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PTO/SB/21 (09-04)
Approved for use through 07/31/2006. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

TRANSMITTAL FORM

(to be used for all correspondence after initial filing)

Total Number of Pages in This Submission

Application Number	10/867,528
Filing Date	06/14/2004
First Named Inventor	THOMAS B. SMITH
Art Unit	
Examiner Name	
Attorney Docket Number	200302USA

ENCLOSURES *(Check all that apply)*

- [x] Fee Transmittal Form
  - [x] Fee Attached
- [ ] Amendment/Reply
  - [ ] After Final
  - [ ] Affidavits/declaration(s)
- [ ] Extension of Time Request
- [ ] Express Abandonment Request
- [ ] Information Disclosure Statement
- [ ] Certified Copy of Priority Document(s)
- [ ] Reply to Missing Parts/ Incomplete Application
  - [ ] Reply to Missing Parts under 37 CFR 1.52 or 1.53
- [ ] Drawing(s)
- [ ] Licensing-related Papers
- [x] Petition
- [ ] Petition to Convert to a Provisional Application
- [ ] Power of Attorney, Revocation Change of Correspondence Address
- [ ] Terminal Disclaimer
- [ ] Request for Refund
- [ ] CD, Number of CD(s) _____
  - [ ] Landscape Table on CD
- [ ] After Allowance Communication to TC
- [ ] Appeal Communication to Board of Appeals and Interferences
- [ ] Appeal Communication to TC **(Appeal Notice, Brief, Reply Brief)**
- [ ] Proprietary Information
- [ ] Status Letter
- [x] Other Enclosure(s) (please Identify below):

Combined Declaration & Power of Attorney; Consent to File Application Under 37 CFR 1.47(a); Statement Accompanying Petition Under 37 CFR 1.47(a);

Remarks

SIGNATURE OF APPLICANT, ATTORNEY, OR AGENT

Firm Name	THE LAW OFFICE OF STEPHEN A. GRATTON		
Signature			
Printed name	Stephen A. Gratton		
Date	10/6/2004	Reg. No.	28,418

CERTIFICATE OF TRANSMISSION/MAILING

I hereby certify that this correspondence is being facsimile transmitted to the USPTO or deposited with the United States Postal Service with sufficient postage as first class mail in an envelope addressed to: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450 on the date shown below:

Signature			
Typed or printed name	Stephen A. Gratton	Date	10/6/2004

This collection of information is required by 37 CFR 1.5. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and1.14. This collection is estimated to 2 hours to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

PTO/SB/17 (10-03)
Approved for use through 07/31/2006. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

FEE TRANSMITTAL for FY 2004

Effective 10/01/2003. Patent fees are subject to annual revision.

☐ Applicant claims small entity status. See 37 CFR 1.27

TOTAL AMOUNT OF PAYMENT ($) 130.00

Complete if Known	
Application Number	10/867,528
Filing Date	06/14/2004
First Named Inventor	THOMAS B. SMITH
Examiner Name	
Art Unit	
Attorney Docket No.	200302USA

METHOD OF PAYMENT *(check all that apply)*

☒ Check ☐ Credit card ☐ Money Order ☐ Other ☐ None

☒ Deposit Account:

Deposit Account Number: 07-1857

Deposit Account Name: Stephen A. Gratton

The Director is authorized to: *(check all that apply)*

☐ Charge fee(s) indicated below ☒ Credit any overpayments

☒ Charge any additional fee(s) or any underpayment of fee(s)

☐ Charge fee(s) indicated below, **except for the filing fee** to the above-identified deposit account.

FEE CALCULATION

1. BASIC FILING FEE

Large Entity Fee Code	Large Entity Fee ($)	Small Entity Fee Code	Small Entity Fee ($)	Fee Description	Fee Paid
1001	770	2001	385	Utility filing fee	
1002	340	2002	170	Design filing fee	
1003	530	2003	265	Plant filing fee	
1004	770	2004	385	Reissue filing fee	
1005	160	2005	80	Provisional filing fee	

SUBTOTAL (1) ($)

2. EXTRA CLAIM FEES FOR UTILITY AND REISSUE

		Extra Claims		Fee from below	Fee Paid
Total Claims		-20** =		X	=
Independent Claims		- 3** =		X	=
Multiple Dependent					=

Large Entity Fee Code	Large Entity Fee ($)	Small Entity Fee Code	Small Entity Fee ($)	Fee Description
1202	18	2202	9	Claims in excess of 20
1201	86	2201	43	Independent claims in excess of 3
1203	290	2203	145	Multiple dependent claim, if not paid
1204	86	2204	43	** Reissue independent claims over original patent
1205	18	2205	9	** Reissue claims in excess of 20 and over original patent

SUBTOTAL (2) ($)

**or number previously paid, if greater; For Reissues, see above

FEE CALCULATION (continued)

3. ADDITIONAL FEES

Large Entity Fee Code	Large Entity Fee ($)	Small Entity Fee Code	Small Entity Fee ($)	Fee Description	Fee Paid
1051	130	2051	65	Surcharge - late filing fee or oath	
1052	50	2052	25	Surcharge - late provisional filing fee or cover sheet	
1053	130	1053	130	Non-English specification	
1812	2,520	1812	2,520	For filing a request for *ex parte* reexamination	
1804	920*	1804	920*	Requesting publication of SIR prior to Examiner action	
1805	1,840*	1805	1,840*	Requesting publication of SIR after Examiner action	
1251	110	2251	55	Extension for reply within first month	
1252	420	2252	210	Extension for reply within second month	
1253	950	2253	475	Extension for reply within third month	
1254	1,480	2254	740	Extension for reply within fourth month	
1255	2,010	2255	1,005	Extension for reply within fifth month	
1401	330	2401	165	Notice of Appeal	
1402	330	2402	165	Filing a brief in support of an appeal	
1403	290	2403	145	Request for oral hearing	
1451	1,510	1451	1,510	Petition to institute a public use proceeding	
1452	110	2452	55	Petition to revive - unavoidable	
1453	1,330	2453	665	Petition to revive - unintentional	
1501	1,330	2501	665	Utility issue fee (or reissue)	
1502	480	2502	240	Design issue fee	
1503	640	2503	320	Plant issue fee	
1460	130	1460	130	Petitions to the Commissioner	130
1807	50	1807	50	Processing fee under 37 CFR 1.17(q)	
1806	180	1806	180	Submission of Information Disclosure Stmt	
8021	40	8021	40	Recording each patent assignment per property (times number of properties)	
1809	770	2809	385	Filing a submission after final rejection (37 CFR 1.129(a))	
1810	770	2810	385	For each additional invention to be examined (37 CFR 1.129(b))	
1801	770	2801	385	Request for Continued Examination (RCE)	
1802	900	1802	900	Request for expedited examination of a design application	

Other fee (specify) _____

*Reduced by Basic Filing Fee Paid

SUBTOTAL (3) ($) 130

SUBMITTED BY

Name (Print/Type)	Stephen A. Gratton	Registration No. (Attorney/Agent)	28,418	Telephone	303 989 6353
Signature				Date	10/6/2004

(Complete *(if applicable)*)

WARNING: Information on this form may become public. Credit card information should not be included on this form. Provide credit card information and authorization on PTO-2038.

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of:

THOMAS B. SMITH
YALE M. PRESTON

Serial No. 10/867,528

Filing Date: 06/14/2004

For: METHOD AND SYSTEM FOR PRODUCING GAS AND LIQUID IN A SUBTERRANEAN WELL

Attorney Docket No.: 200302USA

PETITION UNDER 37 CFR 1.47(a)

October 6, 2004

Office of Petitions
Mail Stop Petition
Commissioner For Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

Applicant requests that the above application be accorded status under 37 CFR 1.47(a) due to the refusal of inventor Yale M. Smith to execute the application papers. As support for this request attached to this Petition are the following documents.

1. Consent of inventor Thomas B. Smith to prosecute the application under 37 CFR 1.47(a).

2. Combined Declaration and Power of Attorney for Patent Application signed by inventor Thomas B. Smith on behalf of himself and on behalf of nonsigning inventor Yale M. Preston.

3. Statement of Stephen A. Gratton, Attorney for Applicant, offered as proof that the nonsigning inventor received the application papers, and refused to sign the Combined Declaration and Power of Attorney for Patent Application included therewith.

4. The last known address of the nonsigning inventor is:

Yale M. Preston
PO Box 383
Story, WY 82842

5. A check in the amount of $130 as the petition fee. Please deduct any additional fees or credit any overpayment to Deposit Account No. 07-1857.

DATED this 6th day of October, 2004.

Respectfully submitted:

STEPHEN A. GRATTON, No. 28,418
Attorney for Applicant

2764 S. Braun Way
Lakewood, CO 80228
Telephone: (303) 989-6353
FAX (303) 989-6538

CERTIFICATE OF MAILING UNDER 37 C.F.R. §1.8

I hereby certify that this correspondence is being deposited with the United States Postal Service with sufficient postage as First Class mail in an envelope addressed to: Mail Stop Petition, Commissioner For Patents, PO BOX 1450, Alexandria, VA 22313-1450 on this 6th day of October, 2004.

October 6, 2004
Date of Signature

Stephen A. Gratton, Attorney for Applicant

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of:

THOMAS B. SMITH
YALE M. PRESTON

Serial No. 10/867,528

Filing Date: 06/14/2004

For: METHOD AND SYSTEM FOR PRODUCING GAS AND LIQUID IN A SUBTERRANEAN WELL

Attorney Docket No.: 200302USA

CONSENT TO FILE APPLICATION UNDER 37 CFR 1.47(a)

Office of Petitions
Mail Stop Petition
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

Inventor, Thomas B. Smith, hereby consents to the filing of the above application under 37 CFR 1.47(a) on behalf of himself, and on behalf of inventor Yale M. Preston who has refused to sign the application papers.

Thomas B. Smith

Thomas B. Smith
7934 S. Gaylord Ct.
Centennial, CO 80122

10-4-04

Date of Signature

Attorney Docket No. 200302USA

Combined Declaration and Power of Attorney for Patent Application

As a below named inventor, I hereby declare that:

Our residence, post office address and citizenship are as stated below next to my name.

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which patent is sought on the invention entitled:

METHOD AND SYSTEM FOR PRODUCING GAS AND LIQUID IN A SUBTERRANEAN WELL

the specification of which (check one)

[ ] is attached hereto.

[x] was filed on June 14, 2004 as Application Serial No. 10/867,528 and was amended on (if applicable) _____.

I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose information which is material to the examination of this application in accordance with Title 37, Code of Federal Regulations, Sec. 1.56(a).

As a named inventor, I hereby appoint the following attorney(s) and/or agents(s) to prosecute this application and transact all business in the Patent and Trademark Office connected therewith

Jack E. Ebel, Reg. No. 28,148
Stephen A. Gratton, Reg. No. 28,418

Address all correspondence to:

Jack E. Ebel
THE LAW OFFICE OF JACK E. EBEL
11735 Applewood Knolls Drive
Lakewood, Colorado 80215
Telephone number (303) 239-9883

Inventor, Thomas B. Smith, makes the above statements on behalf of himself and on behalf of inventor, Yale M. Preston, who has refused to join in the application.

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and such willful false statements may jeopardize the validity of the application or any patent issued thereon.

INVENTOR'S FULL NAME:	**THOMAS B. SMITH**
INVENTOR'S SIGNATURE:	Thomas B Smith
DATE OF SIGNATURE:	10-4-04
RESIDENCE (CITY AND PROVIDENCE):	Centennial, CO
CITIZENSHIP (COUNTRY):	US
POST OFFICE ADDRESS:	7934 S. Gaylord Ct. Centennial, CO 801222

INVENTOR'S FULL NAME:	**YALE M. PRESTON**
RESIDENCE (CITY AND PROVIDENCE):	Story, WY
CITIZENSHIP (COUNTRY):	US
POST OFFICE ADDRESS:	PO Box 383 Story, WY 82842

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of:

THOMAS B. SMITH
YALE M. PRESTON

Serial No. 10/867,528

Filing Date: 06/14/2004

For: METHOD AND SYSTEM FOR PRODUCING GAS AND LIQUID IN A SUBTERRANEAN WELL

Attorney Docket No.: 200302USA

STATEMENT
ACCOMPANYING PETITION UNDER 37 CFR 1.47(A)

October 6, 2004

Office of Petitions
Mail Stop Petition
Commissioner For Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

This Statement is offered as proof that nonsigning inventor Yale M. Preston has received a copy of the application papers in the above case, and has refused to sign the Combined Declaration and Power of Attorney for Patent Application and Assignment included therewith.

Stephen A. Gratton, Attorney for Applicant, hereby states as follows:

1. On June 12, 2004 a letter dated June 12, 2004 was sent with application papers for the above patent

application to Yale M. Preston at his last known address: PO Box 383, Story, WY 82842.

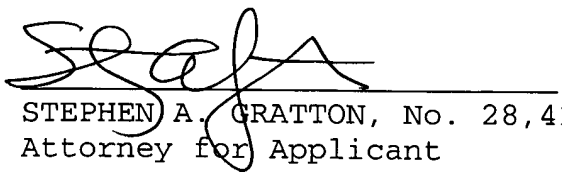
2. Attached to this Statement are copies of the letter and the application papers which included: patent specification (pages 1-17), claims (1-66/pages 18-27), drawings (14 sheets/Figures 1-1E, 2A-2B, 3A-3C, 4A-4C, 5-7), Combined Declaration and Power of Attorney for Patent Application, Assignment, and Employee Agreement.

3. Attached to this Statement is a copy of a Return Receipt Postcard signed Yale M. Preston indicating receipt of the above letter and application papers on June 15, 2004.

4. On September 17, 2004, Stephen A. Gratton contacted Yale M. Preston by phone at phone number (307) 683-3340. During the phone conversation, Yale M. Preston stated to Stephen A. Gratton that he had received the above letter and application papers, but refused to sign and return the Combined Declaration and Power of Attorney, and the Assignment.

DATED this 6th day of October, 2004.

Respectfully submitted:



STEPHEN A. GRATTON, No. 28,418
Attorney for Applicant

2764 S. Braun Way
Lakewood, CO 80228
Telephone: (303) 989-6353
FAX (303) 989-6538

CERTIFICATE OF MAILING UNDER 37 C.F.R. §1.8

I hereby certify that this correspondence is being deposited with the United States Postal Service with sufficient postage as First Class mail in an envelope addressed to: Mail Stop Petition, Commissioner For Patents, PO BOX 1450, Alexandria, VA 22313-1450 on this 6th day of October, 2004.

October 6, 2004
Date of Signature

Stephen A. Gratton, Attorney for Applicant

SENDER: *COMPLETE THIS SECTION*

- Complete items 1, 2, and 3. Also complete item 4 if Restricted Delivery is desired.
- Print your name and address on the reverse so that we can return the card to you.
- Attach this card to the back of the mailpiece, or on the front if space permits.

1. Article Addressed to:

Yale Preston
PO Box 383
Story WY 82842

COMPLETE THIS SECTION ON DELIVERY

A. Signature
X [signature] ☐ Agent ☐ Addressee

B. Received by (Printed Name) Yale Preston C. Date of Delivery JUN 15 2004

D. Is delivery address different from item 1? ☐ Yes
If YES, enter delivery address below: ☐ No

3. Service Type
☐ Certified Mail ☐ Express Mail
☐ Registered ☐ Return Receipt for Merchandise
☐ Insured Mail ☐ C.O.D.

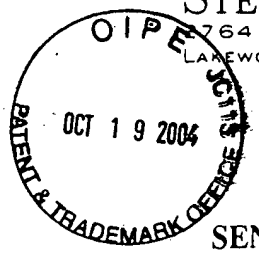
4. Restricted Delivery? (Extra Fee) ☐ Yes

2. Article Number (Transfer from service label) 7609 3220 0005 2783 5589

PS Form 3811, August 2001 Domestic Return Receipt 102595-02-M-1540

THE LAW OFFICE OF
STEPHEN A. GRATTON
7764 SOUTH BRAUN WAY
LAKEWOOD, CO 80228

TELEPHONE: (303) 989-6353
FAX: (303) 989-6538



SENT VIA CERTIFIED MAIL

June 12, 2004

Yale M. Preston
PO BOX 383
Story, WY 82842

Re: Marathon Oil Company
Docket No. 200302 USA
Patent Application entitled "Method And System For Producing Gas And Liquid In A Subterranean Well"

Dear Yale:

I have been retained, along with Jack Ebel, by Marathon Oil Company to prosecute a US patent application entitled "Method And System For Producing Gas And Liquid In A Subterranean Well". Enclosed are copies of the patent specification (pages 1-17), claims (claims 1-66/pages 18-27) and drawings (14 sheets/Figures 1-1E, 2A-2B, 3A-3C, 4A-4C, 5-7) for the patent application.

This application is based on Marathon Oil Company "Invention Disclosure No. 200302", which identifies yourself and Thomas B. Smith as co-inventors. Thomas B. Smith has reviewed and approved the application. Please review the specification, claims and drawings. If everything is correctly stated please sign the enclosed documents entitled "Combined Declaration and Power of Attorney for Patent Application" and "Assignment". Please note that the "Assignment" must also be notarized. The signed documents can be returned to me in the enclosed FEDEX envelope.

As you are aware, this invention was conceived and disclosed using the resources of Marathon Oil Company, and during your tenure as an employee of a Marathon Oil Company. Enclosed for your reference is a copy of your "Employee Agreement" with Marathon Oil Company. Please note that pursuant to paragraph 3 of the "Employee

Agreement", you agreed to execute documents necessary to effectuate assignment of the application to Marathon Oil Company.

Feel free to call if you have questions, or would like to discuss this matter further. Thank you in advance for your cooperation.

Very truly yours:

Steve

Stephen A. Gratton

SAG/rg
Enclosures

cc. Jack Ebel without enclosures

MARATHON OIL COMPANY AND SUBSIDIARIES
EMPLOYEE AGREEMENT

Employee Name: Yale M. Preston Soc. Sec. No.: 516 88 6748
Address: 13 Airport Employee No.: 1144536
City, State: Buffalo, WY Zip Code: 82834

EMPLOYEE and MARATHON agree as follows:

1. **Definitions.**
   (a) "MARATHON GROUP" means Marathon Oil Company, and its present or future majority owned subsidiaries.
   (b) "MARATHON" means that company in the MARATHON GROUP by whom the EMPLOYEE is employed from time to time. After EMPLOYEE is no longer employed by any company in the MARATHON GROUP, "MARATHON" means the company in the MARATHON GROUP which was the last employer of the EMPLOYEE.
   (c) "Confidential Information" means any information EMPLOYEE generates or obtains during employment that is not generally available to the public (whether constituting a trade secret or not) and which relates to the present or reasonably anticipated business of the MARATHON GROUP.
   (d) "Intellectual Property" means all inventions, discoveries, developments, writings, computer programs and related documentation, designs, ideas, and any other work product made or conceived by EMPLOYEE during the term of employment with MARATHON which (1) relate to the present or reasonably anticipated business of the MARATHON GROUP, or (2) were made or created with the use of Confidential Information or any equipment, supplies or facilities of the MARATHON GROUP. Such property made or conceived by EMPLOYEE (or for which EMPLOYEE files a patent or copyright application) within one year after termination of employment with MARATHON will be presumed to have been made or conceived during such employment.
2. **Non-Disclosure of Confidential Information.** Except in the discharge of EMPLOYEE's duties to MARATHON, EMPLOYEE will not disclose or use any Confidential Information without the express written permission of MARATHON.
3. **Disclosure and Assignment of Intellectual Property.** EMPLOYEE agrees to promptly disclose to MARATHON and does hereby assign to MARATHON all Intellectual Property, and EMPLOYEE agrees to execute such other documents as MARATHON may request in order to effectuate such assignment.
4. **Previous Inventions and Writings.** Below is a list and brief description of all of EMPLOYEE's unpatented inventions and unpublished writings. MARATHON agrees that such inventions and writings are NOT Intellectual Property and are NOT the property of MARATHON hereunder. If no listing is made, EMPLOYEE has no such inventions or properties.
   CH4 resonating Manifold. -
5. **Confidential Information of Third Parties.** EMPLOYEE understands that any confidential information of third parties acquired prior to employment by MARATHON remains the property of such third parties, and EMPLOYEE agrees to maintain such information in confidence, not to disclose it to MARATHON and not to use it in EMPLOYEE's employment with MARATHON.
   Except in the discharge of EMPLOYEE's duties to MARATHON, EMPLOYEE will not disclose or use any confidential information of parties doing business with MARATHON obtained by EMPLOYEE during employment with MARATHON.
6. **MARATHON Documents In Possession of EMPLOYEE.** All MARATHON documents containing Intellectual Property or Confidential Information will remain the property of MARATHON. EMPLOYEE agrees to return such documents, together with all copies, to MARATHON upon termination of employment or upon request by MARATHON.
7. **Ownership of Writings Prepared By EMPLOYEE.** Writings prepared by EMPLOYEE which relate to the present or reasonably anticipated business of the MARATHON GROUP shall be deemed "works made for hire" and shall be the property of MARATHON. EMPLOYEE shall hold such writings in confidence unless MARATHON authorizes publication.
8. **Notice to MARATHON of New Employment.** Upon termination of employment, EMPLOYEE will inform MARATHON in writing of the name and address of any new employer and the general nature of the employment, if known.
9. **General Provisions.**
   (a) This Agreement constitutes the entire agreement between MARATHON and EMPLOYEE with respect to the subject matter hereof and it does not provide or imply the duration or other terms of employment.
   (b) This Agreement shall be governed and construed in accordance with Ohio law.
   (c) Any portion of this Agreement which is finally determined to be invalid by law shall be severed from the Agreement and shall have no effect on the other provisions.

MARATHON
By Brenda L Williams
Date 4/5/01

EMPLOYEE
By
Date 4/5/01

Assignment

Whereas, I, YALE M. PRESTON of BUFFALO WY, have co-invented certain improvements in:

METHOD AND SYSTEM FOR PRODUCING GAS AND LIQUID IN A SUBTERRANEAN WELL

(Attorney Docket Number 200302USA) and executed a United States patent application therefore which is being filed concurrently herewith in the United States Patent and Trademark Office; and

Whereas, MARATHON OIL COMPANY, a corporation of Ohio, having a place of business at 5555 San Felipe, Houston, Texas, desires to acquire the entire right, title, and interest in the said application and invention, and to any United States and foreign patents to be obtained therefore;

Now therefore, for Ten United States Dollars ($10) and other valuable considerations, receipt whereof is hereby acknowledged, I, YALE M. PRESTON hereby sell, assign, and transfer to the aforesaid MARATHON OIL COMPANY, its successors and assigns, the entire right, title, and interest in the inventions contained in said application in the United States and foreign countries, and I request the Commissioner of Patents to issue any Letters Patent granted upon the inventions set forth in said applications to the said corporation, its successors and assigns; and I hereby agree that said corporation may apply for foreign Letters Patent on said invention and I will execute all papers necessary in connection with the United States and foreign applications when called upon to do so by the said corporation.

Signed and sealed at _____, on _____ , 2004;

_____
Yale M. Preston

State of Colorado)
County of _____)

On this _____day of_____, 2004, before me personally came Yale M. Preston to me personally known, and know to me to be the person described in and who executed the foregoing assignment, and he acknowledged to me that he executed the same as his free act and deed.

_____
Notary Public

(SEAL)

My commission expires_____

Combined Declaration and Power of Attorney for Patent Application

As a below named inventor, I hereby declare that:

Our residence, post office address and citizenship are as stated below next to my name.

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which patent is sought on the invention entitled:

METHOD AND SYSTEM FOR PRODUCING GAS AND LIQUID IN A SUBTERRANEAN WELL

the specification of which (check one)

[x] is attached hereto.

[ ] was filed on _____ as Application Serial No. _____ and was amended on (if applicable) _____.

I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose information which is material to the examination of this application in accordance with Title 37, Code of Federal Regulations, Sec. 1.56(a).

As a named inventor, I hereby appoint the following attorney(s) and/or agents(s) to prosecute this application and transact all business in the Patent and Trademark Office connected therewith

Jack E. Ebel, Reg. No. 28,148
Stephen A. Gratton, Reg. No. 28,418

Address all correspondence to:

Jack E. Ebel
THE LAW OFFICE OF JACK E. EBEL
11735 Applewood Knolls Drive
Lakewood, Colorado 80215
Telephone number (303) 239-9883

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and such willful false statements may jeopardize the validity of the application or any patent issued thereon.

INVENTOR'S FULL NAME:	**THOMAS B. SMITH**
INVENTOR'S SIGNATURE:	_____
DATE OF SIGNATURE:	_____
RESIDENCE (CITY AND PROVIDENCE):	Centennial, CO
CITIZENSHIP (COUNTRY):	US
POST OFFICE ADDRESS:	7934 S. Gaylord Ct. Centennial, CO 801222

INVENTOR'S FULL NAME:	**YALE M. PRESTON**
INVENTOR'S SIGNATURE:	_____
DATE OF SIGNATURE:	_____
RESIDENCE (CITY AND PROVIDENCE):	Buffalo, WY
CITIZENSHIP (COUNTRY):	US
POST OFFICE ADDRESS:	611 Sourdough Street Buffalo, WY 82834-2531

CERTIFICATE OF MAILING BY "EXPRESS MAIL"

Express Mail No.
Date of Deposit:

I hereby certify that this paper or fee is being deposited with the United States Postal Service "Express Mail Post Office to Address" Service under 37 CFR 1.10 on the date indicated above and is addressed to the Mail Stop Patent Application, Assistant Commissioner of Patents, PO Box 1450, Alexandria, VA 22313-1450.

_____ _____

Date of Signature Jack E. Ebel, Attorney of Record

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

APPLICATION FOR LETTERS PATENT

METHOD AND SYSTEM FOR PRODUCING GAS AND LIQUID IN A SUBTERRANEAN WELL

INVENTORS

THOMAS B. SMITH
YALE M. PRESTON

ATTORNEY'S DOCKET NO. 200302 USA

Jack E. Ebel
THE LAW OFFICE OF JACK E. EBEL
11735 Applewood Knolls Drive
Lakewood, CO 80215
(303) 239 9883

Field of the Invention

This invention relates generally to subterranean wells, and more particularly to a method and system for producing gas and liquid in a subterranean well.

Background of the Invention

Subterranean wells are used to produce various gases and liquids. For example, a subterranean well can be used to produce methane gas and liquid water from a coal seam. This type of subterranean well can include a well bore from the surface to the coal seam, a well casing cemented to the well bore, and a metal tubular within the well casing. The well can also include a submerged pump located within an under reamed cavity in the coal seam. During production from the well, water is pumped from the cavity, and through the tubular, to water production equipment at the surface. In addition, gas flows from the coal seam into the cavity, and through the annulus between the tubular and the well casing, to gas production equipment at the surface.

The methane gas can cause various problems with the submerged pump during production from the well. For example, the pump can experience vapor lock due to excessive gas flow through the pump. This vapor lock can create inefficient pump operation, and excessive duty time for the pump motor. In addition, motor cycling and gas moving through the pump can cause excessive motor heating, and premature failure of the pump and/or motor. Production of gas through the tubular is also a problem, as this gas is entrained with the water, rather than being produced to the gas production equipment at the surface.

One prior art approach to gas flow through the pump is the use of gas shrouds on the pump, which prevent gas from entering the pump inlet. US Patent No. 6,361,272 B1 to Bassett entitled "Centrifugal Submersible Pump", discloses a submersible pump having this type of gas shroud. However, gas shrouds are not always effective in coal bed methane wells, or other pumping installations, which require the pump to be landed within the cavity in the coal seam, or above a producing zone of the well. In addition, gas can be driven downward and into the pump in a u-tubing manner, as heads of water fall back down the annulus, after

they can no longer be lifted toward the surface by gas flowing up the annulus.

The liquid water can also cause various problems during production from the well. For example, water and/or wet gas flowing in the annulus of the well can enter the gas production equipment at the surface. This water can cause excess flowline pressures, lines filling with water, and metering errors in the gas production equipment. Water in the annulus, and water heads moving up and down the annulus, can also create harmful fluid column effects, such as unsteady production of water and/or gas from the well, due to the relative position and amount of fluid movement in the annulus.

One prior art approach to water accumulation in the gas production equipment is the use of drips and blowdown lines in low-lying areas of the gas production equipment, such as surface gas lines. These drips must be vented regularly to blow out the accumulated water. Typically, due to the low pressures in coal bed methane gas lines (e.g., less than 20 psig), the blowing of drips is manpower intensive, and inefficient in comparison to lines operating at higher pressures. It would be advantageous to eliminate water entirely from gas production equipment at the surface, and the need to blow drips from this equipment.

The present invention is directed to a novel method and system for producing gas and liquid in a subterranean well, in which gas flow through a submersible pump, and liquid flow through a well annulus to the surface, are substantially eliminated. In addition, the method and system can be adapted to different types of wells, including wells that employ formation pressures rather than pumps, to move the gas and the liquid.

Summary of the Invention

In accordance with the present invention, a method and a system for producing a gas and a liquid in a subterranean well having an annulus are provided. The method, broadly stated, comprises directing the gas and the liquid in the annulus through at least one baffle plate in the annulus to separate at least some of the liquid from the gas. The separated liquid is directed downward towards a producing formation of the well, while the gas continues upward towards a surface of the well. The method can be performed in wells having a downhole pump for

producing the liquid to the surface, and in wells that use formation pressures to produce the liquid to the surface.

In a first embodiment the system includes a set of baffle plates mounted in the well annulus proximate to a pump of the well, and a single baffle plate mounted in the well annulus proximate to the surface of the well. The set of baffle plates can comprise annular plates threadably attached to a metal tubular of the well, and having one or more through openings in a selected geometry and pattern. The set of baffle plates are configured to create a tortuous flow path through which any gas flow (or liquid flow) moving in either direction in the well annulus must pass. In addition to separating the liquid from the gas, the set of baffle plates maintains a wet gas phase above the set of baffle plates, and a liquid phase below the set of baffle plates. The single baffle plate is configured to further dehydrate the gas flowing to the gas production equipment at the surface.

The system prevents vapor lock in the pump, eliminates the need for a gas shroud on the pump, and improves the efficiency of the pump. The system also prevents liquid from surfacing and collecting in liquid production equipment, and reduces overall system back pressures caused by liquid low spots in the liquid production equipment. In addition, the system improves gas flow in the annulus, reduces gas loss through production with the liquid, and reduces effective formation backpressures caused by a higher density fluid in the annulus above the producing formation.

A second embodiment system includes a single baffle plate in the well annulus located proximate to the surface of the well. A third embodiment system includes a set of baffle plates in the well annulus located proximate to the pump of the well. A fourth embodiment system includes a set of baffle plates located proximate to an inlet of a tubular configured to produce gas and liquid by formation pressure. A fifth embodiment system includes a set of baffle plates located proximate to a perforated casing and a perforated tubular configured to produce gas and liquid by formation pressure. A sixth embodiment system includes a set of baffle plates located proximate to an inlet of a tubular located above a perforated section of casing configured to produce gas and liquid by formation pressure.

Brief Description of the Drawings

Figure 1 is a schematic cross sectional view of a gas well having a system for producing gas and liquid in accordance with the invention;

Figure 1A is a cross sectional view with parts removed taken along section line 1A-1A of Figure 1 illustrating a first baffle plate of the system;

Figure 1B is a cross sectional view with parts removed taken along section line 1B-1B of Figure 1 illustrating a second baffle plate of the system;

Figure 1C is a cross sectional view with parts removed taken along section line 1C-1C of Figure 1 illustrating a third baffle plate of the system;

Figure 1D is a cross sectional view with parts removed taken along section line 1D-1D of Figure 1 illustrating a fourth baffle plate of the system;

Figure 1E is an enlarged view with parts removed taken along line 1E of Figure 1 illustrating a set of baffle plates of the system;

Figure 2A is a schematic cross sectional view illustrating the well with the system of Figure 1;

Figure 2B is a graph illustrating operational parameters of the well with the system of Figure 1;

Figure 3A is a schematic cross sectional view illustrating a gas well with a second embodiment system having a single baffle plate;

Figure 3B is a graph illustrating operational parameters of the well with the system of Figure 3A;

Figure 3C is a graph illustrating operational characteristics of the well with the system of Figure 3A;

Figure 4A is a schematic cross sectional view illustrating a gas well having a third embodiment system with a set of baffle plate;

Figure 4B is a graph illustrating operational parameters of the well with the system of Figure 4A;

Figure 4C is a graph illustrating operational parameters of the well with the system of Figure 4A;

Figure 5 is a schematic cross sectional view illustrating a siphon string gas well having a fourth embodiment system;

Figure 6 is a schematic cross sectional view illustrating a dead string gas well having a fifth embodiment system; and

Figure 7 is a schematic cross sectional view illustrating a conventional flowing gas well having a sixth embodiment system.

Detailed Description of the Preferred Embodiments

Referring to Figure 1, a system 10 (first embodiment) and a well 12 for producing a gas and a liquid in accordance with the invention are illustrated. In the system 10, the well 12 comprises a coal bed methane well, the gas comprises methane, and the liquid comprises water. However, as will be further explained, the system 10 can be adapted to different types of wells and downhole configurations including wells pumped with a surface mounted beam pump jack, sucker rods, and a downhole rod activated pump.

The well 12 includes a well bore 16, and a well casing 14 within the well bore 16 surrounded by concrete 18. The well 12 extends from an earthen surface 20 through geological formations within the earth, which are represented as Zones A, B and C, with Zone C comprising a producing formation, such as a coal seam. The well casing 14 can comprise a plurality of cylindrical metal tubulars, such as lengths of metal pipe or tubing, attached to one another by collars (not shown), or weldments (not shown), configured to form a conduit for gas transmission therethrough.

The well 12 also includes a tubular 22 within the well casing 14, which can also comprise a plurality of cylindrical metal tubulars configured to form a conduit for liquid transmission through the inside diameter thereof. The tubular 22 has an outside diameter which is less than an inside diameter of the well casing 14, such that an annulus 24 is formed between the tubular 22 and the well casing 14 for the gas transmission. The annulus 24 is in flow communication with gas production equipment 30 at the surface 20. Similarly, the inside diameter of the tubular 22 is in flow communication with liquid production equipment 32 at the surface 20.

The well 12 also includes a cavity 34 in the producing formation (Zone C). The cavity 34 can comprise an uncased portion of the well bore 16 or a cased portion having flow openings in the well casing 14. The cavity 34 can also comprise an under reamed cavity having a size larger than the well bore 16 formed using techniques that are known in the art. In the illustrative embodiment, the well casing 14 includes a casing shoe 40 within the cavity 34 configured to direct gas flow from the cavity 34 into the annulus 24. Also in the illustrative embodiment, the gas comprises methane gas, which flows under a natural or externally generated pressure from the producing formation (Zone C) into the cavity 34. The paths of a gas flow 26 in the well 12 will be more fully described as the description proceeds.

The well 12 also includes a submersible pump 36 in the cavity 34 powered by an electric motor 38. The inlet of the pump 36 is in flow communication with any standing liquid accumulating within the cavity 34. In the illustrative embodiment, the liquid comprises water, which flows under a natural or externally generated pressure from producing formation (Zone C) into the cavity 34. The outlet of the pump 36 is in flow communication with the inside diameter of the tubular 22, and with the liquid production equipment 32. The pump 36 thus pumps the liquid from the cavity 34 through the inside diameter of the tubular 22 to the liquid production equipment 32. However, some of the liquid also flows into the annulus 24 in both an upward and a downward direction. The paths of a liquid flow 28 in the well 12 will be more fully described as the description proceeds.

The system 10 includes a set of baffle plates 42 attached to the tubular 22, and located at a selected depth in the well 12. Preferably the set of baffle plates 42 is located proximate to the producing formation (Zone C), the cavity 34, the pump 36 and the casing shoe 40. The set of baffle plates 42 includes a first baffle plate 46, a second baffle plate 48 and a third baffle plate 50. The baffle plates 46, 48, 50 are arranged in a stacked array with the first baffle plate 46 being furthest from the surface 20, the second baffle plate 48 being between the first baffle plate 46 and the third baffle plate 50, and the third baffle plate 50 being closest to the surface 20.

In the illustrative embodiment, the set of baffle plates 42 is located in close proximity to the cavity 34, the casing shoe 40 and the pump 36. By way of example, a distance D1 between the set of baffle plates 42 and the edge of the casing shoe 40 (with the casing shoe 40 and the pump 36 being located in the cavity 34 in close proximity to one another) can be from about one foot to thirty feet. The first baffle plate 46, the second baffle plate 48 and the third baffle plate 50 can also be separated from one another by a selected distance, with from one foot to three feet of separation between adjacent baffle plates 46, 48 or 50 being representative. However, it is to be understood that the number, placement and separation of the baffle plate 46, 48 and 50 are merely exemplary, and other arrangements with a fewer or greater number of baffle plates can be employed.

The set of baffle plates 42 is configured to create a tortuous path for the gas flow 26 and the liquid flow 28 moving mainly in an upward direction, but also in a downward direction in the annulus 24. In addition, the set of baffle plates 42 is configured to separate the liquid from the gas, and to maintain a line of separation in the annulus 24, above which a single phase wet gas is present, and below which a head of liquid is present. Further, gas flow into the pump 36 is substantially reduced because the set of baffle plates 42 maintains the head of liquid proximate to the pump 36. Still further, the set of baffle plates 42 prevents liquid columns from developing in the annulus 24 due to liquid entrained in the gas stream rising to a certain depth, and then falling back onto the pump 36 and the cavity 34. This liquid fallback can carry gas into the intake of the pump 36, which is detrimental to the performance of the pump 36.

As shown in Figure 1A, the first baffle plate 46 has a generally circular peripheral configuration, which matches the circular cross sectional shape of the inside diameter of the well casing 14. In addition, the outside diameter of the first baffle plate 46 is only slightly less than the inside diameter of the well casing 14, such that the first baffle plate 46 fits snuggly within the well casing 14. The second baffle plate 48 and the third baffle plate 50 have a same size and outside peripheral shape as the first baffle plate 46. As shown in Figure 1, the gas flow 26 and the liquid flow 28 in the annulus 24 must thus pass through the set of baffle

plates 42, as there is little or no space between the outside diameter of the baffle plates 46, 48, 50 and the inside diameter of the well casing 14.

As shown in Figure 1A, the first baffle plate 46 includes a plurality of through openings 52, which comprise circles with a selected size and in a selected pattern. The first baffle plate 46 provides a solid surface area for collecting and condensing the liquid, while the openings 52 allow the gas flow 26 and the liquid flow 28 through the annulus 24. As shown in Figure 1B, the second baffle plate 48 includes a single opening 54, which comprises an arcuate slot having a selected width and arcuate length. As shown in Figure 1C, the third baffle plate 50 also includes a single opening 56, which comprises an arcuate slot having a selected width and arcuate length. In addition, the second baffle plate 48 and the third baffle plate 50 are oriented in the annulus 24, such that the openings 54, 56 have opposing orientations which are 180° apart.

The system 10 also includes a single baffle plate 44 located at a selected depth in the well 12 proximate to the surface 20. The single baffle plate 44 is configured to act as a final dehydration mechanism to remove as much liquid as possible from the gas flow 26 before it enters the gas production equipment 30. As shown in Figure 1D, the single baffle plate 44 is substantially similar in construction to the first baffle plate 46, and includes a plurality of circular through openings 58 with a selected size and in a selected pattern. The single baffle plate 44 can be located a selected distance D2 from the surface 20 with from thirty to sixty feet being representative.

The baffle plates 46, 48, 50 for the set of baffle plates 42, and the single baffle plate 44, can be made of a machineable material able to resist the corrosive gases and fluids encountered in the subterranean well 12. One suitable material comprises a plastic, such as "LEXAN" polycarbonate manufactured by the General Electric Company, Polymer Product Department, Pittsfield, MS. Other suitable materials include stainless steel, steel and brass.

The set of baffle plates 42, and the single baffle plate 44 can be attached to the tubular 22 in any suitable manner. One suitable configuration for the set of baffle plates 42 is illustrated in Figure 1E. In the illustrative embodiment, threaded male pipe nipples 60 are configured to attach the set of baffle plates 42 to the tubular 22 at each end.

Alternately, the set of baffle plates 42 can be attached to the tubular 22 at an upper end, and directly to the outlet of the pump 36 at a lower end.

As shown in Figure 1E, the nipples 60 mate with threaded female pipe couplings 62. In addition, the baffle plates 46, 48, 50 have threaded openings 64 that threadably engage mating outside threads cut in the nipples 60, proximate to shoulder portions thereof. In the illustrative embodiment, the baffle plates 46, 48, 50 have a thickness of about 0.5 inches, and the nipples 60 have an extra thread of about this same thickness. Each baffle plate 46, 48, 50 is threadably attached to a nipple 60, which is then threadably attached to a coupling 62. Each baffle plate 46, 48, 50 is thus sandwiched between a nipple 60 and a coupling 62. In addition, the second baffle plate 48 is separated from the first baffle plate 46, and from the third baffle plate 50, by a nipple 60 and a coupling 62. In the illustrative embodiment, this separation distance is about one foot between adjacent baffle plates 46, 48, 50.

The uppermost nipple 60 threadably engages a corresponding coupling or female threads on the tubular 22. Similarly, the lowermost nipple 60 threadably engages a corresponding coupling or female threads on the tubular 22 on the pump 36. The inside diameter of the tubular 22 is thus in flow communication with the inside diameter of the nipples 60 and the couplings 62.

However, it is to be understood that this arrangement is merely exemplary and other mechanisms, such as brackets or weldments, can be used to attach the set of baffle plates 42 to the tubular 22. The single baffle plate 44 can be similarly mounted to a nipple 60 and a coupling 62, and attached to the tubular 22.

Referring to Figure 2A, the operation of the well 12 and the system 10 (Figure 1) are illustrated schematically. As shown in Figure 2A, the liquid flow 28 initiates in the producing formation (Zone C), such that liquid accumulates in the cavity 34, and flows into the inlet of the pump 36. As indicated by the upward liquid flow 28 through the tubular 22, the pump 36 pumps the liquid through the tubular 22 to the liquid production equipment 32 at the surface 20. The gas flow 26 also initiates in the producing formation (Zone C), such that the gas accumulates in the cavity 34, and is directed through the casing shoe 40 into the annulus 24. The baffle plates 46, 48, 50 create a tortuous path

for the gas flow 26, and at least some of the liquid entrained in the gas is condensed, and drops from the baffle plates 46, 48, 50 back into the cavity 34, as indicated by the downward liquid flow 28 from the baffle plates 46, 48, 50. This condensed liquid accumulates in the cavity 34, and is pumped by the pump 36 through the tubular 22 to the liquid production equipment 32 at the surface 20. In addition, the formation of heads of liquid in the annulus 24 is substantially eliminated, such that back pressure on the natural gas pressure in producing formation (Zone C) is reduced. This improves the flow of gas from the producing formation (Zone C) into the annulus 24.

As shown in Figure 2A, the gas flow 26 continues through the annulus 24 to the single baffle plate 44, which acts as a final dehydration mechanism for separating at least some of the liquid entrained in the gas flow 26. As indicated by the upward gas flow 26 from the single baffle plate 44, a single phase gas flows through the annulus 24 to the gas production equipment 30 at the surface 20. As indicated by the downward liquid flow 28 from the single baffle plate 44, the removed liquid flows through the annulus 24 towards the cavity 34.

System 10A With Single Baffle Plate 44

Referring to Figure 3A, the well 12 and a second embodiment system 10A are illustrated schematically. With the system 10A, the single baffle plate 44 is installed approximately thirty to sixty feet from the surface 20 of the well 12. However, the system 10A does not include the set of baffle plates 42 (Figure 1) proximate to the pump 36. The single baffle plate 44 operates substantially as previously described in the system 10 (Figure 1). Specifically, gas flow 26 through the annulus 24 passes through the single baffle plate 44 which acts as a dehydration mechanism for removing at least some liquid from the gas. In addition, the single baffle plate 44 directs at least some liquid flow 28 back down the annulus 24 to the cavity 34.

System 10B With Set of Baffle Plate 42

Referring to Figure 4A, the well 12 and a third embodiment system 10B are illustrated schematically. In the system 10B, the set of baffle plates 42 is located approximately one foot to thirty feet above the

casing shoe 40, the pump 36 and the cavity 34. However, in the system 10B there is no single baffle plate 44 proximate to the surface 20. The set of baffle plates 42 operates substantially as previously described in the system 10 (Figure 1). Specifically, the set of baffle plate 42 creates a tortuous path for the gas flow 26 and the liquid flow 28 in the annulus 24, separates at least some of the liquid from the gas, and directs some liquid flow 28 back down the annulus 24 to the cavity 34.

System 10C With Siphon String

Referring to Figure 5, a well 12A, and a fourth embodiment system 10C are illustrated schematically. The well 12A is constructed substantially as previously described for the well 12 (Figure 1). However, the well 12A does not include an artificial lift such as the pump 36 (Figure 1), but depends on gas and fluid pressures in the producing formation (Zone C) to move the gas and the liquid to the surface 20.

As indicated by gas flow 26 upward through the annulus 24, the well 12A produces gas through the annulus 24 to gas production equipment 30 at the surface 20. As indicated by gas and liquid flow 66 upward through the tubular 22, the well 12A produces liquid and gas through the tubular 22 to gas and liquid production equipment 68 at the surface 20. The tubular 22 includes an inlet 78 located within or proximate to the cavity 34 and the producing formation (Zone C), which directs the gas and liquid flow 66 from the cavity 34 upward through the tubular 22 to the gas and liquid production equipment 68. The gas and liquid flow 66 is generated by natural (or artificially generated) pressure in the producing formation (Zone C).

This type of well 12A is known in the art as a siphon string well, as the tubular 22 is used to siphon the liquid from the bottom of the well 12A using a portion of the gas flow for lift. In a conventional siphon string well, the momentum of the gas and liquid flow 66 rising vertically from below the tubular inlet 78 can cause a foam or liquid laden gas column to form just above the tubular inlet 78. This higher density column causes additional backpressure on the producing formation (Zone C), reducing the productivity of the well. The higher density column can also cause slugging of the gas and liquid flow 66 entering the tubular inlet 78, as it can no longer be supported by the gas velocity from below.

The system 10C includes the set of baffle plates 42 located about ten feet to thirty feet from the casing shoe 40 and the tubular inlet 78 of the well 12A. The set of baffle plates 42 creates a tortuous path for the gas flow 26 upward from the cavity 34 through the annulus 24. As indicated by the downward liquid flow 28 from the set of baffle plates 42, at least some of the liquid is separated from the gas. In addition, the set of baffle plates 42 functions to separate the gas and liquid phase below the tubular inlet 78 from a stable gas phase above the set of baffle plates 42. This substantially eliminates the additional backpressure and slugging described above.

System 10D With Dead String And Perforated Tubular

Referring to Figure 6, a well 12B, and a fifth embodiment system 10D are illustrated schematically. As with the well 12A (Figure 5), there is no artificial lift and the gas and liquid flow 66 is generated by pressure in the producing formation (Zone C). As indicated by the gas and liquid flow 66 upward through the tubular 22, the well 12B produces liquid and gas through the tubular 22 to gas and liquid production equipment 68 at the surface 20. However, there is no gas flow 26 (Figure 5) through the annulus 24 to the surface 20. This type of well is known in the art as a dead string well.

The well 12B also includes a perforated section 70 having a plurality of perforations 72 through the casing 14 and the concrete 18 in flow communication with the producing formation (Zone C). The tubular 22 includes an inlet 78 within or proximate to the perforated section 70 of the casing 14, and a perforated section 74 proximate to the inlet 78 having a plurality of perforations 76 there through. The tubular 22 is thus also in flow communication with the producing formation (Zone C).

The system 10D includes the set of baffle plates 42 located about ten feet to thirty feet from the perforated section 70 of the well 12B. As indicated by the downward liquid flow 28, the set of baffle plates 42 prevents the formation of large liquid columns in the annulus 24. As with the system 10C (Figure 5), this substantially eliminates additional backpressure and slugging of the gas and liquid flow 66 at the perforations 76 and the inlet 78 of the tubular 22.

System 10E With Conventional Flow

Referring to Figure 7, a well 12C, and a sixth embodiment system 10E are illustrated schematically. As with the well 12B (Figure 6), the well 12C produces liquid and gas through the tubular 22 to gas and liquid production equipment 68 at the surface 20. In addition, there is no gas flow 26 (Figure 5) through the annulus 24 to the surface 20. The well 12C includes a perforated section 70 having a plurality of perforations 72 through the casing 14 and the concrete 18 in flow communication with the producing formation (Zone C). The tubular 22 includes an inlet 78 located above the perforated section 70.

The system 10E includes the set of baffle plates 42 located about ten feet to thirty feet from the inlet 78 of the tubular 22. As indicated by the downward liquid flow 28, the set of baffle plates 42 prevents the formation of large liquid columns in the annulus 24. As with the system 10C (Figure 5), this substantially eliminates additional backpressure and slugging of the gas and liquid flow 66 at the inlet 78 of the tubular 22.

Example 1

Figure 2B is a graph illustrating operational parameters of a methane gas well with the system 10 (Figure 2A) located in the Powder River Basin of Wyoming. In the system 10 (Figure 2A), the set of baffle plates 42 was installed approximately fifteen feet above the casing shoe 40, the pump 36 and the cavity 34. The single baffle plate 44 was installed approximately thirty to sixty feet from the surface 20.

In Figure 2B "Daily Gas MCFPD" is represented by the line with diamond points, "Daily Water BWPD" is represented by the line with square points, and "Average Fluid Over Pump" is represented by the line with triangular points. Also in Figure 2B, the horizontal axis quantifies time in one month increments, and the vertical axis quantifies the parameter.

As indicated by Figure 2B, system 10 with the set of baffle plates 42 and the single baffle plate 44 was installed between "Month 12" and "Month 13". Following installation of the system 10, "Daily Gas MCFPD" increased relative to the preceding five months, the "Average Fluid Over Pump" decreased to zero, and "Daily Water BWPD" remained about the same.

Example 2

Figure 3B and Figure 3C are graphs illustrating operational parameters of a methane gas well with the system 10A (Figure 3A) located in the Powder River Basin of Wyoming. In the system 10A (Figure 3A), the single baffle plate 44 was installed approximately sixty feet from the surface 20.

In Figure 3B "Daily Gas MCFPD" is represented by the line with diamond points, "Daily Water BWPD" is represented by the line with square points, and "Average Fluid Over Pump" is represented by the line with triangular points. Also in Figure 3B, the horizontal axis quantifies the time in one month increments, and the vertical axis quantifies the parameter.

As indicated by Figure 3B, the system 10A (Figure 3A) with the single baffle plate 44 was installed in the well between "Month 13" and "Month 14". Following installation of the system 10A (Figure 3A), "Daily Gas MCFPD" increased relative to the preceding three months, "Average Fluid Over Pump" decreased relative to the preceding eight months, and "Daily Water BWPD" remained about the same.

In Figure 3C, "Daily Gas MCFPD" is represented by the line with the diamond points, "Daily Water BWPD" is represented by the line with the square points, "Pump Efficiency" is represented by the line with the circular points, "Feet Over Pump" is represented by the line with the star points, and "Wellhead Pressure" (PSIG X 10) is represented by the line with no points. Also in Figure 3C, the horizontal axis quantifies time in one week increments, and the vertical axis quantifies the parameters, except for pump efficiency, which is quantified on the right vertical axis as a percentage.

As indicated by Figure 3C, the system 10A (Figure 3A) with the single baffle plate 44 was installed in the well just before "Week 4". Following installation of the system 10A "Daily Gas MCFPD" increased relative to the previous weeks then decreased, "Daily Water BWPD" increased relative to the previous weeks then decreased, "Pump Efficiency" increased relative to the previous weeks then decreased, "Feet Over Pump" decreased to zero then increased, and "Wellhead Pressure" increased relative to the previous weeks then decreased.

Example 3

Figure 4B and Figure 4C are graphs illustrating operational parameters of a methane gas well with the system 10B (Figure 4A) installed therein located in the Powder River Basin of Wyoming. In this example, the set of baffle plates 42 was installed approximately fifteen feet above the casing shoe 40, the pump 36 and the cavity 34.

In Figure 4B "Daily Gas MCFPD" is represented by the line with diamond points, "Daily Water BWPD" is represented by the line with square points, and "Average Fluid Over Pump" is represented by the line with triangular points. Also in Figure 4B, the horizontal axis quantifies time in one month increments, and the vertical axis quantifies the parameter.

As indicated by Figure 4B, the system 10B with the set of baffle plates 42 was installed in the well between "Month 12" and "Month 13". Following installation of the system 10B, "Daily Gas MCFPD" increased relative to the preceding months, "Average Fluid Over Pump" decreased relative to the preceding months, and "Daily Water BWPD" increased relative to the preceding six months.

In Figure 4C "Daily Gas MCFPD" is represented by the line with the diamond points, "Daily Water BWPD" is represented by the line with the square points, "Pump Efficiency" is represented by the line with the circular points, "Feet Over Pump" is represented by the line with the star points, and "Wellhead Pressure" (PSIG X 10) is represented by the line with no points. Also in Figure 4C, the horizontal axis quantifies the time in one week increments, the vertical axis on the left quantifies the above parameters except for pump efficiency which is listed on the right vertical axis as a percentage.

As indicated by Figure 4C, the set of baffle plates 42 was installed in the well between "Week 4" and "Week 5". Following installation of the set of baffle plates 42 "Daily Gas MCFPD" increased relative to the previous weeks, "Daily Water BWPD" increased relative to the previous weeks, "Pump Efficiency" increased relative to the previous weeks, "Feet Over Pump" decreased over the previous weeks, and "Wellhead Pressure" decreased then increased relative to the previous weeks except for the spike at about "Week 4".

Thus the invention provides a method and a system for producing a gas and a liquid in a subterranean well. While the invention has been described with reference to certain preferred embodiments, as will be apparent to those skilled in the art, certain changes and modifications can be made without departing from the scope of the invention as defined by the following claims.

WHAT IS CLAIMED IS:

1. A method for producing a gas and a liquid in a well having an annulus comprising:

directing the gas through at least one baffle plate in the annulus to separate at least some of the liquid from the gas.

2. The method of claim 1 further comprising directing the liquid separated during the directing step downward through the annulus.

3. The method of claim 1 wherein the well includes a pump for pumping the liquid, and further comprising directing the liquid separated during the directing step downward through the annulus to the pump.

4. The method of claim 1 wherein the well includes a cavity for accumulating the gas and the liquid, and the at least one baffle plate is located proximate to the cavity.

5. The method of claim 1 further comprising placing a second baffle plate proximate to a surface of the well, and directing the gas through the second baffle plate.

6. The method of claim 1 wherein the well includes a tubular configured to produce the gas and the liquid to the surface by formation pressure and the at least one baffle plate is located proximate to an inlet of the tubular.

7. The method of claim 1 wherein the well includes a tubular having a perforated section configured to produce the gas and the liquid to the surface by formation pressure and the at least one baffle plate is located proximate to the perforated section.

8. The method of claim 1 wherein the well includes a casing having a perforated section configured to produce the gas and the liquid to the surface by formation pressure and the at least one baffle plate is located proximate to the perforated section.

9. A method for producing a gas and a liquid in a well having a pump and an annulus comprising:

directing the gas through a baffle plate in the annulus located proximate to the pump;

removing at least some of the liquid from the gas using the baffle plate; and

directing the liquid from the removing step down the annulus to the pump.

10. The method of claim 9 further comprising prior to the directing the gas step placing the baffle plate proximate to the pump.

11. The method of claim 9 wherein the baffle plate comprises a plate having at least one through opening attached to a tubular in the annulus in flow communication with the pump.

12. The method of claim 9 further comprising placing a second baffle plate in the annulus proximate to a surface of the well and directing the gas through the second baffle plate.

13. The method of claim 9 wherein the gas comprises methane and the liquid comprises water.

14. The method of claim 9 wherein the well includes a cavity in a geological formation and the pump is located in the cavity.

15. A method for producing from a well having a cavity, a casing in flow communication with the cavity, a pump in the cavity, a tubular in the casing in flow communication with the pump, and an annulus between the tubular and the casing, the method comprising:

directing a gas from the cavity through the annulus and through a baffle plate in the annulus proximate to the pump; and

separating a liquid from the gas during the directing step using the baffle plate.

16. The method of claim 15 further comprising providing a second baffle plate in the annulus proximate to a surface of the well, and separating at least some of the liquid from the gas using the second baffle plate.

17. The method of claim 15 further comprising directing a liquid flow from the baffle plate through the annulus to the cavity.

18. The method of claim 15 wherein the baffle plate comprises a circular plate having least one through opening and an outside diameter approximately equal to an inside diameter of the casing.

19. The method of claim 15 wherein the gas comprises methane and the liquid comprises water.

20. In a well having a casing, a tubular in the casing, and an annulus between the tubular and the casing, a method for producing from the well comprising:

directing a gas from a producing formation of the well into the annulus, through a first baffle plate in the annulus located proximate to the producing formation, and through a second baffle plate in the annulus located proximate to a surface of the well, the first baffle plate and the second baffle plate each having an outside diameter approximately equal to an inside diameter of the casing and at least one through opening;

condensing a liquid in the gas using the first baffle plate;

directing the liquid from the condensing step from the first baffle plate through the annulus towards the producing formation; and

dehydrating the gas using the second baffle plate.

21. The method of claim 20 further comprising placing the first baffle plate in the annulus proximate to the producing formation and the second baffle plate in the annulus proximate to the surface prior to the directing the gas step.

22. The method of claim 20 wherein the well includes a pump in flow communication with the tubular configured to pump the liquid from the producing formation to the surface.

23. The method of claim 20 wherein the tubular is configured to produce the gas and the liquid to the surface by formation pressure and the first baffle plate is located proximate to an inlet of the tubular.

24. The method of claim 20 wherein the tubular includes a perforated section configured to produce the gas and the liquid to the surface by formation pressure and the baffle plate is located proximate to the perforated section.

25. The method of claim 20 wherein the casing includes a perforated section configured in flow communication with the producing formation by formation pressure and the at least one baffle plate is located proximate to the perforated section.

26. The method of claim 20 wherein the first baffle plate is part of a set of baffle plates.

27. The method of claim 26 wherein the set of baffle plates includes at least one baffle plate having an arcuate slot therein.

28. The method of claim 20 wherein the casing extends from the surface to a cavity in a coal seam.

29. The method of claim 20 wherein the tubular includes a male nipple attached to a female coupling with the first baffle plate therebetween.

30. A method for producing from a well having a producing formation, a casing in flow communication with the producing formation, a tubular in the casing in flow communication with the producing formation, and an annulus between the tubular and the casing, the method comprising:

directing a gas from the producing formation through the annulus and through a baffle plate in the annulus proximate; and

separating a liquid from the gas during the directing step using the baffle plate.

31. The method of claim 30 wherein the baffle plate is located proximate to the producing formation.

32. The method of claim 30 further comprising providing a second baffle plate in the annulus proximate to a surface of the well, and separating at least some of the liquid from the gas using the second baffle plate.

33. The method of claim 30 wherein the baffle plate comprises a circular plate having least one through opening and an outside diameter approximately equal to an inside diameter of the casing.

34. The method of claim 30 wherein the gas comprises methane and the liquid comprises water.

35. A system for producing a gas and a liquid in a well comprising:

at least one baffle plate in the well configured to provide a tortuous path for the gas through the well and to separate at least some of the liquid from the gas.

36. The system of claim 35 wherein the well includes a casing, a tubular in the casing and an annulus between the casing and the tubular and the at least one baffle plate is located in the annulus.

37. The system of claim 35 further comprising a second baffle plate in the annulus proximate to a surface of the well.

38. The system of claim 35 wherein the at least one baffle plate is located proximate to a producing formation of the well.

39. The system of claim 35 wherein the well includes a downhole pump and the at least one baffle plate is located proximate to the pump.

40. The system of claim 35 wherein the well includes a perforating section of casing proximate to a producing formation and the baffle plate is located proximate to the perforating section.

41. The system of claim 35 wherein the well includes a tubular having an inlet in flow communication with a producing formation and the at least one baffle plate is located proximate to the inlet.

42. The system of claim 35 wherein the gas comprises methane and the liquid comprises water.

43. A system for producing a gas and a liquid in a well having a surface, a producing formation and an annulus comprising:

a first baffle plate in the annulus proximate to the producing formation configured to separate at least some of the liquid from the gas flowing in the annulus; and

a second baffle plate in the annulus proximate to the surface configured to dehydrate the gas flowing in the annulus to the surface.

44. The system of claim 43 further comprising a tubular in flow communication with the producing formation configured to provide a flow conduit for the gas and the liquid to the surface.

45. The system of claim 43 further comprising a pump in flow communication with the producing formation and a tubular in flow communication with the pump configured to provide a flow conduit for the liquid to the surface.

46. The system of claim 43 further comprising a tubular in flow communication with the producing formation and wherein the first baffle plate and the second baffle plate are attached to the tubular.

47. The system of claim 43 wherein the well includes a cavity in a coal seam and a pump located in the cavity.

48. The system of claim 43 wherein the first baffle plate and the second baffle plate each comprise a plurality of circular openings.

49. The system of claim 43 wherein the first baffle plate is part of a set of baffle plates which includes a third baffle plate having a first slot, and a fourth baffle plate having a second slot oriented approximately 180°from the first slot.

50. The system of claim 43 wherein the first baffle plate comprises a polycarbonate.

51. The system of claim 43 wherein the second baffle plate comprises a polycarbonate.

52. A system for producing a gas and a liquid in a well having a surface, a casing, a pump, a tubular in the casing in flow communication with the pump, and an annulus between the tubular and the casing comprising:

a plurality of baffle plates attached to the tubular proximate to the pump configured to provide a tortuous path for the gas flowing up the annulus, and to separate at least some of the liquid from the gas; and

at least one baffle plate attached to the tubular proximate to the surface configured to dehydrate at least some of the liquid from the gas.

53. The system of claim 52 wherein the plurality of baffle plates and the single baffle plate have an outside diameter approximately equal to an inside diameter of the casing.

54. The system of claim 52 wherein the plurality of baffle plates include a first baffle plate having a plurality of circular openings, a second baffle plate having a first arcuate slot, and a third baffle plate having a second arcuate slot.

55. The system of claim 52 wherein the at least one baffle plate includes a plurality of circular openings in a selected pattern.

56. The system of claim 52 wherein the tubular includes a plurality of male nipples attached to corresponding female couplings with the baffle plates clamped between the nipples and the couplings.

57. The system of claim 52 wherein the plurality of baffle plates is located about one to thirty feet from the pump.

58. The system of claim 52 wherein the single baffle plate is located about thirty to sixty feet from the surface.

59. In a well having a surface, a casing, a producing formation, a tubular in the casing having an inlet in flow communication with the producing formation, and an annulus between the tubular and the casing, a system for producing a gas and a liquid from the well comprising:

a set of baffle plates attached to the tubular proximate to the inlet configured to separate and direct at least some liquid from a gas flow in the annulus back down the annulus towards the producing formation; and

a single baffle plate attached to the tubular proximate to the surface configured to dehydrate the gas flow in the annulus to the surface.

60. The system of claim 59 wherein the set of baffle plates includes a first baffle plate having a plurality of first circular openings therethrough, a second baffle plate having a first slot therethrough, and a third baffle plate having a second slot therethrough.

61. The system of claim 59 wherein the single baffle plate includes a plurality of second circular openings therethrough.

62. The system of claim 59 wherein each baffle plate of the set of baffle plate comprises a polycarbonate.

63. The system of claim 59 wherein the single baffle plate comprises a polycarbonate.

64. The system of claim 59 wherein the casing includes a perforated section in flow communication with the producing formation.

65. The system of claim 59 wherein the tubular includes a perforated section in flow communication with the producing formation.

66. The system of claim 59 wherein the well includes a pump in flow communication with the producing formation and the tubular.

Abstract

A method for producing a gas and a liquid in a subterranean well includes the step directing a gas flow in a well annulus through one or more baffle plates to separate at least some of the liquid from the gas. The method can also include the steps of directing the separated liquid down the annulus towards a producing formation of the well, dehydrating the gas flow proximate to a surface of the well, and then directing the dehydrated gas flow to the surface. A system for performing the method includes a set of baffle plates located proximate to the producing formation configured to provide a tortuous path for the gas flow through the annulus, and a single baffle plate located proximate to the surface configured to dehydrate the gas flow. In addition to separating the liquid from the gas flow, the set of baffle plates maintains a single phase wet gas above the baffle plates, and a liquid phase below the baffle plates.

Glossary
(Reference Only - Not A Part Of The Specification)

10	system (single baffle plate and set of baffle plates)
10A	alternate embodiment system (single baffle plate)
10B	alternate embodiment system (set of baffle plates)
10C	alternate embodiment system (siphon string)
10D	alternate embodiment system (dead string)
10E	alternate embodiment system (conventional flowing)
12	well (methane coal bed)
12A	well (siphon string)
12B	well (dead string)
12C	well (conventional flow)
14	well casing (12)
16	well bore (12)
18	concrete (12)
20	surface (12)
22	tubular (12)
24	annulus (12)
26	gas flow (12)
28	liquid flow (12)
30	gas production equipment (12)
32	liquid production equipment (12)
34	cavity (12)
36	pump (12)
38	motor (36)
40	casing shoe (12)
42	set of baffle plates (10)
44	single baffle plate (10)
46	first baffle plate (42)
48	second baffle plate (42)
50	third baffle plate (42)
52	openings (46)
54	opening (48)
56	opening (50)
58	opening (44)
60	nipple (42)
62	coupling (42)

64	threaded opening (44, 46, 48)
66	gas and liquid flow
68	gas and liquid production equipment
70	perforated section (14)
72	perforations (14)
74	perforated section (22)
76	perforations (22)
78	inlet (22)

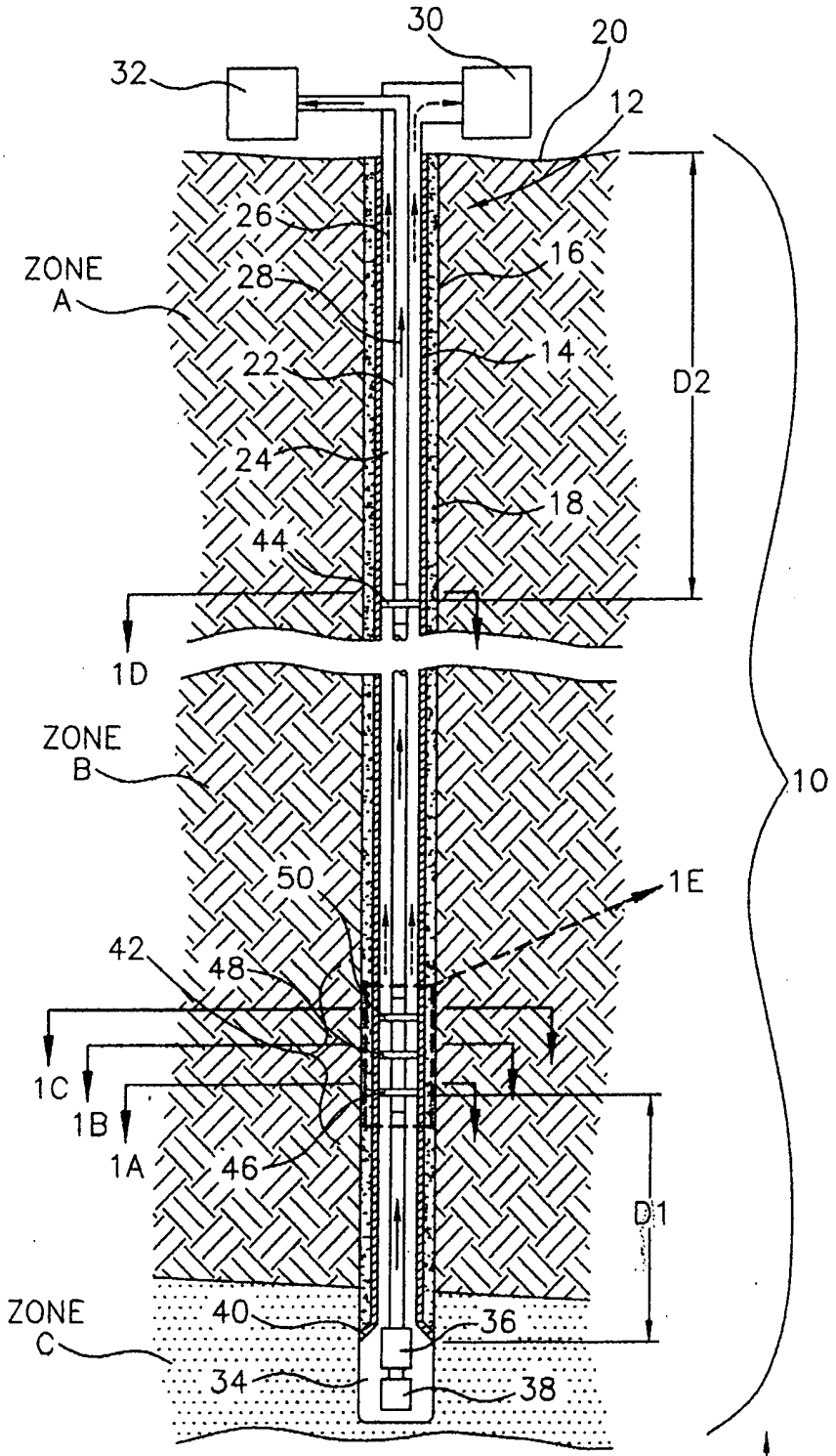


FIGURE 1

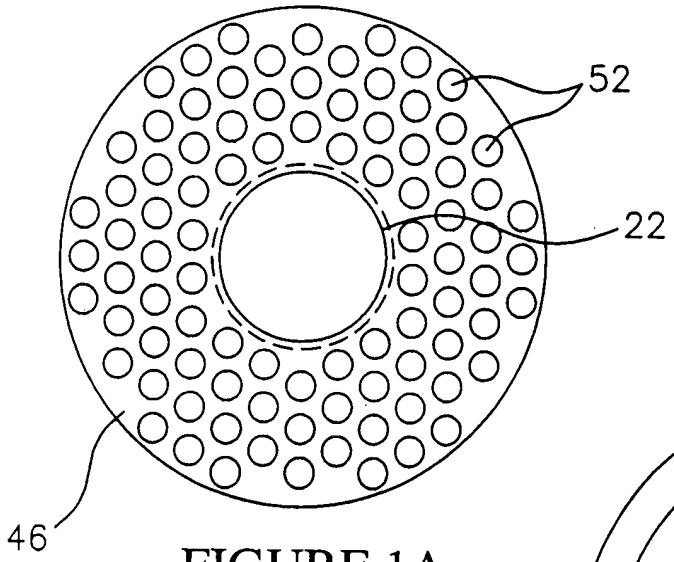


FIGURE 1A

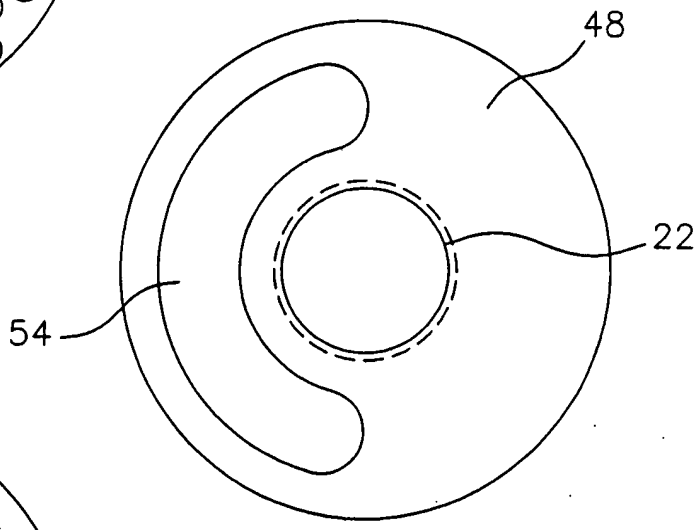


FIGURE 1B

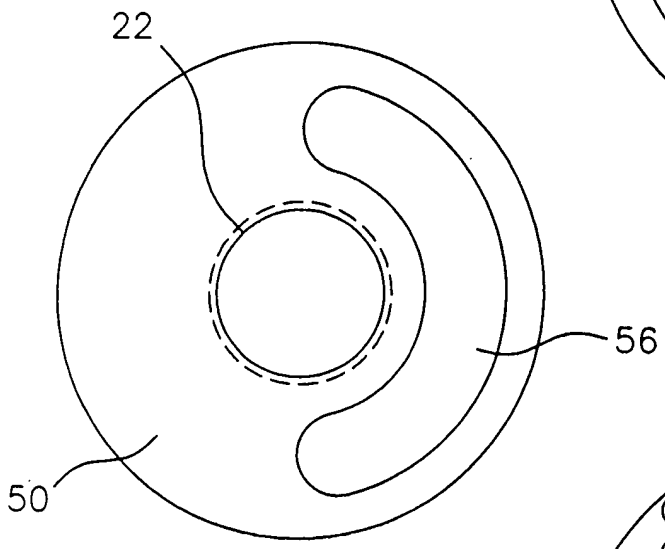


FIGURE 1C

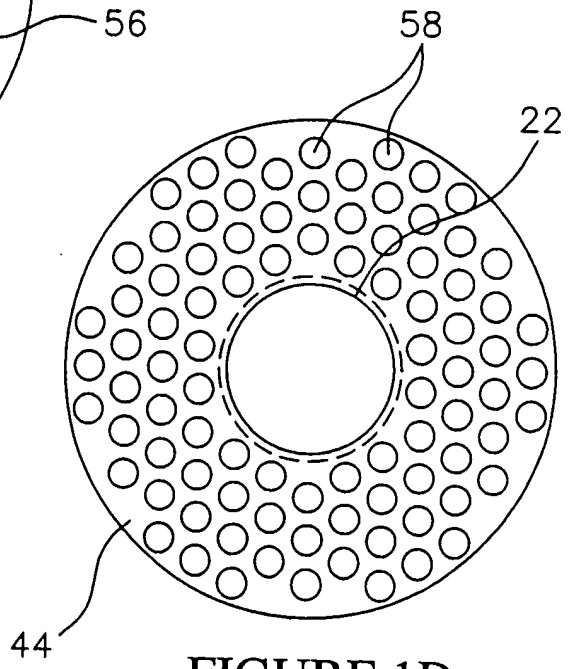


FIGURE 1D

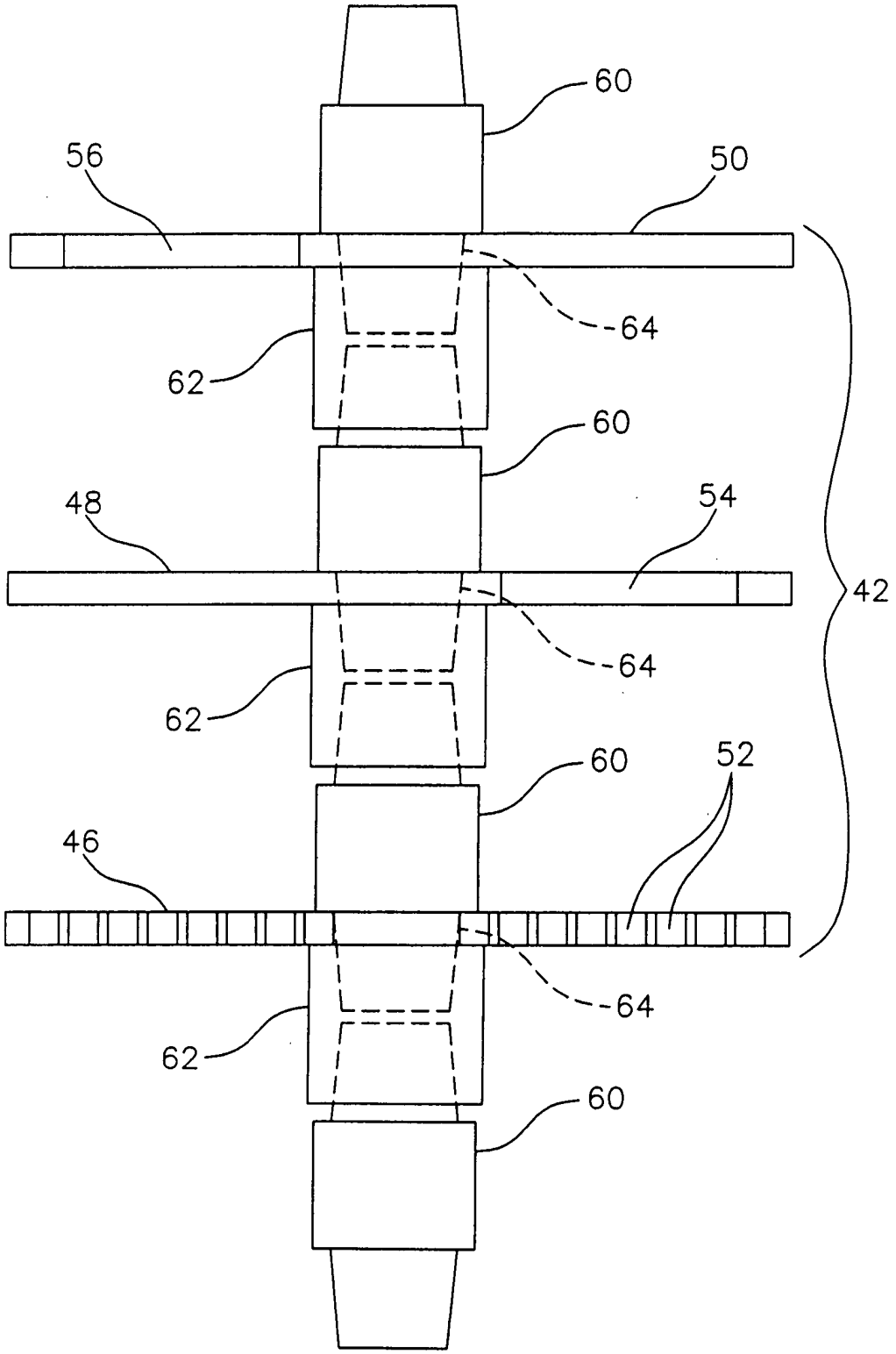
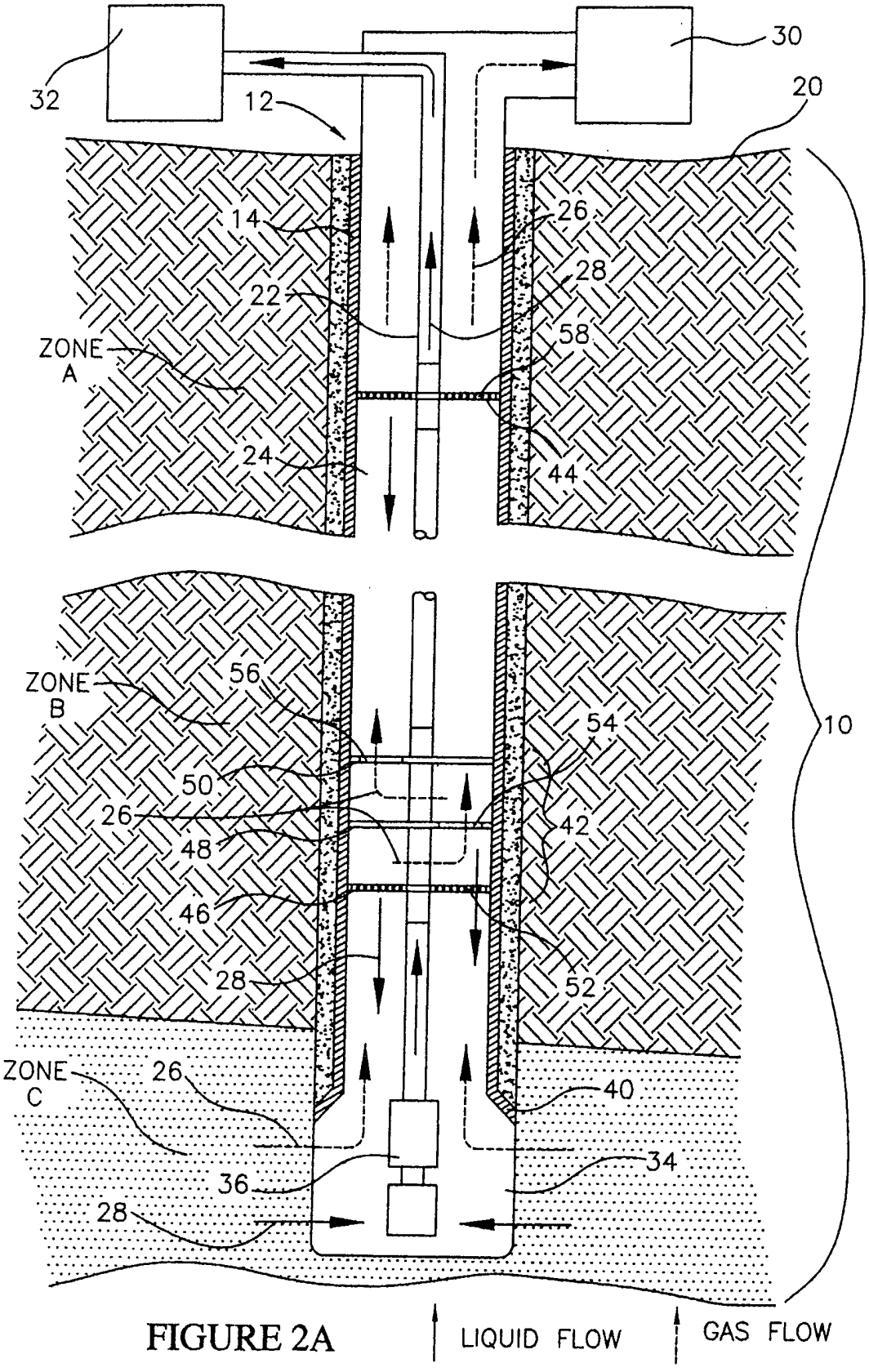


FIGURE 1E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12
30
20
14
26
22
28
58
ZONE A
24
44
ZONE B
56
54
10
50
26
42
48
46
28
52
ZONE C
26
40
34
36
28
LIQUID FLOW
GAS FLOW

FIGURE 2A

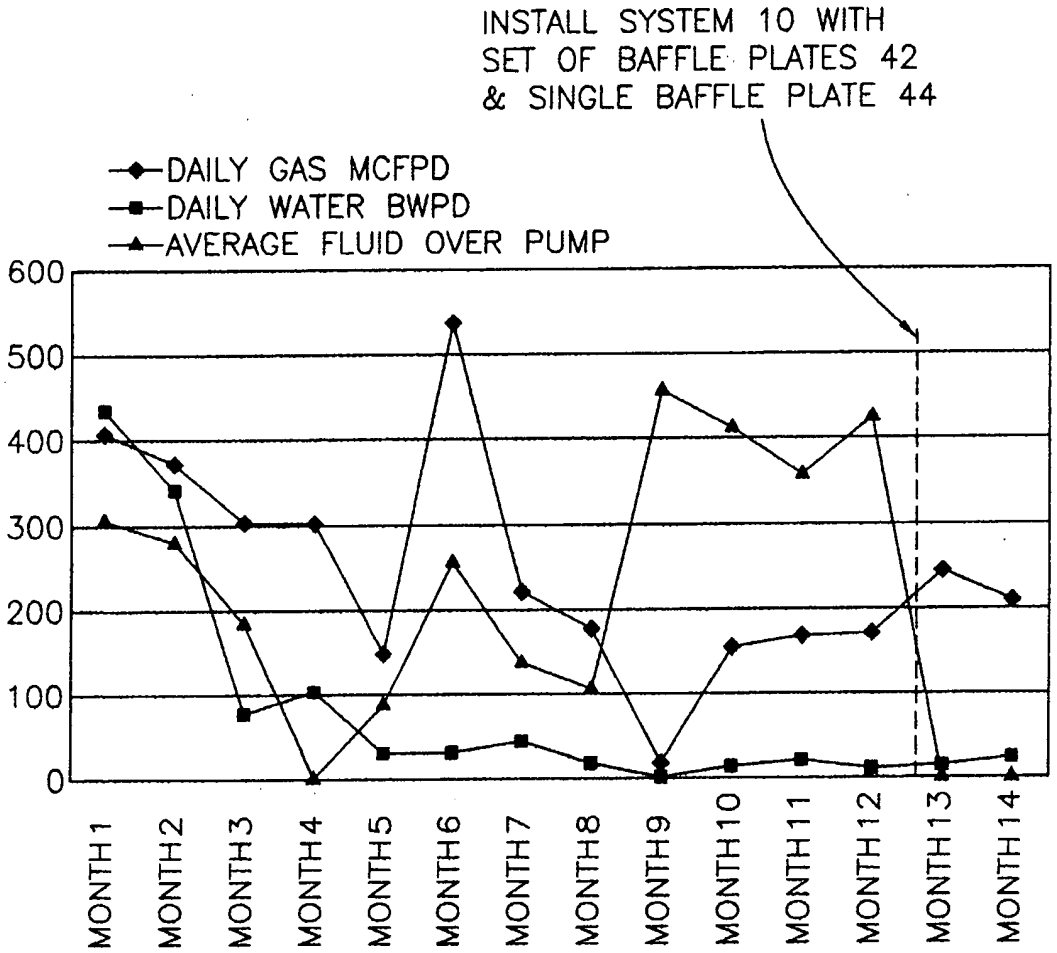
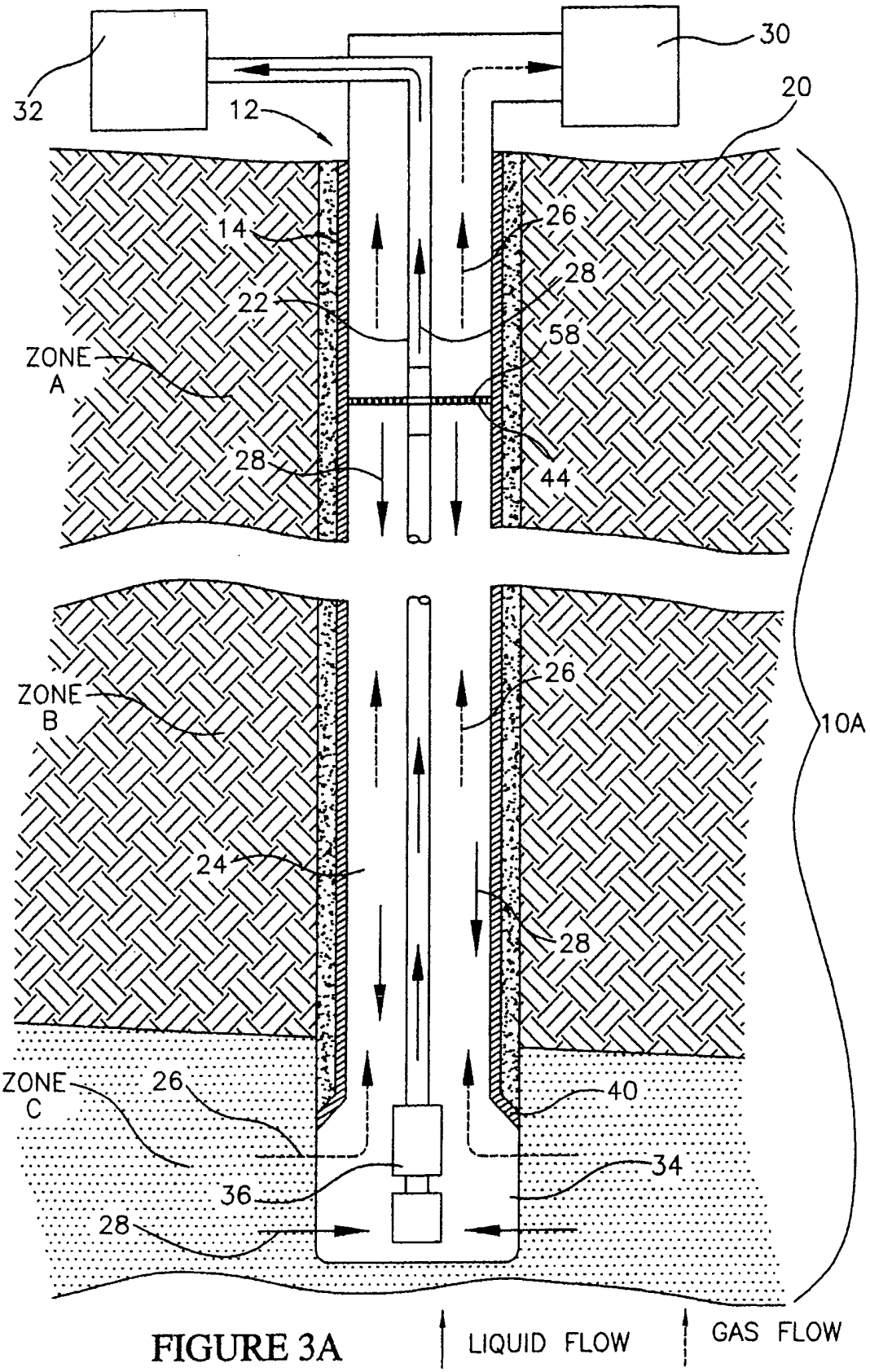

INSTALL SYSTEM 10 WITH
SET OF BAFFLE PLATES 42
& SINGLE BAFFLE PLATE 44
DAILY GAS MCFPD
DAILY WATER BWPD
AVERAGE FLUID OVER PUMP
600
500
400
300
200
100
0
MONTH 1
MONTH 2
MONTH 3
MONTH 4
MONTH 5
MONTH 6
MONTH 7
MONTH 8
MONTH 9
MONTH 10
MONTH 11
MONTH 12
MONTH 13
MONTH 14

FIGURE 2B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12
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20
14
26
28
22
58
ZONE A
28
44
ZONE B
26
10A
24
28
ZONE C
26
40
34
36
28
LIQUID FLOW
GAS FLOW

FIGURE 3A

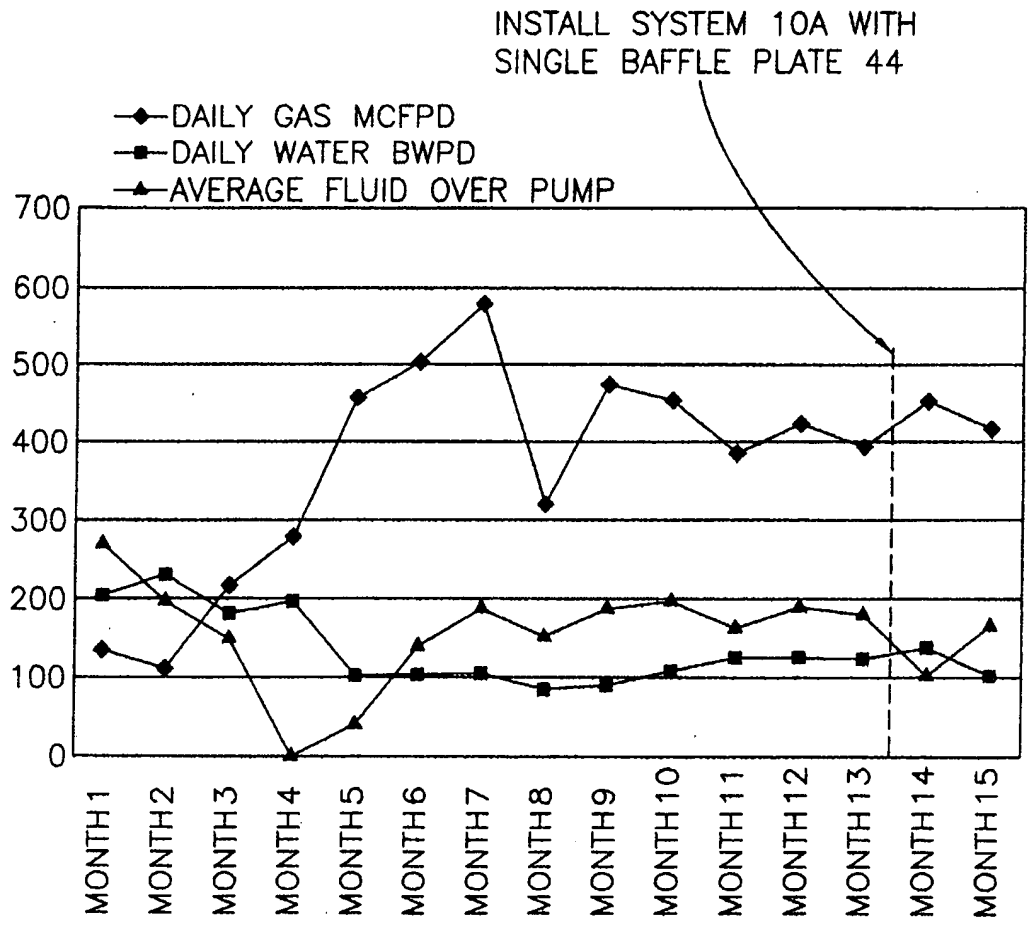

INSTALL SYSTEM 10A WITH
SINGLE BAFFLE PLATE 44
DAILY GAS MCFPD
DAILY WATER BWPD
AVERAGE FLUID OVER PUMP
700
600
500
400
300
200
100
0
MONTH1
MONTH2
MONTH3
MONTH4
MONTH5
MONTH6
MONTH7
MONTH8
MONTH9
MONTH10
MONTH11
MONTH12
MONTH13
MONTH14
MONTH15

FIGURE 3B

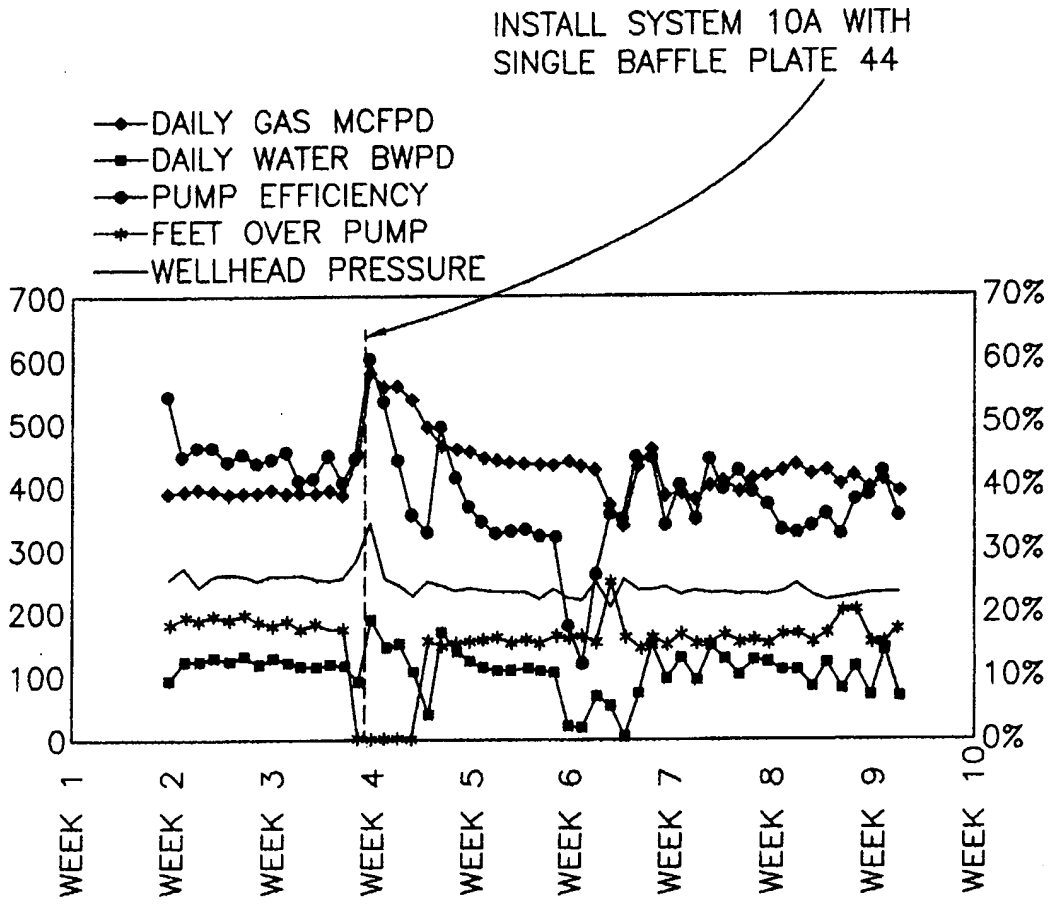
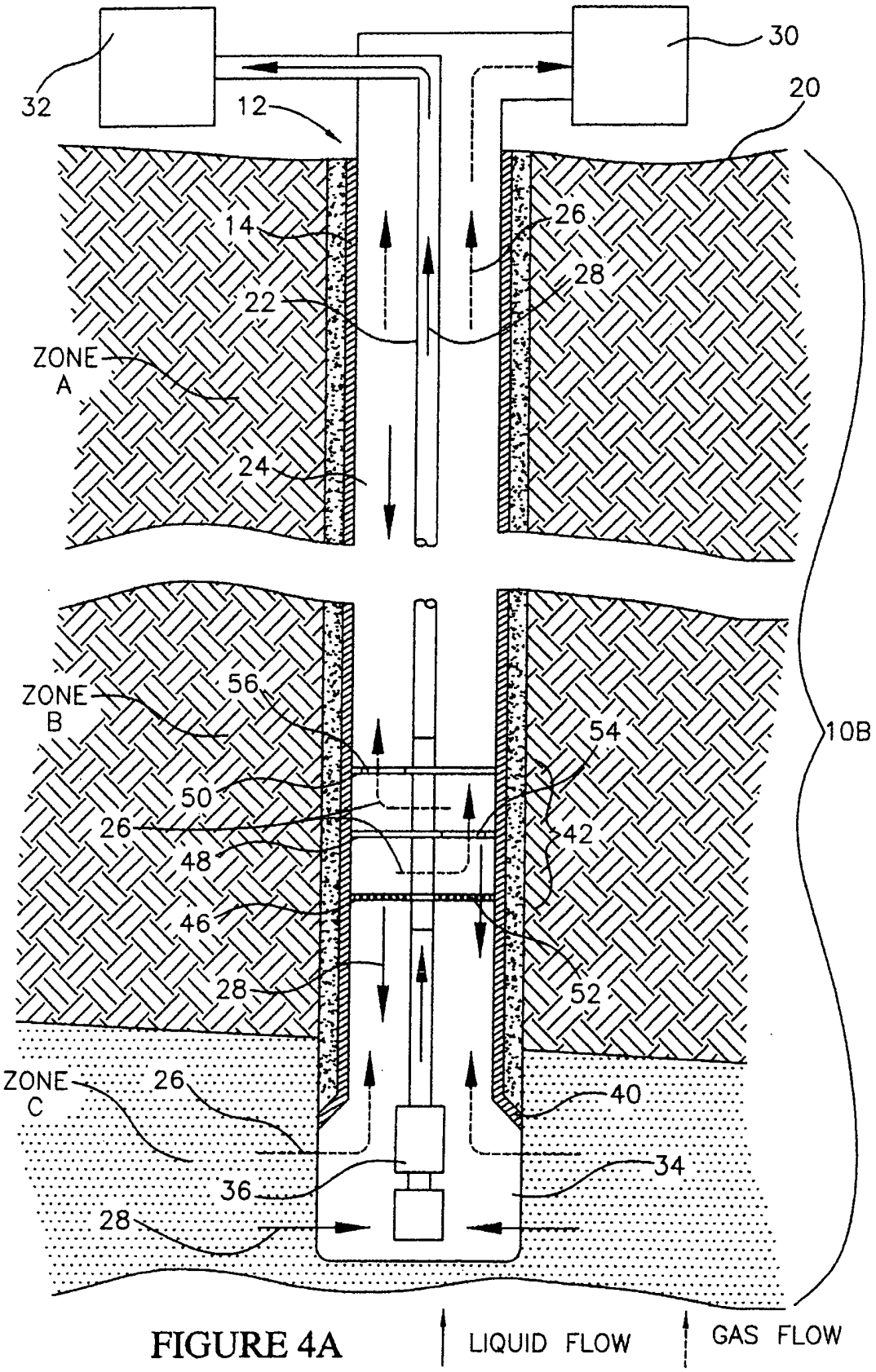

INSTALL SYSTEM 10A WITH
SINGLE BAFFLE PLATE 44
DAILY GAS MCFPD
DAILY WATER BWPD
PUMP EFFICIENCY
FEET OVER PUMP
WELLHEAD PRESSURE
700
600
500
400
300
200
100
0
70%
60%
50%
40%
30%
20%
10%
0%
WEEK 1
WEEK 2
WEEK 3
WEEK 4
WEEK 5
WEEK 6
WEEK 7
WEEK 8
WEEK 9
WEEK 10

FIGURE 3C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12
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14
26
28
22
ZONE
A
24
ZONE
B
56
54
50
26
42
48
46
28
52
10B
ZONE
C
26
40
34
36
28
LIQUID FLOW
GAS FLOW

FIGURE 4A

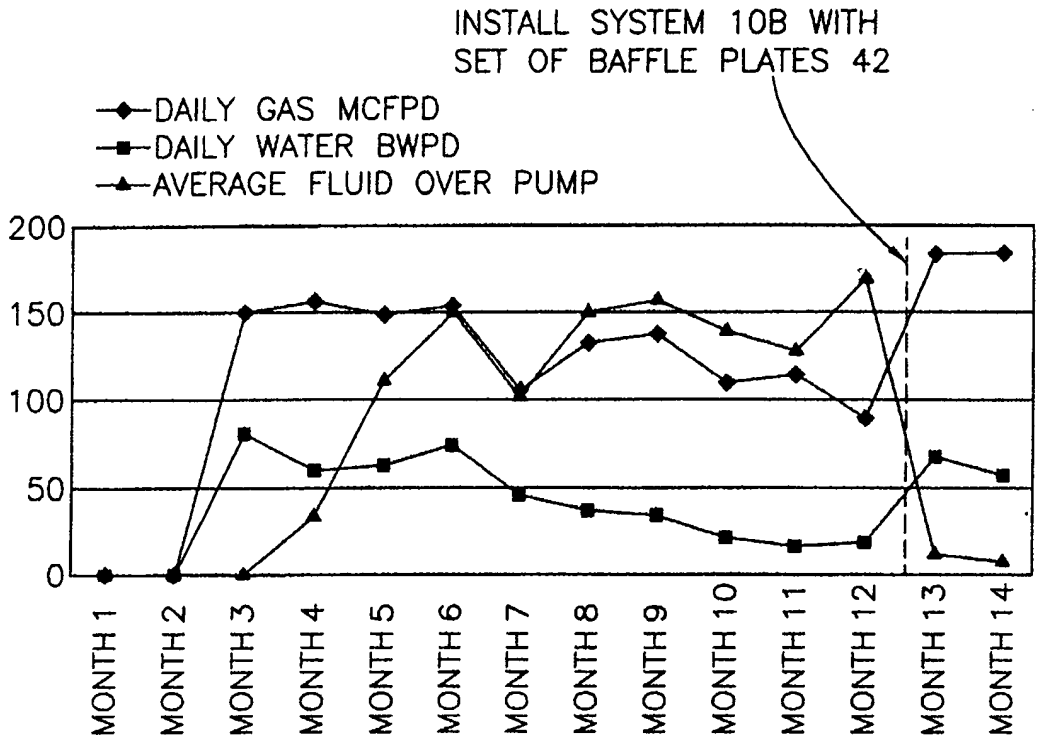

INSTALL SYSTEM 10B WITH
SET OF BAFFLE PLATES 42
DAILY GAS MCFPD
DAILY WATER BWPD
AVERAGE FLUID OVER PUMP
200
150
100
50
0
MONTH 1
MONTH 2
MONTH 3
MONTH 4
MONTH 5
MONTH 6
MONTH 7
MONTH 8
MONTH 9
MONTH 10
MONTH 11
MONTH 12
MONTH 13
MONTH 14

FIGURE 4B

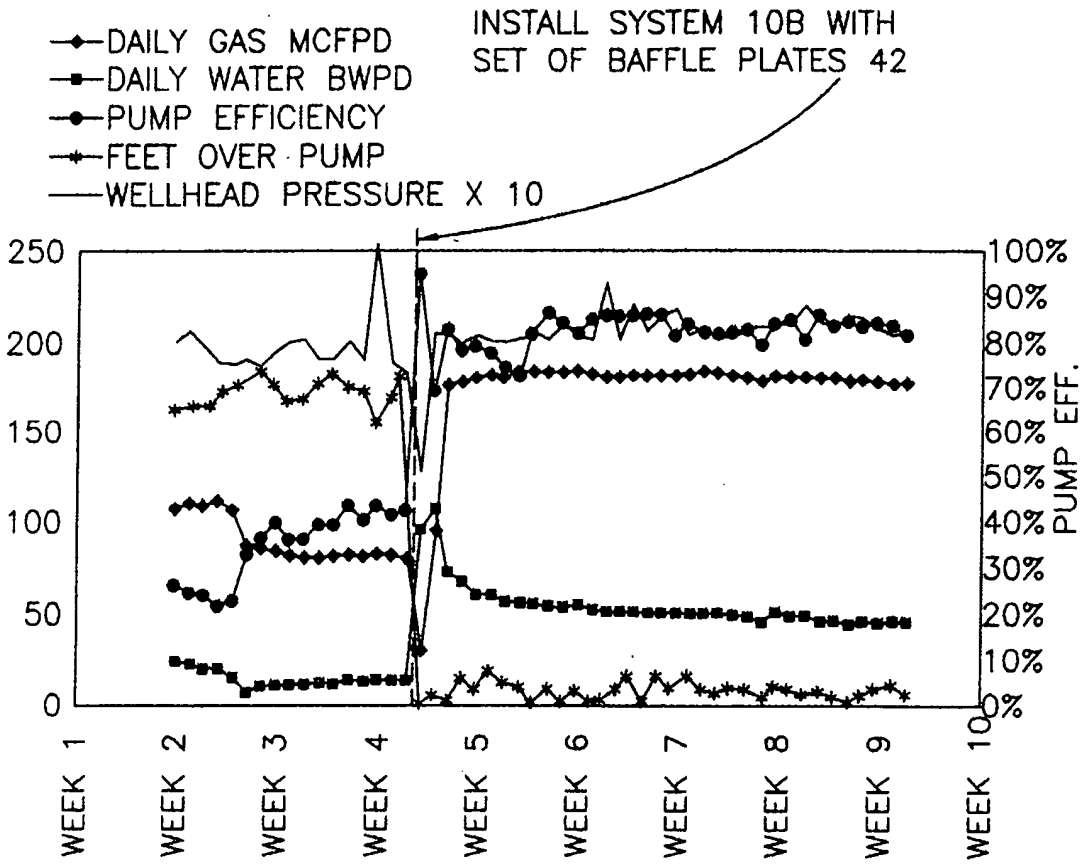
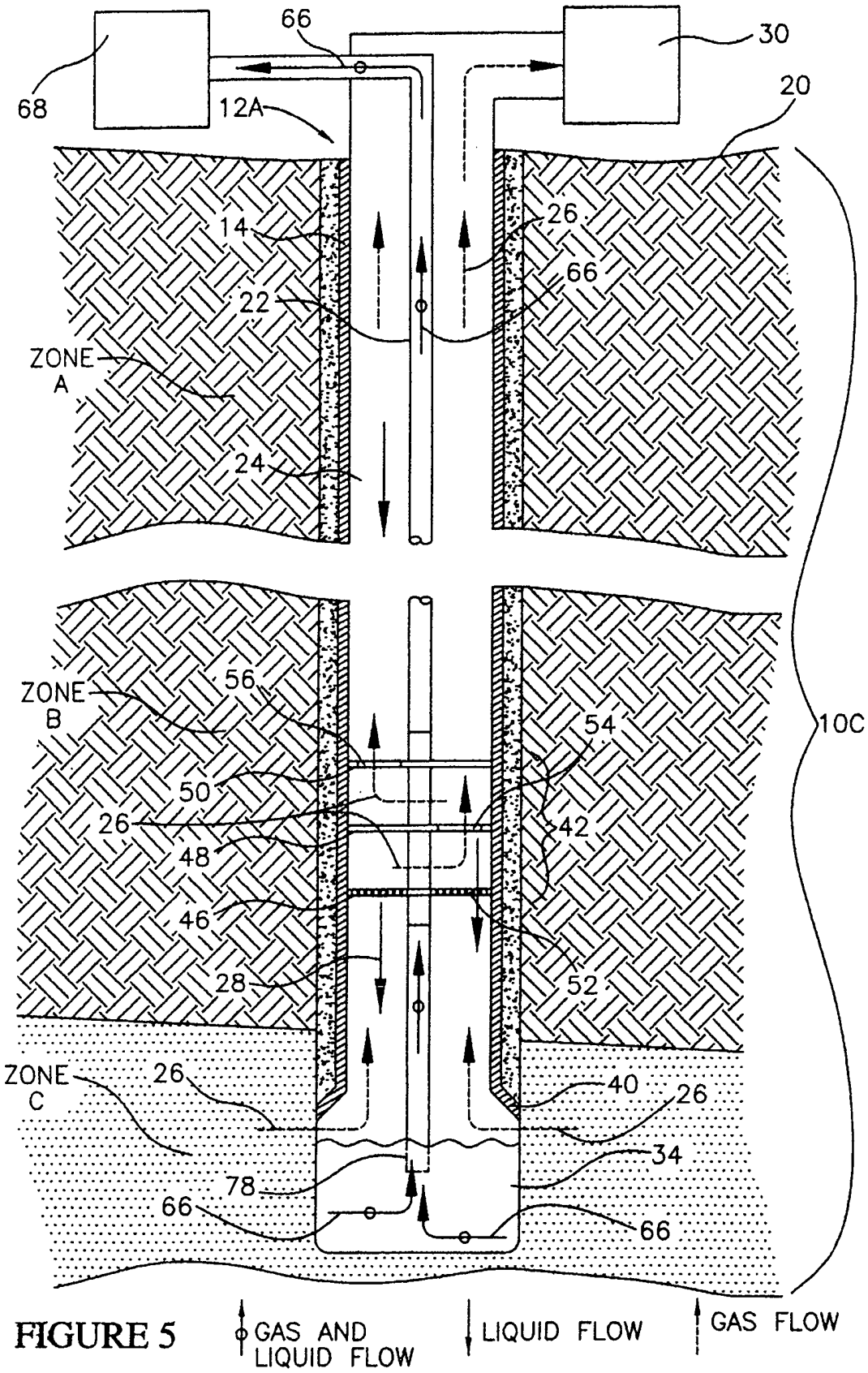

DAILY GAS MCFPD
DAILY WATER BWPD
PUMP EFFICIENCY
FEET OVER PUMP
WELLHEAD PRESSURE X 10
INSTALL SYSTEM 10B WITH
SET OF BAFFLE PLATES 42
250
200
150
100
50
0
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
PUMP EFF.
WEEK 1
WEEK 2
WEEK 3
WEEK 4
WEEK 5
WEEK 6
WEEK 7
WEEK 8
WEEK 9
WEEK 10

FIGURE 4C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68
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20
14
26
66
22
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A
24
ZONE
B
56
54
50
26
42
48
46
28
52
10C
ZONE
C
26
40
26
34
78
66
66
GAS AND
LIQUID FLOW
LIQUID FLOW
GAS FLOW

FIGURE 5

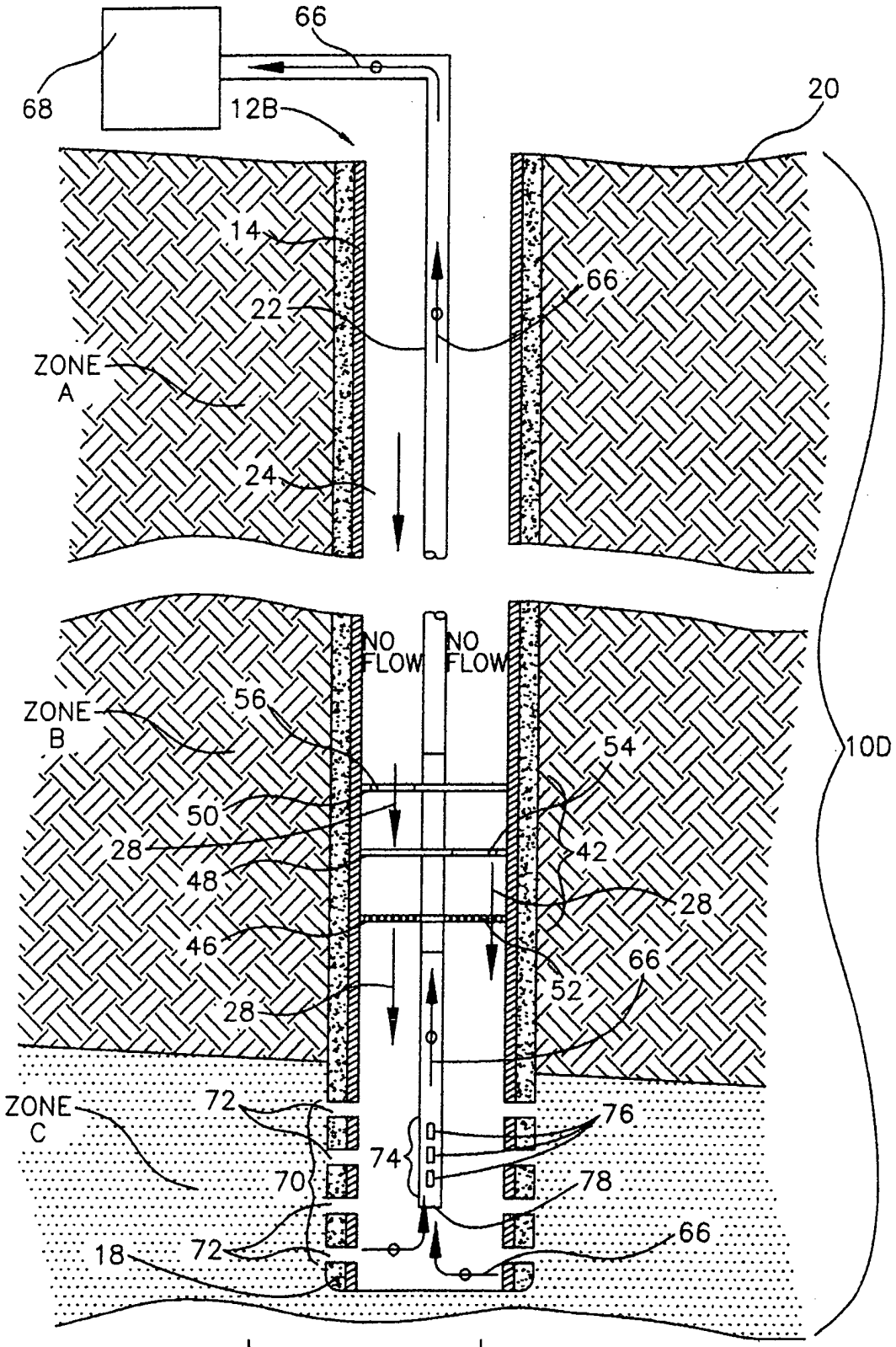

FIGURE 6 GAS AND LIQUID FLOW LIQUID FLOW

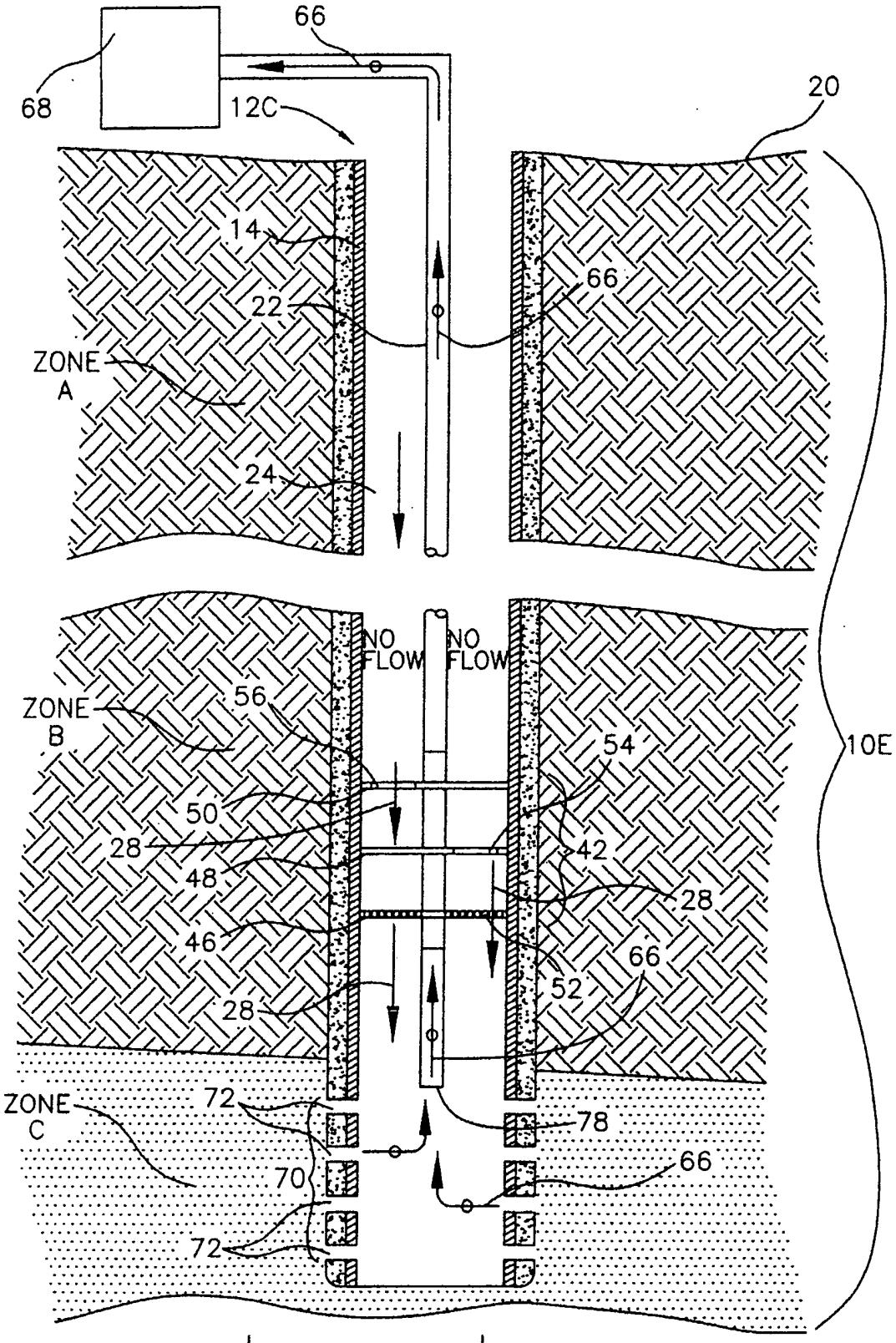
66
68
12C
20
14
22
66
ZONE
A
24
NO
FLOW
NO
FLOW
ZONE
B
56
54
10E
50
28
42
48
28
46
66
52
28
ZONE
C
72
78
70
66
72
GAS AND
LIQUID FLOW
LIQUID FLOW

FIGURE 7

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of:

THOMAS B. SMITH
YALE M. PRESTON

Serial No. 10/867,528

Filing Date: 06/14/2004

For: METHOD AND SYSTEM FOR PRODUCING GAS AND LIQUID IN A SUBTERRANEAN WELL

Attorney Docket No.: 200302USA

PETITION UNDER 37 CFR 1.47(a)

October 6, 2004

Office of Petitions
Mail Stop Petition
Commissioner For Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

Applicant requests that the above application be accorded status under 37 CFR 1.47(a) due to the refusal of inventor Yale M. Smith to execute the application papers. As support for this request attached to this Petition are the following documents.

1. Consent of inventor Thomas B. Smith to prosecute the application under 37 CFR 1.47(a).

2. Combined Declaration and Power of Attorney for Patent Application signed by inventor Thomas B. Smith on behalf of himself and on behalf of nonsigning inventor Yale M. Preston.

3. Statement of Stephen A. Gratton, Attorney for Applicant, offered as proof that the nonsigning inventor received the application papers, and refused to sign the Combined Declaration and Power of Attorney for Patent Application included therewith.

4. The last known address of the nonsigning inventor is:

Yale M. Preston
PO Box 383
Story, WY 82842

5. A check in the amount of $130 as the petition fee. Please deduct any additional fees or credit any overpayment to Deposit Account No. 07-1857.

DATED this 6th day of October, 2004.

Respectfully submitted:

STEPHEN A. GRATTON, No. 28,418
Attorney for Applicant

2764 S. Braun Way
Lakewood, CO 80228
Telephone: (303) 989-6353
FAX (303) 989-6538

CERTIFICATE OF MAILING UNDER 37 C.F.R. §1.8

I hereby certify that this correspondence is being deposited with the United States Postal Service with sufficient postage as First Class mail in an envelope addressed to: Mail Stop Petition, Commissioner For Patents, PO BOX 1450, Alexandria, VA 22313-1450 on this 6th day of October, 2004.

October 6, 2004
Date of Signature

Stephen A. Gratton, Attorney for Applicant