June 4, 1940. H. M. HANSON 2,203,087

DRYING PRINTING INK

Filed May 23, 1939 2 Sheets-Sheet 1

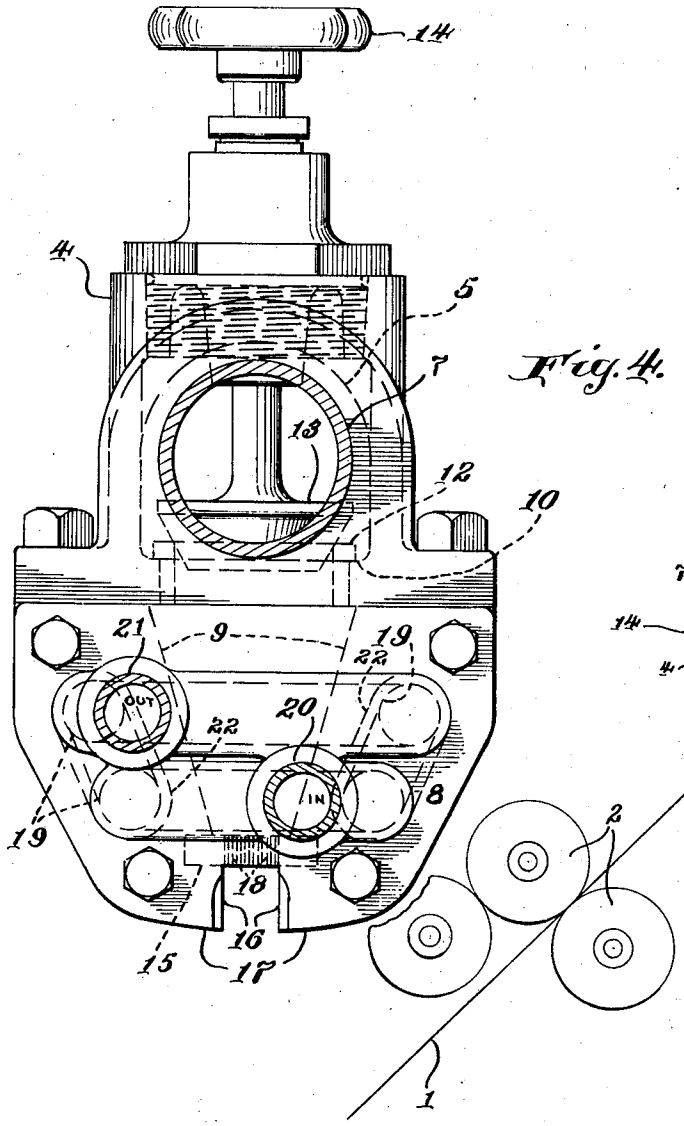

Fig. 4.

Fig. 1.

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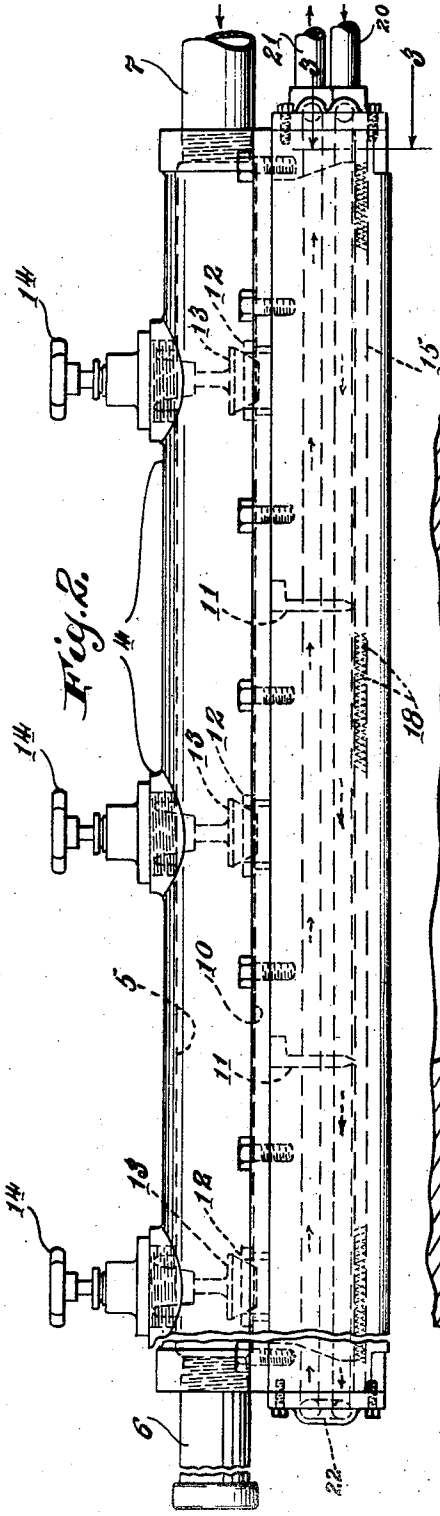

Fig. 2.

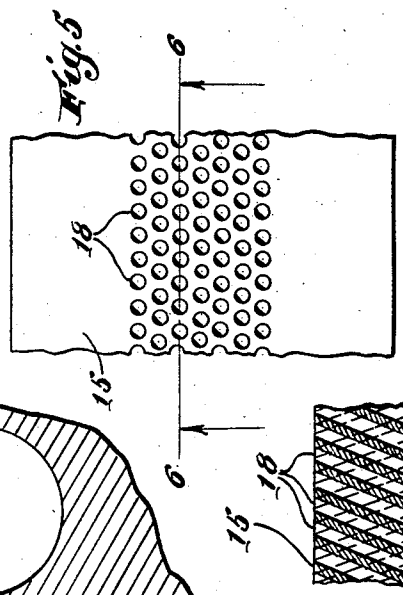

Fig. 5

Fig. 6.

Fig. 3.

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2,203,087

DRYING PRINTING INK

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Application May 23, 1939, Serial No. 275,319

9 Claims. (Cl. 34—24)

With the use of long webs of material in the printing art, the rapid drying of the ink placed upon the webs in printing has been greatly facilitated by the use of inks with highly volatile solvents. Many of these solvents are likewise highly combustible. Various methods of volatilizing combustible solvents and then exploding the solvents have been attempted. It has been proposed to arrange a burner cross-wise of the advancing printed strip having a plurality of jets directed toward the strip. It has been observed in practice that however close together and however spaced these jets may be that there are some spaces across the strip which seem to get a hotter flame than other spaces and they therefore dry more rapidly and sometimes even scorch. It has been proposed to give the jets a reciprocatory motion across the advancing web to insure uniformity of flame spread across the surface but this involves a mechanism of some complexity.

In the present invention the multiplicity of small jets are given a slight angularity cross-wise the advancing web. This has been found to burn the combustible solvent from the ink and dry the ink uniformly across the total width of the advancing sheet thus eliminating scorched lines lengthwise of the web and insuring absolute uniformity of drying of the ink as the web advances. If desired the angular direction may be reversed in alternate rows of outlets. The web is advancing at a rapid regulable speed so that the amount of flame emitted may be accurately adjusted for the speed of the web so that absolute uniformity of drying of any given ink on any given web may be obtained at any given speed of web. This impinging of the flame upon the web at an angle seems to give the flame a sliding or rolling motion over the surface of the web so that the flame passes over the full width of the web like a plurality of hoops, not missing any portion in its drying effect and igniting effect and yet at the same time not impinging upon any portion of the web in a straight right angular point, which straight right angle impinging has perhaps been partly the cause of the scorching heretofore experienced, another cause may have been an uneven flow of gas, and directing alternate outlets in different directions would diffuse the flames from higher pressure areas. Also the points of alternate flames close together would be broken down by the side wall friction of adjacent flames, causing a diffusion of the heat.

Although the heat produced by this multiplicity of flames is intense, because it is so diffused, it does not impinge in right angularly directed points, and therefore the web is not scorched and the intense heat immediately dries the ink and burns the volatile combustible solvent without heating the web itself to any appreciable degree which avoids the deep penetration of the web by the ink and it thus leaves sharp lines of ink upon the web, making the printing matter stand out in clear lines which may be easily read and the avoidance of heating the web likewise avoids the impairment of the flexibility of the web in later use. The combustion of the solvent likewise insures that with changing atmospheric conditions the ink will not resoften and later smear.

The apparatus used in carrying out the method of the invention is very simple and rugged and does not readily get out of order. It likewise involves no moving parts after once being adjusted to the operations involved.

Other objects and advantages of the invention will be apparent from the following description and the accompanying drawings which form a part hereof and in which:

Figure 1 is a diagrammatic view of the burner shown in its relation to the press.

Figure 2 is a side elevational view of the burner.

Figure 3 is an enlarged sectional view of the same substantially on line 3—3 of Figure 2.

Figure 4 is an end view of the burner.

Figure 5 is an inverted plan view on a larger scale of the burner orifice plate.

Figure 6 is a fragmentary cross-sectional view on line 6—6 of Figure 5.

Similar numerals refer to similar parts in the several views.

The web of paper 1 comes from the rolls 2 of the press and passes around the guide roll 3. The burner 4 is placed to face the printed surface of the web 1 as it comes from the rolls 2 of the press.

The burner 4 has a gas chamber 5 with an inlet 7 at one end for a combustible mixture of gas and air, at the other end a capped pipe 6 forms a support for that end of the burner. On the face of the chamber 5 is a troughed burner 8 having a trough shaped opening 9 toward the chamber 5 and a partition 10 is between the burner 8 and the chamber 5. On partition 10 are placed partitions 11 projecting into and dividing the trough 9 into sections. Through the partition 10 are three openings with valve seats 12 thereon into which fit valves 13 which may be adjusted by hand wheels 14 to regulate the amount of gas mixture entering each section of the trough of burner 8. Toward the front of the

trough of burner 8 is the removable orifice plate 15 slidably removable in grooves in the trough burner 8. The face of the trough burner 8 has likewise a chamber 16, between faces 17, in which the flames from the orifice plate 15 burn, insuring a steady undisturbed flame from the orifice plate 15. The orifices 18 in the orifice plate 15 are arranged in staggered rows lengthwise of the plate. These orifices are all sloped so as to project from them a flame angularly disposed to the faces 17 of the burner and when the burner is placed across the advancing web 1 the projecting flame extends at an angle less than a right angle to a line extending across the advancing web. The jets of flame also preferably project at a right angle to the direction of the advance of the web 1. The sides of the trough burner 8 are cooled by having water passages 19 pass therethrough which are connected to entrance and exit water pipes 20 and 21 at one end of the burner. At the other end, passages 22 direct the water from the lower passages to the upper.

The flames or tongues of flame from the orifice plate 15 project in alternate rows in alternate directions from the burner so close together that the side wall friction between adjacent rows breaks down the sharp points of flame, and should the pressure of the gas be irregular and come in waves the sloping orifices will direct the gas in the high pressure zones in different directions away from a straight line lengthwise of the advancing web and thereby diffuse the heat over the surface of the web and prevent streaking or scorching of the same.

It will be apparent that many modifications may be made in the apparatus to carry out the invention without departing from the principle involved therein.

What is claimed as new is:

1. The method of drying ink comprising passing a freshly imprinted surface at a rapid regulable speed faced toward a burner placed across the advance of the surface emitting a large number of small jets of flame adjacent and at substantially a right angle to the direction of advance of the surface and at an angle less than a right angle to a line extending across the advancing surface, substantially cross-wise covering the same.

2. The method of drying ink comprising passing a freshly imprinted surface at a rapid regulable speed faced toward a burner placed across the advance of the surface emitting a large number of small jets of flame adjacent and at substantially a right angle to the direction of advance of the surface and some at one angle and others at substantially equal opposite angles, all less than a right angle, to a line extending across the advancing surface substantially cross-wise covering the same, the jets emitted at opposite angles passing between the others.

3. The method of drying ink comprising passing a freshly imprinted surface at a rapid regulable speed faced toward a burner emitting a large number of small jets of flame arranged in rows, substantially at a right angle to the direction of advance of the surface, some rows sloped at one angle and others at a substantially equal opposite angle, all less than a right angle, to a line extending across the advancing surface, the jets extending in close proximity to the surface.

4. The method of drying ink comprising passing a freshly imprinted surface at a rapid regulable speed faced toward a burner emitting a large number of small jets of flame arranged in rows at substantially a right angle to the direction of the advance of the surface, some rows sloped at one angle and adjacent rows at a substantially equal opposite angle, all less than a right angle, to a line extending across the advancing surface, the jets emitted at opposite angles passing the others side by side, and extending in close proximity to the surface.

5. The method of drying ink comprising passing a freshly imprinted surface at a rapid regulable speed faced toward a burner emitting a large number of interfingering jets of flame arranged in rows each alternate row sloped at one angle and the other row at a substantially equal opposite angle, all less than 90 degrees, to a line extending across the advancing surface and at substantially a right angle to the direction of the advance of the surface and the jets extending in close proximity to the surface.

6. An apparatus for drying ink comprising means for moving a freshly imprinted surface, a burner adjacent and facing the printed surface and arranged transversely of its direction of movement and having a plurality of orifices sloped to direct a flame adjacent the surface at an angle, less than 90 degrees, to a line extending across the advancing surface and a substantially a right angle to the direction of advance of the surface.

7. An apparatus for drying ink comprising means for moving a freshly imprinted surface, a burner adjacent and facing the printed surface and arranged transversely of its direction of movement and having a plurality of orifices sloped, some to direct the tongues of flame from their orifices opposite to those from other orifices, to direct tongues of flame oppositely and angularly, at less than a right angle to a line extending across the advancing surface and at substantially a right angle to the direction of advance of the surface.

8. An apparatus for drying ink comprising means for moving a freshly imprinted surface, a burner adjacent and facing the printed surface and arranged transversely of its direction of movement and having a plurality of orifices arranged in rows some sloped to direct tongues of flame angularly and others sloped to direct tongues of flames at a substantially equal opposite angle, all less than 90 degrees, to a line extending across the advancing surface and at substantially a right angle to its direction of advance, the tongues of flame emitted at the opposite angle passing the others side by side.

9. An apparatus for drying ink comprising means for moving a freshly imprinted surface, a burner adjacent and facing the printed surface and arranged transversely of its direction of movement and having a plurality of orifices arranged in rows some rows sloped to direct tongues of flames angularly and alternate rows sloped to direct tongues of flames at a substantially equal opposite angle all less than 90 degrees, to a line extending across the advancing surface and at substantially a right angle to the direction of advance of the surface, the tongues of flame from alternate rows interfingering with the others.

HARTWIG M. HANSON.