

No. 640,923.

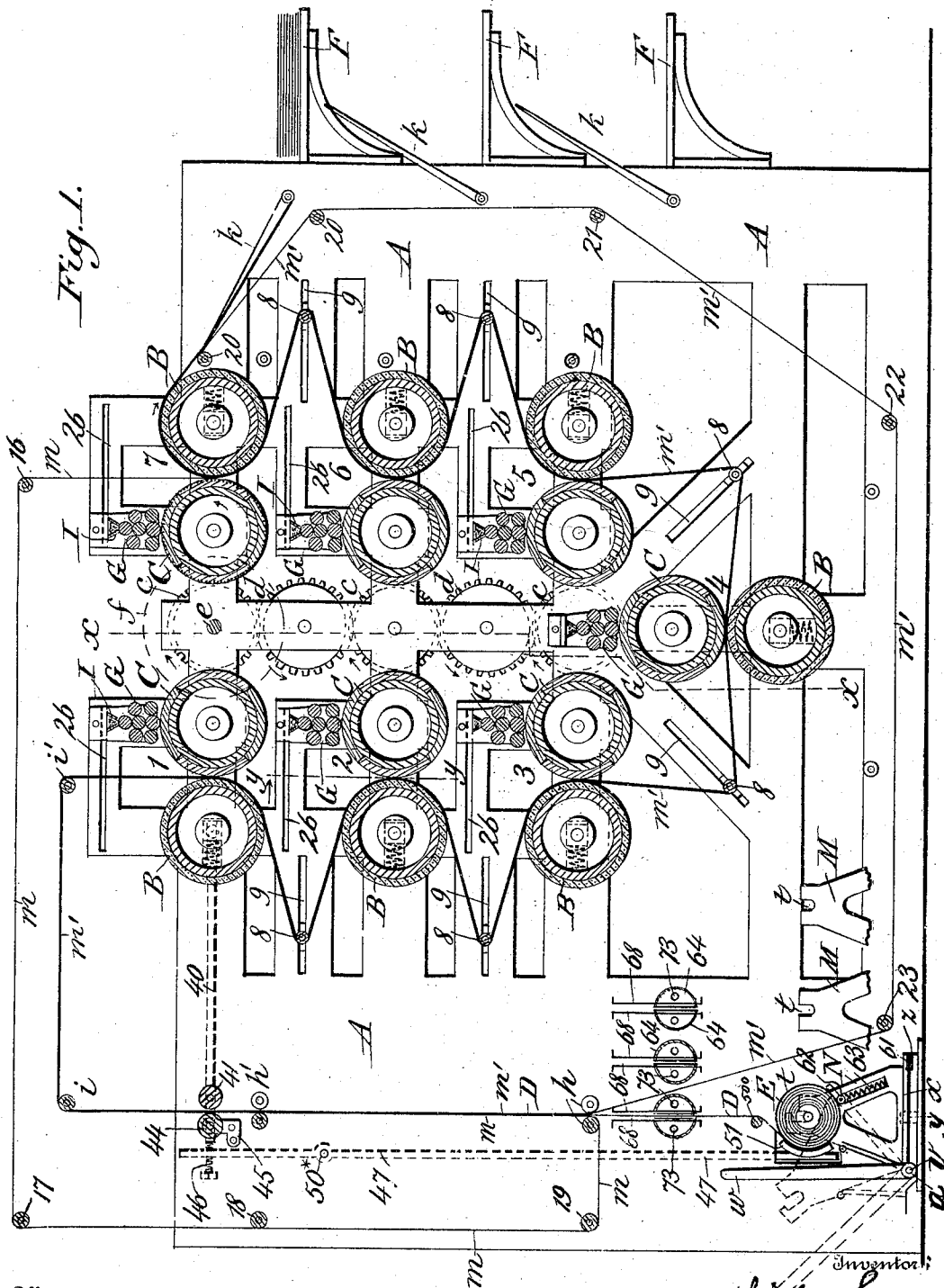
Patented Jan. 9, 1900.

I. LAM.
PRINTING MACHINE.

(Application filed Aug. 21, 1897.)

(No Model.)

7 Sheets—Sheet 1.



Witnesses

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No. 640,923.

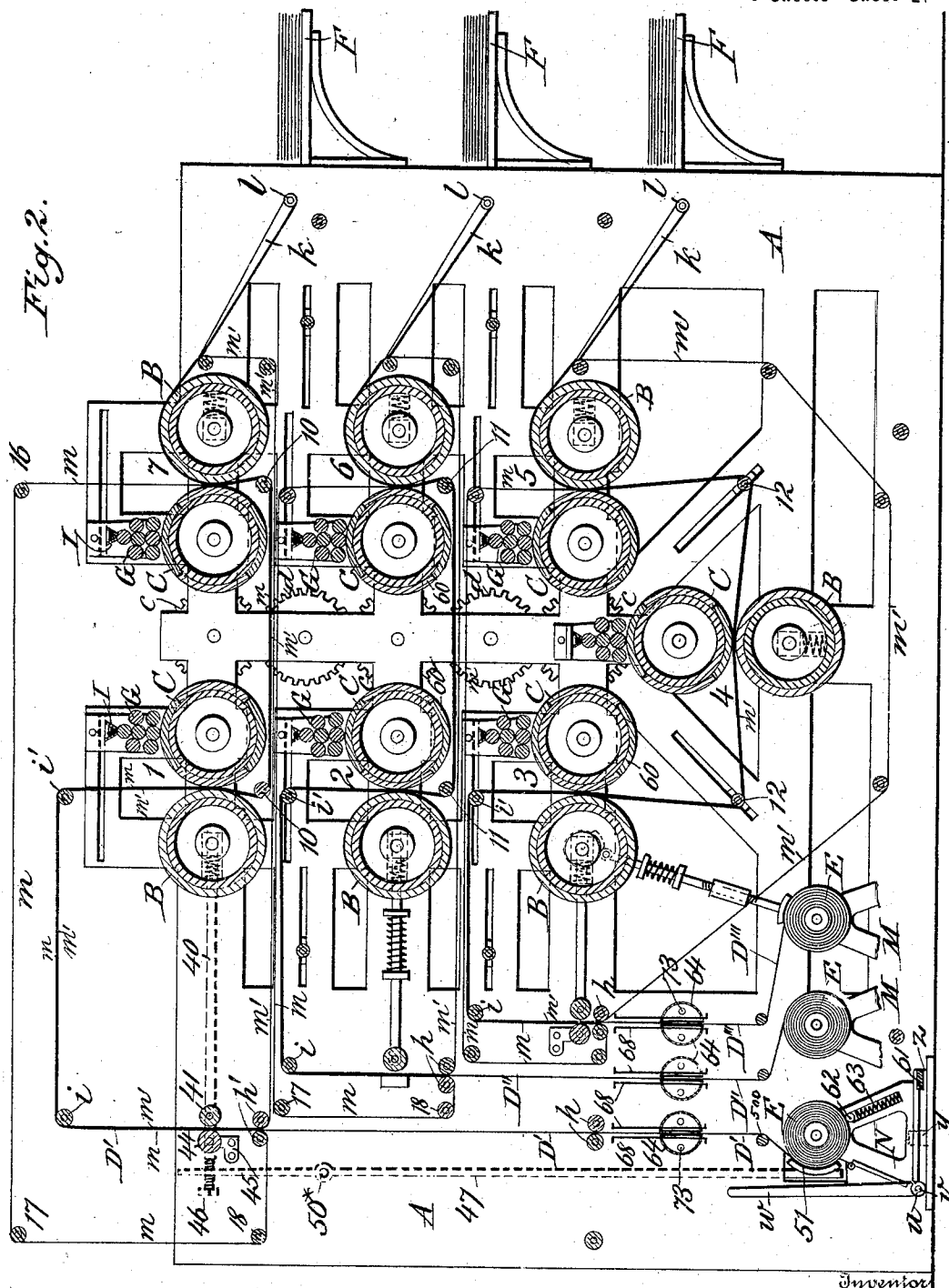
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7 Sheets—Sheet 2.



Witnesses
H. H. Schott
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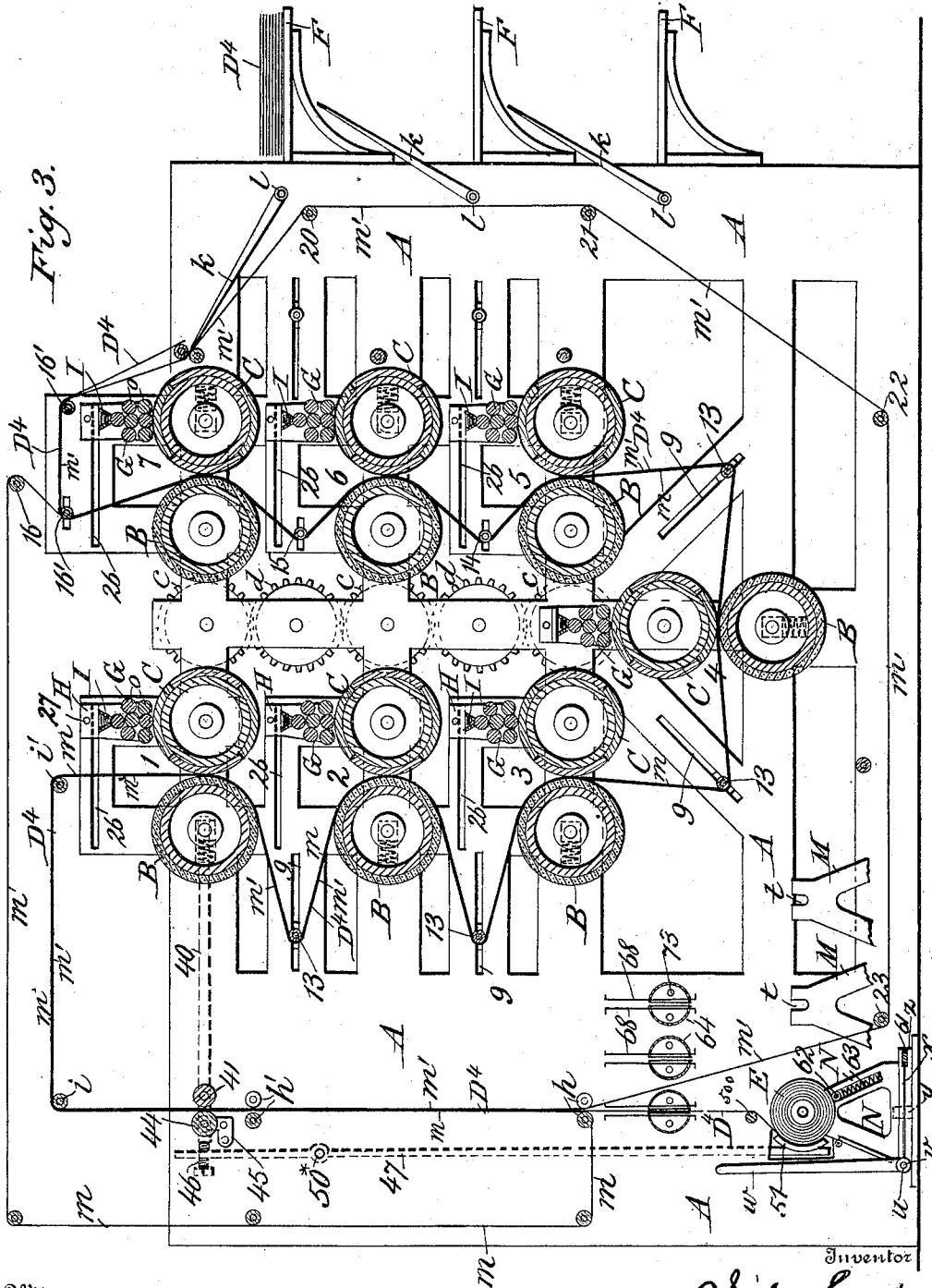
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PRINTING MACHINE.

(Application filed Aug. 21, 1897.)

(No Model.)

7 Sheets—Sheet 3.



Witnesses

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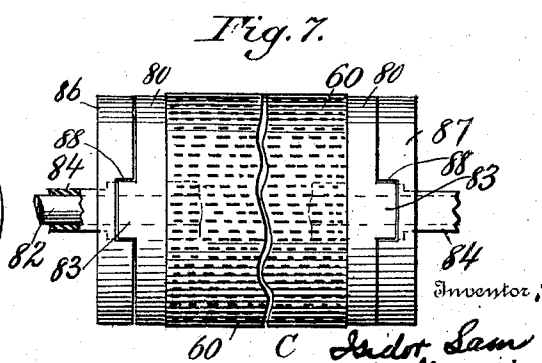
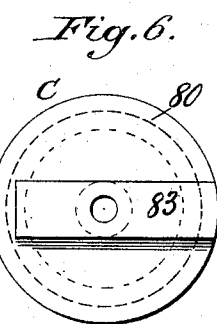
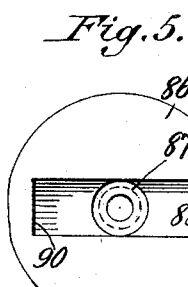
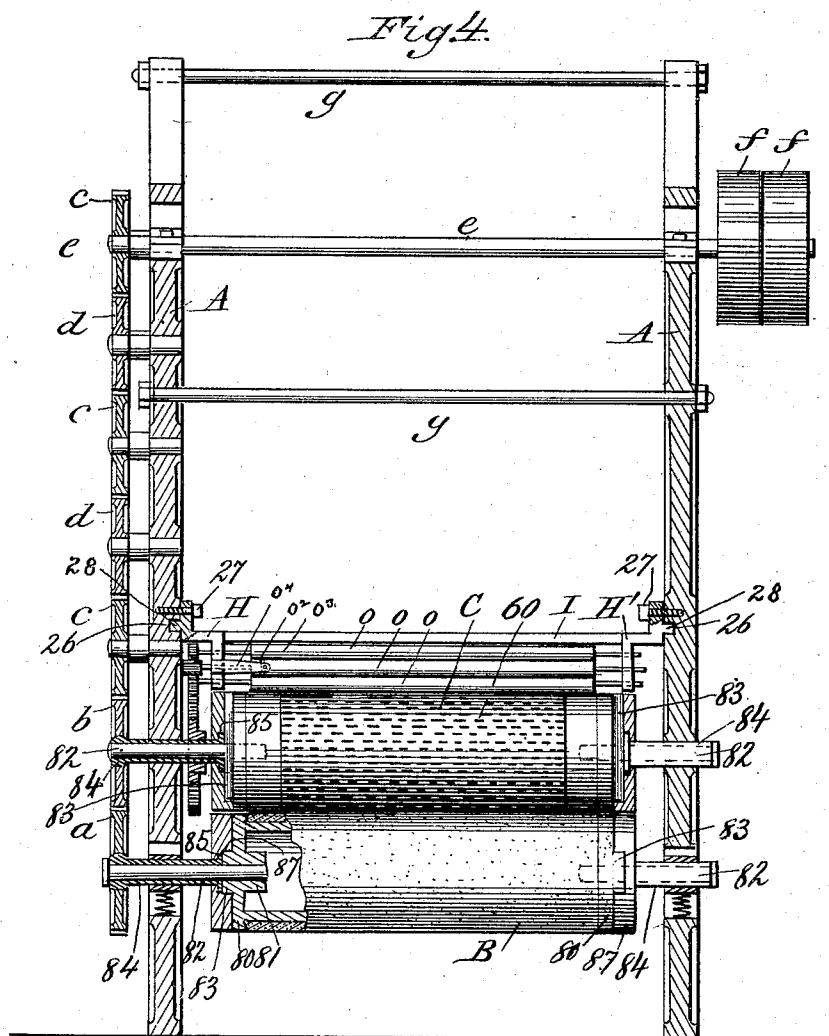
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(Application filed Aug. 21, 1897.)

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7 Sheets—Sheet 4.



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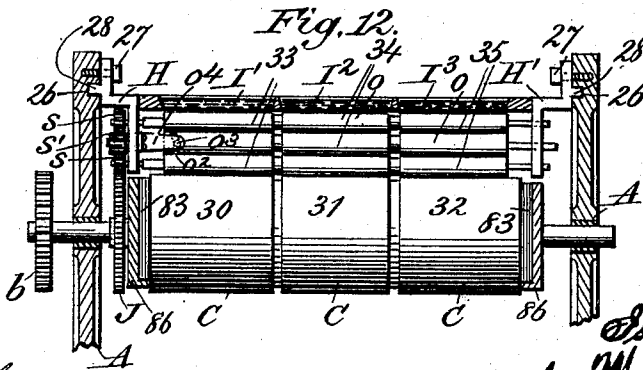
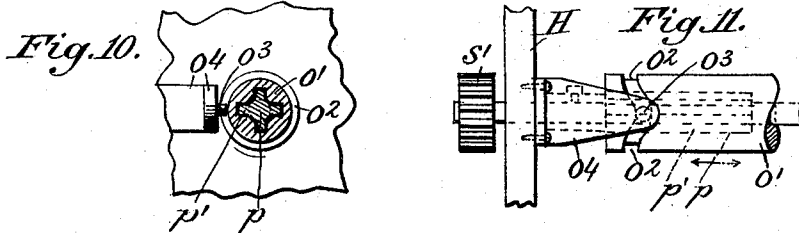
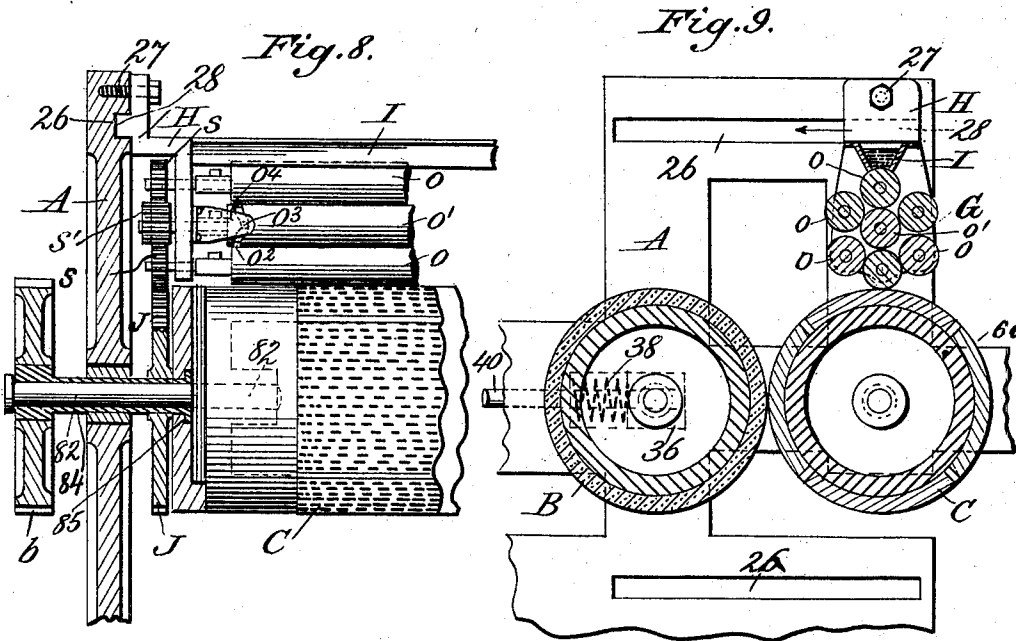
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I. LAM.
PRINTING MACHINE.

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(No Model.)

7 Sheets—Sheet 5.



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PRINTING MACHINE.

(Application filed Aug. 21, 1897.)

(No Model.)

7 Sheets—Sheet 6.

Fig. 13.

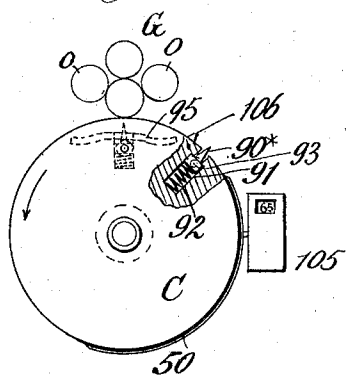


Fig. 14.

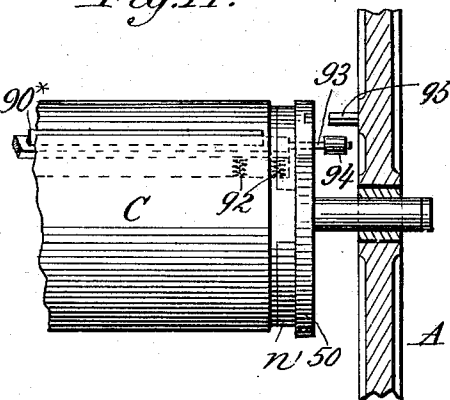


Fig. 15.

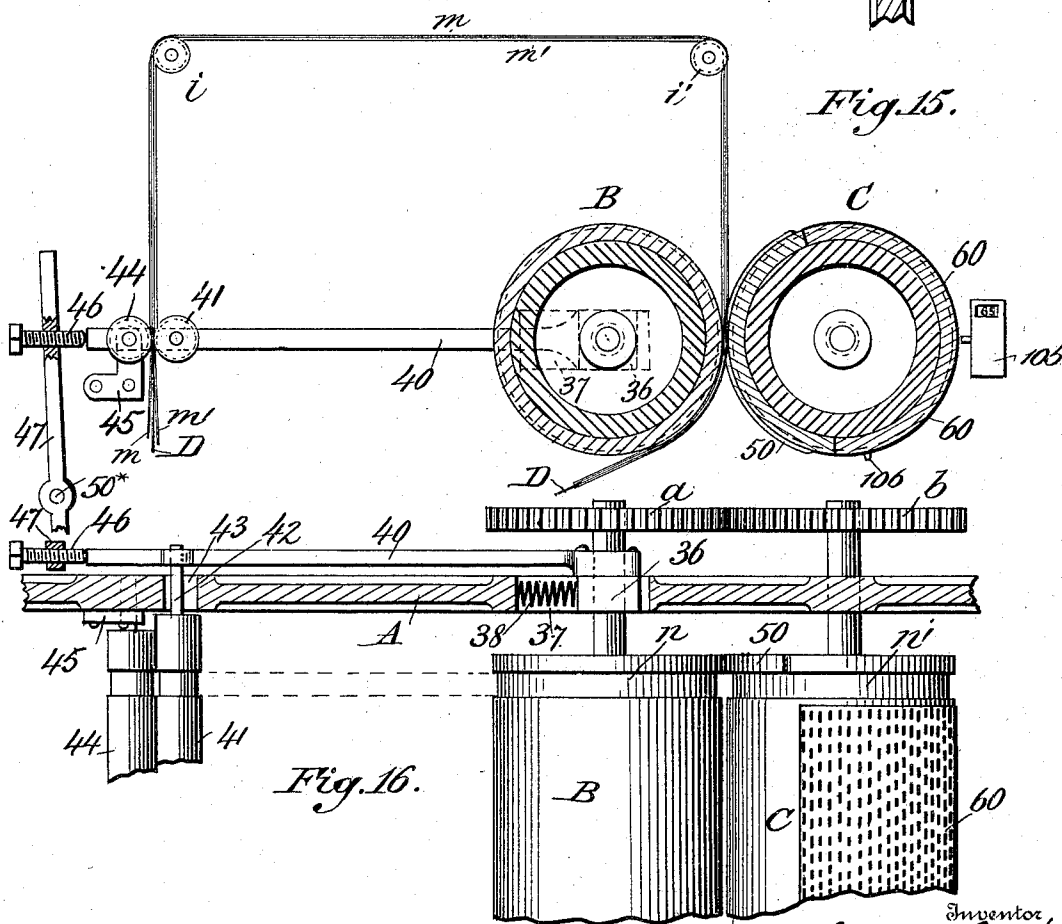
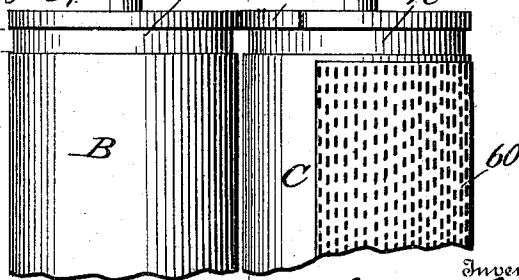


Fig. 16.



Witnesses

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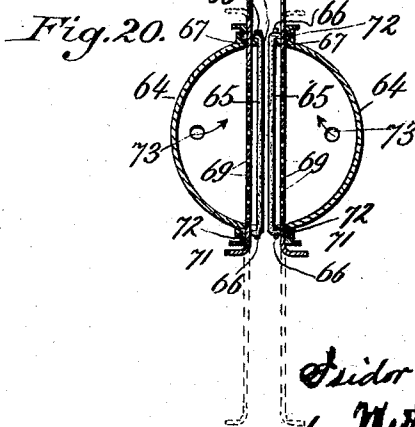
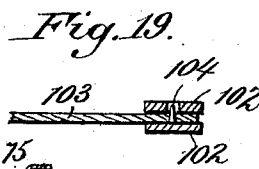
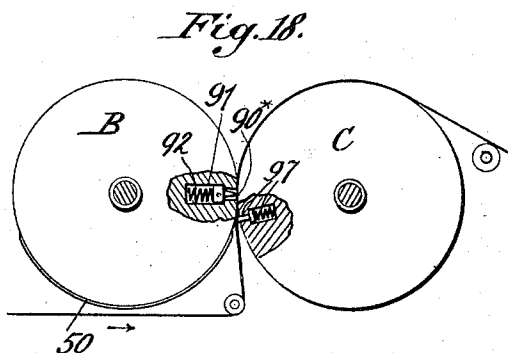
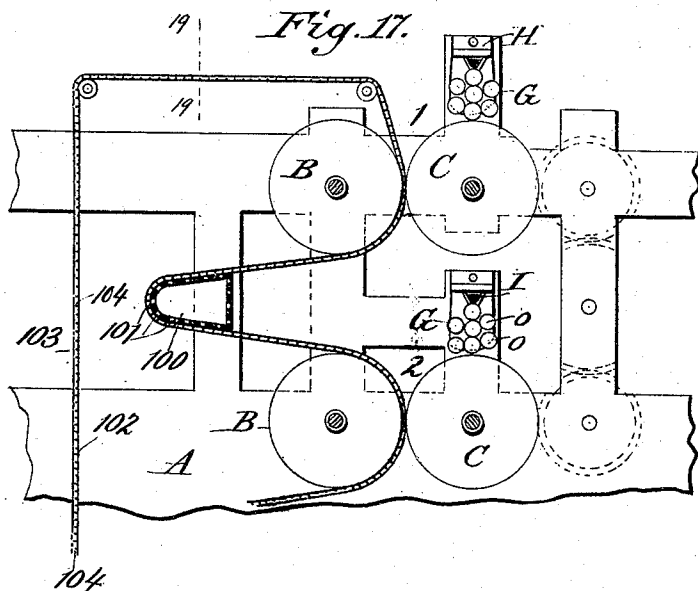
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(Application filed Aug. 21, 1897.)

(No Model.)

7 Sheets—Sheet 7.



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UNITED STATES PATENT OFFICE.

ISIDOR LAM, OF VIENNA, AUSTRIA-HUNGARY.

PRINTING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 640,923, dated January 9, 1900.

Application filed August 21, 1897. Serial No. 649,067. (No model.)

To all whom it may concern:

Be it known that I, ISIDOR LAM, a citizen of Austria-Hungary, and a resident of Vienna, Austria-Hungary, have invented certain new and useful Improvements in Printing-Machines, (patented in Austria, No. 46/230, dated January 20, 1896; in Great Britain, No. 653, dated January 9, 1896, and in Germany, No. 91,615, dated December 10, 1895,) of which the following is a specification.

This invention relates to printing-machines; and it consists, substantially, in such features of improvement as will hereinafter be more particularly described.

The object of the invention is to provide a rotary printing-machine for effecting impressions upon one or both sides of a strip of fabric and also upon one or both sides of a number or plurality of strips simultaneously at one operation.

The above and additional objects I attain by the means illustrated in the accompanying drawings, in which—

Figure 1 is a vertical longitudinal sectional view, in part elevation, of a rotary printing-machine constructed and arranged in accordance with my invention, said view indicating the arrangement of the impression and form cylinders for printing upon one side of the paper or other fabric. Fig. 2 is a similar view indicating the arrangement by which designs or impressions are printed upon one side of a number or plurality of webs simultaneously at one operation. Fig. 3 is also a similar view indicating the arrangement by which designs or impressions are printed first on one side of the fabric and then on the other at a single continuous operation. Fig. 4 is a vertical transverse sectional elevation on the line xx , Fig. 1, and showing more clearly the manner of supporting and operating the impression and form cylinders, together with the inking-rollers. Fig. 5 is an enlarged view in detail of one of the supporting-disks for the ends of the impression and form cylinders. Fig. 6 is a similar view showing the construction of both the impression and form cylinders at the ends, by which the said cylinders are received and held between their supporting-disks. Fig. 7 is a side view of one of the form-cylinders, enlarged, and showing the cylinder inserted between its supporting-disks. Fig. 8 is an en-

larged sectional detail view of a part of the construction shown in Fig. 4, the section in this instance, however, being taken on the dotted line yy , Fig. 1, looking to the right. Fig. 9 is an enlarged detail view, in part section and part elevation, showing more clearly the means for shifting the position of the inking and distributing devices when desired. Figs. 10 and 11 are enlarged views in detail to show more clearly the construction for effecting an endwise movement of one of the inking-rollers. Fig. 12 is a sectional view similar to Fig. 8, on a smaller scale, however, and taken all the way across the machine, and showing a modification of the invention. Fig. 13 is an end view in detail of one of the form-cylinders, enlarged, and showing in connection therewith a tally or registering device and a knife or cutter for severing the paper or other web into strips. Fig. 14 is an enlarged side view in detail and representing more clearly the devices for forcing the knife or cutter inward, so as not to engage or come into contact with the inking-rollers. Fig. 15 is an enlarged detail view, in part section and part elevation, showing the means by which one of the impression-cylinders is moved in its bearings to operate a brake for the fabric during the temporary separation of the impression and form cylinders. Fig. 16 is a plan view of the preceding figure, the supporting-frame being in section and the impression and form cylinders, as well as the guide-rollers for the fabric, being broken off. Fig. 17 is a detail view representing certain modifications of the arrangement shown in the preceding figures; and Figs. 18, 19, and 20 are detail views of certain parts which will be referred to hereinafter.

Preliminary to a more detailed description the following general statement may be made with regard to the construction and arrangement of the principal elements of my improved machine. The said machine is of the type or class known as "multicolor rotary printing-machines," and it comprises in its several arrangements a number of sets of impression and form cylinders, which are preferably operated simultaneously to produce impressions or designs upon a web of paper or other fabric passing between the cylinders of the several sets in a continuous

manner. In some instances, however, by proper disconnection of driving-gear and corresponding changes in the driving connections any one or more of the sets of cylinders can be operated independently or separately, the driving power being thereby correspondingly reduced.

The form-cylinder of each of the several sets of cylinders receives its rotary motion directly from gearing connected with the main operating-shaft, and each of the impression-cylinders is driven or rotated by means connecting the same with its appropriate form-cylinder. The cylinder connecting with the principal or main driving-shaft is set in rotation and by the engagement of suitable gear-wheels the cylinder below and adjacent thereto will be driven and the adjacent cylinders set in motion. The several sets of impression and form cylinders are arranged in two vertical rows or series and an intermediate set between the sides of a suitable supporting-frame, and to effect impressions upon one side of a web or a plurality of webs like rollers of each row or series are disposed in opposite relation to each other—that is to say, the impression-cylinders all operate upon one and the same side of the web or webs and the form-cylinders upon the other. To print or effect impressions upon both sides of the web or webs, a simple interchange is made in the relation or position of the cylinders of some of the sets, and the said web or webs are caused to follow a partly-different course in passing between the cylinders of the sets so altered. Due to varying requirements it may be desirable at different times to alter or interchange the cylinders of all or any one or more of the sets, or such requirements could be met by providing the printing-cylinders with elastic coatings of the thickness of the form-plates on the form-cylinders, which coatings and form-plates may be similarly interchanged.

The form-cylinders are provided with raised form-plates, the printing-surfaces of which receive their supply of ink or printing fluid from independent sets of inking and distributing rollers or devices, and each set of said devices is provided with a fountain or trough supplying the ink or printing fluid directly thereto. Each set of said devices is also movable or adjustable, so as to be readily shifted or changed in position to occupy the proper relation to its particular form-cylinder whenever the position of the latter is changed to operate upon one side or the other of the web.

The wound rolls of paper or other fabric to be printed upon are supported in suitable brackets alongside the machine, and the web or webs after passing between and over suitable guide-rollers are drawn between the successive sets of cylinders continuously by endless traveling bands. To one side of and intermediate the several sets of cylinders suitable tightening-rollers for the web are also arranged, which rollers also serve as guides.

As the paper or other fabric is paid out from the wound rolls thereof it passes through suitable moistening devices therefor, and in some instances I also employ a drier for the fabric. In most instances, however, the fabric is sufficiently dried by evaporation before it reaches and passes between the first set of rotary cylinders.

Having set forth the general features of my improved printing-machine, I will now describe the construction and arrangement of the several parts in detail.

Referring to the accompanying drawings, A, Figs. 1, 2, and 3, represents the framework of the machine, in the sides of which bearings are formed for the support of a number of rotary impression and form cylinders B C. Said cylinders are arranged to operate together in sets or pairs, and the said sets are disposed one above the other in two rows, while an additional set is arranged beneath and intermediate the said rows to properly effect a continuous operation. The said sets or pairs of cylinders are numbered, respectively, from 1 to 7 in the order in which they are referred to hereinafter.

The shafts of each pair or set of cylinders B C are connected at one end by gears *a b*, (see Figs. 4 and 16,) and mounted in one side of the framework intermediate the form-cylinders of adjacent horizontal sets are the gear-wheels *c*, which engage with the correspondingly-adjacent gear-wheels *b*, carried by the shafts of said form-cylinders. Alternating with the gear-wheels *c* in vertical arrangement are suitable idle gear-wheels *d*, which are also engaged by the said gear-wheels *c*, and it will be seen that by rotating upper wheel *c* in the direction of the arrow the cylinders B C of each pair or set will rotate in opposite directions, since all the remaining wheels *c* are made to rotate in the same direction as the first by means of the idlers. The said upper wheel *c* is carried at one end of a main operating-shaft *e*, Fig. 4, on the other end of which are belt or band pulleys *f* for connection with a suitable driving power. In said Fig. 4 two braces or stay-rods *g g* are shown connecting the two sides of the framework A.

In Figs. 1 and 2 the impression and form cylinders of the two rows are disposed in reverse relation to each other throughout the whole number or series of sets, and it is by this particular arrangement that the printing of impressions is effected upon one side of a single web only or upon a number or plurality of webs simultaneously.

In Fig. 1 the web D passes between two sets of guide-rolls *h h'* on leaving the roll E, and thence it passes upward and over additional guide-rolls *i i'*, arranged some distance apart, the latter roll *i'* being located directly above the bite of the cylinders B C of the upper or first set, (marked 1.) The course of the said web between the several sets of cylinders can be readily followed, and it is

to be noted that it passes alternately between the sets and outward and around suitable tightening or adjusting rollers 8, that are supported between the sides of the framework in longitudinal slots 9. By means of these rollers any sagging or stretching of the web can be readily taken up and more perfect results thus insured. On leaving the last set 7 of impression and form cylinders the web passes over an inclined table *k*, and thence it can, if desired, be carried to any suitable device for again winding it into a roll. Preferably, however, I provide suitable means on the last form-cylinder C for cutting or severing the web into strips or lengths, which are deposited in a pile upon a flat table or bracket F, secured in proper position to the ends of the side pieces of the framework A. There are three of such tables on the frame and there are also three of the inclined tables *k*, thus providing for three webs, which may be carried through the machine simultaneously, as in the instance shown in Fig. 2.

The inclined tables *k* are hinged or pivoted to the framework at *l*, and, as shown in Figs. 1 and 3, two of them are turned back out of the way of the webs.

In Fig. 2 three webs are represented as passing through the machine at the same time and which are operated upon simultaneously by the several sets of cylinders through which they respectively pass. The outer or first web D' passes from its roll E between and over several guide-rollers, as in Fig. 1, thence it passes downward between the cylinders of set 1, thence after passing around a guide-roller 10 (which may be adjustable) it extends over and around a similar roller 10 beneath the bite of cylinders B C of the seventh set, and finally it passes upward between said cylinders and to the tables, as already explained. The second web D², Fig. 2, leaves its roll E in like manner as web D', and after passing over the guide-rollers *i i'* it descends between the cylinders of the second set 2, around a guide-roller 11, thence across to and around a similar roller 11 and up between the cylinders of the sixth set, and thence to the tables *k* F. The third web D³ passes across similar guide-rollers in the same way, thence descending between the cylinders of the third set, thence around a tightening-roller 12, adjustable in the framework, as shown, thence between the cylinders B C of the fourth set, to and around another adjustable tightening-roller 12, thence upward between the cylinders of the fifth, and finally to the tables. In regard to the guide-rollers 10 and 11 for the webs D' and D³ it may be stated that the same can be made adjustable in like manner as the rollers 12, so as to also serve the purpose of tightening their respective web D' D³.

In Fig. 3 the arrangement of the impression and form cylinders B C is substantially the same as in Figs. 1 and 2, excepting that in the last three sets, 5, 6, and 7, the said cylinders are interchanged, so that in said sets the

form-cylinders occupy the outermost positions vertically instead of the impression-cylinders, as in Figs. 1 and 2. In this arrangement the passage of the web D⁴ alternately between the cylinders and outward over the adjustable tightening-rollers 13 is precisely the same as in Fig. 1 until the fifth set of cylinders is reached. After passing through or between this set 5 the said web turns inwardly and passes around an adjustable tightening-roller 14, thence upwardly between the cylinders of the sixth set, then inward again and around another adjustable tightening-roller 15, thence upwardly between the cylinders of set 7, and finally over a roller 16 and down over the upper inclined table *k*, as before. It will thus be seen that until the fifth set of cylinders is reached the web D⁴ will be printed upon the inner side or surface thereof and that after leaving the fourth set the printing or impressions will be effected upon the other or outer side of said web.

It should be stated that in the several arrangements of my improved machine the web or webs are held at the edges between suitable endless bands or strips *m m'*, which retain the webs in a spread or flattened condition and which also, in a sense, serve to convey the web or webs through the machine. These said endless bands form an essential part of the machine, and in the several arrangements described appropriate sets or pairs of the same are permanently arranged in and out between cylinders and over and around the several guide and tightening rolls precisely in the same manner as has already been explained with reference to the courses of the several webs. For the purpose of receiving and guiding the said bands *m m'* each of the impression and form cylinders B C is formed with circumferential grooves *n n'* (see Fig. 16) at near the ends thereof and beyond the impression and printing surfaces of said cylinders. The several guide-rollers *h h'* and *i i'* and also the tightening-rollers employed in the different arrangements shown are also each and all of them grooved in a similar manner and for the same purpose, but which it has not been thought necessary to illustrate herein. The said endless bands or strips *m m'* are arranged in pairs, and they receive the edges of the web between them, and they are caused to move with the web or webs by frictional engagement of the impression-cylinders. As before stated, said bands are permanent parts of the machine, and whenever a new web is to be started through the machine the end of the web is simply inserted between the sets of bands at the bite of the guide-rolls *h*, and the continuous motion of the bands will carry the web through the machine in an obvious manner. In Fig. 1, taking the set of rolls *h* as the starting-point, the band *m* follows precisely the same course as the web, and then after leaving the last set of cylinders B C it passes upward over a guide-roller 16, thence backward to and over

a similar roller 17, thence downward against the side of a roller 18, and around a roller 19 to the point of start. The band m' on the other side of the web follows the same course after leaving the rollers h , and then after leaving the last set of cylinders B C it passes downward to the right and over a roller 20, thence straight downward over a roller 21, thence backward over similar rollers 22 23, beneath the cylinders, and back to the starting-point. In Fig. 2 the arrangement of the said bands or strips $m m'$ is substantially the same for the web, with slight alteration in the arrangement of the guide-rollers therefor, and in Fig. 3 the arrangement is also practically the same as shown both in Figs. 1 and 2.

Each form-cylinder of the several sets of impression and form cylinders is provided with an independent set of inking and distributing devices, which are indicated as a whole in Figs. 1, 2, and 3 at G. On reference to Figs. 4, 8, and 9 said devices will be seen to consist of a number of rollers o , loosely supported at the ends in brackets H H', which latter are supported by the side pieces of the framework A. Above the said rollers is an ink trough or fountain I, which is open at the bottom and which partially receives the uppermost roller o , so as to deliver the ink or printing fluid thereto in a manner to be supplied to the remaining rollers by frictional contact. In order to more evenly distribute the printing fluid or ink over the surfaces of the said rollers, I preferably so construct the rollers o' of the number or set as that the same is given a longitudinal reciprocating motion during the time it is rotated by contact with adjacent rollers of the set. Thus I form in said roller o' , at near one end thereof, a circumferential cam-groove o^2 , in which is received a cam-roller o^3 , carried on the end of an arm o^4 , secured to the side of the adjacent bracket H. It will be seen that in virtue of this arrangement the said roller o' will be reciprocated in the desired manner. To enable said roller to so operate, it is supported at one end by means of an independent journal p , having ribs p' , received by corresponding grooves extending partly into said roller at the end. The shafts or spindles of the said rollers o are provided at one end with intermeshing pinions s , which are located between the outer side of bracket H and the adjacent side of the framework A, and one of said pinions is engaged by a gear-wheel J, carried on the shaft of the particular form-cylinder C with which the inking devices coöperate. It will be seen that the pinion s' for the roller o' is made of greater length than the others, so as to maintain its gear connection while the roller is moving longitudinally. In order to enable the said inking and distributing devices G to be shifted so as to occupy the same relation with their form-cylinders whenever the position of the latter is altered or changed, as in Fig. 3, I prefer to make each set of said devices ad-

justable in entirety or as a whole. Thus I suspend the brackets H H' in longitudinal grooves or slots 26, formed in the sides of the framework, and employ screws 27 or other suitable means for securing the said brackets in place. The brackets are provided with ribs or flanges 28, which enter or fit said grooves or slots 26, (see Fig. 8,) and to shift the inking devices it is only necessary to remove the screws and slide the brackets along the grooves or slots. I prefer to provide similar adjustments for all of the sets of inking and distributing devices.

In Fig. 12 I have shown the trough or fountain I as divided or separated into several compartments I', I², and I³ and also shown the corresponding form-cylinders to be composed of an equal number of divisions or sections 30 31 32. Also the inking-rollers are likewise divided into corresponding sections 33 34 35. By this construction and arrangement I am enabled to employ different-colored inks or printing fluids in the same trough and to print in several colors simultaneously on the same impression-cylinder.

For the purpose of effecting continuous impressions upon the surface or surfaces of the webs the surfaces of the form-cylinders C are provided with the necessary raised form-plates 60 extending all around the body or circumference of the said cylinders; but in some instances intermediate blank spaces are to be left between impressions on the web, in which case only a portion of the body or circumference of the form-cylinders is covered or provided with such forms, while the remaining portions thereof are left blank. Of course with this latter arrangement the web will continue to travel through the machine just the same and blank spaces will be left thereon corresponding to the extent of the blank portions of the form-cylinders. In order, however, to vary the distance between impressions on the web, or, in other words, to increase or diminish the extent of the blank spaces between impressions, I resort to the following construction: The bearings 36 (see Fig. 16) for each of the impression-cylinders are movable in slots 37 in the main frame of the machine, and said bearings are acted upon by springs 38, which hold the cylinders to their work. Upon the shaft or journal of the form-cylinders of the first set of cylinders and at near each end thereof is fastened one end of a rod 40, which extends somewhat beyond the said cylinder, as shown, and is supported by said rod at near its other end is a roller 41, the shaft or spindle 42 of which at each end works in a slot in a frame A. Adjacent to said roller 41 is a stationary roller 44, that is supported at each end by means of a plate 45, secured to the frame, and it will be seen that if the roller 41 is moved up to the said roller 44 the web and its guiding-bands will be gripped more or less tightly between the two rollers. The outer end of each of the rods 40 engages with the end of an adjusting-screw 46, which regulates the

movement of a brake-rod 47, as will presently be described. Now it is the purpose to limit or check the travel of the web through the machine in just the degree or proportion necessary to furnish or give the desired extent of blank spaces between impressions on the web, and this is accomplished as follows: To the face of each form-cylinder at each end thereof I attach or secure suitable segments or curved strips 50, which correspond with the blank portions of the cylinder and which are thick enough to project farther beyond the cylinder than the form-plates 60 themselves. It is evident, therefore, that when the said segments or curved strips engage the adjacent impression-cylinder the latter is moved outward, with its bearings, against the action or pressure of the springs 38. The rod 40 is thus correspondingly moved and the roller 41 is carried against the roller 44 more firmly. At the same time the outer end of rod 40 engages the end of adjusting-screw 46 and the brake-rod 47 is carried outward at its upper end. The said brake-rod is pivoted or fulcrumed at 50*, and its lower end reaches down to the web-roll E, where it is provided with a shoe 51, that engages said roll in a manner to regulate the paying out of the web in accordance with the pressure exerted by the brake. It will thus be seen that the web is stopped in its passage pending the passing of the blank portion of the form-cylinder. Of course as soon as those portions are passed the impression-cylinders are moved back by the springs 38, and the braking of the roll E automatically ceases for the time being. It should be remarked that but one set of braking devices is required for each of the arrangements shown in Figs. 1 and 3, while in Fig. 2 one set is required for each web and the cylinders operating therewith. In this latter figure, however, I have shown but one set, as in Figs. 1 and 3, since it is thought unnecessary to show the others in view of the present description. It will be seen that the rollers 41 and 44 also act as a brake to the web, and thus is a double brake obtained. Sometimes said rollers can alone be made to answer the desired purpose by so turning the adjusting-screw 46 as not to be reached or engaged by the end of rod 40 when the latter is moved outward by the movement of the impression-cylinder.

In each of the arrangements shown by Figs. 1, 2, and 3 three brackets are provided for the support of the web-roll E, two of which, of course, not being in use when only a single web is printed. Said brackets can be simple supports M M, provided with notches to receive the ends of the roll spindle or shaft; but I prefer to construct the same as shown at N. In this construction the said bracket N is hinged at *u* on a rod *v*, which is provided with a handle *w*, and by turning the handle backward, as shown in dotted lines, Fig. 1, the said bracket will also be carried backward. In this way the roll can more

readily be inserted in place. Beneath said bracket and working in a base-piece *x* is a pin *y*, and inserted in the end of the platform at *z* is a cushion or pad 61, on which the lower inner end of the bracket rests. By adjusting said pin *y* the bracket can be slightly tilted or raised, and this will also check or somewhat limit the passage of the web from the roll by tightening the web against a small roller 500. Working in a slot in one side of the bracket is a small roll 62, pressed upon by a spring 63 to also exert a pressure on the roll. By means of the various devices shown and described for operating upon the roll it is evident that the travel of the same can be accurately regulated.

Preferably I employ means for dampening or moistening the web after leaving the roll, and while various devices could be resorted to for this purpose I prefer the devices such as I have shown herein. These devices consist of two semicylindric shells 64, (see Fig. 20,) which are of a length about equal to the width of the web or webs, and they are each closed by strips of felt or other absorbent material 65, which are secured to the longitudinal edges of the shells by means of any suitable fastenings, (indicated at 66.) Each of said shells is slotted at 67 a short distance from each of its edges, and working in said slots on the inner sides of the felt strips 65 are suitable gates or slides 68, which project above the shells a distance fully equaling the width of the said strips. Said gates or slides are perforated at 69, and they are each flanged at 70 71 to prevent them from being entirely withdrawn when operated in either direction. A suitable packing 72 may be employed at the slots 67 both to form a steam-tight joint as well as to serve as a friction device for holding the slides in any position to which they may be moved or adjusted. Each of the shells is provided with an opening 73 for the passage or inlet of steam from any suitable source. By moving the gates or slides upward, as shown in full lines, Fig. 20, the felt strips will become saturated by the steam which enters the openings 73; but by closing the gates or pushing them down to the position indicated in dotted lines no steam can pass to said strips.

As shown in Figs. 1, 2, and 3, the webs are each carried through the space 75, Fig. 20, between the strips 65, and it is evident that the same will be dampened or moistened to an extent regulated by the gates. I have found this moistening device to be very effective for its purpose, and it is evident that the details thereof can be varied in practice.

As a means of enabling the impression and form cylinders to be removed and replaced by others without in any manner having to disturb the bearings therefor I resort to the following construction: Each of said cylinders B C is formed or provided at each end with a head 80, (see Figs. 4, 5, 6, 7, 8, and 12,) having an inwardly-extending bearing or hub

portion 81, in which is received the inner end of a journal-pin 82, Figs. 4 and 8, and also having across the outer surface thereof a transverse rib or tongue 83. Surrounding or inclosing the said journal-pin is a sleeve 84, that is flanged at 85 on its inner end, and fitting the said inner end of the sleeve is a disk 86, recessed at 87 to receive the flange 85. The sleeves 84 are provided at or near their outer ends with the gear-wheels *a b*, Fig. 4, and the said disks are each provided diametrically with a groove 88, which is open at one end 89 and closed at the other end 90. Said grooves correspond to the tongues on the heads 80 of the cylinders, and the cylinders are secured in place by simply inserting them between the disks, with the tongues entering the grooves and with the ends of pins 82 entering the hub portion 81. When thus united, the sleeves, the disks, and the cylinders all rotate together, and said cylinders cannot work loose or get out of place. The facility with which the cylinders can be removed and again inserted will be readily understood, it being simply necessary to first move the journal-pins 82 outward far enough to disengage the hub portions.

It is desirable in some instances to cut or sever the printed web into strips before passing out of the machine, and for this purpose I provide the form-cylinder of, say, the last or seventh set, Figs. 1 and 3, with a knife or cutter 90*, extending the full length of the cylinder and working radially in a longitudinal groove 91, formed in said cylinder. (See Figs. 13 and 14.) Said knife or cutter is normally pressed outwardly by a spring or springs 92, seated in the bottom of the groove and projecting from the knife at each end, and extending beyond the ends or heads of the cylinder is a short rod 93, carrying a roller 94, which as the roller is carried around is engaged by the under side of a curved rail or flange 95, projecting inwardly from the side of the framework. The position of the said rails or flanges is such that the rollers are engaged thereby during the passage of the knife or cutter beneath the inking-rollers above, and during this time the knife is forced inward by said rails, so that the knife will not engage or come into contact with said rollers or inking devices. After passing the end of the rail the said knife or cutter is instantly forced outward with some force by the spring or springs 92, and the web is cut or severed immediately at the point of engagement of the cylinder B with its corresponding cylinder C. The pressure between the two cylinders is sufficient to press or force the knife inward, and thus hold it until the knife has passed the cylinder C, whereupon it again moves outward to be next engaged by the rail or flange 95, as explained. It is of course understood that the knife and its operating devices can be removed or dispensed with at any time without in any manner affecting the operation of the machine.

In order to prevent the web from slipping out of place between the last set of cylinders at the time said web is cut or severed by the knife, I also sometimes employ a spring-actuated pin 97 in the impression-cylinder C, (see Fig. 18,) which immediately presses the end of the web against the form-cylinder at the bite of the two cylinders. This is also forced inward during the time it passes between the two cylinders.

Fig. 17 is a diagrammatic view of a portion of the machine and showing the use of a drier for drying the web as it passes, say, from the first to the second set of impression and form cylinders. Said drier consists simply of a shell 100, perforated at 101 for the escape of hot air, with which the same may be provided from any source. In this instance also I prefer to use metal strips 102 for guiding the web 103 through the machine, and said strips are fastened to the web or fabric at the edges by means of pins or rivets 104, as shown in Fig. 19.

The construction and operation of my improved machine will be fully understood in its several embodiments, and it is of course apparent that I am not limited to the precise details thereof shown and described.

The form-cylinder of each successive set of cylinders B C is of course provided with forms of proper design to make up the complete pattern, and they may each be provided with the same or successively different colors of ink or printing fluid.

It should be added that when the knife or cutter is used in connection with the form-cylinder of the last set I also sometimes employ a tallying device or mechanism 105, (see Figs. 13 and 15,) which is operated by a pin 106 on said cylinder, for registering the number of sheets or strips into which the web is cut or divided by the said knife or cutter.

What I claim, and desire to secure by Letters Patent of the United States, is—

1. The combination, in a rotary printing-machine, of a number of sets of impression and form cylinders, arranged in substantially parallel rows to effect impressions upon a web, an additional set beyond and intermediate the rows, and at right angles to the other sets, means for rotating the cylinders of each set simultaneously in opposite directions, and means for forcing the impression-cylinder of each set away from its form-cylinder pending the passing of blank portions of said form-cylinders.

2. The combination, in a rotary printing-machine, of a number of sets of impression and form cylinders arranged in parallel rows, endless bands traversing the impression-cylinders of opposite sets for holding a web, and means for forcing the impression-cylinder of each set away from its form-cylinder during the passing of blank portions of said form-cylinders.

3. The combination, in a rotary printing-

machine, of removable and interchangeable impression and form cylinders, and shiftable inking and distributing devices for the form-cylinders, the same comprising brackets adjustable in grooves in the main frame, and secured in place by screws, a series of rollers supported between the brackets, and an ink trough or fountain also supported between the brackets and partially receiving one of said rollers.

4. The combination, in a rotary printing-machine, of removable and interchangeable impression and form cylinders, and shiftable inking and distributing devices for the form-cylinders, the same comprising adjustable brackets supported by the framework, a series of rollers supported by the brackets with their shafts projecting through the latter, gear-pinions on the projecting ends of said shafts meshing with a gear on the shaft of the form-cylinder, and an ink trough or fountain for the rollers also supported by the brackets.

5. The combination in a rotary printing-machine, of removable and interchangeable impression and form devices, each comprising movable supporting-journals each of which is provided with a sleeve shorter than the journal, a disk fitted to turn with each sleeve, and a cylinder removably inserted between the disks and having heads provided with hub portions, said journals extending into said hub portions, as described.

6. The combination, in a rotary printing-machine, of removable and interchangeable impression and form devices, each comprising movable supporting-journals each of which is provided with a sleeve shorter than the journal, a disk fitted to turn with each sleeve and provided with a transverse groove, and a cylinder provided at the ends with hub portions, and with ribs or tongues to fit said grooves, said journals extending into the hub portions, as set forth.

7. The combination in a rotary printing-machine, of removable and interchangeable impression and form devices each comprising movable supporting-journals each of which is provided with a sleeve shorter than the journal and having a flange at its inner end, a grooved disk fitting upon said sleeve and recessed to receive said flange, and a cylinder having at each end a head having a hub portion and provided with a rib to fit the groove of one of the disks, said journals extending into the hub portions, substantially as described.

8. The combination, in a rotary printing-machine, of a set or pair of impression and form cylinders, for effecting impressions upon a web, a brake engaging the web-roll, and means for moving the impression-cylinder to apply the brake during the passing of blank portions of the form-cylinder.

9. The combination, in a rotary printing-machine, of a number of sets of impression

and form cylinders, for effecting impressions upon a web, a brake operating against the web-roll, means for moving the impression-cylinders outward during the passing of blank portions of the form-cylinders, and means operated by one of the impression-cylinders for applying the brake.

10. The combination, in a rotary printing-machine, of a movable impression-cylinder, and a form-cylinder, arranged to effect impressions upon a web, a brake operating against the web-roll, projections on the form-cylinder for moving the impression-cylinder outward during the passing of the blank portions of said form-cylinder, and means operated by said impression-cylinder for applying the brake.

11. The combination, in a rotary printing-machine, of a number of movable impression-cylinders, and a corresponding number of form-cylinders, arranged in pairs to effect impressions upon a web, a brake operating against the web-roll, projections on the form-cylinders for moving the impression-cylinders outward during the passing of blank portions of the form-cylinders, and means operated by one of the impression-cylinders for applying the brake.

12. The combination, in a rotary printing-machine, of a movable impression-cylinder and a form-cylinder, arranged to effect impressions upon a web, a pivoted brake-rod having a shoe engaging the web-roll and provided at its upper end with a regulating-screw, projecting segments on the form-cylinder for moving the impression-cylinder outward during the passing of blank portions of the form-cylinder, and a rod carried by the shaft of said impression-cylinder and engaging said regulating-screw.

13. The combination, in a rotary printing-machine, of a movable impression-cylinder and a form-cylinder arranged to effect impressions upon a web, a pair of braking-rolls for the web, a brake operating against the web-roll, and means on the form-cylinder for moving the impression-cylinder to apply both the braking-rolls and the brake during the passing of blank portions of the said form-cylinder.

14. The combination, in a rotary printing-machine, of a movable impression-cylinder and a form-cylinder, arranged to effect impressions upon a web, a pivoted brake-rod having a regulating-screw, and provided with a shoe engaging the web-roll, a stationary roller across which the web passes, means on the form-cylinder for moving the impression-cylinder outward during the passing of blank portions of the form-cylinder, a rod operated by said impression-cylinder to apply the brake to the roll, and a braking-roller carried by the rod and cooperating with said stationary roller to regulate the travel of the web.

15. The combination, in a rotary printing-machine, of an impression-cylinder and a

form-cylinder arranged to print impressions upon a web, and a hinged bracket or support for the web-roll having an operating-handle, and provided with a spring-pressed
5 roller bearing against the roll, said bracket being also provided with means for adjusting the same on its pivotal support.

In testimony that I claim the foregoing as my invention I have signed my name in presence of two subscribing witnesses.

ISIDOR LAM.

Witnesses:

EMIL HENZEL,

EBERHARD FABER.