

April 5, 1932.

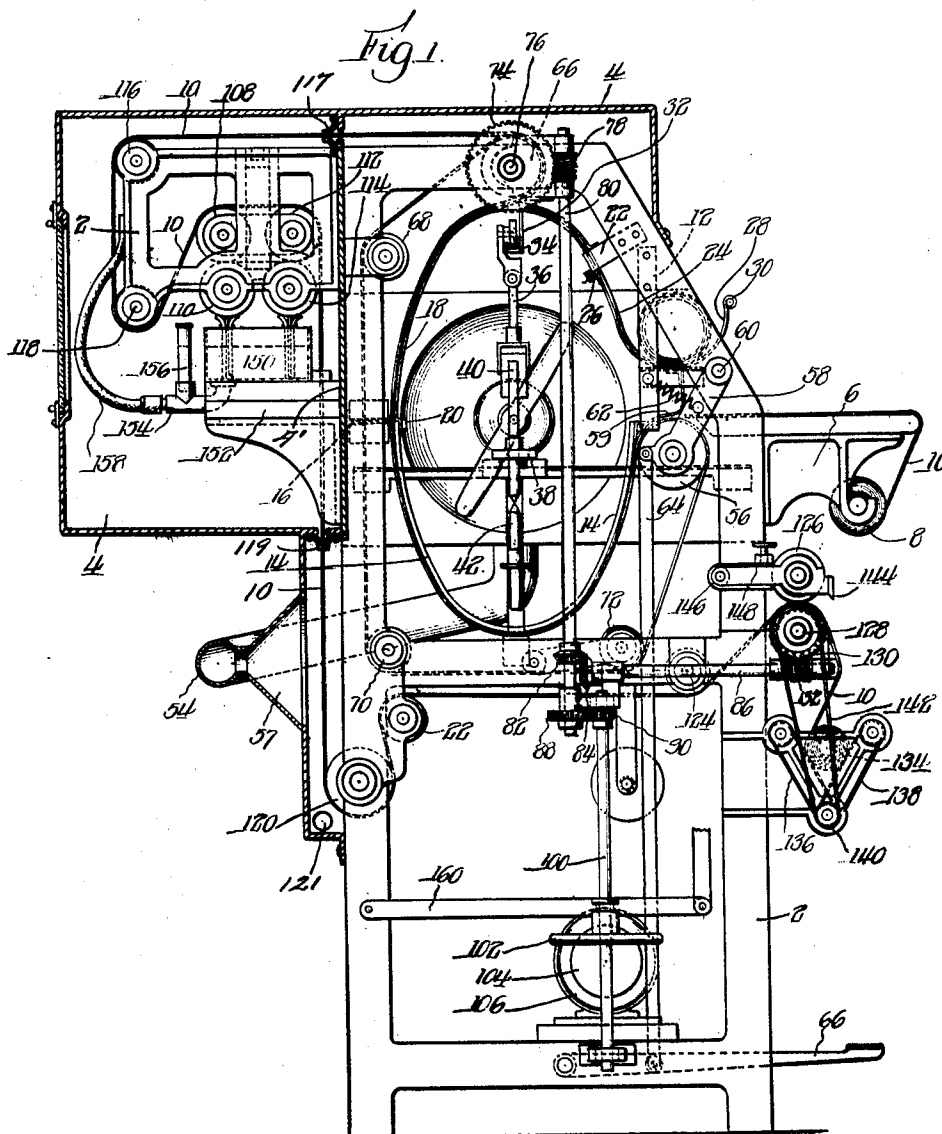
A. LANGSNER

1,852,316

APPARATUS FOR TREATING LIGHT SENSITIVE MATERIAL

Filed Dec. 26, 1927

4 Sheets-Sheet 1



Inventor:
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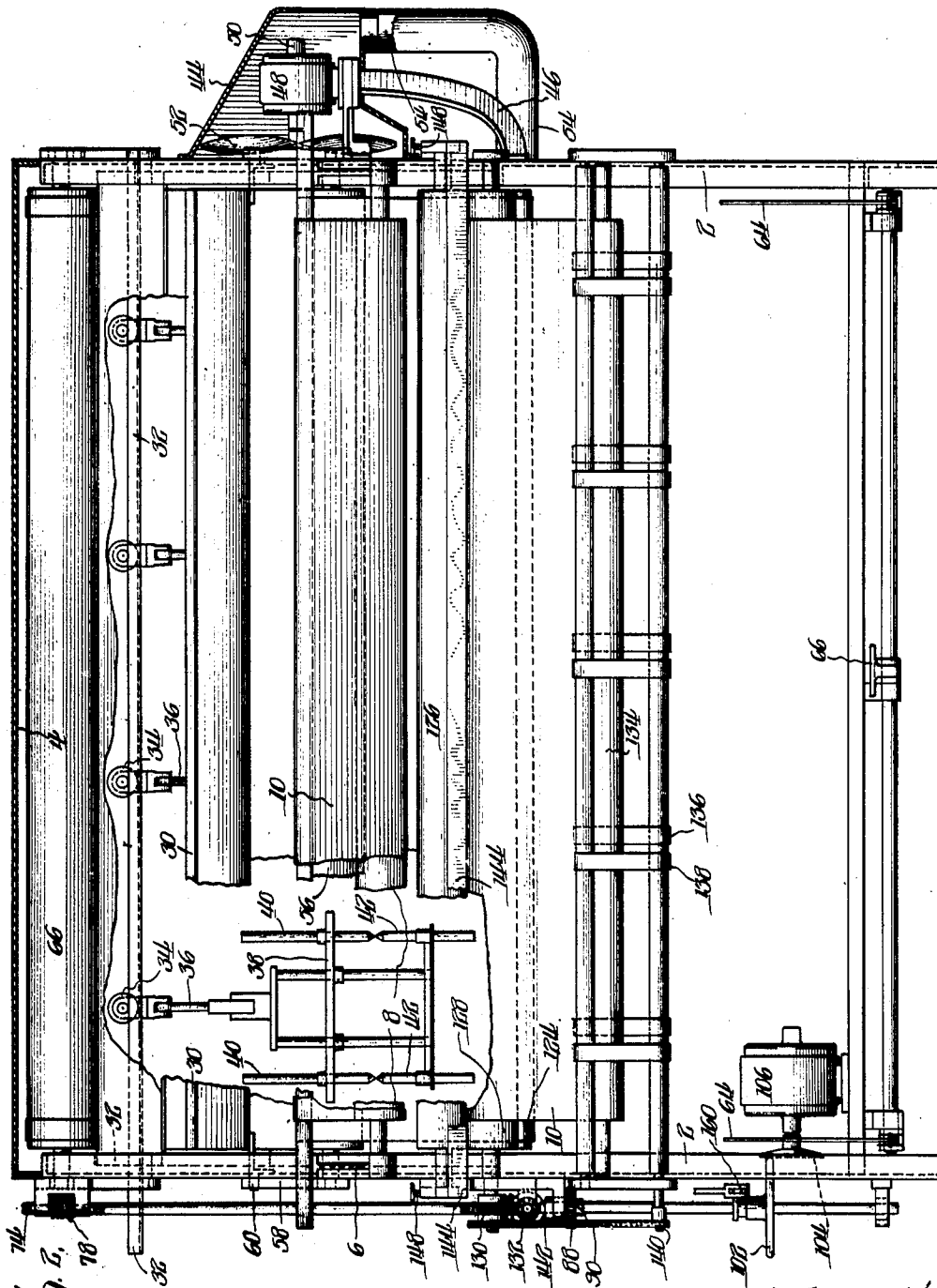


Fig. 2.

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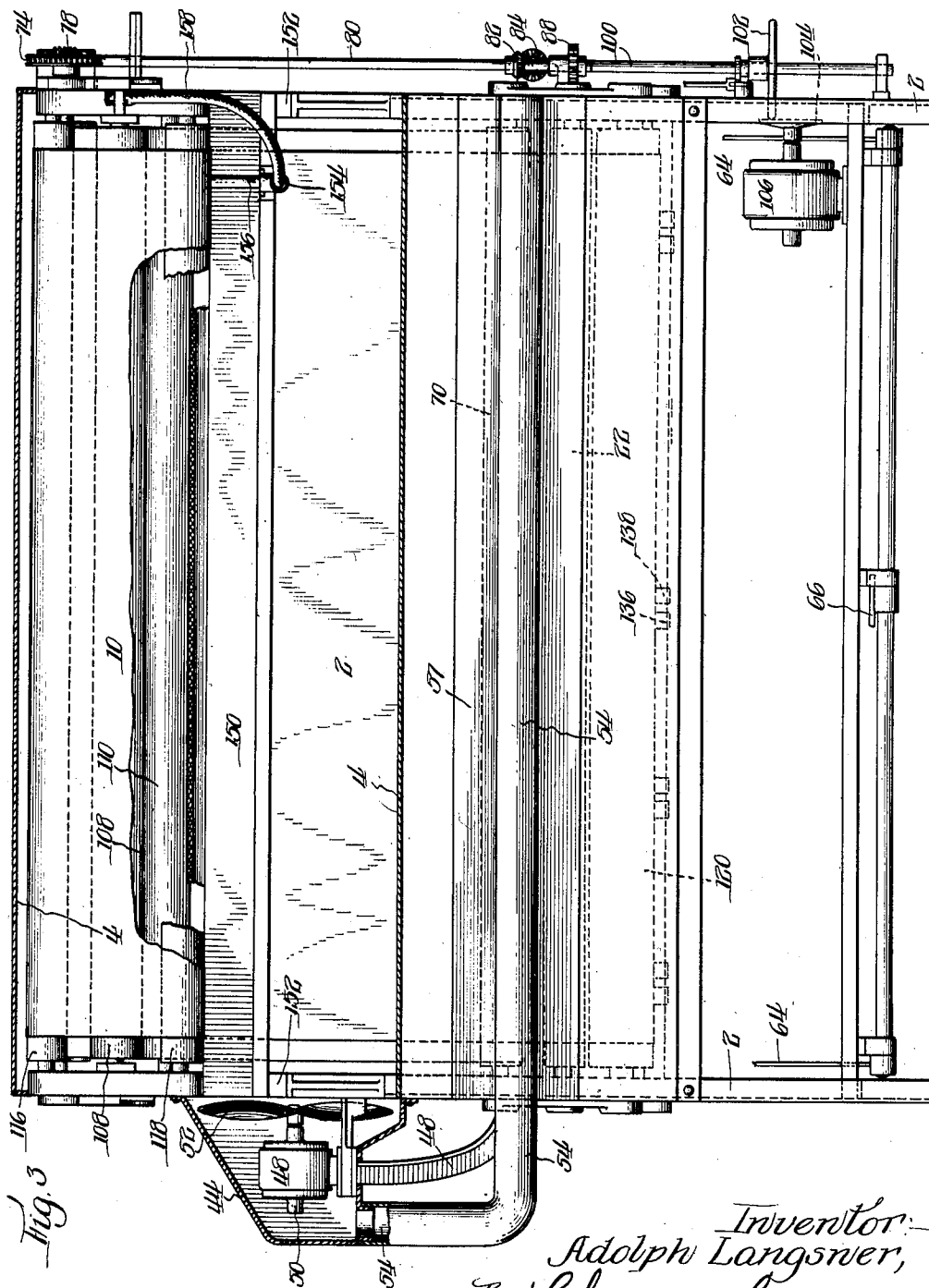


Fig. 3

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4 Sheets-Sheet 4

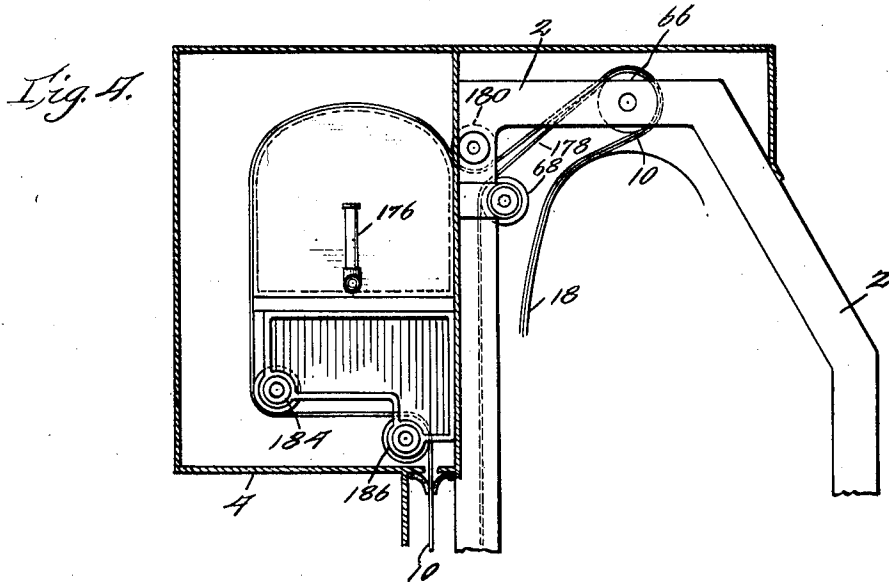


Fig. 5.

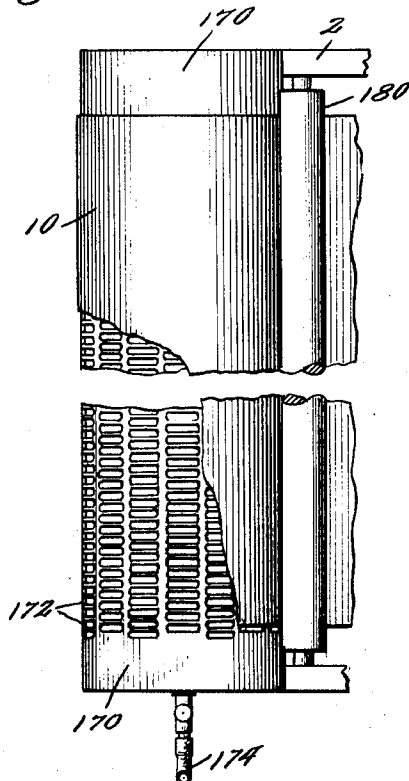
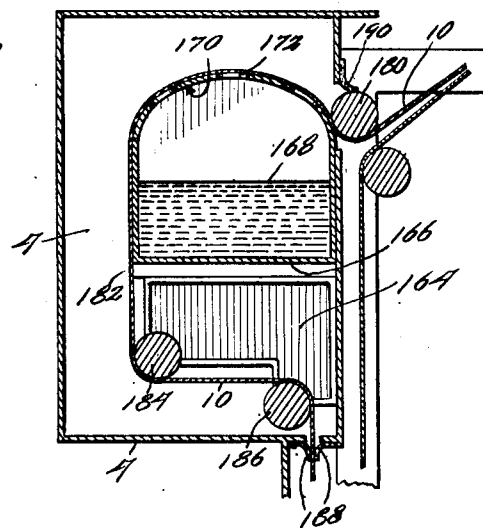


Fig. 6.



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UNITED STATES PATENT OFFICE

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APPARATUS FOR TREATING LIGHT SENSITIVE MATERIAL

Application filed December 26, 1927. Serial No. 242,534.

My invention relates to printing and developing apparatus, and particularly to a combined printing and developing apparatus for light sensitive material of the type which is developed by the action of an alkaline developing agent either in liquid form or in gaseous form.

One of the objects of my invention resides in providing a combined type of machine wherein the paper to be printed is passed in a continuous manner through the apparatus and during its feeding movement there-through is first printed and then developed.

Another object of my invention resides in the construction of a continuous type of machine wherein the light sensitive material, such, for instance, as paper, is continuously fed from a roll around the transparent printing wall together with the printing negatives, which printing negative is separately discharged and the printed paper then automatically travels alone through the developing portion out of the apparatus where it is subjected to the action of the developing agent, and thence travels through the drying and airing mechanism to remove the occluded gases and to heat the paper to dry the same, and thence is wound up in a finished roll.

Another object of my invention resides in the construction of the printing portion of my apparatus, and particularly the manner of mounting the printing lamp within the transparent printing wall whereby the continuously traveling sheet of light sensitive material is subjected to the action of the rays through this transparent wall in a plurality of directions and while the paper is traveling in an arcuate path whereby effective printing is accomplished during the relatively fast travel of the paper.

Yet another object of my invention resides in the means for conveying the light sensitive material around the transparent wall during the printing operation, and for separating the printing negatives from the printed paper so that the printed paper may subsequently travel alone through the developing mechanism.

Yet another object of my invention resides in the means for mounting the printing lamps

within the transparent printing cylinder and in arranging the path of travel of the light sensitive material around the printing cylinder.

Still another object of my invention resides in the apparatus for passing the printed light sensitive material through and contacting with the rolls which apply the liquid developing agent in a uniform manner to the face of the printed paper whereby to develop the same.

Yet another object of my invention resides in the heating mechanism for drying the paper after it has passed into contact with the liquid developing agent, and particularly the means for utilizing the heat of the printing cylinder for conveying a column of heated air and bringing it into contact with the moist developed light sensitive material whereby to dry the same.

Still another object of my invention resides in the means for providing a suction device disposed at the mouth of the printing cylinder not only for the purpose of producing a cool current of air through said cylinder, but also for the purpose of conducting said air to a point and discharging it against the traveling and moistened light sensitive material which has been developed.

Yet another object of my invention resides in the particular manner of applying the developing liquid to the light sensitive material which passes through the machine.

Still another object of my invention resides in means for providing the light sensitive material with a curl after it has passed through the developing and drying mechanism for the purpose of straightening it for winding onto the finished reel.

Yet another object of my invention resides in the pedal-controlled means for the take-up slack of the printing mechanism and the take-up slack for the strip of light sensitive material.

Yet another object of my invention resides in the provision of guide rolls for the discharge end of the printed and developed sheets or strips, and particularly in the inclusion of a knife edge to facilitate in cutting

off the strip at will as it is discharged from the machine.

Yet another object of my invention resides in the particular details of construction of my combined machine.

Another object of my invention resides in providing a modified form of developing apparatus for use in combination with my printing apparatus for the printing and developing of continuously traveling strip of light sensitive material; and my ancillary object of my invention resides in the provision of this improved type of developing apparatus for use solely as a developing device.

These and other objects will be apparent from a perusal of the following specification when taken in connection with the accompanying drawings wherein—

Fig. 1 is a side view of my machine showing the travel of the strip;

Fig. 2 is a side view thereof with the parts broken away;

Fig. 3 is a view of the opposite side of the machine with certain parts broken away;

Fig. 4 is a view partly in section of a modified form of the developing apparatus.

Fig. 5 is a view partly broken away of the perforated top of the developing tank and,

Fig. 6 is a sectional view taken through Figure 4.

Referring now to the drawings in detail, my machine comprises a frame 2 of upright character, which frame is formed with various upright and cross bars for providing a rigid skeleton framework on which the various mechanisms hereinafter described are rigidly mounted. In addition the upper part of the frame is provided with a housing 4 for inclosing the developing portion of the machine. The front part of the machine is provided with an upstanding bracket 6 on which is rollably mounted the roller 8 of light sensitive material 10 to be printed and developed. This strip of material passes over the top of the ledge formed by the upstanding bracket 6 and thence passes into the printing portion of the apparatus which is now to be developed.

This printing apparatus comprises a metal strip 12 forming a bracket and from which is suspended a semi-elliptical transparent printing surface 14 whereby to clamp it securely in position. The clamping strip 18 is also substantially semi-elliptical in shape and forms a complement of the transparent surface 14, being the uppermost surface. The upper portion of this strip 18 is secured by means of a metal strip 20 to the front portion of the frame 2. The frontmost portion 24 of the clamping strip 18 is preferably hinged as at 26 and is provided at its extreme end with a curl 28 and terminates in the handle 30 so that this curl forms a trough for receiving the printing negatives as they are discharged through the printing wall. In addition by

hingedly mounting this portion 24 access may be had to the interior of the printing cylinder or ellipse.

The printing lamp, preferably of the electric carbon arc type is mounted within the printing cylinder. This mechanism comprises a depending track 32 mounted and carried by each end of the frame and extending the full length of the printing cylinder. This track supports a plurality of rollers 34 having depending rods 36 carrying the frame 38 provided with the upper and lower carbons 40 and 42. In lieu of the printing lamp shown any printing lamp may be used. By means of this construction the lamp may be inserted and removed in a very quick manner into and from the printing cylinder.

One end of this printing cylinder I prefer to leave open, while the opposite end is closed with a housing 44 in which is mounted a bracket 46 mounting an electric motor 48 and the drive shaft 50 on which is mounted a suction fan 52, which fan is mounted directly within the printing cylinder so that when this fan is in motion air will be sucked from the left-hand side of the cylinder as shown in Fig. 5, out the cylinder and into the housing 44 which communicates with a bus pipe 54 communicating with a hood 57 which in turn communicates with the lower portion of the housing 44 and directly opposite the path of travel of the developed paper as herein-after described.

Means is provided for feeding the light sensitive material 10 from the roll 8 around this printing cylinder, and while various types of such feeding machines may be used I prefer to use the blanket or belt feed as shown in the accompanying drawings, wherein a fabric rubberized blanket or belt preferably of the width of the printing cylinder passes around a guide and tension roller 56 pivotally mounting on the swing arm 58 and in turn pivoted as at 60 on the front frame of the machine. In addition I provide a deflector 59 located immediately above the guide roll 56 for deflecting the feed of the strip 10 between the roll 56 and the feed blanket for the printing cylinder. This slack or take-up position roll is held by a take-up spring 62 and the take-up roll is provided with a link connection 64 with a pedal 66', so that when the pedal is depressed the guide roll 56 will be removed from the slack take-up position with respect to the traveling strip of paper. After the paper is passed over this guide roll 56 it passes around the transparent semi-elliptical wall 15 and thence around the opposing semi-elliptical wall 18, and thence passes over an upper guide roll 68 and down along the back of the apparatus to another guide roll 70, from whence the belt passes forwardly again over an additional slack take-up roller 72 and thence back up to guide roll 56 completing a

continuous circuit. The roll 66 is driven by means of a tooth gear 74 on the shaft 76 of the roll 66, and this gear 74 meshes with a worm 78 on a shaft 80 mounted in the frame, which shaft has a lower bevel gear 82 meshing with a bevel gear 84 on a horizontal shaft 86. In addition the lower end of the shaft 80 is provided with a gear 88 meshing with another gear 90 on a second vertical shaft 100 driven by means of a friction pulley 102 engaging another transversely disposed friction disc 104 driven by the motor 106.

By means of the foregoing construction it will be seen that as the strip of light sensitive material passes from the roller 8 it will be inserted between the bite of the roll 56 and the traveling blanket 11 so that the feed of the blanket will carry the continuous strip and the negatives superimposed thereon so that the negatives and light sensitive material are continuously fed around the semi-elliptical transparent printing surface and thence upwardly across the corresponding printing surface 18 up to the top of the machine, where the prints will be discharged from the printing cylinder into the negative receiving trough 28 formed by the curl in the portion 24. At the same time the light sensitive strip of paper may then be fed around the upper feed roll 66 as, for instance, initially by hand, and thence will pass through the developing portion of the mechanism as hereinafter described.

During the discharge of the light sensitive material through the transparent printing wall 14 it will be noticed that the paper is subjected to the rays of the printing lamp from both directions; that is while the paper is traveling downwardly around the front portion of the printing ellipse and upwardly along the rear portion of the printing ellipse, and this arcuate or elliptical or even cylindrical contour of the wall provides a more effective printing operation and in a shorter space of time and permits of the quick feeding of the paper through the machine. In other words, the printing is accomplished by subjecting the paper to travel in two directions on each side of the rays of the printing light.

It will also be noticed that during this printing operation the heat created by the arcuate lamps will be carried off by means of the suction fan 52. As hereinafter described, this heated air sucked away by the fan 52 will be hereinafter utilized to effect the drying of the paper as it comes from the developing portion of the apparatus. It will also be seen that the arc lamps are very conveniently and effectively arranged in spaced arrangement from the brackets disposed at the opposed open ends of the printing cylinder and on a track so that the arc mechanism may be rolled outwardly through the end of this cylinder. It must be apparent

that any type of transparent wall may be utilized, but I prefer the semi-elliptical arrangement as shown since it is adaptable for quicker printing and since it permits the rays of light to be placed between the front and rear surfaces over which paper travels; and since it provides a continuous or curved surface over which the feed blanket may easily be fed. In addition this type of cylindrical or tubular printing surface provides a housing for the printing lamp and permits the utilization of a suction fan for creating a current of air therethrough to carry off the heated currents of air, which heat currents of air may be utilized in drying the paper.

The developing portion of my apparatus is conveniently mounted adjacent the discharge end of the printing cylinder and as hereinbefore pointed out is enclosed by the housing 44 so that the fumes from the liquid developing agents will rise upwardly through this casing and will assist in developing the printed paper as it passes through the housing 44.

The preferred form of developing apparatus for connection in use with this machine, although other forms may be used, comprises a plurality of opposed guide and liquid applying rolls over which the strip 10 of printed paper passes and is fed. The details of construction of my developing mechanism comprises preferably one or more pairs of opposed rolls 108 and 110 and 112 and 114 which are mounted in vertical superimposed relation, being carried in brackets on the rear frame 2. The continuous strip of light sensitive paper 10 is adapted to pass from the feed roll 66 along the top of the frame within the housing 44 and thence over a guide roll 116, thence over another guide roll 118, thence upwardly over the two uppermost developing liquid applying rolls 108 and 112 and thence downwardly across the face of the hood 57, through which the heated air is passed. From this point the light sensitive strip passes over another guide roll 120 which imparts a reverse curve to the strip to substantially straighten it, thence the strip passes over a similar guide roll 122 from which it passes forwardly to the front of the machine, thence over guide roller 124 and upwardly between two feed rolls 126 and 128, the latter being driven by means of a gear 130 meshing with a roller 132 on the shaft 86, which shaft is driven by a motor as hereinbefore described. After passing between the feed rolls 126 and 128 the strip 10 winds up into a final reel 134, and this winding mechanism is preferably in the form of two V-shaped belts 136 and 138, the lower common pulley 140 of which belts is driven from a chain belt 142 from the shaft 128 as hereinbefore described. By means of this arrangement these belts constantly serve to rotate the gradual winding roll 134 in a counter clockwise direction, the V-shaped ar-

range ment permitting the roll to gradually rise between the belts so as to take care of the increasing diameter. The upper roll 126 of the pair which constitute the discharge feed rolls through which strip 10 is discharged is provided with a cutter 144 consisting of a knife edge. This feed roll is preferably pivoted to the front frame of the machine as at 146 and the pressure of this roll 146 toward the roll 128 may be controlled by an adjusting screw 148.

The development agent, preferably liquid ammonia, is contained within a tank 150 mounted on a bracket 152 on the rear portion of the frame 2 and this tank has pipe connection 154 which has an upstanding gauge 156 and a flexible connection 158, the open end of which may be clamped or held in position against the bracket 2. This flexible tube 158 constitutes a filling means for the tank 150.

Within this tank and extending longitudinally of the main rolls 110 and 114 and directly beneath said rolls, I provide a combined felt and wick member the details of construction of which are more particularly disclosed in my co-pending application, Serial Number 241,779, filed December 20, 1927, for Developing apparatus, and in general mounted within the container 150 which holds the liquid ammonia and the two felt pieces enclosing the wick which are held in place by means of a sheet metal U-shaped member mounted directly beneath the center of each axial roll. The upper end of the two felt pieces wipingly contact the under surface of the periphery of each of the rolls 110 and 114 and on each side of the central upstanding wick member which wipingly contacts the periphery of the roll, the object being by this arrangement to permit the felt to clean the rolls as they rotate, while the wick by means of this capillary attraction draws the liquid ammonia up from the bottom of the container and applies this ammonia in a light uniform film to the rotating surface of the roll, which film is then applied in a similar manner to the upper roll and thence to the sensitive side of the strip of paper as it passes over these upper rolls. It must be obvious that the strip of paper may pass between the opposed rolls if desired, but I prefer my present arrangement since it provides a better distribution of the developing liquid and a cleaner surface. In connection with this development it will be noted that by reason of the enclosed housing 4 the ammonia gases arising from the tank will assist in developing the printed strip since the gases are contained wholly within this enclosed hood.

By reference to Fig. 1 it will be seen that the partition 4' isolates the developing chamber from the remainder of the apparatus and incloses it so that the gases arising from tank 150 cannot escape. In order to permit the

continuously traveling strip 10 to pass into and out of this developing chamber, I provide the partition 4' with an upper slot and provide the edges of the slot with felt or rubber flexible strips 117 which have the function of preventing the escape of the gases through this slot. In like manner, where the strip 10 passes out of this developing chamber the slotted aperture is also provided with the same strip 190 and in addition I provide the airing chamber with an air exhaust 121 which extends along the width of the hood at this point so as to permit of the escape of the hot air forced by the fan 52.

It will also be noted that as the developed strip passes from the developing rolls down toward the hood 57 and yet moist film due to its contact with the liquid ammonia will be dried by the blast of heated air from the printing cylinder so that the film as thus dried will pass over the guide roll 120 which is arranged to impart a reverse current to that imparted by the other rolls 108 and 12, and in this manner the dried film will be substantially straightened before passing between the discharged feed rolls 156 and 158 and before being wound on the final reel 134.

In order to provide a change of speed in my feeding device the friction disc 102 is adapted to be shifted across the face of the corresponding drive disc 104 as is well known and this is accomplished by means of the shipper rod 160 controlled from the front of the machine.

Referring now to Figures 4, 5 and 6 of the drawings I show a modification of the developing apparatus portion of my invention wherein instead of using the rollers 108 to 114 inclusive and the wicks 150, in the manner shown in Fig. 1, I provide the frame 2 of the machine with a housing 4 adapted to inclose this modified form of developing apparatus. It comprises a bracket 164 on which is mounted a tank 166 extending the entire width of the machine and containing a quantity of liquid ammonia 168. In the present invention the enclosing wall of this tank 166 is formed as a smooth guide surface, preferably curved at the top as at 170 to permit the feed of the light sensitive paper 10 thereover and the top of this tank is provided with longitudinal slots 172 for practically the entire width of the tank so as to permit the developing gases arising from the liquid ammonia 168 to penetrate the surface of the light sensitive material 10 as it is fed over this foraminated top of the tank whereby to develop the printed paper. This tank is filled by means of a filling connection 174 similar to that shown in Fig. 1 of the drawings and is also provided with a liquid level gauge 176. In this construction just as in that shown in Fig. 1 the blanket 178 passes around the printing cylinder 18, thence over the feed and guide roller 166, and thence passes over the

guide roller 68 and passes downwardly in the manner shown in Fig. 1 of the drawings. The continuous strip of printed paper 10 passes around with this blanket 178 and
 5 thence passes away over the guide roller 180 on the frame 2 from which point it comes into contact with the smooth arcuate or curved top 170 of the tank 166 over which it passes and thence the strip passes along the side of the
 10 tanks as at 172, thence downwardly and around roller 184 and then the roller 186 from which point it passes out of the cabinet 4 through the strips 188 of rubber or felt which not only serve to wipe the occluded gases from the strip 10, but also serve to prevent the escape
 15 of the gases from the housing 4. From this point the strip 10 passes along as in the manner shown in Fig. 1 of the drawings. It will be apparent that by reason of this type of apparatus a very simple developing device is
 20 provided and wherein the tank itself is used as a means over which the strip to be developed is passed and wherein the tank is apertured so as to permit the escape of the developing gases in contact with the paper to be developed. In this type of apparatus I
 25 prefer to provide the housing 4 with a felt strip 190 for wipingly engaging the roll 180 so as to prevent the escape of the gases from that portion of the apparatus where the paper
 30 enters the cabinet 4.

By reference to Fig. 4 I provide still another modification of my present construction wherein I propose to provide the tank
 35 with an additional blanket feed in lieu of the guide roll construction 184 and 186 therein shown. In other words, I propose to form the outer service of the tank as a backing member over which a continuous blanket
 40 travels just as it travels about a portion of a periphery of the printing cylinder. For instance referring to Fig. 4 I propose to arrange this second blanket within the cabinet 4 and by means of suitable guide rolls, one or more
 45 of which are power driven, I arranged this belt so that at its uppermost point it will pass over a guide roll which is located in a position corresponding to the guide roll 180 of Fig. 4. The blanket will then loop backwardly and
 50 pass in doubled, spaced-apart formation within the housing 4 and around other guide rolls therein and thence about guide rolls located at the bottom of the tank in a position similar to those numbered 184 and 186
 55 so that the blanket will continuously travel passing first into contact with the tank at the top, thence over the top of the tank, thence downwardly around the lower-most guide rolls from which point the blanket departs
 60 from contact with the tank and returns over the other guide rolls back to the uppermost guide roll corresponding with 180 in Fig. 4. In addition to this improved construction I provide a deflector located immediately below
 65 the roll 180 so as to direct the paper between

the top of the tank and this belt. Thus I have provided a construction wherein the belt or blanket will drag the continuous strip of even sheets of this light sensitive material across
 70 the perforated surface of the tank whereby the strip or the sheets are developed by the action of the gases coming through the perforation in the tank.

It will thus be apparent that by reason of my improved apparatus I have provided
 75 a very effective and simple type of device for continuously developing the light sensitive material as it passes through the developing portion of the machine and this apparatus not only includes a simple type
 80 of means for applying a thin uniform liquid, such as ammonia to the light sensitive side of the strip of traveling paper, but it also provides effective means for utilizing the developing gases arising from the container for the developing liquid and for assisting the developing action. This is accomplished
 85 by utilizing the hoods 4 surrounding the upper portion of the machine. It will also be appreciated that by reason of the heating connection with the printing cylinder I am enabled effectively to dry the developed strip before discharging from the machine, and by the utilization of the various
 90 guiding and driving pulleys I am enabled to feed the strip through the machine, straighten it and finally discharge it in a roll at the front of the machine.

The arrangement of the knife edge as a portion of the upper discharge feed roll is
 100 most convenient since it permits the cutting off of a desired length of paper by a mere lifting movement of the strip as it comes from the machine and without any extra cutting mechanism. In addition by
 105 means of the pivotal mounting of this upper roll its attachment toward the lower power-driven feed roll is made effective and simple. Furthermore by reason of my compact arrangement of motor-driven shafts
 110 and gear connections between the driving pulley for the blanket for the printing feed and the same driving pulley over which the strip of light sensitive material is fed, I am enabled to utilize a single pulley for driving
 115 both of these traveling members, the one the blanket, in the other the strip of light sensitive material. In addition by the utilization of the belt drive over the discharge rolls at the front of the machine, I am enabled to discharge the developed strip in a
 120 continuous manner without permitting any slack to take place in the traveling strip.

It will be appreciated that in describing the present type of device for feeding continuous strips of light sensitive material
 125 therethrough that it is equally adaptable to the printing and developing of sheets of light sensitive material.

Having thus described my invention, 130

what I claim as new and desire to secure by Letters Patent is:—

In a device of the class described, a frame, a printer comprising a transparent printing member having a surface and a lamp, a contact developer carried in the frame behind the printer, means forming a housing around the contact developer in the upper rear portions of the frame, means to separate the upper from the lower portions whereby to constitute the lower portions as a dryer, a conduit connecting the dryer with the interior of the lamp, a fan to blow the heated air through the dryer, a guide means mounted in the frame, and continuous belts carried on the guide means and across one side of the printing member, a platform on which light sensitive material to be developed may be inserted between said belts and the surface of the guide means and carried thereby across said member into the zone of influence of the lamp, said belts being arranged to carry the light sensitive material from the printer to the contact developer and thence into the dryer immediately beneath the developer to be dried by hot vapor forced into the dryer by the fan and a receiver for the dried material.

In witness whereof, I have hereunto subscribed my name.

ADOLPH LANGSNER.

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