

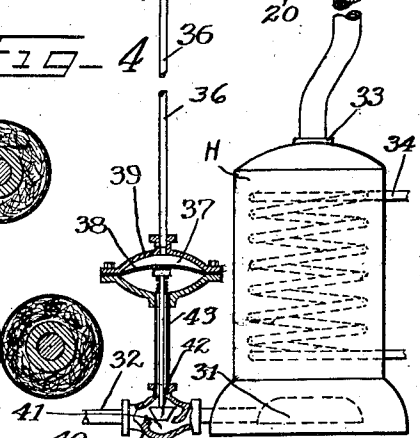
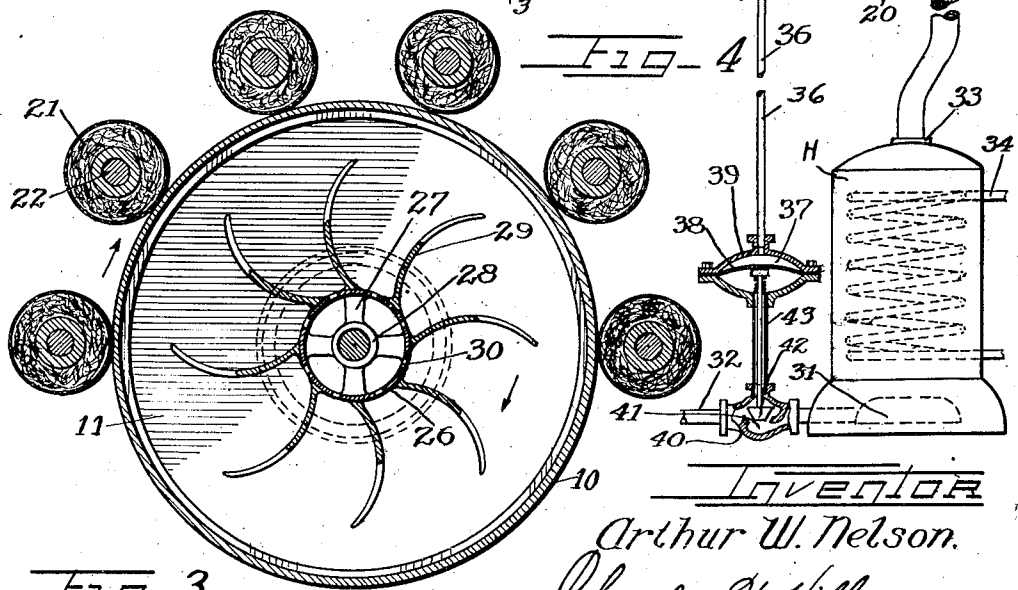
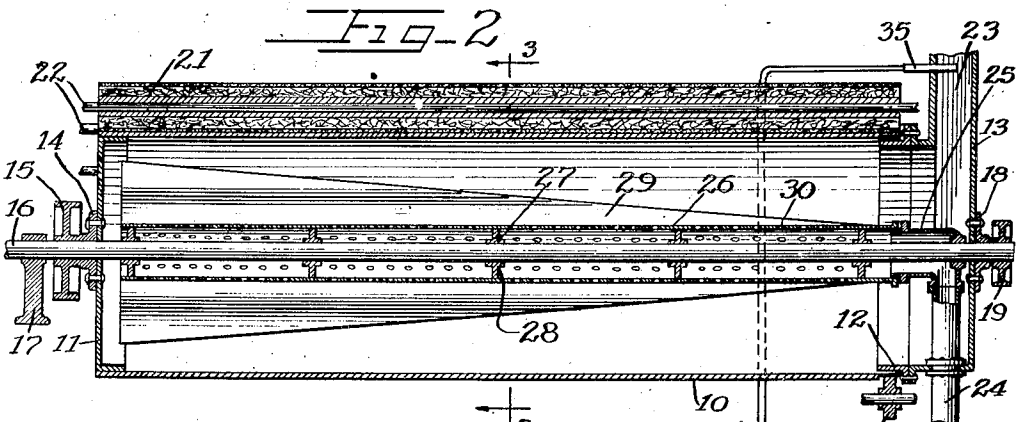
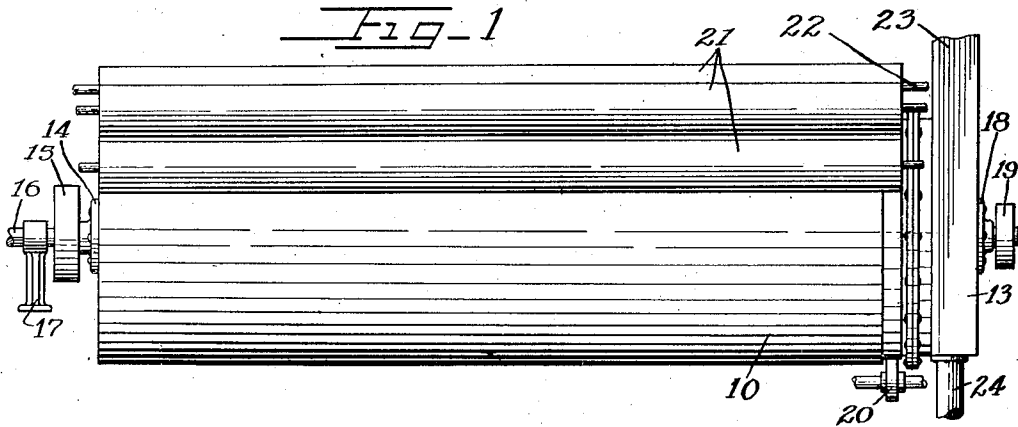
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IRONING MACHINE AND MEANS FOR HEATING SAME

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## IRONING MACHINE AND MEANS FOR HEATING SAME

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12 Claims. (Cl. 257-95)

My invention relates to ironing machines and concerns particularly machines for ironing large pieces of flat work.

In ironing machines of this type, a large ironing cylinder is provided and a plurality of ironing rolls in engagement therewith, the cylinder and rolls being rotated in synchronism in order to draw the work to be iron around the cylinder and in intimate contact with the ironing face thereof. Heretofore the cylinder has usually been heated by direct contact therewith of jets or flames resulting from the combustion of gas in burners located within the cylinder. Such arrangement has many disadvantages, as, for example, nonuniformity of heating, over or under heating, inadequate air supply and choking of the flames, waste of heat, and considerable fire hazard.

An important object of my invention is to dispense with the heating of the ironer by means of combustion within the ironing cylinder and to utilize the heat resulting from combustion carried on outside of the cylinder, and such heat could be provided by the otherwise wasted products of combustion from heating devices, such as furnaces, gas heaters, gas engines, or the like.

A further object of the invention is to provide simple and efficient means for assuring uniform distribution and circulation of heat through the cylinder so that the cylinder will be continuously and uniformly heated.

Another object is to provide a closed cylinder having at one end an inlet for the heating medium and an outlet therefor, together with a rotating structure for uniformly distributing the incoming heating medium axially and radially throughout the cylinder and for creating circulation for expelling the spent heating medium through the outlet.

A further important object is to provide a vane member cooperating with the cylinder to form a blower structure and extending full length through the cylinder and having an axial passageway for receiving and discharging the heating medium into the cylinder and having vanes for directing the heating element radially against the cylinder wall and longitudinally along the wall to the discharge outlet of the cylinder.

Still another object is to provide thermostat means controlled by the temperature of the discharge from the cylinder to control the temperature or supply of heating medium to the cylinder.

The above enumerated and other features of my invention are incorporated in the structure disclosed on the drawing, in which

Figure 1 is a side elevation of the ironer structure;

Figure 2 is a vertical diametrical section; and

Figure 3 is an enlarged section on plane 3-3 of Figure 2.

Figure 4 is a side elevation of the heat producing device for the ironer.

The machine shown comprises a cylindrical ironing shell 10 closed at one end by a head 11 secured thereto and at its other end telescoping the cylindrical flange 12 on a stationary head 13. Secured to the head 11 is a base 14 supporting a pulley 15 concentric with the cylinder, the base and pulley receiving, revolvably therein, a shaft 16 which is journaled in a suitable bearing pedestal 17. At its opposite end, the shaft is journaled in a bearing frame 18 secured to the head 13 concentric with the cylinder, and secured to the shaft at this end is a drive pulley 19. The inlet end of the cylinder surrounding the flange 12 on the head 13 is supported on idlers 20. A suitable belt (not shown) engaging the pulley 15 will serve to rotate the cylinder, while a suitable belt (not shown), applied to the pulley 19, will serve to rotate the shaft 16.

A row of ironing rolls 21 are mounted on shafts 22 extending parallel with the cylinder axis and are rotated in any suitable manner in synchronism with the rotation of the cylinder, so that work fed in between the end roll and the cylinder will be propelled around and against the cylinder to be ironed.

The stationary head 13 encloses the adjacent end of the cylinder and has the outlet passage 23 through which the heating medium may flow after having delivered heat to the cylinder. An inlet pipe 24 for the heating medium extends radially through the head 13 and terminates in a nozzle fitting 25 concentric with the cylinder axis for directing the heating medium into the cylinder.

Concentrically surrounding the shaft 16 and extending full length of the cylinder is a tubular shell or hub 26 supported on arms or spokes 27 extending from hubs 28 which receive and are secured to the shaft. At the inlet end of the cylinder the end of the hub 26 telescopically receives the inner end of the nozzle fitting 25, and the incoming heating medium will travel longitudinally through the hub 26.

Extending radially from the hub 26 are the vanes 29 which are transversely curved, as clearly shown in Figure 3. The radial length or extent of these vanes increases gradually from the inlet end of the cylinder to the opposite end thereof. Between the vanes, the hub 26 has outlet ports or perforations 30 through which the heating medium may discharge radially. The hub 26 with the vanes thereon cooperates with the cylinder to form an inducting or blower structure for distributing the incoming heating medium longitudinally in the hub and radially in the cylinder and for creating pressure conditions for inducing circulation for expelling the spent heating medium through the outlet 23. The rotary vane structure rotates in the direction

indicated by the arrow in Figure 3, and during such rotation the heating medium between the vanes will be expelled radially so that the vacuum or suction effect resulting at the outlets 30 will draw the heating medium out of the hub 26, thereby creating suction or inductive effect at the nozzle 25 which will draw in the heating medium through the pipe 24. The incoming heating medium will tend to flow through the nearest ports 30 directly to and out of the outlet 23. To cause flow of the heating medium through the hub 26 and uniform radial distribution thereof throughout the cylinder, the ports are properly calibrated so that the effective outlet area from the hub 26 will be a minimum at the inlet end of the cylinder and will gradually increase toward the other end of the cylinder. Owing to the gradually increasing radial extent of the vanes, as has been described, the centrifugal action of the vanes will also be a minimum at the inlet end of the cylinder and will gradually increase toward the other end of the cylinder. The combined result of the graduated effective outlet area through the ports 30 and the gradually increasing centrifugal action of the vanes will cause a uniform discharge of heating medium from the ports throughout the length of the cylinder, and the vanes will blow the heating medium against the inner wall of the cylinder which will then be uniformly heated. The gradually increasing expulsion velocity of the heating medium will become static pressure after the medium leaves the vanes, and such pressure will also be a minimum at the outlet end of the cylinder and will gradually increase toward the other end thereof, the result being that the heating medium, after having been centrifugally projected by the vanes against the cylinder wall, will be caused by the difference in pressure, to flow along the cylinder wall into the head 13 and out of the outlet 23. The rotary vane member thus maintains a constant uniform circulation of the heating medium to uniformly heat the cylinder and to flow along the cylinder wall to be discharged from the outlet 23. The vane member is rotated at a proper speed to efficiently maintain the pressure and circulation and, at the same time, permitting the cylinder to withdraw the required heat units from the heating medium for the most efficient ironing. The rotation speed of the vane member is high as compared with the rate of rotation of the cylinder by the pulley 15. For example, the vane member might rotate 400 revolutions per minute, while the cylinder would rotate only 9 revolutions per minute.

The heating medium for the ironer could be produced by a special heating device or could be the otherwise wasted products of combustion discharged from furnaces or other heating devices, or from the exhaust outlets of gas engines.

In Figure 4 I show a heating or heat producing device H in which the heat producing element is a gas burner 31 fed from a gas supply pipe 32. The outlet 33 for the products of combustion may be connected with the inlet pipe 24 for the ironer. The structure H may be a gas water heater having a coil 34 through which water is circulated to be heated. In this case, the products of combustion, which would ordinarily be discharged into the open or into a chimney, can be fed into the ironer to supply the heat therefor.

In order to maintain uniform temperature in the ironer, I preferably control the supply of heating medium by the temperature of the spent heating medium flowing through the outlet 23. In

the arrangement shown, I provide a mercury thermostat 35 subjected to the heat in the outlet 23 and connected through tube 36 with the chamber 37 at one side of the diaphragm 38 within the frame 39. A valve frame 40, included in the gas supply pipe 32, provides a gas passage or port 41 controlled by the valve 42 whose stem 43 extends into the frame 39 and is secured to the diaphragm. With this arrangement, increase in temperature in the ironer outlet 23 will result in expansion of the mercury and deflection of the diaphragm 38 to shift the valve 42 to decrease the size of the passageway 41 and consequently cause reduction of the gas supply to the burner 31. Decrease in temperature in the outlet 23 will cause increased opening of the passageway 41 and increase in the gas supply to the burner, the thermostat arrangement thus automatically controlling the supply of heating medium so that uniform temperature will be maintained at the ironing surface of the cylinder. As the damp and comparatively cold work is fed through the ironer and heat is extracted thereby from the cylinder, material drop in temperature will be prevented by the thermostat regulating means which immediately gives more gas to the burner 31, so that the structure H will deliver increased heat to the ironer to be rapidly distributed by the vane structure and applied to the cylinder to maintain the temperature thereof.

It is evident that instead of having the thermostat device control the gas supply to the combustion device H, it could control a valve, damper, or other flow controlling structure interposed between the combustion device and the inlet 24.

The spent heating medium discharged through the outlet 23 of the iron may be conveyed into the open or into a chimney or stack, and if there are sufficient heat units remaining, the discharged heating medium can be utilized in other devices for heating purposes, so that all the heat would be utilized and would not be wasted.

My improved method for uniformly heating long cylindrical structures by means of heating medium resulting from combustion outside of the cylinder structure overcomes all of the disadvantages incident to the generation of heat by means of combustion directly within the cylinder structure. The apparatus for accomplishing this is of simple and economical manufacture and is very efficient. By its use the heat units in products of combustion which would otherwise be wasted are utilized in the most efficient and safe manner.

Although I have shown one embodiment of the various features of my invention, it is to be understood that such features may be embodied in other structures and that changes and modifications may be made without departing from the scope and principles of the invention.

I claim as follows:

1. In an ironing machine, having an ironing cylinder, a heating medium circulating member comprising a hub forming an inlet passageway extending full length of said cylinder and vanes extending from said hub, means connecting the inlet end of said hub to receive heating medium, said cylinder having an outlet, said hub having outlet ports between said vanes, and means for rotating said hub whereby the heating medium will be drawn out of said ports and deflected radially by said vanes against the cylinder wall to cause heating thereof.

2. In an ironing machine having an ironing cylinder, said cylinder being closed at one end and

having outlet at its other end to the exterior, a heating medium distributing member comprising a hub forming a passageway extending full length of the cylinder axially thereof and having vanes extending radially therefrom, means at the outlet end of said cylinder for conducting heating medium into said hub passageway, said hub having outlet ports from said passageway and the effective outlet area of said ports increasing from the inlet end of said passageway to the other end thereof, the radial extent of said vanes increasing from the inlet end of said passageway to the other end thereof, and means for rotating said hub whereby the heating medium will be inducted along said passageway to be uniformly distributed radially therefrom by said vanes against the cylinder wall, said vanes causing differential pressure for directing the radially deflected heating medium to flow longitudinally along the cylinder wall and from the cylinder outlet.

3. In combination, an ironing cylinder closed at one end and its other end having an axial inlet and a concentric outlet along the cylinder wall, a heating medium distributing and circulating member and means for rotating it, said member having a passageway concentric with said cylinder and connected with said inlet to receive heating medium therefrom, outlets from said passageway calibrated to cause uniform radial distribution of the heating medium from said passageway throughout the length of the cylinder, and vanes for said member for deflecting the heating medium radially against the cylinder wall, the radial extent of said vanes increasing from the inlet end of said cylinder to the other end thereof whereby differential pressure is created to cause the heating medium to flow along the cylinder wall and through the outlet of the cylinder.

4. The combination with an ironing cylinder closed at one end and its other end having an axial inlet and a surrounding outlet, means supplying a heating medium to said inlet, means within said cylinder connected with said inlet and operative to cause uniform radial distribution throughout said cylinder of the received heating medium and circulating it along the cylinder wall and discharging it through the outlet, and means controlled by the temperature of the outflowing heating medium for controlling the temperature of the heating medium delivered to said inlet.

5. The combination with an ironing cylinder closed at one end and its other end having an axial inlet and a surrounding outlet, means supplying a heating medium to said inlet, means within said cylinder connected with said inlet and operative to cause uniform radial distribution throughout said cylinder of the received heating medium and circulating it along the cylinder wall and discharging it through the outlet, and means controlled by the temperature of the outflowing heating medium for controlling the supply of heating medium delivered to said inlet.

6. In combination in an ironing machine, an imperforate ironing cylinder closed at one end and having an outlet at its other end to the exterior, means including an inlet for supplying heating medium at said outlet end, and means including a fan positioned intermediate said inlet and said outlet to cause axial flow of heating medium toward the closed end of said cylinder

and then directly along the inner surface of said cylinder to said outlet.

7. In combination in an ironing machine, an ironing cylinder closed at one end and having an outlet at its other end, means to supply heating medium at said outlet end, means to cause heating medium to flow along an inner path longitudinally of the cylinder to the closed end thereof, and then in reverse direction by an unobstructed path and along the inner surface of said cylinder to said outlet, said last named means including a fan adjacent the closed end of said cylinder.

8. In combination in an ironing machine, an ironing cylinder having an inlet and a surrounding outlet at one end and having its other end closed, means to supply heating medium at said inlet, means to direct heating medium through an inner path longitudinally of said cylinder to the closed end thereof, and means to deflect said medium radially and to cause it to flow by an outer return path directly along the cylinder wall and to said outlet.

9. In combination in an ironing machine, an ironing cylinder closed at one end and having an outlet at the other end, means at the outlet end to supply heating medium to the cylinder, blower means within the cylinder operating to cause flow of heating medium first inwardly through an inner path toward the closed end of said cylinder and then outwardly through an outer path directly along the inner face of said cylinder and to said outlet.

10. An ironing machine comprising, in combination, a drum to be heated, said drum having an outlet at one end thereof and having an inlet for heating medium at the same end, conduit means extending within said drum connected to said inlet, said conduit having an outlet within said drum, and means positioned between said conduit outlet and said drum outlet to draw heating medium from said conduit and to expel it in reversed direction towards said drum outlet and in intimate contact with the inner face of said drum.

11. An ironing machine comprising, in combination, a drum to be heated, said drum having an outlet at one end thereof and having an inlet for heating medium at the same end, conduit means extending within said drum connected to said inlet, said conduit means having an outlet within said drum, and a fan positioned between said conduit outlet and said drum outlet to draw heating medium from said outlet and to expel it in reversed direction towards said drum outlet and in intimate contact with the inner face of said drum.

12. An ironing machine comprising, in combination, a drum to be heated, said drum being closed at one end and having an outlet and an inlet for heating medium at the other end thereof, conduit means connected to said inlet arranged extending within said drum to convey heating medium towards the closed end of said drum, said conduit means having an outlet adjacent the closed end of said drum, and means positioned between said conduit outlet and said drum outlet to impel heating medium towards said drum outlet and in intimate contact with the inner face of said drum.

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