March 17, 1931. C. B. WATSON 1,796,878

METHOD FOR REMOVING CARBON DEPOSIT FROM METAL SURFACES

Filed July 27, 1927

Fig. 1

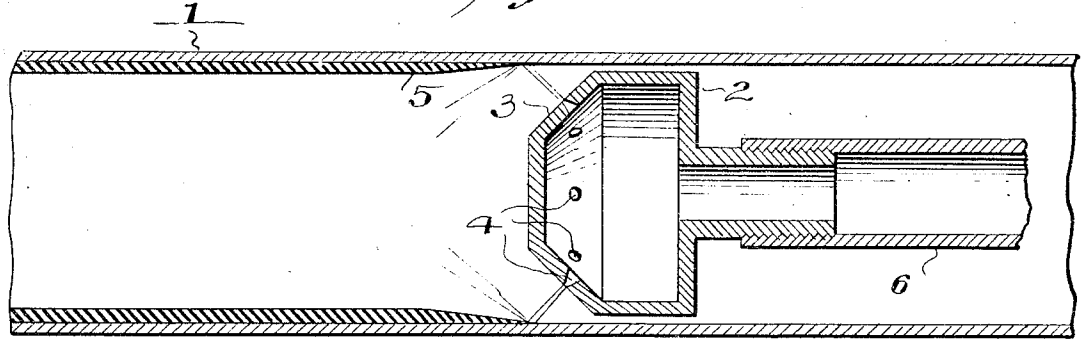
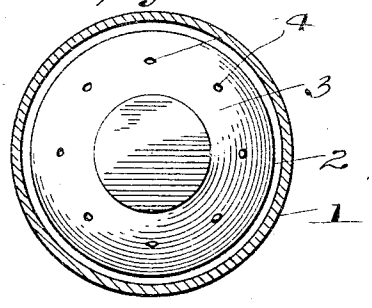


Fig. 2



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UNITED STATES PATENT OFFICE

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METHOD FOR REMOVING CARBON DEPOSIT FROM METAL SURFACES

Application filed July 27, 1927. Serial No. 208,885.

This invention relates to improvements in method and means for removing obstructing coke and carbon deposit from the walls of furnace tubes or other heated conductors through which hydrocarbon oils are passed in either a liquid or vapor state.

In the petroleum industry it is customary in the fractionating, distillation or cracking of oils to employ units variously known as tube stills, pipe stills, cracking stills, converters and the like which consist of or include a multiplicity of pipes or tubes through which the oil is conveyed and subjected to varying temperatures in accordance with the several operations performed on the oil. Mineral oils contain a certain percentage of solid coking matter which is produced by distilling off the lighter or lower boiling point fractions and which, in the operation of the refinery unit above described, manifests itself by producing a hard deposit on the surfaces of the tubes and which interferes materially with the heat transmitting efficiency of such tubes by producing obstructions therein which must be removed to procure normal operating efficiency.

The removal of this coke deposit has been difficult to accomplish, besides being a slow and laborious operation, necessitating the shutting down of the still or other units and thereby interfering materially with production as well as increasing operating costs. Rotary scrapers or cutters have been largely used hitherto in performing this operation but these, however, are open to the objections above set forth.

It is therefore a prime object of the present invention to simplify and expedite the removal of this carbon deposit from the interior of oil conducting elements by the use of a method which consists in passing an orificed jet head through the element so that a fluid, discharged under high pressure from the head in diverging streams, will impinge upon the carbon deposit to tear the latter loose from the metal surfaces to which it normally adheres, leaving said surfaces clean and bright and at the same time enabling the operation to be carried out in a comparatively short time, much shorter than that ordinarily required by the use of ordinary methods in completing the effective and complete removal of such deposits.

For a further understanding of the invention reference is to be had to the following description and the accompanying drawing, wherein:

Figure 1 is a vertical sectional view taken through a furnace tube and the jet head employed in removing the carbon deposit from the interior surfaces of the tube,

Figure 2 is a transverse sectional view taken on the line 2—2 of Figure 1, the jet head being shown in front elevation.

Referring more particularly to the drawing the numeral 1 designates a pipe, tube, conductor or element of standard formation of the kind customarily found in oil heating units such as pipe and cracking stills, converters and the like. These tubes are arranged frequently in furnace settings and are subjected to relatively high temperatures so that in converting operations the oil circulated therethrough is broken down molecularly into compounds of simpler form, or, in other cases, such as in pipe stills, the temperatures used are merely sufficiently high to effect a physical separation of the lighter oil fractions from the heavier without changing the molecular arrangement of the oil compound. In thus heating the oil, however, the heavier and more solid particles thereof build up what is known as a coke deposit on the inner walls of the tube or pipe, which forms a hard crust or body that tenaciously adheres to the inner walls of the pipes or tubes, and interferes materially with the thermal efficiency of such conductors and, in addition, produce an obstruction within the elements which interferes with normal oil circulations and is apt to produce uncontrolled pressures.

Therefore, to improve upon present methods of removing this deposit, I pass what is known as a jet head, indicated at 2 in the drawings, through the pipe or tube and form this head to provide a hollow body which terminates forwardly in a wall of conoidal or frusto-conical form, the head

possessing a diameter slightly less than that of the internal diameter of the tube or conductor through which it is passed. The frusto-conical front wall 3 of the head is provided with a plurality of tapering orifices 4 through which a fluid, such as water, is forced under high pressure and is discharged from the head, by way of such orifices, in diverging, funnel shaped streams. These water jets impinge with great force upon the interior walls of the pipe or tube so as to tear the carbon deposits, indicated at 5, from said walls, thereby leaving the clean portions of the tube free from the adhering carbon deposit. The interior of the head 2 is connected by means of an axially disposed pipe, hose or other conductor 6 with a source of fluid supply, and the fluid is passed under high pressure through the element 6, into the interior of the head 2 and is discharged from the latter by way of the orifices 4 in the form of streams or jets which remove the carbon deposit rapidly and effectively.

While I have described what I consider to be the preferred method and device for carrying my invention into practical operation, never-the-less it will be appreciated that various alterratives may be used also for carrying the invention into practical effect without departing from the working principles of the invention or the spirit and intent of the subjoined claim.

What is claimed is:

The method of removing hardened coke deposit from the inner walls of tubes used in oil heating furnaces, which consists in passing a spray head longitudinally through such tubes, and in continually forcing water outwardly and radially from said spray head under pressure into contact with said coke deposit, the pressure of the water applied to said deposit being of sufficient magnitude to effect of itself the mechanical removal of the adhering deposit from the walls of said tubes.

In testimony whereof I affix my signature.

CORNELIUS B. WATSON.