April 23, 1935. F. A. KORMANN 1,998,627

APPARATUS FOR THE METAL LINING OF PIPES

Filed June 20, 1933

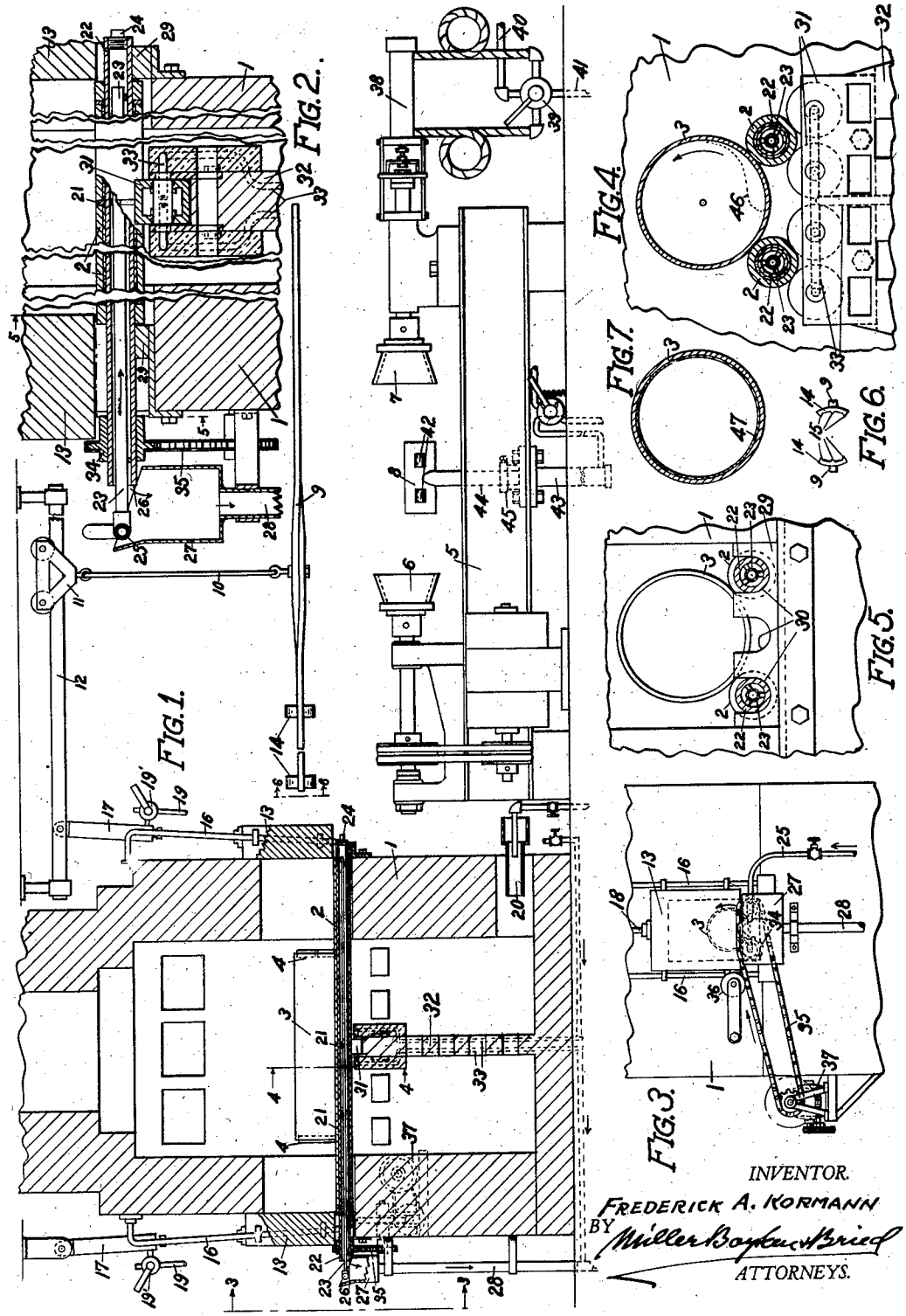


FIG. 1.

FIG. 2.

FIG. 4.

FIG. 7.

FIG. 6.

FIG. 5.

FIG. 3.

INVENTOR.
FREDERICK A. KORMANN
BY Miller Boykin & Brief
ATTORNEYS.

Patented Apr. 23, 1935 1,998,627

UNITED STATES PATENT OFFICE

1,998,627

APPARATUS FOR THE METAL LINING OF PIPES

Frederick A. Kormann, Glendale, Calif., assignor to Industrial Research Laboratories, Ltd., San Francisco, Calif., a corporation of Nevada

Application June 20, 1933, Serial No. 676,696

5 Claims. (Cl. 263—6)

This invention relates to apparatus for the lining of pipes and hollow metal cylindrical bodies with harder or other metals by centrifugal force from a molten state, and has for its object means for carrying out the above expeditiously.

In the drawing accompanying this application Fig. 1 is a side elevation of the apparatus partly in section.

Fig. 2 is an enlarged broken sectional view of the furnace rolls and adjacent structure of Fig. 1.

Fig. 3 is an end view of a portion of Fig. 1 as seen from the line 3—3 thereof.

Fig. 4 is an enlarged cross section of a cylinder in position on the furnace rolls as seen from the line 4—4 of Fig. 1.

Fig. 5 is a fragmentary view of Fig. 2 taken along the line 5—5 thereof.

Fig. 6 is an end view of the tong jaws of Fig. 1 as seen from the line 6—6 thereof.

Fig. 7 is a cross section of a finished iron or steel cylinder lined with a heavy layer carried out with the apparatus herein disclosed.

Briefly described, the apparatus comprises a furnace 1 with water-cooled power-driven supporting rolls 2 on which a cylinder or pipe 3 to be lined is heated to melting point of the lining metal previously placed within it and ends 4 closed and vented. Adjacent the furnace is a spinning lathe 5 with the special large hollow cone cup centers 6, 7 on the head and tail stock respectively and an air lift center rest 8 which may be quickly lifted to receive and lower a red hot cylinder or pipe drawn from the furnace by means of a pair of horizontally disposed tongs 9 suspended by means of a link 10 from a rolling carriage 11 supported on an overhead track 12 extending in line with the furnace live rolls and supporting the tongs at a height for passing directly into the furnace to grab the hot pipe or cylinder 3 when the vertically sliding door 13 is open.

In further detail, the tongs are provided with four jaws 14, two on each lever of the tongs, and each jaw is curved and supplied with three inward projections 15 (see Fig. 6) so that the pipe will be gripped at twelve points simultaneously and thus avoid danger of becoming flattened at opposite sides as might be caused by a plain pair of jaws. The tongs are made to fit the particular size of pipe or cylinders being run, and a different pair is used for the next size run. The furnace has a lift door 13 at both ends of the live rolls which rises on a pair of angularly arranged guide rods 16 by means of an air or hydraulic cylinder 17 connected to the door by means of a rod 18 and operated from any desired point from hose lines 19 by valve 19'.

Since the live rolls 2 which support and drive the pipes or cylinders to be lined are subject to the direct heat of the furnace from the burner or burners 20, it follows that they must be protected against it, and accordingly they each consist of several short sections of heavy high heat resisting steel sleeves 2 as of nickel chrome steel, welded to lugs 21 projecting outwardly from inner spaced pipe 22 spaced within which is a water tube 23. The space outside of pipe 22 is filled with heat insulating material. Pipe 22 is closed at one end as by a plug 24, and the water tube 23 within terminates short of the plugged end so that the water forced through it from a pipe as at 25 will flow out of the inner end of the tube into pipe 22 and back again around the outside of the tube to discharge at 26 into a hopper 27 connected to a drain 28.

The live rolls are supported in half bearings 29 fitting pipes 22 and the latter may be lifted and dropped into various bearing seats 30 so as to space them for large or small work. To avoid sagging of the supporting rolls when the latter are long, I may use intermediate supporting idler rollers 31 within the furnace supported on a bridge wall 32. Suitable water-cooling piping 33 is provided to keep the idler rollers from being destroyed by the heat. The live rolls are provided with sprockets 34 over which passes a drive chain 35 held taut by an idler 36 and receiving its motion from a motor 37 provided with a suitable reduction drive to revolve the rolls about 15 R. P. M. so that the pipe supported thereon will revolve slowly and be evenly heated by the fire.

The lathe tail stock is operated back and forth by a double-acting hydraulic cylinder 38 provided with a four-way valve 39 for turning the water from pipe 40 to either end of the cylinder and the opposite end to waste 41. Center rest 8 is a V structure provided with idlers 42 at each side to receive the hot pipe and is operated by air or hydraulically from a three-way valve connected to a power cylinder 43, but falls quickly by gravity when the valve is turned to waste as it is heavy and carries the additional weight of the hot pipe or cylinder from the tongs. The upwardly extending plunger rod 44 is provided with an adjustable stop 45 so that it may be set to drop precisely to center with a given size of pipe or cylinder being handled.

The moment a red hot pipe is lowered between the centers hydraulic cylinder 38 is operated to

instantly close the cone cup centers upon the ends of the hot pipe and the lathe is at once set in motion by a convenient switch not shown (or may be in motion at time of lowering the pipe). It runs at a speed sufficiently high to spin the liquid metal 46 contained within the pipe so as to form an even layer upon its inner walls, and in a few moments' time the pipe will have cooled to the congealing point so that it may be removed and another one treated in the same manner.

The furnace is provided with a door at both ends of the live rolls so that as a hot pipe is withdrawn by the tongs at one end, a fresh pipe for treatment is pushed into place in the furnace from the other door. Thus as fast as the spinning and removal of the hot pipe from the lathe can be conveniently accomplished another pipe will be ready.

The apparatus was developed principally for spinning linings in steel pipe and cylinders, and since the lining metal placed in a granular condition in the well cleaned pipe melts considerably before injurious softening or sagging of the steel pipe can take place, an even lining 47 is produced which may be of any desired thickness. Of course various metals melting at lower temperatures than the shell may be used and with any desired fluxing material. After charging the pipes with the material the ends are closed as by plugs 4 pierced in the center with a minute aperture so as to let any air and evolved gases escape and maintain the interior in a reducing atmosphere. The plugs are cut off the finished pipe.

The use of the word "pipe" or "pipes" in my appended claims as the article to be lined is intended to include any other hollow object such as cylinders of all kinds.

Having thus described my invention and the manner of its use, I claim:

1. Apparatus for centrifugal lining of metal pipes comprising a furnace, horizontally disposed water-cooled supporting rolls therein extending across the heat zone adapted to support upon them the pipe to be lined, means for revolving a pipe supported longitudinally on said rolls for evenly heating the pipe, means arranged to move longitudinally of said rolls into the furnace for removing a red hot pipe therefrom.

2. In a structure as specified in claim 1, the means for removing the red hot pipe comprising a pair of tongs supported for movement along a track, and said tongs provided with a plurality of curved jaws to embrace the hot pipe and spaced to grip the pipe at four places and formed with pipe engaging projections on their gripping surfaces.

3. A furnace provided with a pair of aligned door openings in the side walls at opposite sides of the heating zone, a pair of substantially horizontal water-cooled rolls arranged adjacent one another and extending across said heating zone and into both of the wall openings whereby work to be heated may be fed from one opening to the other longitudinally of said rolls.

4. In a furnace, a pair of work-supporting rolls extending across the heating zone, said rolls each comprising a supporting pipe, spaced flanges projecting outwardly from said pipe, relatively thick sections of high-heat resisting alloy sleeves between and secured to said flanges and spaced outwardly from said pipe, and heat-insulating material between said sections and said pipe.

5. In a furnace, a pair of work-supporting rolls extending across the heating zone, said rolls each comprising a supporting pipe, spaced flanges projecting outwardly from said pipe, relatively thick sections of high-heat resisting alloy sleeves between and secured to said flanges and spaced outwardly from said pipe and heat-insulating material between said sections and said pipe, and a water supply pipe extending longitudinally of and spaced within said supporting pipe.

FREDERICK A. KORMANN.