

Nov. 5, 1935.

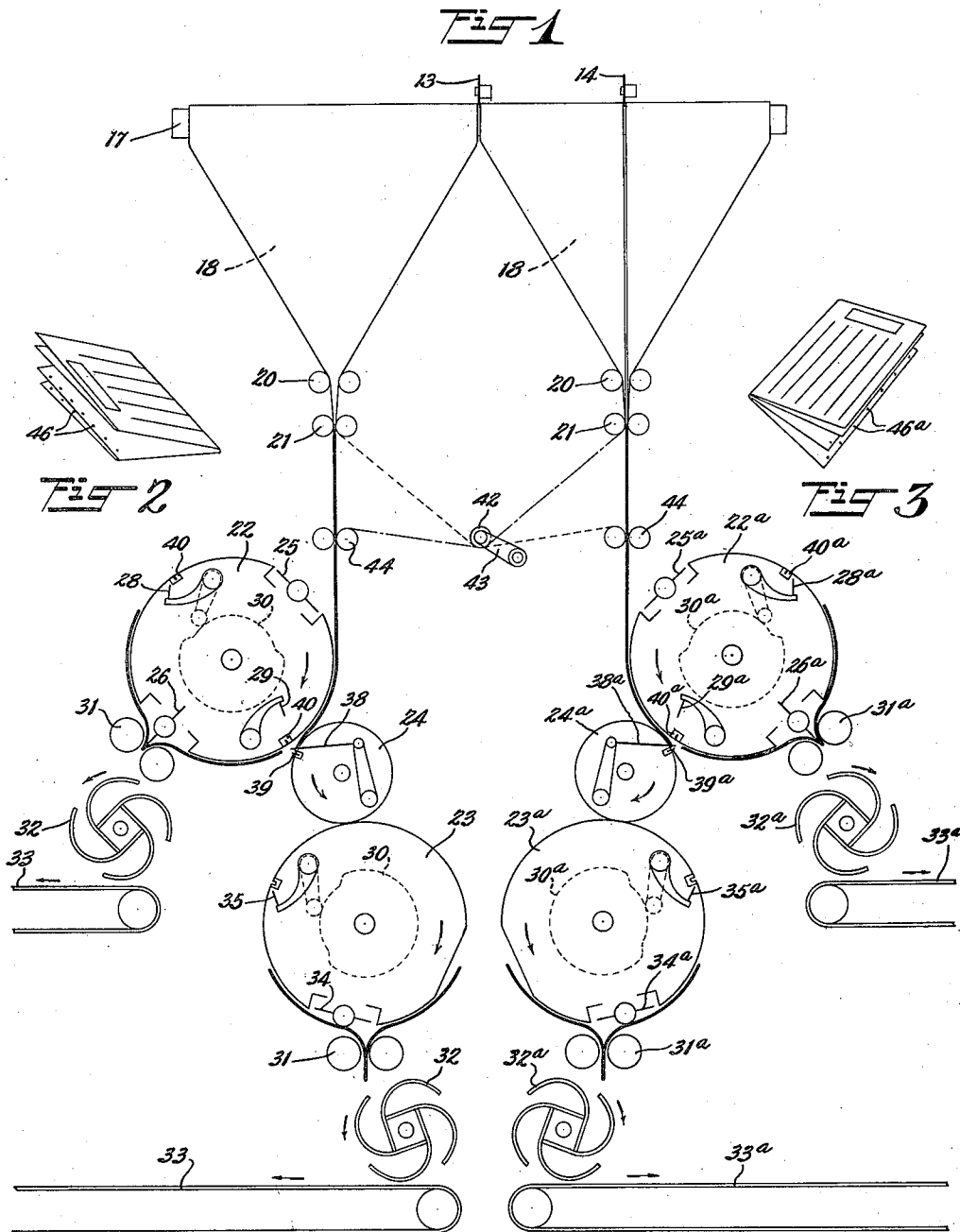
C. S. CRAFTS

2,019,658

FOLDING MECHANISM

Filed Oct. 15, 1932

6 Sheets-Sheet 1



C. S. Crafts INVENTOR
BY John D. Morgan
ATTORNEY

Nov. 5, 1935.

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FOLDING MECHANISM

Filed Oct. 15, 1932

6 Sheets-Sheet 2

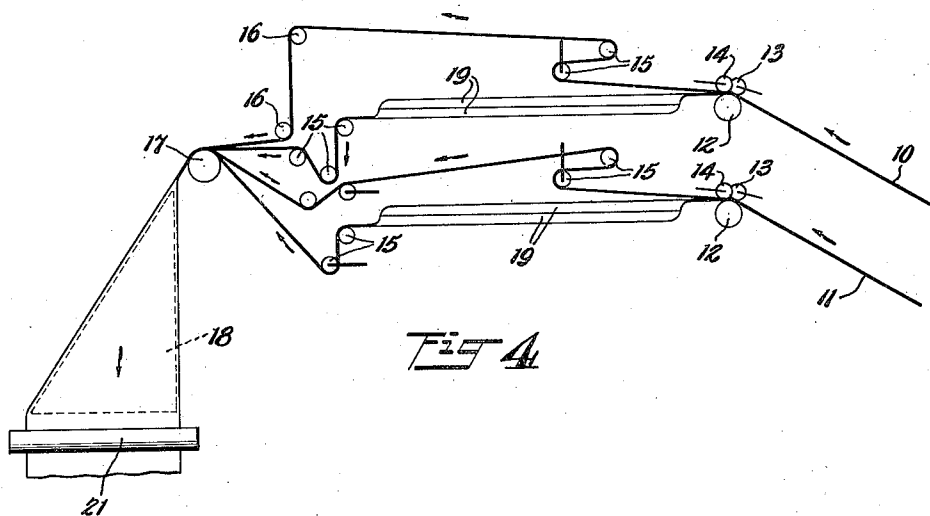


Fig 4

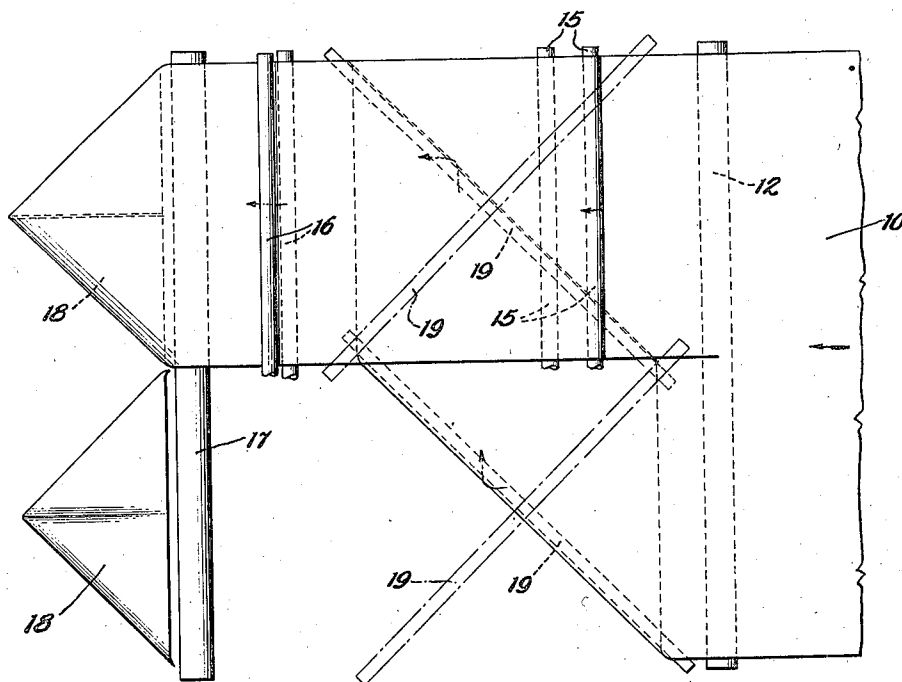


Fig 5

INVENTOR
C. S. Crafts
BY
John D. Morgan
ATTORNEY

Nov. 5, 1935.

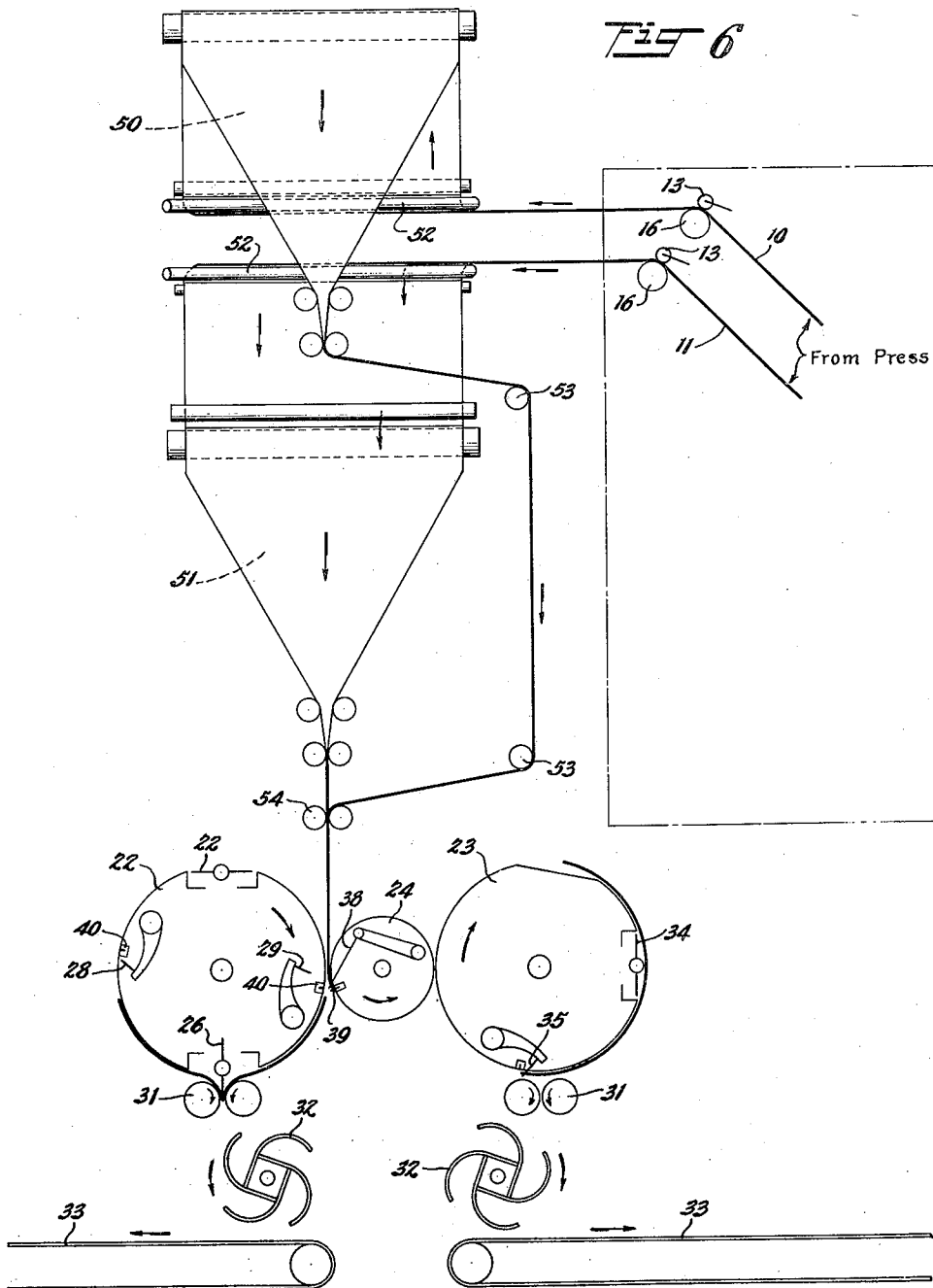
C. S. CRAFTS

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FOLDING MECHANISM

Filed Oct. 15, 1932

6 Sheets-Sheet 3



C. S. Crafts INVENTOR
BY John D. Morgan
ATTORNEY

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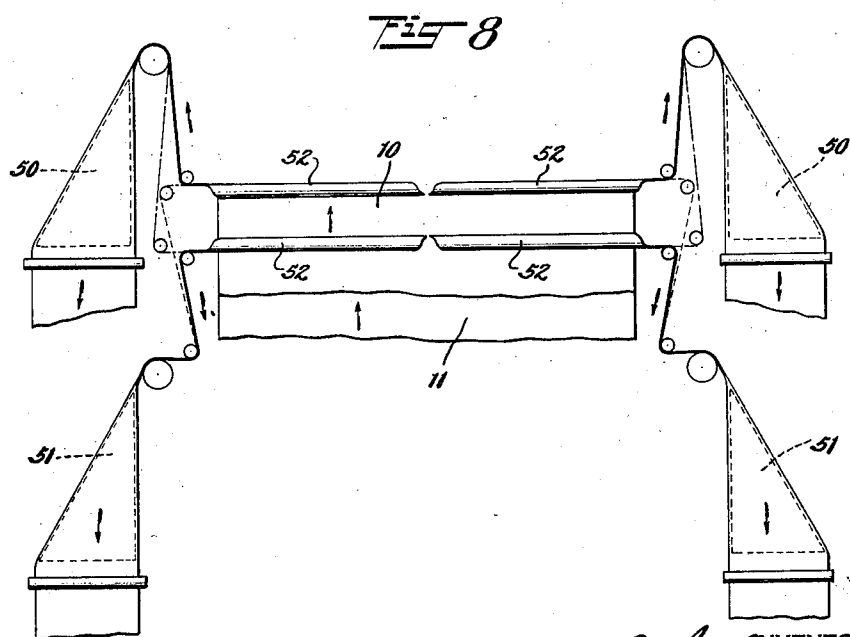
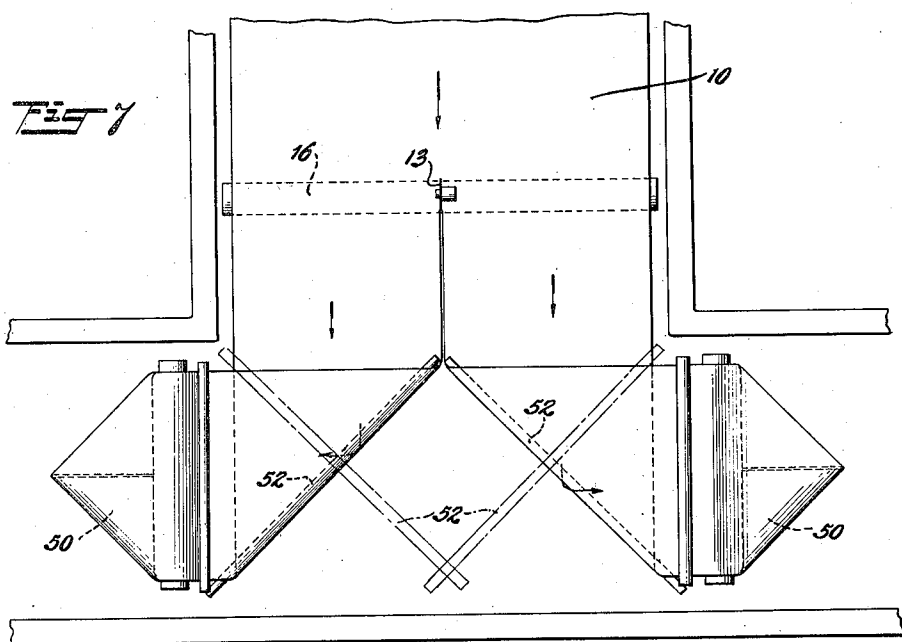
C. S. CRAFTS

2,019,658

FOLDING MECHANISM

Filed Oct. 15, 1932

6 Sheets-Sheet 4



INVENTOR
C. S. Crafts
BY
John D. Morgan
ATTORNEY

Nov. 5, 1935.

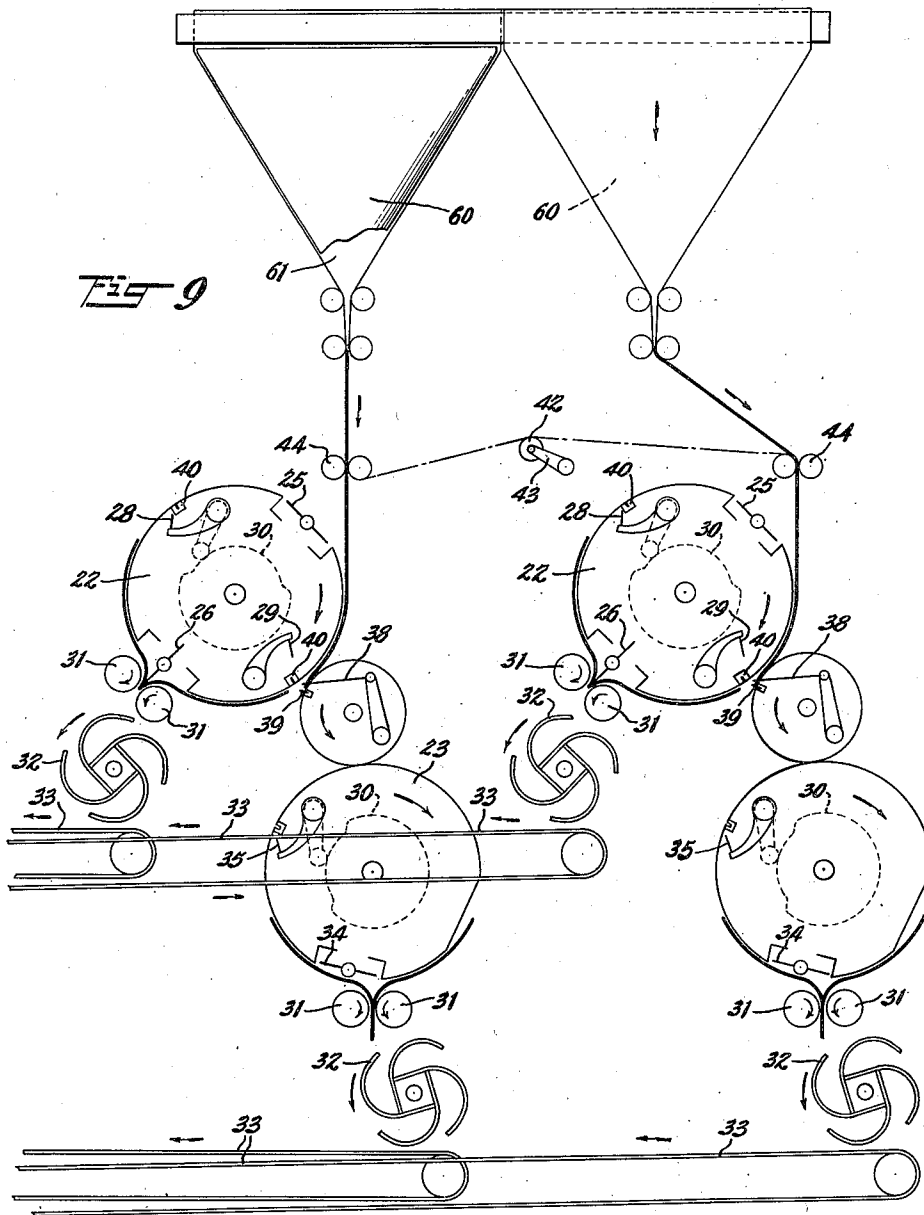
C. S. CRAFTS

2,019,658

FOLDING MECHANISM

Filed Oct. 15, 1932

6 Sheets-Sheet 5



C. S. Crafts INVENTOR
BY John D. Morgan
ATTORNEY

Nov. 5, 1935.

C. S. CRAFTS

2,019,658

FOLDING MECHANISM

Filed Oct. 15, 1932

6 Sheets-Sheet 6

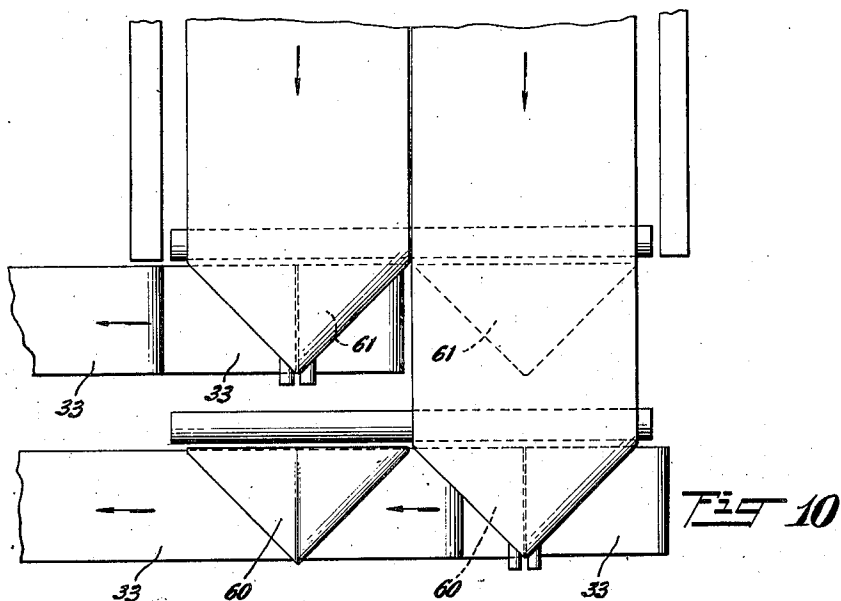
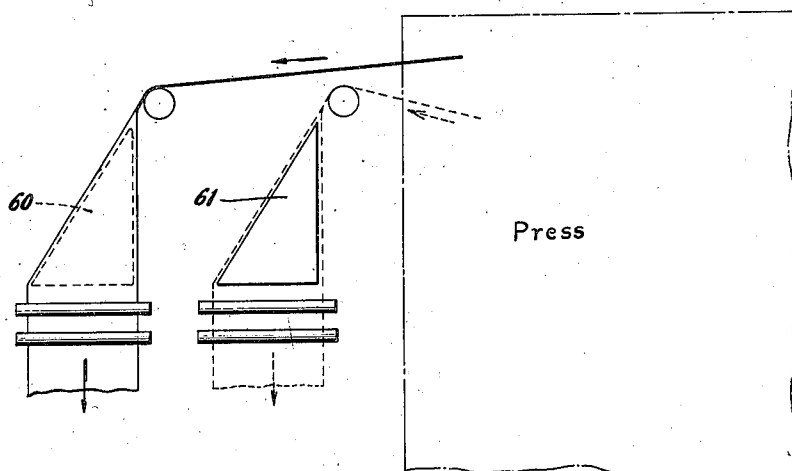


Fig. 11



C. S. Crafts INVENTOR
BY John D. Morgan
ATTORNEY

UNITED STATES PATENT OFFICE

2,019,658

FOLDING MECHANISM

Curtis S. Crafts, Oak Park, Ill., assignor to The
Goss Printing Press Company, Chicago, Ill., a
corporation of Illinois

Application October 15, 1932, Serial No. 637,903

33 Claims. (Cl. 270—6)

The present invention relates to folding mechanism and more particularly to a high speed folding mechanism for use with rotary web printing machines.

5 Objects and advantages of the invention will be set forth in part hereinafter and in part will be obvious herefrom, or may be learned by practice with the invention, the same being realized and attained by means of the instrumentalities and combinations pointed out in the appended claims.

The invention consists in the novel parts, construction, arrangements, combinations and improvements herein shown and described.

15 The accompanying drawings, referred to herein and constituting a part hereof, illustrate embodiments of the invention, and together with the description, serve to explain the principles of the invention.

20 Of the drawings:—

Figure 1 is a diagrammatic front elevation of one embodiment of the present invention;

Figure 2 is a diagrammatic view showing the product delivered by the left-hand portion of the mechanism of Figure 1;

25 Figure 3 is a similar view of the product delivered by the right-hand portion of the mechanism of Figure 1;

Figure 4 is a fragmentary side elevation of the embodiment shown in Figure 1;

30 Figure 5 is a plan view of the mechanism shown in Figure 4;

Figure 6 is a diagrammatic side elevation of a modified embodiment of the invention;

35 Figure 7 is a fragmentary plan view of the parts shown in Figure 6;

Figure 8 is a fragmentary front elevation of the embodiment shown in Figure 6;

40 Figure 9 is a diagrammatic front elevation of a further embodiment of the invention;

Figure 10 is a plan view of the mechanism shown in Figure 9; and

Figure 11 is a side elevation of the embodiment shown in Figures 9 and 10 of the drawings.

45 The present invention has for its object the provision of an improved folding mechanism, particularly adapted for use with high speed rotary web printing presses, in which the products may be delivered at a plurality of points. A further object is the provision of a folding mechanism 50 capacitated to produce an unusually large number of different products. Still another object is the provision of a folding mechanism which will deliver full size or tabloid products which may be collected or uncollected, or straight

or cross-associate, and may all be delivered from one folding cylinder or may be delivered alternately by two folding cylinders.

In accordance with the present invention the webs from the printing press are slit and passed 5 over one or more pairs of formers for longitudinally folding the web, after which the webs from each former are directed to a pair of folding cylinders. Means are preferably provided for slitting the webs centrally thereof, as well as 10 along the line of longitudinal fold of one or both halves of the web, and means are also preferably provided for cross-associating the longitudinally folded or slit webs as they are led to the folding cylinders. Suitable web reversing and guiding 15 means are preferably provided between the printing press and the formers so that one or more webs may be led to each former, or all of the webs may be led to any one of the formers.

In accordance with a modified embodiment of 20 the invention, the formers are arranged at right angles to the press, and two pairs of formers are provided, one former of each pair being superposed over the other former of the pair. In another modified embodiment of the invention, two 25 pairs of formers are provided, one pair being positioned in front of the other pair and preferably on the same level.

The cross-folding and delivering mechanism of the present invention preferably comprises 30 pairs of folding cylinders, with a transfer and collecting cylinder positioned intermediate the folding cylinders of each pair. As embodied, one of the folding cylinders is provided with a pair of double-edged folding blades and two sets of 35 sheet-taking devices, such as pins, one of these sets being optionally silenceable. Means are provided for operating the folding blades once each revolution, and these means may be of any desired conventional construction such as a Husby 40 cam. The second folding cylinder of each pair is provided with a single double-edged folding blade and a single set of sheet-taking devices.

Between the folding cylinders of each pair is 45 positioned an optionally operable cutting, transfer and collecting cylinder with suitable sheet taking mechanism adapted to collect sheets and transfer them to the first cylinder for collect runs, or to transfer the sheets to the second folding cylinder when it is desired to deliver products alternately from the two folding cylinders. 50 When said transfer and collecting cylinder taking means is silenced, both folding blades and sets of sheet-taking devices on the first cylinder are operative and all products from the web fed to this 55

pair of folding cylinders are delivered by one cylinder only.

A separate delivery fly and belt is preferably provided for each folding cylinder and when products are delivered by alternate folding cylinders, these flies and belts may be operated at slow speed.

When the formers are superposed in position at right angles to the press, the folding cylinders for each pair of formers are preferably positioned directly beneath the respective formers, but when the two pairs of formers are positioned one in advance of the other, one pair of folding cylinders is preferably positioned under one former of one pair while the other pair of cylinders is positioned beneath a former of the other pair. With this staggered arrangement of the folding cylinders, the folding-off rollers, delivery flies, and delivery belts may all be arranged on one side of the folding cylinders, and the product delivered by all folding cylinders may be identical, if desired.

It will be understood that the foregoing general description and the following detailed description as well are exemplary and explanatory of the invention but are not restrictive thereof.

Referring now in detail to the illustrative embodiment of the invention shown in Figures 1 to 5 of the drawings, one or more webs 10 and 11 are led from the printing press over a guide roller 12 where the webs are slit centrally by means of a slitting disc 13 and one half of the web may be slit a second time by a slitter 14. The slit webs may then be led over compensator rolls 15 and guide rollers 16 to the roller 17 at the head of the formers 18. A set of turner bars 19, of conventional construction, is also provided for each longitudinal half of the web by which either half of the web may be transferred to and superposed on the other half before it is passed over the former 18.

A similar set of guide rollers, slitters, compensators and turning bars is also provided for the web or webs 11, and these slit webs may be associated with the slit webs 10 as they are led to the formers 18, the guide rollers, turner bars, etc. for web 11 being positioned directly beneath the similar products for web 10.

As embodied, a pair of formers are provided, side-by-side and set straight away with the press, each of the formers being adapted to longitudinally fold the half width webs, and slitters 14 are preferably positioned to slit the web along the line of longitudinal fold, as shown in Figure 1.

The longitudinally folded web or webs of the left-hand former 18 are drawn by drawing rollers 20 and nipping rollers 21 over the point of the former and are directed towards the transverse folding and delivery mechanism positioned beneath the former.

As embodied, the transverse folding mechanism comprises a pair of folding cylinders 22 and 23, and a cutting, transfer and collecting cylinder 24 positioned between said folding cylinders. Folding cylinder 22 is provided with a pair of double-edged folding blades 25 and 26, and two sets of sheet taking devices, such as impaling pins 28 and 29. Suitable cam means, such as a Husby cam (not shown), may be provided for operating each folding blade once each revolution. The cam 30 is also provided for projecting and retracting the impaling pins 28 and 29, to take and release the leading end of the web as the folding cylinder operates. One set of impaling pins 29 on cylinder 22 is preferably capable of being silenced.

Folding cylinder 22 cooperates with a pair of

folding-off rollers 31, which receive the sheet or groups of sheets and fold it along a central transverse line, delivering the folded product into the pocket of rotary delivery fly 32, from which the products are stacked on the moving delivery belts 33.

Folding cylinder 23 is provided with a single folding blade 34 and a single set of impaling pins 35. A cam 36 is provided for operating the pins 35, and a Husby cam (not shown) is provided for actuating the folding blade 34 to tuck the sheet or sheets between cooperating folding rollers 31. Rollers 31 deliver the folded products into delivery fly 32 from which they are laid on the moving belts 33.

The cutting, transfer and collecting cylinder 24 is provided with a single set of sheet-taking devices 38, and means are provided for operating said sheet-taking devices to take the lead end of the longitudinally folded web once each revolution of folding cylinder 22. Cylinder 24 is also provided with a cutting blade 39 to cooperate with cutting blocks 40 mounted on cylinder 24 and positioned immediately in advance of impaling pins 28 and 29. Means are also provided for optionally silencing sheet-taking devices 38, and in operation these devices are silenced when blade 25 and pins 29 are operated. Said means preferably comprise removable cams (not shown) which are driven at the same angular speed as the folding cylinders. One such cam is adapted to operate pins 38 to transfer sheets to cylinder 23, while the other cam is adapted to collect sheets for cylinder 22. When both folding blades 25 and 26 are used, either cam is employed and pins 38 are rendered inoperative.

A similar pair of folding cylinders 22—a and 23—a and transfer and collecting cylinders 24—a are provided for the right-hand former 18, and these may be identical with the similar parts for the left-hand former except that they rotate in the opposite direction.

Means are provided for cross-associating the longitudinally folded webs from either former with the webs from the other former, and for this purpose a compensating roller 42, rotatably mounted in pivoted arms 43, is positioned between the points of the two formers 18, and cooperates with the drawing and guide rollers 44. On cross-associate runs, the webs may assume a path as shown by either set of dotted lines of Figure 1, and in such a case one or the other pairs of folding cylinders 22, 23 or 22—a, 23—a would be silenced.

In the operation of the embodiment illustrated in Figures 1, 4 and 5 of the drawings, the webs 10 and 11 are slit by slitters 13 and 14 and led over compensators 15 and guide rollers 16 to formers 18. If desired, either half of either web may be turned by turner bars 19 and associated with the other half of the web so that both halves of the web are led to the same former 18. In normal operation, however, the left-hand former 18 receives two superposed and associated half width webs, while the right-hand former receives four quarter width webs superposed and associated in pairs, with the pairs being arranged side-by-side and the slit separating the pairs lying along the normal line of longitudinal fold.

The two sets of webs may be cross-associated by means of roller 42 so as to position the products which are slit along the line of longitudinal fold either on the outside or the inside of the final folded product.

In the normal operation of the transverse folding mechanism, a sheet length is cut from the

web by cutter 39, 40 and is folded off between folding rollers 31 by means of folding blade 26. The next sheet length has its lead end taken by pins 39 and is transferred to cylinder 23 where its lead end is taken by pins 35. This sheet length is then folded off by blade 34 cooperating with folding-off rollers 31 to deliver it onto the delivery belt 33 below that cylinder. The next sheet length is taken at its lead end by pins 28 and is similarly folded off by blade 26. The products delivered by folding cylinders 22 and 23 are similar to that shown in Figure 2, with the pin holes 46 along the bottom edge of the product.

The associated quarter width webs from the right-hand former 18 are led to folding cylinders 22—a where their lead end is taken by pins 28—a, and the sheets after being cut are folded off by folding blades 26—a. The next sheet length group of sheets has its lead end taken by pins 38—a which transfers the sheets to cylinder 23—a where they are folded off by folding blade 34—a. These products are shown in Figure 3 and comprise tabloid sections with the pin holes 46—a at the rear of the product. The products delivered by folding blades 26—a and 34—a are folded off into their respective delivery flys which lay them on the corresponding delivery belts.

Folding cylinders 22 and 23—a may be silenced and transfer and collecting cylinders 24 and 24—a may be operated as collecting cylinders, in which case folding blades 26 and 26—a will fold off products of two sections each. In this operation, and the operation described immediately above, the pins 29 and 29—a are silenced.

If desired, all of the products may be folded off from folding cylinders 22 and 22—a, and when this manner of operation is desired, pins 38 and 38—a are silenced and cylinders 24 and 24—a operate only as cutting cylinders to cut sheet lengths from the webs. In this operation, pins 29 and 29—a are rendered operative and one product is folded off each half revolution of folding cylinders 22 and 22—a.

Referring now to Figures 6 to 8 of the drawings, the webs 10 and 11 are led from the printing press over guide roller 16 where they are slit longitudinally and centrally of the web by slitters 13. The slit webs are then directed to formers 50 and 51 by means of turner bars 52, positioned so that either or both halves of web 10 may be led to either former 50, and either or both halves of web 11 may be led to either former 51. Formers 50 and 51 are arranged at right angles to the press, but preferably in alignment with each other with their noses projecting outwardly away from each other. Formers 50 are superposed on the respective formers 51, and the webs which are longitudinally folded by formers 50 may be by-passed around the corresponding former 51 by means of guide rollers 53 which lead the upper web below the nose of former 51 where it is associated by means of rollers 54 with the web longitudinally folded by former 51.

The longitudinally folded and associated webs are led from rollers 54 to the transverse folding mechanism comprising the folding cylinders 22 and 23 and the transfer and collecting cylinder 24. These cylinders may be of a construction identical with that shown in Figure 1 of the drawings, and described in detail above, and their manner of operation may be identical with that previously described.

In this embodiment, the products may be similar to that shown by Figure 2 of the drawings, and may comprise one or two longitudinally

folded sections from either or both webs 10 and 11, and these sections may all be folded off by cylinder 23, or alternately from cylinders 22 and 23, or single or cross-associated sections may be collected on cylinder 24 and transferred to cylinder 22 to be folded off with the next succeeding sections. By the use of additional slitters, tabloid products may be delivered from either or both folders. As will be seen, it is possible to produce an extremely wide range of products, 10 varying from a single section of four pages to a product of thirty-two pages divided into four sections.

In the modified embodiment shown in Figures 9 to 11 of the drawings, the webs 10 and 11 are led from the printing press over guide roller 16 where they are longitudinally and centrally slit by slitter discs 13. The slit webs are then led to two pairs of side-by-side formers 60 and 61, formers 60 being arranged directly in advance of and aligned with formers 61. The longitudinally folded webs from either former of one pair may be cross-associated with the other former of the same pair by means of rollers 42 and 44.

The transverse folding mechanism and delivery mechanisms used in connection with this embodiment may be identical with that shown in the left-hand portion of Figure 1. One of such mechanisms comprising folding cylinders 22 and 23, transfer and collecting cylinder 24, delivery flys 32 and delivery belts 33, is provided for each pair of formers. As shown in Figure 9, the transverse folding and delivery mechanism for formers 60 is positioned directly beneath the right hand former 60 while the transverse folding and delivery mechanism for formers 61 is positioned below the left hand former 61. Delivery belts 33 extend away from their respective folding cylinders in a uniform direction, and as deliveries are made from the same side of all folding cylinders the pin holes may all be positioned at the bottoms of the products.

In the operation of this embodiment, the right-hand halves of the printed webs may all be fed to the right-hand former 60 or to the right-hand former 61, and similarly the left-hand halves may be fed to the left-hand former 60 or to the left-hand former 61. Alternatively, the right-hand half of one web may be fed to the right-hand former 60 and the right-hand half of another web may be fed to the right-hand former 61, and the same arrangement may be followed for the left-hand halves of the web. When both formers 60 or 61 are employed, the corresponding cross-associating guide roller 42 is utilized to cross-associate the webs and feed both longitudinally folded webs to the same transverse folding mechanism.

The invention in its broader aspects is not limited to the specific mechanisms shown and described but departures may be made therefrom within the scope of the accompanying claims without departing from the principles of the invention and without sacrificing its chief advantages.

What I claim is:—

1. In a folding and collecting mechanism for printing presses, the combination of a pair of folding cylinders, means for feeding a web to said cylinders, means for cutting sheets from said web, means for folding off products from said cylinders alternately, means for optionally collecting sheets for one of said cylinders and means for optionally silencing said collecting means, whereby products may be delivered from said cyl- 75

inders alternately or from only one of said cylinders and products may be collected.

2. In a folding and collecting mechanism for printing presses, the combination of a pair of folding cylinders, means for feeding a web to said cylinders, means for cutting sheets from said web, a transfer and collecting cylinder positioned between said folding cylinders, means for folding off sheets alternately from said cylinders or from one of said cylinders only.

3. In a folding and collecting mechanism for printing presses, the combination of a pair of folding cylinders, means for feeding a web to said cylinders, means for cutting sheets from said web, an optionally operable transfer and collecting cylinder positioned between said folding cylinders and means for folding off sheets from said cylinders including a pair of folding blades on one cylinder and a single folding-off blade on the other folding cylinder.

4. In a folding and collecting mechanism for printing presses, the combination of a pair of folding cylinders, means for feeding a web to said cylinders, means for cutting sheets from said web, a transfer and collecting cylinder positioned between said folding cylinders, means for folding off one or two uncollected products or one collected product from one of said folding cylinders each revolution and means operable when said last mentioned cylinder folds off one uncollected product per revolution for folding off an uncollected product each revolution of the other folding cylinder.

5. In a folding and collecting mechanism for printing presses, the combination of a pair of folding cylinders, means for feeding a web to said cylinders, means for cutting sheets from said web, a transfer and collecting cylinder positioned between said folding cylinders, means for folding off all of the products of said web on one folding cylinder and means for optionally folding off a part of the products of said web on the other folding cylinder.

6. In a folding and collecting mechanism for printing presses, the combination of a pair of folding cylinders, means for feeding a web to said cylinders, means for cutting sheets from said web, an optionally operable cylinder positioned between said folding cylinders to operate as a transfer or collecting cylinder and means for folding off the products of said web from one or both of said folding cylinders.

7. In a folding and collecting mechanism for printing presses, the combination of a pair of folding cylinders, means for feeding a web to said cylinders, means for cutting sheets from said web, an optionally operable cylinder positioned between said folding cylinders and capacitated to operate as a transfer or collecting cylinder, a pair of folding off devices on one of said folding cylinders, and a single folding-off device on the other of said folding cylinders.

8. In a printing press, the combination of a pair of side-by-side formers, a pair of folding cylinders below each of said formers, means for directing webs to either or both of said formers, means for slitting the web along a line passing between said formers and means for slitting a web along the line of fold to be made by one of said formers, a transfer cylinder between the folding cylinders of each pair and means for delivering folded products from the folding cylinders of each pair.

9. In a printing press, the combination of a pair of side-by-side formers, a pair of folding

cylinders below each of said formers, means for directing webs to either or both of said formers, means for slitting the web along a line passing between said formers and means for slitting a web along the line of fold to be made by one of said formers, a transfer cylinder between the folding cylinders of each pair and means for delivering folded products alternately from the folding cylinders of each pair.

10. In a printing press, the combination of a pair of side-by-side formers, a pair of folding cylinders below each of said formers, means for directing webs to either or both of said formers, means for slitting the web along a line passing between said formers and means for slitting a web along the line of fold to be made by one of said formers, a transfer cylinder between the folding cylinders of each pair, means for delivering folded products alternately from the folding cylinders of each pair and means for silencing one folding cylinder of each pair whereby all of the products are delivered from one folding cylinder of each pair.

11. In a printing press, the combination of a pair of side-by-side formers, a pair of folding cylinders below each of said formers, means for directing webs to either or both of said formers, means for slitting the web along a line passing between said formers and means for slitting a web along the line of fold to be made by one of said formers, a transfer cylinder between the folding cylinders of each pair, means for operating said transfer cylinder as a collecting cylinder and means for folding off products from one or both folding cylinders of each pair.

12. In a printing press, the combination of a pair of side-by-side formers, a pair of folding cylinders below each of said formers, means for directing webs to either or both of said formers, means for slitting the web along a line passing between said formers and means for slitting a web along the line of fold to be made by one of said formers, a transfer cylinder between the folding cylinders of each pair, means for directing webs from either of said formers to either pair of folding cylinders and means for delivering folded products from all of the folding cylinders.

13. In a printing press, the combination of a pair of side-by-side formers, a pair of folding cylinders below each of said formers, means for directing webs to either or both of said formers, means for slitting the web along a line passing between said formers and means for slitting a web along the line of fold to be made by one of said formers, a transfer cylinder between the folding cylinders of each pair, means for directing webs from either of said formers to either pair of folding cylinders, means for delivering folded products from all of the folding cylinders and means for silencing one folding cylinder of each pair.

14. In a printing press, the combination of a pair of side-by-side formers, means for directing webs to either or both of said formers, means for slitting said webs along a central line, a pair of folding cylinders below each of said formers, a transfer and collecting cylinder between the folding cylinders of each pair and means for delivering folded products from the folding cylinders of each pair.

15. In a printing press, the combination of a pair of side-by-side formers, means for directing webs to either or both of said formers, means for slitting said webs along a central line, a pair of

folding cylinders below each of said formers, a transfer and collecting cylinder between the folding cylinders of each pair, means for cross-associating the longitudinally folded web and means for delivering folded products from the folding cylinders of each pair.

16. In a printing press, the combination of a pair of side-by-side formers, means for directing webs to either or both of said formers, means for slitting said webs along a central line, a pair of folding cylinders below each of said formers, a transfer and collecting cylinder between the folding cylinders of each pair, means for delivering folded products alternately from the folding cylinders of each pair or collected and folded products from one folding cylinder of each pair.

17. In a printing press, the combination of a pair of side-by-side formers, means for directing webs to either or both of said formers, means for slitting said webs along a central line, a pair of folding cylinders below each of said formers, a transfer and collecting cylinder between the folding cylinders of each pair, means for delivering folded products alternately from the folding cylinders of each pair or folded products from one cylinder only of each pair.

18. In a printing press, the combination of a pair of side-by-side formers, means for directing webs to either or both of said formers, means for slitting said webs along a central line, a pair of folding cylinders below each of said formers, a transfer and collecting cylinder between the folding cylinders of each pair, means for cross-associating the longitudinally folded webs, means for delivering folded products alternately from the folding cylinders of each pair and folded products from one folding cylinder of one pair.

19. In a printing press, the combination of a pair of side-by-side formers, means for directing webs to either or both of said formers, means for slitting said webs along a central line, a pair of folding cylinders below each of said formers, a transfer and collecting cylinder between the folding cylinders of each pair, means for cross-associating the longitudinally folded web, means for optionally silencing said transfer and collecting cylinders, means for delivering folded products alternately from the folding cylinders of each pair, collected products from one cylinder only of each pair or cross-associate, collected and folded products from one folding cylinder.

20. In a printing press, the combination of a pair of superposed formers aligned with each other, a pair of folding cylinders below said formers, a transfer cylinder between said folding cylinders to transfer sheets to one of said cylinders and means for guiding webs from either or both of said formers to said cylinders.

21. In a printing press, the combination of a pair of superposed formers aligned with each other and positioned at right angles to the press, a pair of folding cylinders below said formers and means for delivering folded products from said cylinders alternately.

22. In a printing press, the combination of a pair of superposed formers aligned with each other, a pair of folding cylinders below said formers, means for leading the longitudinally folded web from either or both of said formers to said folding cylinders in alternate succession, and means for delivering the products from said folding cylinders alternately.

23. In a printing press, the combination of a pair of superposed formers, a pair of folding cylinders below said formers, means for leading the

longitudinally folded web from either or both of said formers to said folding cylinders in alternate succession or to one of said folding cylinders and means for delivering folded products from said folding cylinders alternately or from one only of said folding cylinders.

24. In a printing press, the combination of a pair of superposed formers positioned at right angles to the press, a pair of folding cylinders positioned below said formers, means for directing longitudinally folded webs from either or both of said formers to said cylinders, a transfer and collecting cylinder positioned between said folding cylinders for collecting sheets or transferring sheets from one folding cylinder to the other folding cylinder, means for optionally silencing said transfer and collecting cylinder and means for delivering folded products from said folding cylinders alternately or from one cylinder only or for folding a collected product from one of said cylinders.

25. In a printing press the combination of two pairs of superposed formers, a pair of folding cylinders below each pair of formers, means for directing a plurality of printed webs to either or both of said pairs of formers, means for directing webs folded longitudinally by said formers to the folding cylinders below said formers and means for delivering folded products alternatively from either or both folding cylinders of each pair.

26. In a printing press the combination of two pairs of superposed formers, a pair of folding cylinders below each pair of formers, means for directing a plurality of printed webs to either or both of said pairs of formers, means for directing webs folded longitudinally by said formers to the folding cylinders below said formers and means for delivering collected and folded products alternatively from one cylinder of each pair or for delivering folded products from all of said cylinders.

27. In a printing press the combination of two pairs of superposed formers, a pair of folding cylinders below each pair of formers, means for directing a plurality of printed webs to either or both of said pairs of formers, means for directing webs folded longitudinally by said formers to the folding cylinders, a transfer and collecting cylinder between the folding cylinders of each pair and means for folding off products from the folding cylinders of each pair alternately or for folding off said products from one cylinder only of each pair.

28. In a printing press, the combination of a pair of formers, a second pair of formers positioned in advance of said first pair, means for alternatively guiding a plurality of webs to either or both formers of either or both pairs, a pair of folding cylinders below each pair of formers and means for directing longitudinally folded webs from said formers to said folding cylinders.

29. In a printing press, the combination of a pair of formers, a second pair of formers positioned in advance of said first pair, a pair of folding cylinders below each pair of formers, an optionally operable transfer and collecting cylinder between the folding cylinders of each pair and means for delivering folded products from one or both folding cylinders of each pair.

30. In a printing press, the combination of a pair of formers, a second pair of formers positioned in advance of said first pair, a pair of folding cylinders below each pair of formers, a transfer and collecting cylinder between the folding cylinders of each pair and means for

alternately delivering folded products from the folding cylinders of each pair.

31. In a printing press, the combination of a pair of formers, a second pair of formers positioned in advance of said first pair, a pair of folding cylinders below each pair of formers, an optionally operable transfer and collecting cylinder between the folding cylinders of each pair, means for delivering folded products from one or both folding cylinders of each pair and means for cross-associating the webs from said formers.

32. In a printing press, the combination of a pair of formers, a second pair of formers positioned in advance of said first pair, means for directing printed webs to either or both of said formers, means for centrally slitting said webs, a pair of folding cylinders below each pair of formers, an optionally operable transfer and col-

lecting cylinder between the folding cylinders of each pair and means for delivering folded products from one or both folding cylinders of each pair.

33. In a printing press, the combination of a pair of formers, a second pair of formers positioned in advance of said first pair, means for directing printed webs to either or both of said formers, means for centrally slitting said webs, a pair of folding cylinders below each pair of formers, an optionally operable transfer and collecting cylinder between the folding cylinders of each pair and means for delivering folded products alternately from the folding cylinders of each pair or for delivering folded and collected or uncollected products from one cylinder of each pair.

CURTIS S. CRAFTS.