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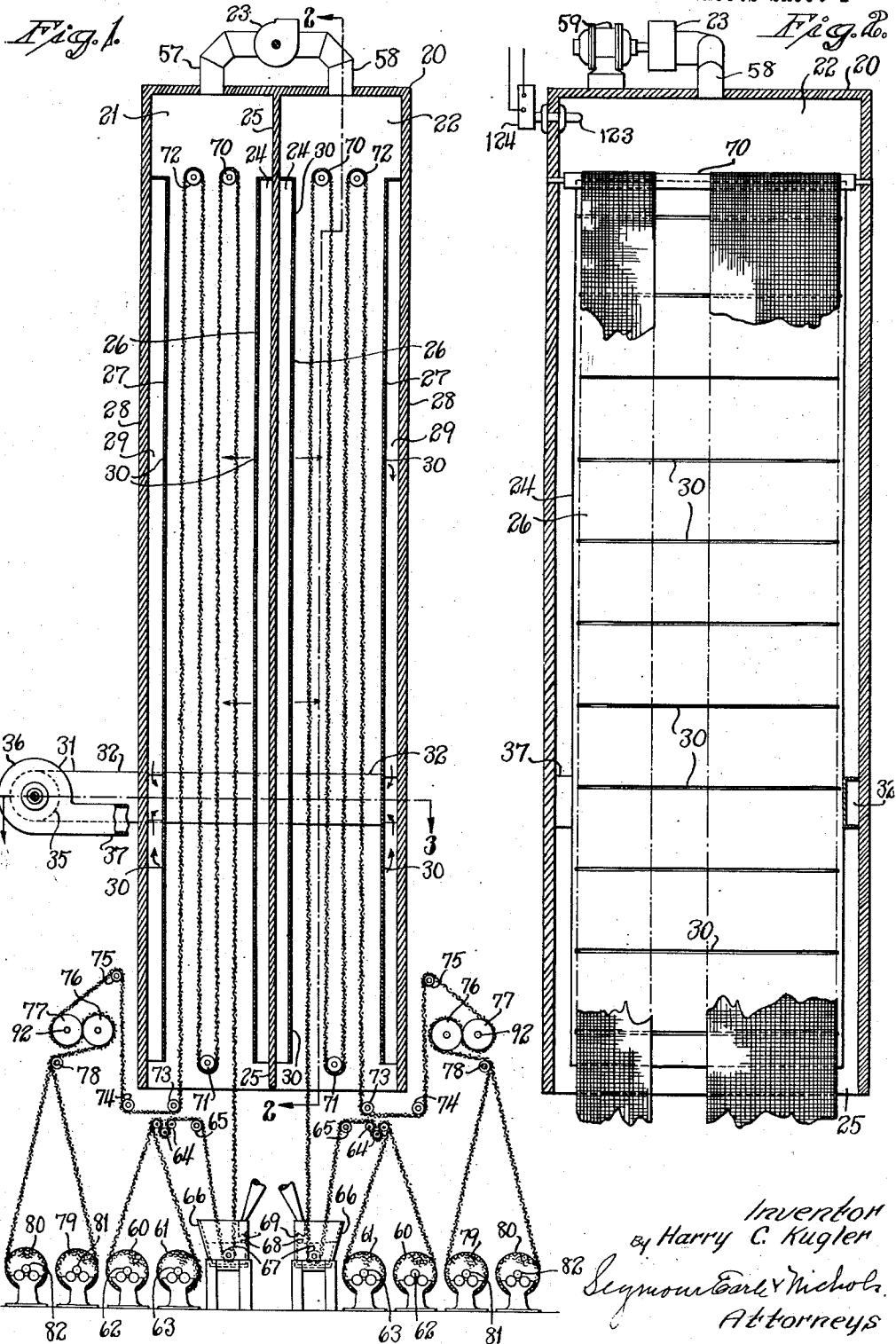
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2,328,078

APPARATUS FOR DRYING WIRE SCREEN CLOTH

Filed Oct. 11, 1939

3 Sheets-Sheet 1



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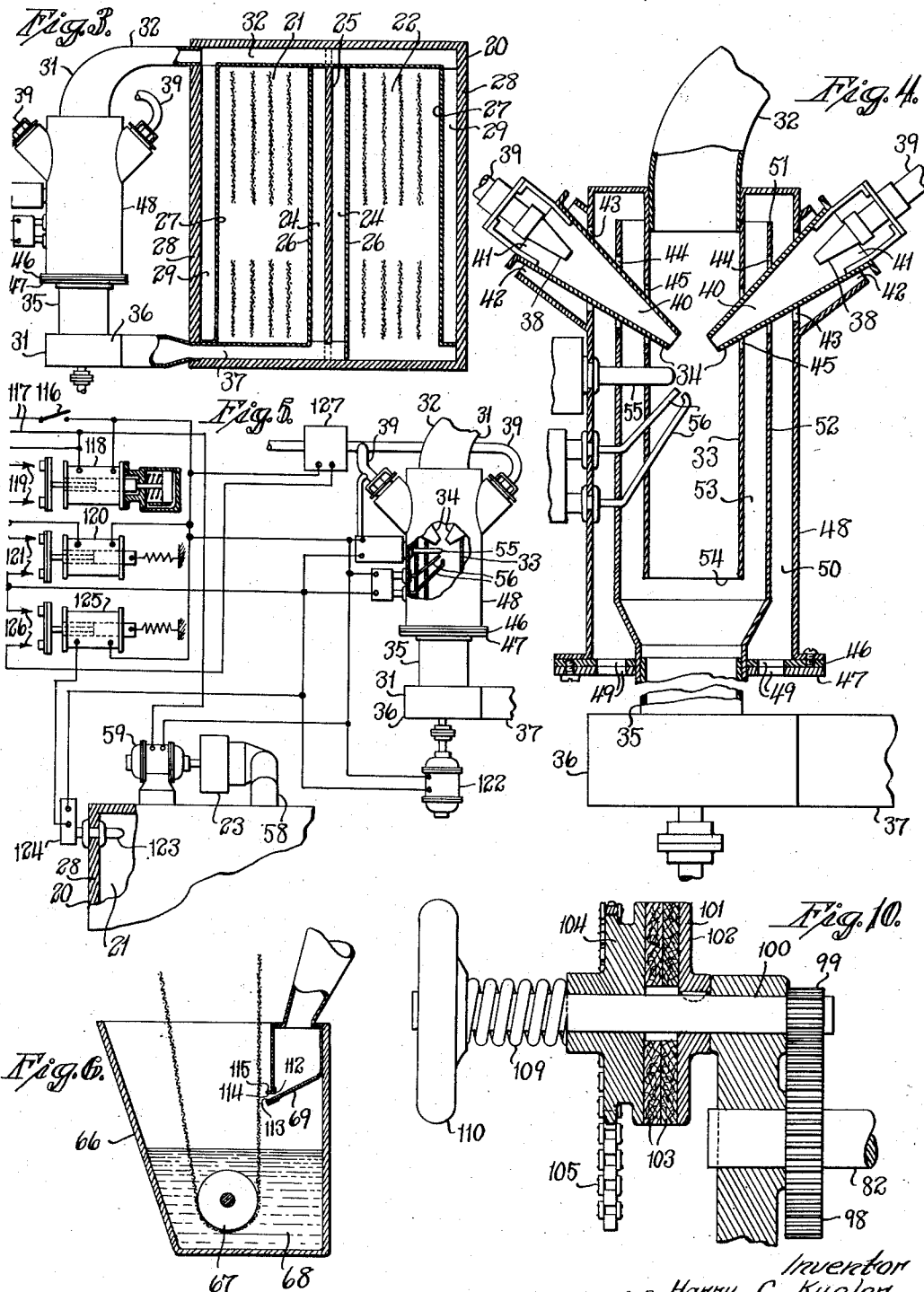
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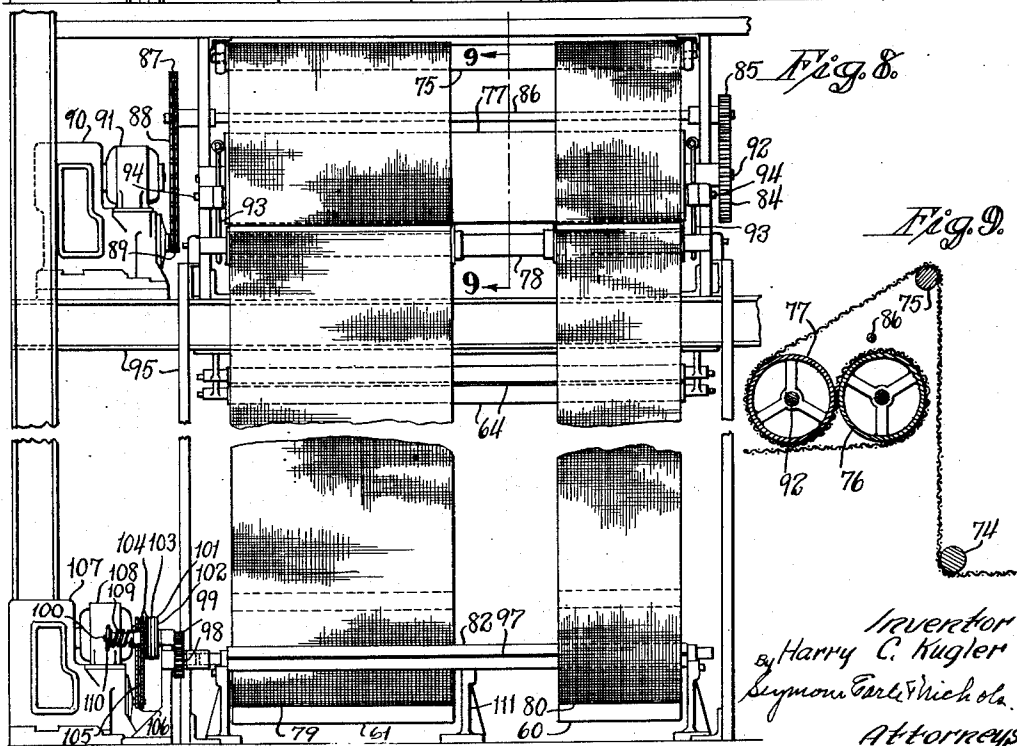
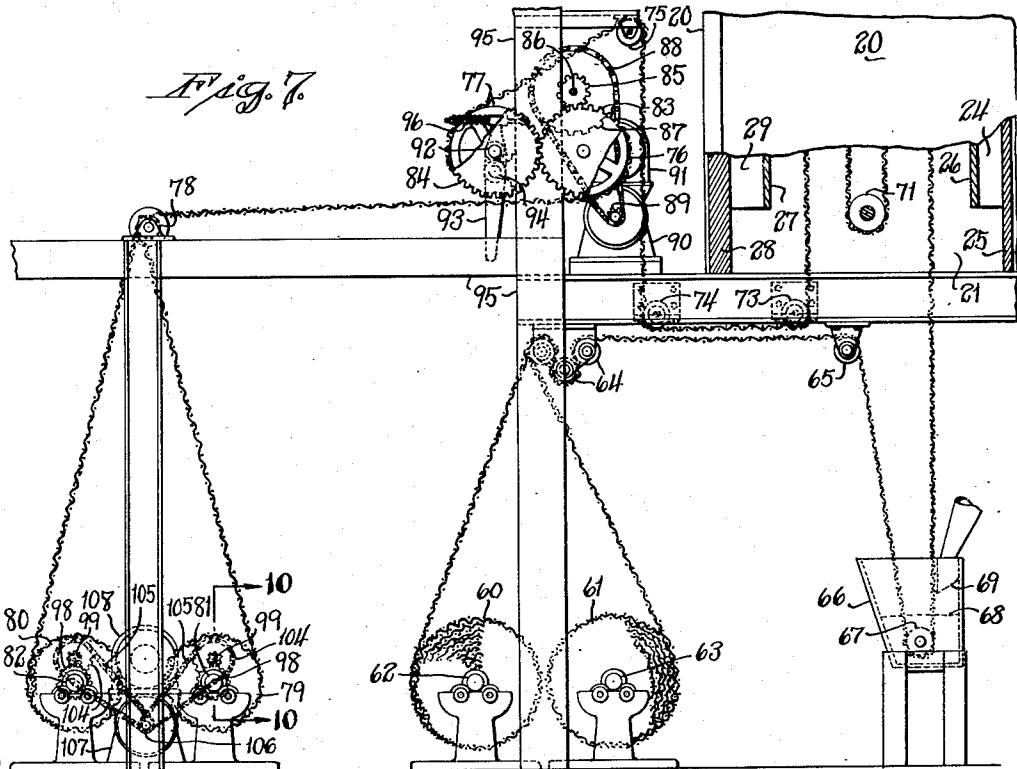
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3 Sheets-Sheet 3



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# UNITED STATES PATENT OFFICE

2,328,078

## APPARATUS FOR DRYING WIRE SCREEN CLOTH

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1 Claim. (Cl. 263-3)

This invention relates to improvements in apparatus for drying wire screen cloth, and is particularly useful in connection with drying wire screen cloth coated with varnish or the like.

One object of this invention is to provide improvements in drying wire screen cloth coated with varnish at a lower cost per square foot.

Another object of this invention is to provide improvements in drying varnish on wire screen cloth under conditions which result in the varnish on wire screen cloth under conditions which result in the varnish being dried properly and speedily, independent of weather conditions.

Another object of this invention is to provide improvements in drying varnish-coated wire screen cloth under conditions minimizing the danger from explosion or fire from the volatile solvent employed in the varnish.

Another object of this invention is to provide improvements in drying varnish on wire screen cloth in an oven or drying chamber of less height than heretofore, whereby heavier grades of screen cloth can be dried.

Another object of this invention is to provide improvements in drying wire screen cloth whereby two widths of screen cloth can be dried at one time.

With the above and other objects in view, as will appear to those skilled in the art from the present disclosure, this invention includes all features in the said disclosure which are novel over the prior art.

In the accompanying drawings forming part of the present disclosure, in which one way of carrying out the invention is shown for illustrative purposes:

Fig. 1 is a vertical sectional view of a double drying oven made in accordance with the present invention, with screen cloth varnishing and driving apparatus shown schematically;

Fig. 2 is a vertical sectional view of the oven on line 2-2 of Fig. 1;

Fig. 3 is a horizontal sectional view on line 3-3 of Fig. 1, with parts shown in elevation;

Fig. 4 is an enlarged horizontal sectional view on line 3-3 of Fig. 1, of the left-hand portion of Fig. 3;

Fig. 5 is a schematic diagram of electrical apparatus and connections for accomplishing automatic control of the main apparatus for drying coated screen wire cloth;

Fig. 6 is an enlarged view in section of one of the varnish-applying means shown at the lower part of Fig. 1;

Fig. 7 is an enlarged view in elevation, with

parts in section, of the screen-cloth feed and reel apparatus schematically illustrated in the lower left-hand portion of Fig. 1;

Fig. 8 is a left-hand elevation of Fig. 7;

Fig. 9 is a fragmental sectional view on line 9-9 of Fig. 8; and

Fig. 10 is a fragmental sectional view on line 10-10 of Fig. 7 of one of the friction slip-clutch mechanisms.

In the description and claims, the various parts and steps are identified by specific names for convenience, but they are intended to be as generic in their application as the prior art with permit.

Referring to the drawings showing the particular form of the invention chosen for illustration, 20 is an upstanding or vertical tower provided with a pair of upstanding ovens or drying-chambers 21 and 22 which are closed at the top except as regards the purging apparatus including the purging fan 23, and are open at the bottom, as illustrated in Fig. 1. The outer walls and center portion of the tower are preferably heat-insulated to conserve heat. Thus, either or both of the drying-chambers may be used at the same time.

Each of the drying-chambers 21 and 22 has an air-delivery duct 24 located between the middle partition 25 of the tower and an inner wall 26 of each drying-chamber. Each of the drying-chambers also has an opposite inner wall 27 spaced from one of the outer walls 28 of the tower to provide an air-return duct 29. Each of the inner walls 26 and 27 is provided with air-slots 30. Air-circulating means 31 provides for circulating or re-circulating heated air and combustion products through the drying-chambers 21 and 22. The air-circulating means 31 includes ducts 32, 33, 35, blower 36 and duct 37, which lead from the air-return ducts 29 past the nozzle ends of two burners 34 to the air-delivery ducts 24, the blower 36 serving to drive the air through the duct 37 and thence into the air-delivery ducts 24, from which delivery-ducts 24, the heated air passes through slots 30 in the upstanding inner walls 26 and across through the intervening spaces of the drying-chambers 21 and 22 and out through similar slots 30 in the opposite inner walls 27 of the drying-chambers and thence into the air-return ducts 29.

Each burner 34 has a gas inlet nozzle 38 leading from a gas supply pipe 39 into the combustion chamber 40. Generally-annular air-inlet opening 41 provides for entrance of auxiliary air to the combustion chamber 40. Generally-annular

air-inlet openings 42, 43, 44 and 45 provide for the entrance of auxiliary air directly into the tube 33 adjacent the ends of the combustion chambers 40 of the burners 34. The two annular plates 46 and 47 are adjustably connected together and carried by the housing 48 and each has an annular series of holes 49 so that the plates can be annularly adjusted relatively to one another to either align the holes of one plate with the holes of the other or offset them so as to block off the passage of air therethrough. Normally, the plates are so adjusted as to have the holes out of alignment and, therefore, in closed position, but if desired, they can be opened in greater or less degree, whereupon additional air will be drawn in through the annular passage 50 and past the end 51 of the casing 52 and along through the annular passage 53 and past the end 54 of the inner tube 33, to thus join with the air passing through the duct 35 to the blower 36. But since air and gas are introduced into the system in conjunction with the operation of burners 34, there is ordinarily no need of introducing additional air through the openings 49. A pilot 55 and an igniter 56 are arranged adjacent the burners 34 in a usual and well known way for igniting and maintaining ignited, the burners 34, and re-igniting them.

The purging fan 23 is connected by pipes 57 and 58 to the upper ends, respectively, of the drying-chambers 21 and 22, the fan 23 being driven by an electric motor 59.

There is a separate reel-supply shaft, varnishing-station, screen-cloth drive and reel-up shaft for each of the drying chambers 21 and 22, and as both of these are identical, only one will be described. While, if desired, only a single roll or single width of screen cloth can be passed through a drying-chamber, in the preferred form of the invention illustrated in the drawings, two rolls of screen cloth 60 and 61, respectively mounted on removably-mounted reel-shafts 62 and 63, pass two lengths of screen cloth in side-by-side edge-to-edge relation over a group of three guide-rolls 64, then over another guide-roll 65, then down into a varnish-containing tank 66, around another guide-roll 67 and up out of the varnish 68, past an air-blast nozzle 69 which drives the excess liquid varnish off the screen cloth, whereupon the screen cloth passes upward into the open lower end of the drying-chamber 21 up to the upper portion thereof and around the guide-roll 70, then down and around a lower guide-roll 71, then again upward and around a guide-roll 72 and then down and around guide-rolls 73, 74 and 75, to two drive-rolls 76 and 77, and then around another guide-roll 78, whereupon the two lengths of screen wire, respectively diverge to form two rolls 79 and 80 of wound-up screen cloth which are mounted on and wound up respectively by the reel-up shafts 81 and 82, which are preferably tapered to aid in removing the roll of wound-up screen cloth. Expressions such as side-by-side edge-to-edge, used in describing the relation of two lengths or widths of screen cloth, mean that the two edge portions which are nearest to each other are directed in a general direction toward one another. Such expressions as passing screen cloth through a drying-chamber includes passing screen cloth up into the bottom of a drying-chamber and down out of the bottom thereof, as in the apparatus illustrated.

The drive-rolls 76 and 77 are respectively driven by meshing-gears 83 and 84, the gear 83

being driven by a pinion 85 secured on a shaft 86 which at the other end carries a sprocket 87 driven by a sprocket chain 88 which is, in turn, driven by another sprocket 89 mounted on the out-put shaft of an adjustable drive 90, such for example as a Reeves drive, driven by an electric motor 91. The drive-roll 77 is mounted on a shaft 92 rotatably mounted in two levers 93 pivoted at 94 to the frame 95 of the apparatus, the upper ends of the levers 93 being actuated by springs 96 to swing the upper ends of the levers toward the drive-roll 76, to thus normally hold the drive-roll 77 in contact with drive-roll 76 to grip the screen cloth passing therebetween to effectively aid in driving the latter. The drive 90 provides for any desired adjustment in the speed of drive or travel of the screen cloth through the apparatus.

Each reel-up shaft 81, 82, has a longitudinal slot 97 to have the end of a length of screen cloth engaged therein, whereby each reel-up shaft can wind a length of screen cloth into a roll. Each of the shafts 81 and 82 is driven by a gear 98 coaxially therewith and which, in turn, is driven by a pinion 99 secured on a shaft 100 which has a slip-friction clutch 101 including a friction-plate 102 of any suitable material such, for example, as brass, keyed to the shaft 100 and frictionally engaged by one or more friction-disks 103 of suitable material such, for example, as fibre, in frictional engagement with a face of a sprocket-wheel 104 rotatably and slidably mounted on shaft 100 and driven by a sprocket chain 105 which, in turn, is driven from a sprocket 106 on the output shaft of an adjustable drive 107 similar to the drive 90, and which is driven by an electric motor 108. A spring 109 acting between a hand-wheel 110 and the sprocket 104 serves to press the latter firmly against the friction-disks 103 to provide a suitable slip-friction drive. The hand-wheel 110 is fixed on shaft 100 and provides for manual operation through the gears 99 and 98 for rotation of the shafts 81 and 82 to reverse their direction of rotation from the reel-up direction, to release the end of the screen cloth engaged in each of the slots 97 preparatory to removal of the rolls of screen cloth 79 and 80 from the shafts 81 and 82. The reel-supply shafts 62 and 63 and the reel-up shafts 81 and 82 can be provided with usual removable hold-down means whereby the shafts can be released for lifting up to remove or place rolls of screen cloth as required. By having the reel-supply shafts and reel-up shafts mounted near the floor as shown, heavy rolls of screen cloth can be loaded and unloaded directly from the floor without the use of a crane, from either side of a shaft without the necessity of passing a large roll of cloth over another shaft.

In the particular construction illustrated in the drawings (Figs. 7 and 8), the reel-up shaft 82 is illustrated as being long enough to carry a full 72" width of screen cloth, although the width of screen cloth actually wound thereon in Fig. 8 is much narrower. While the reel-up shaft 81 could be of full length like the shaft 82, it is only of sufficient length to accommodate a 36" width of screen cloth, the bearing-support 111 in Fig. 8 supporting the right-hand end of the shaft 81 (behind shaft 82). In a similar manner, the reel-supply shaft 63 can be long enough to accommodate a 72" width and the shaft 62 can be short enough to only accommodate a 36" width.

All of the guide- and drive-rolls are of sufficient

length to support a full 72" width or two 36" widths or one 12" width and one 60" or less width, and so forth.

The adjustable drive 90 provides an infinitesimally-adjustable-speed variable-drive by means of which any desired speed of feed or travel of the screen cloth through the varnish-applying means and the drying-chambers can be provided. And the adjustable drive 107 provides an infinitesimally-adjustable-speed variable-drive by means of which the reel-up shafts 81 and 82 can be driven at such speeds as will ensure their winding up the dry screen cloth fast enough to produce tightly wound proper rolls of screen cloth, the two slip-friction clutches 101 permitting the two shafts 81 and 82 to slip relatively to the drive so that the two shafts can acquire any necessary speeds and any variations of speed relatively to each other or to the drive, as may be necessary to produce two tightly properly rolled-up rolls of screen cloth. The screen cloth drive and reel-up mechanisms can be controlled by a separate switch from that controlling the rest of the apparatus.

The air-blast slot 112 of the air-blast nozzle 69 extends transversely entirely across where a 72" width of screen passes up out of the varnish 68 of the tank 66 so as to drive excess varnish from the screen cloth being coated or varnished. In order to give a downward wiping effect, the surface 113 of the bottom of the nozzle 69 forming the lower surface of the slot 112 makes approximately an angle shown in the drawing, of about 27° with the horizontal, while the under surface 114 of the angle iron 115 forming the upper surface of the slot 112 extends horizontally, the narrowest portion of the slot 112 being about an eighth of an inch. The degree of the angle of the surface 113 can be increased up to as much as about a 45° angle depending on various factors. Thus with a suitably-large size varnish-dipping tank and a suitably-larger fan to supply the air blast, a 45° angle could be used. Also, instead of using only one air-blast slot, two air-blast slots could be used, one being located several inches such, for example, as six inches, above the lower one, the larger the degree of angle of the slot with the horizontal, the greater the wiping effect on the cloth in assisting gravity in draining the excess varnish back into the tank. Any varnish films closing meshes of the screen cloth, which might escape the air-blast, will be opened by the cross currents of air between the air slots 30 of opposite inner walls of the drying-chambers.

Closing of the main switch 116 supplies electric current from the main line wires 117 to the electric motor 59 which drives the purge fan 23, and also starts the timing relay 118 which can be set to close the contacts 119 after any desired interval such as for a period of from five to seven minutes. Upon the contacts 119 being closed, the magnetic contactor 120 is actuated to close the contacts 121 thus closing the circuit to the motor 122 of the blower 36 and actuating the electrically-actuated pilot 55 to supply a pilot flame in the pilot, and also actuating the electrically-actuated igniter 56 to light the pilot 55. When the thermostat 123 in one of the drying-chambers has cooled to a low enough temperature to close the thermostat switch 124 thereof, the magnetic contactor 125 is actuated to close the contacts 126 and thus open the gas-supply valve 127 to supply gas to the burners 34 which thus start in operation, and continue in operation until the

thermostat 123 heats up to a degree sufficient to cause the thermostate switch 124 to open, whereupon the gas supply valve 127 is closed, thus shutting off the burners 34. During normal operation of the apparatus, both while the burners 34 are on and while they are off, the motor 59 continues to drive the purge fan 23, which latter has sufficient air-removing or exhausting capacity to just remove or purge sufficient air and products of combustion from the upper ends of the drying chambers 21 and 22 so that even though additional air and products of combustion are introduced into the recirculation system at and adjacent the burners 34, substantially no air is forced down out of the lower open ends of the heating chambers. The switch-means (not shown) for the screen cloth drive and reel-up motors 91 and 108 (Fig. 8) are to be operated by hand or otherwise to start these motors after the drying chambers have been brought to a suitable drying temperature. When the burners 34 are shut off by the thermostat 123, the purge fan 23 continues to operate thus preventing the accumulation of inflammable vapors within the drying chambers. By having the purge fan 23 continue to operate even when the feed of the screen cloth through the apparatus is stopped, permits of allowing the screen cloth to remain in the drying chamber instead of running an apron through, and saves expenses and loss of operating time. The operation of the purge fan 23 prevents the screen cloth from changing color from excessive action of heat.

By means of the apparatus shown and described, air can be heated to a suitably high degree by the burners 34 and caused to travel transversely across the drying-chambers 21 and 22 from one set of slots 30 on one side of each chamber to a similar set of slots on the other side of each chamber, thus causing the air to pass through the several layers of screen cloth which are passing up and down through the drying chambers, and the air as it passes through the screen cloth picks up the volatile varnish solvent. The latter is carried out through the duct 32 and back through the flame produced by the burners 34 to thus eliminate the varnish-solvent vapors by burning them, thus accomplishing two important results, namely, reducing the risk of fire from the varnish vapors in the drying system and at the same time utilizing these vapors as fuel to aid in the production of heat to heat the air being recirculated through the drying-chambers. By means of the apparatus shown and described, a suitably high temperature of air can be maintained so uniformly throughout the heating chambers without endangering the scorching or damaging of the varnish, that the apparatus can be operated effectively in the most humid weather with apparently no harmful effect from the humidity. This appears to be largely due to the fact that a very high average temperature can be maintained very uniformly throughout the drying chamber. Also this high average uniform temperature so greatly increases the speed of drying of the screen cloth that it is not necessary to have the drying chambers as high as has heretofore been necessary.

The invention may be carried out in other specific ways than those herein set forth without departing from the spirit and essential characteristics of the invention, and the present embodiments are, therefore, to be considered in all respects as illustrative and not restrictive, and

all changes coming within the meaning and equivalency range of the appended claims are intended to be embraced therein.

I claim:

Apparatus for drying wire screen cloth having a coating containing volatile solvent, comprising: an elongated upstanding drying chamber open at the bottom and having upstanding opposite inner walls and two sets of air-circulation openings distributed substantially throughout the height and width of said opposite inner walls, said two sets of openings being adapted to permit air to be circulated from one set of openings transversely across the drying chamber and out through the other set of openings; feed means for passing said coated screen cloth between said sets of air-circulation openings and into and out of the open bottom of said drying chamber; air-

circulating means including duct means and an air-pump, said air-circulating means leading from one of said sets of openings to the other of said sets of openings, and said air-pump being for recirculating air through said air-circulating means and drying chamber; flame-heating means exterior of said drying chamber and adapted to produce a flame in said duct means adapted to heat the air and burn solvent in said air passing therethrough, to heat said drying chamber and screen cloth therein; means for introducing air and fuel to said heating means; and means for discharging from the drying apparatus, an amount of said air and combustion products approximately equal to the amount of air and combustion products introduced into the air-circulating means adjacent said flame.

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