

Nov. 16, 1943.

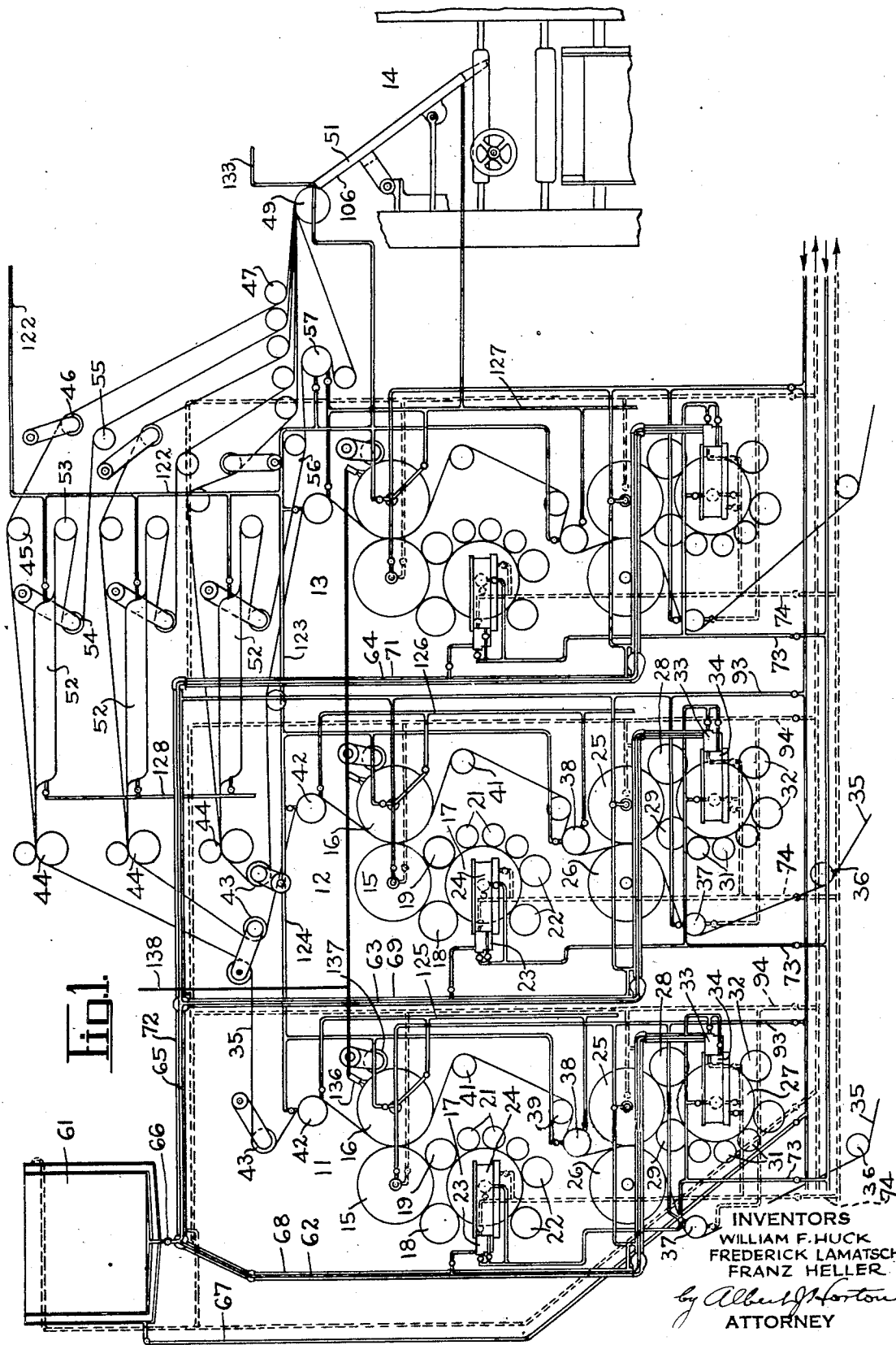
W. F. HUCK ET AL

2,334,628

PRINTING MACHINE

Filed Oct. 3, 1940

4 Sheets-Sheet 1



Nov. 16, 1943.

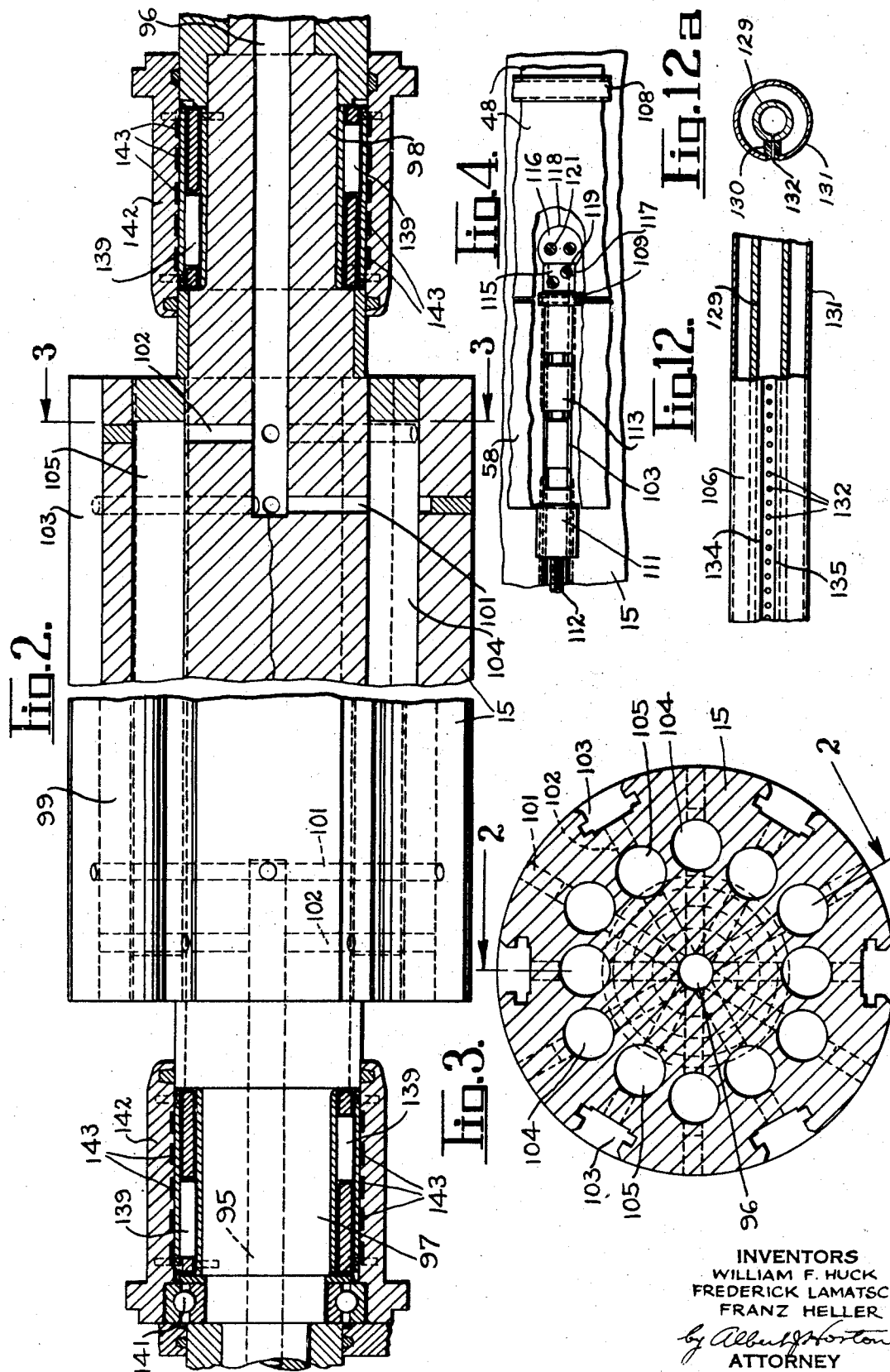
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PRINTING MACHINE

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4 Sheets-Sheet 2



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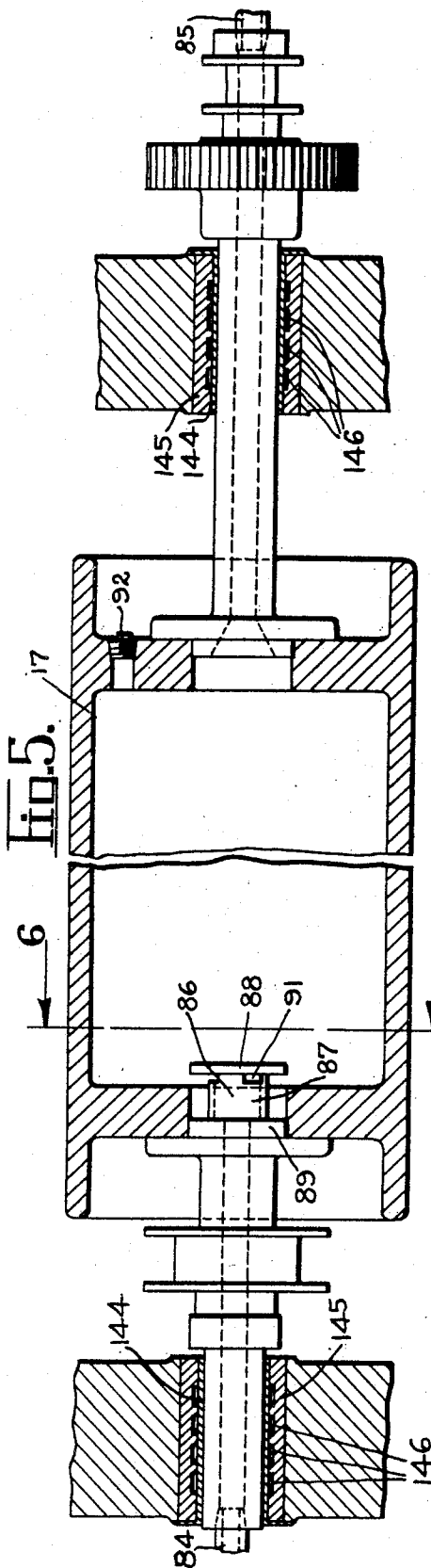
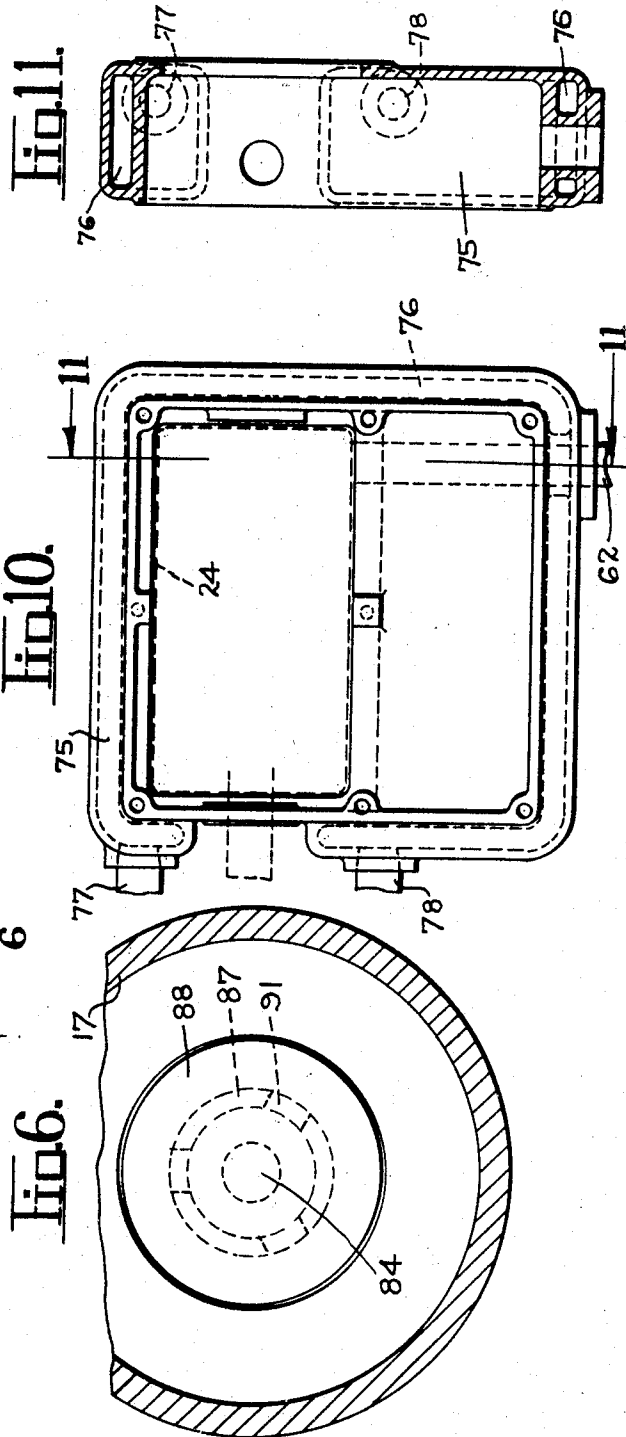
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PRINTING MACHINE

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4 Sheets-Sheet 3



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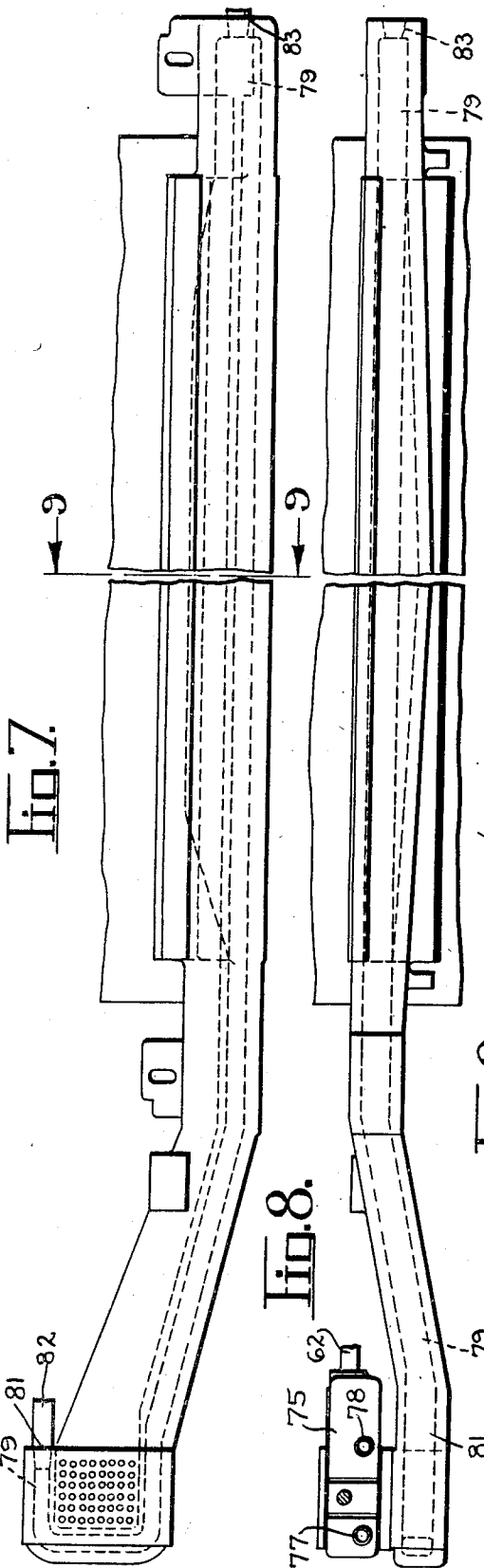
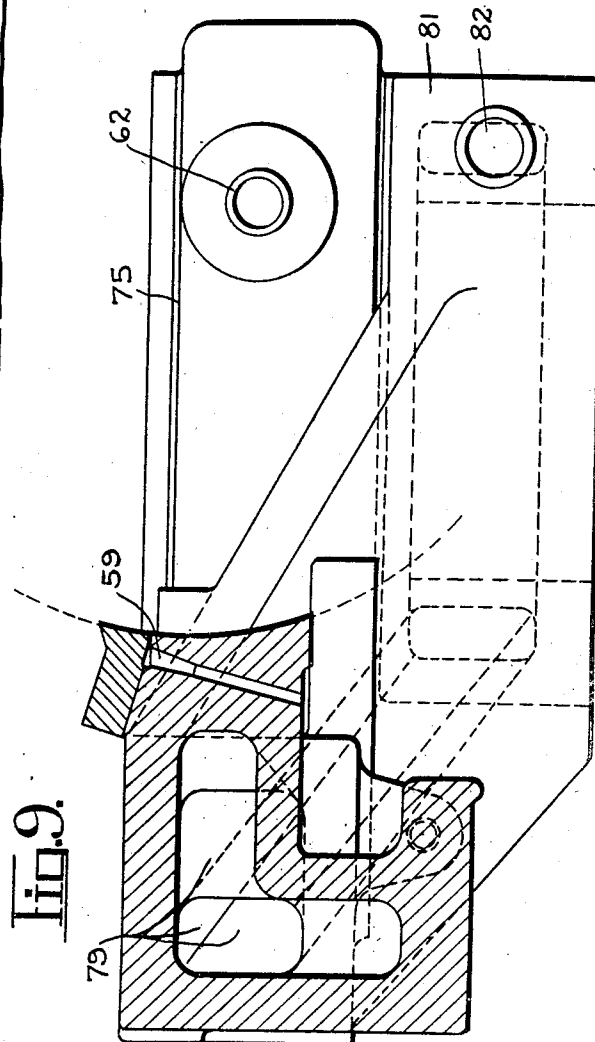
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PRINTING MACHINE

Filed Oct. 3, 1940

4 Sheets-Sheet 4



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UNITED STATES PATENT OFFICE

2,334,628

PRINTING MACHINE

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Application October 3, 1940, Serial No. 359,570

24 Claims. (Cl. 101—219)

This invention relates to printing machines and more particularly to improvements therein to adapt them to use rapidly drying ink of the type requiring the provision of heat to maintain the ink in a fluid condition.

A preferred ink which will quickly dry and which requires heat to liquefy it and to maintain it fluid, contains a wax base in its mixture. This ink is adapted to readily flow when heated to a temperature within the range of 140° to 200° Fahrenheit and solidifies when cooled to about 70° Fahrenheit. This type of ink will not rub off nor smudge when dry, and as it may be dried or solidified very rapidly, is especially adapted for high speed printing.

To first liquefy and then maintain an ink of the above nature usable for printing in high speed printing machines, it has been found desirable to heat certain parts and mechanisms of the machines to temperatures slightly above the ink flowing temperature. It has also been found desirable in some instances to cool other parts and mechanisms of such printing machines to temperatures the same as or below the ink setting temperature. While heating the various machine parts and mechanisms, it is also desirable to maintain the other parts and mechanisms of the machine at substantially normal temperatures and therefore provision is made to insulate the heated and if desired the cooled machine parts and mechanisms, from the remaining parts of the machine.

One object of this invention is to provide an improved printing machine adapted to efficiently operate to print impressions upon a web or sheet, using ink that is solid at normal temperatures and is made fluid by heat.

Another object is to provide in a printing machine, improved means to heat various parts and mechanisms to a temperature slightly in excess of the temperature required to cause such ink to become fluid and to maintain such a temperature substantially constant, and the heat uniformly distributed throughout the heated parts or mechanisms.

Another object is to provide in such a printing machine, means to cool certain parts thereof, and to maintain the cooling action substantially constant and uniform throughout the cooled parts.

It is also an object of this invention to provide a printing machine of generally improved construction and that is arranged to print with ink that is solid at normal temperature, whereby the same will be simple, durable and inexpensive

in construction, as well as convenient, practical, serviceable and efficient in use.

With the foregoing and other objects in view, which will appear as the description proceeds, the invention resides in the combination and arrangement of parts, and in the details of construction hereinafter described and claimed.

The preferred embodiment of the invention is illustrated in the accompanying drawings, wherein:

Figure 1 is a diagrammatical view of a printing machine embodying the features and principles of this invention;

Figure 2 is a side view of a plate cylinder used in the machine of this invention, part of the cylinder being sectioned to show the internal construction thereof on the line 2—2 of Figure 3;

Figure 3 is a sectional view taken on the line 3—3 of Figure 2;

Figure 4 is a broken and partial top plan view of a plate cylinder;

Figure 5 is a sectional view of an ink distributing cylinder used in the machine of this invention;

Figure 6 is an enlarged sectional view taken on the line 5—6 of Figure 5;

Figure 7 is a top plan view of an ink rail used with the machine of this invention;

Figure 8 is a side view of the ink rail shown in Figure 7 and showing an ink pump casing in place thereon;

Figure 9 is an enlarged sectional view taken on the line 9—9 of Figure 7;

Figure 10 is a top plan view of the ink pump casing with its cover removed;

Figure 11 is a sectional view taken on the line 11—11 of Figure 10;

Figure 12 is a broken and partly sectioned side view of a water cooled web turning bar for the edges of the former of the folding mechanism of the machine shown in Figure 1; and

Figure 12a is a sectional view of the turning bar shown in Figure 12.

The printing machine selected to illustrate the features and principles of this invention (Figure 1) includes a plurality of printing units 11, 12 and 13 and a folding mechanism 14. Each of the printing units 11, 12 and 13 in this instance, includes two sets of cooperating printing cylinders, an ink distributing cylinder for each set, ink distributing rollers, an ink rail, and an ink pump for each ink distributing cylinder. These sets of cylinders, rollers and parts are in this instance arranged one above the other, the upper set comprising a plate cylinder 15 which cooper-

ates with an impression cylinder 16, a reciprocable ink distributing cylinder 17, ink transfer rollers 18 and 19, ink spreading rollers 21 and 22, an ink rail 23 and an ink pump 24. The lower set includes a plate cylinder 25, an impression cylinder 26, a reciprocable ink distributing cylinder 27, ink transfer rollers 28 and 29, ink spreading rollers 31 and 32, an ink rail 33 and an ink pump 34.

Each unit 11, 12 and 13 is adapted to receive a web 35 leading thereto from a source of supply such as suitably disposed web rolls (not shown) about a roller 36 and a roller 37, the roller 37 being disposed substantially adjacent to the lower cooperating plate and impression cylinders 25 and 26 respectively. After passing between the lower plate and impression cylinders 25 and 26, the web 35 is led over a roller 38, which is substantially adjacent to these cylinders, and then about rollers 39 and 41 to the cooperating upper plate and impression cylinders 15 and 16 respectively. Upon leaving the plate and impression cylinders 15 and 16, the web 35 is led about a roller 42, a swingable web tensioning roller 43, to a web slitting device 44. From the slitting device 44, one part of the web 35 is led about rollers 45, 46 and 47, over a common roller 49, to a former device 51 of the folding mechanism 14, and the other part of the web 35 is led about a turner bar or bars 52, rollers 53, 54 and 55, and over the roller 49 to the former device 51. The lowermost part 56 of one of the webs 35, which rests upon and is fed over the upper surface of the former device 51 is in this instance led around an extra roller 57. The collected and arranged parts of the webs 35 are folded as desired by the folding mechanism 14 and delivered in assembled condition, as is usual in printing machines of the type under consideration.

Ink is supplied to the plate or plates 43 and 58 (Figure 4) on the plate cylinders 15 and 25, by the ink transfer rollers 18, 19 and 28, 29 respectively, from the ink distributing cylinders 17 and 27 respectively. Ink is supplied to the ink distributing cylinders 17 and 27 by the ink rails 23 and 33 respectively, which obtain a supply of ink from ink pumps 24 and 34 through tubes (not shown but leading from each of the cylinders of each pump), to a plurality of outlets 59 (Figure 9) provided in and spaced apart along the ink rails 23 and 33, where they engage the ink distributing cylinders 17 and 27. The form and operation of the ink pumps and ink rails used with the machine of this invention are fully shown and described in Patents No. 1,589,148, issued June 15, 1926, and No. 1,348,900, issued August 10, 1920, respectively.

Ink is supplied to the ink pumps 24 and 34 from a common source of supply or tank 61, through pipes 62, 63 and 64 leading from a main pipe 65 connected to the tank 61 through a shut-off valve 66. In view of the characteristics of the ink used in the printing machine of this invention, the tank 61 is double-walled and hot water, or other heating medium is caused to flow from a source of supply (not shown) through a pipe 67 into the space between the walls of the tank 61, and about the same to heat the ink contained therein to a temperature whereby it will melt, if solidified, into a fluid condition, and be maintained in such a condition. This liquefied ink may now flow through the pipes 62, 63 and 64 to the ink pumps 24 and 34 of each unit.

In order that the ink in the pipes 62, 63, 64 and 65 will be maintained in the desired fluid condition, each of these pipes is enclosed in a pipe 68, 69, 71 and 72 respectively of larger diameter, through which hot water or like heating medium is caused to flow from and to return to the source of supply by means of connecting pipes 73 and 74 respectively, disposed at each unit.

To maintain the ink in fluid condition while in, and as it passes through, the pumps 24 and 34 at each unit, a casing 75 (Figures 8, 9 and 10) is provided for each pump. The casing 75 is provided with a passageway 76 in its walls through which hot water is caused to flow from an inlet port 77 to an outlet port 78 connected respectively to the source connecting pipes 73 and 74. In order to maintain the ink at flowing temperature as it flows from the ink pumps 24 and 34 to and through the ink rails 23 and 33, and onto the ink distributing cylinders 17 and 27 respectively, each of the ink rails is provided with a passageway 79 (Figure 7) leading from its end 81, upon which the respective pump 24 or 34 is mounted to and beyond the series of ink outlets 59 (Figure 9) in the ink rails 23 and 33. Inlet and outlet ports 82 and 83 are provided for the passageway 79 and are connected respectively to the source connecting pipes 73 and 74, whereby hot water will flow through the passageway 79 to heat the respective rail.

The ink distributing cylinders 17 and 27 (Figures 5 and 6) are hollow and are also heated to maintain the ink thereon in a fluid condition, by passing hot water therethrough, also from the source connecting pipes 73 and 74, which are connected respectively to inlet and outlet ports 84 and 85. A flow deflector 86 is provided at the inlet end of the ink distributing cylinders 17 and 27 to deflect the stream of water as it enters against the interior side walls thereof. The flow deflector 86 comprises, in this instance, a hollow sleeve 87 and a plate 88 covering the inner end of this sleeve, and being larger in diameter than the sleeve, the other sleeve end being secured as by welding, to the shaft spindle 89 of the respective cylinder. Slots 91, three being shown herein, are provided in the sleeve portion 87, just in back of the plate 88, whereby the water entering the cylinder will be directed radially out of the sleeve 87 toward the interior walls of the cylinders 17 or 27. A plug 92 is provided in one end of each of the cylinders 17 and 27 to provide means to allow air to escape when filling the system with hot water and to drain the water from said cylinders, when this is desired.

The plate cylinders 15 and 25 (Figures 2 and 3) are also heated to maintain the ink thereon in a fluid condition as it is being applied to the web 35. This is accomplished by connecting the ends of each plate cylinder 15 and 25 of each unit with a source of hot water supply by inlet and outlet connecting pipes 93 and 94 respectively. The plate cylinders are each provided with a system of interconnecting bores to insure uniform conduction of heat from the hot water supplied thereto to its peripheral or plate receiving surface. This system of bores includes axial bores 95 and 96 leading through cylinder bearing end portions 97 and 98 respectively to the cylinder body 99. The bores 95 and 96 extend a short distance into the cylinder body 99 and a plurality of radially directed bores, in this instance, two axially spaced apart rows of bores 101 and 102, are provided. The

bore 101 and bore 102 are also peripherally spaced apart (Figure 3), the bores 102 leading from the central bores 95 and 96 radially toward plate clamp receiving grooves 103 and the bores 101 leading toward a point intermediate these grooves.

Each of the bores 101 connects with one of a plurality of axially directed and peripherally spaced apart bores 104 and each of the bores 102 connects with one of a plurality of axially directed and peripherally spaced apart bores 105. The bores 104 and 105 are peripherally spaced apart in alignment with the respective bores 101 and 102 connecting therewith, the bores 104 being disposed intermediate the periphery of the plate cylinder and the axis thereof in a determined position, and the bores 105 being disposed intermediate the plate clamp grooves 103 and the axis of the cylinder in a determined position. The position of the bores 104 and 105 and their diameter is such that heat supplied therein by the hot water, circulated there-through from one end to the other from the bores 95 and 96, will be conducted uniformly by the adjacent metallic material of which the cylinder is made, to all parts of the cylinder, whereby even expansion of the same will be obtained and a uniform peripheral temperature will be maintained. In other words, the bores 104 and 105 are so located, with respect to the material mass constituting the cylinder and surrounding these bores, that the heat from the hot water therein will be conducted through this surrounding mass of material uniformly in all directions. To accomplish this result, the centers of the bores 104 are disposed on a circle somewhat larger in diameter than the diameter of the circle upon which the centers of the bores 105 are disposed, thus compensating for the mass of material removed when the clamp grooves 103 are formed therein.

The printing plates 48 and 58 (Figure 4) are, as is usual, clamped upon each half length of the cylinders 15 and 25 against a central stationary ring 108 by means of a floating plate engaging lug 109 and a clamp lug 111 actuated by a clamp screw 112. The lugs 109 and 111 slide axially in the clamp grooves 103 and of necessity are spaced apart. To provide better heat conductivity between the cylinder surface and the printing plates 48 and 58 carried thereon, filler pieces 113 are floatingly disposed in the grooves 103 between the lugs 109 and 111, and filler pieces 115 and 116 are secured in the groove extension 117 beyond the lug 109 and in the substantially semi-circular groove end 118 respectively. The filler pieces 115 and 116 are removably secured in place as by screws 119 and 121 respectively. To further insure good heat conduction contact between the plates 48 and 58 with the peripheral surface of the cylinders 15 and 25 the undersurface of these plates may be formed to fit snugly thereagainst or provided with fewer grooves in their undersurface than it has heretofore been the practice to provide.

In some instances, it is desirable to pre-heat the web 35 before it reaches the first pair of printing cylinders so that excessive cooling effect upon the ink will be avoided. To obtain this result, provision is herein made to heat the rollers 37 by connecting them with the hot water pipes 93 and 94.

In the diagrammatic illustration shown in Figure 1 and as above described, two sources of

hot water supply are indicated, one leading through the pipes 73 to the ink distributing cylinders 17 and 27, the ink pump casings 75, the ink rails 23 and 33, the ink tank 61, and the ink supply pipes 62, 63, 64 and 65, and returning through the pipes 74; and the other leading through the pipes 93 to the plate cylinders 15 and 25 and to the pre-heating rollers 37, and returning through the pipes 94, but in most instances, only one source of hot water supply is required. The advantage of providing two sources of hot water supply is that should a higher temperature of water be found desirable in either circuit, this can be supplied without affecting the temperature of the water supplied to the other.

As hereinbefore mentioned, it is desirable to cool certain other parts and mechanisms of the printing machine of this invention. For this purpose, a supply of cool or refrigerated fluid from a source (not shown) is transmitted to the parts of each of the printing units 11, 12 and 13 by means of pipes 124, 123 and 122 respectively, pipe 122 leading from the said source of supply. Each of the pipes 124, 123 and 122 is connected to one end of each of the rollers 38 and 42 and to the upper impression cylinders 16 of the units 11, 12 and 13 respectively. Exhaust or waste pipes 125, 126 and 127 lead from these rollers 38 and 42 and the impression cylinders 16 of each unit 11, 12 and 13 respectively to a suitable disposal system (not shown). It is also advisable to cool the stationary or rotating turner bars 52 and therefore these are connected to the cold water source connecting pipe 122, and by a pipe 128 to the disposal system. In some instances, it is desired to cool the roller 57, over which the lowermost web portion 56 is led toward the folder 14, and therefore this roller 57 is connected to the cold water source connecting pipe 122, and to the waste pipe 127. Web turning bars 106 on the former 51 also are preferably cooled by being connected to the cold water pipe 122 and to the waste pipe 127.

As indicated in Figures 12 and 12a, the web turning bars 106 may be composed of two telescoped hollow members 129 and 131, both of which are welded to a bar 130. The bar 130 is provided with spaced apart holes 132 which extend through the inner member 129, and through which compressed air led into it by a supply pipe 133 (Figure 1) may flow, the purpose being to obviate heating and sticking of the ink to the surface of the former 51 and to facilitate the movement of the webs. The outer member 131 and the bar 130 are preferably so arranged as to form a groove having sides 134 and 135 to provide for the distribution of air coming from the holes, 132. Cool water from the source connecting pipe 122 may be circulated lengthwise through the outer member 131 to both cool the air in the member 129 and also the webs by the contact thereof upon the outer surface of the member 131. It will be understood that if preferred, the holes 132 may extend only through the outer shell 131, if it is desired to circulate the cooling fluid through the inner member 129 and force air through the outer member 131. If desired, similar web turning bars arranged to be used with air may be employed instead of bars 52.

In addition to cooling the upper impression cylinder 16 by cooled or refrigerated water or other fluid, it is at times, also advisable to atomize or spray an emulsion of oil and water

directly on the peripheral surface of this cylinder 16. Provision is therefore made for so applying such an emulsion, and includes nozzles 136 directed toward the impression cylinder 16 of each unit 11, 12 and 13 adjacent a plush emulsion spreading roller 137 provided for this purpose. The nozzles 136 are connected together and to a pipe 138 leading from a source of emulsion (not shown).

As it is desirable to maintain the parts and mechanisms of the printing machine of this invention, which are not heated at substantially normal temperature, means is shown herein to insulate the plate, impression and ink distributing cylinders from the supporting frames and other adjacent parts of the machine. As a similar arrangement is provided for the plate and impression cylinders, only one is shown (Figure 2) in association with the plate cylinder. The shaft ends of the plate and impression cylinders are preferably journaled in roller bearings 139, and a ball thrust bearing 141 is provided at one end. These roller bearings 139 are supported in bearing sleeves 142, which may be eccentric sleeves arranged to be rotated to adjust the pressure between the plate and impression cylinders. These sleeves 142 are provided in their interior surface adjacent the roller bearings 139 with a plurality of axially spaced annular grooves 143 to reduce the contact area thereof with the outer shells of the bearings 139 and thus reduce the conduction of heat from the cylinder shaft to the machine frame. As indicated in Figure 5, the bearing sleeves 144 of the ink distributing cylinders are supported by insulating sleeves 145 having axially spaced apart annular grooves 146 in their interior surface to insulate the machine frames from the heated ink distributing cylinders.

From the foregoing description of this invention, it is obvious that an improved printing machine has been provided which is adapted to the efficient use of an ink that must be maintained at a relatively high temperature to keep it in a fluid condition before and while printing is being done.

When using the preferred ink, the printing plates 48 and 58 on the cylinders 15 and 25 are maintained at from 215° to 230° Fahrenheit and the cylinders 15 and 25 at from 240° to 250° Fahrenheit. The preferred temperature at which the distributing cylinders 17 and 27, and the web pre-heating rollers 37 are maintained is substantially 215° to 225° Fahrenheit, and the temperature of all of the impression cylinders 16 and 26, the cooled rollers 38 and 42, the turner bars 52, and the bars 106 at the edges of the former 51 is preferably approximately 70° Fahrenheit or below.

It will be understood that the invention may be embodied in other specific forms without departing from the spirit or essential attributes thereof, and it is therefore desired that the present embodiment be considered in all respects as illustrative and not restrictive, and it will be further understood that each and every novel feature and combination present in or possessed by the machine herein disclosed forms a part of the invention included in this application.

What we claim is:

1. In a printing machine capable of using a rapidly drying ink requiring heat to maintain it in a fluid condition, and having means to heat the ink and to maintain it at substantially its liquefying temperature from a source of supply to its

point of use, including a source of ink supply including an ink tank, an ink pump, an ink distributing cylinder, an ink rail to receive ink from the pump and to apply it upon the ink distributing cylinder, means to conduct ink from the tank to the ink pump, fluid jackets surrounding the ink tank and ink conducting means, and means to conduct to and to circulate a heated fluid through the jackets.

2. In a printing machine capable of using a rapidly drying ink requiring heat to maintain it in fluid condition, and having means to heat the ink and to maintain it at substantially its liquefying temperature from a source of supply to its point of use, including a source of ink supply including an ink tank, an ink pump, an ink distributing cylinder, an ink rail to receive ink from the pump and to apply it upon the ink distributing cylinder, means to conduct ink from the ink tank to the ink pump, the ink pump having a hollow casing thereabout having a passageway therethrough for fluid, and means to circulate a heated fluid through the passageway in the hollow casing.

3. In a printing machine capable of using a rapidly drying ink requiring heat to maintain it in fluid condition, and having means to heat the ink and to maintain it at substantially its liquefying temperature from a source of supply to its point of use, including a source of ink supply including an ink tank, an ink pump, an ink distributing cylinder, an ink rail to receive ink from the ink pump and to apply it upon the ink distributing cylinder, means to conduct ink from the ink tank to the ink pump, the ink rail being provided with a passageway, and means to conduct a heated fluid through the passageway in the ink rail.

4. In a printing machine adapted to use a rapidly drying ink requiring heat to maintain it in usable condition, and having means to heat the ink and to maintain it at substantially its liquefying temperature from a source of supply to its point of use, and to cool it to substantially its solidifying temperature at use, including in combination, a plate cylinder, an impression cylinder cooperating with the plate cylinder, an ink distributing cylinder, conduit means to supply heated ink to the ink distributing cylinder, means to heat the peripheral surface of the ink distributing cylinder and printing plates on the plate cylinder, and means to cool the impression cylinder by circulating cold fluid therethrough.

5. In a printing machine adapted to use a rapidly drying ink requiring heat to maintain it in fluid condition, and having means to heat the ink and to maintain it at substantially its liquefying temperature from a source of supply to its point of use, and to cool it to substantially its solidifying temperature at use, including in combination, a plate cylinder, an impression cylinder cooperating with the plate cylinder, an ink distributing cylinder, heated conduit means to supply heated ink to the ink distributing cylinder, means to heat the peripheral surface of the ink distributing cylinder and printing plates on the plate cylinder to a temperature above the liquefying temperature of the ink being used, and means to cool the impression cylinder to a temperature below the solidifying temperature of the ink by circulating cold fluid therethrough.

6. In a web printing machine capable of using a rapidly drying ink requiring heat to maintain it in a fluid condition, and having means to heat

the ink and to maintain it at substantially its liquefying temperature from a source of supply to its point of use, including in combination, a plate cylinder, an impression cylinder cooperating with the plate cylinder, an ink distributing cylinder, means to heat the peripheral surface of the ink distributing cylinder and printing plates on the plate cylinder to a temperature above the liquefying temperature of the ink being used, a heated ink container, and conduit means through which heated ink is carried from the container to the ink distributing cylinder and deposited thereon without substantially lowering the temperature of the ink and without exposing it to the atmosphere.

7. In a web printing machine capable of using a rapidly drying ink requiring heat to maintain it in a fluid condition, and having means to heat the ink and to maintain it at substantially its liquefying temperature from a source of supply to its point of use, and to cool it to substantially its solidifying temperature, including in combination, a plate cylinder, an impression cylinder cooperating with the plate cylinder, an ink distributing cylinder, means to heat the peripheral surface of the ink distributing cylinder and printing plates on the plate cylinder to a temperature above the liquefying temperature of the ink being used, a heated ink reservoir, conduit means through which heated ink is carried from the reservoir to the ink distributing cylinder and deposited thereon without substantially lowering the temperature of the ink, and without exposing it to the atmosphere, means to cool the web after it is printed, and means to heat said conduit means.

8. In a printing machine having a frame and adapted to use a rapidly drying ink requiring heat to maintain it in usable condition, and having means to heat the ink and to maintain it at substantially its liquefying temperature from a source of supply to its point of use, including in combination, a plate cylinder, an impression cylinder cooperating with the plate cylinder, an ink distributing cylinder, means to supply heated ink to the ink distributing cylinder, means to heat the peripheral surface of the ink distributing cylinder and printing plates on the plate cylinder, and bearing sleeves having annular grooves to reduce the conduction of heat from the plate and ink distributing cylinders to the machine frame.

9. In a printing machine adapted to use a rapidly drying ink requiring heat to maintain it in usable condition, and having means to heat the ink and to maintain it at substantially its liquefying temperature from a source of supply to its point of use, and to cool it to substantially its solidifying temperature, including a plate cylinder, an impression cylinder cooperating with the plate cylinder, an ink distributing cylinder, means to supply heated ink to the ink distributing cylinder, means to heat the peripheral surface of the ink distributing cylinder and printing plates on the plate cylinder, bearing sleeves having annular grooves to retard conduction of heat from the plate and ink distributing cylinders to the frame, means to cool the surface of the impression cylinder, and bearing sleeves having annular grooves to retard the conduction of heat from the machine frame to the impression cylinder.

10. In a web printing machine capable of using rapidly drying ink requiring heat to maintain it in a fluid condition, and having means to heat the ink and to maintain it at substantially

its liquefying temperature from a source of supply to its point of use, and to cool it to substantially its solidifying temperature, including in combination, a plate cylinder, an impression cylinder cooperating with the plate cylinder, an ink distributing cylinder, an ink container, conduit means to carry ink from the container to the ink distributing cylinder and deposit it thereon, means to heat the peripheral surface of the ink distributing cylinder and printing plates on the plate cylinder to a temperature above the liquefying temperature of the ink being used, means to heat the ink container, and means to cool the web after it is printed; the said heating means for the ink distributing cylinder, the printing plates and the ink container including passages through which a hot fluid is circulated.

11. In a printing machine adapted to use a rapidly drying ink requiring heat to maintain it in fluid condition, and having means to heat the ink and to maintain it at substantially its liquefying temperature from a source of supply to its point of use, and to cool it to substantially its solidifying temperature, including a plate cylinder, an impression cylinder cooperating with the plate cylinder, an ink distributing cylinder, means to supply heated ink to the ink distributing cylinder, means to heat the peripheral surface of the ink distributing cylinder and printing plates on the plate cylinder, web turner bars to turn a web after it has been acted upon by the plate cylinder, and means to cool the turner bars to a temperature below the solidifying temperature of the ink being used.

12. In a printing machine adapted to use a rapidly drying ink requiring heat to maintain it in fluid condition, and having means to heat the ink and to maintain it at substantially its liquefying temperature from a source of supply to its point of use, and to cool it to substantially its solidifying temperature, including a plate cylinder, an impression cylinder cooperating with the plate cylinder, an ink distributing cylinder, means to supply heated ink to the ink distributing cylinder, means to heat the peripheral surface of the ink distributing cylinder and printing plates on the plate cylinder, a folding mechanism having a former with tubular turner bars at each side edge to receive compressed air and having outlets to direct the air against a web running thereover, and a hollow casing over the turner bars to receive cooled fluid to keep the air and the surface of the bars cool.

13. In a printing machine adapted to use a rapidly drying ink requiring heat to maintain it in fluid condition, and having means to heat the ink and to maintain it at substantially its liquefying temperature from a source of supply to its point of use, including a plate cylinder, an impression cylinder cooperating with the plate cylinder, an ink distributing cylinder, means to supply heated ink to the ink distributing cylinder, means to heat the peripheral surface of the ink distributing cylinder and the plate cylinder, metallic filler pieces disposed in plate clamp slots in the plate cylinder to conduct heat from the cylinder to printing plates secured thereon.

14. In a printing machine adapted to use a rapidly drying ink requiring heat to maintain it in usable condition, and having means to heat the ink and to maintain it at substantially its liquefying temperature from a source of supply to its point of use, including in combination, a plate cylinder, an impression cylinder cooperating with

the plate cylinder, an ink distributing cylinder, means to supply heated ink to the ink distributing cylinder, the ink distributing cylinder being hollow and having hollow shaft ends communicating with the interior of the cylinder, a baffle plate disposed at the connection between the end of one of the hollow shaft ends and the interior of the cylinder to direct fluid toward the periphery of the cylinder, and means to supply and circulate heated fluid to and through the cylinder from one end to the other.

15. In a printing machine adapted to use a rapidly drying ink requiring heat to maintain it in usable condition, and having means to heat the ink and to maintain it at substantially its liquefying temperature from a source of supply to its point of use, including in combination, a plate cylinder, an impression cylinder cooperating with the plate cylinder, an ink distributing cylinder, means to supply heated ink to the ink distributing cylinder, the plate cylinder having spaced apart bores extending lengthwise thereof, an axial bore leading into each end of the cylinder and radially directed bores connecting the axial bores with the spaced apart bores, and means to supply heated fluid to the axial bore at one end of the cylinder and lead it out of the bore at the other end.

16. In a printing machine adapted to use a rapidly drying ink requiring heat to maintain it in usable condition, and having means to heat the ink and to maintain it at substantially its liquefying temperature from a source of supply to its point of use, including in combination, a plate cylinder, an impression cylinder cooperating with the plate cylinder, an ink distributing cylinder, means to supply heated ink to the ink distributing cylinder, the plate cylinder having a plurality of peripherally spaced apart plate clamp slots in its peripheral surface extending substantially parallel with its axis and having a plurality of spaced apart bores extending parallel with and below the plate clamp slots, an axial bore leading into each end of the cylinder, radially directed bores connecting the axial bores with the spaced apart bores, and means to supply heated fluid to the axial bore at one end and to lead the fluid away from the axial bore at the other end of the cylinder.

17. In a printing machine adapted to use a rapidly drying ink requiring heat to maintain it in usable condition, and having means to heat the ink and to maintain it at substantially its liquefying temperature from a source of supply to its point of use, including a plate cylinder, an impression cylinder cooperating with the plate cylinder, an ink distributing cylinder, means to supply heated ink to the ink distributing cylinder, the plate cylinder having a plurality of spaced apart plate clamp slots in its peripheral surface extending substantially parallel with its axis and having a plurality of spaced apart bores extending parallel with and below the said plate clamp slots, an axial bore leading into each end of the cylinder, radially directed bores connecting the axial bores with the spaced apart bores, certain of the radial bores being in alignment with the clamp slots in the peripheral surface of the cylinder and others being disposed intermediate the same, and means to supply heated fluid to the axial bore at one end and to lead the fluid away from the axial bore at the other end of the cylinder.

18. In a printing machine adapted to use a rap-

idly drying ink requiring heat to maintain it in usable condition, and having means to heat the ink and to maintain it at substantially its liquefying temperature from a source of supply to its point of use, including in combination, a plate cylinder,

an impression cylinder cooperating with the plate cylinder, an ink distributing cylinder, means to supply heated ink to the ink distributing cylinder, the plate cylinder having a plurality of spaced apart plate clamp slots in its peripheral surface extending substantially parallel with its axis and having a plurality of spaced apart bores extending parallel with and below the plate clamp slots, an axial bore leading into each end of the cylinder, radially directed bores connecting the axial bores with the spaced apart bores, certain of the radial bores being in alignment with the clamp slots in the peripheral surface of the cylinder and others being disposed intermediate the same, the bores aligned with the clamp slots being disposed nearer the axis of the cylinder than the other bores, the connecting bores at each cylinder end being arranged in two axially spaced apart planes, and means to supply heated fluid to the axial bore at one end and to lead the fluid away from the axial bore at the other end of the cylinder.

19. In a printing machine adapted to print with an ink that is hardened by cooling, and having means to heat the ink and to maintain it at substantially its liquefying temperature from a source of supply to its point of use, and to cool it after the point of use of the ink to substantially its solidifying temperature, including a web turning member having an air passage therein, and a series of openings communicating with the passage through which air may be directed against the web to lessen the pressure of the web against the member, the said member also having a second passage adjacent the aforesaid passage through which a cooling fluid may be passed.

20. In a printing machine adapted to print with an ink that is hardened by cooling, and having means to heat the ink and to maintain it at substantially its liquefying temperature from a source of supply to its point of use, and to cool it after the point of use of the ink to substantially its solidifying temperature, including a web turning member having an air passage therein, and a series of openings communicating with the passage through which air may be directed against the web to lessen the pressure of the web against the member, the said member also having a second passage substantially concentric with the aforesaid passage through which a cooling fluid may be passed.

21. In a printing machine, means to maintain a rapidly drying ink requiring heat to maintain it in fluid condition substantially at its liquefying temperature from a source of supply to its point of use, including a heated source of supply, a heated printing plate carrying cylinder, an ink distributing cylinder, a heated ink rail to receive ink from the source of supply and to apply it upon the ink distributing cylinder, and heated connections from the source of supply to the ink rail.

22. In a printing machine, means to maintain a rapidly drying ink requiring heat to maintain it in fluid condition substantially at its liquefying temperature from a source of supply to its point of use, including a heated source of supply, a heated printing plate carrying cylinder, an ink distributing cylinder, a heated ink rail adapted to apply ink upon the ink distributing cylinder, a heated ink pump to force ink into the ink rail.

and heated connections from the source of supply to the pump.

23. In a printing machine adapted to use a rapidly drying ink requiring heat to maintain it in fluid condition, a heated printing plate carrying cylinder over which a web is led, a heated ink distributing cylinder, a heated ink rail adapted to apply ink upon the ink distributing cylinder, a heated source of ink supply, and heated connections between the source of supply and the rail, including heated means to force the ink into the rail.

24. In a printing machine adapted to use a rapidly drying ink requiring heat to maintain it in fluid condition, a heated roller over which

5 a web is led, a heated printing plate carrying cylinder by which the web is printed, a heated ink distributing cylinder, a heated ink rail adapted to apply ink upon the ink distributing cylinder, a heated source of ink supply, heated connections between the source of supply and the rail, including heated means to force ink under pressure into the rail, a cooled roller over which the web is led after it is printed by the plate cylinder, a cooled former, and cooled turner bars between the cooled roller and the former.

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