said skirt. Also due to these features of its construction it may be reduced to the lightest possible cross sectional configuration without decreasing its efficiency or resistance against wear.

It will also be apparent that partial rotation of the skirt on the upper part of the piston may be effected from time to time if desired to compensate for any tendency there may be for the said skirt to wear more at one part of its surface than another.

This feature, more particularly in large engines not operated at high speeds, may be further utilized by using the locking ring simply as a means of securing the skirt to the upper part of the piston but not against rotation, such rotation within the cylinder being thereby permitted to admit of the said skirt finding its own wearing surface relative to the walls of the cylinder.

The ring 19 may be of any suitable material for the purposes which it is intended to fulfil and serves while locking the skirt in position to also lock the gudgeon pin against rotation or displacement.

Furthermore the described arrangement does not call for machining to very fine limits, apart from the outside diameter of the skirt, the diametrical dimensions of the groove and the inner edge of the flange 15, so that the device admits of quantity production in a simple manner and the parts may be easily made of a readily interchangeable nature.

This invention may be developed within the scope of the following claims without departing from the essential features of the said invention, and it is desired that the specification and drawing be read as merely illustrative and not in a limiting sense, except as necessitated by the prior art.

What I claim is:—

1. In a piston, an upper part of light material, a skirt of heavier wear resisting material, detachably secured to said upper part, and means clamping said skirt into locking engagement with said upper part, said skirt being rotatable on said clamping means when the clamping pressure thereof is relieved.

2. In a piston, an upper part, a skirt detachably secured to said upper part, a gudgeon pin, supporting means therefor depending into said skirt from said upper part of the piston, and means locking said skirt on said upper part of the piston, said locking means being supported by said depending means through the medium of said gudgeon pin.

3. In a piston, an upper part, a skirt engaging the lower marginal portion of said upper part, a gudgeon pin within said skirt, said gudgeon pin being supported by the upper part of said piston, and means securing said skirt to said upper part of the piston, said means being supported by and interposed between said gudgeon pin and the upper part of said piston.

4. In a piston, an upper part, a skirt engaging the lower marginal portion of said upper part, a gudgeon pin within said skirt, said gudgeon pin being supported by the upper part of said piston, and rotatable means supported by and interposed between said gudgeon pin and the upper part of the piston, and adapted upon rotation to lock said skirt on to the upper part of said piston.

5. In a piston, an upper part, a skirt engaging the lower marginal portion of said upper part, a gudgeon pin within said skirt, said gudgeon pin being supported by the upper part of said piston, rotatable means supported by and interposed between said gudgeon pin and adapted upon rotation to lock said skirt to the upper part of said piston, and means securing said rotatable means against rotation when in locking position.

6. A piston according to claim 8, wherein the pin is provided with flats engaged by the rotatable means whereby said pin is also locked in its supported position.

7. In a piston, an upper part, a detachable skirt engaging said upper part, a gudgeon pin, supports therefor extending into said skirt from said upper part, said skirt having an opening therein through which said pin may be inserted into its supports, and adjustable means adapted to be wedged between said pin and said skirt whereby both said skirt and said pin are locked in their assembled positions.

8. In a piston, an upper part, and a detachable skirt having truly circular inner walls, an inner annular flange on said skirt engaging the upper part of said piston, and a locking ring detachably securing said flange in such engagement.

In testimony whereof I affix my signature.

ALFRED DEANS.