

**RAT HOLE BYPASS FOR GRAVEL PACKING ASSEMBLY****CROSS-REFERENCE TO RELATED APPLICATIONS**

**[0001]** None.

**STATEMENT REGARDING FEDERALLY SPONSORED  
RESEARCH OR DEVELOPMENT**

**[0002]** Not applicable.

**REFERENCE TO A MICROFICHE APPENDIX**

**[0003]** Not applicable.

**FIELD OF THE INVENTION**

**[0004]** The present invention relates to gravel packing of hydrocarbon producing wells and more particularly to a gravel packing slurry bypass for gravel packing assemblies.

**BACKGROUND OF THE INVENTION**

**[0005]** Oil and gas wells are often completed with an open hole in unconsolidated formations containing fines and sand which flow with fluids produced from the formations. The sand in the produced fluids can abrade and otherwise damage tubing, pumps, etc. and must be removed from the produced fluids. Gravel packs which include sand screens and the like are commonly installed in wellbores to filter out the fines and sand in the produced fluids.

**[0006]** In a typical gravel packing operation, a screen is placed in the wellbore and positioned within the producing zone. The screen is typically connected to a tool string which includes a packer and a crossover and the tool string is connected to and supported by a work or production string. A slurry of particulate matter, usually graded sand and referred to as gravel, carried in a fluid is pumped down the work string, through the crossover and into the annulus between the screen and the wellbore. The slurry fluid leaks off through the screen which is sized to prevent the sand in the slurry from flowing therethrough. Some of the fluid may also leak off into the formation. As a result, the sand fills the annulus around the screen forming a gravel pack. The sand size is selected to prevent formation fines and sand from flowing into the production tubing.

**[0007]** In forming the gravel pack, it is important to keep the sand from settling out of the slurry before it reaches the screen borehole annulus. The viscosity of the slurry fluid, sand particle size and borehole geometry determine the minimum flow velocity at which the sand remains suspended in and continues to flow with the fluid.

**[0008]** In most open hole completions, an upper part of the wellbore is lined with steel casing which is cemented into the wellbore. The upper part of the wellbore is normally drilled to a larger diameter than the lower open hole portion. The casing is normally placed in the upper portion and cemented before the lower, generally smaller diameter portion is drilled. There is normally a portion of the larger diameter bore below the bottom of the casing and above the smaller diameter open hole portion of the well. This portion has a diameter greater than the inner diameter of the casing and greater than the diameter of the lower open hole portion and is often referred to as a rat hole. During gravel packing, the crossover and its packer are normally set in the cased portion of the wellbore while the screen and blank pipe connected to the screen are in the lower open hole portion. The gravel packing slurry enters the well annulus in the cased portion and must flow through the rat hole region to reach the annulus around the screen. Since the rat hole portion has a larger diameter than either the cased upper portion or the open hole lower portion, the slurry flow velocity is significantly reduced through the rat hole area. In some cases, especially in horizontal wells, the flow velocity in the rat hole area may not be sufficient to keep the sand fluidized. When this happens, the sand may settle out of the slurry and cause a sand bridge preventing the slurry from reaching the yet unpacked open hole below the rat hole.

**[0009]** In horizontal wells, even if the sand does not pack off in the rat hole, the low velocity in the rat hole will produce a relatively high Alpha Wave height. The slurry must flow above the top of the Alpha Wave. At the bottom of the rat hole, the slurry must dip down to enter the open hole section. The geometry change causes fluctuations in the flow velocity and flow regime which may initiate a sand bridge and prevent slurry from continuing along the open hole section.

**[0010]** Flow velocity may be maintained by increasing the rate of pumping of slurry. However, the increased rate usually requires higher pump pressure. The higher pump pressure may cause undesirable fluid leak off into the formation and in some cases may cause undesirable fracturing of earth formations.

#### SUMMARY OF THE INVENTION

**[0011]** The present invention provides a bypass flow path for gravel packing slurry. The bypass flow path has a cross sectional area selected to maintain the flow velocity of the gravel packing slurry at a level sufficient to keep the gravel packing sand suspended in the slurry liquid.

**[0012]** In one embodiment, a section of liner is carried on a section of tubing between a gravel-packing crossover and a screen. The liner is sized and positioned to span a rat hole and any associated irregularities in a wellbore. The bypass flow path is the annulus between the liner and the tubing. A flow seal is preferably provided to restrict fluid flow between the liner and the borehole.

#### BRIEF DESCRIPTION OF THE DRAWINGS

**[0013]** Fig. 1 is a general schematic diagram showing an embodiment of a complete gravel packing assembly including a crossover assembly, a bypass, and a screen assembly in a vertical well.

**[0014]** Fig. 2 is a more detailed cross sectional illustration of a gravel-packing bypass in an embodiment in a horizontal well.

**[0015]** Fig. 3 is a partially cross-sectional illustration of an alternative embodiment in which a bypass liner includes perforations plugged with a removable material to facilitate production from a rat hole area.

#### DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

**[0016]** Various elements of the embodiments are described with reference to their normal positions when used in a borehole. For example, a screen may be described as being below or downhole from a crossover. For vertical wells, the screen will actually be located below the crossover. For horizontal wells, the screen will be horizontally displaced from the crossover, but will be farther from the surface location of the well as measured through the well. Downhole or below refers to a position in a well farther from the surface location in the well.

**[0017]** An annulus, as used in the embodiments, is generally a space between two generally cylindrical elements formed when a first generally cylindrical element is positioned inside a second generally cylindrical element. For example, a tubing is a cylindrical element which may be positioned in a wellbore, the wall of which is generally cylindrical forming an annulus between the tubing and the wellbore. While drawings of such arrangements typically show the inner element centrally positioned in the second, it should be understood that inner element may be offset and may actually contact a surface of the outer element at some radial location, e.g. on the lower side of a horizontal well. The width of an annulus is therefore typically not the same in all radial directions.

**[0018]** Fig. 1 provides a general schematic diagram of a gravel packing assembly according to one embodiment of the invention. Fig. 1 is not drawn to scale in order to better illustrate the relative locations and positions of the various elements.

**[0019]** A wellbore 10 is shown passing vertically through earth formations 12 and 14. Formation 14 may be a formation from which hydrocarbons may be produced. An upper portion 16 of wellbore 10 is shown as having been drilled to a larger diameter down to a depth 18 above the producing formation 14, but may extend into the formation 14. A steel casing 20 is positioned in the upper portion 16 with the lower end or casing shoe 22 of the casing 20 positioned some distance above the depth 18. The portion of the well between the bottom 22 of the casing 20 and the depth location 18 is generally referred to as a rat hole 26. A typical rat hole 26 may be from two to fifteen meters long. Cement 24 fills the annulus between the casing 20 and the borehole 10.

**[0020]** A lower portion 28 of the well 10 has been drilled below the rat hole 26 down through the formation 14. The lower portion 28 is normally drilled after the casing 20 has been cemented into the upper portion 16. The lower portion 28 may therefore have an inner diameter almost as big as, as big as, or in some cases slightly larger than the inner diameter of casing 20, since a drill bit used to drill lower portion 28 is lowered through the casing 20 to drill portion 28. The diameter of the lower portion 28 is however generally smaller than the diameter of the rat hole 26.

**[0021]** The change in borehole diameter at the bottom 18 of the rat hole 26 creates a borehole irregularity which may generate a sand bridge or otherwise interfere with proper gravel packing as discussed above. Other types of borehole irregularities may exist below the bottom 22 of the casing 20 and may extend below the rat hole 26. For example, after setting and cementing the casing 20 in a horizontal completion, the cement may be drilled out at an angle below horizontal to locate the bottom of an oil reservoir and where the water level is. When this testing is completed, the open hole may be cemented back to the casing and then drilled out again in a horizontal path. These operations all extend from the rat hole to some distance below the rat hole and may create irregularities for some distance below the rat hole. The bypass of the present invention is intended for bypassing all borehole irregularities in the rat hole area, that is irregularities associated with or in reasonable proximity to the casing shoe 22 and rat hole 26.

**[0022]** A gravel packing assembly is shown positioned within wellbore 10. The assembly has been lowered into the well 10 on a work string 30 which extends up to the surface location of the well 10. A cross over 32 is carried on the lower end of work string 30 and carries a packer 34 which seals the annulus between the crossover 32 and the casing 20. A length of tubing 36 and collar 38 extend from the lower end of crossover 32 and support the remaining portions of the gravel packing assembly.

**[0023]** A bypass 40 according the present invention is connected to and supported by the collar 38. The bypass 40 includes a section of tubing 42, which may comprise several separate sections connected by collars, and one or more sections of liner 44 carried on the tubing 42. A seal 46, for example an elastomeric cup seal, is carried on the upper outer surface of the liner section 44. The bypass 40 is preferably positioned so that the seal 46 is located within the casing 20 and is sized to contact and seal against the inner surface of the casing 20. Alternatively, a separate seal element 46 may not be carried on the liner 44, but instead the liner 44 itself may act as a seal by being constructed of such a large diameter and sufficient length extending inside the casing 20 that flow outside the bypass 40, but inside the casing 20 is so constricted by friction that such flow is significantly blocked. The length of bypass 40 is selected so that the

lower end of the liner 44 is at or below the bottom 18 of the rat hole 26 and any other associated borehole irregularities. A collar 48 is provided at the lower end of the tubing section 42.

**[0024]** Element 44 is referred to herein as a liner, because in the described embodiments an oilfield tubular element commonly referred to as liner was used to make the element 44 and, when used to bypass a rat hole, it is positioned below the bottom of casing 20 somewhat like a permanent well liner. However, other oilfield tubular members may be used to make the liner 44. Such members may be made of steel and may have thin or thick walls. Non-metallic, for example fiberglass, tubular members could also be used to make the liner 44. While the liner 44 is substantially tubular, it does not have to have a perfectly cylindrical shape, but could have surface irregularities such as corrugations as built, or may be bent, dented or otherwise deformed to some extent during handling and positioning in a well and should function properly.

**[0025]** A screen assembly 50 is carried on the collar 48. The screen assembly 50 may include one or more blank tubing sections 51. Although the tubing section 51 is illustrated as being short relative to the actual screen 50, it is understood that blank section 51 can be of any length as needed to properly position the screen 50. The screen assembly 50 is positioned within the lower portion 28 of the well 10 and is adjacent a producing portion of formation 14. The purpose of the gravel packing assembly is to completely fill, or pack, the annulus 52 between screen 50 and the borehole lower portion 28 with gravel packing particulate or sand.

**[0026]** Gravel packing is performed by flowing a slurry of gravel packing sand in a fluid down through the work string 30. At cross-over 32, the slurry flows out of one or more ports 54 below packer 34 and down the annulus 56 as indicated by the arrow 58. Since the seal 46 restricts flow in part of the annulus, the slurry will flow into an annulus between tubing 42 and the liner 44, and out the lower end thereof as indicated by the arrow 60. The lower end of the liner 44 is located below the rat hole 26 and in the smaller diameter lower well portion 28. The slurry flows down the annulus 52 to and around the screen 50. The fluid portion of the slurry flows through the screen 50 and possibly into the formation 14 and the particulates fill the annulus 52 forming the desired gravel pack. The slurry fluid

which flows into the screen 50 flows up through tubing 42, 36 to the crossover 32 and out an upper port 60 above packer 34 as indicated by the arrow 62. The fluid then returns to the surface location of the well by flowing up the annulus 64 between work string 30 and the casing 20.

**[0027]** The crossover 32, packer 34 and screen assembly 50 may be the same as components used in prior art gravel packing assemblies. However, in the prior art assemblies, these components are connected together only by a section of tubing 51 having sufficient length to position the crossover 32 and packer 34 in the casing 20 and the screen 50 at a desired location in the producing zone 14. With the prior art assembly, the gravel packing slurry would flow through the rat hole 26 at a reduced speed, increasing the possibility that the particulates would settle out of the slurry and bridge off in the rat hole 26. The geometry change at the bottom of the rat hole 26 or other associated borehole irregularities may also cause formation of a bridge in the annulus above the screen 50. In either case, gravel packing in the annulus around the screen 50 may be prevented or may have voids. With the bypass 40 of the present invention, the slurry flow through the rat hole 26 is confined to the smaller cross sectional area of the annulus between liner 44 and tubing 42. The smaller cross sectional area helps maintain a desirable high slurry velocity which helps the particulates remain suspended in the slurry and flow into the annulus 52 around the screen 50. As a result, a good gravel pack may be achieved.

**[0028]** Fig. 2 is a more detailed partially cross-sectional view of a gravel packing assembly according to an embodiment of the invention. Parts which may be the same as parts shown in Fig. 1 are given the same reference numbers. In Fig. 2, the well 10 is shown in a horizontal orientation in zone 14 with the understanding that the casing 20 would normally extend through a substantially vertical portion of the well above the producing zone 14. Gravel packing is more difficult in horizontal completions than in vertical completions and the present invention is particularly useful in horizontal completions.

**[0029]** As shown in Fig. 2, the bypass 40 may be formed of several elements assembled onto a length of tubing 42. The tubing 42 is preferably formed from at least two lengths of tubing. One is a short length of tubing 66, e.g. about three

meters long, connected to a longer section 68 by a collar 70. The lower, or downhole end of the short section 66 is connected to the collar 48. It will be apparent that the longer section 68 could be formed of several sections of tubing coupled by collars depending on the length of the bypass 40 needed for a particular well.

**[0030]** The bypass 40 may also include a length of liner 72 coupled between a lower end cap 74 and an upper end cap 76. Lower end cap 74 includes an inner sleeve 78 sized to be slidably carried on the tubing section 66, but to have an inner diameter too small to slide over or past the collars 48 and 70. Therefore, when assembled as shown in Fig. 2, the lower end cap 74 may slide up and down the tubing 42 by about the length of the tubing section 66. The end cap 74 also has an outer sleeve 80 having an outer diameter about equal to that of the liner section 72, and coupled to the section 72 by a collar 82. The inner sleeve 78 and outer sleeve 80 are connected together by a plurality, e.g. four, of radial ribs 84 which allow fluids to flow between the sleeves 78 and 80.

**[0031]** The upper end cap 76 is very similar to the lower end cap 74. It includes an inner sleeve 86 slidably carried on tubing section 68, an outer sleeve 88 and radial ribs 90 connecting the inner sleeve 86 and the outer sleeve 88. The upper end cap 76 outer sleeve 88 may be connected to the upper end of liner section 76 by a separate coupling 92 on which is carried the cup seal 46. A threaded connection between outer sleeve 88 and coupling 92 provides a convenient location for mounting the inner portion of the cup seal 46. When the bypass 40 is assembled as shown in Fig. 2, the entire bypass 40 may slide a distance up and down the tubing 42 limited by the lower end cap 74 and the collars 48 and 70.

**[0032]** The bypass 40 may be assembled as shown in Fig. 2 as a simple, separate modular assembly with threaded connectors on each end of the tubing 42. The complete gravel packing assembly of Fig. 1 may be made up by connecting the bypass 40 between a conventional cross-over and packer assembly above the bypass 40 and a conventional screen assembly 50 below the bypass.

**[0033]** The overall length of the bypass 40 may be selected by selecting a length of the liner section 72. The lower end cap 74 and upper end cap 76 may have the same dimensions regardless of the overall length of a bypass 40. The tubing 42 should be somewhat longer than the combined lengths of the liner 72 and endcaps 74, 76, unless the Fig. 3 alternative embodiment extending the screen 50 to within the rat hole 26 is being used, such alternative requiring the special care in selection of screen and service tool type and geometry as discussed below. It is preferred that the bypass 40 have sufficient overall length to allow the seal 46 to be positioned within the casing 20 while the lower end cap 74 is positioned at or below the lower end 18 of the rat hole 26 and other associated borehole irregularities. However, due to uncertainties in the depth of placement of the gravel packing assembly in a well, it may be desirable for the bypass 40 to be somewhat longer than the rat hole 26. For a typical rat hole having a length of five meters, it may be desirable to provide a bypass having a length of twenty meters. That would allow a fifteen meter range in depth placement of the bypass 40 which would still provide a suitable bypass for the rat hole. With these dimensions, up to fifteen meters of the bypass 40 may be located within the lower smaller diameter portion 28 of the well or in the casing 20 and will not interfere with the gravel packing operation.

**[0034]** After the gravel packing assembly has been assembled, it may be positioned in a well as shown in Fig. 1. A gravel packing operation may be performed according to well known gravel packing practice. By using the bypass 40 of the present invention, problems caused by rat hole 26 are avoided and a good gravel pack is more easily achieved.

**[0035]** Use of one or more cup seals 46 is preferred to block flow of slurry outside of the liner 44. In addition to the cup seal 46 carried on upper end cap 76, a second seal could be carried on the lower end cap 74 and sized to at least partially seal against the borehole in the lower open hole portion 28. The seal or seals direct the slurry flow through the bypass 40 maintaining a desirable high flow velocity and avoiding formation of a bridge in the rat hole 26. In some cases, the bypass 40 may be used without a seal 46. If a sand bridge forms outside the bypass 40, the bridge itself may force essentially all of the slurry flow through the

bypass. If a sand bridge were to form in the bypass, the full slurry flow would be forced through the rat hole, but the flow cross section would be reduced by the liner 44 and the flow velocity may be sufficient to prevent formation of a sand bridge. Thus, even if the seal 46 is not used, or is damaged or torn off in placement of the gravel packing assembly in a well, the bypass 40 may prevent formation of a sand bridge in a rat hole and facilitate formation of good gravel packs below the rat hole.

**[0036]** If a seal 46 is not used, proper selection, sizing and positioning of the bypass 40 can substantially block flow of slurry through the annulus between the liner 44 and the casing 20 and thereby substantially bypass the rat hole 26. The liner 44 may be selected to have an outer diameter which forms a close fit with the inner diameter of casing 20, but which does not interfere with running the liner 44 into the casing 20. A suitable diameter may be the drift diameter specified for the casing 20 or a diameter a fraction of an inch, e.g. one-sixteenth to one-quarter of an inch, less than the drift diameter of the casing 20. Smaller diameters may also be suitable. The length of liner 44 may be selected so that a significant length of the liner 44 may be positioned within the casing 20 for the gravel packing operation. The flow area in the annulus between tubing 42 and the casing 20 will thereby be divided into two flow areas, with the majority of the flow area in the annulus between tubing 42 and the liner 44 and only a small part of the flow area in the annulus between the liner 44 and the casing 20. This difference in flow areas alone may cause substantially all of the slurry to flow through the annulus between tubing 42 and the liner 44. Flow through the annulus between the liner 44 and the casing 20, will be substantially restricted by friction pressure and will be at a lower velocity. The friction pressure will divert substantially all slurry flow through the annulus between liner 44 and the tubing 42. The low velocity may result in a sand bridge forming in the annulus between liner 44 and the casing 20 or in the rat hole outside the liner 44. Such an outer sand bridge may act as a seal, further causing substantially all slurry to flow through the annulus between liner 44 and the tubing 42, which is the desired result. A similar result may be achieved by providing an outer diameter, e.g. about casing drift diameter, of the

upper end cap 76 to form a close fit to the casing 20 without an elastomeric seal 46 and without necessarily using a larger diameter liner 44.

**[0037]** The present invention provides a defined primary slurry flow path that substantially bypasses the rat hole area. The bypass flow path has a cross sectional area and shape which can be preselected to provide a desirable slurry velocity and to minimize disruptions in the geometry of the flow path which may cause aggregate to drop out of the slurry. In the above-described embodiments, the flow path through bypass 40 is in the form of an annulus between the tubing 42 and the liner 44. However, it is apparent that a flow path of desirable cross sectional area could have other geometries. For example one or more circular, square or other cross-section tubes or conduits could be carried axially along the outer surface of the tubing 42 to provide a bypass. If multiple conduits are used, the total cross sectional flow area can be selected to provide a desirable slurry velocity. In Fig. 2, the flow path through the end caps 74, 76 is actually divided into four quarter-annulus segments by the radially extending ribs 84 and 90 respectively. Each end cap therefore may be described as made up of a plurality of separate conduits each having somewhat of a square cross section, with the combined flow area through the plurality of conduits providing a desirable slurry velocity. Such multiple conduits could extend over the entire length of the bypass 40. Four separate conduits could be coupled between the end caps 74, 76, one end of each coupled to each of the four quarter-annulus segments defined by the end caps 74, 76. In such alternative embodiments, an elastomeric seal or other means of restricting flow outside the bypass 40 may be used.

**[0038]** In some wells, the rat hole 26 may be positioned in a productive zone and it may be desirable to position a sand screen in the rat hole area to allow recovery of produced fluids which may flow from the rat hole area. Fig. 3 illustrates an alternative embodiment which may provide the bypass advantages of the present invention during gravel packing without interfering with production from the rat hole area. Most parts in Fig. 3 may be the same as those in Fig. 1 and are given the same reference numbers. The bypass 40 includes a liner 94 having a plurality of perforations 96. Each perforation 96 is filled with a removable plug 98. A sand screen 100, which may be an extension of screen 50, may be

included in the tubing string 42 and positioned in the rat hole area. So long as the plugs 98 are in place in the perforations 96, the liner 94 is functionally equivalent to the liner 44 and facilitates gravel packing, including forming a gravel pack between the liner 94 and the screen 100. When the plugs 98 are removed, formation fluids may flow from the rat hole area through the liner 94 and into the screen 100.

**[0039]** Positioning of the screen 100 within the rat hole 26 may require that care be taken with the selection of the type and/or geometry of the screen 100 (e.g., erosion-resistant screen types, special inner and outer diameter screen), and associated service tools used to place the pack (e.g., the washpipe inside such additional screen 50 could have a larger outer diameter than is typical) within the rat hole 26. Such selection may be needed to reliably pack the annulus between the screen 100 and the liner 94. Such special types of screen and service tools are well known to those skilled in the art of gravel packing.

**[0040]** To completely enable production through the liner 94, a means to open the perforations 96 through the liner 94 after gravel packing is required. One means may be the use of the removable plugs 98 in the perforations 96, which plugs could be removed by chemical or mechanical means such as fluid contact with the plugs after gravel packing is complete, or merely the passage of time during which the plugs could naturally degrade or dissolve in common well bore fluids. Such removable plugs are well known in the art. For example, U.S. Patent 5,355,956 teaches use of sacrificial plugs fabricated from a sacrificial metal such as zinc, aluminum and magnesium. Such materials are considered sacrificial because they have a relatively high rate of etching or dissolution when contacted by an acid or base solution, as compared to the rate at which a steel liner is affected by such solutions. The plugs 98 may alternatively be made of a mixture of magnesium oxide and magnesium chloride that is soluble in hydrochloric or sulfamic acid.

**[0041]** The plugs 98 may also be made of polylactic acid, which combines with water to degrade to lactic acid. In oil wells, an oil soluble resin may be used to form the plugs 98. Both polylactic acid and oil soluble resin degrade at slow enough rates that they would retain sufficient strength during the gravel packing

operation, but degrade completely within one or two weeks when in contact with borehole fluids.

**[0042]** The plugs 98 may also be partially or entirely made of other chemicals used to treat oil wells. Such materials include phosphate scale inhibitors or encapsulated inhibitors. Solidified or encapsulated glycols may be used to provide hydrate suppression. Solidified or encapsulated materials of an acidic or caustic nature may aid in filter cake removal. Treatment materials may be mixed with or bound together with other materials, such as the polylactic acid mentioned above. When the blocking materials are removed after the packing process, the chemicals may be released to perform their normal well treatment function.

**[0043]** While the liner 94 is illustrated as a substantially tubular pipe or tubing in which circular perforations have been formed, it is apparent that the perforations could have other shapes such as square or slotted. The liner 94 may have a large number of small perforations like a sand screen. The liner 94 could be made of a porous material similar to some sand screens. The liner 94 could be coated or saturated with one of the materials discussed above, e.g. polylactic acid, to make it essentially impermeable during a gravel packing operation. After the material is removed, dissolved, etc. produced fluids could flow through the liner 94. Alternatively, the plugs 98 may be made of a permanent porous material with the pores filled initially with one of the materials listed above.

**[0044]** While the present invention has been illustrated and described with reference to particular structures and methods of use, it is apparent that various substitutions of equivalent parts and modifications thereto may be made within the scope of the invention as covered by the appended claims.

## CLAIMS:

1. A gravel packing slurry bypass, comprising:
  - a section of tubing adapted for connection between a crossover and a screen, and
  - a section of a substantially tubular member carried on the tubing and forming an annulus between the tubing and the tubular member.
2. The gravel packing slurry bypass of claim 1, further comprising:
  - a seal carried on an outer surface of the section of substantially tubular member.
3. The gravel packing slurry bypass of claim 2, wherein the seal is adapted to restrict flow in an annulus surrounding the substantially tubular member when the seal is positioned in a well casing.
4. The gravel packing slurry bypass of claim 1, wherein the section of substantially tubular member has an outer diameter selected to restrict flow in an annulus surrounding the substantially tubular member when a portion of the section of substantially tubular member is positioned in a well casing.
5. The gravel packing slurry bypass of claim 1, wherein the section of substantially tubular member has a length selected to extend across at least a rat hole area in a borehole.
6. The gravel packing slurry bypass of claim 1 wherein the substantially tubular member is slidably carried on the tubing.
7. The gravel packing slurry bypass of claim 1, further comprising a sleeve slidably carried on the tubing and attached to the substantially tubular member.

8. The gravel packing slurry bypass of claim 7, wherein the tubing comprises a plurality of sections of tubing connected together by collars having an outer diameter, the sleeve has an inner diameter less than the collar outer diameter, and the sleeve is slidably carried on the tubing between two collars.
9. The gravel packing slurry bypass of claim 1, wherein the section of substantially tubular member has one or more perforations, further comprising a removable material blocking flow of fluids through the one or more perforations.
10. Apparatus for flowing gravel packing slurry through borehole irregularities located between an upper cased portion of a borehole and a lower portion of a borehole, comprising:
  - a section of tubing adapted to be coupled between a gravel packing crossover in the cased portion of the borehole and a screen in the lower portion of the borehole, and
  - a liner carried on the outer surface of the tubing, and forming an annulus between the tubing and liner, the liner having a length selected to extend across the borehole irregularities.
11. The apparatus of Claim 10, further comprising:
  - a seal carried on the outer surface of the liner and adapted to block slurry flow through an annulus between the liner and the cased portion of the borehole.
12. The apparatus of claim 10, wherein the liner has an outer diameter selected to restrict flow in an annulus surrounding the liner when a portion of the liner is positioned in a well casing.
13. The apparatus of claim 10 wherein the liner is slidably carried on the tubing.

14. The apparatus of claim 10, further comprising a sleeve slidably carried on the tubing and attached to the liner.
15. The apparatus of claim 14, wherein the tubing comprises a plurality of sections of tubing connected together by collars having an outer diameter, the sleeve has an inner diameter less than the collar outer diameter, and the sleeve is slidably carried on the tubing between two collars.
16. The apparatus of claim 10, wherein the liner has one or more perforations, further comprising a removable material blocking flow of fluids through the one or more perforations.
17. A method for flowing gravel packing slurry through a rat hole area between a gravel packing crossover and a screen in a wellbore, comprising:
  - placing a section of pipe in the rat hole area between a gravel packing crossover and a screen, and
  - positioning a section of tubular member around the section of pipe, thereby forming a first annulus between the pipe and tubular member and a second annulus between the tubular member and the wellbore.
18. The method of Claim 17, further comprising flowing gravel packing slurry through the first annulus.
19. The method of Claim 17, further comprising:
  - restricting the flow of slurry through the second annulus.
20. The method of claim 19 further comprising restricting the flow of slurry with a seal carried on the section of tubular member.

21. The method of claim 20 wherein the wellbore is cased above the rat hole area and the section of tubular member has an upper end, further comprising positioning the seal between the upper end of the tubular member and the cased portion of the wellbore.
22. The method of claim 19 further comprising restricting the flow of slurry by selecting an outer diameter of at least a portion of the section of tubular member to form a close fit to a well casing when the section of tubular member is positioned in a well.
23. The method of claim 17 wherein the section of tubular member has one or more perforations, further comprising:  
filling the one or more perforations with a removable material, thereby substantially blocking flow through the perforations, and removing the removable material.
24. A method for gravel packing a wellbore that penetrates a subterranean oil or gas reservoir and bypassing a rat hole area of the well during gravel packing, comprising:  
(a) providing a wellbore in the reservoir;  
(b) locating a gravel packing assembly in the wellbore, the assembly comprising a crossover, a length of tubing coupled to the crossover and a screen coupled to the tubing, the tubing extending through the rat hole area;  
(c) locating a section of liner over the tubing corresponding to the rat hole area, whereby a first annulus is formed between the tubing and the liner and a second annulus is formed between the liner and the wellbore;  
(d) restricting the flow of fluids through the second annulus; and  
(d) injecting a fluid slurry containing gravel through the crossover into the first annulus.

25. The method of Claim 24, wherein the flow of fluids through the second annulus is restricted by a seal.
26. The method of claim 25 wherein the wellbore is cased above the rat hole area and the section of liner has an upper end, further comprising positioning the seal between the upper end of the liner and the cased portion of the wellbore.
27. The method of claim 24, wherein the flow of fluids through the second annulus is restricted by selecting a liner size, relative to wellbore size, so that the flow area in the second annulus is substantially smaller than the flow area in the first annulus.
28. The method of claim 27, wherein the wellbore is cased above the rat hole area, further comprising selecting the outer diameter of a portion of the liner to form a close fit with the casing and positioning the portion of the liner in the casing.
29. The method of claim 24 wherein the section of liner has one or more perforations, further comprising:
  - filling the one or more perforations with a removable material, thereby
  - substantially blocking flow through the perforations, and
  - removing the removable material.
30. The method of claim 29, further comprising flowing produced fluids through the one or more perforations.

31. A gravel packing assembly, comprising:
  - a crossover,
  - a length of tubing having a first end connected to the crossover,
  - a screen connected to a second end of the length of tubing, and
  - a length of liner carried on the outer surface of the length of tubing.
32. The gravel packing assembly of claim 31, further comprising a seal carried on the outer surface of the liner and adapted for blocking flow of fluid between the liner and a borehole.
33. The gravel packing assembly of claim 31, wherein the liner has an outer diameter adapted for blocking flow of fluid between the liner and a borehole.
34. The gravel packing assembly of claim 31, wherein the liner has one or more perforations, further comprising a removable material blocking flow of fluids through the one or more perforations.
35. Apparatus for flowing gravel packing slurry through borehole irregularities located between an upper cased portion of a borehole and a lower portion of a borehole, comprising:
  - a section of tubing adapted to be coupled between a gravel packing crossover in the cased portion of the borehole and a screen in the lower portion of the borehole, the tubing forming an annulus between the tubing and the borehole,
  - one or more conduits carried on the outer surface of the tubing and in the annulus, the conduits having a length selected to extend across the borehole irregularities, and
  - a seal for restricting flow in the annulus outside the conduits.
36. Apparatus according to claim 35 wherein the seal comprises an elastomeric seal substantially filling the annulus outside the one or more conduits.

37. Apparatus according to claim 36 wherein the elastomeric seal has an outer diameter selected to seal against a well casing.
38. Apparatus according to claim 35 wherein the one or more conduits comprises a section of a substantially tubular member carried substantially coaxially around the section of tubing.
39. Apparatus according to claim 38 wherein the section of a substantially tubular member has an outer diameter selected to form a close fit to a well casing, the close fit forming the seal for restricting flow in the annulus outside the one or more conduits.
40. A method for gravel packing a well having a cased upper portion, a rat hole area below the cased upper portion and a producing zone below the rat hole area, comprising:
  - positioning a sand screen in the producing zone,
  - positioning a tubing in the well extending through at least a portion of the cased upper portion and the rat hole area and to the sand screen, the tubing defining an annulus between the tubing and the well,
  - positioning one or more conduits in the annulus extending across the rat hole area, and
  - flowing gravel packing slurry from the surface to the producing zone comprising flowing substantially all of the gravel packing slurry through the one or more conduits.
41. A method according to claim 40, further comprising restricting flow of fluids in the annulus outside the one or more conduits.
42. A method according to claim 41, further comprising positioning a seal in the annulus outside the one or more conduits.