MULTIPLE HORIZON OIL PRODUCTION METHOD

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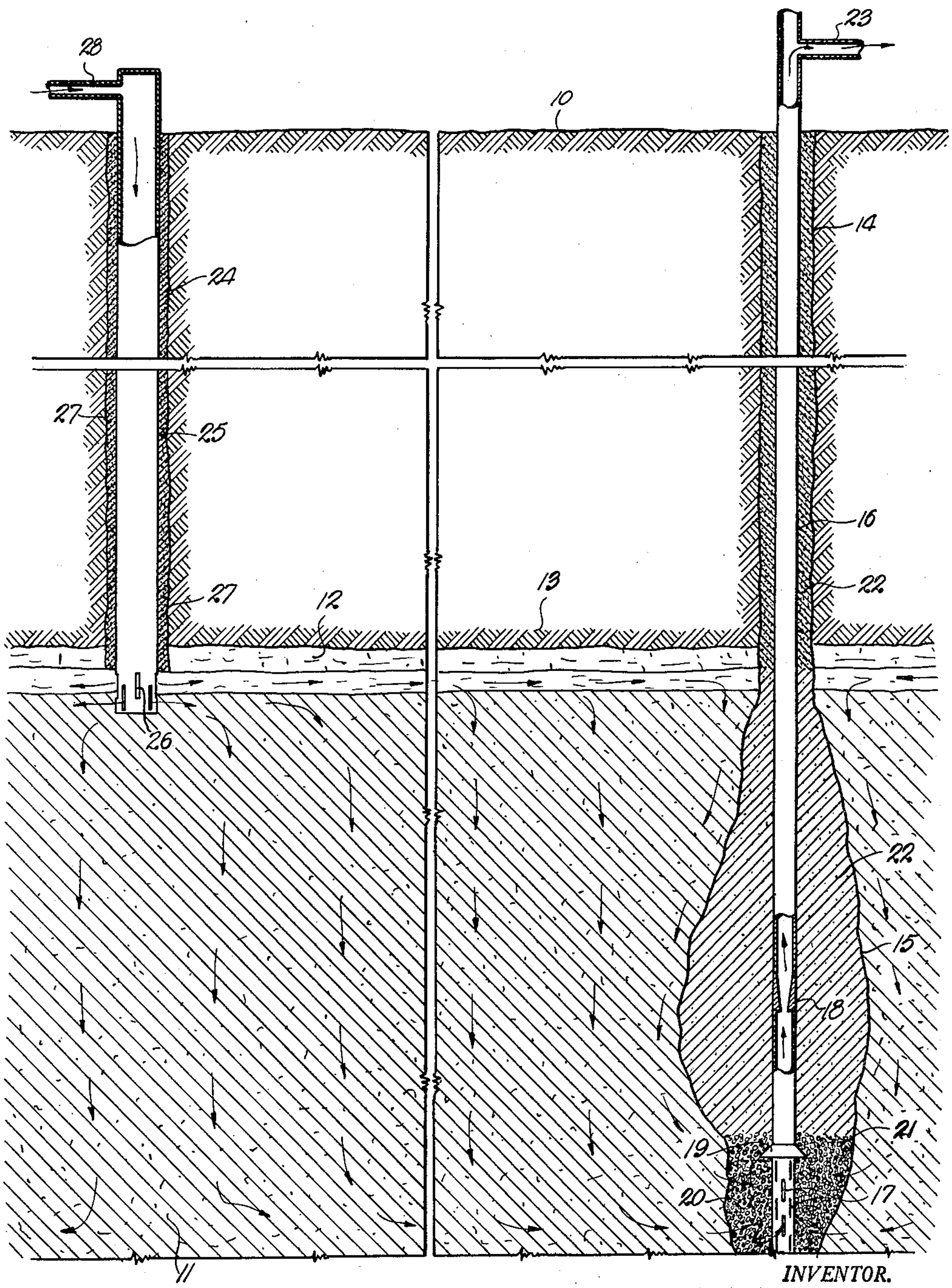

Fig. 1.

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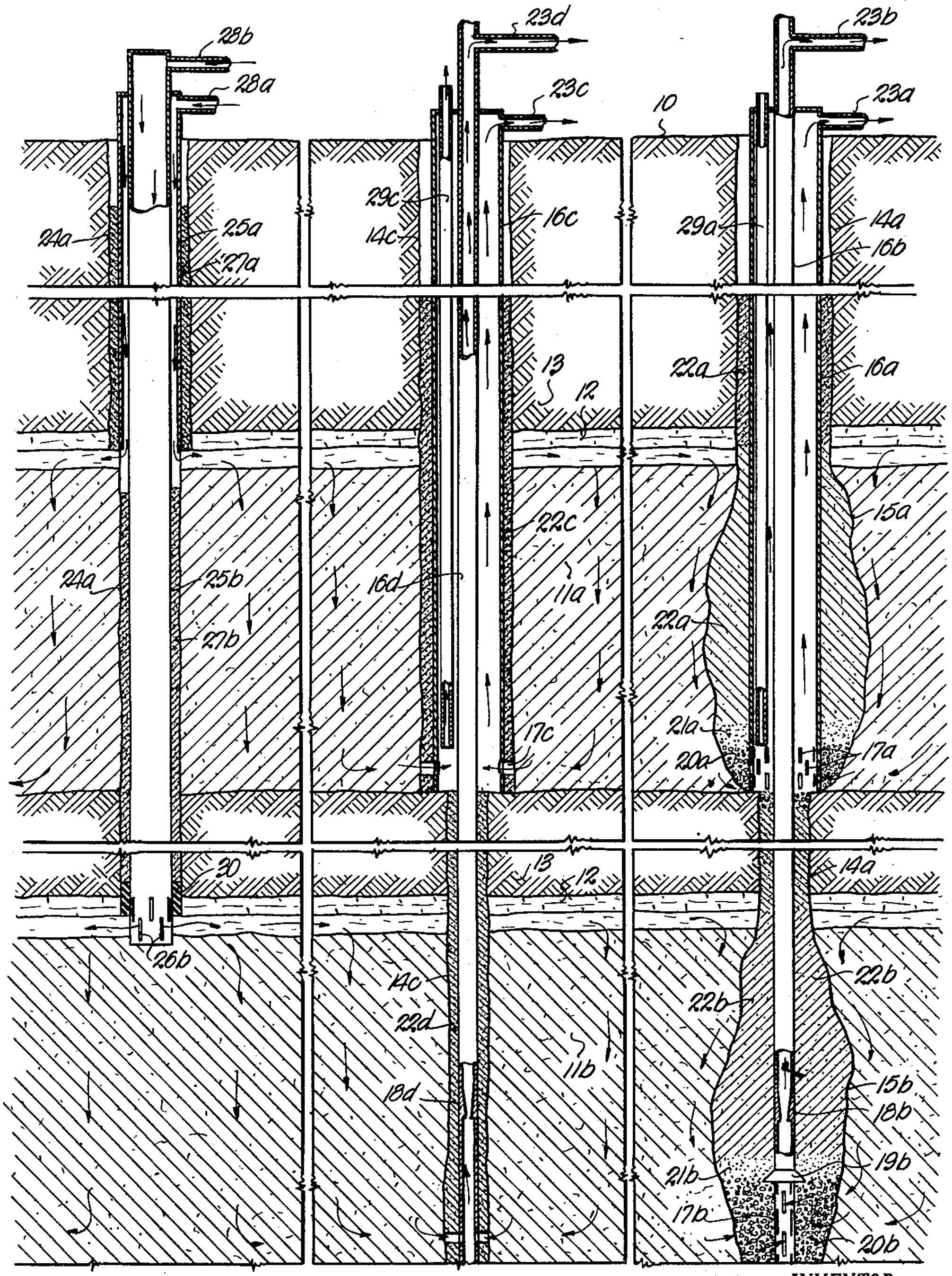

Fig. 2.

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MULTIPLE HORIZON OIL PRODUCTION METHOD

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20 Claims. (Cl. 166—10)

This invention relates to a method of producing oil wells having in a single well one or more producing horizons and refers more particularly to such a method wherein gaseous pressure is applied to the top portions of the horizons to be produced and oil is removed from the lower portions of said horizons. This method is designed to be employed either in newly drilled well locations or in secondary recovery production.

This application is a continuation-in-part of my copending application Serial No. 262,568, filed December 20, 1951, now Patent No. 2,725,106, which in turn is a continuation-in-part of my earlier application Serial No. 750,396, filed May 26, 1947, and issued on April 22, 1952, as Patent No. 2,593,497.

The present method represents an adaptation of the gas pressurization oil production techniques set forth in my previous applications to permit their employment in new wells or secondary recovery situations where the well to be produced has had its sands shot with explosives, thus forming large caverns within the sands at the bottom of the borehole and in wells where it is desired to produce more than one oil horizon in a single well.

One of the distinctive features of my oil production methods as set forth in this and my previous applications is that gaseous pressure is applied to the top portions of the oil horizons and oil is produced from the lower portions of said horizons, the oil within the horizon being driven vertically downward by the pressurization. Such gas pressurization methods are feasible and workable only when the casings of the wells employed are properly sealed throughout portions of their lengths in, as well as above and below, the horizons to be produced.

For example, if separate pressure and production wells are employed in such a method, it is necessary for the production well casing to be sealed to the borehole wall from a point above the top of the oil horizon through the horizon to the oil intake zone on the production casing. Furthermore, it is necessary to seal the casing of the pressure well to the well wall at the top of the oil horizon. If the pressure well is not so sealed, the gaseous pressurizing agent may escape into the formations above the oil horizon, and pressure thus be lost and, if the production well is not so sealed, the pressurizing agent will diffuse along the top of the oil horizon until it reaches the production well and then pass down the outside of the unsealed production casing and escape through the oil intake holes in the production casing without producing oil or serving as a pressurizing agent.

Similar considerations apply when a single well is used both for pressurization and production, but will not be detailed here as the present invention employs separate pressure and production wells.

The advantages of a successful gaseous pressurization method lie in the very high percentage of oil recovery from the sand and the minimal expense as compared with other pressurizing methods such as water drive.

A tremendous advantage of the Spearow gas pressurization methods, which involve sealing the casings of the pressure and production wells to the surrounding formations to permit no escape of pressure from the horizon except at the oil withdrawal points, is the fact that when the pressurization of the horizon has proceeded to a certain level it is possible to shut down the compressors and continue to produce oil by the agency of "sealed-in" pressures for a long-time interval without further input of pressure into the horizon. This result is greatly in contrast to a pressurization method such as water drive, wherein shutting down of the water pumps causes the production of oil, by water drive means, to cease immediately. As an example of this performance of the Spearow method, in an actual operation in Eastern Kansas the compressors to a field of over twenty wells producing under gaseous pressurization were shut off for a period of over five weeks and at the end of this time (the present writing) the wells were still flowing and pumping oil without any diminishing in volume. This is additional proof of the necessity of sealing the space between the casing and the formations and the effectiveness of that sealing.

Previously, attempts have been made to produce oil wells by introduction of gaseous pressure into the horizon and moving the oil horizontally through the sand. Attempts have also been made where the presure was introduced into the horizon above the desired oil withdrawal zone. None of these methods has proved practical because the practice of properly sealing the pressure and production casings to the earth formations within the well as delineated above was not conceived and employed.

Many wells which are desired to be produced in secondary production were perforated or shot to increase production. The result of shooting an oil horizon within a well is the formation of a relatively large shot hole cavern in the horizon surrounding the borehole of the well. This cavern poses a severe problem if it is desired to properly seal a production casing within the original borehole and practice a secondary recovery method utilizing gaseous pressurization. Similarly, under certain permeability conditions, it is often desirable to shoot the oil horizons in newly drilled wells.

Furthermore, many well locations have access to more than one oil horizon in a single borehole and it is advantageous to produce these multiple horizons from the single hole. Such a situation may occur in original or secondary production and in either the horizons may or may not have been previously shot. It is therefore highly desirable that a method of producing such wells be provided utilizing gaseous pressurization with its concomitant advantages.

Therefore, an object of the present invention is to provide a method of producing oil from more than a single horizon within a single well, by applying gaseous pressure to the top portions of the horizons, irrespective of whether the horizons have been shot previously.

Another object of the invention is to provide a method of producing wells having perforated oil horizons by applying gaseous pressure to the top portions of the horizons and withdrawing oil from the lower portions of the horizons.

Another object of the invention is to provide a method of producing oil wells by applying gaseous pressure to the top portions of the horizons and withdrawing oil from the lower portions of the horizons wherein the pressurization may be applied intermittently to the horizon with the production remaining relatively independent of the pressurization periods.

A further object is to provide a method of producing wells containing more than a single producing horizon and wells containing shot caverns in the producing horizons in which pressure is applied to the top portions of the oil horizons through pressure wells whose casings are sealed to the well wall at the cap rock of the respective horizons and in which oil is produced from production wells having casings sealed to the well wall from points above the cap rock of the producing horizons through the horizons to the oil intake holes in the production casings.

Other and further objects will appear in the course of the following description:

Fig. 1 is a cross-sectional view taken through the geologic structure of an oil field showing two wells, one of which is a pressure well, the other a production well.

Fig. 2 is a cross-sectional view taken through the geologic structure of an oil field showing three wells, one a pressure well, the others production wells.

In the description like reference numerals will be used to indicate like parts in the various views.

Referring to the drawings, Fig. 1 will be first described as it illustrates the method as performed in a single oil-producing sand.

The ground level is indicated at **10**. Oil horizon **11** has a relatively impervious cap **12** which is topped by earth formations **13**. Borehole **14** extends through oil horizon **11** and has a shot hole cavern **15**. Positioned within borehole **14** and extending to the vicinity of the bottom of horizon **11** is production casing **16** having perforations **17** near its lower end. A pumping string nipple **18** is shown inside the casing **16** and fastened to the outside of casing **16** above perforations **17** is baffle collar **19**. Surrounding casing **16** in the vicinity of the perforations **17** is placed a batch of pea gravel **20**. On top of gravel **20** is placed a layer of granular insulating material such as sand. Production casing **16** has a cement seal **22** to the well wall from a point above the top of horizon **11** to the sand layer **21**. Withdrawal pipe **23** is connected into casing **16** above ground level **10**.

At **24** in Fig. 1 is shown the borehole of a pressurization well which is drilled into the top of horizon **11**. Pressure casing **25** having perforations **26** near its lower end, extends into the top of horizon **11**. Casing **25** is likewise sealed as shown at **27** from the top of horizon **11** to any desired point above horizon **11** according to the character of the formation. Pressure input pipe **28** is connected above the surface into casing **25**.

In Fig. 2 is shown the method as applied to wells reaching multiple production horizons, illustrating an unperforated well and a well having shot caverns in the producing horizons.

Referring first to the production well at the right side of the figure where the caverns appear, ground level is again designated as **10**. The upper oil horizon **11*a*** and lower oil horizon **11*b*** have impervious caps **12** topped by earth formations **13**. Borehole **14*a*** extends through oil horizons **11*a*** and **11*b***, both of which have shot caverns **15*a*** and **15*b*** respectively. Positioned within borehole **14*a*** and extending to the vicinity of the bottom of horizon **11*a*** is primary production casing **16*a*** having perforations **17*a*** near its lower end. Surrounding casing **16*a*** in the vicinity of the perforations **17*a*** is placed a batch of pea gravel **20*a*** and above the gravel is placed a layer of sand or other insulating material **21*a***. Production casing **16*a*** is likewise sealed by a column **22*a*** of cement to the well wall from a point above the top of horizon **11*a*** to the sand layer **21*a***, the location of the top of the cement column being governed by the character of the formations above the oil sand. Withdrawal pipe **23*a*** is connected into casing **16*a*** above ground level **10**. Positioned within primary production casing **16*a*** and extending to the vicinity of the bottom of horizon **11*b*** is secondary production casing or tubing **16*b*** having perforations **17*b*** near its lower end. A pumping string nipple **18*b*** is shown inside the casing **16*b*** and fastened to the outside of casing **16*b*** above perforations **17*b*** is baffle collar **19*b***. Surrounding casing **16*b*** in the vicinity of perforations **17*b*** is placed a bed of pea gravel **20*b***. On the top of gravel **20*b*** is a layer of sand or other insulating material **21*b***. Production casing **16*b*** has a seal **22*b*** to the well wall from the top of sand layer **21*b*** to the vicinity of the bottom of casing **16*a***. Oil withdrawal pipe **23*b*** is connected to casing **16*b*** above ground level **10**. Pumping string **29*a*** is shown within the annulus between production casings **16*a*** and **16*b*** extending from the ground level to the vicinity of perforations **17*a*** in casing **16*a***.

Referring now to the production well in the center of Fig. 2 without shot caverns, borehole **14*c*** extends through oil horizons **11*a*** and **11*b***. Positioned within borehole **14*c*** and extending to the vicinity of the bottom of horizon **11*a*** is primary production casing **16*c*** having perforations **17*c*** near its lower end. Production casing **16*c*** is sealed as shown at **22*c*** to the well wall from a point above the top of horizon **11*a*** to the bottom of casing **16*c*** according to the character of the formation. Casing **16*c*** and its surrounding annular seal are perforated near the bottom of horizon **11*a***. Withdrawal pipe **23*c*** is connected to casing **16*c*** above the ground level **10**. Positioned within casing **16*c*** and extending to the vicinity of the bottom of horizon **11*b*** is secondary production casing **16*d***. Pumping string nipple **18*d*** is shown inside casing **16*d***. Secondary production casing **16*d*** has a seal **22*d*** to the well wall from a point adjacent the bottom of primary production casing **16*c*** to the bottom of secondary production casing **16*c***. Secondary production casing **16*d*** and its surrounding annular seal **22*d*** are perforated near the bottom of oil horizon **11*b***. Oil withdrawal pipe **23*d*** is connected to casing **16*d*** above ground level **10**. Positioned within the annulus between production casings **16*c*** and **16*d*** is pumping string **29*c*** extending from ground level to the vicinity of the perforations in casing **16*c*** and its surrounding annular seal.

At **24*a*** in Fig. 2 is shown the borehole of a pressurization well which is drilled through horizon **11*a*** into the top of horizon **11*b***. Pressure casing **25*a*** extends into the top of horizon **11*a*** and has a seal **27*a*** from the top of horizon **11*a*** to any desired point above horizon **11*a*** depending on the character of the formation. Pressure input pipe **28*a*** opens into casing **25*a***. Secondary pressure casing **25*b*** having perforations **26*b*** near its lower end extends into the top of horizon **11*b***. Secondary pressure casing **25*b*** has a seal **27*b*** from the top of horizon **11*b*** to a point adjacent the lower end of primary pressure casing **25*a***. Pressure input pipe **28*b*** is connected into casing **25*b***. At **30** is shown a conventional packer set on casing **24*b*** to form a bond between it and the holebore of the pressurization well.

Referring first to the operation of the method in a single oil horizon as exemplified in Fig. 1, a casing **16** perforated near its lower end is run into the borehole **14** of a well and to the vicinity of the bottom of the oil horizon **11**. The casing is then gravel packed in the vicinity of the perforations **17**. The material used is suitable granular material such as smooth and normally round, clean, pea gravel **20**. Probably the best size is gravel ¼ to ½ of an inch in diameter. This gravel acts as a suitable screen through which the oil may enter the casing from the sand body and functions as a base upon which it is possible to securely seal off the upper portions of the oil sand in the shot hole **14** through the oil sand. A layer of sand or other insulating material **21** is next placed on top of the gravel. The material best employed here is common builders' sand. This layer of sand or other similar material will sufficiently separate and insulate the gravel bed from the cement or other sealing material **22**. The borehole **14** surrounding the casing is then sealed from the top of the sand layer to a level above the top of the oil horizon. If desired, this material may extend to the vicinity of the ground level. It is very important that this cement or sealing material bond with the oil saturated wall of the oil horizon and thus prevent any marginal migration of the pressure agent or sand fluids downward between it and the oil sand once the pressure agent comes in contact as it must, with the sealed shot hole.

Gaseous pressure is then applied to the top portions of the oil horizon to cause the fluid oil to migrate downwardly within the oil horizon and flow through the perforations in the casing. To accomplish this, a pressure well **24** is drilled to the top of the oil horizon **11** as shown. A casing **25** is run in the pressure well and sealed to the earth formation from the top of the oil horizon to a point above the top of the oil horizon. If desired, this seal **27** may be extended to the vicinity of the ground level. All casing seals in both pressure and production wells must be of sufficient strength to secure whatever pressures are employed in driving the fluid and gaseous hydrocarbons downward through the sand body and must offer no means of escape for these pressures except at the points designated at the base of the oil sand. The method as above described can be employed with a plurality of production wells or a plurality of pressure and production wells. Furthermore, when desired, pumping strings may be employed within the production casings to aid in the recovery of the oil from the horizon when the pressures are not sufficient to raise the oil to ground level.

Referring now to the method as practiced in a production well of the type illustrated at the right side of Fig. 2, a primary production casing **16*a*** perforated near its lower end is run within the borehole **14*a*** of the well to the vicinity of the bottom of the upper oil horizon **11*a***. The primary production casing is then gravel packed in the vicinity of the perforations **17*a***. A layer of sand or other insulating material **21*a*** is next placed on top of the gravel **20*a***. The borehole **14*a*** surrounding the primary production casing is then sealed from the top of the sand layer to any desired level above the upper oil horizon. A secondary production casing **16*b*** perforated near its lower end is run within the primary production casing **16*a*** to the vicinity of the bottom of the lower oil horizon **11*b***. The secondary production casing is then gravel packed in the vicinity of the perforations **17*b***. A layer of sand **21*b*** is placed on top of the gravel **20*b***. The borehole **14*a*** surrounding the secondary production casing is then sealed from the top of the sand or other insulating material to a point adjacent the lower end of the primary production casing. Pressure is then applied to the upper portions of the upper and lower oil horizons to cause the oil to migrate downwardly and flow through the perforations in the respective production casings. As the method of applying pressure to the multiple horizons is similar for both embodiments of the method illustrated in Fig. 2, detailed description of the pressure well will be omitted until completion of the description of the production well illustrated in the central portion of Fig. 2.

Referring now to the production well illustrated in the central portion of Fig. 2, a primary production casing **16*c*** extending to the vicinity of the bottom of the upper oil horizon **11*a*** is sealed through the upper oil horizon from a point near its bottom to a point above its top. This seal **22*c*** may be extended to the vicinity of the ground level if desired. The primary production casing and its surrounding seal are then perforated near the bottom of the upper oil horizon. A secondary production casing **16*d*** is positioned within the primary production casing extending to the vicinity of the bottom of the next lower oil horizon **11*b***. The secondary production casing is sealed through the lower oil horizon from a point near its bottom to a point adjacent the lower end of the primary production casing. The secondary production casing and its surrounding seal **22*d*** are perforated near the bottom of the lower oil horizon. Pressure is then applied to the upper portions of the upper and lower oil horizons whereby the oil migrates downwardly and flows through the perforations in the production casings **16*c*** and **16*d***.

Pressure is applied to the upper portions of the upper and lower oil horizons through a pressure well **24*a*** drilled through the upper oil horizon and into the top of the lowest oil horizon. A primary pressure casing **25*a*** is run into the top of the upper oil horizon and sealed from the top of the upper oil horizon to any desired point above the top of the said horizon. A secondary pressure casing **25*b*** is run within the primary pressure casing into the top of the lower oil horizon and sealed from the top of the lower horizon to a point adjacent to but below the lower end of the primary pressure casing. A conventional packer **30** is ordinarily set on the secondary casing to bond between the casing and the holebore. The packer keeps a full pressure seal at the top of the lower horizon. The packer is set at this point rather than reduce the size of the hole entering the oil sand. The packer can be eliminated by seating the casing **25*b*** on the top of the horizon but the holebore **24*a*** then entering the lower oil sand would be reduced to the internal diameter of the casing. This would restrict the intake wall area for introduction of pressure and might not be feasible if the permeability factor in the oil sand is low. The considerations set forth in the description of the method as applied in Fig. 1 relating to the seals between the casings and the well walls apply with equal force in the multiple horizon application of the method. Pressure is applied to the upper portions of the upper and lower oil horizons through the primary and secondary casings and oil is withdrawn from the bottom portions of said horizons through the perforations in the primary and secondary production casings. If the formation pressure is insufficient to lift the oil to the surface, pumping strings may be inserted in the primary and secondary production casings to assist in the removal of oil from the horizons.

As noted earlier in the specification, once pressurization of a horizon has proceeded to successful production from the horizon, it is feasible to intermittently shut down the compressors and continue to produce oil by the agency of "sealed in" pressures for long time intervals. This performance is, of course, feasible only when the pressurization and production wells are sealed properly as delineated above.

If it is desired to apply the method to wells having more than two producing horizons, additional production casings may be run within the primary and secondary production casings and gravel packed or sealed to through the lower oil horizon in the same manner as described above, depending on whether or not the horizon has been shot or not. Similarly, the pressure wells may be extended to additional horizons.

A method of producing oil wells by gaseous pressure applied to the top portions of the horizons to be produced where oil is removed from the lower portions of said horizons has thus been provided applicable to wells having one or more producing horizons and also applicable to wells with either perforated or unperforated oil sands. This method is made practical by provision of techniques of sealing the well walls to the surrounding producing and the nonproducing horizons.

From the foregoing it will be seen that this invention is one well adapted to attain all of the ends and objects hereinabove set forth together with other advantages which are obvious and which are inherent to the structure.

It will be understood that certain features and subcombinations are of utility and may be employed without reference to other features and subcombinations. This is contemplated by and is within the scope of the claims.

As many possible embodiments may be made of the invention without departing from the scope thereof, it is to be understood that all matter herein set forth or shown in the accompanying drawings is to be interpreted as illustrative and not in a limiting sense.

Having thus described my invention, I claim:

1. A method of producing an oil well having a plurality of producing horizons comprising the steps of positioning and sealing a primary production casing to the upper oil horizon to be produced from a level near the bottom of said upper oil horizon to a level above the top of said upper oil horizon, perforating the primary production casing and its surrounding seal near the bottom of said upper oil horizon, positioning a secondary production casing within the primary production casing and sealing it to the next lower oil horizon to be produced from a level near the bottom of said next lower horizon to a level adjacent the lower end of the primary production casing, perforating the secondary production casing and its surrounding seal near the bottom of the next lower oil horizon to be produced, and applying fluid under pressure to the upper portions of the oil horizons desired to be produced whereby the oil within said horizons is caused to migrate downwardly and flow through the perforations in the respective production casings.

2. A method as in claim 1 applied in a plurality of production wells.

3. A method as in claim 1 wherein oil is pumped from the production casings.

4. A method as in claim 1 wherein the pressure is applied intermittently to the upper portions of the horizons.

5. A method of producing an oil well having a plurality of producing horizons comprising the steps of positioning and sealing a primary production casing to the upper oil horizon to be produced from a level near the bottom of said upper oil horizon to a level above the top of said upper oil horizon, perforating the primary production casing and its surrounding seal near the bottom of said upper oil horizon, positioning a secondary production casing within the primary production casing and sealing it to the next lower oil horizon to be produced from a level near the bottom of said next lower horizon to a level adjacent the lower end of the primary production casing, perforating the secondary production casing and its surrounding seal near the bottom of the next lower oil horizon to be produced, drilling a pressure well into the top of the lowest oil horizon desired to be produced, running primary pressure casing into the top of said upper oil horizon to be produced, sealing said primary pressure casing from the top of said upper oil horizon to a level above the top of said upper oil horizon, running a secondary pressure casing within the primary pressure casing into the top of the next lowest oil horizon to be produced, sealing said secondary pressure casing from the top of said next lower oil horizon to a level adjacent to but below the lower end of the primary pressure casing, applying fluid under pressure to the upper portions of the oil horizons to be produced through said pressure casings whereby the oil within said horizons is caused to migrate downwardly and flow through the perforations in the respective production casings and recovering the oil from said production casings.

6. A method as in claim 5 applied in a plurality of pressure and production wells.

7. A method of producing an oil well with a shot cavern in the horizon portion of the borehole comprising the steps of running a casing perforated near its lower end into the borehole of the well and to the vicinity of the bottom of the oil horizon to be produced, gravel packing the casing in the vicinity of the perforations, placing a layer of fine, granular material on top of the gravel, said fine granular material being of finer texture and lesser diameter than said gravel, sealing the borehole surrounding the casing from the top of the fine, granular layer to a level above the top of the oil horizon, and applying fluid under pressure to the top portion of the oil horizon to cause the oil to migrate downwardly and flow through the perforations in the casing.

8. A method as in claim 7 applied in a plurality of production wells.

9. A method as in claim 7 wherein oil is pumped from the production casing.

10. A method as in claim 7 wherein the pressure is applied intermittently to the upper portions of the horizons.

11. A method of producing an oil well with a shot cavern in the horizon portion of the borehole comprising the steps of running a production casing perforated near its lower end into the borehole of the well and to the vicinity of the bottom of the oil horizon to be produced, gravel packing the production casing in the vicinity of the perforations, placing a layer of fine, granular material on top of the gravel, said fine, granular material being of finer texture and lesser diameter than said gravel, sealing the borehole surrounding the production casing from the top of the fine, granular layer to a level above the top of the oil horizon, drilling a pressurization well to the top of the oil horizon to be produced, running a casing in said pressurization well and sealing it to the earth formations from the top of the oil horizon to be produced to a point above the top of said oil horizon, applying fluid under pressure to the upper portion of said oil horizon through the pressurization well whereby the oil migrates downwardly and flows through perforations in the production casing.

12. A method as in claim 11 applied in a plurality of pressurization and production wells.

13. A method of producing an oil well having multiple oil horizons within the well and shot caverns in the horizons comprising the steps of running a primary production casing perforated near its lower end within the borehole of the well to the vicinity of the bottom of the upper oil horizon, gravel packing the primary production casing in the vicinity of the perforations, placing a layer of fine, granular material on top of the gravel, said fine, granular material having a finer texture and lesser diameter than said gravel, sealing the borehole surrounding the primary production casing from the top of the fine, granular layer to a level above the upper oil horizon to be produced, then running a secondary production casing perforated near its lower end within said primary production casing to the vicinity of the bottom of the lower oil horizon to be produced, gravel packing the secondary production casing in the vicinity of the perforations, placing a layer of fine, granular material on top of the gravel similar to that relative the first production casing, sealing the borehole surrounding the secondary production casing from the top of the fine, granular layer to a point adjacent the lower end of the primary production casing, and applying fluid under pressure to the upper portions of the upper and lower oil horizons to be produced to cause the oil to migrate downwardly and flow through the perforations in the respective production casings.

14. A method as in claim 13 applied in a plurality of production wells.

15. A method as in claim 13 wherein oil is pumped from the production casings.

16. A method as in claim 13 wherein the pressure is applied intermittently to the upper portions of the horizons.

17. A method of reconditioning and producing an oil well having multiple oil horizons within the well and shot caverns within the horizons comprising the steps of running a primary production casing perforated near its lower end within the borehole of the well to the vicinity of the bottom of the upper oil horizon to be produced, gravel packing the primary production casing in the vicinity of the perforations, placing a layer of fine, granular material on top of the gravel, said fine, granular material having a finer texture and lesser diameter than the gravel, sealing the borehole surrounding the primary production casing from the top of the fine, granular layer to a level above the top of said upper oil horizon, running a second-

ary production casing perforated near its lower end within the primary production casing to the vicinity of the bottom of the lower oil horizon to be produced, gravel packing the secondary production casing in the vicinity of the perforations, placing a layer of fine, granular material on top of the gravel, said fine, granular material of the same character as that positioned relative the primary production casing, sealing the borehole surrounding the secondary production casing from the top of the fine, granular layer to a point adjacent the lower end of the primary production casing, drilling a pressurization well into the top of said lower oil horizon, running a primary pressurization casing into the top of said upper oil horizon, sealing said primary casing from the top of said upper oil horizon to a point above the top of said upper oil horizon, running a secondary pressurization casing into the top of said lower oil horizon, sealing said secondary pressurization casing from the top of said lower oil horizon to a point adjacent to but below the lower end of the primary pressurization casing, applying fluid under pressure through the primary and secondary pressurization casings to the tops of said upper and lower oil horizons, accumulating and producing oil from the production wells.

18. A method as in claim 17 applied in a plurality of pressurization and production wells.

19. A method of producing an oil well having a plurality of producing horizons comprising the steps of positioning and sealing a primary production casing within the well bore opposite the upper oil horizon to be produced from a level near the bottom of said upper oil horizon to a level above the top of said upper oil horizon, said primary casing having an inlet opening adjacent the lower end thereof thereby providing fluid communication from the lower portion of said upper oil horizon into the lower part of the primary production casing, then positioning and sealing a secondary production casing positioned within the primary production casing to the next lower oil horizon to be produced from a level near the bottom of said next lower horizon to a level adjacent the lower end of the primary production casing, said secondary casing having an inlet opening adjacent its lower end thereof thereby providing access from the lower portion of the lower oil horizon into the lower part of the secondary production casing and applying pressure to the upper portions of the oil horizons desired to be produced whereby the oil within said horizons is caused to migrate downwardly and flow into the respective production casings.

20. A method as in claim 19 wherein the pressure is applied intermittently to the upper portions of the horizons.

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