

P. G. SCHMIDT.

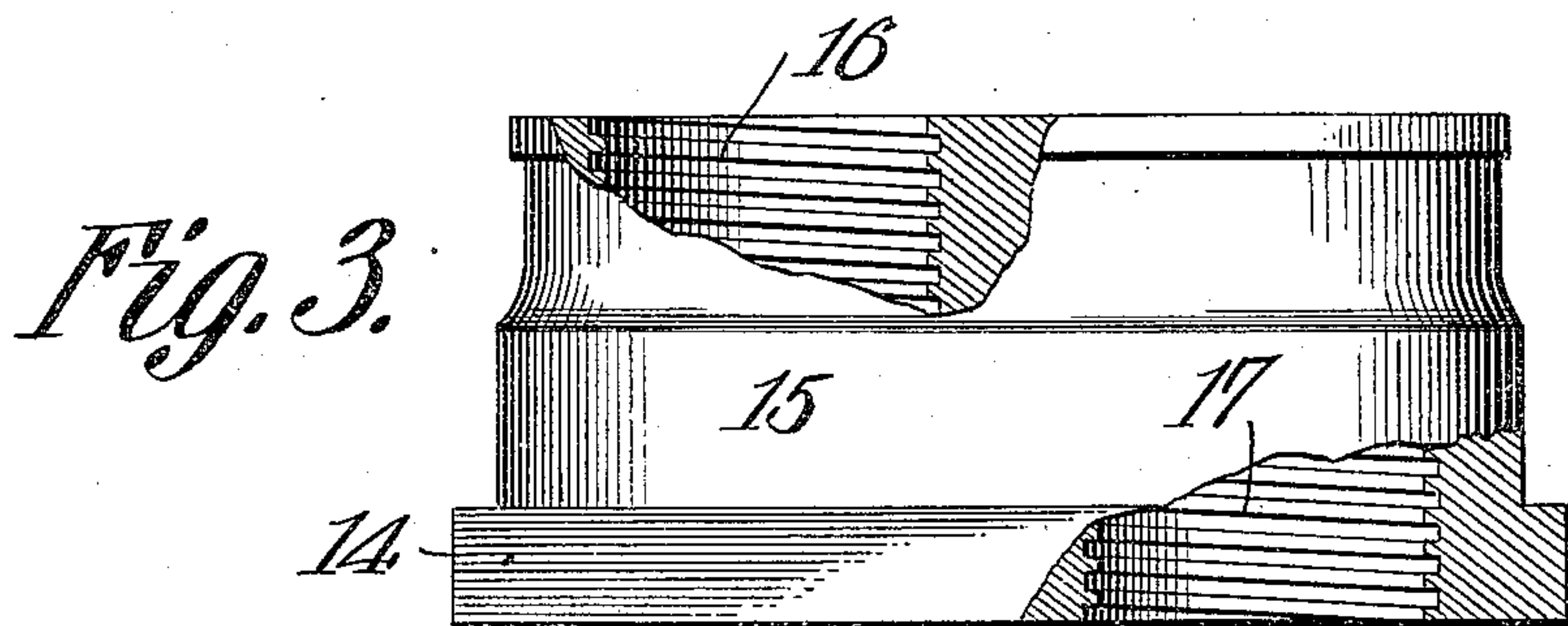
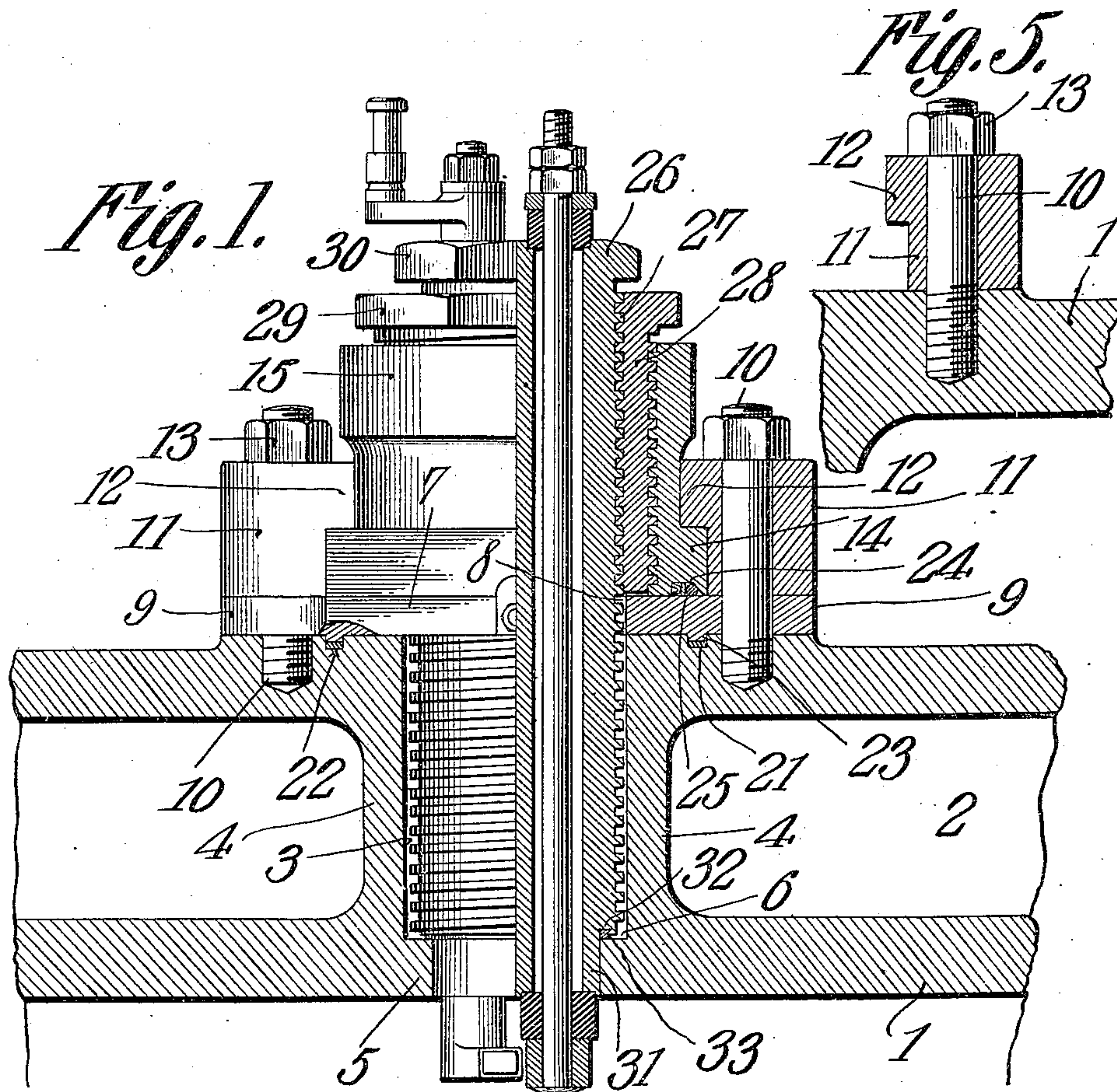
IGNITER CHANGER FOR IGNITION CHAMBERS.

APPLICATION FILED FEB. 21, 1908. RENEWED FEB. 27, 1911.

990,394.

Patented Apr. 25, 1911.

2 SHEETS—SHEET 1.



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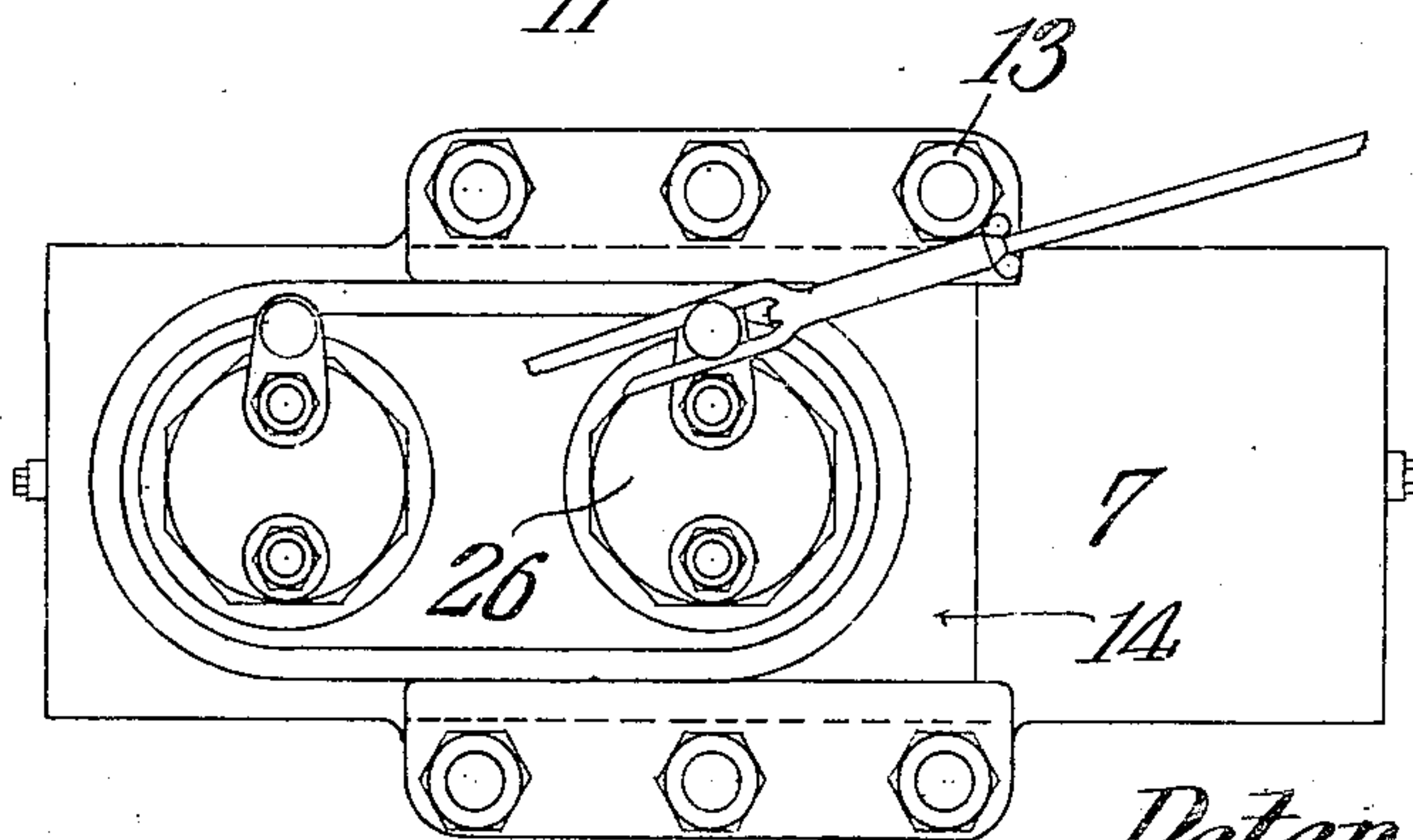
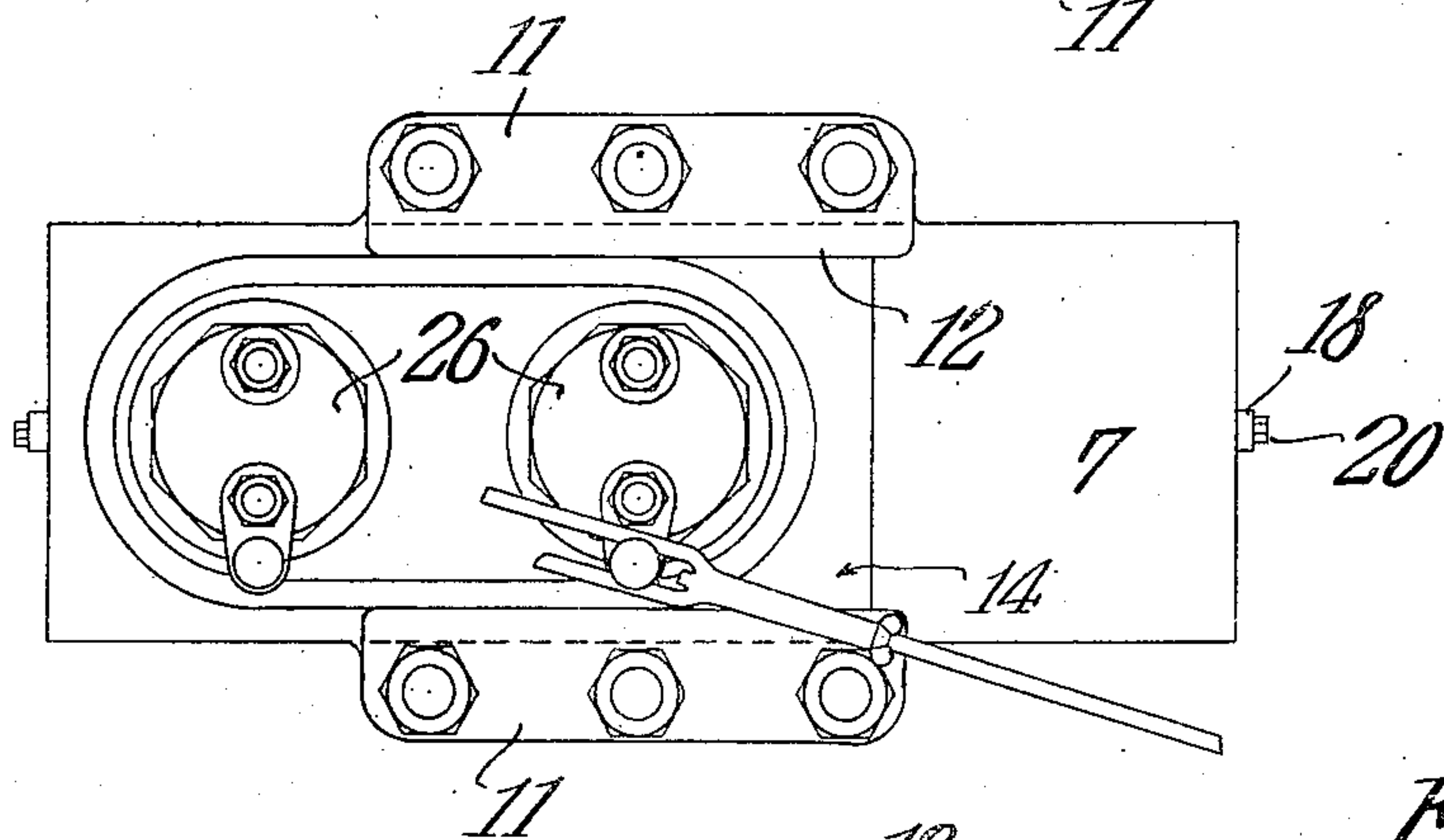
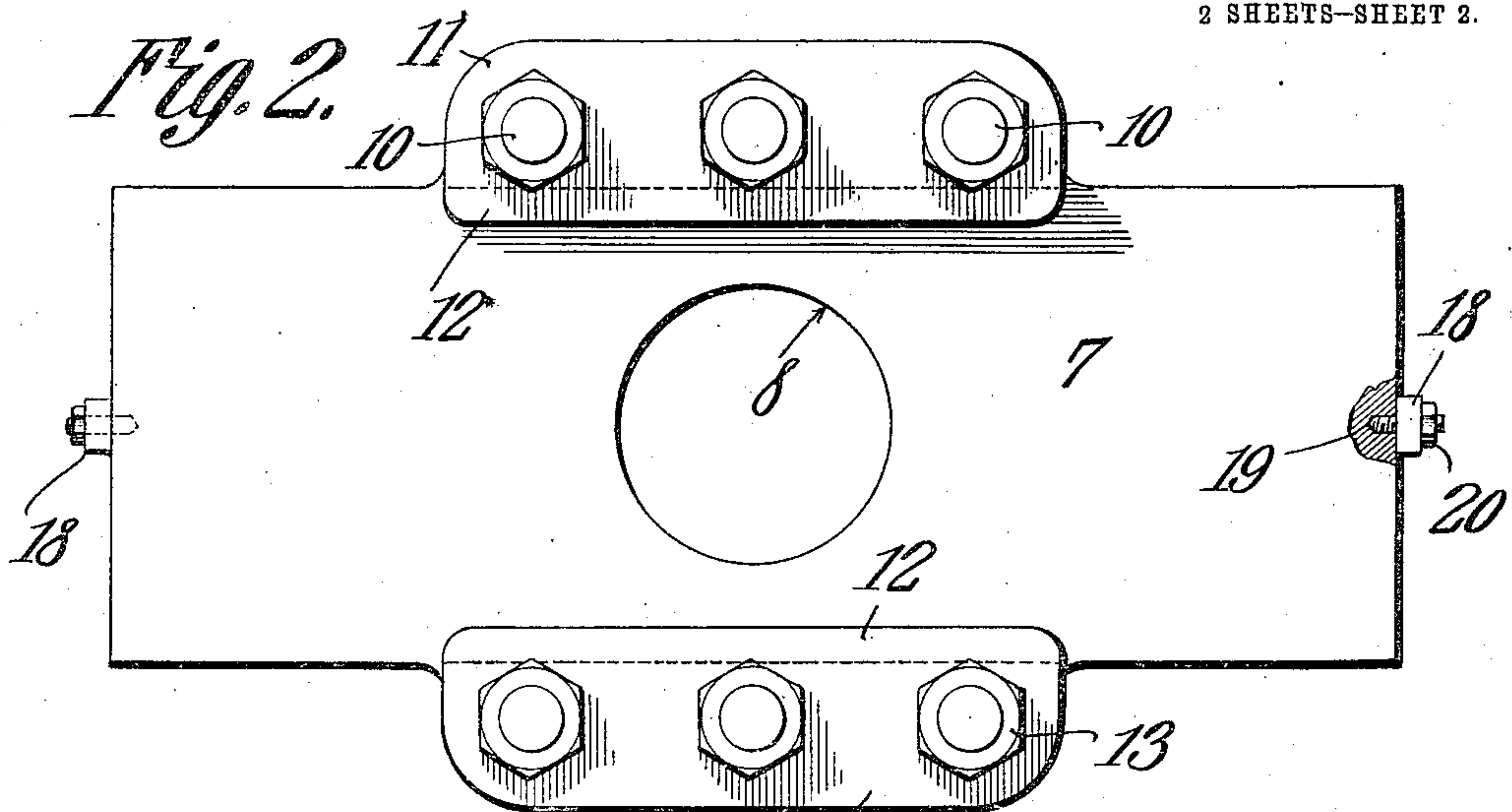


Fig. 4.

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IGNITER-CHANGER FOR IGNITION-CHAMBERS.

990,394.

Specification of Letters Patent.

Patented Apr. 25, 1911.

Application filed February 21, 1908, Serial No. 417,157. Renewed February 27, 1911. Serial No. 611,236.

To all whom it may concern:

Be it known that I, PETER G. SCHMIDT, a citizen of the United States, residing at Tumwater, in the county of Thurston and State of Washington, have invented a new and useful Igniter-Changer for Ignition-Chambers, of which the following is a specification.

This invention has reference to igniter changers for ignition chambers and is adapted for use in connection with ignition or explosion chambers of any kind, whether the igniters have their active parts normally located within the explosion chambers proper or whether they be located in ignition chambers which may or may not be connected with explosion chambers.

The object of the invention is to provide a means whereby an ignition member can be removed from the ignition chamber and repaired or replaced by another ignition member without stopping the operation of the device with which the ignition member is used.

To this end the invention comprises a member capable of carrying an ignition plug or a number of plugs or a number of groups of plugs, one of the plugs being active and the other or others normally inactive, the arrangement being such that the active ignition plug may be withdrawn from the ignition chamber without putting the latter in communication with the external atmosphere, and another plug may be substituted for the withdrawn plug so that successive charges may be ignited without the necessity of stopping the operation of the apparatus. This is particularly true where the ignition chamber is equipped with two or more igniter changers, in which case the active igniter or igniters will fire the charge while the other igniter is being removed and replaced.

The invention requires no special type of ignition plug which may be a hot tube or hot member or a spark plug of the wipe, hammer, or jump spark type, or in fact any ignition member which may be inserted into or removed from an ignition chamber may be used. Furthermore, no bonnets or shields are necessary on the inside of the ignition chamber for the purpose of cutting out the ignition plug from active relation to the ignition chamber in order that the plug may be withdrawn for repairs or replacement.

In the present invention the relation of the active end of the ignition plug to the ignition chamber may be that commonly employed in gas engine practice.

The invention also contemplates means whereby a gas tight connection may be made through the use of suitable packing or other suitable joint at points which will protect the threaded portion of the screw plug where such is used, from the action of hot exploded gases, and thus any danger of the plug becoming stuck in its seat or injured in any way, is avoided. Furthermore, provision is made by this invention for preventing the escape of gases to any noticeable extent from the ignition chamber while the plug is being withdrawn therefrom, it not being material should a very slight leakage occur in the very short interval during which the change from one plug to another is being made.

The invention likewise makes provision for compensating for the condensing of the packing due to repeated removals and insertions of the ignition plugs so that in the case of those plugs having movable members to be operated by moving parts of the apparatus, the proper relation of the parts may always be maintained even though there should be a tendency of the packing used to condense sufficiently to permit the plug to be screwed into its seat to a greater extent than when the plug and operating parts therefor were first adjusted.

In one practical embodiment of the invention there is provided a slidable member in the form of a bonnet having two or more threaded passages either of which may be brought into coincidence with the opening through the walls of the ignition chamber designed for the passage of the ignition plug. This sliding member is controlled by guide plates serving to hold the member in place but at the same time permitting the sliding member to be moved to bring the plug-receiving openings individually into coincidence with the passage to the interior of the ignition chamber.

For convenience of description the invention will be assumed to be applied to the cylinder of an ordinary explosive engine with the understanding, however, that such engine is to be taken as indicative of any other structure wherein a suitable mixture is to

be ignited by the heat of any suitable igniting apparatus or material, including electric sparks.

Some engines have surfaces of sufficient extent, which, with or without being flattened by planing off the top surface of the metal, provide a suitable seat for the sliding member, and in such case the sliding member is held to the flat or flattened portion of the cylinder by means of guide plates secured in any suitable manner. In engines where for one reason or another the sliding member cannot be directly applied to the engine as, constructed, a supplemental seat may be fastened to the engine for the support and guidance of the sliding member. This sliding member will be assumed to be in the form of a block or bonnet provided with one or two or more passages each tapped for the reception of an exteriorly threaded ignition plug or for a screw bushing arranged to receive such plug, all for a purpose which will appear hereinafter. The construction thus outlined is such that shoulders are provided between the interior of the ignition chamber of the engine for the reception of gas tight packing, or some other gas tight joint is provided so that the hot exploded gases cannot reach the threads of the screw plug or screw bushing, as the case may be, and so gum the same by the deposition of carbonaceous or other material, or cause these threads to bind in their seat or to injure the threads by burning them, all of which will interfere with or prevent the removal of the plug.

The specific instrument of the means for carrying out the invention, together with the purpose and operation of the several parts, will be understood from a consideration of the following detail description taken in connection with the accompanying drawings forming a part of this specification, wherein—

Figure 1 is a longitudinal section, partly in elevation, of a structure embodying the invention as applied to the explosion chamber of a gas engine. Fig. 2 is a plan view of the seat for the sliding member with the latter omitted. Fig. 3 is a side elevation, partly in section, of the sliding member or bonnet, slightly modified in construction. Fig. 4 is a diagrammatic view showing the manner of coupling up the ignition plug to an operating member. Fig. 5 is a detail view.

Referring to the drawings, there is shown a portion 1 of a cylinder of a gas engine which may be taken as indicative of any ignition chamber to which the invention is applicable, and this cylinder is shown as provided with the usual water-jacket chamber 2. Extending through the cylinder and water-jacket is a passage 3 separated from the chamber 2 by suitable walls 4, the said

passage being provided for the reception of a suitable ignition plug, to which reference will presently be made. The passage 3 is of equal diameter throughout, except where it enters into the ignition chamber, and here the diameter is contracted by an inward radially-projecting flange 5, the outer edge of which, that is the edge away from the ignition chamber, being formed into a ledge or shoulder 6, for a purpose which will presently appear.

The outer face of the cylinder surrounding the passage 3 is either initially cast flat or may be planed flat for the reception of a plate 7 of sufficient width and length for the purposes hereinafter set forth, and this plate 7 is provided with a through passage 8 coincident with the passage 3. The plate is formed with side extensions 9 for the passage of stud bolts 10 entering suitably located threaded openings in the outer wall of the cylinder or water-jacket. These stud bolts receive undercut strips 11, one edge 12 of which latter overhangs the corresponding portion of the plate 7 parallel thereto, and these strips 11 are held to the plate 7 and the latter is held to the engine cylinder by suitable nuts 13 applied to the stud bolts 10. The strips 11 are located on opposite sides of the opening 8 and extend longitudinally of the plate 7 beyond the limits of the opening 8, while the spaces between the overhanging portions 12 of the strips 11 and the to surface of the plate 7 receive a perimetral flange 14 formed on the bottom of a bonnet 15 constituting the movable member of the structure. This bonnet, as shown, is provided with two spaced passages 16, 17, internally screw-threaded, the threads being of the heavy rectangular type in cross section. The bottom of the bonnet is rectangular in shape to conform to the general shape of the plate 7, but is of less length than the plate 7 so that it may have a limited travel on said plate between lugs 18 on each end of the plate, these lugs being held in place by studs 19 screwed into the ends of the plate 7, and by lock nuts 20. The parts are so proportioned and adjusted that when the bonnet 15 is in engagement with one of the lugs 18 the passage 16 is coincident with the openings 8 in the plate 7 and with the opening 3 through the engine cylinder. When the bonnet is moved to the other limit of its travel, that is, until stopped by the lug 18, then the passage 16 is moved out of coincidence with the opening 8 and the passage 17 is brought into coincidence with said opening 8. Possible leakage of exploded gases between the plate 7 and the surface of the cylinder is prevented by packing 21 introduced in a suitable groove 22 formed in the outer surface of the cylinder, and this packing is engaged by a rib 23 formed on the corresponding face of

the plate 7. The bonnet or movable member may also be provided with a groove 24 on the face riding on the plate 7, and this groove may receive suitable packing 25.

5 The passages 16 and 17, as well as the opening 8 and passage 3, are designed to receive suitable ignition plugs. In the drawings, there is shown a spark plug 26 of the hammer type, which may be taken as indicative
10 of any type of ignition plug and not necessarily confined to the hammer or any other particular type. The plug 26 is provided with exterior screw threads 27 of the same type as shown in connection with the pas-
15 sages 16 and 17 in Fig. 3.

When the ignition plug is of the hammer or wipe type, then for reasons which will presently appear the passages 16 and 17 in the sliding member 15 are made of greater
20 diameter than sufficient to receive the ignition plug 26, and then the plug 26 is carried by a bushing 28 threaded on both the inner and outer surfaces, said bushing receiving the ignition plug 26 and itself being screwed
25 into the passage 16 or 17, as the case may be. In this case, the upper edge of the bushing is formed with a polygonal flange 29 or provided with wrench holes or otherwise shaped for the application of a suitable
30 wrench. In either case the plug 26 has its upper end formed with a similar wrench-receiving flange 30. The main body of the plug 26 is of sufficient length to extend not only through the sliding member 15 but also
35 through the plate 7 and passage 3 to the shoulder 6, and beyond this point the plug 26 is reduced in diameter to form a neck 31 extending to the inner face of the cylinder constituting the outer wall of the ignition
40 chamber. Between the neck 31 and the threaded portion of the plug 26 there is formed a circumferential groove 32 in which is seated a packing ring 33 capable of forming a gas tight joint with the ledge of
45 shoulder 6 when the plug 26 is screwed down on the ledge 6. It is not necessary to illustrate the several types of ignition plugs since the construction of these plugs forms no part of this present invention and any
50 one of the various types may be used indifferently.

Let it be assumed that the sliding member 15 is in a position to bring the passage 16 in coincidence with the opening 8 of the
55 plate 7 and an ignition plug is in proper position with its active end in the explosion chamber. Also, let it be assumed that the parts are all connected up for operation and that the engine is running in the usual manner. Furthermore, let it be assumed that
60 it is desirable to remove the active ignition plug either for inspection or for renewal and that it is not convenient to stop the engine, the stoppage of the engine being undesirable especially with large units. The ig-

niton plug is unscrewed until the active end is above the upper surface of the plate 7. Now, the sliding member is free to be moved in the direction to bring the passage 17 into coincidence with the opening 8 and
70 to carry the withdrawn ignition plug away from said opening. Assuming further that an ignition plug is introduced into the passage 17 before the sliding member has been moved, it will be seen that this exchange
75 of ignition plugs may be made without unclosing the opening 8 or providing communication between the interior of the cylinder and the external atmosphere. As soon as the new ignition plug in the passage 17
80 has been brought into coincidence with the opening 8, it is screwed into the cylinder through the passage 3 until firmly seated with the packing 33 in tight relation to the ledge 6. When the first-named ignition
85 plug is unscrewed until its active end is above the plate 7 there is sometimes a very slight leakage by the threads joining the ignition plug to the sliding member, but this leakage is so slight and the exchange
90 of ignition plugs may be made with such facility that the leakage becomes immaterial. If the engine be of a type using two or more ignition plugs in active service in each cylinder, then it will be seen that any
95 one of the active ignition plugs may be removed and inspected and repaired or replaced by a new one without stopping the engine or interfering with the succession of explosions or permitting the escape of the
100 gases or products of combustion to any material extent.

While the plug is being unscrewed from the explosion chamber or screwed thereinto the time interval is so short that any prod-
105 ucts of combustion which may reach the threads during the journey through the passage 3 will not cause any harmful deposition of carbon or other material on these threads, since before this can occur the pack-
110 ing 33 is firmly seated on the ledge 6, thus preventing any further access of the hot gases to the threads within the passage 3.

It is not desirable to provide new packing 33 every time a plug is replaced but the
115 repeated screwing of the plugs into place causes the packing to be more or less condensed beyond the initial condition of the packing on the first adjustment. The result of this is that the plug will screw in a little
120 farther each time it is used and in the case of the hammer or wipe type of plugs the moving parts will no longer maintain the same relation to the acting connections from the engine as when the plug was first ad-
125 justed. It is to avoid this trouble that the bushing 28 is provided so that by a differential adjustment between the inner and outer threads of the bushing 28 the plug 26 may be made to always seat with its packing on
130

the ledge 6 when the movable parts of the plug are in proper relation to the actuating members connected to the engine. Thus, no matter to what extent the packing 33 may become compressed the proper positioning of the movable parts of the plug to the actuating structures may always be assured.

It will be seen that the present invention provides means for the interchange of ignition plugs without interrupting the operation of the engine and without the necessity of modifying the construction of the engine in any manner, doing away with the necessity of all chambers, pockets or interior parts within the ignition chamber while at the same time the body of the ignition plug is protected from the gunming or clogging action of deposits from the burned gases or from the heat of the burned gases. The invention thus avoids the use of interior working parts, chambers or pockets, and all such features heretofore used which are undesirable in the cylinders or ignition chambers of internal combustion engines.

Of course a blind or dummy plug instead of an ignition plug can be used to close either of the passages 16 or 17 while changing the plugs, and if another ignition plug is not at hand to be put into working position then the blind or dummy plug which should in such case be identical in exterior construction to the active plug, so that it can be inserted into the passage 3 to close it, the same as would be the case were an active ignition plug used, may be employed, thereby restoring the proper clearance space to the engine cylinder or ignition chamber.

A single passage 16 or 17 might be used in the movable member and the latter may be of sufficient length, in such case, to close the opening 8 when the ignition plug is moved out of coincidence therewith, and then the exchange of plugs, in case the engine has only one active plug, may be made while the momentum of the engine keeps it in motion, but it is preferable to use a sliding member provided with receptacles for at least two plugs so as to expedite the change and to close the passage 3 as soon as possible with another active or dummy ignition plug. Where the engine is provided with a number of ignition plugs to each cylinder, then a blind or dummy plug may be inserted in place of the removed active plug without interrupting the explosions taking place in the engine.

While in the foregoing detail description the term "explosive engine" has been used, it is to be understood that the invention is not limited to use with the ordinary explosive engine but is useful in connection with any type of explosion or ignition chamber where it is desirable to cause the ignition of combustible materials. It is to be further understood that the term "ignition cham-

ber" is equally applicable to a chamber in which the gases or other materials are both ignited and exploded and to a supplemental chamber where the gases or other materials are first ignited and while burning are allowed to pass into another chamber where the active or power explosion takes place.

It is to be understood that the guides for the sliding member may be otherwise shaped than shown and the engaging parts of the sliding member may be also otherwise shaped than shown and in case it is unnecessary to use the plate 9 because of there being ample space on the top of the ignition chamber, the guides may be attached directly to the walls of the ignition chamber, as indicated in Fig. 5.

While the present invention has been described more particularly with relation to igniters for ignition chambers, it is to be understood that the invention is applicable for the insertion into and removal from ignition chambers of other structures than igniters without opening the ignition chamber to the atmosphere. Again, it is of advantage to test the temperature of the ignited charges. For this purpose a plug may be provided carrying a thermometer of suitable type so that the temperature of the exploding charges may be taken at any time without in any manner interfering with the normal operation of the apparatus. In fact, any instrumentality useful in the running of the apparatus or in the testing of conditions present within the ignition chamber may be used, and such insertible and removable instrumentalities are to be understood as included in the term "plug", which latter term is used to designate an insertible and removable structure adapted to a passageway leading from the external atmosphere to the interior of the ignition chamber and operating as a support for any type of structure which may be useful in connection with the running or testing of the apparatus in so far as the ignition chamber is concerned.

In the foregoing description, the carrier has been described as moving upon a plane or straight surface. It will be understood that these carriers may be made to conform to the curvature of a cylindrical or other like ignition chamber so as to move in curved paths in conformity with the exterior shape of the chamber, the carrier being correspondingly curved. Also the carrier may be curved in such manner that while its support is a plane surface it may move in the arc of a circle upon said plane surface. In fact the carrier may be made of any shape necessary or desired so long as a plug adapted to enter the ignition chamber or passageway leading therein may be moved into and out of coincidence with such passageway without uncovering the same to the external atmosphere.

What is claimed is:—

1. In an apparatus provided with an ignition chamber and having an opening leading into said chamber, an ignition plug movable into and out of the ignition chamber through said opening and when in the latter closing it against access of gases of ignition, and a carrier for said ignition plug mounted exterior to the passage leading into said chamber and movable bodily toward and from said passage, said carrier being of sufficient length to close the passage when the ignition plug is removed from said ignition chamber and then conveyed by the movement of the carrier away from said passage.

2. In an apparatus provided with an ignition chamber and a passage leading from the exterior of the chamber to the interior thereof for the reception of an ignition plug, an ignition plug carrier mounted exterior to the ignition chamber and to the passage therefrom and provided with an ignition plug receiving passage, said carrier being movable bodily to carry an ignition plug located in the ignition plug receiving passage into and out of alinement with the passage leading to the said ignition chamber from the external atmosphere, the said ignition chamber passage being closed by the plug against access of gases of combustion when the plug is seated therein and the carrier being of sufficient length to close the passage to the external atmosphere when the plug is out of alinement with said passage.

3. In an apparatus provided with an ignition chamber and a passage thereto, an ignition plug, a carrier mounted exterior to said passage and provided with an ignition plug passage through which the plug is introduceable into the passage to the ignition chamber, said carrier being movable bodily along a plane path to carry the ignition plug passage of said carrier into and out of coincidence with said ignition plug passage to the ignition chamber, said passage to the ignition chamber having means coactive with the ignition plug to prevent access of gases of combustion to the ignition chamber passage.

4. In an apparatus provided with an ignition chamber and a passage leading thereto for an ignition plug, a carrier and a mounting therefor exterior to the ignition chamber and passage leading thereto, said carrier being movable bodily along its mounting across the outer end of the plug receiving passage and provided with a plurality of threaded passages each movable into alinement with the passage to the ignition chamber individually by the movement of the carrier, and each of said threaded passages in the carrier being adapted to receive an ignition plug.

5. In an apparatus provided with an ignition chamber and an ignition plug-receiv-

ing passage provided with a seat adjacent to the ignition chamber, an ignition plug provided with external screw threads, and means for forming a gas-tight joint between the plug and seat, a threaded carrier for the ignition plug, and a screw bushing adapted to enter between the threaded portion of the ignition plug and the threaded carrier therefor.

6. An apparatus provided with an ignition chamber and a passage to the ignition chamber, a carrier for ignition plugs provided with a plurality of passages for the plugs, said carrier being exterior to and movable bodily across the passage leading to the ignition chamber and of sufficient length to bring an ignition plug passage into alinement with the passage to the ignition chamber without uncovering the latter, said passages in the carrier extending entirely through the said carrier.

7. In an apparatus provided with an ignition chamber and a passage for an igniter plug leading thereto, a guide plate exterior to the chamber and provided with a passage coincident with the passage leading to said chamber, retaining and guiding means on said plate, a sliding member on and movable bodily along said plate and engaged by said retaining and guiding means and provided with a plurality of through passages, said passages being movable one at a time into coincidence with the opening in the plate, and ignition plugs adapted to be supported in said passages with their active ends either above the guide plate or in the ignition chamber.

8. In an apparatus provided with an ignition chamber and a plain or smooth passage for an ignition plug leading thereto, a guide plate exterior to the chamber and provided with a plain or smooth passage coincident with the passage leading to the ignition chamber, guiding means on said plate, a sliding member on and movable bodily along said plate and engaged by said guiding means and provided with a plurality of threaded passages therethrough, said threaded passages being movable one at a time into coincidence with the opening in the plate, limiting means on said guide plate for determining the extent of movement of the sliding member, and exteriorly threaded ignition plugs adapted to said threaded passages and supported by said carrier with their active ends either in the ignition chamber or exterior to the guide plate.

9. In an apparatus provided with an ignition chamber and a passage leading thereto for the reception of an ignition plug, guiding and limiting means on the exterior of the chamber, a sliding member engaged by the guiding means and limited in movement by the limiting means, said sliding

member being provided with means for carrying one or more ignition plugs and movable bodily to bring a plug into and out of alinement with the plug receiving passage to the ignition chamber without uncovering said passage, and permitting the introduction of the plug into the passage leading to the ignition chamber.

10. In an apparatus provided with an ignition chamber and a passage leading thereto for the reception of an ignition plug, guiding and limiting means on the chamber, and a carrier provided with means for the reception of one or more ignition plugs and held on the chamber and limited in movement thereon by the guiding and limiting means, said carrier having a range of bodily movement toward and away from the passage leading to the ignition chamber sufficient to bring an ignition plug carried thereby into alinement with the said passage leading to the ignition chamber without at any time uncovering the same, and ignition plugs adapted to the carrier and to enter the ignition chamber and having means to then prevent access of burned gases to the carrier.

11. In an apparatus provided with an ignition chamber and an ignition plug-receiving passage to the said chamber, a guideway on the chamber provided with an opening forming part of the passage to the ignition chamber, a sliding carrier adapted to and movable bodily on said guideway, means for confining the carrier to the guideway and for limiting the movement thereon, said carrier being provided with a plurality of through passages for ignition plugs, said passages through the carrier being movable into coincidence, one at a time, with the passage to the ignition chamber, and adjustable bushings adapted to be interposed between the plugs and the walls of the passages therefor in the carrier.

12. In an apparatus provided with an ignition chamber having an opening leading therethrough, an ignition plug insertible through said opening and into operative relation to the interior of the ignition chamber, a carrier exterior to said ignition chamber and the opening leading thereinto and provided with means for supporting the ignition plug, said carrier being bodily movable to bring the plug into and out of alinement with the opening to the ignition chamber and of such length as to permit such movement without uncovering the said opening, and the plug having means for closing the opening to the ignition chamber against access of gases of ignition.

13. In an apparatus provided with an ignition chamber and a passage leading to the interior thereof, an ignition plug, a sliding carrier exterior to the ignition cham-

ber and the passage leading thereto and provided with means for the reception of the plug and movable bodily to carry said plug into and out of alinement with the passageway without uncovering the latter, a pathway on the exterior of the ignition chamber along which the carrier is movable bodily, and a passage closing means on the walls of the passage to the ignition chamber contacting with the plug for preventing access of gases of ignition to the passage when the plug is in operative relation to the ignition chamber.

14. In an apparatus provided with an ignition chamber and a plain or smooth passageway leading to the interior of the latter, an ignition plug adapted to enter said passageway, a sliding carrier exterior to the ignition chamber and to the passage leading thereto and movable along a plane path across the plug receiving passage, said carrier being provided with a threaded passage for the reception of a suitable plug movable into and out of alinement with the passage leading to the ignition chamber and the plug being adapted to enter the smooth passageway and to close the ignition chamber end thereof.

15. In an apparatus provided with an ignition chamber and an opening leading thereto, said opening being provided with an inwardly directed ledge at the ignition chamber end thereof, an ignition plug adapted to enter said opening and at its active end shaped to engage the ledge in the said opening to prevent access of hot gases of ignition to said opening, and an ignition plug carrier exterior to said chamber and of sufficient length to maintain the latter closed at the opening leading thereinto when the plug is removed from said opening.

16. In an apparatus provided with an ignition chamber having an opening leading thereto, said opening being provided with an inwardly directed ledge, an ignition plug adapted to enter the ignition chamber operatively through the opening and to then engage the ledge, and an ignition plug carrier exterior to said chamber and of such length as to maintain the latter closed at the ignition plug opening when the plug is removed from the ignition chamber.

17. In an apparatus provided with an ignition chamber, a plug having a seat at its active end in operative relation to the ignition chamber, and a support for the plug in which the plug is longitudinally adjustable to maintain it in engagement with its seat and which support is also longitudinally adjustable to maintain a fixed relation of the plug to its seat.

18. In an apparatus provided with an ignition chamber, a plug having a seat at its active end in operative relation to the

ignition chamber, and a differential bushing
for the plug in which the latter is longitudi-
nally adjustable to maintain it in engage-
ment with its seat and which bushing is
5 also longitudinally adjustable to maintain
a fixed relation of the plug to its seat.

In testimony that I claim the foregoing as

my own, I have hereto affixed my signature
in the presence of two witnesses.

PETER G. SCHMIDT.

Witnesses:

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E. W. CADY.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents,
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