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D. R. BAKER.

APPARATUS FOR EXTRACTING THE VOLATILIZABLE CONTENTS OF SEDIMENTARY STRATA.

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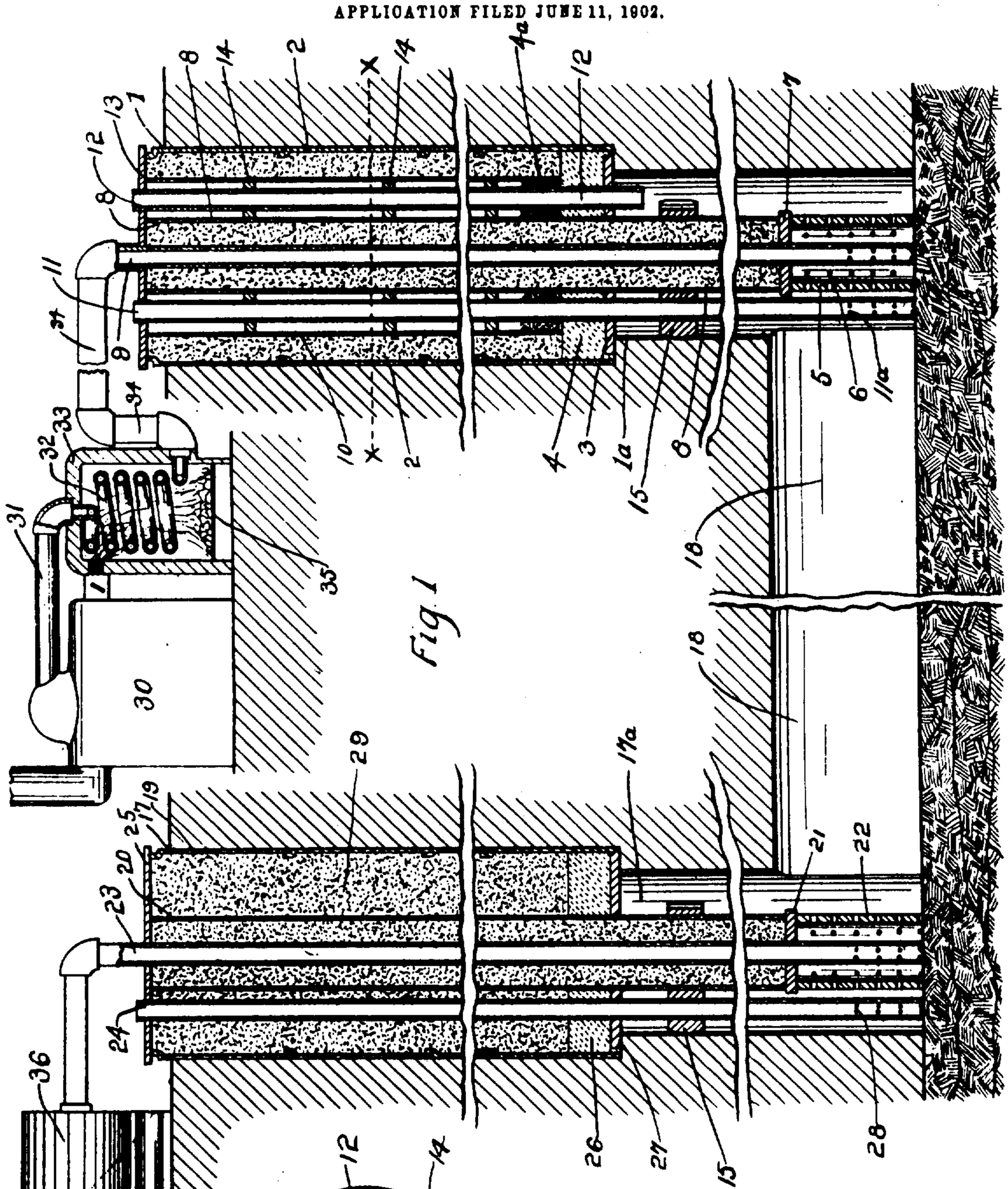

Fig. 1

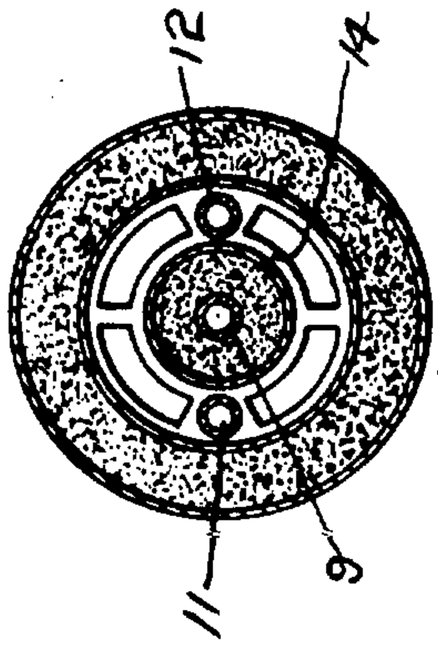

Fig. 2

Fig. 4

Fig. 3

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APPARATUS FOR EXTRACTING THE VOLATILIZABLE CONTENTS OF SEDIMENTARY STRATA.

No. 895,612. Specification of Letters Patent. Patented Aug. 11, 1908.

Application filed June 11, 1902. Serial No. 111,093.

To all whom it may concern:

Be it known that I, DELOS R. BAKER, a citizen of the United States, residing at Delaware, in the county of Delaware, and State of Ohio, have invented a certain new and useful Improvement in Apparatus for Extracting the Volatilizable Contents of Sedimentary Strata, of which the following is a specification.

My invention relates to the improvement of apparatus for the extraction and recovery of the volatilizable contents of sedimentary strata; and the objects of my invention are to provide apparatus and means of novel construction for the purpose above set forth, and to produce certain improvements in details of construction and arrangement of parts which will be more fully pointed out hereinafter. These objects I accomplish in the manner illustrated in the accompanying drawings, in which—

Figure 1 shows a vertical section through two connected earth wells or channels and their contents. Fig. 2 is a transverse section on line *x x* of Fig. 1. Fig. 3 is a detail plan view of one of the lower guide rings and Fig. 4 is a section on line *y y* of Fig. 3.

Similar numerals refer to similar parts throughout the several views.

In carrying out my invention, I employ a channel or well 1 formed in the earth, which although preferably vertical may extend instead in other directions, if desired. The well thus employed preferably has its lower portion of less diameter than its upper portion as indicated at 1^a. The upper and larger portion of the well is provided with a water-tight casing 2 which fits therein, said casing being formed of sections which are arranged one upon the other, as shown. Within the lower end of the enlarged upper portion of the well 1 and seated upon the shoulder formed by the junction of the enlarged and reduced portions of said well, is a plate 3 preferably of metal and upon and about the latter is arranged a sealing diaphragm 4 of cement, concrete or similar material, upon which is superimposed a layer of dried and pulverized clay or its equivalent 4^a. In the lower end or bottom of the well 1, I provide a vertically arranged tubular body 5, the latter being perforated as indicated at 6. Upon the upper end of this tubular body or casing 5, I provide a cap-plate 7. Bearing upon this cap-plate is the lower end of a casing 8, the latter extending upward through the central portion of the casing 1, as shown. Extending downward and centrally through the casing 8 is a tube or pipe 9, the latter having its lower portion extending through the cap-plate 7 and into the tubular perforated body 5, said lower pipe portion being perforated. Bearing upon the sealing diaphragm 4 is a casing 10 of greater diameter than the casing 8, and between said casings 8 and 10 are arranged tubes or pipes 11 and 12, said pipes 11 and 12 leading upward through a top plate 13 of the external casing 1. The pipe 11 passes downward through the lower end portion of the well 1 on the outer side of the tubular body 5, and has its lower portion perforated as indicated at 11^a. The pipe 12 has its lower termination preferably a short distance below the plate 3. As indicated in the drawing, the spaces between the central pipe 9 and casing 8 and between the casing 10 and casing 1, are filled with sand or other suitable heat-insulating material.

At intervals within the casing 10, and fitting loosely within the said casing, I preferably provide guide-rings such as are indicated at 14, each of which as shown more clearly in Fig. 2 of the drawing, is in the nature of an open-work ring having openings for the reception of the tubes or pipes 11 and 12. In the lower portion of the well, I likewise provide at suitable intervals guide-rings or frames 15, each of the latter consisting of a central ring portion from which project radially one or more T-arms 16, one of said arms being enlarged and formed with an opening 16^a for the reception of the pipe 11. The heads of the T-arms 16 are adapted to bear against the inner surface of the well.

In connection with the well 1, I employ one or more additional wells 17, each of the latter being as prescribed for said well 1 formed with a lower reduced portion 17^a. These additional wells are located at a distance from well 1 and communicate with well 1 only through the seams, veins, pores or other natural openings in said strata. The well 17 is, as prescribed for the well 1, provided with a casing 19, within the central portion of which is arranged a casing 20 which bears upon the cap-plate 21 of a perforated tubular body 22 located in the bottom of the well. Through the central portion of the casing 20 passes a pipe 23 which

likewise passes through the central opening in the plate 21 and has its portion within the tubular body 22 perforated. I also provide an outlet pipe 24, which as is the case with the pipe 23, passes through an opening in the top plate 25, thence downward within and through the casing 19 through the sealing diaphragm 26 in the lower end of the enlarged portion of the well, thence through a plate 27 corresponding with the plate 3 and terminating in the lower end of the well, said terminal portion being perforated as indicated at 28. The reduced portion of the well may be provided as prescribed for the well portion 1ª with a desirable number of guide-rings or frames 15. The sealing diaphragms 4 and 26 fit so loosely about the tubes and casings which perforate the said diaphragms, as to allow of vertical motion of said tubes and casings without breaking the seal made by the superincumbent layer of pulverized clay 4ª.

As prescribed for the casings of the well 1, those portions of the interior of the casings 19 and 20 which are not occupied by the material forming the casing 20 and tubes 23 and 24 are provided with a suitable heat-insulating filling 29. The said seal of that part of the said strata intervenient between the innermost portions of said wells respectively, is effected partly by the impervious strata already naturally superincumbent upon said innermost strata which is to be operated upon, the said superincumbent strata constituting the natural element of said seal. Partly also it is effected by the said desiccated and pulverized clay which I superimpose upon the sealing diaphragm 4, which clay-layer is the artificial element of the said seal. This artificial element of said seal is by its own nature and condition defended against any disruptive action upon it of heat conveyed in any of the tubes which penetrate therethrough. But that part of the natural element of said seal which lies immediately contiguous to either the entrance well or the exit well would be speedily disrupted by the desiccating and destructively distilling action of heat radiated from said tubes to said casings and from said casings into said contiguous parts of said natural element of said seal, and thus would defeat the operation of the invention, unless some adiathermic defense of said casings and thereby of said contiguous parts of said natural element of said seal were provided. Hence for this purpose I arrange to interpose between said tubes and the sides of said wells the adiathermic defenses above shown and described. Incidentally also said adiathermic defenses operate to conserve the heat of said fluid agents during their passage through said tubes into and out of the innermost (sealed) portions of said wells. But this conservation of heat in passage is but a secondary and incidental effect, the primary and chief function of said defenses being the preservation, as said above, of the said seal against the disruptive action of heat upon those parts of the said natural element of said seal situate contiguous to said wells.

At a suitable point above or adjacent to the earth's surface, I provide a boiler 30 which through a pipe 31 connects with a coiled pipe 32 arranged in a chamber 33, said coiled pipe at its lower end being connected through a pipe 34 with the upper end of the pipe 9. Below the coiled pipe I employ fire supporting grate-bars 35. With the upper end of the pipe 23 is connected a suitable reservoir 36.

The apparatus above described is designed to be utilized for the purpose hereinbefore set forth, as follows: Steam, or other vapor, generated in the boiler 30 and passed through the coil 32 is super-heated from the fire on the grate-bars 35, said super-heated steam, or other vapor or gas passing through the pipes 34 and 9 and through the perforations of the latter and the perforations of the body 5 and thence by means of difference of pressure maintained in the two wells respectively through the veins, pores, interstices or other natural channels in said strata to well 17, with the result that the sedimentary strata in place in the earth, is operated upon by the heated vapor or gas thus furnished, this operation in turn resulting in the extraction of the volatilizable contents of the strata in the manner fully set forth in my former application for patent, Serial Number 109,835, filed June 2nd, 1902. The operation referred to is briefly as follows: The heat conveyed by said heated fluids during their passage through said strata, distil therefrom any contents of said strata of lower boiling point than the temperature of the said fluids. The said distillation by lessening the cubical contents of the said strata, disrupts the said strata and opens up therein, crevices and cavities in all directions, thereby exposing progressively ever new surfaces to the said process of distillation until at length the said strata by this operation becomes exhausted of its said volatilizable contents. As set forth in said former application, the volatilizable contents thus extracted may pass outward through the pipe 23 of the well 17 and collected in the reservoir 36. Such liquid product as may result from the action of the heated vapor or gas on the rocks may be withdrawn by suitable means through the pipe 11 or pipe 24.

Although I have described the use of the means and apparatus herein shown in connection with steam or other vapor generated, super-heated and conveyed as described, said apparatus is as set forth in my said former application, adapted for the purpose of conveying to the sedimentary strata in place in the earth, heated gases, vapors or fumes and

for the recovery of the volatilizable products of the operation of said heated gases, vapors or fumes upon the said rocks in place.

In order to effect and maintain a difference of pressure in the inlet and outlet pipes or tubes and thereby provide a desirable circulation of said gases, vapors or fumes and of the products of their operation, it is evident that I may employ in connection with said outlet tube, any desirable or well known form of exhaust pump or engine.

Having now fully described my invention, what I claim and desire to secure by Letters Patent is,

In an apparatus for extracting the volatilizable contents of sedimentary strata in place in the earth, the combination with two earth wells intercommunicating subterraneously only through natural openings in said strata, and with conduits for the circulation of a heated aeriform fluid from the earth's surface through one of said wells to said openings, thence through said openings, and thence through the other of said wells back to the earth's surface again, of a well seal consisting of both a natural and an artificial element, said artificial element being composed of adiathermic material which is interposed between said conduits and said natural element.

DELOS R. BAKER.

In the presence of—
C. C. SHEPHERD,
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