Aug. 26, 1930. E. A. WALLER 1,774,119

PRINTING PRESS

Filed March 26, 1928 8 Sheets-Sheet 1

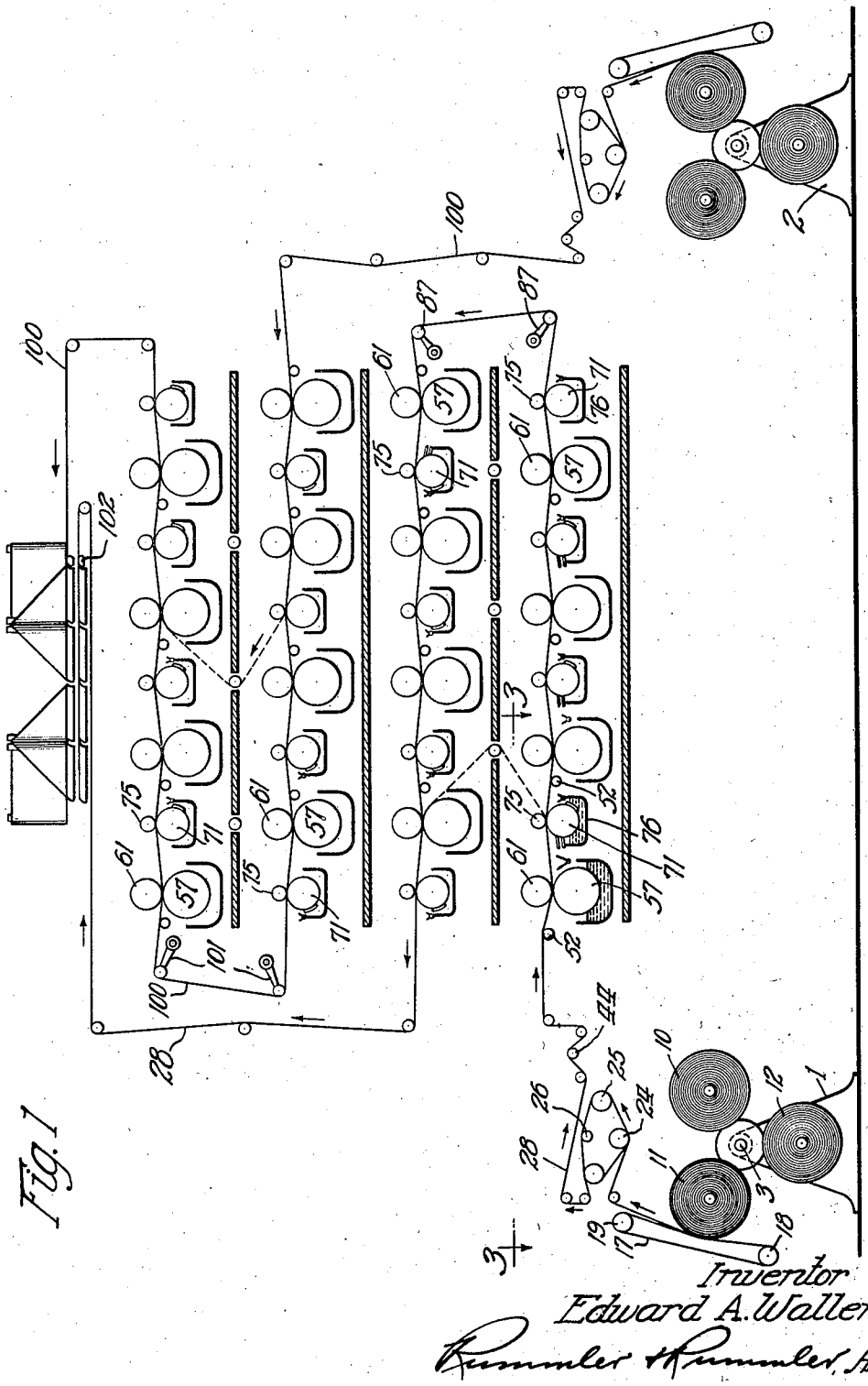


Fig. 1

Inventor
Edward A. Waller
Rummler & Rummler, Attys.

Aug. 26, 1930. E. A. WALLER 1,774,119

PRINTING PRESS

Filed March 26, 1928 8 Sheets-Sheet 2

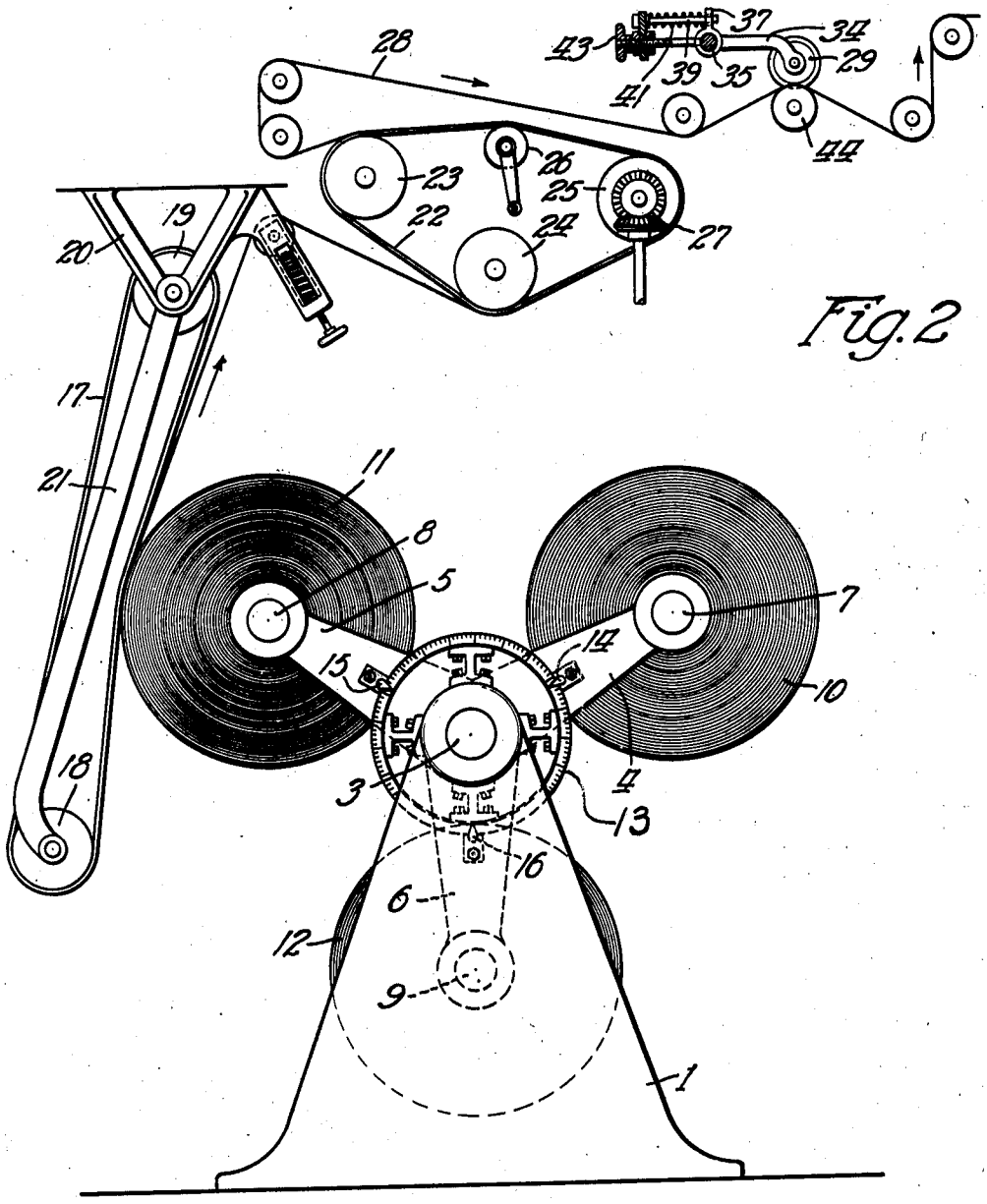


Fig. 2

Inventor
Edward A. Waller
Rummler & Rummler, Attys.

Aug. 26, 1930. E. A. WALLER 1,774,119

PRINTING PRESS

Filed March 26, 1928 8 Sheets-Sheet 3

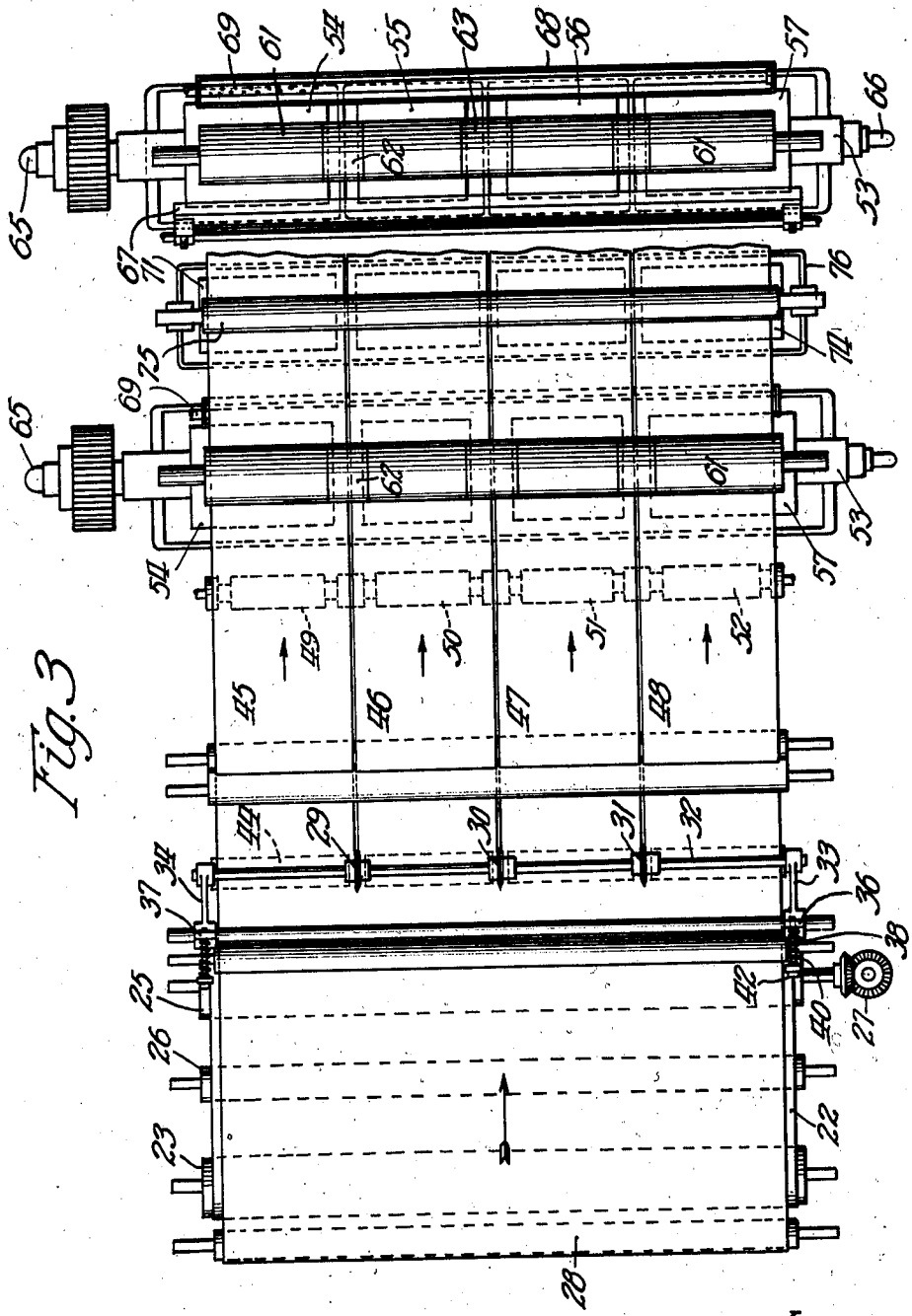


Fig. 3

Inventor
Edward A. Waller
Rummler & Rummler, Attys.

Aug. 26, 1930. E. A. WALLER 1,774,119

PRINTING PRESS

Filed March 26, 1928 8 Sheets-Sheet 4

Fig. 4

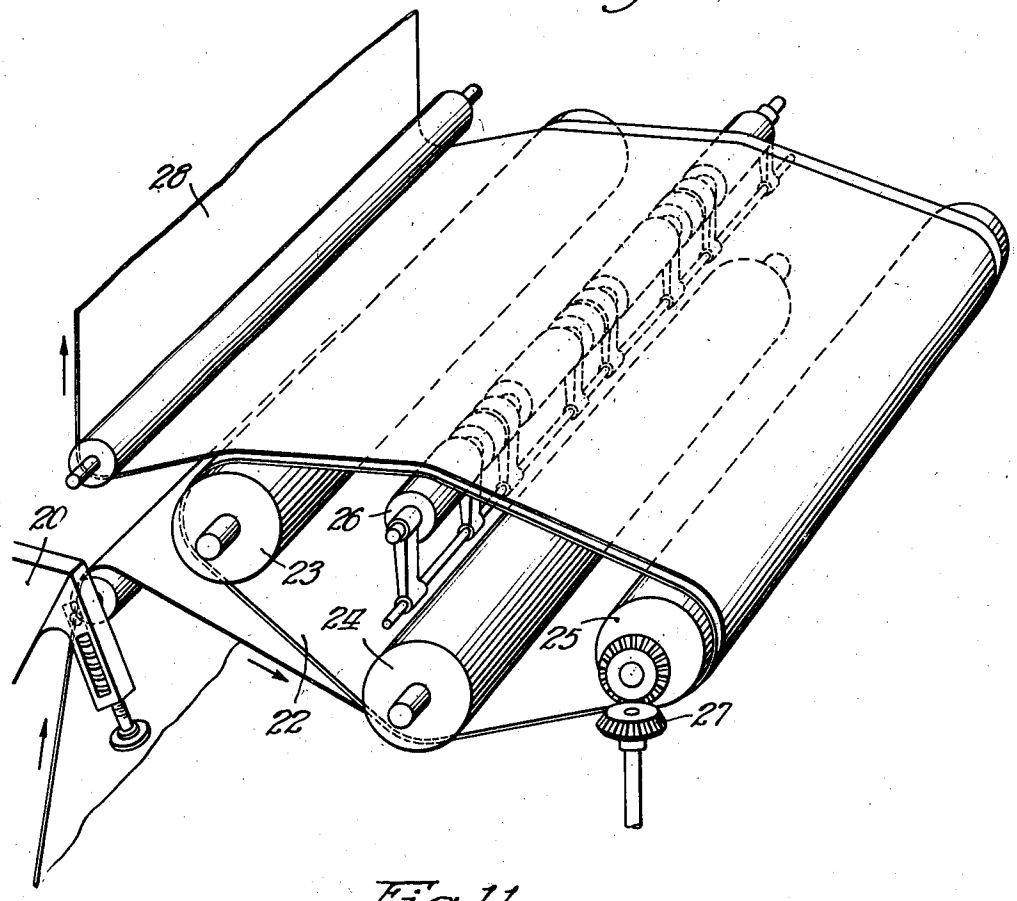
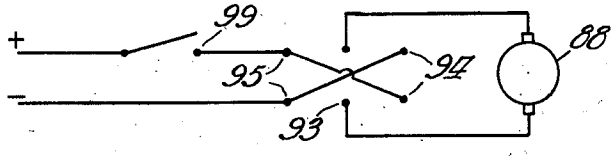


Fig. 11



Inventor
Edward A. Waller
Rummler & Rummler, Attys.

Aug. 26, 1930. E. A. WALLER 1,774,119

PRINTING PRESS

Filed March 26, 1928 8 Sheets-Sheet 5

Fig. 5

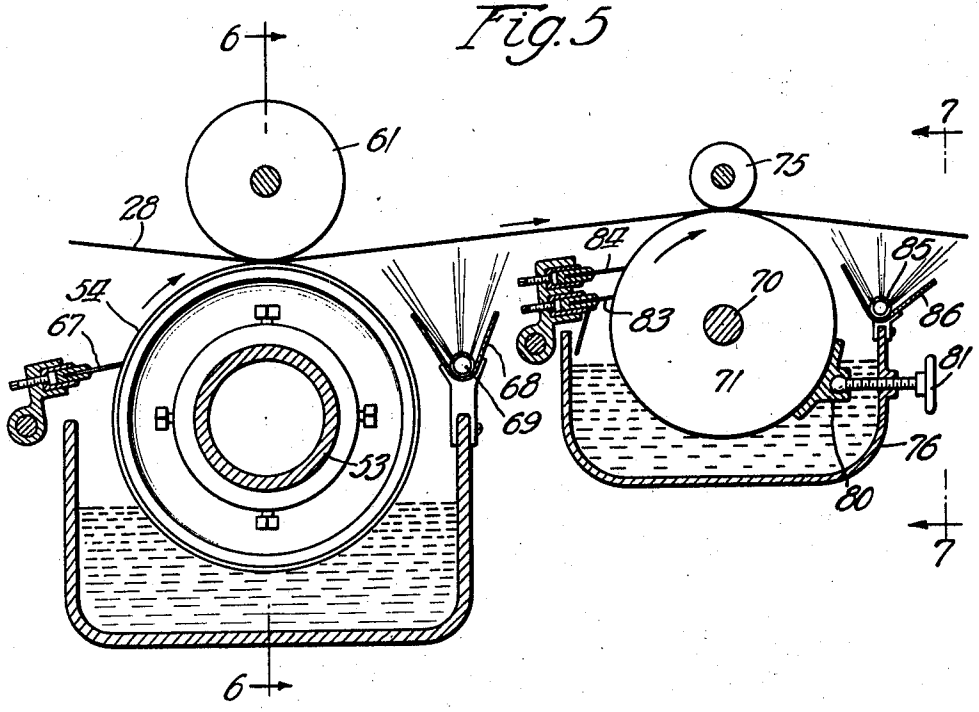
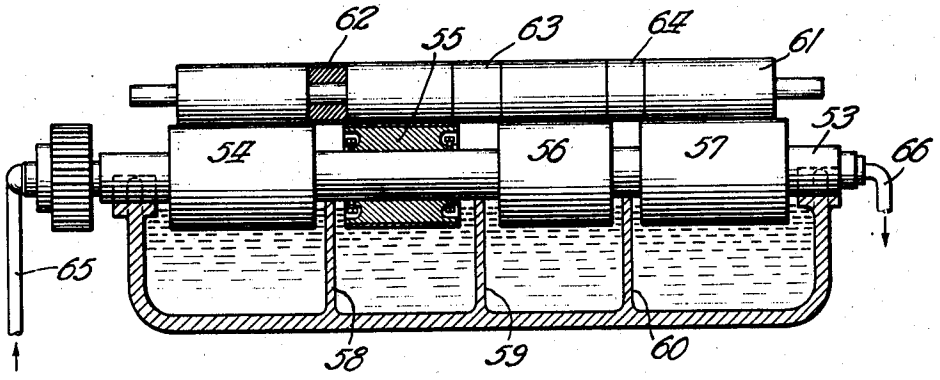


Fig. 6



Inventor
Edward A. Waller
Rummler & Rummler Attys.

Aug. 26, 1930. E. A. WALLER 1,774,119

PRINTING PRESS

Filed March 26, 1928 8 Sheets-Sheet 6

Fig. 7

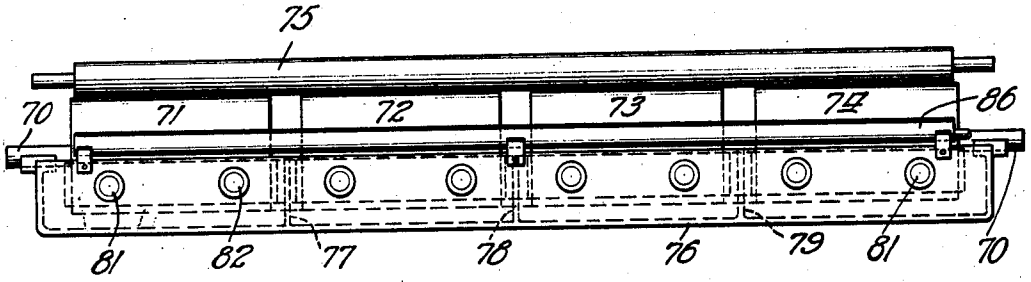


Fig. 8

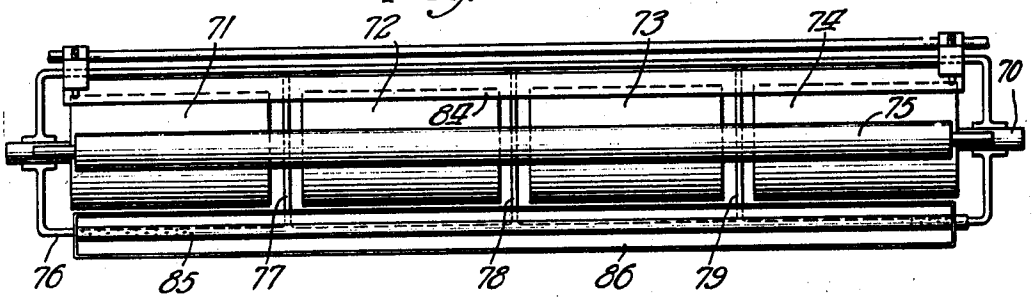
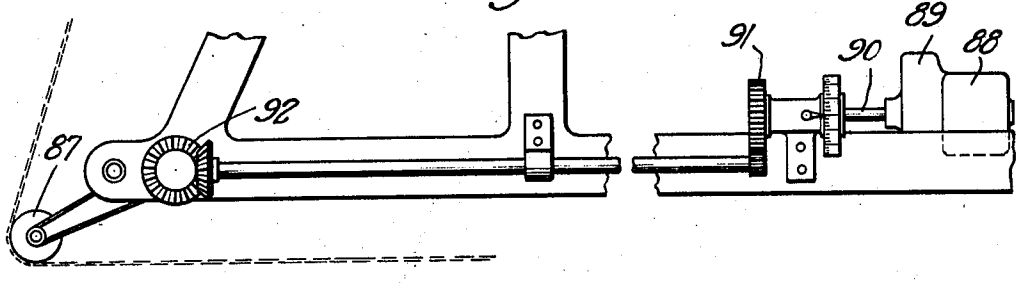


Fig. 9



Inventor
Edward A. Waller
Rummler & Rummler Attys.

Aug. 26, 1930. E. A. WALLER 1,774,119

PRINTING PRESS

Filed March 26, 1928 8 Sheets-Sheet 7

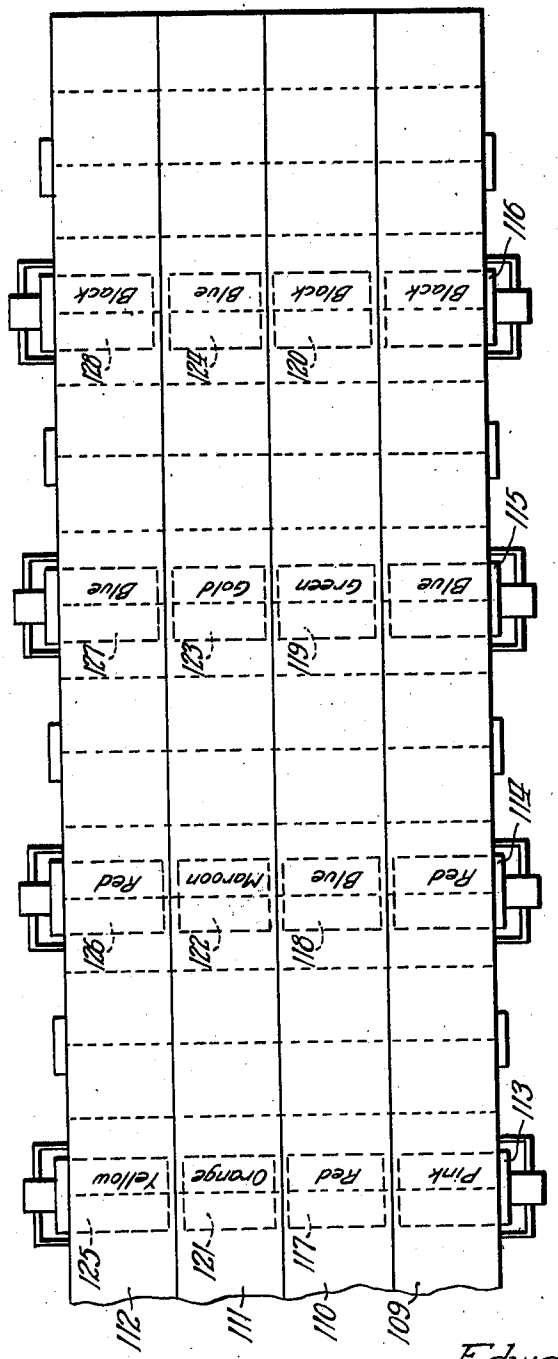


Fig. 11

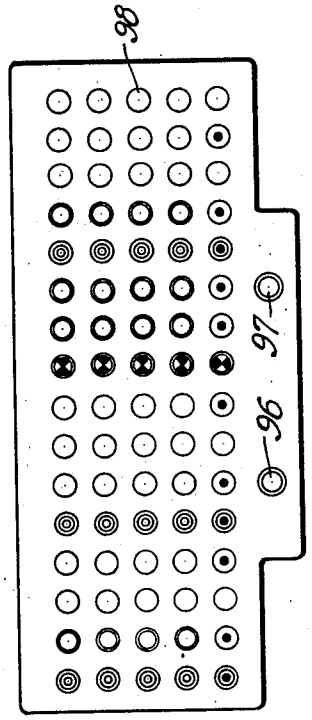


Fig. 10

Inventor
Edward A. Waller
Rummler & Rummler, Attys.

Aug. 26, 1930. E. A. WALLER 1,774,119

PRINTING PRESS

Filed March 26, 1928 8 Sheets-Sheet 8

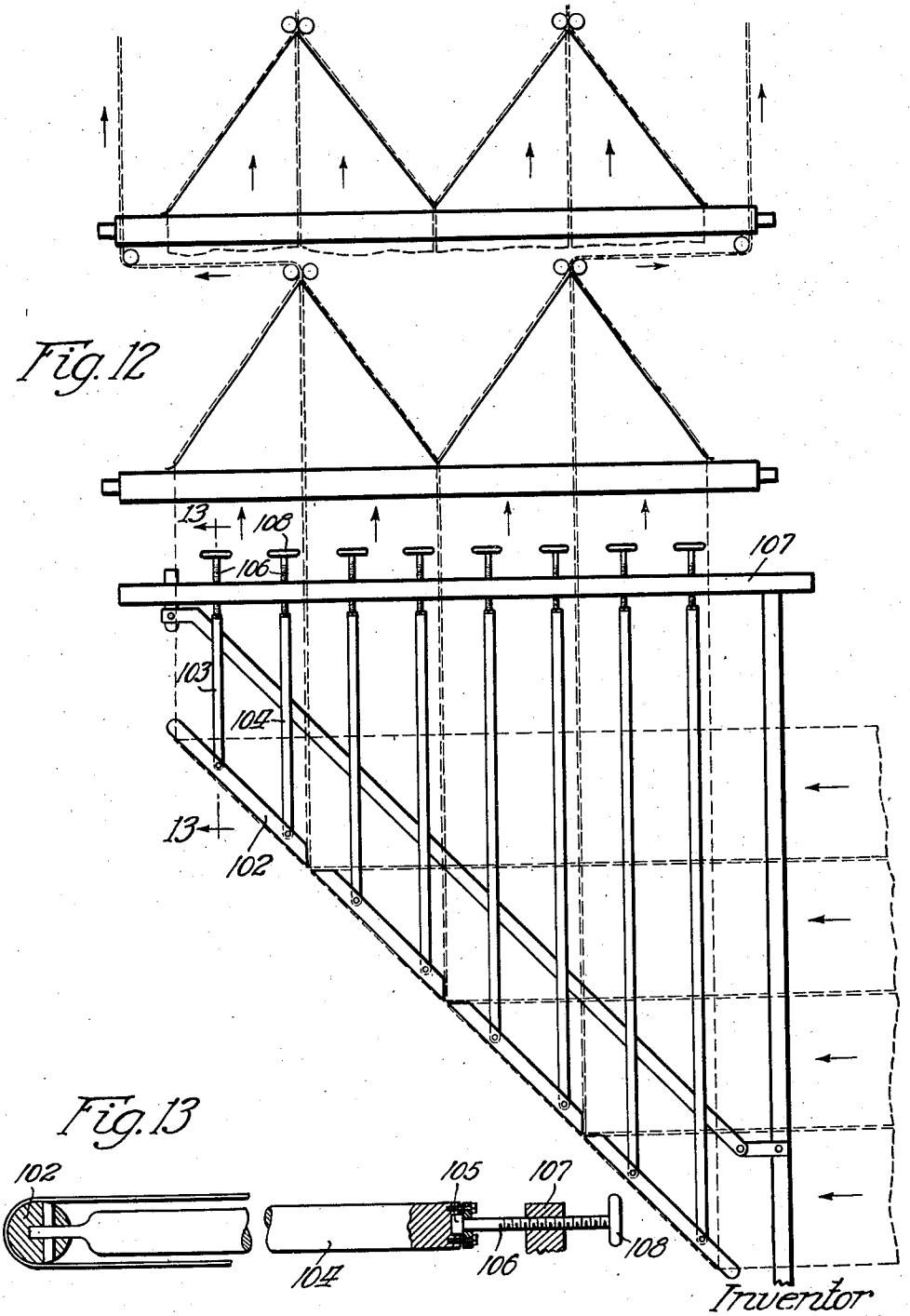


Fig. 12

Fig. 13

Inventor
Edward A. Waller
Rummler & Rummler, Attys.

Patented Aug. 26, 1930 1,774,119

UNITED STATES PATENT OFFICE

EDWARD A. WALLER, OF CHICAGO, ILLINOIS

PRINTING PRESS

Application filed March 26, 1928. Serial No. 264,701.

This invention relates to printing presses of the intaglio type, and particularly those used for multiple color work.

The main objects of this invention are to provide an improved form of intaglio printing press in which the main web of paper supplied from one large roll is slit into a plurality of sub-webs and each individual sub-web is independently controlled to secure exact registration of the different colored impressions as they pass through the press; to provide a press of this character in which an improved drying unit is provided positioned after each impression unit, such drying unit operating on the web of paper in such manner that the web maintains a substantially straightline, horizontal travel through the press; to provide an improved form of drying unit which occupies a relatively small amount of space and thus permits the various series of printing units to be arranged in superimposed horizontal rows; to provide improved means for eliminating the wrinkles and other unevennesses of the web of paper prior to its introduction into the press; to provide improved printing rolls which are divided axially into a plurality of independent rolls so that it is possible to print different colors on each of the different webs passing thereover; to provide improved means whereby independent and individual adjustment of each sub-web of paper at each printing roller may be secured from a central control station; and to provide a generally improved intaglio type of printing press in which exact and accurate registry of the multiple colors may be secured, thus eliminating a large number of "spoils" and "throw-outs", which are had with the present type of color press.

An illustrative embodiment of this invention is shown in the accompanying drawings in which:

Fig. 1 is a diagrammatic view of a complete printing press showing the travel of two main webs of paper through a press arranged four-decks high.

Fig. 2 is an enlarged view of the reel for rolls of news print paper, together with the compensator for eliminating wrinkles and the like from the web.

Fig. 3 is an enlarged plan view taken on the line 3—3 of Fig. 1, showing the manner in which the main web is slit into sub-webs prior to its passage into the press.

Fig. 4 is an enlarged view in perspective of the improved belt type compensator for straightening the web and eliminating the wrinkles prior to its passage to the slitting knives.

Fig. 5 is an enlarged transverse sectional view of a printing unit with its impression roller and a drying unit of the type which is placed following each printing unit.

Fig. 6 is a sectional view taken on the line 6—6 of Fig. 5.

Fig. 7 is a view taken on the line 7—7 of Fig. 5.

Fig. 8 is a top plan view of the drying unit shown in Fig. 7.

Fig. 9 is an enlarged fragmentary view of the improved power-driven electrically-controlled compensator.

Fig. 10 is a view of the panel switchboard from which an operator can individually adjust each of the compensators located at each of the printing units.

Fig. 11 is a diagrammatic view of the electric circuit which connects the push buttons on the panel board with the electric motor which operates each of the compensators.

Fig. 12 is a plan view of the mechanism for turning the sub-webs at right angles to their path of travel immediately prior to their entry into the folding mechanism.

Fig. 13 is an enlarged view taken on the line 13—13 of Fig. 12.

Fig. 14 is a top plan view of one series of printing units with the impression rollers removed, and showing four sub-webs, said sub-webs being divided by transverse dotted lines to show the respective page spaces whereon various color combinations may be applied by a press of this type.

Heretofore in the printing of multiple color work in printing presses of the rotary gravure type, it has been very difficult to secure exact registration of each of the colors as the web passes through the press. As a

consequence, a large number of printed sheets have to be discarded and very often where the printing of advertisements in colors has not been made with a fair degree of accuracy in registration, the customers have refused to pay the advertising bill or demanded a large reduction thereof and much controversy has resulted.

In the presses now in use, registration is particularly difficult to secure on account of the fact that the webs of paper pass through large drying ovens which shrink the paper and the amount of shrinkage continually varies in accordance with the condition and amount of moisture in the paper at the time it passes into the drying ovens. Therefore, it will be seen that continual adjustment is necessary when using the present equipment and with this continual adjustment, it is not uncommon to have fifty per cent of the pictures printed of such a degree of improper registration as to render them unsatisfactory for use.

In my improved type of printing press, the main web of news print is first smoothed out, so as to eliminate all wrinkles and other variations in it, and then split into a plurality of sub-webs prior to the entry of the paper into the printing press. The number of sub-webs is preferably four and each of the printing rolls is divided axially into four spaced sections, one for each sub-web. Each of the roll sections dips into an individual ink fountain so that different colors can be printed on each of the different sub-webs as it passes through each printing unit. Individual and independently operated compensators are provided for each sub-web at each printing unit, so that exact and perfect registration of each color impression may be secured at each printing unit. In this manner, the percentage of imperfect copies of multiple colored prints is practically negligible.

In the multiple color printing presses now in use, following each printing unit, the web of paper has to be passed through a large and bulky drying machine which extends up to a considerable height above the printing units and occupies a relatively large amount of space. The space occupied by these drying units at present in use is so great that it is not practical to arrange the printing units in series of superimposed banks, but they are arranged in one long horizontal series of units which occupy a vast amount of floor space.

The drying of each impression of colored ink must be secured, however, before the web of paper passes to the next color roll and this is secured in my present invention by an improved type of drying unit which occupies less space, both horizontally and vertically, than the printing units, thus permitting a complete printing press to handle two main webs or eight sub-webs of paper, arranged in four superimposed tiers, the entire press occupying a relatively small amount of space, both in floor area and in height.

At the present time, compensators for the web of news print paper are manually operated and adjustment at different points requires the operator to travel from place to place in order to secure adjustment. In my improved press, each compensator for each sub-web at each printing unit is operated by an electric motor and all of the electric motors are controlled from one panel switchboard which may be located where the printed and folded copies are discharged from the press, so that one operator, stationed at this point, by observing the finished and completed sheet, can instantly make individual color registration adjustments at any point in the press and a few moments later observe the result of his adjustment. Such individual and independent control will give practically one hundred per cent perfect results in multiple color printing work.

Another difficulty experienced with the present type of color printing presses is the number of fires which occur during the operation of the presses. The rapidity with which the web of paper passes through the printing rollers, in addition to the heat of the drying units, causes a great amount of static electricity to be generated. A spark caused by the discharging of this static electricity at various points ignites the fumes and vapors from the color ink fountains and much damage and trouble result. In my improved type of press, the shafts which carry each of the printing rolls are hollow and a circulation of cooling fluid is maintained therethrough which tends not only to cool the rolls, but acts as a ground for carrying away the static electricity generated in the web of paper.

This cooling of the rolls eliminates vaporization of the ink in which the rolls dip, and also prevents fuming of the ink. Furthermore, if the printing rollers are not cooled, thin layers of ink congeal in the shallow etchings of the roll and thus imperfect printing results. By means of the cooling fluid, the temperature of the roll can be maintained at any desired degree, such as 65 degrees F.

In the construction shown in the drawings, a pair of reels 1 and 2 for supporting the rolls of news print paper are provided in suitable locations, preferably one at each end of the press. Each reel is adapted to support three rolls of paper as shown particularly in Figure 2 of the drawings.

The reel comprises a pair of spaced standards which support at their upper ends a horizontally-disposed shaft 3 mounted thereon at its ends and which in turn supports a pair of spaced spiders, each of which is provided with three arms 4, 5 and 6, equi-distantly spaced from each other. The outer ends of each of the arms in turn support transverse

shafts 7, 8 and 9 respectively which carry the rolls of news print paper 10, 11 and 12 respectively.

An annular gauge or scale 13 is rigidly mounted on the shaft 3 so as to remain stationary with respect to the end supports for the shaft and the arms 4, 5 and 6 are provided with indicators or pointers 14, 15 and 16 respectively, for aiding in adjusting the position of each new roll of paper as it is turned into position to be fed in the press.

In the drawings, the roll 11 of news print paper is in position for feeding into the printing press and the roll of paper is rotated by an endless belt 17, supported on a pair of rollers 18 and 19 in position to frictionally contact with the surface of the roll 11. The belt roller 19 is journaled on a frame 20 and is driven by mechanism, not shown, so as to unroll the paper at approximately the same speed at which it is fed through the printing press. Roller 18 is journaled on a pair of spaced arms 21 swingably mounted on their upper ends on the frame 20.

When news print paper is manufactured at the mill, the entire width of the web is of substantially a uniform texture and tension but during shipment of the paper, the rolls are often placed on end and the lower ends of the rolls draw damp and when the paper is unrolled to be used in the press, the web is then found to have wrinkles, bulges and the like therein. In order to straighten out the web and remove the wrinkles and bulges, I first pass the web of paper, after being unrolled, to a special compensator which comprises an endless belt 22, which travels about and is supported upon four sets of rolls 23, 24, 25 and 26, arranged so that a different angle is provided for the web of paper to travel after passing around each roll. Power is applied to the roll 25 by means of suitable gear mechanism 27.

The set of rolls 26 is split into a plurality of individually-operable compensating rolls preferably arranged in four sections, as shown particularly in Fig. 4 of the drawings. Details of this particular type of compensating roll is shown and described in my United States Letters Patent No. 1,643,324 dated September 27, 1927.

This improved endless belt wrinkle-and-bulge eliminating compensator is very effective in ironing out and smoothing out the paper prior to its passage to the printing press by reason of the adhesion of the web of printing paper to the endless belt, as there is a tendency for this rapidly traveling belt to draw the web of news print snugly thereagainst and thus straighten out the unevennesses therein.

From this endless belt compensator and treater the main web 28 of paper passes to a slitting mechanism which comprises three disk-cuting knives 29, 30 and 31, carried in equi-distant, spaced relationship on a shaft 32, which is journaled at its opposite ends on arms 33 and 34. The arms 33 and 34 are pivotally mounted on a stationary rod 35 and are provided with integrally-formed, upstanding lugs 36 and 37 respectively which have apertures therethrough for slidably receiving one end of spring supporting rods 38 and 39 respectively. The rods 38 and 39 support coil compression springs 40 and 41 respectively which may be adjustably tensioned by adjusting nuts 42 and 43 for varying the tension on the slitting disks.

The disks 29, 30 and 31 co-operate with a roller 44 which is provided with grooves formed in the peripheral surface thereof, so that the main web 28 is divided into four sub-webs 45, 46, 47 and 48 of equal width. Each of the sub-webs 45, 46, 47 and 48 then pass over indivdual, independently operated compensators, 49, 50, 51 and 52 and from thence to the printing units.

Each of the compensators 49, 50, 51 and 52 is preferably operated by an electric motor which is controlled from a central control switchboard, as will be hereinafter more fully explained.

Each printing unit comprises a shaft 53 which supports a plurality of intaglio printing cylinders, preferably four in number, 54, 55, 56 and 57, arranged in spaced relationship to one another, shown in detail in Fig. 6.

Each of the rollers 54, 55, 56 and 57 is secured to the shaft 53 by set screws and may thus be adjusted both axially and rotatively on the shaft to secure registration of impressions printed thereby. Sufficient space is left between the cylinders so that access may be had to the set screws.

The ink fountain for this improved printing unit is provided with three vertically-disposed, upstanding partitions 58, 59 and 60 which extend upwardly between each of the cylinders, so that each cylinder has its own individual supply of ink.

In this manner four different colors may be had in the same printing unit. A suitable impression roller 61, preferably of rubber, is provided above each of the printing units for co-operating therewith.

The impression roller is preferably provided with brass bands 62, 63 and 64 which are of slightly greater axial width than the space between the printing rollers, so that the marginal edges of each band is positioned to slightly overlap the marginal edges of the adjacent printing rollers. This arrangement prevents the rubber from being cut and distorted by the edges of the rollers.

The shaft 53 is hollow, as shown in Fig. 5, and a cooling medium, such as cold water, is circulated therethrough for the purpose of keeping the printing roller cooled sufficiently, so that there will be no tendency of the ink to dry out or congeal on the surface

thereof and also for keeping the ink in which the cylinder dips, cooled sufficiently to prevent it from vaporizing and fuming. The cooling fluid intake pipe 65 is provided at one end of the shaft 53, and an outlet pipe 66 at the opposite end thereof.

The usual adjustable doctor blade 67 is provided for the printing cylinders for removing the ink from the surface of the cylinder.

The upstanding longitudinal edge of the ink fountain on the side opposite the entry side of the paper has an upwardly facing V-shaped trough 68, mounted thereon within which is housed a hot air blast pipe 69. The pipe 69 is provided with a plurality of apertures in the upper surface thereof for directing a blast of hot air against the under side of the printed sheet immediately after it leaves the printing rollers.

An improved blotting and drying unit is provided for treating the printed web, following each printing unit and comprises a shaft 70 which carries a plurality of axially-spaced cylinders 71, 72, 73 and 74 one cylinder being provided for each sub-web of paper passing through the press.

These blotting cylinders may be of brass or other suitable material and an impression roller 75 is provided for co-operating therewith, so as to press the printed webs tightly thereagainst. Each of the blotting cylinders dips into an individual fountain of washing and cleaning fluid in much the same manner as the printing cylinders. The fountain is preferably an elongated trough 76 subdivided by vertical partition walls 77, 78 and 79, which extend up into the spaces between the blotting cylinders 71, 72, 73 and 74.

Means are provided for frictionally scrubbing the surface of each of the blotting cylinders and comprise a block of soft metal 80 mounted on the inner ends of adjustable screws 81 and 82. At the opposite side of the fountain, double adjustable doctor blades 83 and 84 are provided for cleansing the surface of each of the blotting units before coming in contact with the printed web of paper.

After the printed and blotted web of paper leaves each of the blotting cylinders, it is again subjected to a blast of hot air from a perforated pipe 85, carried in an upwardly facing V-shaped trough 86, which is mounted on the upstanding longitudinal edge of the washing fountain 76.

Each of the printing units is of the same construction and each of the blotting and drying units is also of the same construction and any number of these units may be used in a press, although four units of each have been shown herein, each unit being subdivided to accommodate four sub-webs of printing paper.

By passing the webs through four sets of printing and drying units, a four-color impression, having exact razor-edge registration of each color, is thus secured on one side of the webs.

The webs then pass around suitable compensators 87 as shown in Fig. 1 of the drawings, and reverse their direction of travel so as to pass back through a second series of four units to print the opposite sides thereof. This second series of units is preferably located in super-imposed relationship to the first series and the deck there-between may be cut through at intervals as shown in Fig. 1, so that if a less number of colors is desired, the web can be passed through at any point and the opposite side printed.

Also if the press is to be utilized for ordinary type printing, one side of the web may be printed by the first printing unit of the lower series and after passing through the blotting and drying unit, then passes directly to the last unit of the next series above, so as to print the opposite side thereof. It is thus seen that the press may be utilized for ordinary newspaper printing as well as for multiple color work.

Each of compensators 87, as shown in Figures 1 and 9, is operated by an electric motor 88, through a speed reduction gear 89, shaft 90 and gears 91 and 92, in the same manner as the compensators for each sub-web at each printing unit. The electric motor is connected through wiring, a diagram of which is shown in Fig. 11, through a reversing switch 93, which has one pair of contacts 94 for turning the motor in one direction and another pair 95 for turning it in the opposite direction.

Referring to the panel control board, shown in Fig. 10, the master control button 96 is for connecting the motor through the contacts 94 to rotate in one direction and a master control button 97 for connecting the motor through the contacts 95, so as to rotate in the opposite direction. The remaining push buttons 98 on the panel board are for closing the circuit switch 99 shown in the diagram in Fig. 11, one circuit being provided for each button on the control board and all the circuits being controlled through the master forward or reverse buttons 96 and 97.

Paper from the supporting reel 2 is passed around an endless belt compensator in the same manner as the paper from the supporting reel 1 and thence upwardly to a third series of printing units and blotting and drying units in the same manner as outlined for the paper from the supporting reel 1. After passing through the press and having the colors imprinted on one side thereof, the web 100 passes around compensators 101 and back through a fourth series of printing units and blotting and drying units to print the opposite side thereof.

The two webs 28 and 100 having been divided into four sub-webs prior to their entry

into the press, are then brought together in superimposed spaced relationship and each series of sub-webs pass over a set of angle bars for changing the direction of the webs, prior to their entry into the folding mechanisms.

These angle bars are of improved construction, shown in Figures 12 and 13, and comprise an individually adjustable bar for each sub-web. The individual bars are all substantially the same construction and comprise a bar 102 of substantially circular cross section supported adjacent its ends by rods 103 and 104, one end of each of said rods being pivoted to the bar 102 and the other end thereof being swiveled on a head 105 of a threaded shaft 106, mounted in frame 107. The opposite end of said shaft 106 is provided with a hand wheel 108 for rotating the shaft and securing adjustment of that end of the bar 102 to which the shaft is connected.

Referring now to Fig. 14, four sub-webs of paper 109, 110, 111 and 112 are shown passing over a series of four printing units, each unit being subdivided into four individual printing cylinders.

As is customary in this type of work, each printing cylinder is of sufficient diameter to print a newspaper of four magazine size pages at each revolution of the cylinder. These divisions have been laid off in dotted lines extending clear across on the sub-webs. The best results are secured from this type of printing by printing the lighter colors first, then printing the darker ones in their order of depth.

For instance, web 109 as it passes over printing cylinder 113 is printed in pink, then as it passes over the next printing unit 114 those portions thereof requiring red color are printed. The web then passes to cylinder 115 which prints blue and then to cylinder 116 which prints black.

The inks for whatever particular shades of color are required for the sheet or picture may be placed in the individual fountains for each of these printing units, and are separate from and independent of the shading of the ink used in the next fountain on the same printing unit. In this manner a great variety of delicate shadings may be had for the different pictures being printed, and each series of shading and colors is entirely independent of the other colors being printed by the same printing unit.

As shown in Fig. 14, the sub-web 110, for example, as it passes over its first printing cylinder 117 has red parts printed thereon. As the sub-web passes to the next printing unit, it passes over printing roller 118 and has blue printed thereon. Thence it passes to the third printing unit over printing cylinder 119 which, in this instance, is shown as printing green and from there to the last unit where the cylinder 120 prints black.

As sub-web 111 passes over the first printing unit, cylinder 121 prints an orange color thereon; in the next printing unit, the cylinder 122 prints a maroon; the third printing unit, cylinder 123, prints a gold and in the fourth printing unit, the cylinder 124 prints a blue.

Likewise sub-web 112, passing through the first printing unit, has yellow printed thereon by cylinder 125, red printed thereon in the second unit by cylinder 126 and the third unit, blue by cylinder 127, and black by cylinder 128 in the fourth printing unit. It is thus seen that in the four printing units various combinations may be had and that these four units are capable of printing sixteen different colors or shades of color.

The sub-webs then pass up to the next bank of printing units where the opposite sides of each of the webs is printed in the same manner.

By reason of each cylinder printing two sheets of newspaper size, it is thus possible for the four units of each series on each deck to print sixteen newspaper size pages on both sides and by having the quadruple arrangement, shown in Fig. 1 of the drawings, the two main webs being fed to the same press, it is possible to print thirty-two pages, newspaper size, or sixty-four pages, magazine size, on this one press.

In the operation of this printing press, the rolls of news print are mounted on reels and the web of paper 28 unrolled and passed around the endless belt compensator 22 to take out bulges, eliminate wrinkles and other variations in the stock. The web 28 then passes through the cutting disks 29, 30 and 31, which split the main web into four equal sub-webs. Each individual sub-web is independently adjusted immediately prior to passing to the first printing unit.

After passing through the first printing unit, it is subjected to a blast of hot air which partially dries the ink thereon and then passes to the combination blotting and drying unit where the surplus ink is either pressed into the paper or removed on the blotting roller. The blotting rollers are self cleansing and are in clean condition at all times when in contact with the web.

After the web passes through the blotting roller, it is again subjected to a blast of hot air and the remaining ink thereon thoroughly dried before passing to the next printing unit. The same arrangement is provided at each of the printing units which are herein shown as being four in number for printing four colors on one side of eight pages, newspaper size. The sub-webs then pass up to the next bank of printing and drying units where the opposite side of the web is printed in like manner.

The web 100 from the opposite side of the

press is fed to the two upper banks of printing units in the same manner.

Individual and independent adjustment of each sub-web at each printing unit is had at all times from a central-control station by means of the switch-control board having the master buttons 96 and 97 for forward and reverse thereon and individual switch buttons 98 for each compensator in the press. In this manner one press man, without taking time to go from unit to unit, can individually control the printing taking place at any point in the press, so as to secure exact razor edge registration of colors at all times. It will be understood that different rolls of paper passing through the press vary in texture and adjustments have to be made, and then variations occur even in the same roll of paper.

Although but one specific embodiment of this invention has been herein shown and described, it will be understood that details of the construction shown may be altered or omitted without departing from the spirit of this invention as defined by the following claims.

I claim:

1. The combination in a web press of a series of cylindrical printing units comprising forms and impression means coperating therewith, arranged in substantially horizontal alinement for printing one side of the web; a series of drying units, one of said drying units being positioned after each of said printing units in substantially horizontal alinement therewith so that said web will maintain a substantially horizontal straight line of travel, and a second series of similar printing and drying units arranged in substantially horizontal alinement in spaced relation above said first series for printing the opposite side of the web.

2. The combination in a web printing press of a plurality of cylindrical printing units and impression means cooperating therewith, each of said printing cylinders being divided axially into a plurality of sections, means for dividing the main web into a like number of sub-webs in advance of said printing units, independent compensators for each of said sub-webs at each of said printing units, and means operable from a single control station for individually and independently adjusting each of said compensators.

3. The combination in a web printing press of a plurality of printing units and impression means cooperating therewith, a compensator for each of said printing units for adjusting registration of impression and means operable from a single control station for individually and independently adjusting each of said compensators.

4. The combination in a web printing press of a plurality of printing units and impression means cooperating therewith, a compensator for each of said printing units for adjusting registration of impression, an electric motor for operating each of said compensators and a unitary switch-control board for independently and individually controlling each of said motors.

5. The combination in a web printing press of a cylindrical printing unit, an impression means cooperating therewith, said cylindrical printing unit comprising a plurality of cylinders axially spaced on a supporting shaft, said impression means comprising a cylinder having metallic bands of sufficient axial length and positioned so as to bridge the space between said printing cylinders and slightly overlap the adjacent marginal edges thereof.

6. The combination in a web printing press of a cylindrical printing unit, an impression means cooperating therewith, said cylindrical printing unit comprising a plurality of cylinders axially spaced on a supporting shaft, said impression means comprising a cylinder having metallic bands of sufficient axial length and positioned so as to bridge the space between said printing cylinders and slightly overlap the adjacent marginal edges thereof and a separate and individual ink bath for each of said printing cylinders.

Signed at Chicago this 24th day of March, 1928.

EDWARD A. WALLER.