May 24, 1949. R. C. STROMQUIST 2,470,796

APPARATUS FOR COATING PIPE

Filed Oct. 25, 1945 2 Sheets-Sheet 1

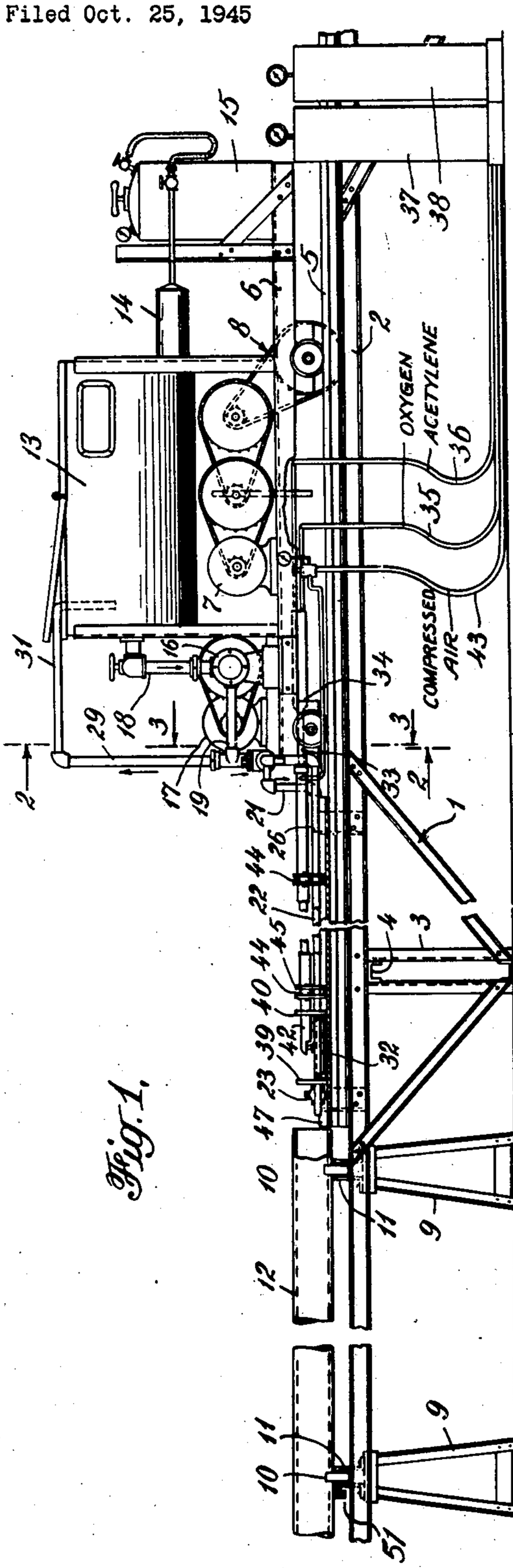

Fig. 1.

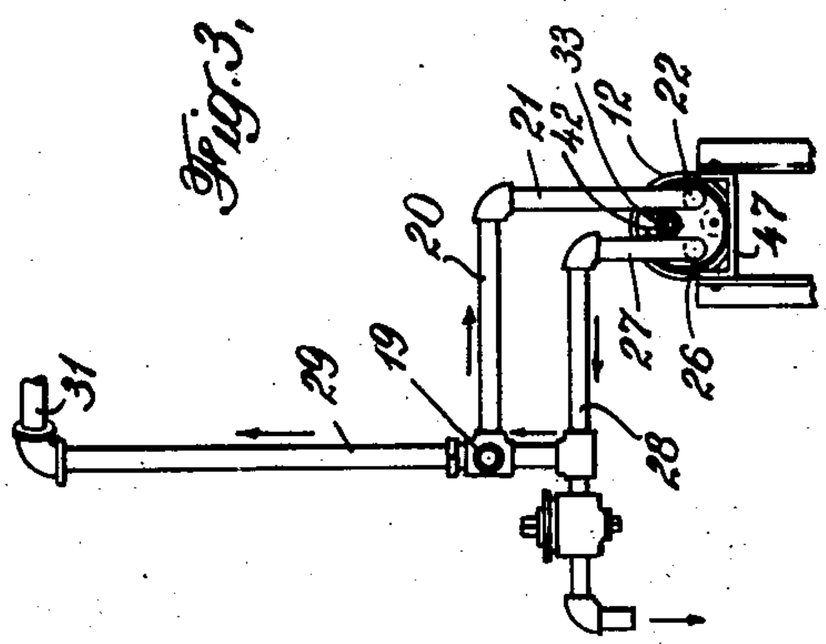

Fig. 3.

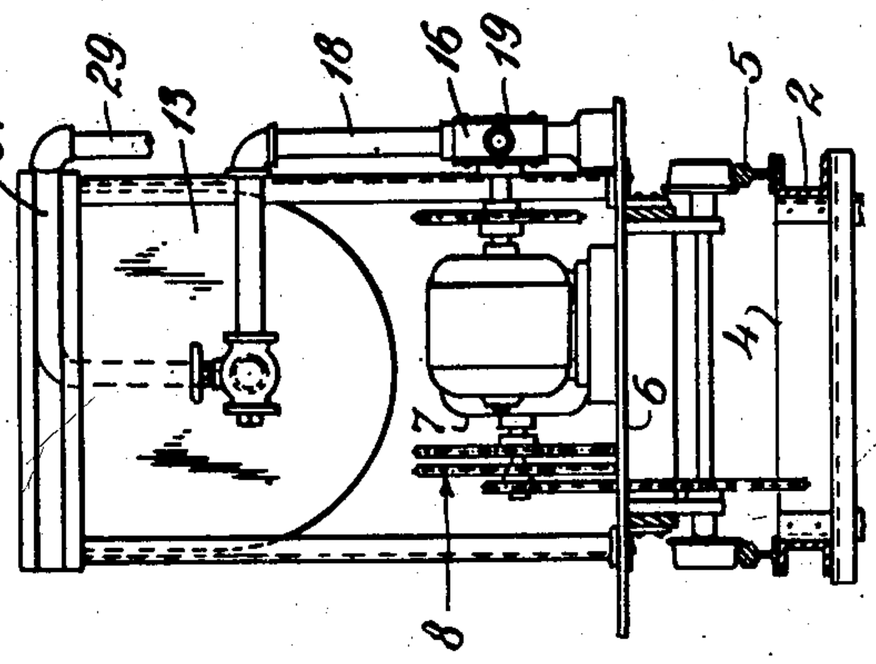

Fig. 2.

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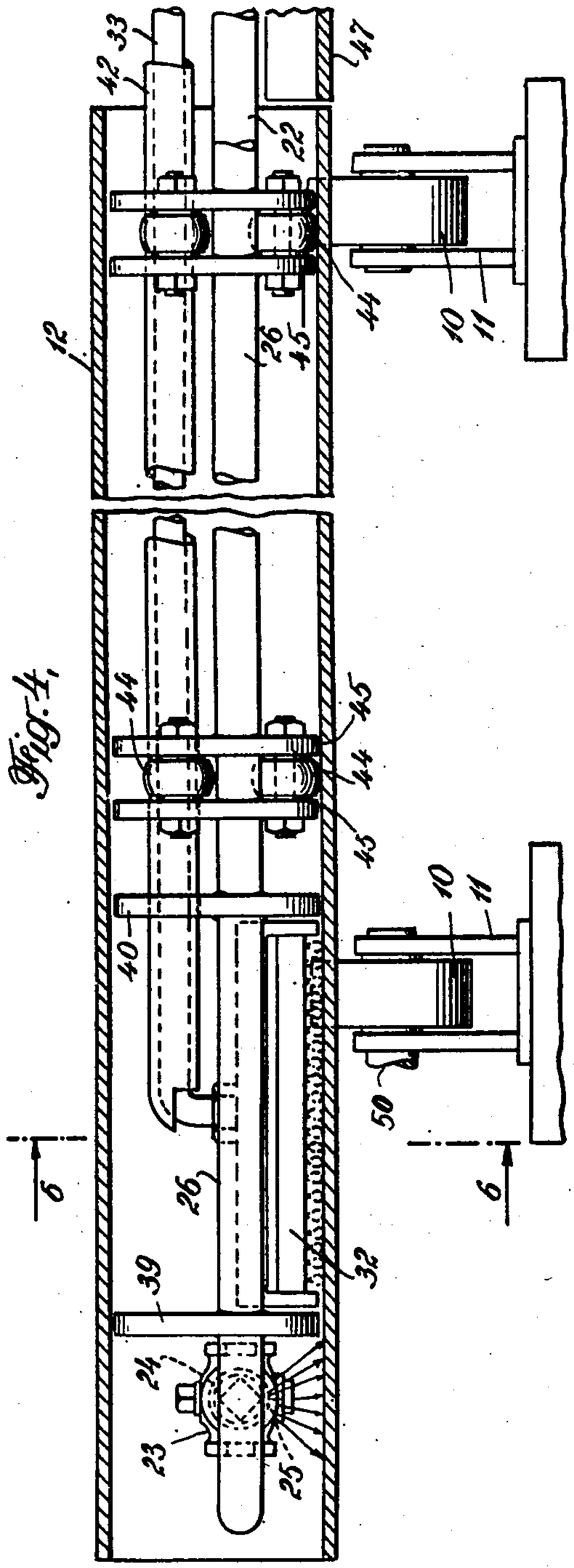

Fig. 4,

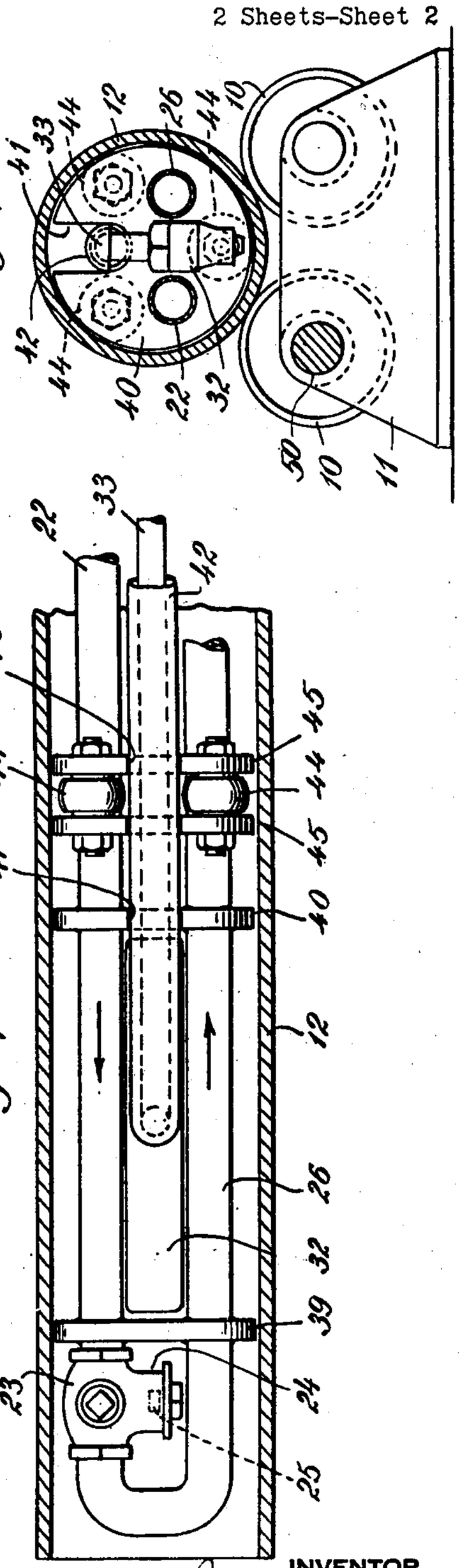

Fig. 5,

Fig. 6,

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UNITED STATES PATENT OFFICE

2,470,796

APPARATUS FOR COATING PIPE

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Application October 25, 1945, Serial No. 624,459

9 Claims. (Cl. 91—13)

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This invention relates to an apparatus for coating metal pipe with hot liquid bitumen and in particular for 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 a method which I have invented, and which forms the subject of my copending application, Serial No. 624,458, filed October 25, 1948, I subject the surface to be coated to an intense heat immediately prior to or simultaneously with the application of the hot liquid bitumen. In this way the skin of the pipe to be coated is heated 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 whole pipe. I thus avoid the need for applying a priming coat or preheating the entire pipe.

The apparatus used to coat the interior of pipe by the method just described, and which forms the subject matter of the present application, comprises a heater and a bitumen nozzle designed to operate within the pipe and provided with means for supplying the heater, preferably a flame cleaning head, with fuel and auxiliary air for combustion, if necessary, and the bitumen nozzle with hot liquid bitumen. Means are also provided for rotating the pipe and for moving the heating and coating unit through it, the heater preceding the bitumen so that the skin of the pipe is heated to a temperature at which the bitumen will adhere just before the hot, liquid bitumen is applied. In order to increase the effectiveness of the heat and the speed with which the temperature of the pipe skin is raised, the heater is confined between two circular baffles which travel with it.

In the accompanying drawings, I have illustrated a preferred embodiment of the coating apparatus of my invention, although others embodying the same principles could doubtless be devised. In these drawings,

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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.

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. For example the shaft 50 of one of the rollers 10 is provided with a spur pinion 51 which meshes with a drive gear of any suitable power drive.

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, nozzle and valve, and the flame head and connections are supported by means of rollers 44 journaled between pairs of plates 45, the flame head lying between the nozzle and the supporting rollers. 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 operations, the bitumen nozzle and flame head and their various connections are supported by the rollers 44 upon the pipe itself. Supported upon the uncoated inner surface of 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 bitumen 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 bitumen 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 discharge 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 per 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 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. (American Water Works Association) 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. Apparatus for coating a metal pipe with hot, liquid bitumen which comprises a heater for locally heating the skin of the pipe to a temperature at which the bitumen will adhere to the metal, a nozzle at one side of the heater for applying hot, liquid bitumen to the heated areas of the pipe, a support for the heater and nozzle at the other side of the heater, and means for moving the heater along the pipe with the bitumen-applying means immediately following.

2. Apparatus for coating a metal pipe with hot, liquid bitumen which comprises a flame head for locally heating the skin of the pipe to a temperature at which the bitumen will adhere to the metal, a duct for supplying oxygen and fuel to the flame head, a nozzle for applying hot liquid bitumen to the pipe immediately behind the flame head, a conduit for supplying bitumen to the nozzle, a support for the nozzle and flame head at the side of the flame head opposite the nozzle, and means for moving the flame head and nozzle relative to the pipe with the former in advance of the latter.

3. Apparatus for coating the interior of a metal pipe with hot liquid bitumen which comprises a flame head for locally heating the skin of the pipe to a temperature at which the bitumen will adhere to the metal, means for supplying oxygen and fuel to the flame head, a nozzle for applying hot liquid bitumen to the pipe imme-

diately behind the flame head, means for supplying bitumen to the nozzle, means for rotating the pipe, means for supporting the flame head and nozzle upon the uncoated inner surface of the pipe and means for moving the flame head and nozzle through the pipe with the former in advance of the latter.

4. Apparatus for coating the interior of a metal pipe with hot, liquid bitumen which comprises a flame head for locally heating the skin of the pipe to a temperature at which the bitumen will adhere to the metal, means for supplying oxygen and fuel to the flame head, baffles at either end of the flame head to confine and concentrate the heat, a nozzle for applying hot, liquid bitumen to the pipe immediately behind the flame head but beyond the rear baffle, means for supplying bitumen to the nozzle, means for supporting the flame head and nozzle upon the uncoated inner surface of the pipe, and means for moving the flame head and nozzle relative to the pipe with the former in advance of the latter.

5. Apparatus for coating a metal pipe with hot, liquid bitumen which comprises a flame head for locally heating the skin of the pipe to a temperature at which the bitumen will adhere to the metal, means for supplying oxygen and fuel to the flame head, means for supplying auxiliary air for combustion to the flame head, a nozzle for applying hot, liquid bitumen to the pipe immediately behind the flame head, means for supplying bitumen to the nozzle, means for supporting the flame head and nozzle upon the uncoated surface of the pipe, and means for moving the flame head and nozzle relative to the pipe with the former in advance of the latter.

6. Apparatus for coating the interior of a metal pipe with hot, liquid bitumen which comprises a flame head for locally heating the skin of the pipe to a temperature at which the bitumen will adhere to the metal, means for supplying oxygen and fuel to the flame head, baffles at either end of the flame head to confine and concentrate the head, means for supplying auxiliary air for combustion to the space between the baffles, a nozzle for applying hot, liquid bitumen to the pipe immediately behind the flame head but beyond the rear baffle, means for supplying bitumen to the nozzle, means for rotating the pipe, means for supporting the flame head and nozzle upon the uncoated inner surface of the pipe, and means for moving the flame head and nozzle relative to the pipe with the former in advance of the latter.

7. Apparatus for coating a metal pipe with hot, liquid bitumen which comprises a flame head for locally heating the skin of the pipe to a temperature at which the bitumen will adhere to the metal, means for supplying oxygen and fuel to the flame head, a nozzle for applying hot, liquid bitumen to the pipe immediately behind the flame head, means for supporting the flame head and nozzle upon the uncoated surface of the pipe a supply kettle for liquid bitumen, a pump for transferring liquid bitumen from the kettle to the nozzle, a carriage for the kettle, pump, flame head and nozzle and means for moving the carriage to move the flame head and nozzle relative to the pipe with the former in advance of the latter.

8. Apparatus for coating the interior of a metal pipe with hot, liquid bitumen which comprises a flame head for locally heating the skin of the pipe to a temperature at which the bitumen will adhere to the metal, means for supplying oxygen and fuel to the flame head, baffles at either end of the flame head to confine and concentrate the head, means for supplying auxiliary air for combustion to the space between the baffles, a nozzle for applying hot, liquid bitumen to the pipe immediately behind the flame head but beyond the rear baffle, means for supplying bitumen to the nozzle, and means for rotating the pipe, means for supporting the flame head and nozzle upon the uncoated inner surface of the pipe, a supply kettle for liquid bitumen, a pump for transferring liquid bitumen from the kettle to the nozzle, a carriage for the kettle, pump, flame head and nozzle and means for moving the carriage to move the flame head and nozzle relative to the pipe with the former in advance of the latter.

9. Apparatus for cleaning the interior of a metal pipe and coating it with hot, liquid bitumen which comprises a flame-cleaning head for locally heating the skin of the pipe to remove scale and dirt and raising it to a temperature at which the bitumen will adhere to the metal, a duct for supplying oxygen and fuel to the flame head, baffles at either end of the flame head to confine and concentrate the head, a duct for supplying auxiliary air for combustion to the space between the baffles, a nozzle for applying hot, liquid bitumen to the pipe immediately behind the flame head but beyond the rear baffle, a conduit for supplying bitumen to the nozzle, rollers for rotating the pipe, rollers for supporting the flame head and nozzle upon the uncoated inner surface of the pipe, a supply kettle for liquid bitumen, a pump for transferring liquid bitumen from the kettle to the nozzle, a carriage for the kettle, pump, flame head and nozzle and means for moving the carriage to move the flame head and nozzle relative to the pipe with the former in advance of the latter.

RUSSELL C. STROMQUIST.

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The following references are of record in the file of this patent:

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844,437	France	April 24, 1939

Certificate of Correction

Patent No. 2,470,796. May 24, 1949.

RUSSELL C. STROMQUIST

It is hereby certified that errors appear in the printed specification of the above numbered patent requiring correction as follows:

Column 3, line 45, strike out the words "the uncoated inner surface of" and insert the same in line 44, same column, after "upon";

and that the said Letters Patent should be read with these corrections therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 25th day of October, A. D. 1949.

[SEAL]

THOMAS F. MURPHY,
Assistant Commissioner of Patents.