Aug. 3, 1926. 1,594,761

R. C. STEVENSON

MACHINE FOR PRODUCING MANIFOLD FORMS

Filed Jan. 11, 1923 5 Sheets-Sheet 1

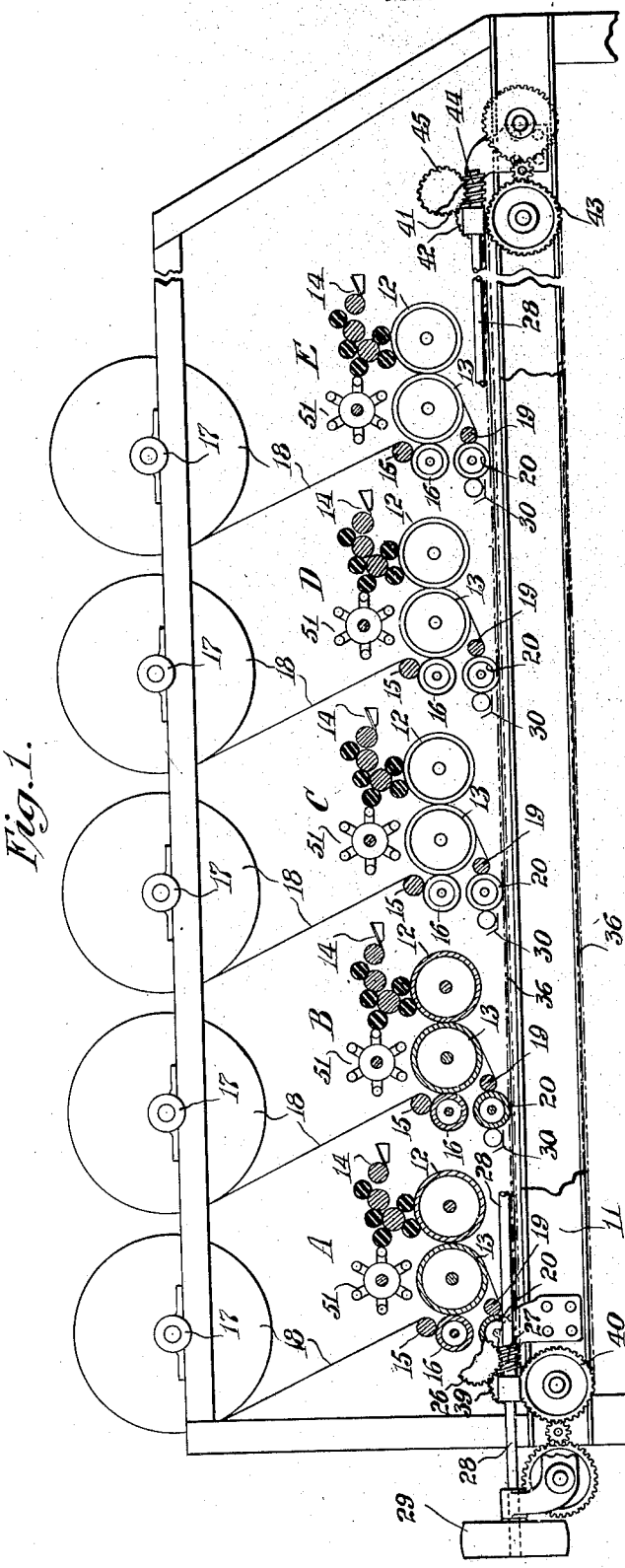


Fig. 1.

Ralph C. Stevenson
INVENTOR

Frank P. Wentworth
his ATTORNEY.

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Filed Jan. 11, 1923 5 Sheets-Sheet

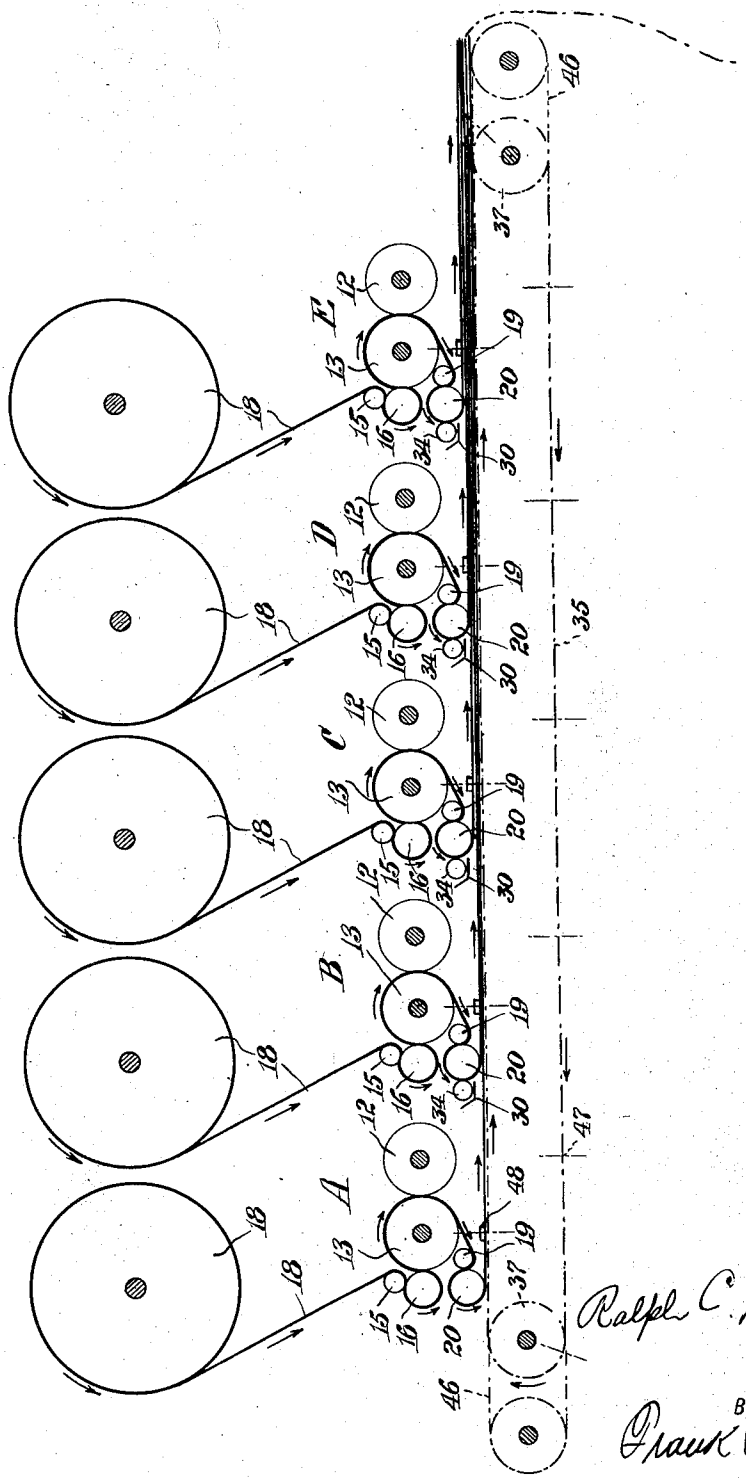


Fig. 2.

Ralph C. Stevenson
INVENTOR

BY Frank P. Wentworth
his ATTORNEY.

Aug. 3, 1926. 1,594,761

R. C. STEVENSON

MACHINE FOR PRODUCING MANIFOLD FORMS

Filed Jan. 11, 1923 5 Sheets-Sheet 3

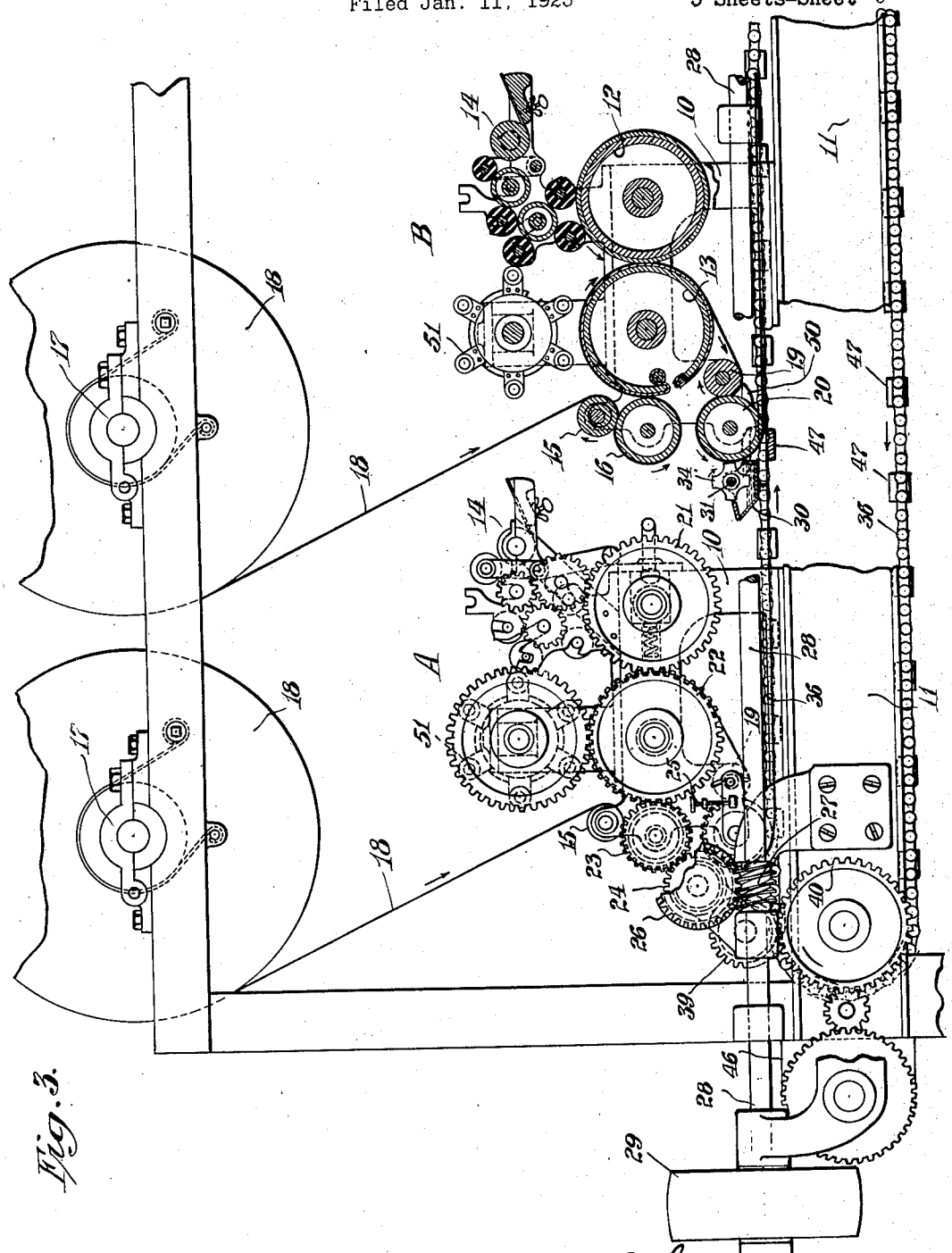


Fig. 3.

Ralph C. Stevenson INVENTOR

BY Frank G. Wentworth
his ATTORNEY.

Aug. 3, 1926. **1,594,761**

R. C. STEVENSON

MACHINE FOR PRODUCING MANIFOLD FORMS

Filed Jan. 11, 1923 5 Sheets-Sheet 4

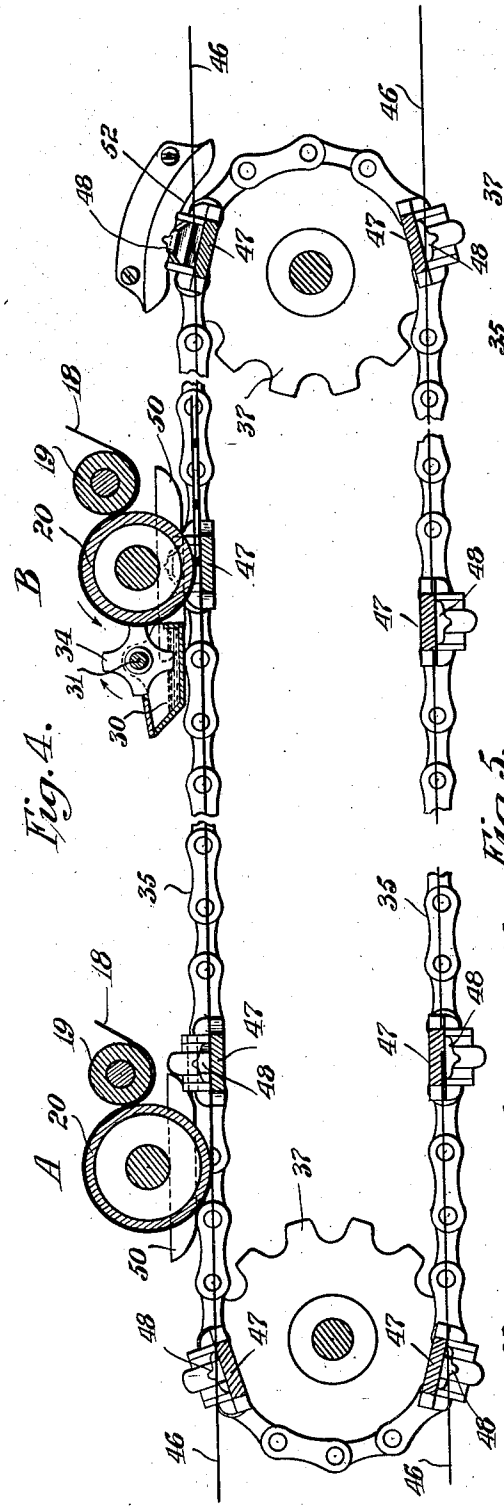


Fig. 4.

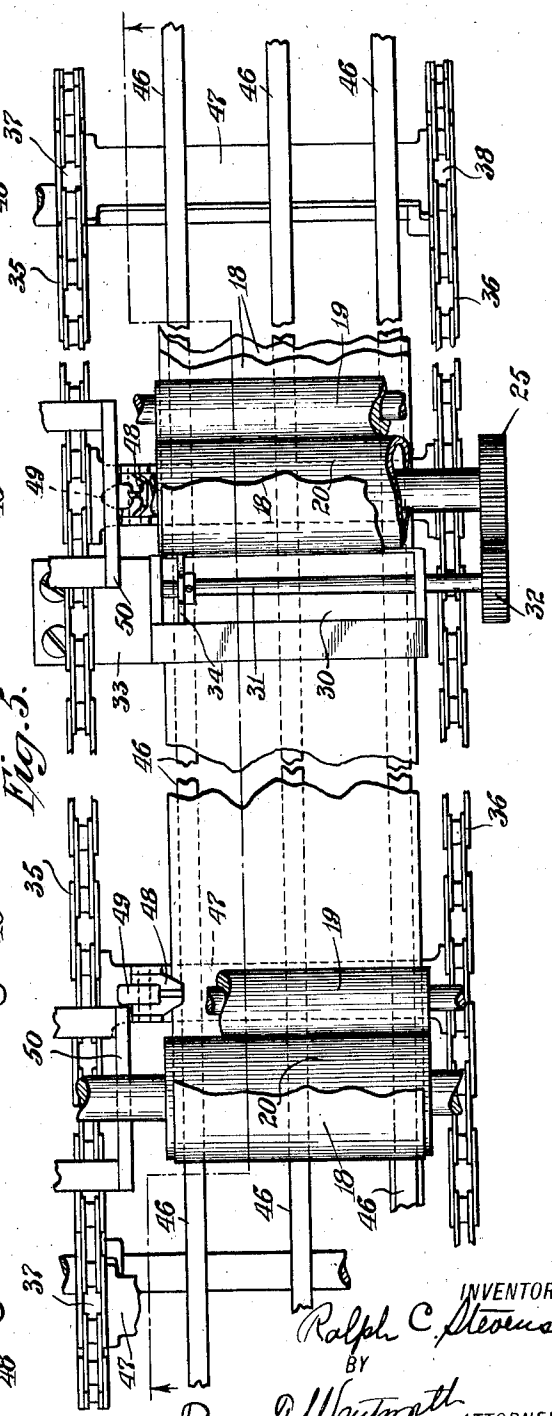


Fig. 5.

INVENTOR
Ralph C. Stevenson
BY
Francis D. Wentworth Jr. ATTORNEY

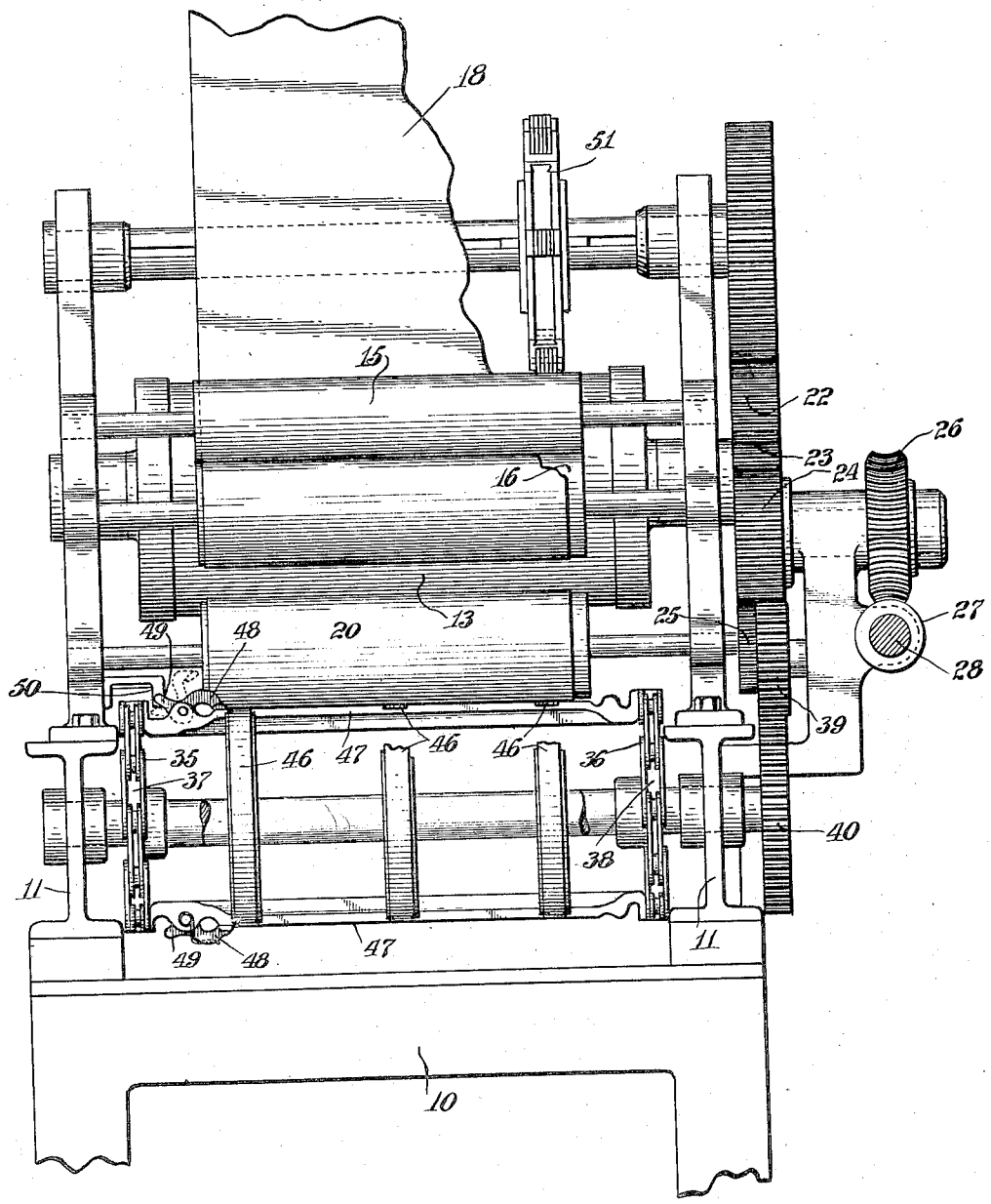
Aug. 3, 1926. 1,594,761

R. C. STEVENSON

MACHINE FOR PRODUCING MANIFOLD FORMS

Filed Jan. 11, 1923 5 Sheets-Sheet 5

Fig. 6.



Ralph C. Stevenson INVENTOR

By Frank C. Wentworth his ATTORNEY.

Patented Aug. 3, 1926. 1,594,761

UNITED STATES PATENT OFFICE.

RALPH C. STEVENSON, OF BROOKLYN, NEW YORK, ASSIGNOR, BY MESNE ASSIGNMENTS, TO GILMAN FANFOLD CORPORATION, LIMITED, OF NIAGARA FALLS, NEW YORK, A CORPORATION OF CANADA.

MACHINE FOR PRODUCING MANIFOLD FORMS.

Application filed January 11, 1923. Serial No. 611,923.

My invention relates to machines for producing manifold forms, and more particularly to a machine in which a plurality of independent webs will each have related printing matter having corresponding blank spaces, impressed thereon, and the printed webs collected and collated in a manner to superimpose them one upon the other with the blank spaces thereon in sufficiently accurate register to permit the duplication of matter, afterwards impressed in the blank spaces upon the uppermost form, upon corresponding blank spaces in the lower forms.

Heretofore in this art it has been the common practice in what is known as fanfold forms, to impress the printed matter upon different portions and upon the alternate reverse sides of a web of paper which may then be so folded as to bring the printing upon different portions of the web into register with each other through the medium of a special folding machine. This particular form, and a corresponding form in which register is secured by lateral folding of the web, and the web so formed has its opposite edges trimmed so as to separate the different sheets, have gone into extensive use. This particular manifold form, however, has the disadvantage that register results from great nicety in the makeready of a press and that in such forms all of the sheets thereof must be of the same weight, quality and color of paper and the number of sheets which may be incorporated in a form is limited owing to mechanical difficulties of printing and folding. Furthermore, accuracy of register is very difficult to secure, since this is determined by two factors, to wit: accuracy in the printing of the web and accuracy in its folding.

With the above conditions in mind, I have produced a machine wherein a plurality of entirely independent strips or webs of paper may have impressed thereon printed matter, each strip or web being acted upon by its own printing unit, the functioning of which is synchronized with the units operative upon the other strips or webs, a collecting and collating mechanism common to all of said units and synchronized in its lineal speed with the angular speed of the printing couple of the various units, being used to convey the printed web from adjacent each printing unit and superimpose it upon, and with the blank spaces in the imprint thereon in registering relation to the blank spaces of the imprints on the printed webs from the other units.

The employment of a sequence of printing units, and the use of a collecting and collating mechanism upon which the strips or webs accumulate in superimposed relation as this mechanism progresses from one unit to the other, not only permits the use of strips or webs of paper of different weights, qualities or colors for the different sheets of each form, and places no limitation upon the number of sheets which may be incorporated in each form, but permits the production of complete manifold forms by a continuous operation.

Furthermore, the employment of independent printing units will permit the printed matter upon the different strips or webs to appear in inks of different colors, if desired, it being permissible, considering the invention from its broader aspects, to use printing units some of which will do cameo or typo printing, and the others of which will do planographic printing.

When employing a plurality of independent printing units, it is sometimes difficult to secure sufficient accuracy in the impression cylinder during the makeready to ensure absolute uniformity in the lineal traverse of the web through the makeready. To correct this condition, I provide means whereby the tension of the strip or web as it is being fed in relation to the printing couple, may be varied to compensate for variance in the makeready of different units, and also provide means in each printing unit for varying the lineal traverse of the web after leaving the printing couple and prior to its delivery to the collecting and collating mechanism, to permit longitudinal adjustment of any web, by a setting of the machine, so as to permit the establishment, and ensure the maintenance of, the proper registering relation of the printed webs after they have left the various printing units.

While the adjustment mechanism above referred to may be relied upon to correct any slight differences in the adjustment of the printing plates upon different cylinders, and correct any material loss of register due thereto, I also preferably so construct the collecting and collating mechanism that it

will, with each cycle of the machine, feed a definite, fixed length of each web, so that when the machine has been once so set as to secure initial register, any error will be compensated for with each cycle of operation of the machine, and prevent such accumulated error as will, with a long run, result in material loss of register as to the different sheets of each form.

In each of the printing units, with one exception, I provide a pasting device which will apply a very small quantity of adhesive upon the surface of the web delivered by the adjacent printing unit, which pasting mechanism is so located that this adhesive may be applied upon the surface of the web between the side edges thereof so as to secure a surface bond, as distinguished from an edge bond. Preferably the pasting mechanism is so constructed that the adhesive may be applied adjacent either side edge, or at any point intermediate the side edges of the web, the construction of the mechanism being such as to ensure the application of the adhesive in a manner to permit the convenient separation of adjacent strips as they are fed to a billing or other machine upon which the forms are used.

The invention consists primarily in a machine for producing manifold forms embodying therein a sequence of printing units, means whereby independent strips or webs are fed with relation to said units respectively, and a collecting and collating mechanism common to all of said units and having continuous, unidirectional movement in relation thereto and including therein means carried by said mechanism and engaging the printed sheets, whereby corresponding portions thereof are successively brought into the operative relation to succeeding units, and a strip or web delivered by each unit will be conveyed therefrom and brought into operative relation to the strips or webs of succeeding units, to be superimposed thereupon with the blanks thereon in registering relation, and conveyed to the delivery point of the machine; and in such other novel features of construction and combination of parts as are hereinafter set forth and described, and more particularly pointed out in the claims hereto appended.

Referring to the drawings,

Fig. 1 is a side view of a machine embodying my invention, partly in elevation and partly in section;

Fig. 2 is a diagrammatic view illustrating the operation of the machine;

Fig. 3 is an enlarged detail view of one end of the machine, partly in elevation and partly in section;

Fig. 4 is a detail condensed sectional view illustrating the pasting mechanism and the collecting and collating mechanism;

Fig. 5 is a plan view of the mechanisms shown in Fig. 4; and

Fig. 6 is an end view of the machine.

Like numerals refer to like parts throughout the several views.

In the embodiment of my invention shown in the drawings, I have illustrated a plurailty of printing units, A, B, C, D and E, each of which in all its essentials as to the angular speed of the cylinders of the printing couple, the feeding and delivery mechanisms for the continuous strip or web, and the inking mechanism, is identical with every other, although it is apparent that so long as the angular speed and the operative effect of the strip feeding and delivery mechanisms are the same, that the character of the printing couple and the inking mechanism may be modified so as to permit some of the webs to be printed by cameo or typo printing methods, and others to be printed by planographic methods.

In the accompanying drawings, I have shown the use of units so constructed as to print by cameo or typo methods, and will limit my description of the printing units to this construction of printing couple and inking mechanism, and will describe but one of these units since corresponding parts, bearing corresponding numerals in the drawings, are incorporated in the other units.

This printing unit comprises a frame 10 which is removably mounted upon the main frame 11 of the machine and has mounted therein a printing couple consisting of a plate cylinder 12 and an impression cylinder 13. Associated with the plate cylinder 12 is an ordinary inking mechanism 14, a detailed description of which is unnecessary to a complete understanding of the invention, since this mechanism functions in the same manner as the inking mechanism of the ordinary rotary press. Upon one side of the impression cylinder 13 is a pair of feed rollers 15 and 16 arranged between the support 17 for a roll of the strip or web 18 and the printing point of the couple 12—13. While the roll of strip or web 18, and its support 17 is provided with the usual retard friction disk, I also make the rollers 15 and 16 adjustable with relation to each other in order to apply a tensioning stress to the strip or web closely adjacent the printing couple, and ensure a positive feed of same from the roll.

Mounted in the frame 10 beyond the printing point of the cylinders 12 and 13, and preferably upon the same side of the cylinder 13 as the rollers 15 and 16, is a pair of delivery rollers 19 and 20, one of which as 19 is adjustable circumferentially of the other, 20, for the purpose of varying the length of the strip or web between the printing point of the couple 12—13 and the

point at which it is delivered to the collecting and collating mechanism, which will be hereinafter described.

By arranging the web or strip feeding rollers 15 and 16 and the delivery rollers 19 and 20 in the manner described, and by driving these rollers at the same angular speed, I am not only enabled to control the tension of the paper strip or web 18 from the roll, and thus minutely vary the length of strip or web fed with each cycle of the printing couple, but am also enabled to so set the machine as to longitudinally adjust the strip or web upon and in relation to the collecting and collating mechanism and different strips or webs thereupon, so as to secure the desired accurate register of the blanks in printed matter impressed upon the different strips or webs, or correct any loss of register which may develop during the initial run of the machine.

The plate and impression cylinders 12 and 13 of the printing couple are provided with intermeshing gears 21 and 22 upon the shafts of said cylinders respectively, which gears are entrained with gears 23, 24 and 25, the gears 23 and 25 of which are utilized to drive the rollers 16 and 20 of the web feeding and web delivering mechanism respectively.

The gear 24 is carried upon the shaft of a worm gear 26, said gear 26 of each printing unit A, B, C, D and E meshing with a worm 27 upon a worm shaft 28 extending the full length of the machine and co-operating with each printing unit so as to ensure substantially the same printing speed in each of said units. The shaft 28 is driven from the power pulley 29, or power may be applied thereto in any desired manner.

The various printing units A, B, C, D and E, and while but five of these are indicated in the drawings, a greater or less number may be used according to the number of sheets required in the forms to be produced, are spaced equal distances apart upon the main frame 11, this distance being such that if succeeding impressions were being made upon a single web, instead of upon independent webs, such succeeding impressions would be in register, or approximately so.

Each of the frames 10 is removably mounted upon the main frame 11, so that each unit in its entirety may be removed bodily from the machine for the purpose of facilitating the makeready of the unit. This removability also will permit a system in a plant by which, while some units for printing one form are in use upon a frame 11, other units for other forms may be in process of being made ready, so that upon the completion of a run with some of these units, they may be removed from the frame 11 and other units already prepared may be quickly substituted therefor, and thus secure economy in the operation of a plant or an increased output with a small press room equipment.

Assuming that the printing unit A always designates the unit upon which the lowermost web of the completely assembled forms is printed, all printing units other than A will have associated therewith a pasting mechanism consisting of a trough 30 having mounted above same a shaft 31 carrying a gear 32 in mesh with the gear 25 driving the delivery cylinder 20. The trough 30 is carried by a suitable bracket 33 secured to the main frame 11 of the machine, so as to be moved into and out of position independently of the frame 10.

Mounted upon the shaft 31 is a paste wheel 34 secured to said shaft by means of a set screw or in any other desired manner so as to be adjustable longitudinally of the shaft.

This wheel is of a diameter, and the shaft 31 is so set as to cause the wheel to bear upon the sheet or web 18, while it is passing about the delivery cylinder 20, thus ensuring the application of the desired amount of adhesive to the surface of the web, which will, as this web is superimposed upon the web printed by the preceding printing unit, contact with this web in a manner to secure a light bond between the webs which will be sufficient to preserve the relative position of these webs while at the same time permitting them to be readily separated without mutilation or soiling of the separate webs.

Preferably the paste wheel 34 has spaced contact surfaces as shown to apply the adhesive in spaced dashes, although this construction is not essential.

With the construction and arrangement of printing units described, an impression will be made by each unit upon its own web 18 simultaneously with the making of a corresponding impression by each of the other units upon its web. It is essential, therefore, to provide a collecting and collating mechanism by which the web from the first and from the successive printing units, will be conveyed, while substantially flat, to adjacent the succeeding printing units from which it will receive a printed web, so that the webs of the various units in this manner will be superimposed one upon the other and be delivered from the machine as a unit with the blank spaces in the various impressions in sufficiently accurate register to permit the use of the forms in a billing or other like machine. To secure the desired result it is not only essential that the collecting and collating mechanism shall have a lineal speed substantially coincident with the angular speed of the printing cylinders of the various printing units, but this mechanism must be common to all of said units, and have continuous, unidirectional

movement with relation thereto so that corresponding portions thereof will be brought successively into the operative relation to said units to ensure the proper positioning of the webs upon this mechanism.

In the embodiment of the invention shown in the drawings, this collecting and collating mechanism comprises oppositely disposed parallel conveyor chains 35 and 36 passing about two pairs of sprocket wheels 37 and 38 upon opposite sides of the machine respectively, said sprocket wheels being driven at the same angular speed as the cylinders of the printing couple through the intermeshing gears 39 and 40 entrained with the gear 24 adjacent the first printing unit A, and gears 41, 42 and 43 at the opposite end of the machine, which gears are driven by a worm 44 upon the shaft 28 and a worm wheel 45, the shaft of which carries the gear wheel 41.

Intermediate the chains 35 and 36 are suitable tapes 46 for supporting the webs intermediate the edges thereof, said chains not being engaged by the web. The tapes 46 pass about tape wheels positioned beyond the sprockets 37 and 38 at opposite ends of the machine. Carried by the chains 35 and 36 respectively, and extending from one of these chains to the other, are a sequence of platen bars 47 having at either or both edges thereof, side grippers adapted to engage the web or webs upon the collecting and collating mechanism adjacent each printing unit with the two-fold object of ensuring movement of the web with the chains 35 and 36, and advancing the web or webs with said chains irrespective of the delivery mechanism of the respective printing units. In fact these grippers will co-operate with the delivery mechanism in preventing the accumulation of error in the feeding of any web, as in the case of a slight excess of web being fed by one printing unit, this excess will be accumulated between succeeding grippers. It will be appreciated that this excess movement will be measured by possibly a few thousands of an inch only so that the corrective effect of the grippers will result in only a very minute buckling of a web which will be immaterial in the completed forms.

Each gripper mechanism comprises a pivotal gripper jaw 48 mounted adjacent either end of the platen bar 47 and having a short arm 49 by means of which the gripper may be moved not only into and out of operative relation to the platen bar, but to a position where its path of movement will be at one side of the edge of the web and the end of the cylinder 20 of the delivery mechanism.

Carried by the frame 10 of each printing unit is an elongated cam 50 arranged in the path of movement of the actuating arm 49 of the gripper so that the gripper will be raised as it approaches each printing unit and maintained in the raised position until after it has passed the delivery mechanism and is in a position where it may be engaged with the web delivered upon the collecting and collating mechanism by said delivery mechanism.

The various tapes 46 are positioned outside of the various platen bars 47, it being permissible if desired to recess said bars to receive the tapes so as to have the tapes and the bars occupy the same plane when the paper webs are being conveyed thereby.

I preferably employ gripper jaws 48 of a number and so spaced that a plurality of such will engage a length of web fed with each cycle of the printing couple.

If desired, a numberng head cylinder 51 may be associated with each impression cylinder 13 and inking mechanism 14 so as to number the printing matter of the forms impressed by each printing couple upon its web.

A cam 52 is positioned adjacent the delivery point of the collecting and collating mechanisms in a position where it will be engaged by the short arms 49 of the grippers 48, so as to disengage these grippers from the completely assembled forms and permit the forms to follow the tapes 46 and be delivered from the machine to a folding mechanism, or a collecting roller, as desired, these mechanisms not being shown in the drawings.

The operation of the herein described mechanism is substantially as follows:—

When preparing for a run of a machine embodying my invention, the desired number of printing units A, B, C, D and E are mounted upon the main frame 11 of the machine and the web 18 for each printing unit is threaded between the feeding rollers 15 and 16 about the impression cylinder 13 and between it and the plate cylinder 12, and thereafter between the delivery rollers 19 and 20, the end of the web thereafter being laid upon the tapes 46 so that the web with the subsequent actuation of the printing couple and its appurtances will advance with said tapes and the chains 35—36. The lateral adjustment of each web is secured by exactitude in the location of the roll of web, or if desired ordinary straighteners common in web printing machines, may be used.

When the various webs have been properly threaded through their respective printing units, power is applied to the machine through the shaft 28, which through the various worms 27 thereon will drive the various mechanisms of the different printing units at uniform speed, the gearing heretofore described ensuring the same angular speed of the cylinders of the web feeding mechanism, the printing couple and the web delivery mechanism of each printing unit.

In preparing for a run, it is apparent that the set of the plate cylinders of the various units must be such that if a continuous web were run through all of said cylinders, the impressions thereon would be in approximate register, so that when power is initially applied to the machine, each printing couple will impress upon its web, a printed form having blank spaces therein which will coincide with corresponding blank spaces upon the printing matter upon other webs.

The main difficulty in a machine for producing manifold forms is that of securing absolutely identical conditions in the makeready of the impression cylinder of different printing units, particularly as when printing upon a continuous web, and with long runs, a very small variance in the diameter of the impression cylinder will result in accumulated error under normal conditions which would prevent the necessary exactitude in the registering of the impressions upon different webs one with the other. By employing a positively actuated delivery mechanism, such error may be reduced to a minimum, as it will make evident any material variance in the amount of paper passing through the printing couple, and thus permit correction of this condition by adjusting the feeding mechanism.

In web printing, the peculiar condition is present that with any makeready, the quantity of paper fed will be increased with slackness in the web, and the quantity of paper fed will be decreased if the web be tautened. While the difference in the quantity of paper passing through the couple, under the conditions of maximum slackness and maximum tautness of the web is small, it is sufficient to be a material factor upon a long run, even though it may be measured only by thousandths of an inch as to each impression.

When starting the machine, certain wastage must occur, until the various adjustments of the machine are made to secure accuracy in the register of the impressions upon different webs. If it be found that any web is slightly in advance (as to the impression thereon), of the impressions upon other webs, this web may be drawn backward, or this effect may be secured as a result of a continued run of a machine, by adjusting the roller 19 downwardly, as to the roller 20 of the delivery mechanism of the printing unit by which this web is delivered, this adjustment having the effect of increasing the length of paper between the printing point of the printing couple and the delivery tapes, so that when once properly adjusted, the web will thereafter run perfectly true with the impression thereon in register with the impressions upon other webs. If, on the contrary, the web has the impression thereon rearwardly of the impressions upon the other webs, the movement of the rollers 19 upwardly will permit the advance of the sheet independently of the printing couple, with a resultant correction as to register.

It is apparent that since the lineal speed of the chains 35 and 36 and the tapes 46 is coincident with the angular speed of the rotary members of each printing unit, that all of the webs will be fed from the different printing units at the same speed and will be conveyed from adjacent one unit to adjacent the succeeding unit at a speed which will bring the printing matter upon one web in a position where corresponding or co-ordinating printing matter upon another web may be brought into register therewith as a result of the normal feeding movement of the two webs, and that as the same portion of the tapes of the collecting and collating mechanism advances from one printing unit to the others successively and toward the delivery point of the machine, the printed webs will be progressively accumulated upon said tapes, superimposed one upon another with the various printed forms thereon in substantially accurate register.

In the event that the mechanisms of one printing unit feeds its web slightly more rapidly than other units, even though this amount be but one or two thousandths of an inch, this error would gradually accumulate, so that after a few minutes run of the machine, it would be impossible to secure and maintain register of the printed forms upon different webs. To correct possibility of this condition, the platen bars 47 and gripper jaws 48 are provided, these parts ensuring the advance of a definite length of paper with each cycle of each printing unit, which amount will correspond with the amount fed by that unit with each cycle and may vary with different units. Hence, if there be any error, this error will be duplicated upon succeeding cycles of the printing unit, instead of being accumulated. The above conditions can arise only in the event of variances in the makeready of the impression cylinders of different printing units, which can ordinarily be corrected by varying the tautness of the web, the grippers, however, being provided as a precautionary measure to make accuracy of register doubly sure.

The operation of the grippers is apparent from the foregoing description, wherein it is pointed out that the cam 50 adjacent each printing couple, by engagement with the arm 49, will raise the gripper jaw 48 away from the platen bar 47 as this bar is approaching each cylinder 20, this movement of the gripper jaw being sufficient to move it beyond the end of the cylinder 20 and the edge of the web 18 being delivered thereby. Immediately upon leaving the cam 50, the gripper jaw will be automatically closed upon the web adjacent the edge there-

of, the web being thus lightly clamped between the gripper jaw and the platen bar 47. This operation will be the same whether the gripper engages only one or a much greater number of webs as they are being collected and collated. When these grippers engage the web, it is apparent that if the web is fed slightly in excess of the rate of travel of the grippers, the result will be a minute buckling of the paper between a gripper 48 which has passed a delivery mechanism and the delivery point of the cylinder 20 of that mechanism, so that the succeeding gripper as it engages the webs will cause the excess to be fed entirely independently of the cylinder 20 with the effect above referred to as to prevent accumulation of error. It may be stated, however, that if four or five grippers are employed within a distance corresponding with the length of paper fed with each cycle of a printing unit, that the effect above referred to as to each gripper, would be measured by a fraction of a thousandth of an inch and will not be perceptible in the completed form.

As the various webs delivered by the respective printing units beyond the first printing unit, as A, pass about the delivery cylinder 20 of that unit, the pasting wheel 34 will apply a minute quantity of paste to the back of the web so that a temporary bond will be formed between that web and the web immediately below. By positioning the pasting wheel 34 above one of the tapes 46, sufficient pressure will be developed between this tape and the cylinder 20 to secure the desired sealing action.

By spacing the printing units apart upon the main frame 11, a distance substantially equalling the periphery of the plate cylinder upon each of said units, the impressions upon the webs as they are superimposed upon the collecting and collating mechanism, will have the printed matter upon the superimposed webs in substantial register, although any slight difference in the makeready of the different presses and in the set of the plate cylinders when starting a run, may be compensated for by the adjustments above referred to. In a machine embodying my invention, it is possible by a continuing operation, to print independent webs entering into manifold forms arranged in a strip, and to assemble such webs superimposed one upon the other in proper registering relation so as to deliver completely assembled forms having the desired number of sheets, and these sheets may be of the same or different quality, weight or color of paper, and may have the ink impressions thereon of the same or different colors.

When a machine has once been properly adjusted, it may be operated at high speed, without possibility of loss of register in the printing matter upon the superimposed forms.

The tapes 46 are used to prevent sagging of the sheets between the platen bars 47, or to hold the sheets flat while being collected and collated, to avoid error. The use of a collecting and collating mechanism continuously moving from adjacent one printing unit to adjacent other printing units successively, so as to receive the printed webs from each of these units, which webs are deposited upon the webs previously delivered to said mechanism, I have found essential in securing that degree of accuracy of register of the printed matter upon different forms, necessary in forms of the character which a machine of my invention is designed to produce.

It is not my intention, however, to limit the invention to the precise details of construction shown in the accompanying drawings, it being apparent that such may be varied without departing from the spirit and scope of the invention.

It will be readily understood that the main frame 11 of the machine and the collecting and collating mechanism may be made of a length to receive any desired number of printing units, my invention contemplating the possibility of producing forms containing sixteen or even twenty sheets. It is apparent that the increase or decrease in the number of printing units will not in any way modify the mode of operation of a machine.

Having described the invention, what I claim as new and desire to have protected by Letters Patent, is:—

1. A machine for producing manifold forms, embodying therein a sequence of printing units, means whereby independent strips or webs are fed with relation to said units respectively, and a collecting and collating mechanism common to all of said units and having continuous, unidirectional movement in relation thereto and including therein means carried by said mechanism and engaging the printed sheets, whereby corresponding portions thereof are successively brought into the operative relation to succeeding units, and a strip or web delivered by each unit will be conveyed therefrom and brought into operative relation to the strips or webs of succeeding units, to be superimposed thereupon with the blanks thereon in registering relation, and conveyed to the delivery point of the machine.

2. A machine for producing manifold forms, embodying therein a sequence of printing units, each consisting of a rotary printing couple, feed rollers for directing a strip or web between the members of said couple, and delivery rollers adapted to receive the printed strip or web from said couple and feed it in relation to a collecting

and collating mechanism, and a collecting and collating mechanism common to all of said units and having continuous, unidirectional movement in relation thereto, whereby corresponding portions thereof are successively brought into the operative relation to succeeding units, and a strip or web delivered by each unit will be conveyed therefrom and brought into operative relation to the strips or webs of succeeding units, to be superimposed thereupon with the blanks thereon in registering relation, and conveyed to the delivery point of the machine.

3. A machine for producing manifold forms, embodying therein a sequence of printing units, each consisting of a rotary printing couple, feed rollers for directing a strip or web between the members of said couple, delivery rollers adapted to receive the printed strip or web from said couple and feed it in relation to a collecting and collating mechanism, and means whereby said feed rollers may be adjusted with relation to each other to control the tension of the paper web or strip, and a collecting and collating mechanism common to all of said units and having continuous, unidirectional movement in relation thereto, whereby corresponding portions thereof are successively brought into the operative relation to succeeding units, and a strip or web delivered by each unit will be conveyed therefrom and brought into operative relation to the strips or webs of succeeding units, to be superimposed thereupon with the blanks thereon in registering relation, and conveyed to the delivery point of the machine.

4. A machine for producing manifold forms, embodying therein a sequence of printing units, each consisting of a rotary printing couple, feed rollers for directing a strip or web between the members of said couple, delivery rollers adapted to receive the printed strip or web from said couple and feed it in relation to a collecting and collating mechanism, and means whereby one of said delivery rollers may be adjusted circumferentially about another of said rollers, to vary the length of strip or web between the printing couple and the point of the delivery of the strip or web with relation to the collecting and collating mechanism, and a collecting and collating mechanism common to all of said units and having continuous, unidirectional movement in relation thereto, whereby corresponding portions thereof are successively brought into the operative relation to succeeding units, and a strip or web delivered by each unit will be conveyed therefrom and brought into operative relation to the strips or webs of succeeding units, to be superimposed thereupon with the blanks thereon in registering relation, and conveyed to the delivery point of the machine.

5. A machine for producing manifold forms, embodying therein a sequence of printing units, each consisting of a rotary printing couple, feed rollers for directing a strip or web between the members of said couple, delivery rollers adapted to receive the printed strip or web from said couple and feed it in relation to a collecting and collating mechanism, means whereby said feed rollers may be adjusted with relation to each other to control the tension of the paper web or strip, and means whereby one of said delivery rollers may be adjusted circumferentially about another of said rollers, to vary the length of strip or web between the printing couple and the point of the delivery of the strip or web with relation to the collecting and collating mechanism, and a collecting and collating mechanism common to all of said units and having continuous, unidirectional movement in relation thereto, whereby corresponding portions thereof are successively brought into the operative relation to succeeding units, and a strip or web delivered by each unit will be conveyed therefrom and brought into operative relation to the strips or webs of succeeding units, to be superimposed thereupon with the blanks thereon in registering relation, and conveyed to the delivery point of the machine.

6. A machine for producing manifold forms, embodying therein a sequence of printing units including a rotary printing couple, a driving mechanism common to all of said printing units, whereby the several printing couples will be actuated at substantially uniform angular speed means whereby independent strips or webs are fed with relation to said units respectively, and a collecting and collating mechanism common to all of said units and having continuous unidirectional movement in relation thereto, whereby corresponding portions thereof are successively brought into the operative relation to succeeding units, and a strip or web delivered by each unit will be conveyed therefrom and brought into operative relation to the strips or webs of succeeding units, to be superimposed thereupon with the blanks thereon in registering relation, and conveyed to the delivery point of the machine.

7. A machine for producing manifold forms, embodying therein a sequence of printing units including a rotary printing couple, a worm shaft having a worm section adjacent each printing unit, a worm gear carried by each unit and meshing with the adjacent worm section, a gear train transmitting power from said worm wheel to the printing couple of said unit, means whereby independent strips or webs are fed with relation to said units respectively, and a collecting and collating mechanism com-

mon to all of said units and having continuous, unidirectional movement in relation thereto, whereby corresponding portions thereof are successively brought into the operative relation to succeeding units, and a strip or web delivered by each unit will be conveyed therefrom and brought into operative relation to the strips or webs of succeeding units, to be superimposed thereupon with the blanks thereon in registering relation, and conveyed to the delivery point of the machine.

8. A machine for producing manifold forms, embodying therein a sequence of printing units, each consisting of a rotary printing couple, feed rollers for directing a strip or web between the members of said couple, and delivery rollers adapted to receive the printed strip or web from said couple and feed it in relation to a collecting and collating mechanism, a worm shaft having a worm section adjacent each printing unit, a worm gear carried by each unit and meshing with the adjacent worm section, a gear train transmitting power from said worm wheel to the printing couple and the feed rollers of said unit, and a collecting and collating mechanism common to all of said units and having continuous unidirectional movement in relation thereto, whereby corresponding portions thereof are successively brought into the operative relation to succeeding units, and a strip or web delivered by each unit will be conveyed therefrom and brought into operative relation to the strips or webs of succeeding units, to be superimposed thereupon with the blanks thereon in registering relation, and conveyed to the delivery point of the machine.

9. A machine for producing manifold forms, embodying therein a main frame, a sequence of independent printing units removably mounted thereon at equal distances apart, the distance between said units being approximately coincident with the periphery of the plate cylinder with the plates thereon, means whereby independent strips or webs are fed with relation to said units respectively, and a collecting and collating mechanism common to all of said units and having continuous, unidirectional movement in relation thereto, whereby corresponding portions thereof are successively brought into the operative relation to succeeding units, and a strip or web delivered by each unit will be conveyed therefrom and brought into operative relation to the strips or webs of succeeding units, to be superimposed thereupon with the blanks thereon in registering relation, and conveyed to the delivery point of the machine.

10. A machine for producing manifold forms, embodying therein a sequence of printing units, means whereby independent strips or webs are fed with relation to said units respectively, a conveyor mechanism extending adjacent and below all of said printing units, means whereby said conveyor mechanism has rectilineal, unidirectional movement imparted thereto at a speed coinciding with the angular speed of the printing couple, whereby corresponding portions thereof are successively brought into the operative relation to succeeding units, and a strip or web delivered by each unit will be conveyed therefrom and brought into operative relation to the strips or webs of succeeding units, to be superimposed thereupon with the blanks thereon in registering relation, and conveyed to the delivery point of the machine.

11. A machine for producing manifold forms, embodying therein a sequence of rotary printing units, means whereby independent strips or webs are fed with relation to said units respectively, conveyor chains located at opposite ends of the printing units, spaced grippers thereon extending towards the printing unit, means adjacent each printing unit for elevating the gripper as it approaches each unit, to a position at one side of the printing units and permitting the gripper to descend into engagement with a web adjacent the edge thereof, after passing said unit, and means whereby said chains have rectilineal, unidirectional movement imparted thereto at a speed coinciding with the angular speed of the printing couple, whereby corresponding portions thereof are successively brought into the operative relation to succeeding units, and a strip or web delivered by each unit will be conveyed therefrom and brought into operative relation to the strips or webs of succeeding units, to be superimposed thereupon with the blanks thereon in registering relation, and conveyed to the delivery point of the machine.

12. A machine for producing manifold forms, embodying therein a sequence of rotary printing units, means whereby independent strips or webs are fed with relation to said units respectively, conveyor chains located at opposite ends of the printing units, spaced platen bars extending from one of said chains to the other, a gripper provided at one end of each platen bar and having a jaw extending towards the printing unit adapted to engage said platen bar, and a short arm for actuating said jaw, a cam in the path of movement of said short arm and adjacent each printing unit for elevating the gripper as it approaches each unit, to a position at one side of the printing units and permitting the gripper to descend into engagement with a web adjacent the edge thereof, after passing said unit, and means whereby said chains have rectilineal, unidirectional movement imparted thereto at a speed coinciding with

the angular speed of the printing couple, whereby corresponding portions thereof are successively brought into the operative relation to succeeding units, and a strip or web delivered by each unit will be conveyed therefrom and brought into operative relation to the strips or webs of succeeding units, to be superimposed thereupon with the blanks thereon in registering relation, and conveyed to the delivery point of the machine.

13. A machine for producing manifold forms, embodying therein a sequence of rotary printing units, means whereby independent strips or webs are fed with relation to said units respectively, conveyor chains located at opposite ends of the printing units, endless tapes intermediate said chains, spaced grippers on said chains extending towards the printing unit, means adjacent each printing unit for elevating the gripper as it approaches each unit, to a position at one side of the printing units and permitting the gripper to descend into engagement with a web adjacent the edge thereof, after passing said unit, and means whereby said chains have rectilineal, unidirectional movement imparted thereto at a speed coinciding with the angular speed of the printing couple, whereby corresponding portions thereof are successively brought into the operative relation to succeeding units, and a strip or web delivered by each unit will be conveyed therefrom and brought into operative relation to the strips or webs of succeeding unit, to be superimposed thereupon with the blanks thereon in registering relation, and conveyed to the delivery point of the machine.

14. A machine for producing manifold forms, embodying therein a sequence of printing units, means whereby independent strips or webs are fed with relation to said units respectively, a collecting and collating mechanism common to all of said units and having continuous, unidirectional movement in relation thereto, whereby corresponding portions thereof are successively brought into the operative relation to succeeding units, and a strip or web delivered by each unit will be conveyed therefrom and brought into operative relation to the strips or webs of succeeding units, to be superimposed thereupon with the blanks thereon in registering relation, and conveyed to the delivery point of the machine, and a pasting mechanism adjacent some of said printing units whereby said strips or webs will have adhesive applied to the surface thereof intermediate the side edges before being delivered to said last named mechanism.

15. A machine for producing manifold forms, embodying therein a sequence of printing units, each consisting of a rotary printing couple, feed rollers for directing a strip or web between the members of said couple, and delivery rollers adapted to receive the printed strip or web from said couple and feed it in relation to a collecting and collating mechanism, a collecting and collating mechanism common to all of said units and having continuous, unidirectional movement in relation thereto, whereby corresponding portions thereof are successively brought into the operative relation to succeeding units, and a strip or web delivered by each unit will be conveyed therefrom and brought into operative relation to the strips or webs of succeeding units, to be superimposed thereupon with the blanks thereon in registering relation, and conveyed to the delivery point of the machine, a paste trough adjacent one of said delivery rollers of some of said printing units, a shaft rotating in synchronism with said roller, and a paste wheel upon said shaft and adapted to engage a strip or web passing about said roller whereby said strips or webs will have adhesive applied to the surface thereof intermediate the side edges before being delivered to said last named mechanism.

16. A machine for producing manifold forms, embodying therein a sequence of printing units, each consisting of a rotary printing couple, feed rollers for directing a strip or web between the members of said couple, and delivery rollers adapted to receive the printed strip or web from said couple and feed it in relation to a collecting and collating mechanism, a collecting and collating mechanism common to all of said units and having continuous, unidirectional movement in relation thereto, whereby corresponding portions thereof are successively brought into the operative relation to succeeding units, and a strip or web delivered by each unit will be conveyed therefrom and brought into operative relation to the strips or webs of succeeding units, to be superimposed thereupon with the blanks thereon in registering relation, and conveyed to the delivery point of the machine, a paste trough adjacent one of said delivery rollers of some of said printing units, a shaft rotating in synchronism with said roller, and a paste wheel upon said shaft and adapted to engage a strip or web passing about said roller whereby said strips or webs will have adhesive applied to the surface thereof intermediate the side edges before being delivered to said last named mechanism, and means whereby said wheel may be adjusted longitudinally of said shaft to vary the portion of the surface of the strip or web to which the adhesive is applied.

In witness whereof I have hereunto affixed my signature this 8th day of January, 1923.

RALPH C. STEVENSON.