

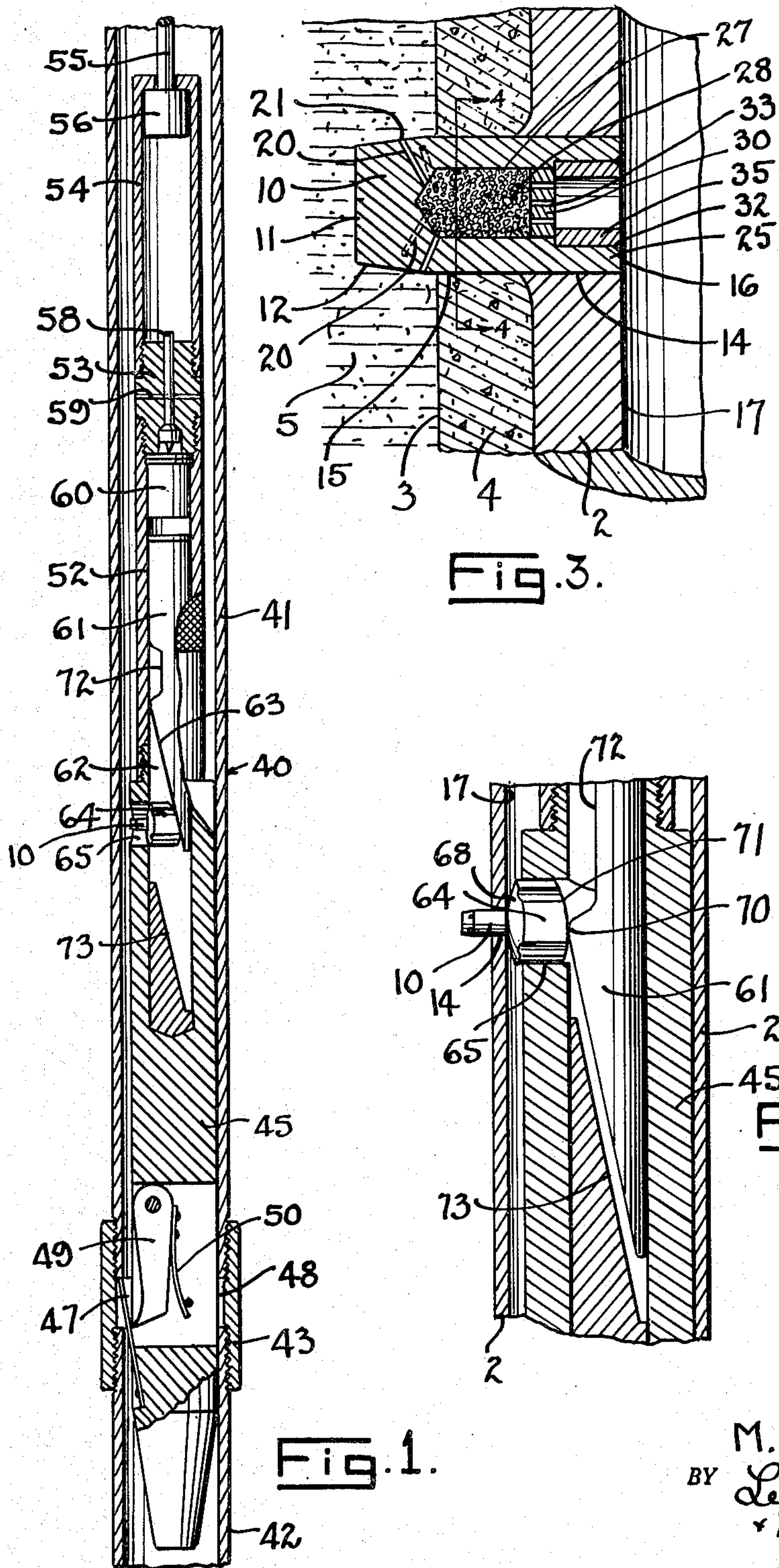
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INSERT STRAINER PLUG FOR WELL CASINGS

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INSERT STRAINER PLUG FOR WELL CASINGS

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4 Claims. (Cl. 166—6)

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The invention relates to improvements in insert strainer members insertible in casings in situ in a well bore and is directed particularly to a strainer member which will project from the casing into the productive formation with the view of conducting a fluid from the formation through the strainer and allowing it to discharge into the casing in the well.

In one of the principal procedures for completing wells at the present time the well is drilled through the formation which is believed to contain the desired fluids such as oil, water or gas, the casing is run into position and cemented in place, completely closing off the productive formation. The next step is to then perforate the casing by discharging bullets therethrough which are intended to penetrate the casing and the cement thereabout so as to provide an opening from the productive formation into the interior of the casing. The bullets, in order to have sufficient power to penetrate the casing and the cement, must be of such a size that they provide a relatively large opening in the pipe and the cement, and the result is that when an inflow into the casing occurs a great deal of sand and other foreign matter from the productive formation immediately flow into the casing, causing the well to sand up and in some instances to stick the shooting tool inside of the casing. When the well is shot then a strainer or other pipe is lowered inside of the casing so as to exclude the sand and other foreign matter entering the casing, and the straining is performed by the filter or strainer inside of the casing. In some instances quantities of granular material are deposited inside the casing around the strainer to form a filter pack in attempting to keep the sand away from the strainer.

The present invention contemplates a solution of this problem by providing a bullet with which to perforate the casing wherein the bullet is in the form of a strainer so that the bullet may be punched or forced through the casing, surrounding cement and project into the productive formation so as to fill the opening which is thus made and to strain the fluids entering the casing and exclude the sand and other foreign matter.

It is, therefore, one of the objects of the invention to provide a strainer member which is adapted for insertion in the well bore.

Another object of the invention is to provide an insert strainer member to perforate a well casing and the cement therearound and conduct the productive fluid into the well while straining the foreign matter therefrom.

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Still another object of the invention is to provide an insert strainer made up of a body having flow passages and a quantity of filter material therein.

Still another object of the invention is to provide an insert strainer having flow passages therein which will project through a casing and the surrounding cement and into a productive formation so as to control the volume of fluids entering the well casing.

Other and further objects of the invention will be readily apparent when the following description is considered in connection with the accompanying drawings, in which:

Fig. 1 is a vertical section view of a tool in position ready to insert one of the insert strainers into a well casing;

Fig. 2 is a broken sectional view showing the insert strainer as having been punched through the casing;

Fig. 3 is an enlarged sectional view of one of the strainer inserts which has been punched through the casing, the cement therearound and is shown as projecting into the productive formation so as to strain the fluid from such formation into the casing; and

Fig. 4 is a section of the insert strainer taken on the line 4—4 of Fig. 3.

The insert strainer is best seen in the enlarged view in Fig. 3, where the well casing 2 is shown in position in the well bore 3 and enclosed in a sheath of cement 4. The productive formation 5 surrounds the cement and the insert strainer 10 is shown as having been punched through the casing and the cement by having the forward end 11 and the tapered area 12 thereabout punched through the casing and cement. This punching operation creates the opening 14 in the pipe and 15 in the cement so that the rear end 16 of the insert is flush with the interior surface 17 of the casing. The forward end 11 of the insert is shown as projecting beyond the surface of the well bore 3 and into the productive formation 5 to such an extent that the flow passages or orifices 20 have their outer ends 21 open to the productive formation 5. A plurality of these passages 20 are shown as extending radially outwardly of the body portion 25 of the insert and they are inclined forwardly to form the entrances for the fluid from the formation. All of these passages 20 lead into a central chamber 27, which is formed in the interior of the body 25. This chamber 27 is partly filled with a granular material 28, as best seen in Fig. 3, which material is of a type to form a suitable filter body or

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strainer for the fluids entering the insert through the passages 20. In order to confine this granular material, a perforated disc 30 is shown as having been inserted into the body 25 and the chamber 27, and the disc is held in place by a bushing 35, which may be welded at 32 or otherwise affixed so as to anchor the disc in place. The disc is provided with the perforations 33 so as to allow for a flow of fluid from the formation into the interior of the casing.

It seems obvious that any desired number of these inserts 10 may be punched through the casing so as to accommodate the desired flow of fluid from the formation into the casing.

It is intended that these inserts will be positioned after the casing has been anchored in the well bore and that they will form their own openings when punched into position and will be firmly held by the frictional engagement with the casing and the cement material. These inserts may be of any desired size and construction and, of course, the size of the passages 20 and the size of the granular material 28 will be predetermined so as to exclude the sand or other foreign matter from the formation.

This insert may be positioned or punched through the casing and the cement by the Means for Explosively Inserting Orifices in Pipe in Wells as set forth in my prior co-pending application Serial No. 453,008, filed July 31, 1942, now Patent No. 2,426,106, granted August 19, 1947, wherein broadly an insert orifice bullet or bushing is claimed.

In order to illustrate the tool described in my above noted prior application, a vertical sectional view thereof has been illustrated in Fig. 1 where the casing 40 is shown as being made up of the sections 41 and 42, which are joined by a threaded coupling 43. The tool 45 is made up of a body 46, which carries a spring finger 47 adapted to snap into the opening 48 formed by the coupling and the pipe ends due to the provision of a finger 49 normally forced outwardly by a spring 50. This body has an explosion chamber 52 threaded to its upper end and a coupling 53 carries the head 54 so that the tool may be suspended by the connection 55 and the plunger 56 movable in the head 54. A suitable wire line or other manipulating device may be connected to the plunger 55 so that the tool can be suspended thereon and lowered into the well bore. When the approximate elevation is reached where the insertion is to be made, the tool will be raised slightly to cause the finger 47 to snap into the opening 48. This locates the tool with respect to the coupling 43 and the tool is now ready for operation to insert the bushing.

To accomplish this inserting operation a lowering action is performed on the supporting mechanism so that the plunger 56 drops sharply to strike a firing pin 58 so as to cause it to shear a pin 59 in the coupling 53 and to cause the firing pin to strike the cartridge 60. The cartridge thus explodes and drives the wedge member 61 downwardly in the explosion chamber 62 so that the wedge face 63 thereof bearing against the carrier 64 will cause the carrier to move radially outward in the opening 65 from the position of Fig. 1 to the position of Fig. 2. This carrier has the insert strainer 10 releasably connected to its forward face 68 so that the force of the wedge member 61 will cause the insert member to punch the opening 14 through the casing and will move the insert to the position shown in Fig. 2, where the rear end 16 thereof is flush with the inner sur-

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face 17 of the casing 2. In this manner a controlled movement is had so that the insert strainer is moved to the proper position when the heel portion 70 of the wedge 61 moves along the rear face 71 of the carrier 64. A recess 72 allows the wedge member to pass beyond the carrier and come to rest against the stop member 73 in the body 45. The tool may now be raised by lifting on the connection plunger 55 so that the carrier 64 is pulled loose from the insert strainer 10.

While the invention has been shown and described as applied to a casing, it seems obvious that the inserts may be applied to a production string of pipe or even to tubing. For instance, the casing could be set, perforated, the production string run into place and then the strainer inserts punched into the production pipe either with or without gravel packing.

If desired, of course, the granular material may be omitted and the straining function performed by the passages 20, which would be made of the desired size, shape or number. Such passages could be provided in the end 11 rather than in the sides as shown, or slots of a suitable size might be used. The passages 33 in the disc 30 could be used as the strainer or as a secondary strainer area.

In some instances where a pipe such as the pipe 2 is stuck in a well, a number of large inserts like the insert 10 may be punched into the pipe at the same elevation so as to weaken the overall strength of the pipe sufficiently to permit the pipe to be pulled in two. Such a pipe cutting operation is preferable to depositing a shot of explosive in the well or pipe.

What is claimed is:

1. An insert strainer plug for insertion in a well pipe in situ in wells comprising a body, a solid forward end thereon adapted to be punched through the pipe, a chamber in the body open to the rearward end thereof, a plurality of flow inlets extending from openings in the periphery of the body a substantial distance rearwardly of the forward end thereof into said chamber, a body a substantial distance rearwardly of the forward end thereof of granular filtering material in the chamber to filter the flow of fluid from the well, and means to retain said granular material in said chamber.

2. An insert strainer plug for insertion in a well pipe in situ in wells comprising a body, a solid forward end thereon to punch a hole through the pipe, a chamber in the body open to the rearward end thereof, a plurality of flow inlets extending from openings in the periphery of the body a substantial distance rearwardly of the forward end thereof into said chamber, a body a substantial distance rearwardly of the forward end thereof of granular filtering material in the chamber to filter the flow of fluid from the well, and means to retain said granular material in said chamber including a perforate plate, said body being of a length to extend through the pipe and project beyond a layer of cement about the pipe and position said inlet openings in communication with a well formation beyond the cement.

3. An insert strainer plug for wells comprising a body, a solid forward end thereon adapted to be punched through the pipe, a chamber in the body open to the rearward end thereof, a plurality of flow inlets extending from the periphery of the body into said chamber rearwardly of said solid forward end, a body of granular filtering material in the chamber to filter the flow of fluid

from the well, and means to retain said granular material in said chamber including a perforate plate and a retainer bushing both disposed in said chamber, said body being of a length to extend through the pipe and project beyond a layer of cement about the pipe and to position said inlet openings in communication with a well formation beyond the cement.

4. An insert member for pipe in situ in wells, comprising a body, a solid forward end thereon to punch thru the pipe, a chamber in said body behind said end, said end of a length to project beyond the outer periphery of the pipe when inserted therein, flow passages laterally of said body opening outwardly from said chamber directly behind said end and beyond the pipe periphery, a body of filter material disposed in said chamber, and ported means to retain the filter material in the body.

MYRON M. KINLEY.

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The following references are of record in the file of this patent:

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Certificate of Correction

Patent No. 2,540,123

February 6, 1951

MYRON M. KINLEY

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows:

Column 4, lines 45 and 46, and lines 58 and 59, strike out the words "a substantial distance rearwardly of the forward end thereof";

and that the said Letters Patent should be read as corrected above, so that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 29th day of May, A. D. 1951.

[SEAL]

THOMAS F. MURPHY,
Assistant Commissioner of Patents.