Feb. 2, 1932. J. A. BOYCE 1,843,441

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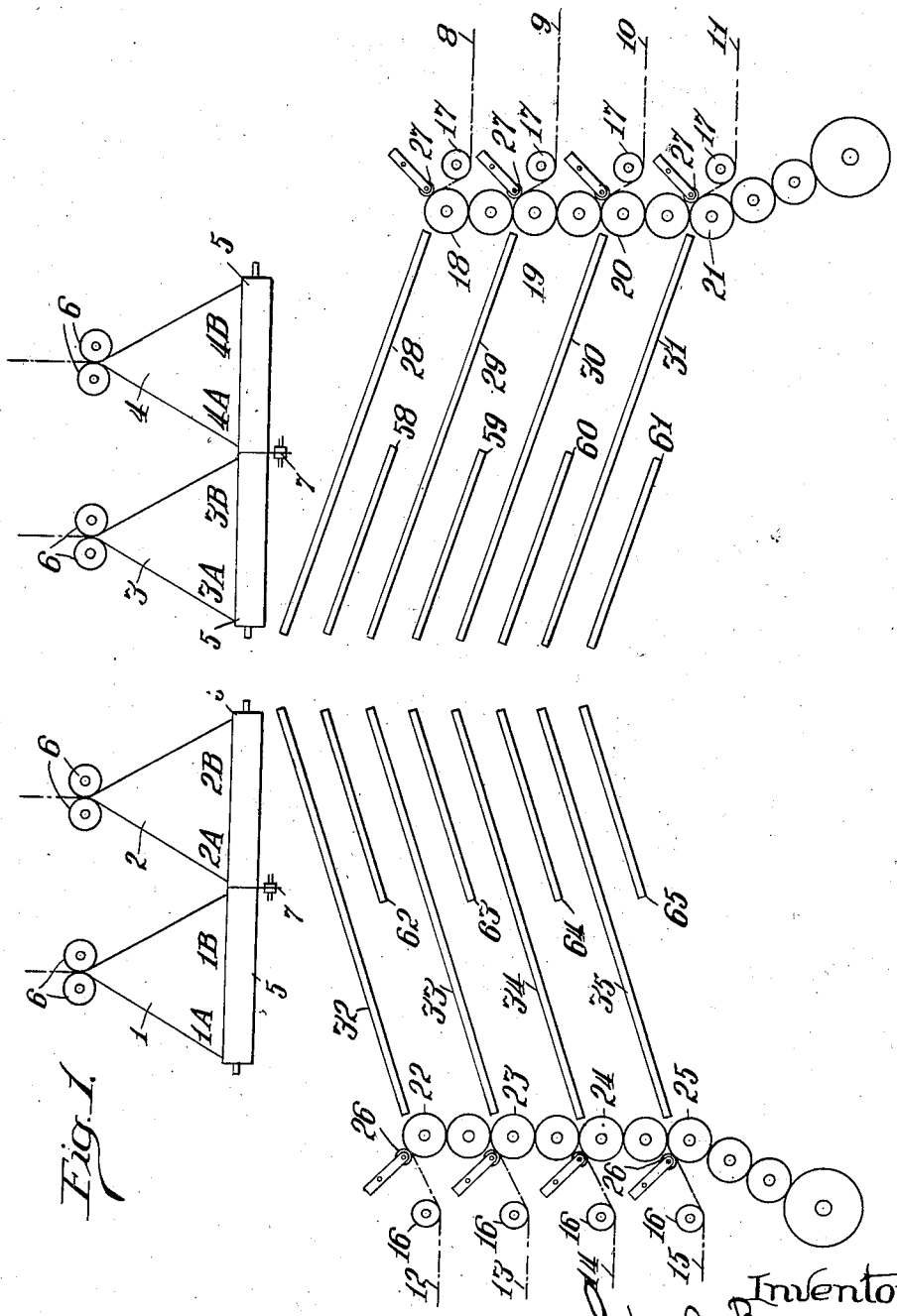


Fig. 1.

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Fig. 2.

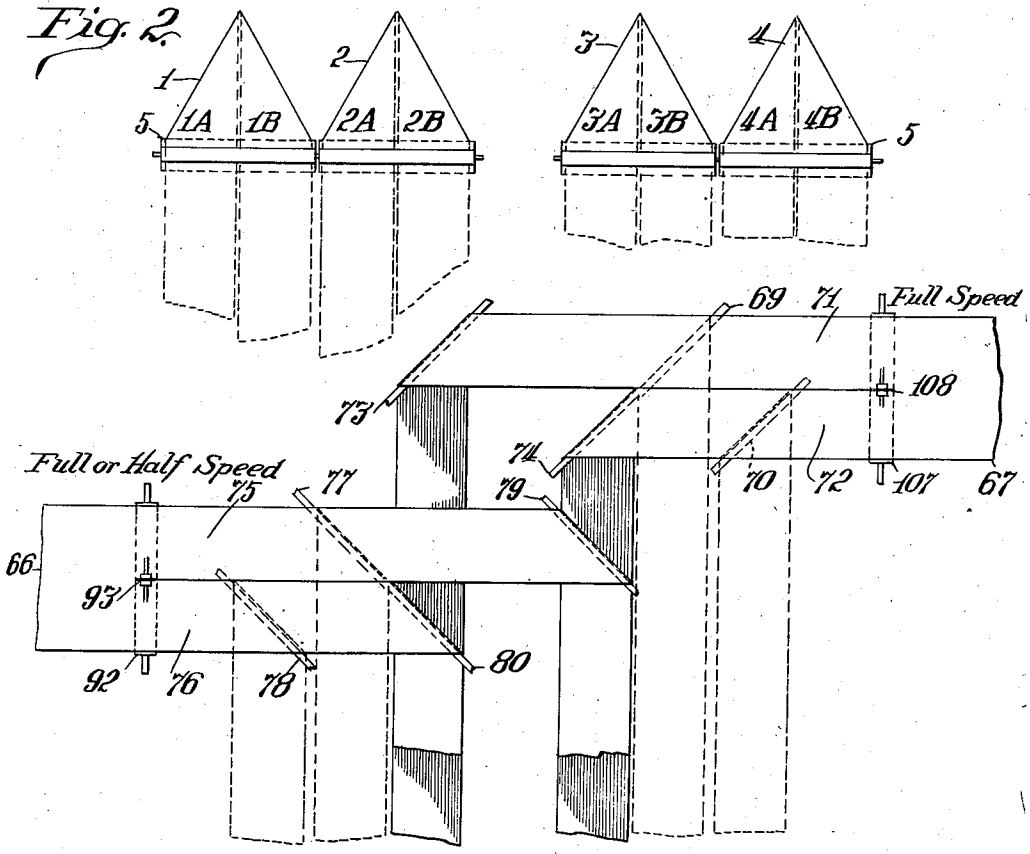
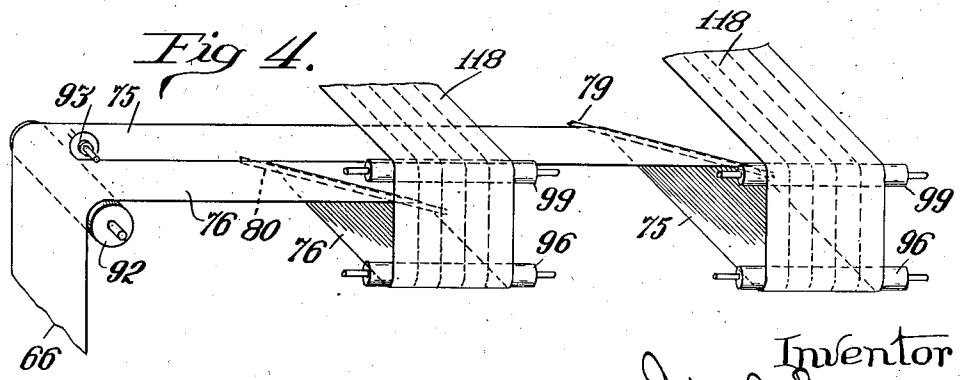


Fig 4.



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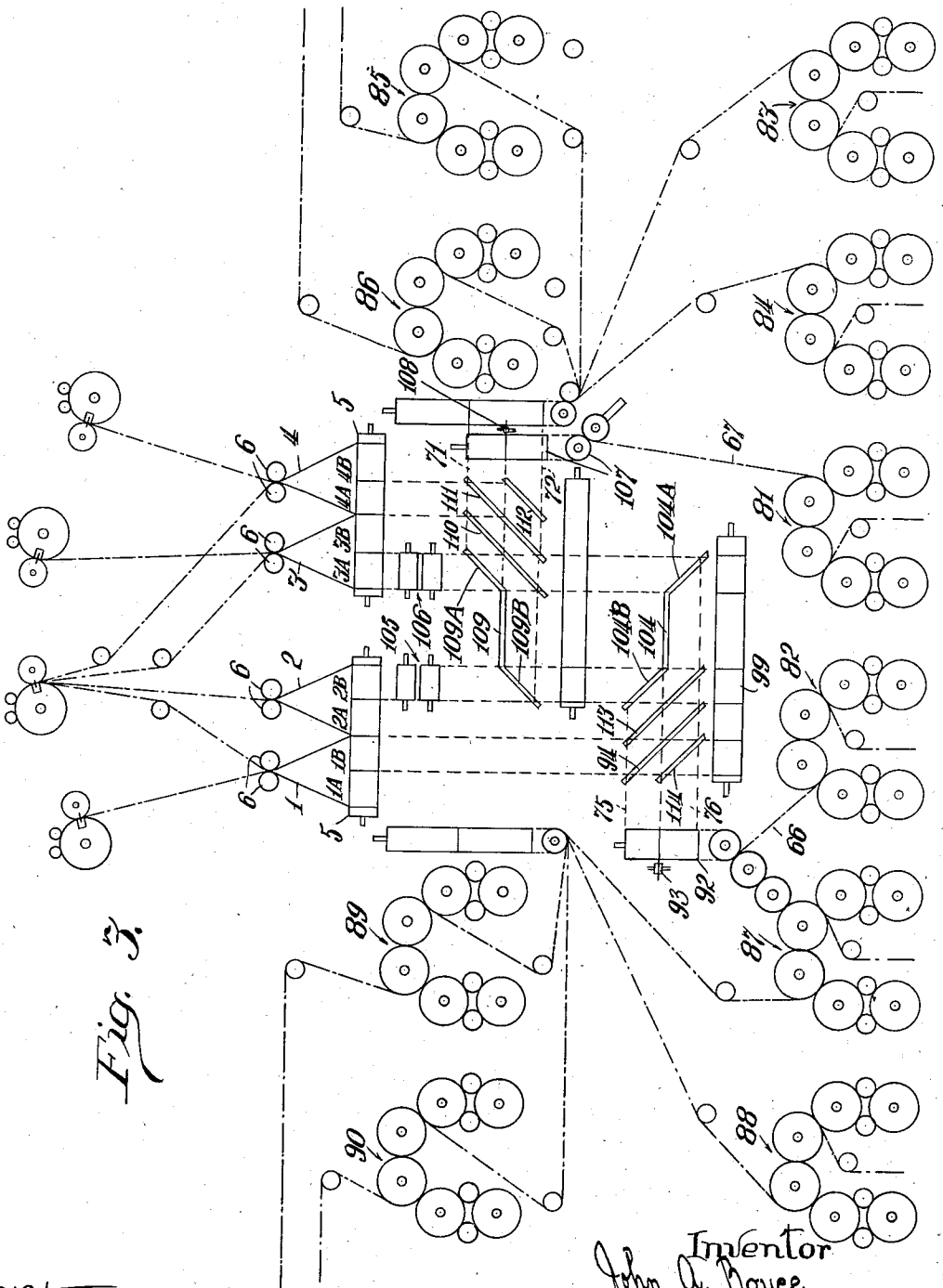


Fig. 3.

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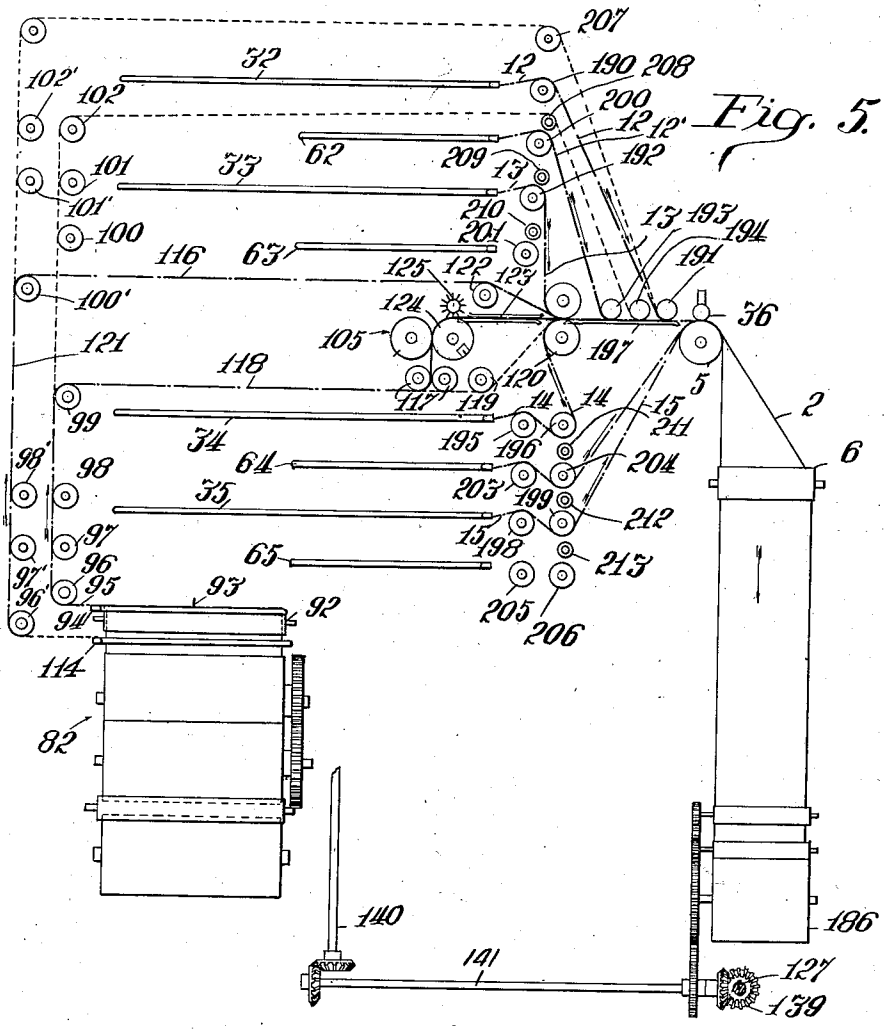
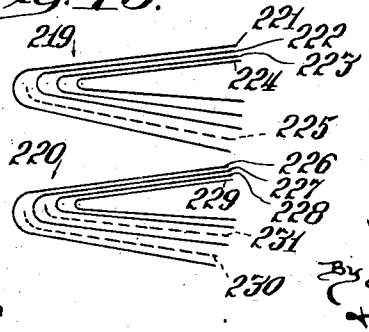


Fig. 5.

Fig. 13.



38 Pages

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Fig. 6.

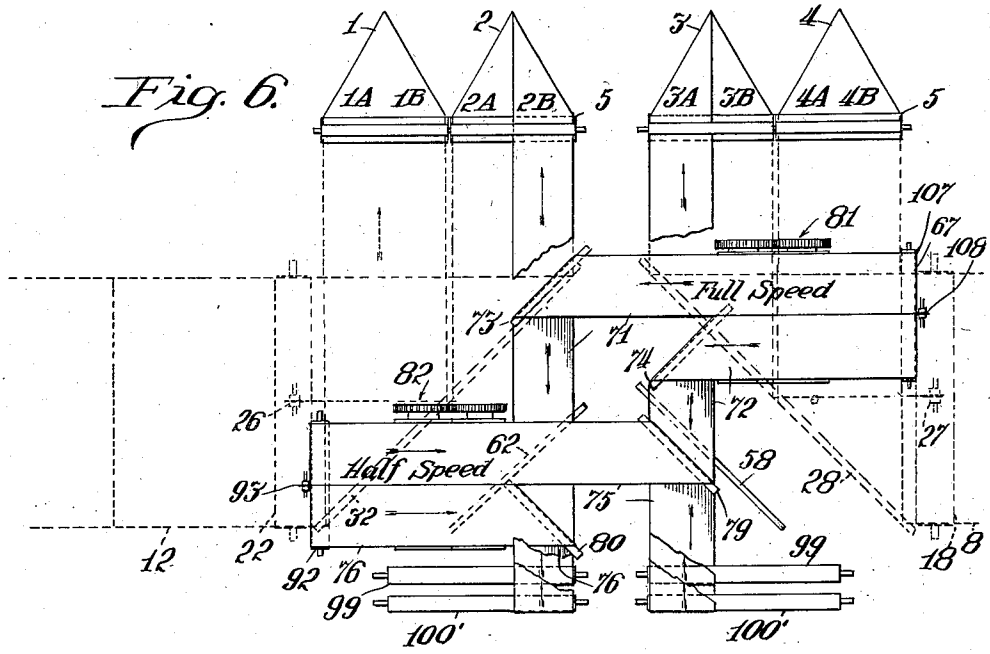
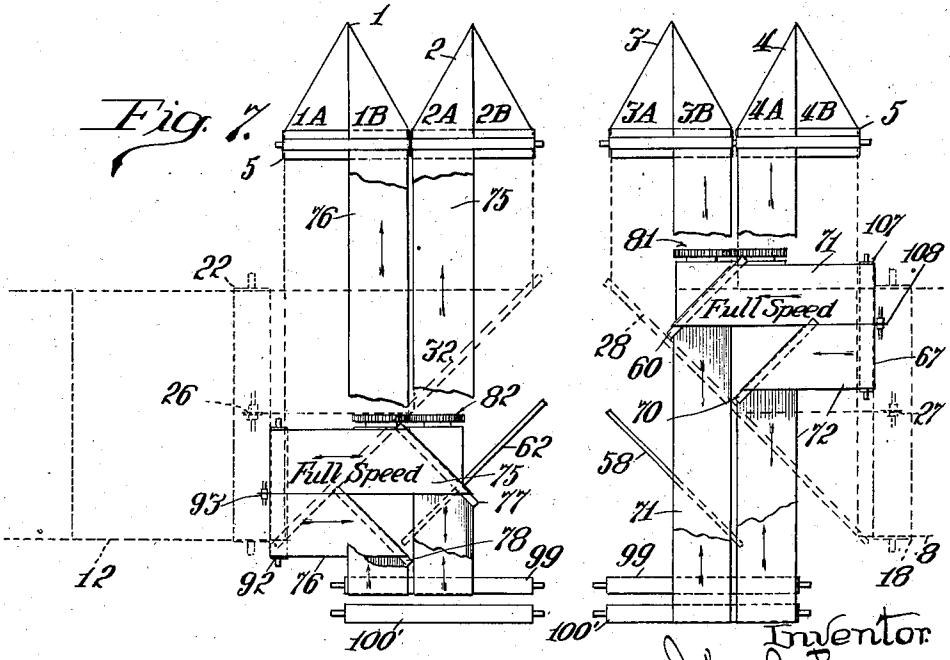


Fig. 7.



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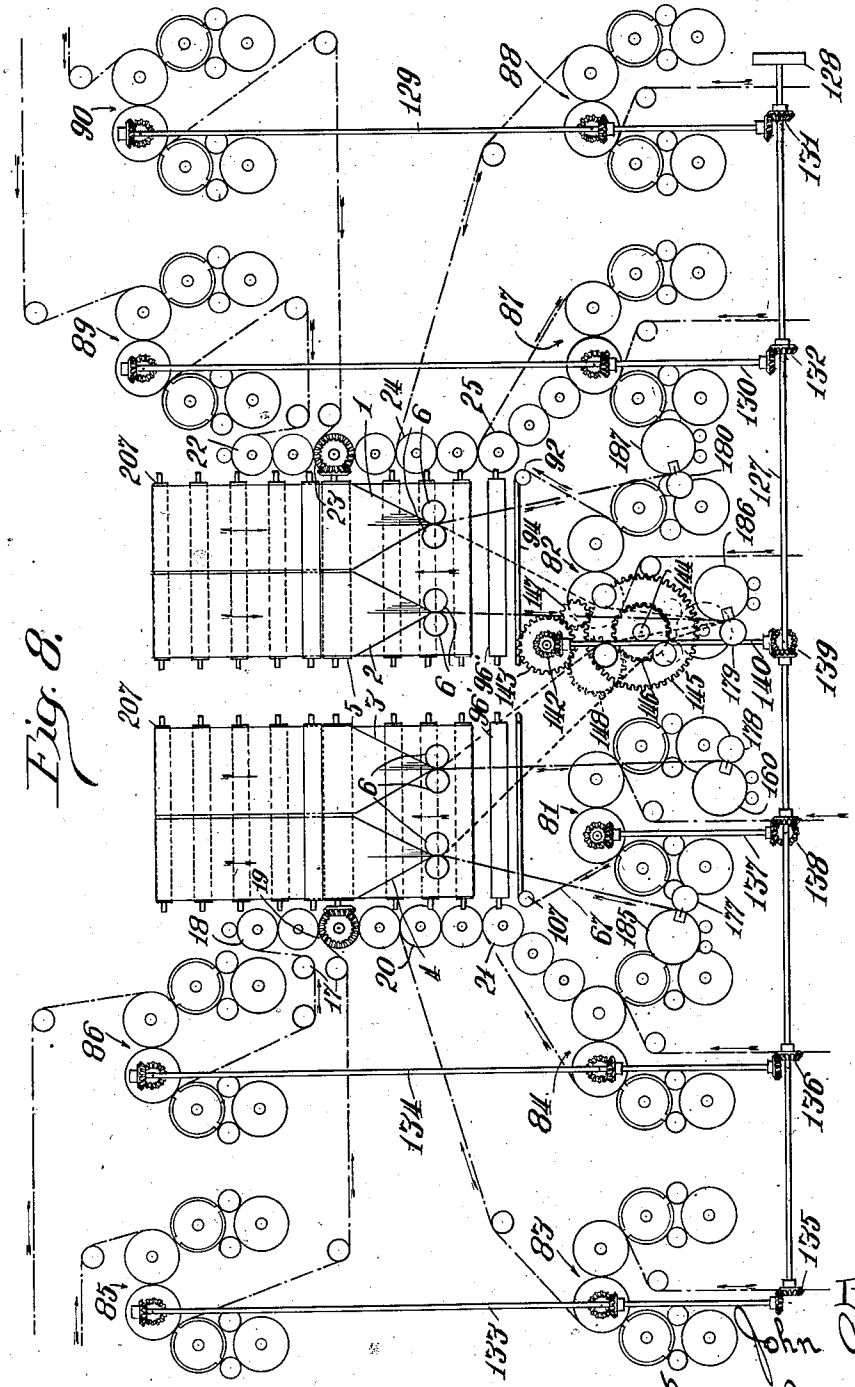


Fig. 8.

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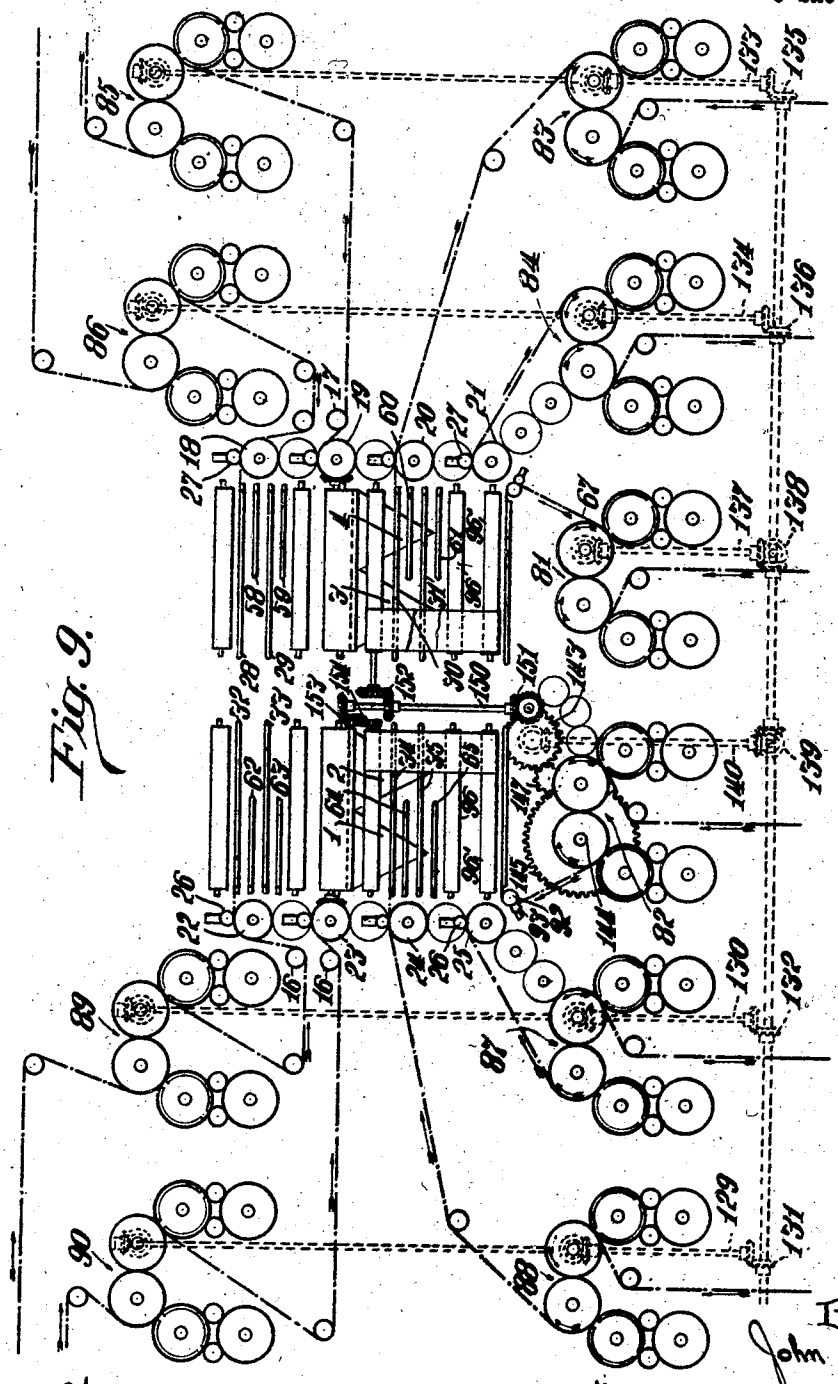


Fig. 9.

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Fig. 10.

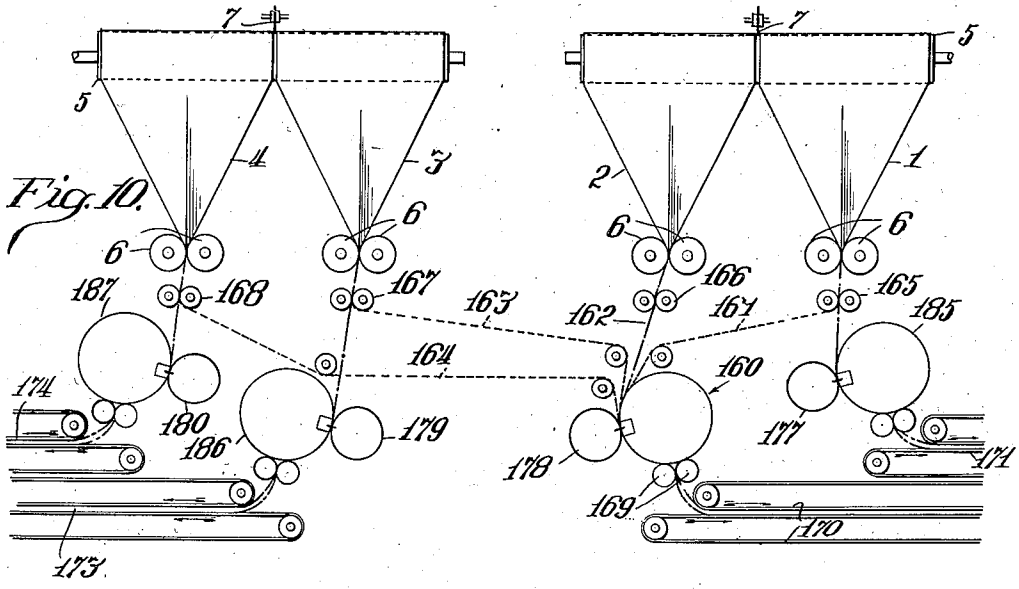
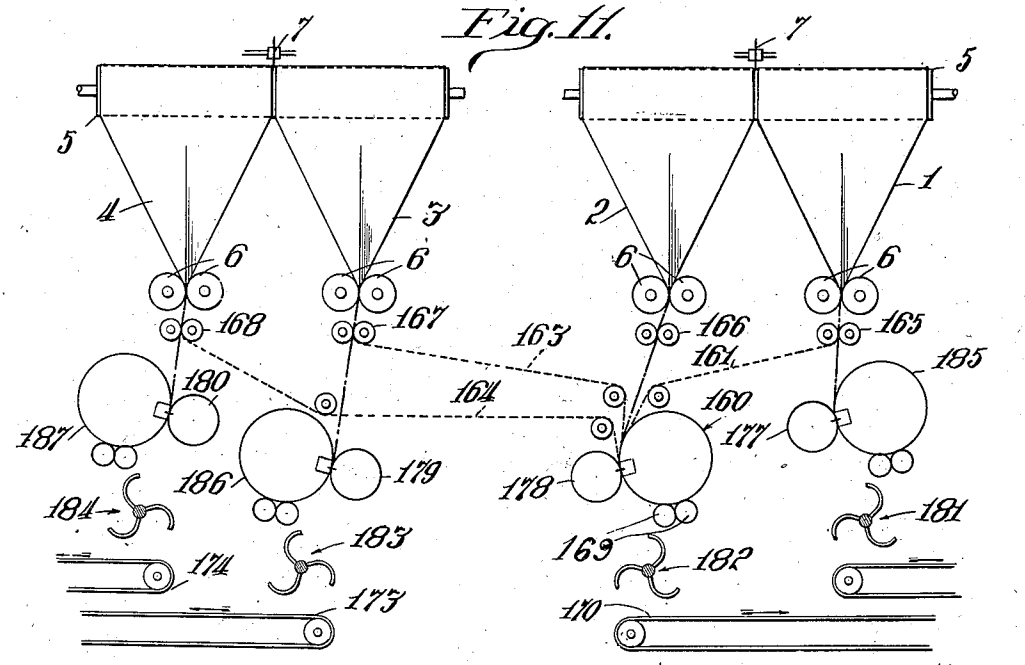


Fig. 11.



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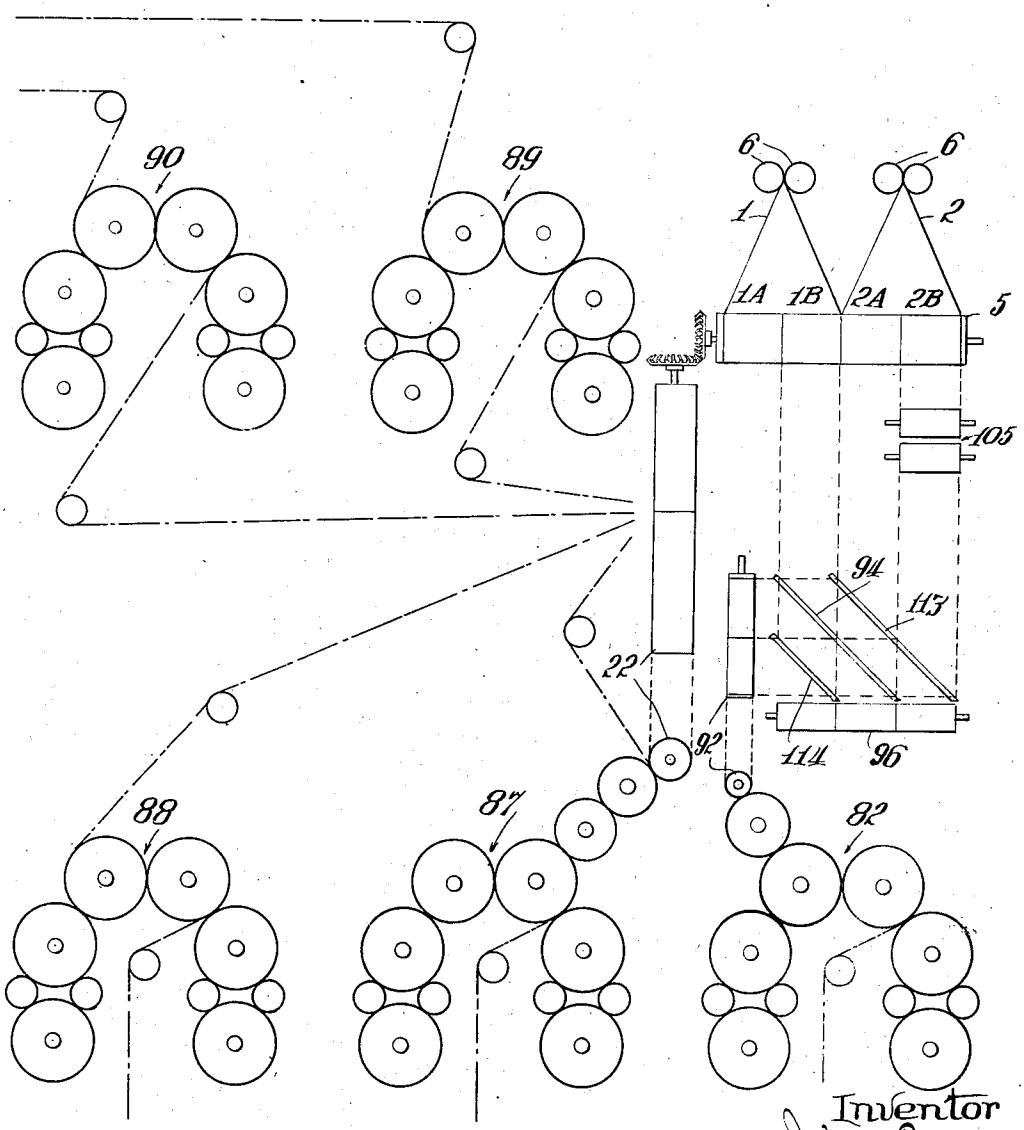
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Fig. 12.



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UNITED STATES PATENT OFFICE

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PRINTING PRESS

Application filed March 22, 1929. Serial No. 349,146.

My invention relates to machines for printing, associating, inserting, folding, and collecting the constituent parts of a newspaper or the like.

The general requirements of a press of the type to which this invention relates is a machine which is capable of turning out a product of the maximum number of pages, or any less number of pages in minimum time. It is desirable that the machine be so constructed and organized as to give the maximum of utility in producing a product of any desired number of pages within its capacity and with as wide a variety of structure or makeup of the product as may be desired and at the same time be readily convertible from one set-up to another.

It can be seen that the larger the maximum number of pages of the product which the machine is capable of producing the greater will be the complications in securing the various permutations within the maximum output.

Since a newspaper is essentially the publication of recent events the factor of time in producing the paper is of the greatest importance. If changing the set-up of the machine is difficult or time consuming, or if the rate of production of papers is low, the machine does not satisfy the requirements of modern conditions.

Now it is the object of the present invention to provide a machine which while capable of large maximum number of pages in its product or output is nevertheless simple in structure and flexible in adjustment or set-up for all products coming within its possible maximum output. In brief, I aim to provide a mechanism which is as simple as possible to get the desired range and character of product by using the same part in as many different ways as possible to get the desired results. Considered, therefore, from the standpoint of the broad problem of what the machine should do and the general line of attack, that is, to employ the elements of the machine in a maximum number of useful permutations and combinations, the specific problem is to devise the form of elements in the combination machine which will be capable of readily and satisfactorily entering into the required number of set ups to secure the desired range of product in as simple a manner as possible.

In looking to the attainment of the aforesaid broad objects I have, according to the present invention, adopted as the preferred form a number of main printing mechanisms all operating at full speed, a pair of supplement printing mechanisms, one of which is operated at full speed and the other of which may be operated optionally at full speed or at half speed. Associated with the above printing mechanisms for perfecting the webs are rollers, web slitters, angle bars, formers, collectors, folders, and the like, as will more fully appear later.

The printing units or mechanisms are provided with plate cylinders two pages in circumference with columns extending circumferentially and adapted to perfect both sides of continuously moving webs. The main web perfecting units are preferably four pages wide whereas the supplement perfecting units are only one or two pages wide, preferably the latter.

I provide two pairs of formers all located side by side at the central part of the machine, these formers leading off laterally and being disposed at the side of the main frame of the machine. The main frame of the machine supports at the central part the two supplementary web perfecting units which are, therefore, nearest the formers.

The main web perfecting units are disposed in the main frame in parallelism with the supplement perfecting units on opposite sides of the latter, that is to say, the supplement perfecting units are disposed between the main units. The main units may be mounted on several decks and the supplement perfecting units are preferably mounted on the lower or bottom level of the machine.

By the provision of sets of angle bars and rollers or straight bars together with slitters the webs from all of the perfecting units may be suitably associated on the formers to secure the desired product. Beyond the formers I provide suitable mechanism for cutting

and folding the product of the formers singly or collectively. Additional mechanism below the formers may be employed for associating or collecting all or a part of the product of the formers, as will be readily apparent to those skilled in the art.

The supplement perfecting units which are, as above noted, preferably one or two pages wide are preferably disposed in line with respect to each other and the rollers and angle bars disposed at different levels so that the webs therefrom may conveniently pass each other and at the same time be distributed in line with the formers, as may be desired.

For the purpose of inserting the sheets provided by the half speed perfecting unit, cutting and inserting devices are provided preferably one in line with the inner halves of the control pair of formers so that single sheets of two printed pages may be inserted into alternate sections of the web passing over the corresponding former.

The group of angle bars and straight bars or rollers provides two distinct major functions. The first function is to change the direction of run of the webs. The angle bars change the direction edgewise, generally to control direction of run and the straight bars, or rollers, change the direction flatwise, generally to control the level of the run of the webs. The second major function is to provide convenient means for permitting the insertion of a web or to control its position with respect to the other webs in the final product. That is to say, by turning all of the webs before they pass on to the formers an opportunity is given to insert the supplement webs at any desired position even though the perfecting units have their operating shafts all in parallelism.

The machine employs cutting and assembling or collecting mechanism below the formers preferably of standard or conventional type to assemble, associate or collect the product of the formers.

A modified form of my invention may be constructed by utilizing only one of the supplement perfecting units and the main units of one end of the machine. In other words, the single end of the machine employing the supplement perfecting units operable at either full speed or half speed constitute a complete machine capable of successfully producing a wide variety of products. The modified machine is thus a single end machine corresponding to one-half of the large or complete machine.

The machine of my invention provides a press suitable for printing metropolitan newspapers and having a number of distinct advantages over known machines, among others being the following:

1. The machine of the present invention will print and fold a multiple of two pages up to the full capacity of the machine without any idle perfecting units. It is able to print and fold more products without idle perfecting units than any machine known to me.

2. It provides an improvel arrangement of the main turners cooperating with the formers.

3. The location of the two page wide half speed and full speed supplement perfecting webs back of the formers provides a marked improvement.

4. The provision of the supplement angle bars cooperating with the aforesaid supplement perfecting units and the four formers is novel and highly advantageous.

5. The two pairs of formers disposed close to the floor line having their noses in a straight line provide a feature of novelty and advantage.

6. The machine is compact and easy to set up and operate. The change for different sized newspapers can be made quickly. This makes for an increased rate of production.

The present machine embodies the concept of delivering papers in multiple to as great an extent as is possible. That is to say, I have conceived the possibility of keeping the printing couples busy their full width whenever they are used and doing this by operating in multiple in order to occupy the capacity of the machine, particularly where a product consists of a number of printed pages considerably less than the maximum.

Now in order to acquaint those skilled in the art with the manner of constructing and operating my invention, I shall describe in connection with the accompanying drawings a specific embodiment of the same.

In the drawings:

Figure 1 is a diagram of web forwarding devices, turning bar and formers showing the means for associating the main webs upon the formers in various combinations;

Figure 2 is a similar diagram illustrating how the supplement webs may be aligned with and delivered upon the desired ones of the formers;

Figure 3 is a diagram partly in side elevation and partly in plan showing particularly the manner of aligning the supplement webs with the formers and indicating the general location of some of the parts;

Figure 4 is a partial perspective to illustrate the mode of slitting, turning and inserting one of the supplement webs;

Figure 5 is a fragmentary end view of the turning bars for the main webs of one end of the machine, the supplement web perfecting unit capable of operation at half speed and the half speed web cutter;

Figures 6 and 7 are plan views of the supplement web forwarding devices under different conditions of use;

Figure 8 is a diagrammatic front view of the machine of my invention;

Figure 9 is a like rear view;

Figure 10 is a front view of the formers, collectors and conveyors;

Figure 11 is a like view showing the use of group collectors and delivery and counting devices and conveyors;

Figure 12 is a diagrammatic view like Figure 3 of a single end machine of my invention; and

Figure 13 is a diagram showing how a 38 page newspaper may be produced by the machine of my invention.

Referring now to Figure 1, I shall explain the general relation of the turning bars and formers for the main webs.

Formers and main web turners

I provide four formers, 1, 2, 3, and 4. While in Figure 1 these formers are shown as extending horizontally, it will be understood that they lead downwardly to fold a web two pages wide along the central margin.

These formers have at their upper ends pulling rolls 5, 5 preferably cooperating with spring pressed or loaded follower rolls, such as 36 shown in Figure 5, for pulling the webs and delivering the same in line upon the formers 1, 2, 3 and 4.

Below the formers, that is, immediately below the noses of the same, I provide pairs of pulling rollers 6, 6, for pulling the folded web and forwarding the same downwardly. Slitting knives 7, 7 may be provided in conjunction with the pulling and forwarding rolls 5, 5 where, as will be described later, the four page wide webs are turned on the longer turning bars. This is optional as the webs may be slitted before they are turned.

Web perfecting devices, not shown in Figure 1 but later explained, perfect webs four pages wide, the printing couples having columns around and perfecting both sides of the webs, four such couples being disposed to the right and furnishing webs 8, 9, 10 and 11, and four similar couples being disposed at the left of Figure 1 and furnishing perfected webs 12, 13, 14 and 15. These webs are directed over or under suitable guide rollers, such as indicated at 16 at the left and 17 at the right, and then the webs are passed over rollers 18, 19, 20 and 21 at the right and 22, 23, 24 and 25 at the left. These latter groups of rollers may have slitting knives cooperating therewith, as indicated at 26 at the left and 27 at the right, for slitting the main webs before they are delivered on to the turning bars and then turned on to the formers.

I have shown as between the forwarding rollers 18, 19, 20 and 21 on the right and 22, 23, 24 and 25 on the left and back of the formers 1, 2, 3, 4, groups of bars consisting of main full length bars 28, 29, 30 and 31 at the right and 32, 33, 34 and 35 at the left. These full length bars are for the purpose of turning the main webs either slitted or unslitted and delivering them to the forwarding rollers 5 and on to the formers. It is to be observed that the formers are arranged in pairs with suitable space between the pairs the virtue of which will appear more at length later.

In addition to the full length bars there are half length bars disposed respectively on the same levels as the corresponding full length bars, namely, the bars 58, 59, 60 and 61 at the right, and similar short bars 62, 63, 64 and 65 similarly disposed with respect to the long bars at the left.

When the webs such as 12, 13, 14 and 15 are to be turned and guided onto the formers 1 and 2, they are trained over the full length bars. If the webs are to be slit and the resulting two page wide webs are to be guided onto the former 2 then the one web is turned upon the end of the long bar such as 32 which is nearest the former 2 and the other web is turned over the short bar such as the bar 62.

Now by reference to the dotted line showing of the main webs in Figures 6 and 7 the function of these long and short bars will more fully appear. In Figure 6 the full width or main web 12 is shown as extending over the forwarding roller 22 and being slit by the slitter 26, the lower half of the web then turning on the lower end of the long bar 32 and being delivered in line with the former 1 and the upper half being turned on the upper end of the long bar 32 as indicated in the dotted lines in Figure 6. This part of the web is then delivered in line with the former 2. I speak of these webs being delivered in line with the formers; this means in register but not necessarily upon the same level, since the webs may readily be guided up or down as required, in the present case down, in order to arrive upon the pulling and forwarding rolls 5, 6 of the formers. If the full width web 12 were to be delivered and slit upon the forwarding roll 5, the full width web would be turned on the single long bar 32. If the web is slitted at the slitter 26 both halves may be delivered onto former 2 by passing the upper half around the upper part of bar 32 and the lower half of the web around the short bar 62 and onto former 2. The same is true of the other webs 13, 14 and 15 on the same side as web 12. Likewise the webs 8, 9, 10 and 11 may be turned onto formers 3 and 4.

It will presently be apparent that while the main webs are given a quarter turn and either raised or lowered to run onto the formers, the supplement webs are given a quarter turn in the opposite direction, i. e., away from the formers and are then brought up and led for-

ward at any desired level to permit insertion between the main webs on the formers.

Supplement web turning bars

In Figure 2 I have indicated the formers 1, 2, 3, 4, and the supplement webs 66 and 67. While these webs 66 and 67 are shown in Figs. 2, 3, 6 and 7 as out of register for the sake of clearness, it is to be borne in mind that in the machine the perfecting units are preferably in line with each other lengthwise of the machine. This provides a space back of the former where workmen can operate and pass freely. The web 67 is perfected by a full speed supplement perfecting mechanism or unit two pages wide with columns around and the web is delivered at full speed. The web 66 is perfected on a unit which may be operated either at half speed or at full speed, this web likewise being preferably two pages wide and the printing cylinders having columns lying around. It is desired to be able to slit these webs into single page wide webs and deliver the single page wide webs upon the former halves 1B, 2A, 2B, 3A, 3B and 4A. Since the slitted webs of single page width are to be used only in conjunction with webs two pages wide, it is not necessary that the single width webs be delivered upon the outer halves, that is on the left half of former 1, nor the right half of former 4, but it is desirable that these single width webs be deliverable upon the right half of former 1 and the left half of former 4, or upon either right or left half of formers 2 and 3.

To provide this possibility I furnish turning bars 69 and 70 for delivering the slitted single width webs 71 and 72, resulting from slitting of the web 67, on to the right half of former 3 and the left half of former 4.

Likewise, I provide a pair of bars 73 and 74 for delivering the single width webs 71 and 72 upon the right half of former 2 and the left half of former 3, respectively.

In conjunction with the supplement web 66 which is slit into two single page width webs 75 and 76 I provide a pair of angle bars 77 and 78 for delivering the webs 75 and 76, respectively, on to the left half of former 2 and the right half of former 1, respectively. Likewise, I provide a pair of angle bars 79 and 80 for delivering the single page width webs 75 and 76 on to the left half of former 3 and the right half of former 2, respectively.

While I have shown short bars arranged in pairs for turning the single page width webs, it is to be understood that bars of a width suitable to turn the two page wide webs, such as 66 and 67, may be employed instead. That is to say, it may be desirable to lay a full width web from either supplement web perfecting unit on to either or both of the inner formers 2 and 3. To this end I have shown in Figure 3 the preferred arrangement of bars which will be explained presently.

Location of the supplement width perfecting units

The two supplement width perfecting units indicated as to position in Figures 8 and 9 are indicated generally by the reference numerals 81 and 82, the units 82 being capable of operation either at full speed or half speed and the unit 81 being capable of operation at full speed only.

As viewed from the front of the machine (Figure 8) the main web perfecting units at the left comprise the two units 83 and 84 on the lower level and the two units 85 and 86 on the upper level. These units have plate cylinders with columns lying around, two printed pages in circumference and four pages wide.

Likewise at the left there are two main web perfecting units 87 and 88 at the lower level and two units 80 and 90 at the upper level, also operating at full speed on webs four pages wide, the plate cylinders having columns lying around and being two printed pages in circumference.

The supplement perfecting units 81 and 82 lie at the central part of the machine back of and at a lower level than the formers 1, 2, 3, 4. It may be observed that the webs issuing from the web perfecting units, both main and supplemental, must be turned at right angles to register with the formers. Now whereas the main webs are turned on the turning bars, as illustrated in Figure 1 diagrammatically and in dotted lines on Figures 6 and 7, the main web turners are located at a higher level than the web turners for the supplement web perfecting devices.

The reason for this is that the supplement webs are to be inserted at different points, that is between different pairs of webs, and in order to get the supplement webs clear of the main webs these supplement webs are turned at a lower level toward the rear then conveyed upwardly to the desired level between any pair of main webs and then led forward in the desired place between main webs and passed on to the formers.

Now the manner in which this turning to the rear, raising and then bringing forward of the supplement webs is brought about will be better understood from the diagram of Figure 3 and Figures 5, 6 and 7. Referring first to Figure 5, which shows the supplement perfecting units 82 that may be operated either at half speed or at full speed, the web is delivered upwardly from the printing couples over a roller 92 which has its axis parallel to the axes of the printing couples of the units 82. The webs may here be slitted as by means of a cutter indicated at 93, although if desired the slitting may occur at a higher level, as will be apparent

later. The web is then turned upon angle bar 94 and led toward the rear, as indicated at 95, and then passed under a roller 96 and led upwardly.

There are a series of rollers 96 to 102, inclusive, all parallel to each other and of a width suitable to deliver the supplement web from the supplement web perfecting unit 82 on to the two middle formers 2 and 3 and the right side of former 1 and the left side of former 4.

Thus by means of a roller such as 92 parallel to the shaft of the printing couple 82 an angle bar at 45° to that axis and a roller at right angles to the axis of the printing couples the web has been turned to the rear and directed upwardly. The web may then be taken off at any level corresponding to the rollers 97 to 102, inclusive.

Similar sets of rollers and angle bars are provided for the full speed supplement web perfecting device 81 shown at the right of Figure 3.

In Figure 5 the angle bars such as 114 are indicated at a lower level than bars such as 94 so that the webs when strung as indicated at Figure 2 and Figure 6 may pass each other.

Figure 3, in order to be understood, is to be considered as showing the printing couples in side elevation and the rollers, turning bars, supplement web cutters and formers in plan.

Now referring to Figures 6 and 7, it will be seen how it is possible to provide various combinations by the simple expedient of leading the webs over the proper angle bars and rollers to deliver the supplement webs, or the halves of them produced by slitting, on to any desired former or half former within the limits of former sections 1B to 4A the machine.

In Figure 6, considering the supplement web 66 issuing from the supplement web perfecting unit 82 to be slit by the slitter 93 into two parts, namely, 75 and 76, these narrow webs 75 and 76 may be delivered upon any one of the six halves of the formers above referred to.

Where the printing couple 82 is operated at half speed the half webs 75 and 76 are trained over the bars 80 and 79, indicated as short bars in Figure 6 but preferably consisting of parts 104B and 104A of the long bar 104 as shown in Figure 3, to turn them rearwardly in register with but away from the former halves 2B and 3A.

At the turning bars these webs 75 and 76 are turned towards the rear, that is away from the formers toward the rollers 96 over which they are trained and are then carried upwardly and turned horizontally as by means of rollers such as 99 or 100 (see Figure 5) and then forwarded preferably through supplement web cutters indicated at 105 and 106 in Figure 3 then inserted and carried on to the corresponding former halves 2B and 3A. The supplement web 66, is, of course, operated only at half speed where half speed single page wide inserts are to be made.

Now at the same time as shown in Figure 6, the web 67 perfected by the full speed supplement web perfecting device 81 is turned over the roller 107 where it may be slit by the slitter 108 then carried to the left in the form of the narrow webs 71 and 72 and trained over the angle bars, such as 73 and 74 (see Figures 2 and 6) and then carried to the rear under rollers, such as 96′, and upwardly and turned again horizontally on rollers such, for example, as 100′ (see Figure 5) and then carried forward toward the formers as indicated on the line 116 of Figure 5.

Where both supplement web perfecting units are operated at full speed, the slitted webs 75 and 76 from the perfecting unit 82, now operating at full speed, may be turned as shown in Figure 7 on bars such as 77 and 78 to the rear around parts of the roller 96, then run upwardly and then turned horizontally over parts of roller 99 and delivered on to the formers without passing through the supplement cutting mechanism 105 or 106. That is to say, in this event instead of passing between the pulling rollers 117 (see Figure 5) the web indicated on the line 118 would extend past the pulling rollers 117 and over the forwarding rollers 119 to be delivered between the full speed pulling rollers 120.

In like manner the web 67 perfected by the units 81 is led around roller 107 where it may be slitted by the slitting device 108 into the single page wide narrow webs 71 and 72 and turned on the bars such as 69 and 70 toward the rear, then turned vertically at the rear, as indicated at 121, and led upwardly over the rollers 100′ on the level 116 and then led over the forwarding roller 122 (see Figure 5) and between the full speed forwarding and pulling rollers 120 and from thence delivered on to the formers. The two narrow webs 71 and 72 are trained on to the former halves 3B and 4A respectively, as shown in Figure 7.

Now it is to be observed that the supplement perfecting units are shown as offset with respect to each other, that is out of registry, see Figures 2, 6 and 7. They are in practice, however, in register and at the rear of the frame remote from the formers. Likewise, it is to be observed that the roller, such as 107, and the corresponding turning bars such as 112 or 111 for the full speed supplement perfecting unit 81 are disposed at a lower level than the corresponding roller 92 and the corresponding turning bars for the supplement perfecting unit 82. Likewise, the web of the full speed supplement unit 81 is led further to the rear than is the web of the unit 82 so that there may be no interference between these webs under conditions

of use. The horizontally disposed rollers at the rear are suitably placed to bring the webs in proper registration.

Supplement web cutter and inserting device

It has been previously pointed out that where single page wide inserts of the half speed web are to be cut and inserted into the product going on to the formers the narrow webs resulting from splitting the two page wide web of the perfecting unit 82 are led through the supplement cutters 105 and 106 which are in registration, respectively, with the former halves 2B and 3A. As shown in Figure 5, the cutter 105 comprises the usual pair of rollers, one of which bears a knife and the other a cutting block and pins for carrying forward the edge of the cut web, a suitable stripper 123 running in grooves on the drum 124 leading the forward edge of each cut of the supplement webs into the bite of the pair of full speed forwarding and pulling rollers 120. A brushing roller 125 assists in directing the advancing edges along the guide and stripper 123 to deliver the cut sections into the bite of the rollers 120.

Figure 4 is a fragmentary view showing the half speed supplement web 66 forwarded over the roller 92 where the web is slit into the two narrow webs 76 and 75, turned on the bars 80 and 79, led to the rear, turned upwardly on the rollers 96, 96, and then turned horizontally on the rollers 99, 99 and carried forward on the level 118.

I shall now describe the mechanical drive of the respective units.

Driving mechanism

The mechanical drive for the machine is indicated in Figures 8 and 9. It comprises the main drive shaft 127 extending longitudinally of the side frames of the machine. This main shaft 127 may be driven by means of a belt pulley 128 or by an electric motor of any other suitable driving connection. Vertical shafts 129 and 130 are connected as by means of bevel gears 131 and 132 to the main shaft 127 and through bevel gears connections are taken off to the perfecting units 87 and 88 on the lower level and 89 and 90 on the upper level. In like manner, vertical shafts 133 and 134 connected through bevel gears 135 and 136 are driven from the main shaft 127 and are connected to the web perfecting units 83 and 84 on the lower level and to the units 85 and 86 on the upper level. This provides the drive for the main units. For driving the full speed supplement web perfecting unit 81 a vertical shaft 137 is connected through bevel gears 138 to a horizontal shaft which is connected through bevel gears to the main shaft 127. Since the supplement perfecting units are of only two page width horizontal shafts are extended from the bevel gears, such as 138 and 139, to the lower ends of the shafts 137 and 140 for driving these supplement perfecting units through the vertical shafts 137 and 140, respectively. Such horizontal shaft 141 is shown in Figure 5 as providing the connection between the main shaft 127 and the vertical shaft 140.

For driving the supplement perfecting unit 82 which may be driven at either full speed or half speed, the vertical shaft 140 extends upwardly and is connected through bevel gears 142 to a spur gear 143 which spur gear 143 may be connected at either one to one ratio to the shaft 144 or at one to two ratio to said shaft 144. The shaft 144 bears two gears, namely, a large gear 145 which is twice the diameter of the gear 143, and a gear 146 which is equal in diameter to the diameter of the gear 143. By means of idler 147 the gear 143 may be connected to the gear 145 in a one to two ratio, or by means of idler 148 the gear 143 may be connected to the gear 146 at a one to one ratio.

The half speed supplement cutters 105 and 106 may be driven by a connection extending up between the two supplement web perfecting devices as indicated diagrammatically in Fig. 9.

A vertical shaft 150 is driven in unison with gear 143 through bevel gears 151. At its upper end this shaft 150 is geared at a one to two ratio through bevel gears 152 to the supplement cutter 106 which is in line with the single page wide web shown at the right of Fig. 9 but which cutter 106 has been omitted for the sake of clearness. Likewise, the shaft 150 drives the supplement cutter 105 at the right through bevel gears 153 and an idler 154 at the same drive ratio, namely, two revolutions of shaft 150 to one revolution of the cutter rollers 105. It is to be understood that the drive of the supplement cutter may be provided in any other suitable manner but it is easy to see that the drive shaft 150 may extend up in the space between the two supplement web perfecting units and be out of the way of the operator in setting up the machine.

Cutting, collecting, and delivering below the formers

In Figures 10 and 11, I have shown the manner in which the product of the formers, namely, the two page wide webs with their inserts either at full sped or half speed pass down between the pulling rollers 6 to be then cut into page length product. All of the products of the formers may be led over to a single cutting cylinder 160, as indicated by the dotted lines 161, 163 and 164 leading through suitable pairs of rollers such as 165, 166, 167 and 168, and over guide rollers to associate the folded webs 161, 163 and 164 with the folded web 162 coming from the former 2. The folded webs may then be cut

by the cutting cylinder 160 and delivered between the delivery rollers 169 between moving belts or conveyors 170 for delivery of the product to any suitable point. Delivery conveyors or webs are provided for each of the formers below the cutters. Obviously, all of the formers may have folded webs individually cut and delivered or cut and collected and delivered as by means of the cutting cylinders and their cooperating collecting cylinders such as 177, 178, 179 and 180.

In Figure 11, I have shown, in addition, the delivery devices 181, 182, 183 and 184 and conveying belts or carriers beneath the same.

The cutting cylinders 185, 160, 186 and 187 are provided with folding blades and the rollers, such as 169, cooperate with each to fold the papers transverse to the columns before delivering the same to the delivery devices, as shown in Figure 11, or to the conveyors 170, 171, 173 and 174.

I believe that the provision of four formers all in parallel, side by side, is broadly new. By means of this arrangement it is possible to deliver, four, three, two or one paper from these formers. The rotary folder and cutter 187—180 is at a higher level than the rotary folder and cutter 186—179 and the corresponding conveyors 174 and 173 are at correspondingly different levels. Likewise, at the right of Figs. 10 and 11, the rotary folder and cutter 160—178 is at a lower level than the rotary folder and cutter 185—177 and the conveyors 170 and 171 are at corresponding levels. This feature of rotary folders and cutters on different levels so as to provide for consolidating the output of the machine and using a minimum of space is of marked value. Also, it permits of a convenient arrangement of the conveyors.

The rotary folders with cutting and collecting cylinders and the conveyors and delivery devices are of known character. Figures 10 and 11 indicate the flexibility of the machine in assembling the desired product from a single former or from pairs of formers, or from all the formers.

Single end machine

In Figure 12 I have indicated diagrammatically the manner in which a single ended machine of my invention may be constructed. This is in all substantial respects like the one-half of the double ended machine including the supplement web perfecting device operating at either half speed or full speed.

In Figure 12 the web perfecting units 87, 88, 89 and 90, which operate on four page wide full speed webs, and the supplement perfecting unit 82, operating on a two page wide web operating at either full speed or half speed, are shown in side elevation whereas the rollers, turners, supplement cutting rollers 105, and the formers are shown in plan. By means of the roller 92 parallel to the axis of the perfecting cylinders of the unit 82 the supplement web may be led full width on to the former 2 by turning the same over the bar 113 and then over the two right hand sections of the roller 96, as shown in Figure 12, to extend the same on to the former 2. If the web from the perfecting unit 82 is slitted then the two webs may be placed anywhere on the three former halves, namely 1B, 2A or 2B, or both narrow webs superposed upon the former halves 1B or 2A through the medium of the turning bars 113, 94 and 114.

It will be seen that where the single ended machine is employed the additional turning bar, such as 104 shown in Figure 3, need not be employed. The three angle or turning bars 113, 94 and 114 are sufficient for the purposes of the single end machine. Where a single page width insert is to be made in the machine of Figure 12 only one-half of the plate surface of the perfecting unit 82 will be employed and a narrow web, that is one page wide, will extend from the unit 82 over the roller 92, lower end of angle bar 113, roller 96 and then up and over a roller like 99 as shown in Figure 5 between the cylinders of the half speed cutting and supplement inserting device 105 on to the former half 2B.

The turning bars

The arrangement of the turning bars may be widely varied but the arrangement shown in Figure 3 for the supplement webs is perhaps as satisfactory as any. Here there are a series of four angle or turning bars to permit the supplementary webs to be disposed in two page widths upon either of the corresponding pair of formers, or to permit the slit products, that is single page width webs, to be laid upon the former halves in a variety of ways. The angle bars for unit 82 will permit the laying of a single page width web upon the former halves 1B, 2A, 2B and 3A, whereas the angle bars for supplement perfecting unit 81 will permit the laying of a single page width web upon the former halves 2B, 3A, 3B and 4A. It is to be noted that the single page wide web 75 may be turned on bar 104A to the rear and the corresponding web 76 turned on bar 104B to the rear and then these webs are brought upwardly and led forwardly through the cutting and inserting series 105, 106 for inserting single page wide inserts at half speed.

Obviously, if desired, by the addition of further bars the webs might be laid upon any former or former half. While the turning bars, as shown in Figures 3 and 12, are somewhat differently disposed from the bars shown in Figures 2, 6 and 7, it is to be noted that the showing is largely diagrammatic in

each case and one skilled in the art will have no difficulty in perceiving the structure and mode of operation herein disclosed and claimed.

The main bars, which are shown more particularly in Figures 1, 5 and 9, are all arranged at higher levels than the supplement web turning bars. By reference to Figure 5, it will be seen that the webs after they are turned on different levels, for example on the bars 32, 33, 34 and 35, must be brought to the same level and carried over the pulling and forwarding rollers 5 in order to direct the assembled webs downwardly over the formers. Where the full width web is to be turned, either slitted or unslitted, on the corresponding bar of the formers, the long bars 33, 34 and 35 of the left end, as shown in Figure 1, and long bars 28, 29, 30 and 31, at the right of Figure 1, are employed. Assume that the main web 12 (see Figures 1 and 5) is brought on to the long turning bar 32, is then carried over the idling roller 190, then trained downwardly under an idling roller 191 and from there forwarded to the pulling and forwarding roller 5 with its follower 36. In a similar manner the web 13, after being turned on the long bar 33 is trained over the idler 192 downwardly between the pulling and forwarding rollers 120 and then passed under the rollers 193, 194 and 191 on to the pulling roller 5.

The full width web 14, after being turned on the bar 34, is conducted around rollers 195, 196, then led upwardly between the pulling and forwarding rollers 120 and carried forward over the stripper plate 197 which lies under rollers 193, 194 and 191. The single page wide inserts from the half speed perfecting unit 82 which are cut at the supplement web cutter 105 are passed between webs 13 and 14, or if web 14 is not in use, then the same are passed under the web 13 only.

Web 15 after being turned on the bar 35 is conducted around rollers 198 and 199 and then led directly to the pulling and forwarding roller 5. Where the web is slitted and turned on both the short bar and the adjacent end of the long bar, as for example to lay both halves of the web 12 on to the former 2, the part of the web nearest the former will be turned on the short bar 62 and the part of the web remote from the formers will be turned on the corresponding end of the long bar 32. The portion of the web 12 which is trained over the short bar 62 is led over a roller 200 and then down and around the roller 193 and forwarded to the pulling roller 5. I have shown the bar 62 as considerably below the bar 32. In practice this need be only great enough to provide the necessary space for the rollers, such as 190 and 200, otherwise the bars 32 and 62 would preferably be disposed on the same level. In fact, it is possible to have the bars on substantially the same level and train the two halves of the main web over the same roller, such as 190.

In a similar manner, when both halves of the slitted web 13 are to be led on to the former 2, the short bar 63 and the adjacent end of the long bar 33 are employed. The web passing over the short bar 63 may be directed over the idler 201 and then passed between the pulling rollers 120. In like manner the web 14 when slitted and both halves are to be laid on the former 2, will be trained over the short bar 64 and the adjacent end of the long bar 34. The part of the web that is trained over the short bar 64 is led between rollers 203 and 204 and then carried upwardly to the pulling roller 5.

Likewise the web 15 when slitted and both halves are to be laid on the former 2 is trained on the short bar 65 and the long bar 35, and the part of the web which is trained on the short bar 65 is led, between rollers 205 and 206 and then carried upwardly to the pulling roller 5.

Idling rollers over which the supplement webs may be led are indicated as at 207, 208, 209, 210, 211, 212, and 213. The roller 207 is adapted to forward a cover or outside sheet, such as a pink or like colored sheet for the outer page of a newspaper or section of a newspaper, the web therefor being perfected preferably on the full speed supplement perfecting unit 81. The other rollers referred to are adapted to cooperate with the corresponding rollers at the rear of the supplement perfecting unit for the insertion of the supplement webs operating at full speed between any two main webs.

The foregoing description of the long and short bars has referred more particularly to the left end of the machine, as viewed in Figure 9, or the end of the single end machine indicated in Figure 12. The bars, rollers and forwarding devices are similar for the right end of the machine, as viewed in Figure 9. A description for one end of the machine will suffice for the other, since the two are in this respect identical.

Operation

The operation of the machine heretofore described is believed to be clear from the foregoing detailed description. With four full speed main web perfecting devices in operation at each end and with both supplement perfecting units in operation at full speed, it is possible to produce a large variety of products. For example, former 1 may deliver a longitudinally folded product which is cut below the former, and having four two page wide webs longitudinally folded to provide a book form newspaper of sixteen pages. Former 2 may deliver at the same time in book form a twelve page newspaper; former 3 at the same time may deliver a twelve page book form newspaper, and former 4 an eight

page book form newspaper. In other words, for each half revolution of all printing couples forty-eight pages of printed matter are perfected and may be delivered at the formers in various products. As previously explained in reference to Figures 10 and 11, all of this printed matter may be assembled into a single product (see the dotted lines in Figures 10 and 11) and delivered in sections of a single product. The rotary folders may collect below the formers, and hence a wide variety of products may be secured.

By laying half of each supplement web upon adjacent formers it is possible to secure by cutting below the formers for each half of the revolution of the printing couples four book form newspapers of ten pages each. Obviously, by collecting below the formers on each of the above illustrations, the number of pages in the product may be doubled. It is possible to produce a newspaper of any number of pages and of a different number of sections within the capacity of the machine. For example, it is possible to produce by collection below the formers a thirty-eight page newspaper in two sections, as illustrated in Figure 13. As shown in Figure 13, the section 219 contains sixteen pages on the two page wide webs 221, 222, 223, and 224, and two pages on the single page wide full speed supplement 225. In section 220 there are sixteen pages on the four main webs 226, 227, 228 and 229, two pages on the full speed supplement 230, and two additional pages on the half speed supplement web 231, providing thereby a product of thirty-eight pages.

It is not believed necessary to explain in detail all the various products that can be secured by this machine, as it will be apparent to those skilled in the art that the machine is capable of producing a wide variety of products in a simple expeditious manner.

The general operation of the machine involves the turning of the main webs and forwarding them to the pulling rollers 5 just above the formers. The supplement webs are turned in the opposite direction, that is towards the rear of the machine away from formers by the supplement turning bars and then conducted upwardly to the desired level where they are to be inserted between the main webs or parts of main webs and then carried on to the formers with the main webs or parts of webs.

By reference to roller 208 of Figure 5 it will be seen that the supplement web may be inserted between the two parts of a main web, which are laid upon each other. This may be done on any level of the machine for either end. Where half speed inserts are to be made and the product collected below the former, the unit 82 is operated at half speed, its web slitted and turned on bars which bring the single page width webs in register with the desired supplement web cutters 105 and 106 and the narrow webs are then conducted to supplement cutting and forwarding devices which insert the cut pages successively between alternate plate impressions on the main webs so as to produce the two extra pages which are required for making up the product.

The single end machine operates in all respects like the double end machine except that where a single page width supplement is to be inserted the supplement web perfecting device, if it is two pages wide, runs idle at one end, that is, it operates on a web only one page wide. If desired, the unit 82 may be only one page wide on the single end machine, or it may be likewise a single page in width on the double end machine. In the double end machine there is no necessity for running any of the printing couples partly idle.

I do not intend to be limited to the details shown and described.

I claim:

1. The combination of printing, associating, cutting, inserting, folding and collecting devices, comprising a plurality of opposite sets of main four page wide perfecting mechanisms, with columns disposed circumferential to the plate cylinders, two pairs of formers in intermediate relation to the two opposite sets of perfecting mechanisms, two sets of two page wide supplement perfecting units back of said formers, one of said supplement perfecting units adapted to run at half speed, and the other supplement set adapted to run at full speed, two single width half speed supplement cutting and inserting devices in line with the two inside formers, two sets of supplement angle bars cooperating with the two supplement perfecting units, two sets of main web turning devices cooperating with said two pairs of formers, and folding and collecting devices below the formers, substantially as described.

2. In a device of the class described, the combination of main perfecting units, four formers in intermediate relation to the main perfecting units, a two page wide half speed supplement perfecting unit back of the formers equipped with angle bars, and guide rollers, two single width half speed supplement cutting and inserting devices in line with the two inside formers, means for slitting the half speed supplement web into one page wide web members and turning said members over said angle bars to align the two web members with the supplement cutting devices, means for forwarding the two web members to the two half speed supplement cutting devices, said devices having means for cutting off the two supplement sheets and inserting them in line with the two inside formers.

3. In a device of the class described, the combination of four formers abreast in a

straight line, two full speed two page wide supplement web perfecting units back of the formers having columns circumferential to the plate cylinders and adapted to deliver a plurality of supplemental webs, two sets of angle bars, and guide rollers cooperating with the formers, means for slitting one of said supplement webs into one page wide web members, and means for aligning both of said latter web members in position to cover half the face of two formers, means for slitting the other two page wide web into one page wide web members, and means for aligning both of said latter web members in position to cover half of the face of two formers.

4. The combination of main perfecting units, two pairs of formers disposed abreast in a straight line intermediate the main perfecting units, the two inside formers being spaced apart, one set of main angle bars comprising long and short angle bars cooperating with one pair of formers and another set of main angle bars comprising long and short angle bars cooperating with the other pair of formers, two two page wide supplemental web perfecting units back of the formers, one unit adapted to run at half speed, and the other unit adapted to run at full speed, a plurality of angle bars cooperating with the half speed supplement perfecting unit, a plurality of angle bars cooperating with the full speed supplement perfecting unit, supplement slitting and forwarding devices in cooperative relation to both sets of supplement perfecting units, two single width half speed supplement cutting devices between the supplement perfecting units and the formers, main cutters and collecting devices located below the formers, said mechanisms adapted to print and fold for each revolution of the printing couples, two newspapers, each having two sections, one section in each paper having one two page insert sheet, substantially as described.

5. The combination of a single ender printing and folding machine, comprising a plurality of four page wide perfecting units having columns circumferential to the plate cylinders, two formers at right angles to the printing couples, and outside the main perfecting units as the webs run, a half speed supplement perfecting unit back of the two formers, a plurality of angle bars and forwarding devices cooperating with the half speed supplement perfecting unit, main angle bars in operative relation to the formers and the main printing couples, a half speed single width supplement cutting device between the supplement perfecting unit, and one of said formers, said main angle bars giving the main perfected webs one quarter turn to direct the webs or web members in line with one or two formers, means for leading the one page wide supplement web around one of said angle bars to bring the web in alignment with the half speed supplement cutting device, means for leading the supplement web to the supplement cutting device, said device having means for cutting off the half speed supplement sheets and inserting them between the main webs or web members on one of said formers substantially as described.

6. In a printing, inserting, cutting, collecting and folding machine capable of printing a multiple of two pages up to the full capacity of the printing machine, the combination of the following mechanisms; a plurality of full speed perfecting units having columns circumferential to the plate cylinders, one set of main angle bars comprising short and long angle bars of the same set, cooperating with two formers, a half speed supplement perfecting unit back of the formers equipped with supplement angle bars, and guide rollers, half speed single width supplement cutting device located between the main angle bars in a position to insert half speed supplement sheets between the webs or web members running down over the former substantially as described.

7. The combination of a former, main angle bars cooperating with said former, half speed supplement cutting and carrier cylinders located between said angle bars and adjacent to said former, forwarding rollers, a brush roller cooperating with said supplement carrier, and strippers between said carrier and said forwarding rollers, substantially as described.

8. The combination of two side by side formers, one set of main angle bars cooperating with one former, and another set of main angle bars cooperating with the other former, two single width half speed supplement cutting devices in operative relation to said formers and located back of said formers, one set of cutting devices located between one set of main angle bars and the other set of cutting devices located between the other set of main angle bars, a two page wide half speed supplement perfecting unit back of said formers, supplement angle bars, and a slitting device cooperating with said supplement perfecting unit, said device slitting the two page wide supplement web into two one page wide web members, means for aligning the one page wide web members with the supplement cutters substantially as described.

9. The combination of a former, a drag roller therefor, a half speed supplement cutting and inserting device, located adjacent to said former, a plurality of long and short angle bars disposed below the supplement cutting and inserting device, a plurality of guide rollers cooperating with the bottom angle bars adapted to control the webs or web members running to the drag roller and

over said former, substantially as described.

10. The combination of two pairs of side by side formers, a set of long and short main angle bars cooperating with one pair of formers and another set of long and short main angle bars cooperating with the other pair of formers, said angle bars being so positioned as to give the main webs or web members one quarter turn and associate them on one pair of formers, or two pairs of formers, two sets of supplement angle bars on a lower level than the main angle bars adapted to give the supplement webs or web members one quarter turn and so position them as to place them where desired on said formers, guide rollers cooperating with the supplement web or web members to guide them upward to be associated with any of the main webs or web members in any desired position running down over the former.

11. The combination of a double ender printing and folding machine comprising main perfecting units four pages wide having columns circumferential to the plate cylinders, said main perfecting units being all on the same level, two pairs of side by side formers intermediate to the opposite sets of main perfecting units, two supplement perfecting units two pages wide on the same level and intermediate to the main perfecting units, and back of said formers.

12. The combination of a double ender printing and folding machine, comprising a plurality of main perfecting units four pages wide on a high level, and a low level, a plurality of opposite sets of four page wide main perfecting units, on a high and low level, two pairs of formers intermediate to the main perfecting units, two perfecting units two pages wide and intermediate and in line with two lower sets of perfecting units and back of said formers.

13. In a double ender printing and folding machine, the combination of a plurality of forwarding devices on one end of the machine, slitters cooperating with the said forwarding devices, another set of forwarding devices on the other end of the machine, and slitters cooperating with the forwarding devices, two pairs of side by side formers intermediate with said forwarding devices, one set of angle bars consisting of long and short angle bars adapted to give certain of the webs or web members one quarter turn to associate them on one former, or two formers, and an opposite set of angle bars consisting of long and short angle bars adapted to give others of the webs or web members one quarter turn to associate them on one former or on two formers.

14. In a single ender printing and folding machine having main perfecting units on a high level and on a low level, the combination of a plurality of forwarding and slitting devices cooperating with the main perfecting units, a supplemental perfecting unit adapted to deliver a supplemental web, two formers outside the forwarding and slitting devices, as the webs run, a set of long and short angle bars in operative relation to said forwarding devices and said formers, and in line with the low level main perfecting units, and angle bars cooperating with the supplement perfecting unit adapted to align the supplement web in different positions on said formers.

15. In combination with main web perfecting devices comprising plate cylinders having columns disposed circumferentially for perfecting a plurality of main webs, a plurality of formers disposed in parallel relation laterally of said units, angle bars for turning said main webs toward and into line with said formers, of a supplement web perfecting device comprising plate cylinders having columns disposed circumferentially for perfecting a supplement web, angle bars for turning said supplement web away from said formers and into line with a selected one of the formers, guides for leading said supplement web vertically to a desired position between two main webs.

16. In combination with main web perfecting units comprising plate cylinders having columns disposed circumferentially for perfecting a plurality of main webs, a plurality of formers disposed in parallel relation laterally of said units, angle bars for turning said main webs toward and in line with said formers, a supplement web perfecting device disposed in parallel relation to said main units and comprising plate cylinders having columns disposed circumferentially for perfecting a supplement web at half speed, angle bars for turning said supplement web away from but in line with said formers, supplement web cutting and inserting means disposed above the supplement web perfecting device and in line with the formers and means for leading the supplement web to said means.

17. In a machine of the class described, an oblong main frame, a plurality of main web perfecting units in the frame having their axes parallel to each other and transverse to the major axis of the frame, a plurality of supplement web perfecting units disposed in the frame intermediate the main units, said supplement units having their axes parallel to the axes of the main units, a plurality of formers disposed at a side of the main frame opposite the supplement units, main angle bars for turning the main webs toward the formers, supplement angle bars for turning the supplement webs away from the formers, means for conducting the supplement webs between the main webs and means for delivering the main and supplement webs onto the formers.

18. In a printing machine, a pair of formers disposed for parallel delivery of two

longitudinally folded webs, main printing couples having their axes extending substantially in the direction of the run of the webs over the formers, said couples having printing plates with columns lying around two pages in circumference, supplement printing couples having their axes parallel to the axes of the main couples and having printing plates of half the width of the main webs, main turning bars on different levels for turning the main webs into the direction of the formers, supplement turning bars below the main turning bars for turning the supplement webs in the opposite direction from the run of the main turning bars and rollers for leading the supplement webs away from the formers, then upwardly, then into the same direction as the main webs, and means for directing the main and supplement webs onto the formers.

19. In a device of the class described, the combination of four formers abreast in a straight line, two perfecting units back of the formers a plurality of pages in width and having columns disposed circumferentially of the plate cylinders, two sets of angle bars, guide rollers cooperating with the perfecting units, means for slitting one of the said webs into two one-page-wide web members, means for aligning said web members in position to cover half the face of each of two formers, means for slitting the other two-page-wide web into two one-page-wide web members, and means for aligning both of said web members in position to cover half of the face of each of the other two formers.

20. The combination of a plurality of four-page-wide main perfecting units having columns circumferential to the plate cylinders, two side by side formers the tops of which are positioned at right angles to the said main perfecting units, a set of long and short angle bars in line with the two formers, slitting means cooperating with said angle bars, a two-page-wide perfecting unit back of the two said formers, slitting and web turning devices cooperating with said perfecting units and adapted to align the web or web members on one former or two formers, two main cutters and two rotary folders below said formers, and means for controlling the folded product.

21. The combination of left and right main perfecting units a plurality of pages in width, a passageway between left and right main perfecting units, two pairs of side by side formers in line with said passageways, the formers extending outside of the said perfecting units, the tops of said formers being at right angles thereto, one set of long and short main angle bars cooperating with the units on the left and in alignment with one pair of formers, a second set of long and short angle bars cooperating with the right-hand units and in alignment with the other pair of formers, a plurality of web slitting devices in operative relation to both sets of angle bars and formers, supplement perfecting means a plurality of pages in width located back of said formers, supplement turning devices below the main angle bars adapted to turn the supplement web or webs are in opposite directions from said formers, a plurality of guide rollers on different levels to guide the supplement web or webs upward in different positions so that they can be placed between any of the sets of said main angle bars, a plurality of cutters and rotary folders below said formers, and means for delivering the folded products on one side of or lengthwise of the machine.

22. The combination of a printing and folding machine comprising a plurality of perfecting units a plurality of pages in width at one side and a plurality of perfecting units a plurality of pages in width at the other side, a passageway between said one and other side perfecting units, a first and second pair of side by side formers outside the said passageway, all on one side of the printing machine the tops of said formers being at right angles to said perfecting units, a first set of main angle bars comprising long and short angle bars cooperating with the unit on said one side and in alignment with the first pair of formers, a second set of main angle bars comprising long and short angle bars cooperating with the units on said other side and in alignment with the second pair of formers, a plurality of web slitting means in operative relation to both sets of main angle bars and said two pairs of formers, the main sets of angle bars and inside formers being spaced apart four main cutting devices, four rotary folders below said two pairs of formers, two delivery devices, on said one side and at different levels adapted to carry the folded products toward said one side, and two delivery devices on said other side at different levels adapted to carry the folded products toward said other side, all of said folded products being delivered at one side of or lengthwise of the printing machine.

23. The combination of a printing and folding machine comprising a plurality of four-page-wide main perfecting units, one pair of side by side formers located outside of the printing machine, the tops of the formers being at right angles to said units, a plurality of main angle bars cooperating with the said units and in alignment with said formers, web slitting means in operative relation to the angle bars and said formers, said angle bars being adapted to give the webs or web members one-quarter turn to align them on one former or two formers, a supplement perfecting means a plurality of pages in width back of said formers and parallel to the main perfecting units, means for turning the supplement web away from said formers,

a plurality of guide rollers on different levels to guide the supplement web upward and between the webs or web members running to the formers in any desired position, a plurality of cutters and rotary folders below said formers, and means for delivering the folded products on one side of or lengthwise of the printing machine.

24. In a printing machine of the class described comprising a plurality of main perfecting units to one side, and a plurality of main perfecting units on the other side, a supplement perfecting means intermediate of the main perfecting units on the said one side and the main perfecting units on the said other side, two pairs of side by side formers disposed at one side of the printing machine, and opposite to the supplement perfecting means, the tops of the formers being at right angles to the perfecting units, main angle bars for turning the main webs or web members toward the formers and supplement angle bars and for turning the supplement web or web members away from the formers, means for conducting the supplement web or webs between the main webs or web members running over said formers, a plurality of cutting devices and rotary folders below said formers, and means for delivering the folded products on one side of or lengthwise of the printing machine.

25. In a printing machine of the class described comprising a plurality of perfecting units in alignment, two pairs of side by side formers located outside the printing machine, the tops of the formers being at right angles to the perfecting units, a plurality of angle bars comprising a first set, a plurality of slitting means in operative relation to the first set of angle bars, said angle bars being adapted to give the webs or web members one-quarter turn to align them on one or two formers of one pair of formers, a plurality of angle bars comprising a second set, a plurality of slitting means in operative relation to said second set of angle bars, said angle bars being adapted to give the webs or web members one-quarter turn to align them on one or two formers of the other pair of formers, a cutting and folding device below each former, the two inner devices being on one level, and the two outer devices being on a higher level, means for leading the products of more than one former onto one of said devices and pairs of traveling conveyors leading from said devices, the conveyors for the inner pair of devices extending in opposite directions on substantially the same level, and the conveyors for the outer pair of devices leading substantially parallel to the other conveyors and at a higher level.

26. In a printing machine of the class described comprising a plurality of web forwarding and slitting means on the left-hand side of the machine, a plurality of long and short angle bars on the left-hand side of the machine adapted to give the web or web members one-quarter turn, a first pair of side by side formers located outside of the printing machine, the tops of said formers being in alignment with said angle bars on the left, a plurality of web forwarding and slitting means on the right-hand side of the machine, a plurality of long and short angle bars on the right-hand side of the machine adapted to give the webs or web members one-quarter turn, a second pair of side by side formers located outside of the printing machine in alignment with the first pair of said side by side formers, the tops of said formers being in alignment with said angle bars on the right, a continuous passageway between the two inside formers of the two pairs of formers and the left and right-hand sets of angle bars, a plurality of cutting and folding devices below said formers, means for forwarding a plurality of folded webs to a plurality of cutters or all to one cutter, and means for delivering the folded products all at one side of or lengthwise of the printing machine.

In witness whereof, I hereunto subscribe my name this 19th day of March, 1929.

JOHN A. BOYCE.