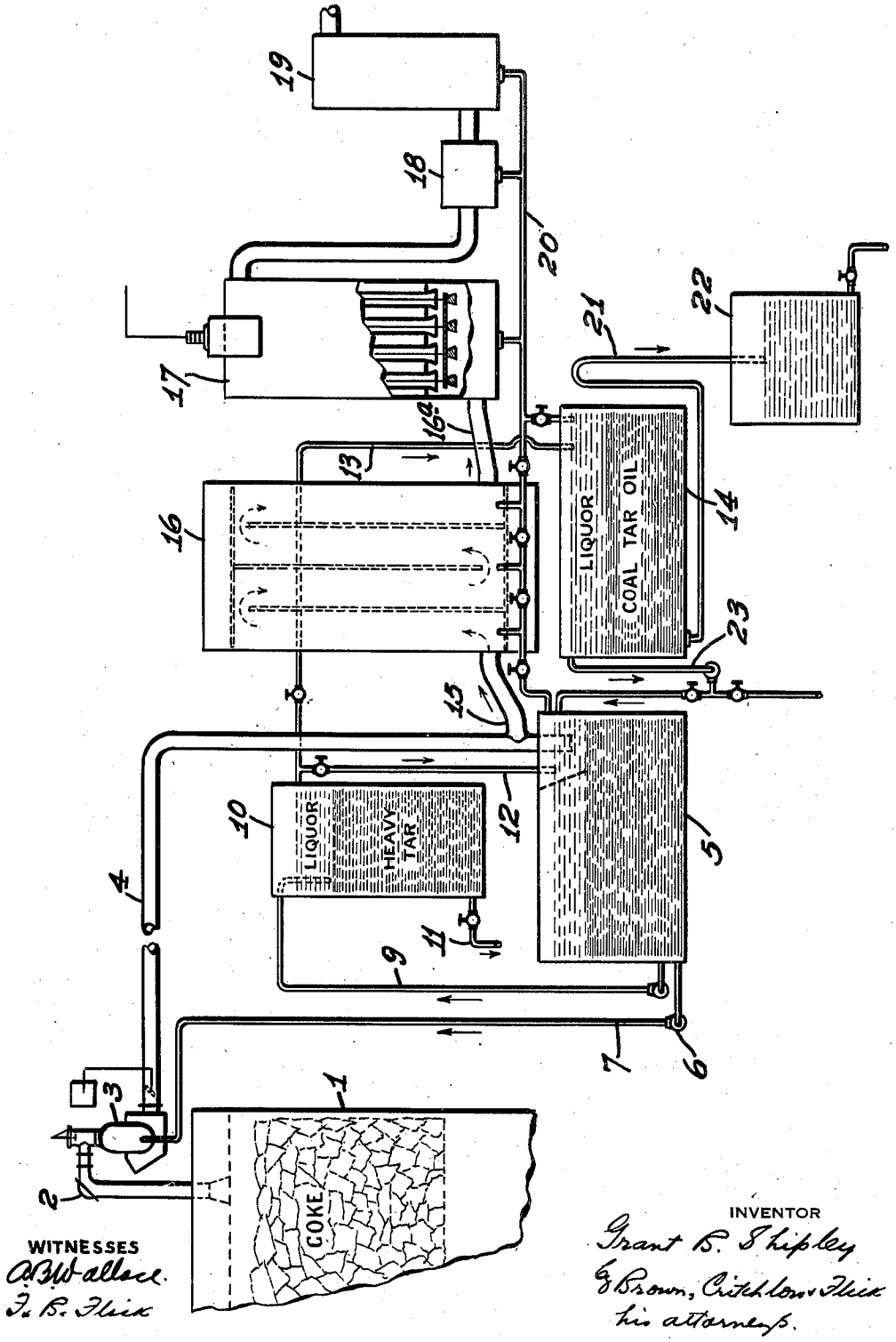
Jan. 5, 1937. G. B. SHIPLEY 2,066,583

METHOD OF PRESERVING WOOD

Filed April 29, 1933



WITNESSES

A. B. Wallace.

J. B. Flick

INVENTOR

Grant B. Shipley

by Brown, Critchlow & Flick

his attorneys.

Patented Jan. 5, 1937

2,066,583

UNITED STATES PATENT OFFICE

2,066,583

METHOD OF PRESERVING WOOD

Grant B. Shipley, Pittsburgh, Pa.

Application April 29, 1933, Serial No. 668,565

1 Claim. (Cl. 21—44)

This invention relates to preservative treatment of wood, and particularly to wood-preservative materials.

One of the oldest and most widely used wood preservatives is a coal tar distillate commonly called creosote oil. At first only pure distillate was used because it was thought that pure creosote oil was necessary to provide sufficient toxicity toward wood-destroying organisms, such as decay fungi, to prevent destruction of exposed wooden members, e. g., railway ties. The industry then considered that impregnation to provide about five pounds of this preservative per cubic foot of wood was sufficient to satisfactorily prolong the useful life of the wooden member.

Subsequently it was found that in some dry, arid regions exposed members, such as ties, showed a tendency to split and open up. To overcome that tendency the pure creosote oil was mixed with ordinary coal tar, or in some instances with petroleum oil. At first these mixed materials comprised about 80 per cent of distillate and 20 per cent of tar, but with greater experience the tar content was progressively increased to about 50 per cent, and coincidentally the total weight of preservative solution added to the wood was increased, the idea being to maintain the original proportion of distillate (5 lb./cu. ft.) and simply add tar to prevent cracking and checking. Thus the practice was to treat the wood with sufficient mixed preservative to add about four to five pounds of creosote distillate per cubic foot of wood.

While the use of creosote or creosote oil-coal tar mixtures has afforded satisfactory protection, the use of such materials has become open to certain disadvantages. Thus, creosote oil has become more and more expensive, and with refinements in methods of its production certain other disadvantages have necessarily accrued. These have resulted in large part from the development of improved stills and distillation methods intended to increase the yield of creosote oil obtained in the distillation of crude coal tar.

The crude coal tar from which creosote oil is produced comprises a complex mixture of organic compounds classed, for purposes of creosote manufacture, as high boiling oils and low boiling oils. It is the latter fraction which contains the highly toxic wood preservative ingredients. I now believe that the increased yields of creosote oil (i. e., of low boiling and high boiling oils) result from a greater yield of the high boiling oils, i. e., those boiling above about 355° C., which are distilled into the creosote oil with the more efficient distilling apparatus, rather than being decomposed as formerly and remaining as residue in the still. With this greater addition of products which are relatively inert in wood preservation, the naturally occurring highly toxic low boiling oils are diluted, thus decreasing the concentration of toxic constituents and the efficacy of the creosote oil.

Whether or not the foregoing belief is correct, it is true that as the yield of creosote oil has been progressively increased by refinements in stills and distillation methods, the residue from the laboratory retort distillation of creosote oil (A. S. T. M.—D—246) has also increased progressively, and it is recognized in the art that the toxicity of creosote oil decreases with an increase of the residue referred to.

For that reason the modern creosote oils are not of maximum toxicity. Another serious disadvantage of present creosote oil is that it is not feasible to mix the desired percentages of crude tar with them, because when the desired amount of tar is added the viscosity of the mixture may become undesirably high, whereby it becomes increasingly difficult to effect deep penetration of the wood.

It is among the objects of this invention to provide satisfactory creosote wood preservation, and particularly a wood-preservative material which possesses satisfactorily high toxicity to wood-destroying organisms, has a particularly desirable low absolute viscosity, entirely avoids the expense and concomitant disadvantages of the distillation procedures heretofore invariably used in the production of coal tar derivative wood preservatives, and which embodies all of the advantages of the coal tar derivatives used heretofore.

The invention may be described with reference to the accompanying drawing, which represents schematically a portion of the condensing and gas purifying system of one type of by-product coke oven.

The invention is predicated upon my discovery that the whole of the tarry oil recovered from the condensing and cooling system of a by-product coke oven, i. e., in the high temperature coking of coal, provides an exceptionally satisfactory wood preservative. In the operation of such an oven the coal gases arising from the ovens are lead to a collector main in which ammonical liquors and heavy tar are separated from the gases. The next stages in the treatment involve passing the gas to a condensing and cooling, or purifying, system comprising condensers and scrubbers which recover a further amount of tar in the

form of a complex liquid mixture of materials referred to herein as "tarry oil recovered from the condensing system of a by-product coke oven." Heretofore the invariable practice has been to mix the heavy tar from the collector main and the tarry oil from the condensing and cooling system to produce what is known in the trade as coal tar, and in the manufacture of coal tar wood preservative materials the invariable practice further has been to distill that mixture of heavy tar and tarry oil from the condensing and cooling system. I have discovered, however, that the tarry oil collected directly from the condensing and cooling system and used in its recovered form, i. e., without distillation or other similar treatment, possesses superior qualities as a wood preservative to the distilled coal tar materials heretofore known and used in the industry.

In the practice of the invention the coal tar oil, or tarry oil, portion of the impurities in the gas is recovered and used as such, i. e., without distillation, and it is an oil, as distinguished from heavy tar. For these reasons the material is refered to herein and in the claims as "the whole of the tarry oil," or "the whole coal tar oil."

Various advantages of substantial nature flow from the invention. The whole coal tar oil as segregated from the gas is highly toxic to wood-destroying fungi and the like, and it is much less viscous than the creosote-coal tar solutions in use prior to my invention, which makes impregnation easier and permits deeper impregnation. The whole coal tar oil segregated from the oven gas may be shipped directly to wood-treating plants, thus avoiding the expense of distillation, the losses due to distillation, and the subsequent admixture of tar which has been necessary heretofore. Other substantial advantages are also present, as will appear hereinafter.

As bearing upon these advantages, a whole coal tar oil recovered in commercial operation of a by-product coke oven showed a distillation residue above 355° C. of 33.5 per cent, and its absolute viscosity at 185° F. was 2.47 centipoises. On the other hand, one Grade 1 creosote oil tested showed a distillation residue of 36 per cent and an absolute viscosity of 3.31 centipoises at 185° F., while the distillation residues of commonly used creosote-coal tar mixtures vary from about 36 per cent with a 70–30 mixture to about 47 per cent with a 50–50 mixture, the absolute viscosity of the mixtures varying correspondingly from about 3.71 to 6.43 centipoises at 185° F.

Thus it will be seen that the whole of the tarry oil contains an amount of toxic constituents at least equal to that of the 70–30 creosote-coal tar solutions and materially above that of the 60–40 and 50–50 mixtures heretofore used widely. Similarly, the absolute viscosity of the material provided by my invention is very much less than that of the commercially used mixtures, as well as materially below substantially any of the coal tar derivative materials heretofore proposed for these purposes, as shown by the foregoing values. This is an important advantage, since it insures deeper, easier, and more satisfactory penetration in commercial impregnation, particularly for difficultly treated timbers.

A further, and particular, advantage of the invention resides in a natural ability of the whole coal tar oil to confer substantial weathering resistance upon the treated wood. Coal tar condensates apparently contain certain compounds which resinify readily. But these have been more or less lacking, or functionless, in the distillates heretofore used exclusively, because the heat applied in distillation caused resinification to take place, thus eliminating these valuable constituents. Such resinifying materials are present in my new wood-impregnating material in their natural form and proportions, and they become transformed, upon exposure to air, into resinous or pitchy substances at the surface and in the outer layers of the treated wood. Thus there is formed a protective coating which resists weathering, splitting and checking of the wood. This coating also is particularly valuable because it seals the low boiling, highly toxic oils within the wood, so as to materially increase the useful life of the preservative as regards resistance to destructive organisms.

The common practice in the treatment of by-product coke oven gases has been to condense and recover the heavy tar and tarry oils together. Those skilled in the art will recognize, however, how the whole coal tar oil used in the practice of this invention may be recovered. For purposes of illustration, however, the accompanying drawing represents schematically a portion of the condensing and purifying system of one type of modern by-product coke oven plant equipped for the recovery of the whole coal tar oil.

Having reference to the drawing, gas rises from the oven **1** into an uptake **2** connected to a collector main **3** from which the gas flows into a cross-over **4**. Heavy tar and ammonical liquor condensed in collector main **3** flows through cross-over **4** into a hot drain tank **5**. In practice the collector main may be flushed with a mixture of tar and liquor from hot drain tank **5** through a pump **6** and delivery line **7**. The heavy tar is recovered by pumping it through a line **9** to a decanter tank **10**, where the tar and liquor separate into strata, the heavy tar being delivered through a line **11** to any desired point, and liquor being drawn off through a line **12** to the hot drain tank, or through a branch line **13** to a decanter **14**. Cross-over **4** is also connected by a branch pipe **15** to a cooler or condenser **16**, and from thence the gas flows through a pipe **16a** to a tar extractor **17**, the form shown being of the electrostatic type. From the precipitator the gas passes in turn to an exhauster **18** and a reheater **19**, and from thence to other standard purifying devices which play no part in this invention and accordingly are not shown.

The condensates obtained in condenser **16**, precipitator **17**, exhaustor **18** and reheater **19** are gathered in a header **20** from which they may be delivered to coal tar oil decanter **14** in which there occurs a separation of the whole coal tar oil, or tarry oil, and the accompanying liquor. The oil may be drawn off, for use in the practice of the invention, through an adjustable seal **21** to a tank **22**. Liquor from decanter **14** passes through line **23** for use as desired.

Header **20** is valved, for example in the manner shown, so that the tarry oil condensate may be delivered to decanter **14** from any or all of the purifying units, and so that it may be passed from any or all of the sections of condenser **16** to hot drain tank **5**, so that the amount or quality of the heavy tar collected in the hot drain tank may be varied within limits.

It will be understood that the invention is not limited to whole tarry oil recovered in the ap-

paratus or manner just described, these being purely for the purpose of describing how a suitable whole tarry oil may be obtained.

I have discovered also that the whole coal tar oil may be admixed with heavy tar, for example, up to 35 per cent or more of heavy tar, without, however, exceeding the absolute viscosity of commercially used creosoting compositions. In the practice of the invention the whole coal tar oil may be recovered separately from the heavy tar, and the two materials then mixed in desired proportions, or if desired, the condensates collected in the header may be supplied in whole or in any desired part to hot drain tank 5 by means of a conduit appropriately valved as described previously.

The material provided by the invention may be used for the pressure impregnation of wood, for example by any of the processes used in the art.

Thus the invention provides a material of substantial importance in wood preservation. Distillate creosote alone lacks the natural sealing constituents and is not of maximum toxicity, and alone or in tar solutions possesses relatively high absolute viscosity. The whole of the tarry oil provided by the invention contains its natural toxic and resinous ingredients, is highly toxic, of very low viscosity, and can be mixed with tar without raising the viscosity unduly. And all distillation costs are eliminated. Other advantages may be recognized by those skilled in the art.

The practice of the invention is advantageous also in that the heavy tar, recovered separately from the tarry oil, possesses valuable uses. Thus it may be used satisfactorily as a liquid fuel for operation of boiler, heating and other furnaces, and particularly for firing open hearth furnaces because it gives the highly luminous flames sought by open hearth operators. The heavy tar also is useful for numerous other purposes, such as to provide a bituminous coating for ingot molds.

According to the provisions of the patent statutes, I have explained the principle and mode of operation of my invention and have illustrated and described what I now consider to represent its best embodiment. However, I desire to have it understood that, within the scope of the appended claim, the invention may be practiced otherwise than as specifically illustrated and described.

I claim:

In a method of preserving wood by impregnation with a preservative, that step comprising impregnating the wood with wood-preserving impregnant comprising the undistilled whole of the tarry oil recovered from the condensing system of a by-product coke oven separately from the heavy tar deposited in the hydraulic main, said tarry oil having an absolute viscosity of 2.47 centipoises at 185° F. and a distillation residue of about 33.5 per cent above 355° F., and high weatherproofing power.

GRANT B. SHIPLEY.