May 24, 1949. R. C. STROMQUIST 2,470,958

METHOD OF COATING PIPES

Filed Oct. 25, 1945

2 Sheets-Sheet 1

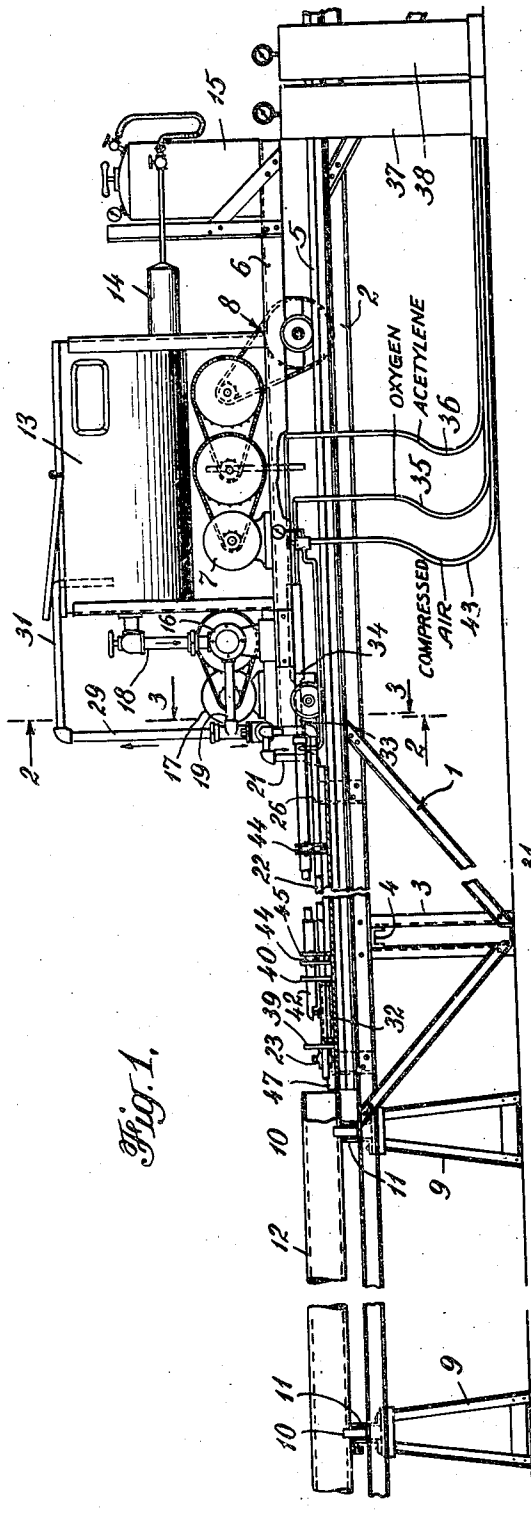


Fig. 1.

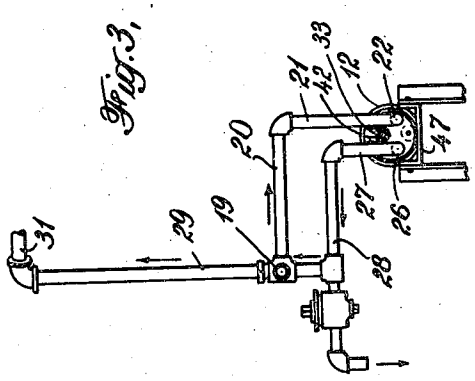


Fig. 3.

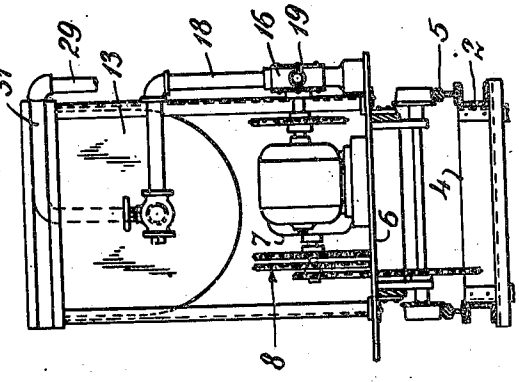


Fig. 2.

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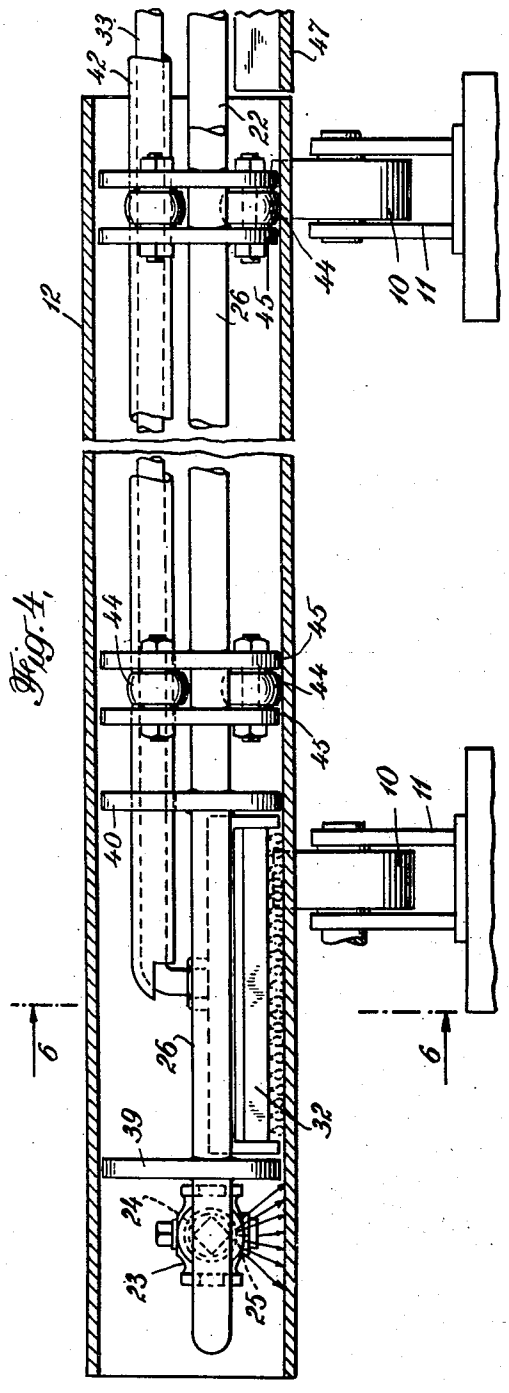


Fig. 4.

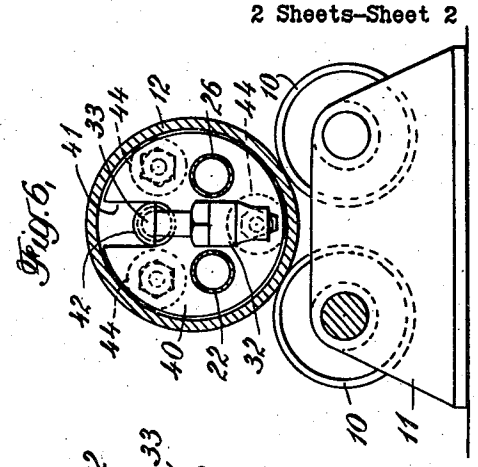


Fig. 6.

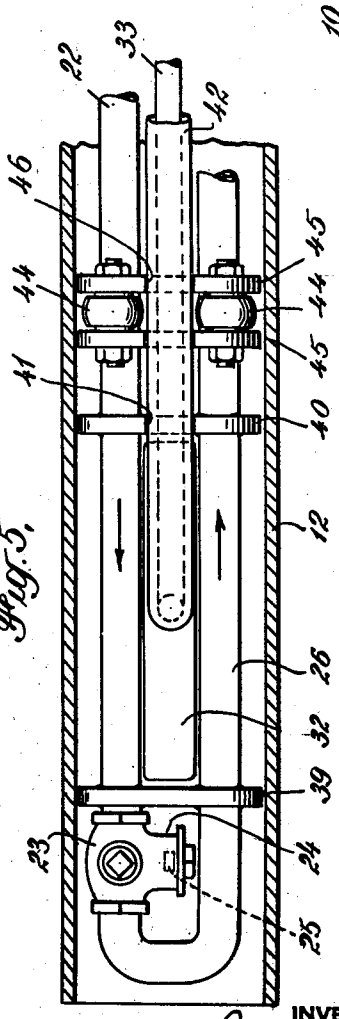


Fig. 5.

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UNITED STATES PATENT OFFICE

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METHOD OF COATING PIPE

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Application October 25, 1945, Serial No. 624,458

2 Claims. (Cl. 117—49)

1

This invention relates to a method of coating metal pipe with hot liquid bitumen, and in particular to coating the interior of such pipe to protect the metal of the pipe from the corrosive action of fluids passing through them. As the bitumen hardens well above atmospheric temperatures, it is applied hot and in liquid condition. As hot liquid bitumen will not adhere to cold metal surfaces, two methods have been employed to effect adhesion: (1) a priming coat is first applied and dried, or (2) the entire pipe is heated before the coating is applied. Both of these are time-consuming and expensive.

According to the present invention I subject the surface to be coated to an intense heat immediately prior to or simultaneously with the application of the hot liquid bitumen. The intensity and duration of the heat are correlated so as to raise uniformly the skin of the pipe to be coated momentarily to a temperature high enough to ensure the necessary bond between the metal and the bitumen without, however, appreciably raising the temperature of the body of the pipe underlying the heated skin. I thus avoid the need for applying a primary coat or preheating the entire pipe.

My method has another advantage. The oxy-acetylene flame, which I prefer to use as my source of heat, acts to cleanse the surface of the pipe. Any large pieces of scale dislodged would have to be removed, as by blowing, but small pieces would simply be imbedded in the bitumen and do no harm.

In using my method to coat the interior of a pipe, I rotate the pipe, then move through it a heater in the form of a flame head which progressively applies heat locally, and preferably follow it with a valved nozzle through the orifice of which hot liquid bitumen is progressively discharged upon the heated areas. The flame head is confined between two circular baffles which travel with it and, by confining and concentrating the heat within a limited section of the pipe at any given moment, increase the speed at which the pipe surface is heated. Auxiliary air for combustion is supplied to the space between the baffles.

In the accompanying drawings I have illustrated a form of apparatus which I have successfully used in carrying out my method, and which apparatus forms the subject matter of my copending application, Serial No. 624,459, filed October 25, 1945.

In these drawings:

Figure 1 is a side elevation of the entire apparatus showing the pipe to be coated, mounted for rotation at the left-hand end of the apparatus, with the flame head and bitumen nozzle retracted and their connections to the various sources of supply shown,

Figure 2 is a transverse section taken along line 2—2 of Figure 1,

Figure 3 is a transverse section taken along line 3—3 of Figure 1,

Figure 4 is a vertical, longitudinal section, on an enlarged scale through a pipe to be coated, showing in elevation the bitumen nozzle, the flame head and their connections supported within the pipe,

Figure 5 is a horizontal, longitudinal section through the pipe showing the parts shown in Figure 4 in plan, and

Figure 6 is a vertical transverse section taken along line 6—6 of Figure 4.

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The apparatus shown in these drawings is supported on a long trestle 1, comprising a pair of channel irons 2 supported on uprights 3 and tied together by cross pieces 4. A pair of rails 5 mounted on the channel irons 2 form a track on which a carriage 6 is mounted and driven in either direction by means of a motor 7 through driving connections 8 comprising clutch, chains and sprockets. On this carriage are mounted all of the movable parts of the apparatus which I shall describe presently.

Mounted upon upright frames 9 at the left-hand end of the trestle are two pairs of rollers 10 journaled in bearing plates 11 and rotatably supporting the pipe 12 to be coated. One or more of these rollers is connected to a power drive, not shown.

Mounted on the carriage 6 is a supply kettle 13 containing the hot liquid bitumen which is kept in molten condition by means of the usual oil burner 14 supplied from a tank 15 likewise mounted on the carriage. The bitumen is heated to the application temperature in larger kettles, not shown, which are located alongside the apparatus, and transferred to the smaller supply kettle 13, as needed. Mounted on the carriage in front of the kettle is a pump 16 driven by a motor 17. This pump withdraws liquid bitumen from the kettle through section 18, and passes it through sections 19, 20 and 21 to a long horizontal conduit 22 carrying at its outer end a modified three-way valve 23 provided with a nozzle 24 having a discharge orifice 25. Connected to the far side of valve 23 is a return conduit 26 which through sections 27, 28, 29 and 31 returns any unused bitumen to the kettle.

Lying between the conduits 22 and 26 adjacent the valve 23 is a flame cleaning head 32, the flame outlets of which point toward the lower, inner face of the pipe and are closely adjacent to it, as shown in Figure 4. A mixture of oxygen and acetylene is fed to this flame head by a duct 33 from a mixing chamber 34 to which the gases are fed through flexible tubes 35 and 36 leading from oxygen and acetylene cylinders 37 and 38 respectively. The flame head 32 is confined between two circular baffles 39 and 40 which substantially fill the pipe and provide an enclosed space for the flame head to operate in. The bitumen conduits 22 and 26 pass through these baffles and are secured thereto while a slot 41 in baffle 39 provides for the passage of the oxyacetylene duct 33. Auxiliary compressed air for combustion is delivered to the space between the baffles 39 and 40 through a duct 42 surrounding and concentric with duct 33, which duct likewise passes through slot 41. This duct 42 is connected to a source of compressed air, not shown, through flexible hose 43.

The bitumen conduits and valve, and the flame head and connections are supported by means of rollers 44 journaled between pairs of plates 45. As in the case of the baffles 39 and 40, the bitumen conduits pass through and are secured to these plates 45 while the oxyacetylene duct 33 and the auxiliary air duct 42 pass through slots 46 therein. During the coating operation, the bitumen nozzle and flame head and their various connections are supported by the rollers 44 upon the pipe itself. Supported upon the trestle in alignment with and closely approaching the inner end of the pipe 12 is a channel 47 which supports these parts when in their retracted or partly retracted position. It will be understood that a plurality of sets of rollers 44 are provided so that ample support is provided at spaced intervals.

The apparatus operates as follows: The pipe to be coated is placed horizontally upon the rollers 10, whereupon the carriage is moved to the left (referring to Figure 1) until the valve 23 and the flame head have passed through the pipe and project beyond it on the far side. The motor 16 is started to circulate bitument from the kettle through the piping, previously described, and back to the kettle, whereupon the flame is ignited and the valve opened to permit the discharge of hot liquid bitument through the orifice 25 of the nozzle 24. The pipe is then rotated and the carriage moved to the right by means of motor 7 and drive 8 so that the flame head, and immediately following it the stream of bitumen discharged from the nozzle orifice, move progressively along the length of the rotating pipe. When the flame head and valve have passed through the pipe to the position, shown in Figure 1, the movement of the carriage is arrested, the flame is shut off and the valve closed. Circulation of the bitumen continues after the closing of the valve so that there is no danger of its freezing in the conduits between coating operations.

By using one 6" flame cleaning head it is possible to coat the interior surfaces of pipes at a rate of approximately 1050 square feet per hour, with a consumption of oxygen and acetylene gases of approximately 137 cubic feet per hour for each gas. Auxiliary compressed air is supplied at the rate of approximately 900 cubic feet per hour. If it is desired to coat pipes at a rate greater than 1050 square feet per hour, additional

flame cleaning heads may be added to this mechanism; thus the rate at which the pipe can be coated will be increased by the number of flame cleaning heads used and will be in a direct ratio to the quantity of oxygen and acetylene gases consumed per hour based on an approximate coating rate of 1050 square feet per hour 137 cubic feet of oxygen and 137 cubic feet of acetylene gases consumed per hour. The diameter of the pipe and the rate at which the pipe is desired to be coated will govern the number of flame cleaning heads to be used.

The temperature to which the interior skin of the pipe must be heated in order to effect a satisfactory bond between the metal and the bitumen will vary depending upon the nature of the bitumen used. The temperature required to effect a bond between the pipe and the conventional coatings used for lining pipe must be somewhat in excess of 200° F. This temperature applies to a coal-tar coating conforming to A. W. W. A. Specifications 7A.5—1940 and 7A.6—1940 for Coal Tar Protective Coatings for Steel Water Pipe.

The oxyacetylene flame is a high temperature flame which can develop a local temperature of at least 2000° F. and so cleanse the surface of the pipe of scale and dirt. The rate of movement of the flame-cleaning head is such that the pipe is neither burned nor overheated, but is such that the surface temperature of the pipe will be somewhat in excess of 200° F. when the molten bitumen is applied to the surface from the nozzle.

I claim:

1. In the method of obtaining a substantially continuous uniform coating of bitumen of a metal pipe of substantial length by first applying heat to the pipe and subsequently applying the bitumen in a melted state; the improvement which comprises applying intense local heat successively to portions of the surface of the pipe to be coated, the intensity and duration of the heat applied to such successive portions being correlated so as to raise uniformly the skin only of the successive portions of the pipe to a temperature at which bitumen will adhere without appreciably raising the temperature of the body of the pipe wall underlying the heated skin, causing relative motion between the source of heat and the pipe in a direction longitudinally of the pipe and simultaneously applying the hot melted bitumen to the successively heated portions of the pipe immediately after the application of the heat thereto and while the successive portions of the pipe are at such temperature.

2. In the method of obtaining a substantially continuous uniform coating of bitumen on the interior of a metal pipe of substantial length by first applying heat to the pipe and subsequently applying the bitumen in a melted state; the improvement which comprises rotating the pipe, simultaneously with the rotation of the pipe applying intense local heat successively to portions of the interior surface of the pipe to be coated, the intensity and duration of the heat applied to such successive portions being correlated so as to raise uniformly the skin only of the successive portions of the pipe to a temperature at which bitumen will adhere without appreciably raising the temperature of the body of the pipe wall underlying the heated skin, causing relative motion between the source of heat and the pipe in a direction longitudinally of the pipe and simultaneously applying the hot melted bitu-

men to the successively heated portions of the pipe immediately after the application of the heat thereto and while said successive portions of the pipe are at such temperature.

RUSSELL C. STROMQUIST.

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