

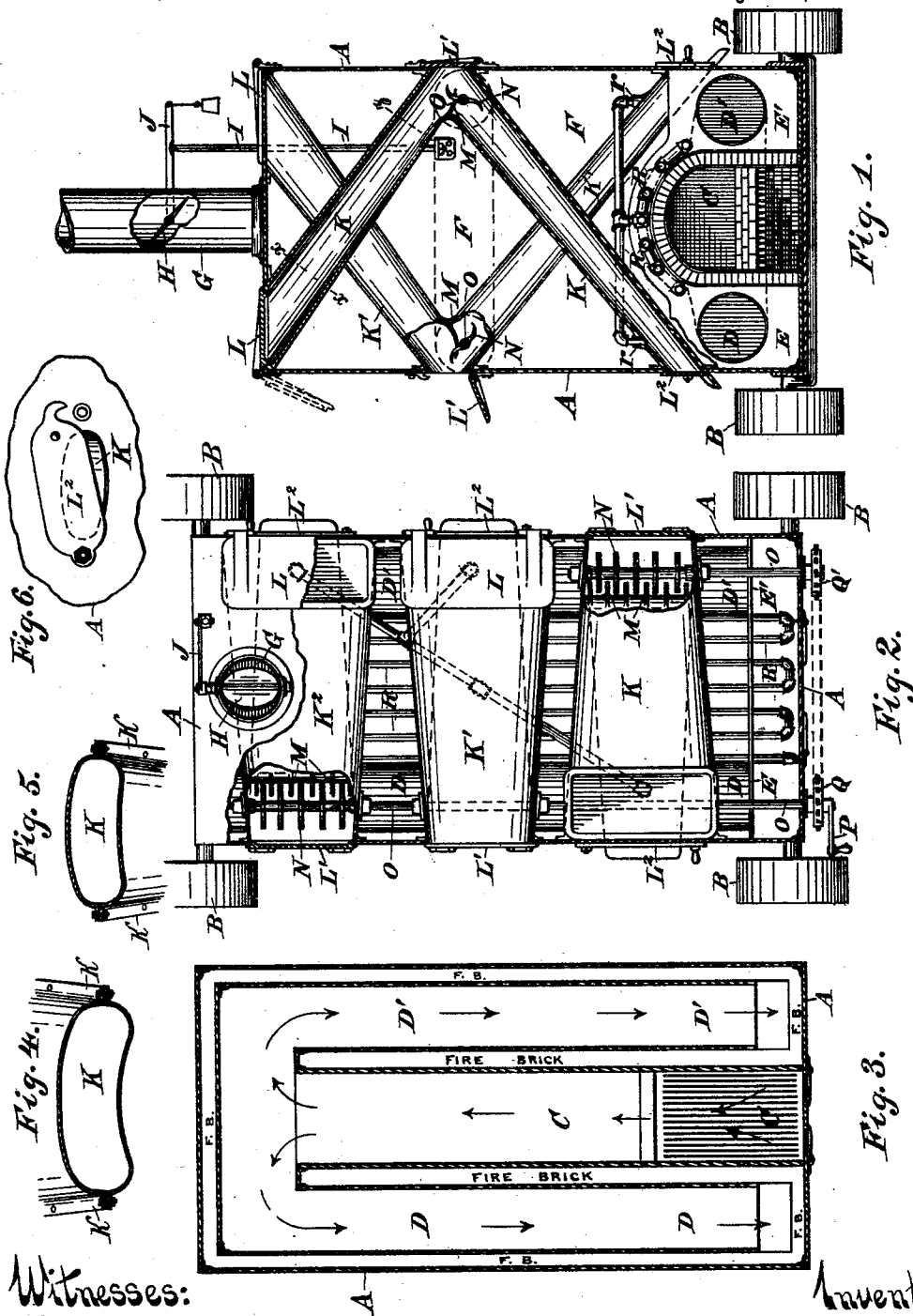
(No Model.)

A. FORD.

APPARATUS FOR REDUCING BITUMINOUS ROCK.

No. 479,496.

Patented July 26, 1892.



Witnesses:

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UNITED STATES PATENT OFFICE.

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APPARATUS FOR REDUCING BITUMINOUS ROCK.

SPECIFICATION forming part of Letters Patent No. 479,496, dated July 26, 1892.

Application filed February 3, 1892. Serial No. 420,194. (No model.)

To all whom it may concern:

Be it known that I, ARCHIBALD FORD, a citizen of the United States, residing at Golden Gate, in the county of Alameda and State of California, have invented a new and useful Apparatus for Reducing Bituminous Rock; and I do declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to the letters of reference marked thereon, which form a part of this specification.

My invention relates to implements used for the preparation of native asphalt or bituminous rock for paving and kindred purposes.

The object of this invention is to provide suitable means for reducing rock of this class according to a new process, which consists in baking the material instead of steaming it or dissolving it with the aid of hot water, as heretofore practiced.

I have observed that pavements made of bituminous rock treated after the old method do not last as they should; that when, for instance, they have been exposed for some time to the heat of the sun and subjected to the changes of the various seasons they quickly decompose and rot, and, further, that it is next to impossible in laying them to produce a perfect bond between fresh boiled or steamed material and that already spread out and cooled off. This I have found to be due to the excess of moisture forced into the rock by the faulty process followed. Water has little affinity for the pitchy molecules of bituminous rock and rather destroys their cohesiveness. It is but natural that these two misallied elements should part, and one leaves the other in more or less disunited particles, with the result that the pavement rapidly wears out. It is to obviate this radical defect that I have devised my invention and adapted it for a reducing agent which will not add moisture to the rock while under treatment, but will partly rid it, instead, of the watery vapors and gases which it contains in its native state.

My improved apparatus therefore comprises a furnace having return-flues by the sides of the fire-chamber and an upper compartment wherein the products of combustion

are diffused before reaching a smoke-stack at the rear. In this compartment are placed several inclined retorts, in which the bituminous rock is inclosed and baked at slow heat, as in an oven, entirely free from contact with the reducing agent, except in the case of refractory or overheated material, a current of hot or cold air brought from the outside by a coil of pipes leading to the lower end of the retorts. The furnace is rendered self-regulating by means of an expansion-rod working a damper in the smoke-stack. The whole apparatus is portable and easily hauled from one place to another.

Referring to the drawings for a more complete description of my improved apparatus, Figure 1 is a front elevation thereof with the front open and portions in section. Fig. 2 is a plan with the top partially removed and portions broken away. Fig. 3 is a diagrammatic plan through the furnace, showing the course of heat. Fig. 4 is an enlarged cross-section of a retort on the line *xx*, Fig. 1. Fig. 5 is a similar view taken also from Fig. 1 on the line *z*, and Fig. 6 is a front view of a pivoted door located at the spout or discharge-opening of the retorts.

The letter A designates the body of the furnace, which is made in any suitable manner, but preferably composed of metal plates riveted together and lined with fire-clay bricks, as indicated in the drawings. This furnace may be stationary, though I have represented it mounted on wheels B to conform with the most approved style of construction.

C is the fire-chamber, which is equipped with the usual grate-bars, ash-pit, and bridge, and extends back to the rear wall of the furnace. There it opens into side flues D D', through which the products of combustion are returned to small chambers formed between the front wall and low partitions E E', from whence they are poured into and diffused in an upper compartment F to afterward escape through a smoke-stack G, located at the rear end of the furnace.

A uniform degree of heat is maintained in the compartment F by means of a damper H. This damper is opened and closed automatically by an expansion-rod I, set partly inside the furnace to be acted upon by the heat and reaching up to a weighted lever J, connected

with the damper. When the heat produced is above the normal, the rod expands and operates to stop the draft. The contrary action takes place when the temperature is being

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reduced. K K' K² are retorts in which the material to be heated is inclosed. By preference these are cast in halves provided with lateral flanges *k k*, tightly bolted together, (see Figs. 10 4 and 5,) and forming when joined a tapering channel nearly elliptical in cross-section and the under side whereof is inwardly curved in the upper part. The retorts may be placed in any convenient position within the compartment above the fire-chamber; but as a rule they will be found more useful if given enough pitch and arranged so as to cause the rock fused therein to slowly move down by its own weight. In the present instance they 20 have been illustrated as made in lengths set obliquely to one another at an angle of about forty-five degrees. These lengths, however, may be multiplied and their inclination varied at will, so the retorts will be brought up to any desired height in zigzag form or any equivalent thereof, such as the shape of the worm, the object being to secure a prolonged exposure to heat and economize space by having the bituminous rock travel along a more 30 or less deflected course. Any number of retorts may be used; but it is conceived that three or four will afford a constant and ample supply of reduced material for an ordinary force of pavers.

35 Doors L L' L² are provided at both ends of the retorts and at such points in the bends thereof as it may be convenient to have either for cleaning the retorts or inspecting their contents. Those at the mouth and side 40 are hinged at their outer and lower edge, respectively, dropping down, as shown. That at the discharge-orifice is made to swing vertically about a pivot, as illustrated in Fig. 6.

Within the elbows formed by the bends in 45 the retorts are set series of bars M, extending across the channel followed by the rock in its course downward and adapted to break or else hold back such pieces as are not softening readily. In connection with these bars 50 are used rotary stirrers N, disposed in a line close thereto and designed to assist in further comminuting the rock and prevent clogging. The stirrers N are mounted on and revolved by shafts O, journaled in suitable 55 bearings in the sides of the retorts and end walls of the furnace. A crank P and sprocket-wheels Q Q', connected by a chain, constitute the actuating mechanism.

Cases will occur in which the rock will resist fusion, despite long subjection to heat 60 and the frequent use of the stirrers; or, again, the material under treatment may become so overheated that it is liable to be spoiled unless speedy relief is forthcoming. To provide for these contingencies, I make use of 65 a coil of pipes R, which I lay upon the arch

of the fire-chamber and connect, as at *r*, with the lower end of the retorts. I am then enabled, if necessity arises, to force a current of either hot or cold air into actual contact with 70 the bituminous rock, and thus heighten or lower its temperature to suit. An ordinary fan or blower may be employed for this purpose.

The operation is as follows: The furnace 75 being fired so as to produce a moderate degree of heat in the upper compartment—say from 212° to 250° Fahrenheit—the upper doors L are thrown open and the bituminous rock is fed to the retorts until they are about 80 full, the fragmentary portion naturally running down along the side passages formed by the curved under side of the retorts and through the bars and stirrers toward the lower aperture and the bigger lumps remaining in the wider upper end, where the heat is given a larger surface to act upon. All the doors having been closed, the heat soon makes its action felt on the rock, which, being confined as in an oven and basted, so to 90 speak, in its own vapors, is quickly baked to the core and softened, assuming that plastic state in which it is fit for use, especially that part of it to be found at the lower end of the retorts. This much, at least, may then be 95 drawn out and laid down without delay. The larger pieces being heated all this time and urged on by their own weight against the bars M, aided, if need be, by an occasional turn of the stirrers N, gradually dwindle 100 down to smaller particles and also find their way to the outlet in proper condition. By a judicious feeding of the retorts one may thus obtain an unceasing supply of reduced rock. If the material is too rich, some sand or coal-ashes are thrown into the retorts with it. If, 105 on the other hand, it is of poor quality, it is first mixed with a better grade of native asphalt. Should the rock prove refractory or by chance be overheated, recourse is then 110 had to the air-pipes, as hereinbefore explained.

Having described my invention, what I claim as new, and desire to secure by Letters Patent of the United States, is— 115

1. An apparatus for reducing bituminous rock, comprising a fire-chamber, a compartment arranged above and communicating with said fire-chamber, wherein the products of combustion are diffused, and a series of 120 substantially vertically-disposed retorts arranged in said compartment and extending through the same.

2. In an apparatus of the character described, the combination, with the heating-chamber, of downwardly-inclined retorts extending vertically through said chamber and tapering toward their lower ends. 125

3. The combination, with the heating-chamber, of a series of bent tubular retorts extending through the said chamber in a substantially vertical position. 130

4. The combination of bent inclined tubular retorts and breaking-bars in the angles thereof, substantially as set forth.

5 5. The combination of bent inclined retorts, bars in the bends thereof, and stirrers working in connection with said bars, substantially as set forth.

6. The combination of a fire-chamber, retorts above the same, and air-pipes arranged

on the fire-chamber connected with the retorts, substantially as and for the purposes set forth. 10

In testimony whereof I affix my signature in presence of two witnesses.

ARCHIBALD FORD. [L. S.]

Witnesses:

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