Jan. 2, 1945. J. A. LA HATTE ET AL 2,366,411

APPARATUS FOR APPLYING CARBON TO SHEETS

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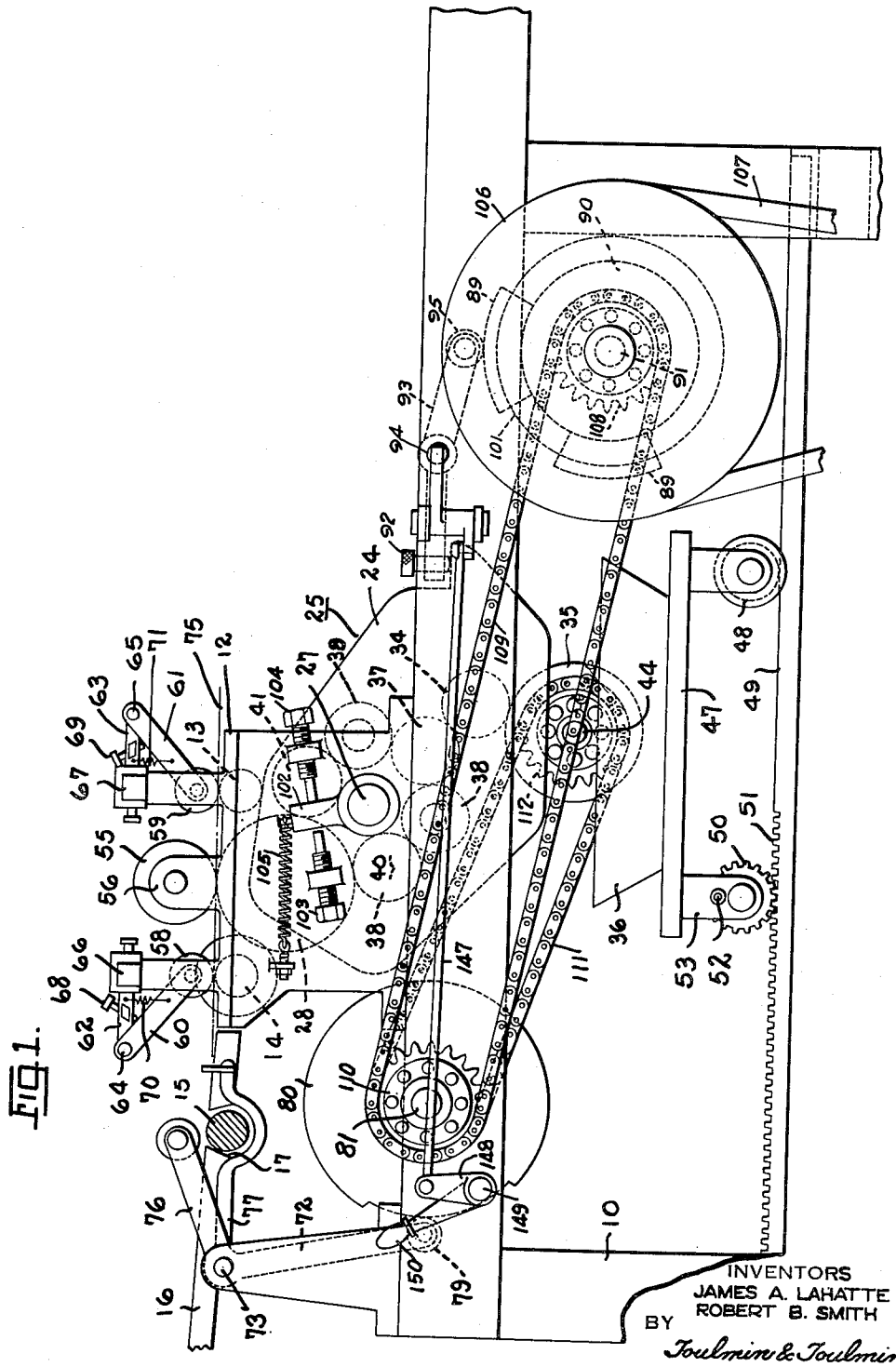


FIG. 1.

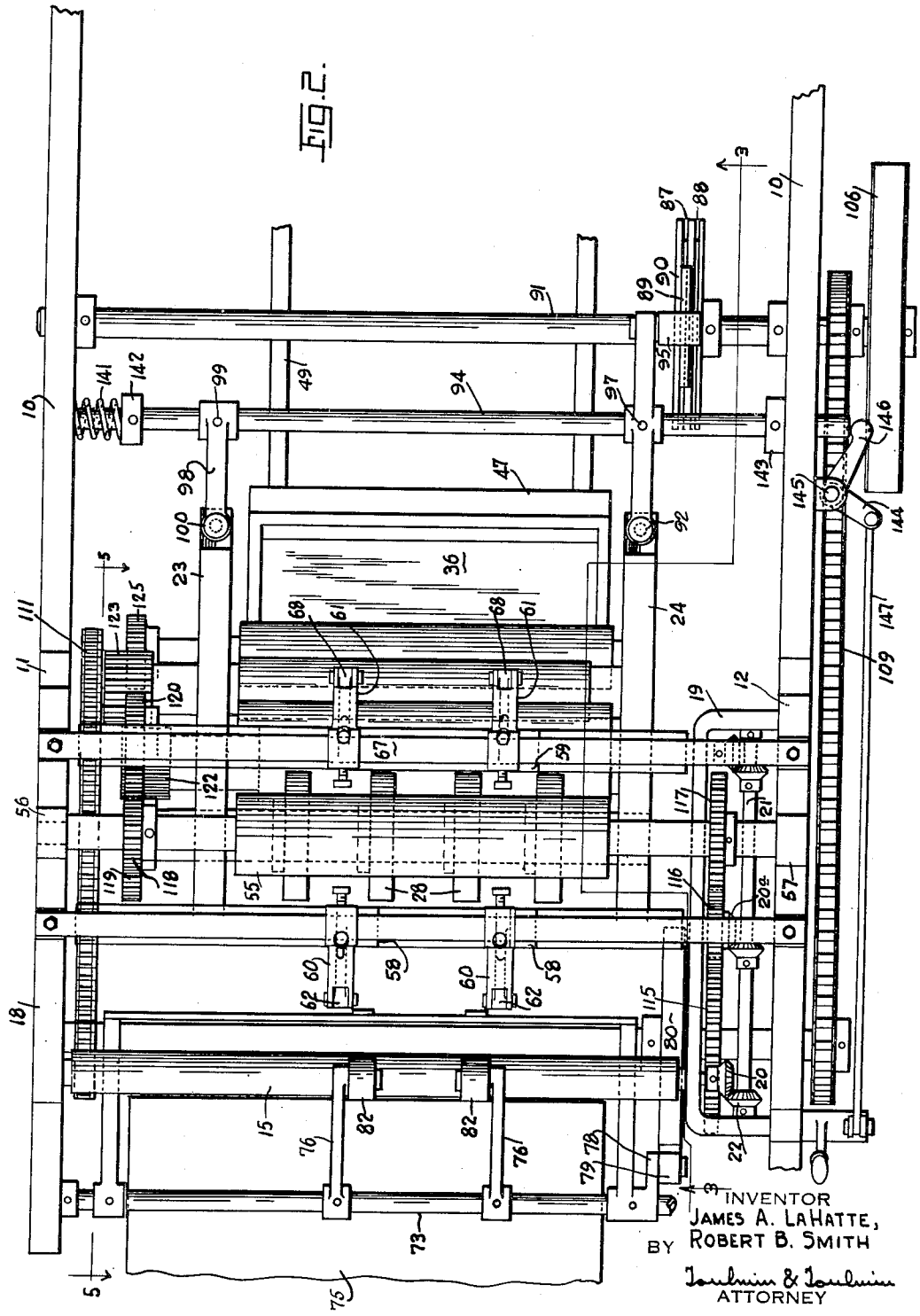
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APPARATUS FOR APPLYING CARBON TO SHEETS

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Fig. 2.



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APPARATUS FOR APPLYING CARBON TO SHEETS

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FIG. 7.

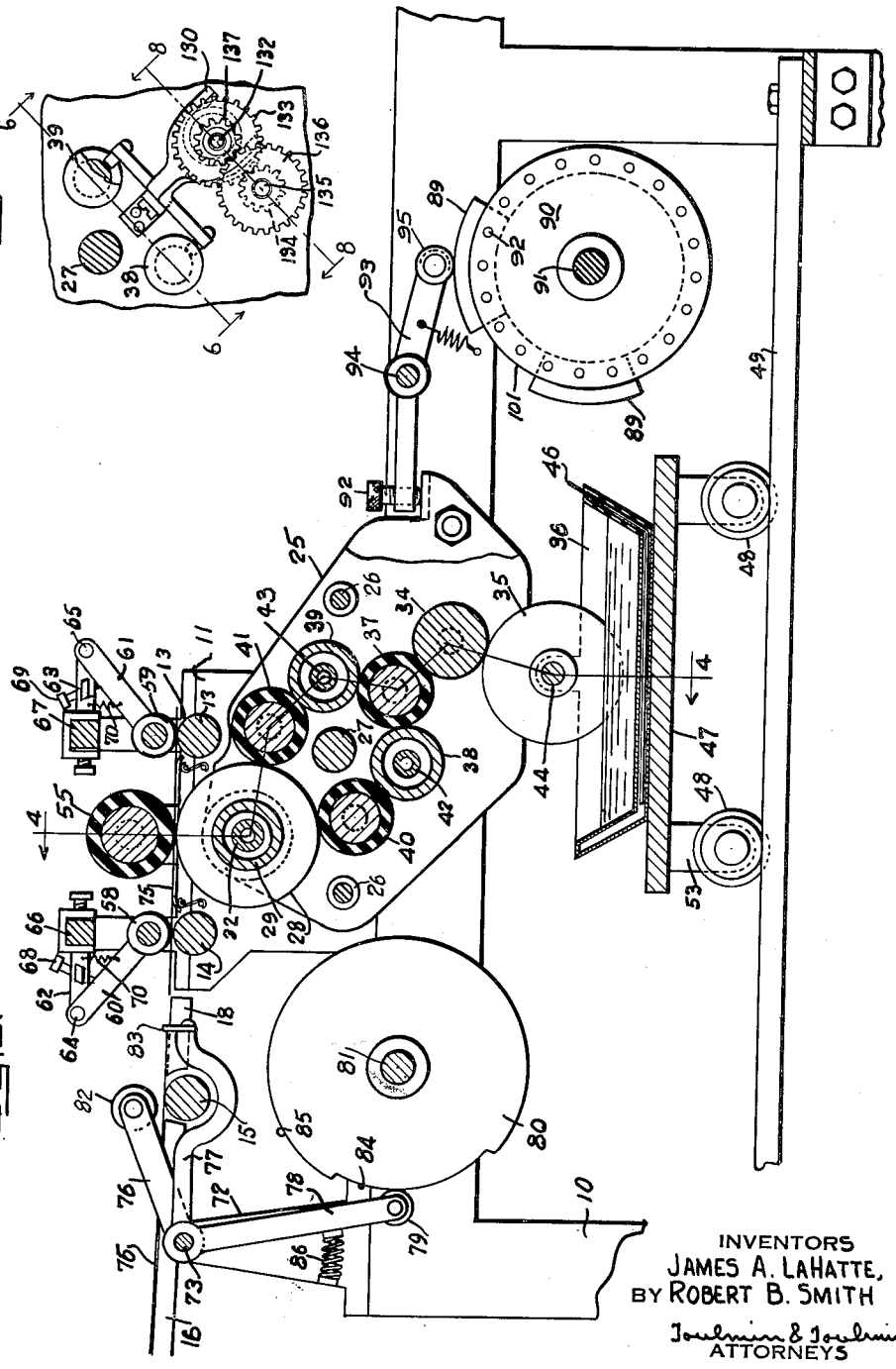


FIG. 3.

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APPARATUS FOR APPLYING CARBON TO SHEETS

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FIG. 4.

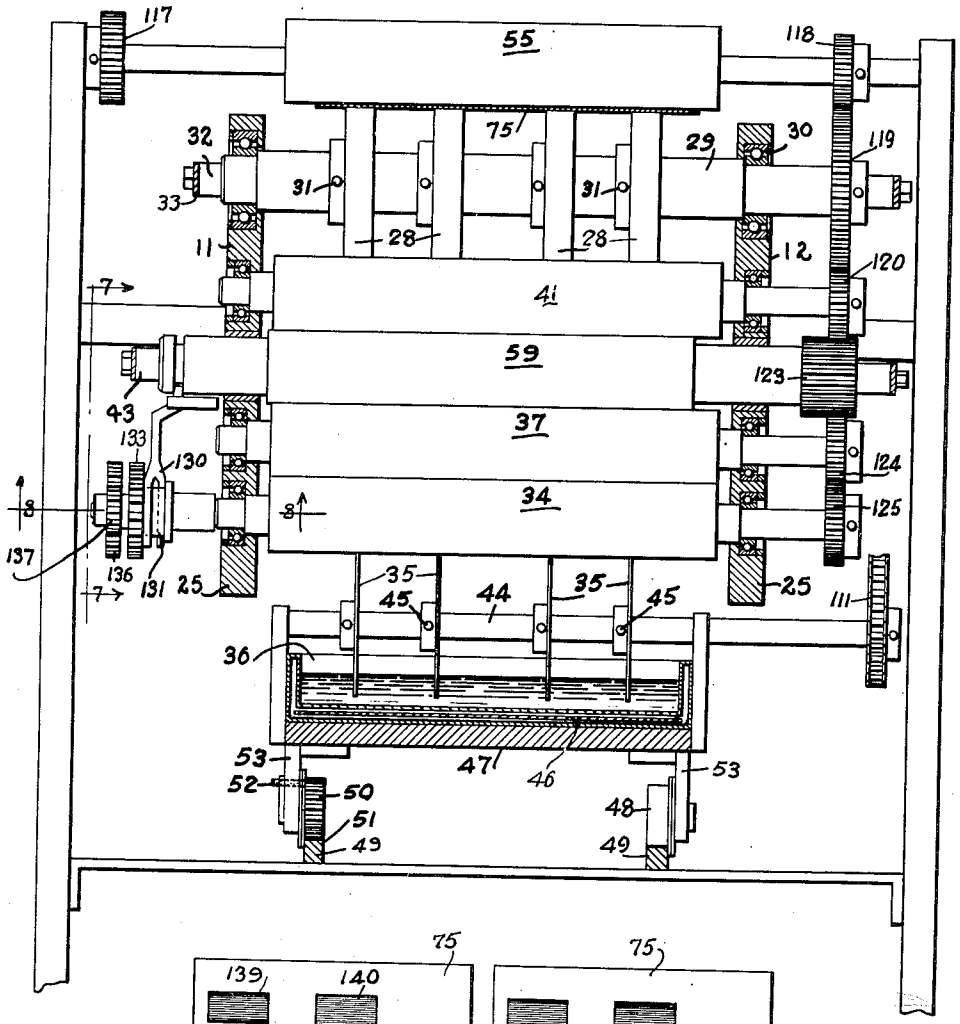
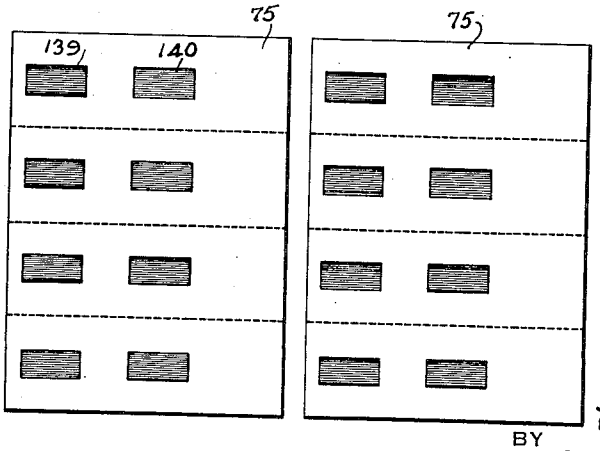


FIG. 9.



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APPARATUS FOR APPLYING CARBON TO SHEETS

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Fig. 6.

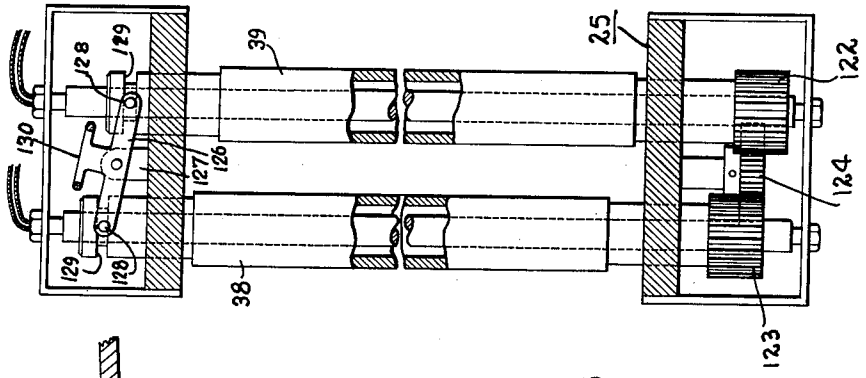


Fig. 8.

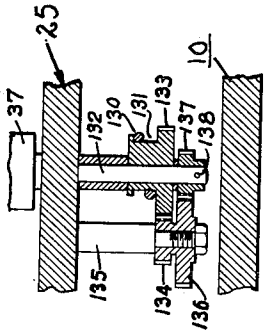


Fig. 5.

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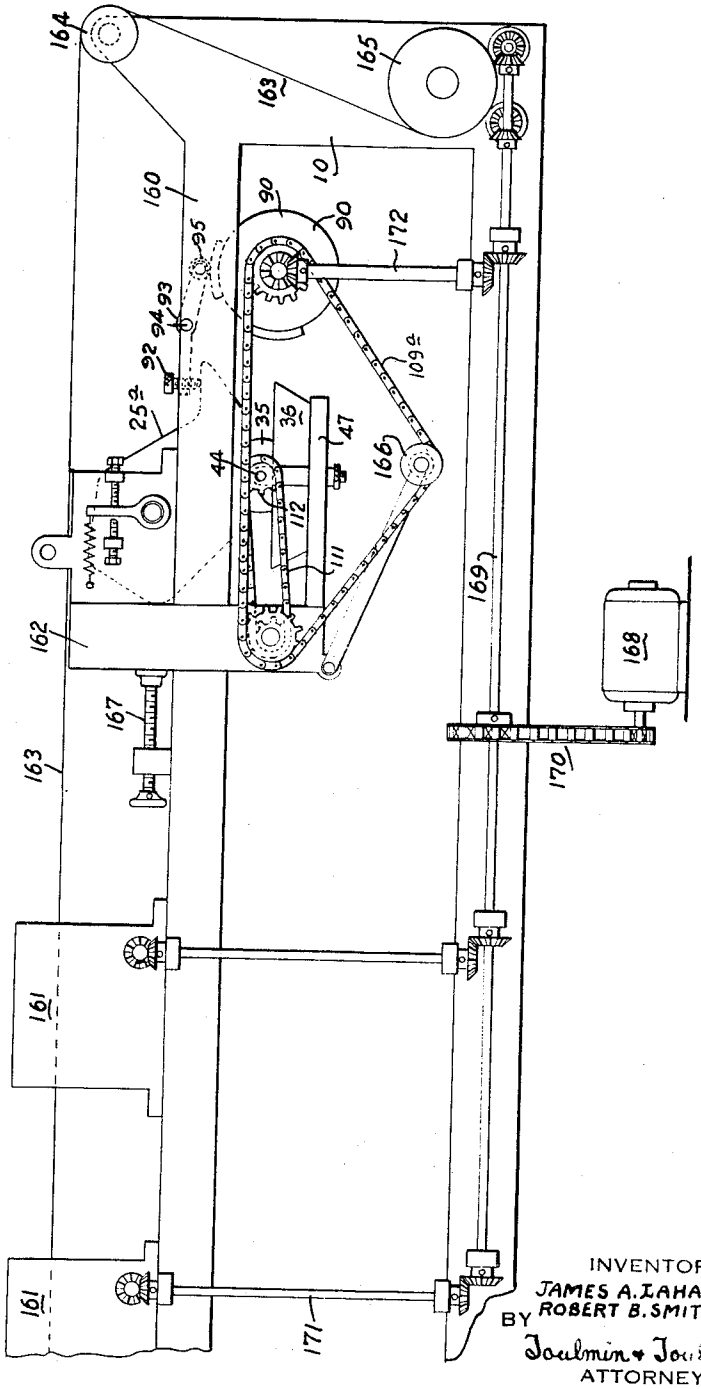
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APPARATUS FOR APPLYING CARBON TO SHEETS

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Fig. 10.



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Patented Jan. 2, 1945

2,366,411

UNITED STATES PATENT OFFICE

2,366,411

APPARATUS FOR APPLYING CARBON TO SHEETS

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Application June 20, 1942, Serial No. 447,850

17 Claims. (Cl. 91—50)

This invention relates to an apparatus for applying carbon spots upon sheets of paper in predetermined areas, and is capable of repeating the performance on any number of sheets passed through the machine, or upon a continuous web.

An object of the invention is to provide a simplified machine for applying carbon spots upon predetermined areas of paper sheets or webs that is positive in its action and avoids the use of complicated printing machinery.

Another object of the invention is to provide a simplified machine for applying carbon upon predetermined areas of a paper sheet or web in a manner that the carbon applying apparatus engages the web only during the interval of time required to apply carbon to the predetermined areas, and wherein the liquid carbon is supplied to the carbon applying apparatus during the same interval of time.

Another object of the invention is to provide an apparatus for applying carbon upon spot areas of a paper sheet or web that is constructed and arranged as a unit so that it can be positioned adjacent any paper handling machine to receive sheets or webs from the machine and apply carbon thereupon.

It is another object of the invention to provide a carbon applying apparatus that can be used as a unit in combination with other paper handling units so that paper sheets can be continuously handled by a plurality of paper handling units, one of which is the carbon applying unit to produce finished paper sheets or webs.

It is another object of the invention to provide a carbon applying apparatus that is adapted to receive liquid carbon from a supply source only when carbon is being applied upon a paper sheet or web, and the interval of supply and application is accurately controlled by means of a cam system.

Another object of the invention is to provide a carbon applying apparatus wherein liquid carbon is supplied to a carbon supplying roll through a series of transfer rolls and vibrating rolls for evenly distributing the carbon supply upon the carbon supply rolls.

It is another object of the invention to provide a carbon applying apparatus wherein the paper sheet or web feeding mechanism is synchronous with the carbon applying mechanism so that the carbon applying mechanism operates only when the paper sheet is in proper position adjacent the same to receive carbon spots in predetermined areas upon the sheet or web.

Another object of the invention is to provide a carbon applying apparatus wherein the carbon applying mechanism is movable with respect to the sheet adapted to receive the carbon so that it can be actuated to engage the sheet for applying carbon upon predetermined areas thereon.

It is another object of the invention to provide a carbon applying apparatus having means to prevent actuation of the carbon applying rolls if a sheet or paper should not feed through the carbon applying apparatus in its proper position so that carbon would not be placed upon an impression roller that cooperates with the carbon applying rollers.

It is another object of the invention to provide an apparatus for applying liquid carbon upon a continuous web or paper in a manner that the carbon applying apparatus is arranged as one of the units adapted to handle a paper web through a series of operations.

Further objects and advantages will become apparent from the drawings and the following description.

In the drawings:

Fig. 1 is a side elevational view of the carbon applying apparatus of this invention.

Fig. 2 is a top plan view of the apparatus.

Fig. 3 is a vertical cross-sectional view of the apparatus taken along line 3—3 of Fig. 2.

Fig. 4 is a transverse cross-sectional view of the apparatus taken along line 4—4 of Fig. 3, placing the rolls in a common plane to illustrate the transfer of the carbon from the supply source to the paper.

Fig. 5 is a longitudinal cross-sectional view of a portion of the apparatus taken along line 5—5 of Fig. 2, showing the gear trains for driving the various rolls of the apparatus.

Fig. 6 is a cross-sectional view of the vibrator rolls taken along line 6—6 of Fig. 7.

Fig. 7 is an end elevational view of the mechanism for producing vibration of the vibrator rolls, taken along line 7—7 of Fig. 4.

Fig. 8 is a horizontal cross-sectional view of the gear train for driving the vibrator rolls taken along line 8—8 of Figs. 4 and 7.

Fig. 9 is an elevational view of typical work produced upon the machine of this invention.

Fig. 10 is a side elevational view of a machine for handling a continuous web through a plurality of paper handling units, one of which is the carbon applying unit of this invention.

The carbon applying apparatus of this invention consists of a frame 10 upon which a pair of upwardly extending brackets 11 and 12 are

secured upon opposite sides of the frame 10. A pair of paper sheet or web feeding rolls 13 and 14 is suitably bearinged in the brackets 11 and 12 and are arranged in parallel alignment therebetween. A feed roll 15 is disposed in parallel relationship with the feed roll 14 and disposed within a support table 16 upon which the paper sheet or web rests in its passage to the feed rolls 13 and 14. A suitable slot 17 is provided in the table 16 so that the surface of the roll 15 can be disposed slightly above the upper surface of the table 16. One end of the feed roll 15 is bearinged in an arm 18 extending from the bracket 11 while the opposite end of the feed roll is bearinged in a bar 19 secured to the bracket 12. The feed rolls 13 and 14 are also bearinged in the bar 19 at one end thereof.

Each of the feed rolls 13, 14 and 15 has a beveled gear 20 upon the shaft thereof disposed between the bar 19 and the bracket 12. A countershaft 21 is suitably bearinged in the bar 19 and is provided with beveled gears 22 adapted to engage the beveled gears 20 so that the feed rolls 13, 14 and 15 will be driven at synchronous speeds. The center beveled gear 20*a* drives the countershaft 21 and in turn is driven by the feed roll 14 through a gear train which will be hereinafter described.

The carbon applying unit 25 consists of a pair of frame members 23 and 24 retained in spaced parallel relationship by means of the bars 26. A shaft 27 supports the frame members 23 and 24 and is bearinged in the bracket members 11 and 12 and thereby provides a pivot for the carbon applying unit 25.

Carbon applying rolls 28 are carried upon a shaft 29 suitably bearinged in the frame members 23 and 24, as for example, by means of the ball bearings 30. The carbon applying rolls 28 are adjustable axially upon the shaft 29 so that they can be disposed at any selected position with respect to a paper sheet or web passing thereover. The rolls 28 may be secured to the shaft 29 by means of suitable set screws 31. An electric heating unit 32 is disosed within the shaft 29 for heating the carbon applying rolls 28 and thus maintain the carbon in liquid form for application upon a paper web. The heating unit may be supported upon the frame members 23 and 24 by means of suitable brackets 33.

A carbon receiving roll 34 is suitably bearinged in the frame members 23 and 24 and is disposed adjacent the lower end of the frame members for engaging carbon supplying discs 35 supported upon a liquid carbon supply container 36. The carbon supplying discs are adapted to lightly engage the roll 34 for supplying carbon thereto. The roll 34 engages a transfer roll 37 that is suitably bearinged in the frame members 23 and 24. The transfer roll 37 in turn engages a pair of vibrating rolls 38 and 39, and they in turn engage the transfer rolls 40 and 41, respectively, which in their turn engage the carbon applying rolls 28 for supplying liquid carbon thereto. The rolls 37 to 41 inclusive are all suitably bearinged in the frame members 23 and 24 in parallel alignment with one another so that their entire surfaces engage for transferring carbon from the carbon receiving roll 34 to the carbon applying rolls 28. Electric heating elements 42 and 43 are disposed within the vibrator rolls 38 and 39 to heat the same and maintain the carbon in liquid form during its transfer from the transfer roll 37 to the transfer rolls 40 and 41.

The carbon supplying discs 35 are carried upon a shaft 44 supported upon the carbon supply container 36. The carbon supplying discs 35 are adjustable axially upon the shaft 44 to position the discs in alignment with cooperating carbon applying rolls 28 as shown in Fig. 4. The discs 35 may be secured to the shaft 44 by means of set screws 45.

The carbon supply container is adapted to be heated by means of an electric strip heater 46 positioned within the walls of the container 36 for maintaining the temperature of the carbon therein sufficiently high to hold it in liquid form. The supply container 36 may be supported by means of a cart 47 having wheels 48 adapted to run upon tracks 49 for moving the cart and supply container with respect to the carbon receiving roll 34 of the carbon applying unit 25. One of the wheels for the cart 47 may consist of a spur gear 50 adapted to ride upon the rack 51. A screw 52 extends through the supporting leg 53 for the gear 50 and is adapted to frictionally engage the gear to prevent its rotation and thus prevent movement of the cart 47 with respect to the carbon applying unit 25.

An impression roller 55 is supported upon the brackets 11 and 12 by means of upwardly extending ears 56 and 57, respectively, and is disposed above the carbon applying rolls 28 so that a paper sheet or web can be fed therebetween. Pressure rollers 58 and 59 are disposed above the feed rollers 14 and 13, respectively for applying pressure upon a paper sheet or web passing across the feed rollers 14 and 13. The pressure rollers 58 and 59 are carried upon arms 60 and 61, respectively that are pivoted to brackets 62 and 63, respectively by means of pivot pins 64 and 65. The brackets 62 and 63 are clamped upon supporting brackets 66 and 67 that are secured to the bracket members 11 and 12 extending upwardly from the frame 10. The arms 60 and 61 maintain the rollers 58 and 59 in close adjacent relationship to the feed rollers 14 and 13, being adjusted by means of screws 68 and 69. Springs 70 and 71 retain the arms 60 and 61 in engagement with the screws 68 and 69 to maintain a predetermined adjusted relationship between the rollers 58 and 59 and the feed rollers 14 and 13, respectively.

Paper sheets 75 or a paper web is adapted to be fed from the table 16 to the feed roller 14 by means of the feed roll 15. This feeding mechanism consists of a bell crank lever 72 pivoted upon the pivot pin 73 and having two arms 76 and 77 extending angularly from the arm 78 of the bell crank lever 72. The arm 78 carries a roller 79 that engages the surface of an actuating cam 80 carried upon a driven shaft 81, the drive for the shaft 81 being hereinafter described. A spring 86 retains the roller 79 in engagement with the surface of the cam 80. The arm 76 of the bell crank lever 72 carries a roller 82 disposed above the feed roll 15 so that the paper sheet or web 75 can pass between the roll 82 and the feed roll 15. The arm 77 of the bell crank lever 72 is disposed beneath the feed roll 15 and carries a stop pin 83 that is adapted to stop the end of the sheet 75 for properly positioning the same for advancement to the feed roll 14 so that carbon spots can be applied to the under surface of the sheet or web 75 by means of the carbon rolls 28.

Rotation of the cam 80 causes the roller 79 to ride upon the valley 84 and the land 85 of the cam 80. As long as the roller 79 engages

the valley 84 the roller 82 will be out of engagement with the paper sheet or web 75 passing between the roller 82 and the feed roll 15. The sheet or web 75 is moved forward into engagement with the stop pin 83 to prelocate the forward edge of the paper sheet or web 75 for advancement to the feed roll 15. When the land 85 engages the roller 79 on the arm 78 of the bell crank lever 72, the arms 76 and 77 will be moved downwardly as viewed in Fig. 3 so that the roller 82 will apply pressure upon the paper sheet or web 75 so that the feed roll 15 then advances the paper sheet or web 75 to the feed roll 14. It is, of course, understood that movement of the arm 77 removes the stop pin 83 from engagement with the edge of the paper sheet or web 75 so that the same can be advanced to the feed roll 14. This feed mechanism is synchronized with the operation of the elements of the machine in a manner hereinafter described.

As heretofore mentioned the carbon applying unit 25 is pivotally mounted upon the shaft 27. The carbon applying unit is pivotally mounted to permit movement of the carbon applying rolls 28 with respect to the impression roller 55. Simultaneously, with this movement the carbon receiving roll 34 is moved into and out of engagement with the carbon applying discs 35 so that the carbon is supplied to the receiving roll 34 only when the carbon applying rolls are in engagement with a paper sheet or web 75. By so actuating the carbon applying unit the carbon is used from the unit for application upon a paper sheet or web 75 as rapidly as supplied to the carbon receiving roll 34. Therefore the carbon applying unit 25 does not become loaded with excess carbon in the intervals between the applications of carbon to the sheet or web 75.

A driven cam 90 is provided for actuating the carbon applying unit 25 for pivoting the same upon the shaft 27 at the proper intervals for applying carbon to spot areas upon the paper web or sheet 75. The cam 90 is secured to a driven shaft 91 and is synchronized with the other mechanism of the machine in a manner hereinafter described. The cam 90 is provided with a pair of annular grooves 87 and 88 adapted to receive cam segments 89. Screws 92 secure the cam segments 89 within the grooves 87 and 88. These segments 89 determine the interval of time that the carbon applying rolls 28 will be in engagement with the paper sheet or web 75. Either a single segment can be used for controlling the engagement time of the carbon applying rolls 28, or a plurality of segments can cooperate with one another to provide any length time interval desired and thus control the length of the carbon spot applied to the sheet or web 75. As shown in Fig. 3 the cam segments 89 are separated from one another and therefore the carbon applying rolls are brought into engagement with the sheet or web 75 twice for each revolution of the cam 90.

The segments 89 provide the lands on the cam 90 for actuating a bell crank lever 93 which pivots at 94 to the frame 10 and having a roller 95 on one end thereof and an adjusting screw 92 on the opposite end thereof adapted to engage the frame member 24 of the carbon applying unit 25. The pivot 94 for the bell crank lever 93 is a shaft that extends between the frame members 11 and 12, the lever 93 being secured to the shaft 94 by a set screw 97. A lever 98 is secured upon the shaft 94 and retained from rotation by means of a set screw 99. The lever 98 is provided with an adjusting screw 100 similar to the adjusting screw 92 and is adapted to engage the frame member 23 of the carbon applying unit 25.

Rotation of the cam 90 causes the roller 95 to ride upon the lands provided by the cam segments 89 to rotate the carbon applying unit in a clockwise direction about the pivot 27 and thus place the carbon receiving roll 34 in engagement with the carbon applying discs 35 and place the carbon applying rolls 28 in engagement with the under side of the paper sheet or web 75 passing between the carbon applying rolls 28 and the impression roll 55. As long as the roll 95 engages the cam segment 89 the carbon will be transferred from the carbon applying rolls 28 to the paper web or sheet 75. When the roll 95 rides in a valley 101 provided by the surface of the cam 90 the carbon applying unit will be rotated to prevent engagement of the carbon applying rolls with the web or sheet 75 and prevent engagement of the carbon receiving roll with the carbon applying discs 35. The edges of the cam segments 89 are sharp to provide rapid engagement and disengagement of the carbon rolls 28 with the paper sheet or web 75 so that a sharp line of carbon is provided at the point of engagement and disengagement with the web 75 thereby improving the neatness and appearance of the finished product.

The shaft 27, which provides the pivot for the carbon applying unit 25 carries a stop member 102 that limits the degree of rotation of the carbon applying unit 25 (see Fig. 1). Adjustable stop members 103 and 104 are carried upon the bracket 12 between which the stop member 102 may reciprocate. The adjustment of the stop members 103 and 104 control the rotation of the carbon applying unit 25. A spring 105 urges the stop member 102 against the stop 103 to make a clean break between the carbon applying rolls 28 and the paper web or sheet 75 passing thereover.

The various elements of the machine heretofore described are synchronized in their operation by means of a system of chain and gear drives. The shaft 91 for the cam 90 carries a pulley 106 driven by a belt 107 from a suitable source of power such as an electric motor. An endless chain 109 engages a sprocket 108 carried upon the shaft 91 and a sprocket 110 carried upon the shaft 81 for the feed cam 80. Therefore, the cam 90 for actuating the carbon applying unit 25 and the cam 80 for feeding the paper sheets toward the carbon applying rolls 28 may be synchronized in their operation so that the cam 80 will operate the bell crank lever 72 to feed the paper web or sheet toward the carbon applying rolls 28 at the proper interval of time in advance of the actuation of the carbon applying unit 25 by means of the cam segments 89 so that the sheet or web 75 will be in position above the carbon applying rolls 28 for applying carbon to the underneath side of the sheet at the proper spots on the sheet. Since the paper feeding cam 80 rotates once for each revolution of the carbon unit actuating cam 90 it will be readily apparent that the carbon spots will be applied upon the sheets passing over the carbon applying rolls at the same location on each sheet.

An endless chain 111 engages a second sprocket on the shaft 81 and engages a sprocket 112 on the shaft 44 that carries the carbon applying discs 35 whereby the discs are driven for rotation in the liquid carbon contained in the supply

container 36. The shaft 81 also carries a spur gear 113 that drives a gear train consisting of the spur gears 114, 115, 116 and 117 for rotating the impression roller 55. The spur gear 116 is carried upon the shaft for the feed roll 14 and thus drives the beveled gear 20a (see Fig. 2) for driving the feed rolls 15 and 13 therefrom. The supporting shaft for the impression roller 55 has a second spur gear 118 thereon that drives a gear train consisting of the gears 119, 120, 121, 122, 123, 124 and 125 for driving the carbon applying rolls 28, the transfer rolls 40 and 41, the vibrator rolls 38 and 39, the transfer roll 37 and the carbon receiving roll 34. Thus it will be seen that all of the mechanism of the carbon applying unit 25 is driven in synchronism. The rotation of the carbon applying unit 25 about the pivot 27 is insufficient to separate the mesh between the spur gears 118 and 119 so that the drive connection is never lost.

The vibrator rolls 38 and 39 are adapted to be reciprocated axially by means of a crank arm 126 that is pivotally mounted upon the ears 127 extending from the frame of the carbon applying unit 25. The crank arm is provided with pins 128 that engage annular grooves 129 in the vibrator rolls 38 and 39. A yoke 130 on the crank arm 126 engages an eccentric 131 (see Figs. 4 and 8) rotatably carried upon the shaft 132 for the carbon receiving roll 34. The eccentric 131 has a spur gear 133 integral therewith that meshes with a pinion 134 carried upon a stub shaft 135. The pinion 134 is integral with a spur gear 136 that meshes with a pinion 137 secured to the shaft 132 by means of a pin 138, whereby the eccentric 131 is slowly driven to oscillate the crank arm 126 and thus reciprocate the vibrator rolls axially. Reciprocation of the vibrator rolls 38 and 39 spreads the liquid carbon upon the transfer rolls 37, 40 and 41 so that the carbon is more evenly distributed upon the surface of the carbon applying rolls 28.

A typical workpiece having carbon spots applied thereto is shown in Fig. 9 wherein the carbon spots 139 and 140 have been applied to the sheet 75 in two different areas. The length of the carbon spots 139 and 140 is controlled by the length of the cam segments 89 as previously described. The transverse position of the carbon spots 139 and 140 upon the sheet 75 is regulated by axial adjustment of the carbon applying rollers 28 upon the shaft 29 that support the same. The width of the carbon spot is regulated by the width of the carbon applying roll. Thus it may be seen that the spots can be applied at any location upon a sheet and they may be of any width or length desired.

There may be times when a paper sheet 75 does not enter between the feed roll 14 and the pressure applying roll 58 in the proper manner so that if the sheet was permitted to go between the carbon applying rollers and the impression roll 55 the carbon on the rollers 28 would smear the face of the impression roll 55. To prevent this from happening the shaft 94 is movable axially so that the bell crank lever 93 and the lever 98 can be moved out of engagement with the frame member 23 and 24 of the carbon applying unit and thus prevent actuation of the unit when the cam segments 89 engage the roller 95.

The shaft 94 is slidable in the frame 10 and is provided with a spring 141 around one end thereof retained between the frame 10 and the collar 142 so that the spring urges the shaft in a downward direction as viewed in Fig. 2. A collar 143 limits the movement of the shaft 94. A bell crank lever 144 is pivoted by a pin 145 upon the frame 10 and has the end 146 in engagement with the end of the shaft 94 and the opposite end connected to a rod 147. The rod 147 is connected to a bell crank lever 148 pivoted at 149 and having a handle 150 for operating the bell crank lever 148 and thus the bell crank lever 144 to move the shaft 94 upwardly as viewed in Fig. 2 when desired.

The machine that has been described thus far is particularly adaptable for use in applying carbon spots on individual sheets of paper. Each sheet of paper is fed against the stop pin 83 and is thus properly located for passage through the carbon applying unit of the machine. The carbon applying unit is capable of being used as one of the units in a series of paper handling units wherein a continuous web may be printed, perforated, creased, carbon applied thereon, folded, stacked, etc. The carbon apparatus of this invention performs one of a series of operations on a continuous web.

Fig. 10 shows a schematic machine for performing a series of operations upon a continuous web, one of which is the carbon applying operation performed by the machine of this invention. In this modification the frame 160 supports a plurality of paper handling units 161 and the carbon applying apparatus 162 of this invention. A continuous web 163 is fed or pulled through the paper handling unit 161 and the carbon applying apparatus 162, and as shown in this modification, the web passes over a roll 164 to a receiving roll 165. The carbon applying apparatus 162 is identical with the carbon apparatus previously described except that the continuous chain 109a for driving between the cam 90 and the cam 80 is somewhat longer to permit adjustment of the carbon applying unit 25a with respect to the cam 90 so that slight variations in location of the carbon spot on the continuous web can be adjusted. An idler pulley is provided to retain tension upon the endless chain 109a. The carbon applying unit 25a is adjustable upon the frame 160 by means of an adjusting screw 167. An electric motor 168 drives a shaft 169 through a chain and spur gear 170 for driving the paper handling units 161 by means of the shafts 171 and the carbon applying apparatus 162 by means of the shaft 172. The operation of the carbon applying apparatus 162 is identical with the operation of the apparatus heretofore described.

While the apparatus disclosed and described herein constitutes a preferred form of the invention, yet it is to be understood that although the apparatus herein is constructed in a manner that the carbon applying unit is moved with respect to the paper sheets or web passing through the machine for applying carbon thereon, that it is also possible to move the paper sheet or web with respect to the carbon applying rolls while the carbon applying unit remains stationary, to obtain the same result. In the latter instance the carbon receiving roll would be moved with respect to the carbon supply discs simultaneously with movement of the paper web with respect to the carbon applying rolls so that the carbon would be supplied to the carbon applying unit only when the carbon is being applied upon a paper sheet or web. It is thus seen that the apparatus is capable of mechanical alteration without departing from the spirit of the invention,

and that all such modifications as fall within the scope of the appended claims are intended to be included herein.

Having thus fully described my invention, what I claim as new and desire to secure by Letters Patent is:

1. An apparatus for applying liquid carbon to a sheet of paper that includes the combination of, a carbon applying unit having carbon applying rolls, an impression roll cooperating with said carbon rolls to cause a paper sheet to engage the carbon rolls when fed between said carbon rolls and said impression roll, means for feeding a paper sheet between said carbon rolls and said impression roll, means movably mounting said carbon applying unit with respect to said impression roll to release a paper sheet passing therebetween, means for actuating said carbon applying unit to move the same with respect to said impression roll at periodic intervals to thereby apply carbon upon a sheet in predetermined spaced areas, and means for disconnecting said actuating means from said carbon applying unit to prevent actuation thereof.

2. An apparatus for applying liquid carbon to a sheet of paper that includes the combination of, a carbon applying unit having carbon applying rolls, an impression roll cooperating with said carbon rolls to cause a paper sheet to engage the carbon rolls when fed between said carbon rolls and said impression roll, means for feeding a paper sheet between said carbon rolls and said impression roll, means movably mounting said carbon applying unit with respect to said impression roll to release a paper sheet passing therebetween, cam means, lever means extending between said cam means and said carbon applying unit for actuating said carbon applying unit upon rotation of said cam means, and mens for moving said lever means with respect to said carbon applying unit to prevent actuation thereof by said cam means.

3. An apparatus for applying liquid carbon to a sheet of paper that includes the combination of, a carbon applying unit having carbon applying rolls, an impression roll cooperating with said carbon rolls to cause a paper sheet to engage the carbon rolls when fed between said carbon rolls and said impression roll, means for feeding a paper sheet between said carbon rolls and said impression roll, means movably mounting said carbon applying unit with respect to said impression roll to release a paper sheet passing therebetween, cam means, lever means extending between said cam means and said carbon applying unit for actuating the same to cause movement of said carbon applying rolls with respect to said impression roll at periodic intervals to apply carbon upon a sheet of paper passing therebetween at spaced areas, said feeding means including rotating feed roll means, cam means, lever means actuated by said cam means and having means to frictionally engage a sheet of paper with said feed roll means for advancing the sheet toward said carbon applying rolls and said impression roll, and means drivingly interconnecting said carbon unit actuating cam means and said feeding cam means to cause actuation of said feeding means to move a paper sheet between said carbon applying rolls and said impression roll and position the same therebetween before actuation of said carbon applying unit, whereby liquid carbon is applied upon the sheet in predetermined spaced areas.

4. In a machine for applying liquid carbon upon a paper sheet, the combination of; a carbon applying unit having carbon applying rolls, a carbon receiving roll, carbon transfer rolls for transferring carbon from said receiving roll to said applying rolls, and vibrator rolls for spreading the carbon upon said transfer rolls; means for applying liquid carbon upon said carbon receiving roll comprising a disc in engagement with said carbon receiving roll, an impression roll disposed above said carbon rolls and adapted to cooperate therewith to engage paper passing therebetween, feed rolls disposed adjacent said carbon applying rolls for moving a paper sheet between said carbon rolls and said impression roll, and means for moving said carbon applying unit to move said carbon applying rolls with respect to said impression roll to engage a paper sheet passing therebetween and applying carbon thereupon.

5. In a machine for applying liquid carbon upon a paper sheet, the combination of; a carbon applying unit having carbon applying rolls, a carbon receiving roll, carbon transfer rolls for transferring carbon from said receiving roll to said applying rolls, and vibrator rolls for spreading the carbon upon said transfer rolls; means for applying liquid carbon upon said carbon receiving roll comprising a disc in engagement with said carbon receiving roll, an impression roll disposed above said carbon rolls and adapted to cooperate therewith to engage paper passing therebetween, feed rolls disposed adjacent said carbon applying rolls for moving a paper sheet between said carbon rolls and said impression roll, means for moving said carbon applying unit to move said carbon applying rolls with respect to said impression roll to engage a paper sheet passing therebetween and applying carbon thereupon, and means for moving said liquid carbon supply disc with respect to said receiving roll to adjust the clearance therebetween.

6. In a machine for applying liquid carbon upon a paper sheet, the combination of; a carbon applying unit having carbon applying rolls, a carbon receiving roll, carbon transfer rolls for transferring carbon from said receiving roll to said applying rolls, and vibrator rolls for spreading the carbon upon said transfer rolls; means for applying liquid carbon upon said carbon receiving roll comprising a disc in engagement with said carbon receiving roll, an impression roll disposed above said carbon rolls and adapted to cooperate therewith to engage paper passing therebetween, feed rolls disposed adjacent said carbon applying rolls for moving a paper sheet between said carbon rolls and said impression roll, rotatable cam means, lever means extending between said cam means and said carbon applying unit for moving the same to move said carbon applying rolls with respect to said impression roll and said carbon receiving roll with respect to a liquid carbon supply disc to apply carbon upon a paper sheet simultaneously with supply of carbon to said receiving roll.

7. In a machine for applying liquid carbon upon a paper sheet, the combination of; a carbon applying unit having carbon applying rolls, a carbon receiving roll, carbon transfer rolls for transferring carbon from said receiving roll to said applying rolls, and vibrator rolls for spreading the carbon upon said transfer rolls; means for applying liquid carbon upon said carbon receiving roll comprising a disc in engagement with said carbon receiving roll, an impression roll

disposed above said carbon rolls and adapted to cooperate therewith to engage paper passing therebetween, feed rolls disposed adjacent said carbon applying rolls for moving a paper sheet between said carbon rolls and said impression roll, rotatable cam means, lever means extending between said cam means and said carbon applying unit for moving the same to move said carbon applying rolls with respect to said impression roll and said carbon receiving roll with respect to said liquid carbon supply disc to apply carbon upon a paper sheet simultaneously with supply of carbon to said receiving roll, a second rotatable feed roll disposed in advance of said carbon applying rolls, a second rotatable cam means, lever means actuated by said second cam means and having roll means carried thereby for engaging said second rotatable feed roll for engaging a paper sheet to feed the same to the feed rolls adjacent said carbon applying rolls, and means drivingly interconnecting said first mentioned and said second mentioned cam means to synchronize operation of said carbon applying unit and said feed means to cause actuation of said feed means in advance of actuation of said carbon applying means and thereby position a paper sheet in a predetermined position beneath said impression roll before being engaged by said carbon applying rolls.

8. In a machine for applying liquid carbon upon a paper sheet, the combination of; a carbon applying unit having carbon applying rolls, a carbon receiving roll, carbon transfer rolls for transferring carbon from said receiving roll to said applying rolls, and vibrator rolls for spreading the carbon upon said transfer rolls; means for applying liquid carbon upon said carbon receiving roll comprising a disc in engagement with said carbon receiving roll, an impression roll disposed above said carbon rolls and adapted to cooperate therewith to engage paper passing therebetween, feed rolls disposed adjacent said carbon applying rolls for moving a paper sheet between said carbon rolls and said impression roll, rotatable cam means, lever means extending between said cam means and said carbon applying unit for moving the same to move said carbon applying rolls with respect to said impression roll and said carbon receiving roll with respect to said liquid carbon supply disc to apply carbon upon a paper sheet simultaneously with supply of carbon to said receiving roll, a second rotatable feed roll disposed in advance of said carbon applying rolls, a second rotatable cam means, lever means actuated by said second cam means and having roll means carried thereby for engaging said second rotatable feed roll for engaging a paper sheet to feed the same to the feed rolls adjacent said carbon applying rolls, said last mentioned lever means also having stop means disposed between said second mentioned feed roll and said carbon applying rolls for engaging the edge of a paper sheet to be fed to the carbon applying rolls, and means drivingly interconnecting said first mentioned and said second mentioned cam means to synchronize operation of said carbon applying unit and said feed means to cause actuation of said feed means in advance of actuation of said carbon applying means and thereby position a paper sheet in a predetermined position beneath said impression roll before being engaged by said carbon applying rolls.

9. In an apparatus for applying liquid carbon upon a sheet of paper, the combination of, a carbon applying roll, feeding mechanism for moving a sheet of paper across said carbon roll, mechanism for supplying liquid carbon to said carbon applying roll including a carbon receiving roll, a carbon supplying means adapted to be engaged by said receiving roll, and a mechanism for moving said carbon applying roll into and out of engagement with a paper sheet passing thereover concomitantly with movement of said receiving roll into and out of engagement respectively with said supplying means for applying liquid carbon to predetermined areas on the paper sheet concomitant with supplying said receiving roll with carbon, said last mentioned mechanism including a cam for actuating the mechanism a determined number of times for each revolution of the cam and thereby cause the carbon applying roll to contact the paper sheet a determined number of times for a determined length of sheet passed thereover.

10. In an apparatus for applying liquid carbon upon a sheet of paper, the combination of, a carbon applying roll, feeding mechanism for moving a sheet of paper across said carbon roll, mechanism for supplying liquid carbon to said carbon applying roll including a carbon receiving roll, a carbon supplying means adapted to be engaged by said receiving roll, a mechanism for moving said carbon applying roll into and out of engagement with a paper sheet passing thereover concomitantly with movement of said receiving roll into and out of engagement respectively with said supplying means for applying liquid carbon to predetermined areas on the paper sheet concomitant with supplying said receiving roll with carbon, said feeding mechanism including cam means for actuating the mechanism to engage a paper sheet being fed therethrough a predetermined interval of time for each revolution of the cam, and means for synchronizing the operation of said cams to actuate said feeding mechanism a predetermined time interval in advance of actuation of said carbon applying mechanism whereby to locate the carbon areas in determined positions upon a sheet of paper.

11. In a machine for applying liquid carbon upon predetermined areas of a sheet of paper; the combination of; a liquid carbon applying unit consisting of a carbon applying roll, a carbon receiving roll, and carbon transfer rolls positioned between said applying roll and said receiving roll, said rolls being in constant contact to transfer carbon from the receiving roll to the applying roll and carried by a frame structure; a source of liquid carbon supply for said carbon applying unit, feed mechanism for moving a paper sheet across said carbon applying roll, means movably mounting said frame structure of said carbon applying unit, and a mechanism for moving said frame structure to cause engagement and disengagement of said applying roll with a paper sheet respectively and simultaneously with engagement and disengagement of said receiving roll with the source of carbon supply for predetermined time intervals to apply carbon upon a paper sheet in predetermined areas simultaneously with supplying said carbon applying unit with carbon in determined amounts as regulated by the period of time the receiving roll engages the source of liquid carbon.

12. In a machine for applying liquid carbon upon predetermined areas of a sheet of paper; the combination of; a liquid carbon applying

unit consisting of a carbon applying roll, a carbon receiving roll, and carbon transfer rolls positioned between said applying roll and said receiving roll, said rolls being in constant contact to transfer carbon from the receiving roll to the applying roll and carried by a frame structure; a source of liquid carbon supply for said carbon applying unit, feed mechanism for moving a paper sheet across said carbon applying roll, means movably mounting said frame structure of said carbon applying unit, a mechanism for moving said frame structure to cause engagement and disengagement of said applying roll with a paper sheet respectively and simultaneously with engagement and disengagement of said receiving roll with the source of carbon supply for predetermined time intervals to apply carbon upon a paper sheet in predetermined areas simultaneously with supplying said carbon applying unit with carbon in determined amounts as regulated by the period of time the receiving roll engages the source of liquid carbon, said carbon applying unit frame actuating mechanism including a cam having a contour to actuate said applying unit actuating mechanism for each time an area of carbon is placed upon a sheet of paper passing across the carbon applying rolls, said feed mechanism including cam means having a contour to actuate said feeding mechanism to engage a paper sheet a predetermined interval of the rotation of the cam, and means positively interconnecting both of said cam means to synchronize rotation thereof to cause actuation of said feeding mechanism in advance of the actuation of said carbon applying actuating mechanism whereby to feed a paper sheet to a predetermined position over the carbon applying rolls before the carbon applying unit actuating mechanism is operated.

13. A machine for applying liquid carbon upon a sheet of paper which includes in combination; a carbon applying unit including a carbon applying roll, a carbon receiving roll, and transfer rolls positioned between said receiving roll and said applying roll, said rolls being in constant contact for transferring carbon from the receiving roll to the applying roll, and a frame supporting said rolls; an impression roll positioned above said carbon applying roll, means for feeding a paper sheet between said impression roll and said carbon applying roll, a source of liquid carbon positioned beneath said receiving roll, means movably mounting said frame whereby to permit movement thereof to cause said receiving roll to move upwardly away from said carbon supplying means simultaneously with downward movement of said applying roll from said impression roll, and means for so moving said frame intermittently to cause engagement or disengagement of the applying roll with the paper sheet and the receiving roll with the source of carbon simultaneously, whereby carbon is supplied to the carbon applying unit only when carbon is being applied by the unit to a paper sheet.

14. A machine for applying liquid carbon upon a sheet of paper which includes in combination; a carbon applying unit including a carbon applying roll, a carbon receiving roll, and transfer rolls positioned between said receiving roll and said applying roll, said rolls being in constant contact for transferring carbon from the receiving roll to the applying roll, and a frame supporting said rolls; an impression roll positioned above said carbon applying roll, means for feeding a paper sheet between said impression roll and said carbon applying roll, a source of liquid carbon positioned beneath said receiving roll, means movably mounting said frame whereby to permit movement thereof to cause said receiving roll to move upwardly away from said carbon supplying means simultaneously with downward movement of said applying roll from said impression roll, means for so moving said frame intermittently to cause engagement or disengagement of the applying roll with the paper sheet and the receiving roll with the source of carbon simultaneously, whereby carbon is supplied to the carbon applying unit only when carbon is being applied by the unit to a paper sheet, and means for regulating the degree of movement of said carbon applying roll with respect to said impression roll.

15. In an apparatus for applying liquid carbon upon a sheet of paper, the combination that includes; a carbon applying unit consisting of a carbon applying roll, a carbon receiving roll, transfer rolls and vibrator rolls positioned between said receiving roll and said applying roll whereby to transfer carbon from the receiving roll to the applying roll and uniformly spread the carbon upon the applying roll, a frame structure for operably supporting said rolls in constant contact, an impression member positioned above said applying roll, a carbon supplying means positioned beneath said receiving roll, means rotatably supporting said frame on an axis parallel to the axis of the aforesaid rolls, and means for rotating said frame whereby to cause movement of said applying roll and said receiving roll toward or away from said impression member and said carbon supplying means simultaneously.

16. In an apparatus for applying liquid carbon upon a sheet of paper, the combination that includes; a carbon applying unit consisting of a carbon applying roll, a carbon receiving roll, transfer rolls and vibrator rolls positioned between said receiving roll and said applying roll whereby to transfer carbon from the receiving roll to the applying roll and uniformly spread the carbon upon the applying roll, a frame structure for operably supporting said rolls in constant contact, an impression member positioned above said applying roll, a carbon supplying means positioned beneath said receiving roll and consisting of narrow disc like members adapted to be engaged by the receiving roll for applying a substantially narrow line of liquid carbon thereupon, means rotatably supporting said frame on an axis parallel to the axis of the aforesaid rolls, and means for rotating said frame whereby to cause movement of said applying roll and said receiving roll toward or away from said impression member and said carbon supplying means simultaneously.

17. In an apparatus for applying liquid carbon upon a sheet of paper, the combination that includes; a carbon applying unit consisting of a carbon applying roll, a carbon receiving roll, transfer rolls and vibrator rolls positioned between said receiving roll and said applying roll whereby to transfer carbon from the receiving roll to the applying roll and uniformly spread the carbon upon the applying roll, a frame structure for operably supporting said rolls in constant contact, an impression member positioned above said applying roll, a carbon supplying means positioned beneath said receiving roll and consisting of narrow disc like members adapted to be engaged by the receiving roll for applying a substantially narrow line of liquid carbon thereupon, means rotatably supporting said frame on an axis parallel to the axis of the aforesaid rolls,

means for rotating said frame whereby to cause movement of said applying roll and said receiving roll toward or away from said impression member and said carbon supplying means simultaneously, and means for adjustably regulating the rotation of said frame and the position of said discs relative to said receiving roll for regulating the position of the applying roll relatively to said impression member and to position said discs relatively to said receiving roll for causing contact of the receiving roll with said discs simultaneously with contact of said applying roll upon a paper sheet passing between the same and the impression member.

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