H. A. BARDEEN.

APPARATUS FOR ANNEALING AND STRAIGHTENING PIPE.

APPLICATION FILED JUNE 28, 1916.

1,260,624. Patented Mar. 26, 1918.

Fig. 1.

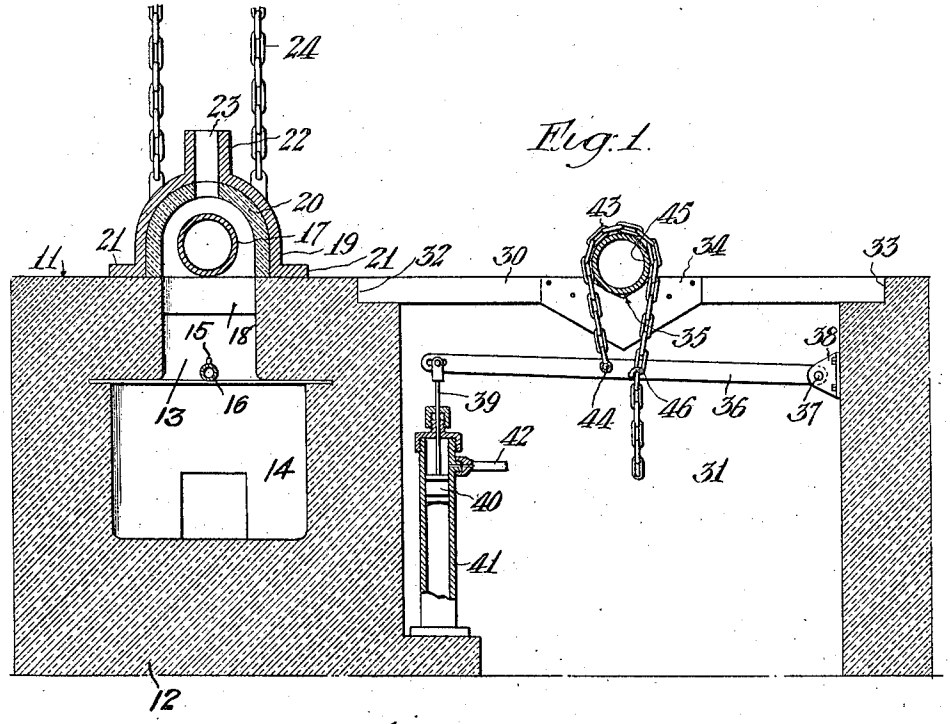
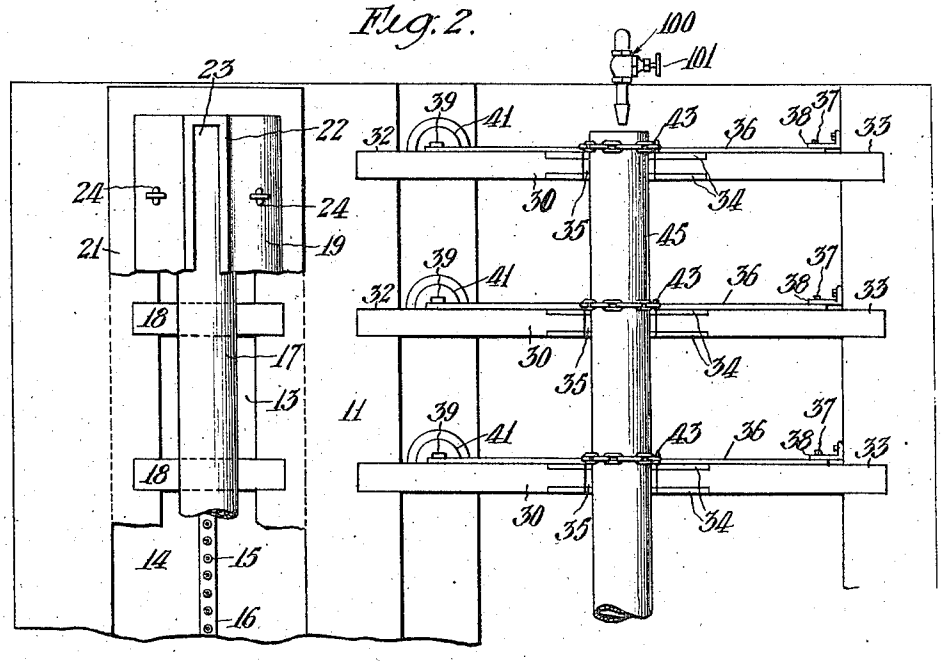


Fig. 2.



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UNITED STATES PATENT OFFICE.

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APPARATUS FOR ANNEALING AND STRAIGHTENING PIPE.

1,260,624. Specification of Letters Patent. Patented Mar. 26, 1918.

Original application filed April 10, 1916, Serial No. 90,267. Divided and this application filed June 28, 1916. Serial No. 106,538.

To all whom it may concern:

Be it known that I, HUGH A. BARDEEN, a citizen of the United States, residing at Venice, in the county of Los Angeles and State of California, have invented a new and useful Apparatus for Annealing and Straightening Pipe, of which the following is a specification.

The invention disclosed herein is a division of my application, Serial No. 90,267, filed April 10, 1916.

My invention relates to a new art, namely, that of annealing and straightening crystallized and crooked pipe. Pipe of this character is very plentiful in the oil fields, large quantities of such pipe being used as drill pipe and becoming badly damaged both by being bent and by being crystallized when in use.

The principal object of my invention is to provide an apparatus by which such pipe can be annealed and straightened, so that it is restored to its original condition. Various oil operators have from time to time attempted to anneal such pipe, but have found that the pipe after annealing is valueless for their purpose, due to the fact that it is not sufficiently straight, the operations of heating and cooling tending to warp the pipe so that it is valueless for most purposes. Certain operators have attempted to straighten the pipe while cold, but such cold straightening is injurious to the pipe as it sets up internal strains therein which manifest themselves by breakage or bending when the pipe is in use. By my invention, the pipe is annealed and straightened while hot, so that it is ready for immediate use in an oil well.

Further objects and advantages will be set forth hereinafter.

In the drawings, which are for illustrative purposes only:

Figure 1 is a sectional elevation showing a preferred form of my invention.

Fig. 2 is a plan view of the same, portions thereof being broken away or shown in section to better illustrate the internal structure.

In the form of the invention illustrated in the drawings, a surface 11 is formed of various supports hereinafter to be described, this surface being practically continuous so that pipe can be readily rolled thereover either when hot or cold with certain advantages which will be set forth hereinafter. For the purpose of heating the pipe, I provide a masonry structure 12 having a flue opening 13 in the center thereof, this flue opening being somewhat longer than the pipe to be treated, and being fed by a draft opening 14 which extends longitudinally under the pipe and communicated with the outer air at either end. A series of burners 15, fed with oil or gas from a longitudinal pipe 16, are provided, these burners 15 projecting upwardly in the opening 13 and providing the heating medium for heating the pipe shown at 17. This pipe is placed on a series of fire brick, or metal members 18 which extend across the opening 13 at regular intervals, the space between the members 18 being open so that the hot gases from the burners 15 may play against the bottom and pass around the sides of the pipe 17. A hood 19, preferably formed of metal, lined with fire resisting material 20, is provided, this hood being of sufficient length to cover the longest length of pipe which it will ever be desired to anneal. The hood 19 is provided with flanges 21 which rest on the surface 11 and form a tight closure therewith. A short chimney 22 is provided in the top of the hood having a flue 23 therein through which the hot gases supplied by the burners 15 may escape. Chains 24, or equivalent means, are provided, by means of which the hood may be lifted bodily. A series of straightening supports 30 are provided, these supports extending over a pit 31 forming an extension of the surface 11, and being secured at 32 and 33 in the walls of this pit. These supports are preferably of metal and each has near the center thereof a plate 34, these plates being preferably provided with V-notches 35, the notches 35 of the different plates being in alinement so that a pipe which rests in all of these notches is in a straight line. Straightening levers 36 are pivoted at 37 on supports 38 fixed on the wall of the pit 31, these levers extending over and being secured to piston rods 39 secured to pistons 40 sliding in cylinders 41. The upper portion of each of the cylinders 41 may be supplied with compressed air or other fluid through a supply pipe 42. Hold-down chains 43 are pivoted at 44 on the le-

vers 36 and are of sufficient length to pass over a pipe 45 resting in the notches 35, the other end of each of the chains 43 being secured on hooks 46 secured in the lever 36. The cylinder 41 is rigidly secured on the floor of the pit.

The method of operation is as follows:

A pipe 17, which may be badly bent and crystallized, is rolled on the supports 18, and the hood 19 is dropped thereover as shown in Fig. 1. The burners 15 are then lighted, and the hot flames are allowed to play on the bottom of the pipe, passing around and over the pipe and upwardly through the opening 23 in the chimney 22. This operation is continued until the pipe is raised considerably above a red heat, this being a satisfactory temperature for thoroughly annealing and removing the crystallization therefrom.

I have found that where pipe is annealed in this manner that there is great liability of any bends or crooks therein being accentuated during the heating operation, so that the pipe after having been thoroughly heated is still very crooked. This pipe could be allowed to cool and might be straightened after it cools off, but I have found that where pipe is so straightened that it has an inherent tendency to resume its crooked condition, and I have further found that where such pipe is straightened cold that there is liability of injuring the metal during the cold straightening operation. For these reasons, I prefer to straighten the pipe while it is hot and in a semi-plastic condition. For this purpose the apparatus shown is provided.

After the pipe is thoroughly heated the hood 19 is lifted and the pipe is immediately rolled or pushed into the position shown at 45 in Fig. 1. By resting the pipe on the surface 11, which is continuous from the heating means to the straightening means, and by providing the hood 19 which can be rapidly raised, I am able to transfer the pipe from the position 17 to the position 45 in a minimum of time, so that it may be pushed into the notches 35 without any appreciable loss of heat. The chains are then thrown over the pipe and secured on the hooks 46. As soon as all these chains are secured, and there may be as many of them as are necessary to produce straight pipe, compressed air is turned in through the pipe 42 and each of the levers 36 is pushed down, the chains 43 pulling the pipe to its bearings in the notches 35. The whole operation of moving the pipe over into the notches 35, throwing the chains therearound and clamping it down, can be performed very rapidly.

In the actual operation of my invention, operating on six inch diameter pipe, which is a common size in use in the oil fields, I prefer to place one of the straightening supports 30 at least every eighteen inches and preferably every foot along the length of the pipe. By so doing, the pipe may be pulled down so that it is straight, even very short kinks being readily taken out by this method. By providing an apparatus in which the transfer from the heating means to the straightening means is made very rapidly, and by providing connection means for pulling the pipe down, I am able to straighten it before it cools off appreciably, thus preventing injuring the metal. After the pipe has been pulled down to its bearings, it may be artificially cooled by means of a steam jet 100 which is controlled by a valve 101, or by compressed air, or by other means. I prefer to round the edges of the notches 35 so that the pipe in contraction can slide therethrough and can also slide through the chains 43. I have found that pipe can be readily and rapidly straightened by this method and that when it is so straightened it is superior to cold straightened pipe, and that it is generally superior to the average run of commercial pipe which has not been subjected to any special heat treatment and which is ordinarily straightened cold in the process of manufacture.

I claim as my invention:—

1. An apparatus for annealing and straightening pipe, comprising supports forming a surface over which the pipe may be rolled, means for heating a pipe resting on said surface, hood means for preventing the escape of heat from said pipe while it is being heated, and means in said supports for restraining said heated pipe in a straight line.

2. An apparatus for annealing and straightening pipe comprising supports forming a surface over which the pipe may be rolled, means for heating a pipe resting on said surface, hood means for preventing the escape of heat from said pipe while it is being heated, means for cooling said pipe, and means in said supports for restraining said heated pipe in a straight line while it is being cooled.

3. An apparatus for annealing and straightening pipe comprising supports forming a surface over which the pipe may be rolled, means for heating a pipe resting on said surface, hood means for preventing the escape of heat from said pipe while it is being heated, a steam jet for cooling said pipe, and means in said supports for restraining said heated pipe in a straight line while it is being cooled.

4. An apparatus for annealing and straightening pipe comprising supports forming a surface over which the pipe may be rolled, a gas or oil burner for heating a pipe resting on said surface, hood means for preventing the escape of heat from said pipe while it is being heated, and means in

said supports for restraining said heated pipe in a straight line.

5. An apparatus for annealing and straightening pipe comprising supports forming a surface over which the pipe may be rolled, means for heating a pipe resting on said surface, hood means for preventing the escape of heat from said pipe while it is being heated, means for raising and lowering said hood means to allow the pipe a free movement over said surface, and means in said supports for restraining said heated pipe in a straight line.

6. An apparatus for annealing and straightening pipe comprising supports forming a surface over which the pipe may be rolled, means for heating a pipe resting on said surface, hood means for preventing the escape of heat from said pipe while it is being heated, a series of cooling supports in the plane of said surface, said supports extending under the pipe and having notches in the upper surface thereof in which the pipe may rest, the notches in said supports being of similar size and in alinement with each other, and means by which the heated pipe may be clamped down in said notches.

7. An apparatus for annealing and straightening pipe comprising supports forming a surface over which the pipe may be rolled, means for heating a pipe resting on said surface, hood means for preventing the escape of heat from said pipe while it is being heated, a series of cooling supports in the plane of said surface, said supports extending under the pipe and having notches in the upper surface thereof in which the pipe may rest, the notches in said supports being of similar size and in alinement with each other, pull-down means under each support, and means by which said pull-down means may engage said pipe and pull said pipe to a bearing in said notches.

8. An apparatus for annealing and straightening pipe comprising supports forming a surface over which the pipe may be rolled; means for heating a pipe resting on said surface; and means in said supports for restraining said heated pipe in a straight line.

9. An apparatus for annealing and straightening pipe comprising supports forming a surface over which the pipe may be rolled; means for heating a pipe resting on said surface; means for cooling said pipe; and means in said supports for restraining said heated pipe in a straight line while it is being cooled.

10. An apparatus for annealing and straightening pipe comprising supports forming a surface over which the pipe may be rolled; means for heating a pipe resting on said surface; a steam jet for cooling said pipe; and means in said supports for restraining said heated pipe in a straight line while it is being cooled.

11. An apparatus for annealing and straightening pipe comprising supports forming a surface over which the pipe may be rolled; a gas or oil burner for heating a pipe resting on said surface; and means in said supports for restraining said heated pipe in a straight line.

12. An apparatus for annealing and straightening pipe comprising supports forming a surface over which the pipe may be rolled; means for heating a pipe resting on said surface; a series of cooling supports in the plane of said surface, said supports extending under the pipe and having notches in the upper surface thereof in which the pipe may rest, the notches in said supports being of similar size and in alinement with each other; and means by which the heated pipe may be clamped down in said notches.

13. An apparatus for annealing and straightening pipe comprising supports forming a surface over which the pipe may be rolled; means for heating a pipe resting on said surface; a series of cooling supports in the plane of said surface; said supports extending under the pipe and having notches in the upper surface thereof in which the pipe may rest, the notches in said supports being of similar size and in alinement with each other; and means by which the heated pipe may be clamped down in said notches.

In testimony whereof, I have hereunto set my hand at Los Angeles, California, this 22nd day of June, 1916.

HUGH A. BARDEEN.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."