April 10, 1951 HENRY LELAND VAN DERMARK ALSO KNOWN AS HENRY L. VAN DERMARK 2,547,986

METHOD FOR REMOVAL OF BROKEN SPARK PLUGS

Filed Nov. 27, 1946

2 Sheets-Sheet 1

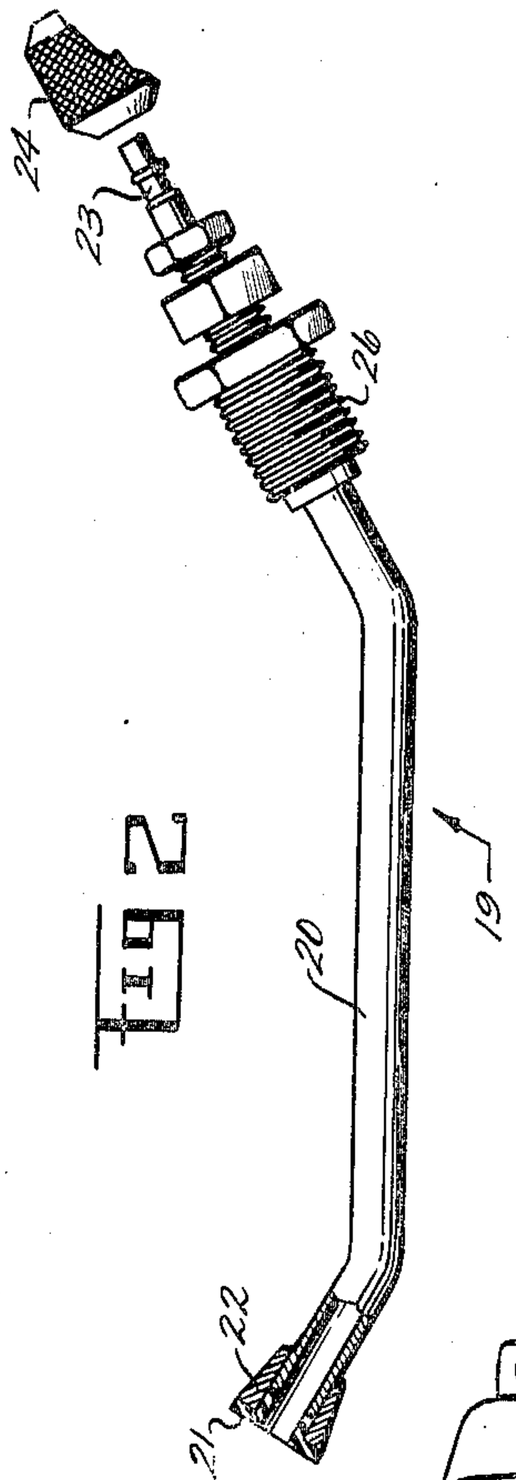

Fig 2

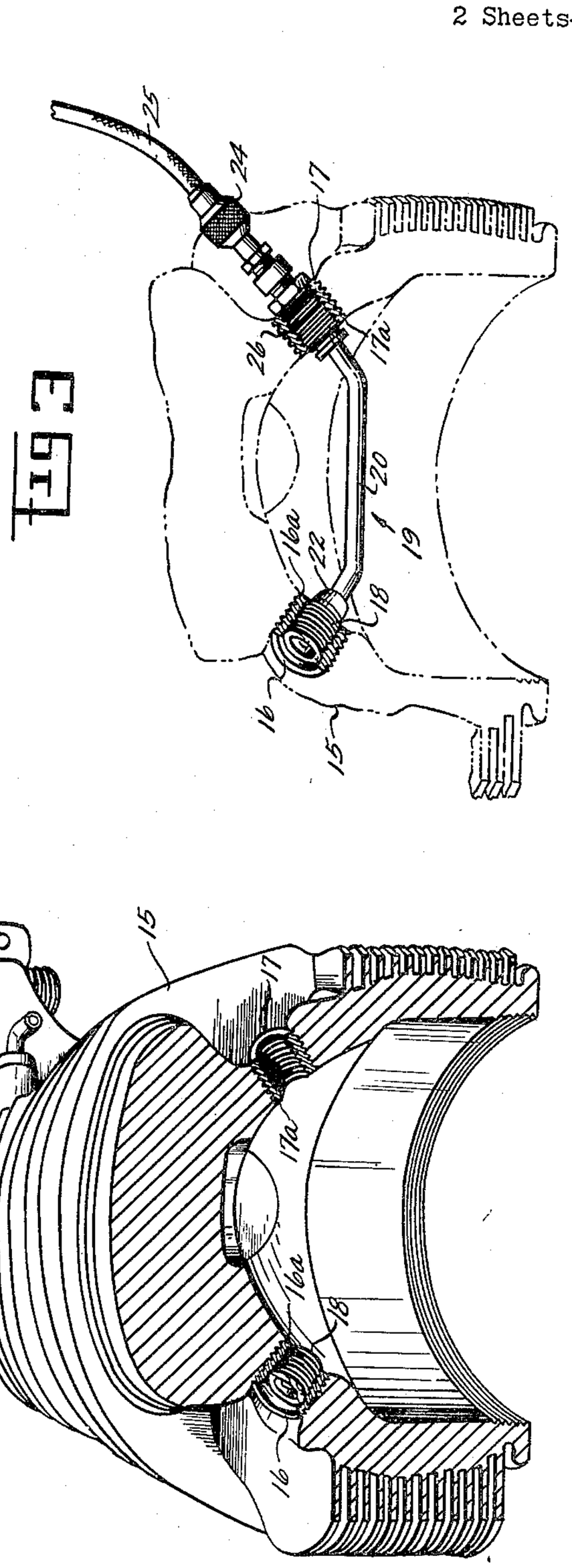

Fig 3

Fig 1

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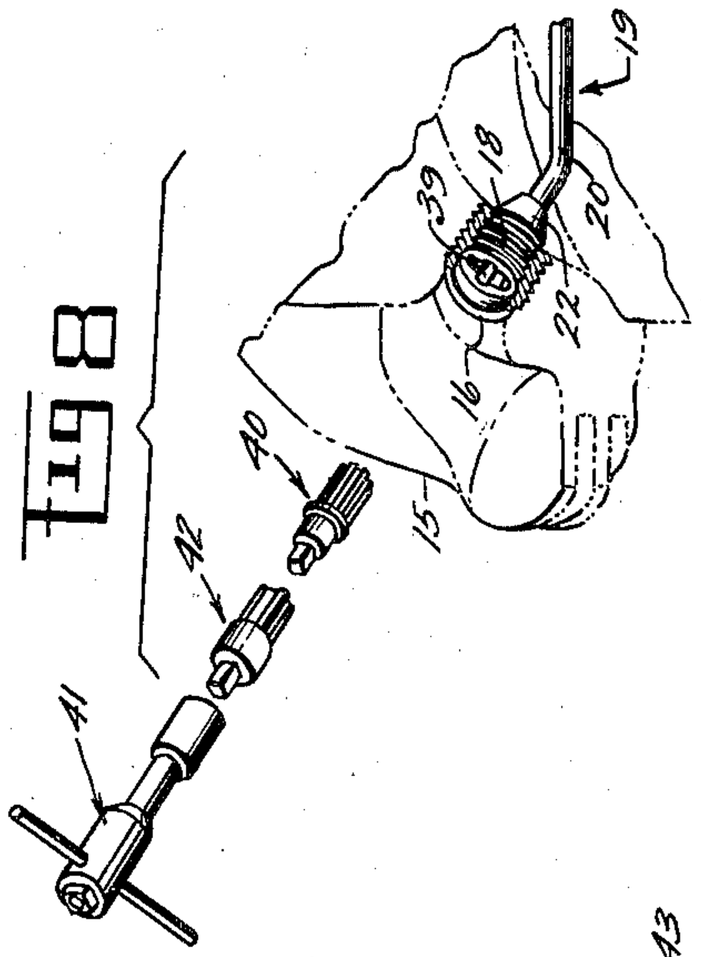

Fig 8

Fig 5

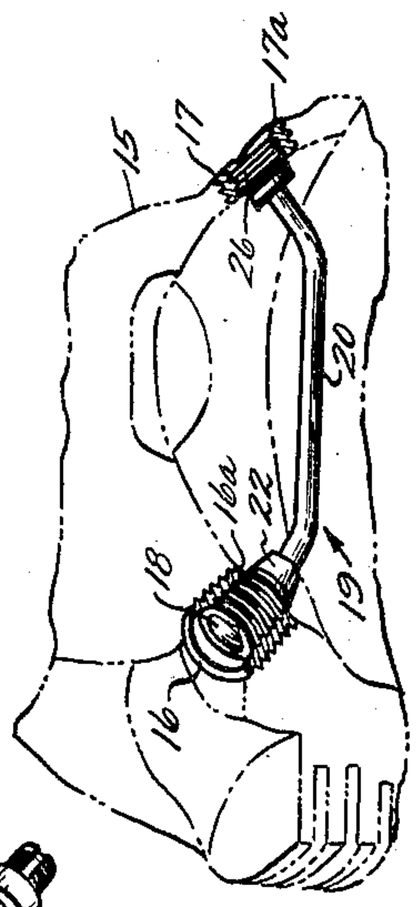

Fig 6

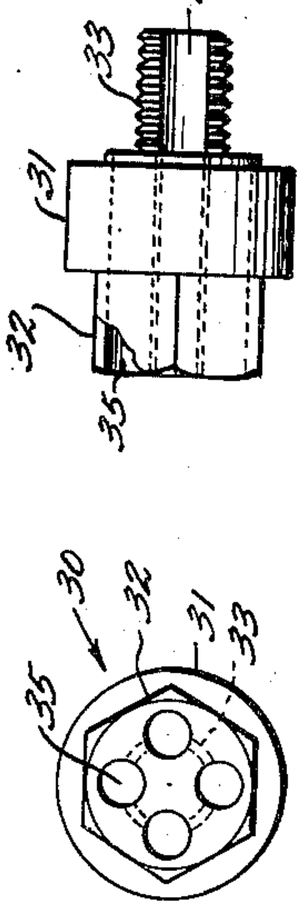

Fig 7

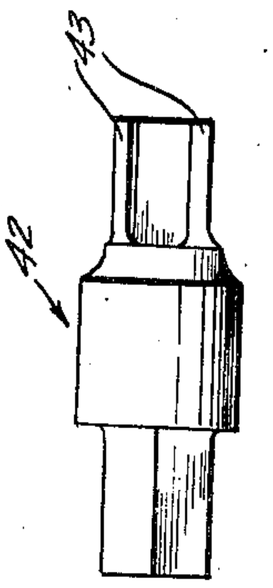

Fig 9

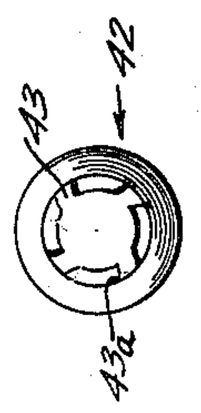

Fig 10

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Patented Apr. 10, 1951

2,547,986

UNITED STATES PATENT OFFICE

2,547,986

METHOD FOR REMOVAL OF BROKEN SPARK PLUGS

Henry Leland Van Dermark, also known as Henry L. Van Dermark, deceased, late of Sacramento, Calif., by Hazel L. Van Dermark, executrix, Medford, Oreg.

Application November 27, 1946, Serial No. 712,612

2 Claims. (Cl. 29—148)

(Granted under the act of March 3, 1883, as amended April 30, 1928; 370 O. G. 757)

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The invention described herein may be manufactured and used by or for the Government for governmental purposes without payment of any royalty thereon.

This inventoin relates to a method of removing broken spark plugs from internal combustion engines, particularly those of aircraft. The method is applicable particularly to such engines, the cylinder heads of which are provided with dual ignition from spark plugs located in opposed relation in the head. The method is of general application to spark plug ignition engines however, provided that they have the necessary openings for the introduction of tools as will be described.

In the past, an obstinate broken spark plug necessitated removal of the cylinder head. Often, if the head was not removed, broken pieces of metal or porcelain (chips) dropped into the cylinder and created scoring or even worse trouble in the cylinder.

One object of the invention is to enable removal of a broken plug without taking off the cylinder head.

Another object is to prevent dropping of metal or porcelain chips inside the cylinder.

Another object is to provide a powerful bite for the removal tool into the shell of the broken plug.

Referring now to the drawings:

Fig. 1 is a perspective view in vertical section of an aircraft cylinder head showing a broken plug in its left plug recess.

Fig. 2 is a side elevation of a chip removal tool or air blast tube which forms a related invention.

Fig. 3 is a phantom view of the aircraft cylinder head corresponding to Fig. 1 showing the chip removal tool in full view.

Fig. 4 is a fragmentary view corresponding to Fig. 3 showing the drilling tools ready to be applied.

Fig. 5 is a stop drill shown on a larger scale than in the preceding figure.

Fig. 6 is a plan or end view of the drill jig shown in perspective among the tools shown in Fig. 4.

Fig. 7 is a side elevation of the drill jig.

Fig. 8 is a view corresponding to Fig. 4 with the substitution of removal tools for the drilling tools.

Fig. 9 is a side view of a splined removal tool.

Fig. 10 is an end view of the splined removal tool shown in Fig. 9.

In the figures, 15 is a vertical section of a cylinder head having two spark plug recesses or ports 16 and 17, these being at the left and right hand, respectively. Both are fitted with threaded bushings 16*a* and 17*a*, respectively. Within the bushing 16*a* there is shown a broken spark plug 18.

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The first step in the method after knocking out the porcelain core is the insertion through the port 17 of the chip removal tool or air blast tube 19 shown in Fig. 2 above and in Fig. 3 locked in place for use. The tool itself comprises a tube 20 having on its outer end a soft rubber gasket 21 and a shoulder 22 to support the gasket. At the opposite or inner end there is a ferrule or connection 23 for the chuck 24 of an air hose 25 (see Fig. 3). A threaded sleeve 26 is adapted to be screwed into the threaded bushing 17*a* to make a substantially air-tight joint about the tube 20. When the sleeve 26 is tightened after the gasket 21 has been brought against the bottom of the broken plug 18, the tool will occupy the position shown in Fig. 3. As soon as this position is attained, air pressure, say 20 pounds per square inch, is turned on through the hose 25. Chips will then be blown out as they become loosened. The pressure is maintained as long as there is any likelihood of chips being formed.

Referring now to Fig. 4, 30 is a drill bushing having a body 31 provided with a hexagonal shouldered portion 32 and a threaded extension which is provided with four flutes 34. Four equidistant holes 35 extend longitudinally through the hexagonal portion 32 and the body 31. The flutes 34 are extensions of the holes 35. The threaded portion 33 fits the threaded bushing 16. In use the jig 30 is screwed into the bushing 16 until it abuts the shell of the broken plug 18. A stop drill 36 which fits holes 35 with a running fit is now inserted into each hole 35 in turn and the top of the shell 18 is drilled until a stop 37 prevents further entry. An electric drill 38 is used to drive the drill 36.

The result of the above operation is that the spark plug shell 18 is now provided with four internal flutes 39 as indicated in Fig. 8. Since the shoulders of the flutes 39 are rough, the interior of shell 18 is hand reamed by means of a reamer 40 and a hand wrench 41. After this operation, a splined tool 42 is inserted so that the splines 43 thereof extend into the flutes 39. Since the splines are sharp on the one edge 43*a* as shown in Fig. 10, an excellent bite is provided in the direction of reversal of the spark plug threads, i. e., in a direction that will unscrew the plug. The splined tool 42 is then rotated until the plug 18 is clear of the port 16.

The invention claimed is:

1. The process of removing a spark plug from an engine cylinder which comprises removing

the porcelain core of the spark plug, inserting and locking an air blast tube in such a position on the remainder of the plug so that the air blast proceeding from said tube will blow away from the engine cylinder, placing the spark plug to be removed under air pressuer applied through said air blast tube, placing a drill bushing provided with openings over said spark plug, drilling openings in a predetermined pattern in the periphery of the shell of the plug, discontinuing the air pressure after there is no chip formation, applying a tool which fits the openings simultaneously and then unscrewing the plug by rotating the tool.

2. The process of removing a spark plug from an engine cylinder which comprises knocking out the porcelain core of the spark plug to remove same from the plug shell, inserting and locking in place an air blast tube against the bottom of the plug shell, placing the spark plug shell under air pressure applied through said air blast tube to blow chips in a direction away from the cylinder, placing a drill bushing with openings over said plug shell, drilling the openings in a predetermined pattern in the periphery of the shell, discontinuing the air pressure after chip formation ceases, applying a turning tool which fits more than one of the openings drilled into the spark plug shell and then unscrewing the plug by rotation of the tool.

HAZEL L. VAN DERMARK,

Executrix of the Will of Henry Leland Van Dermark, also known as Henry L. Van Dermark, Deceased.

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