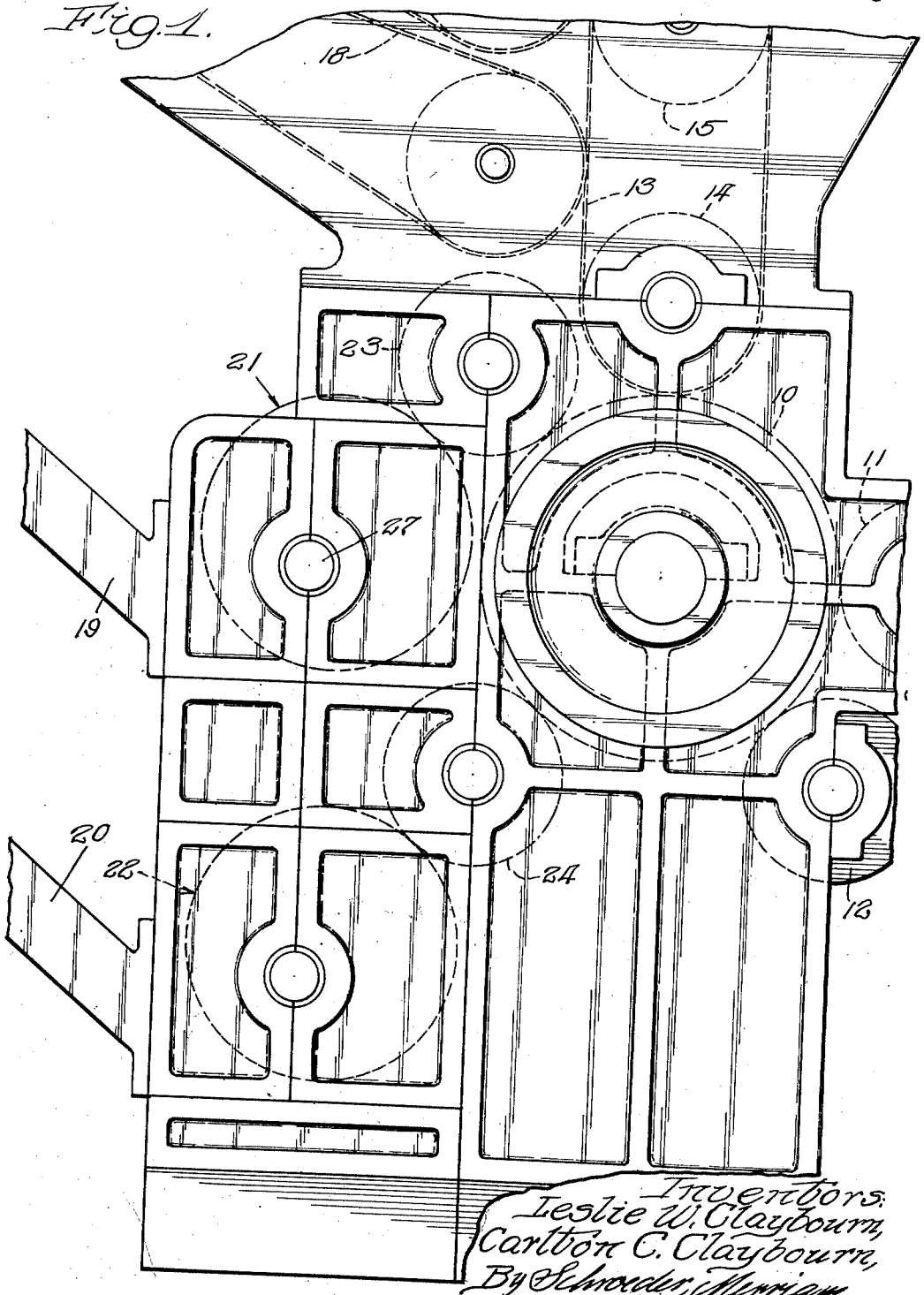
Jan. 11, 1955 L. W. CLAYBOURN ET AL 2,699,333

APPARATUS AND METHOD FOR FEEDING SHEETS TO PRINTING PRESSES

Filed March 27, 1952

5 Sheets-Sheet 1

Fig. 1.



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5 Sheets-Sheet 2

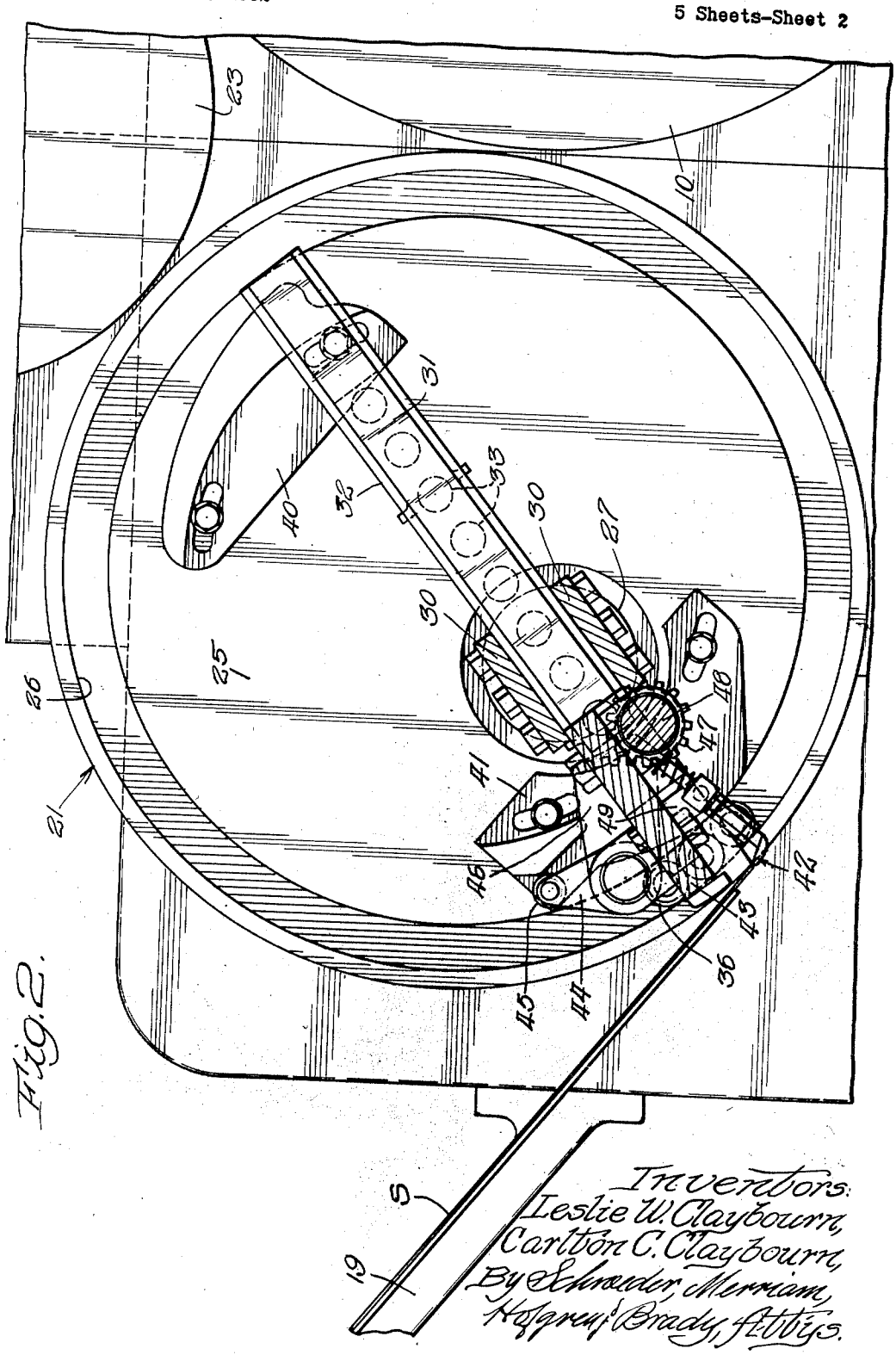


Fig. 2.

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5 Sheets-Sheet 3

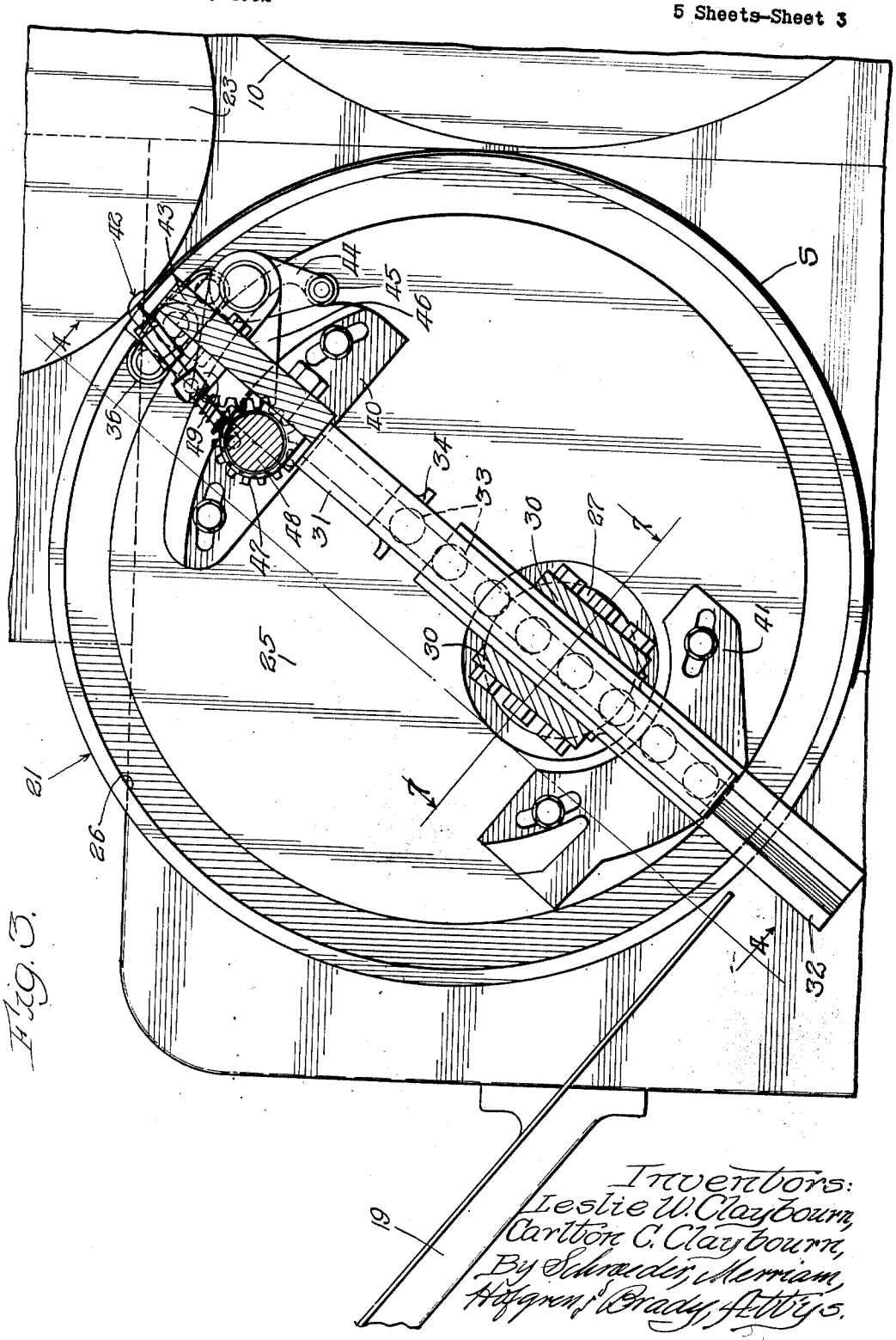


Fig. 3.

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APPARATUS AND METHOD FOR FEEDING SHEETS TO PRINTING PRESSES

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5 Sheets-Sheet 4

Fig. 4.

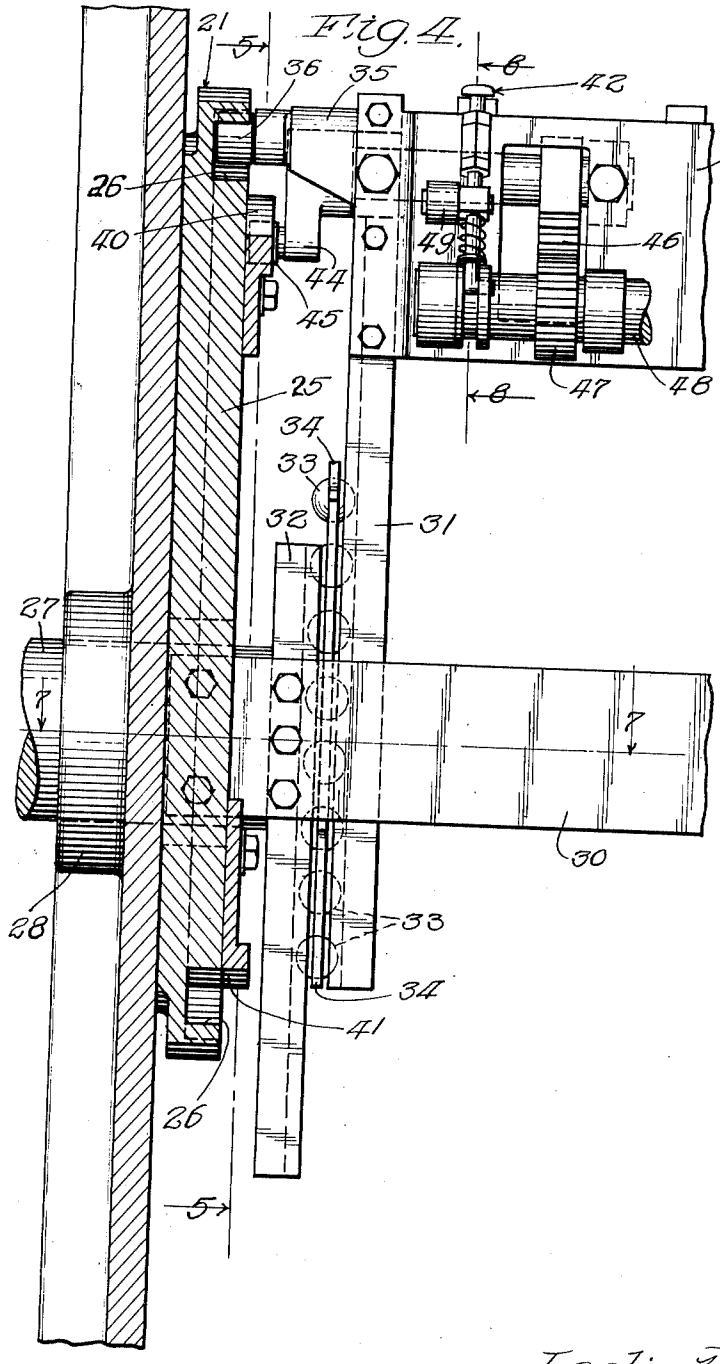
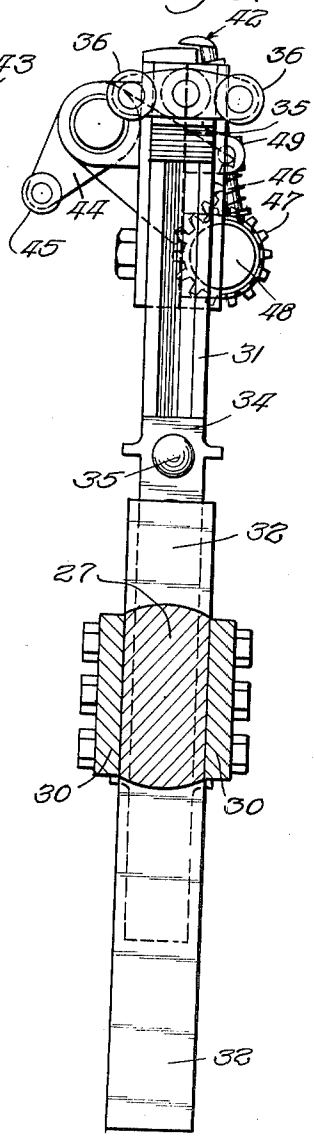


Fig. 5.



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APPARATUS AND METHOD FOR FEEDING SHEETS TO PRINTING PRESSES

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5 Sheets-Sheet 5

Fig. 6.

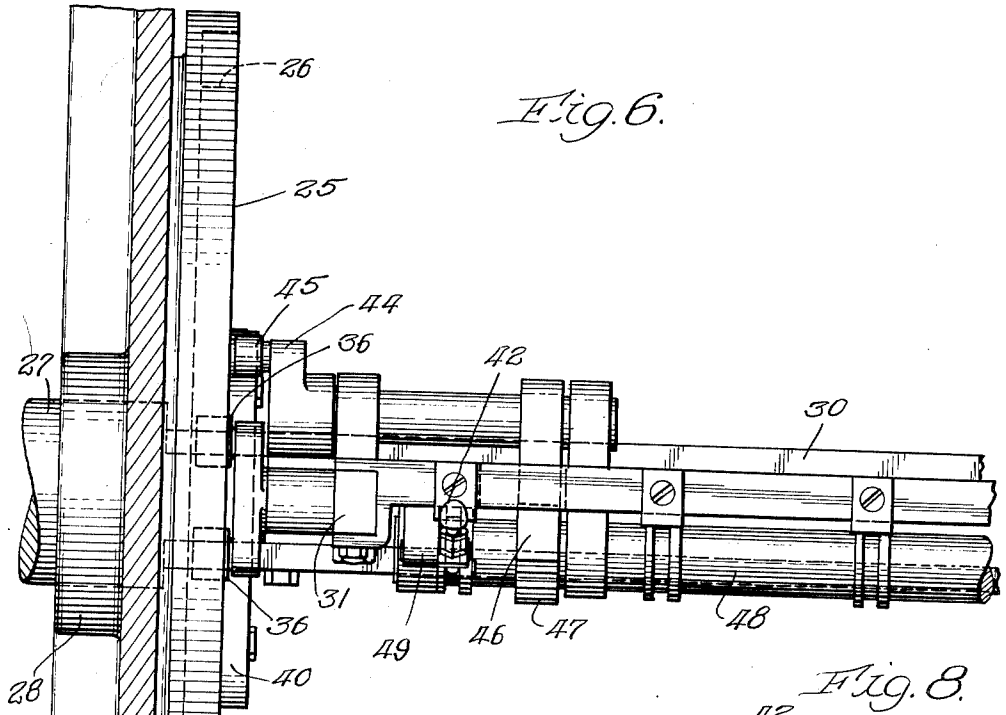


Fig. 8.

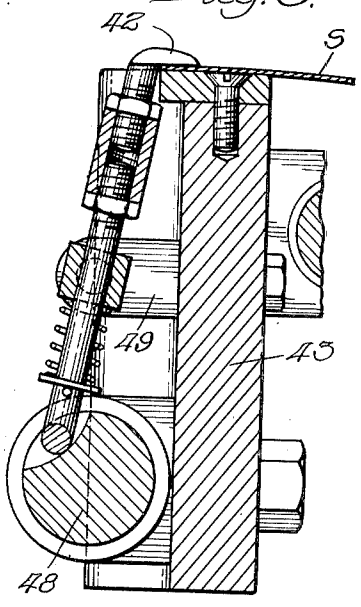
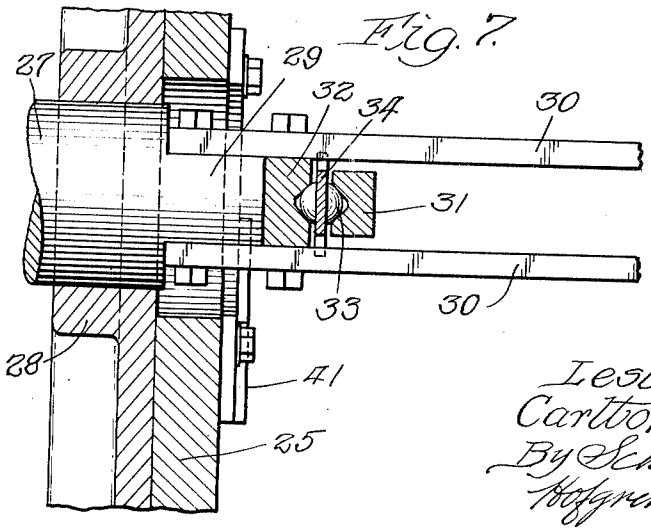


Fig. 7.



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2,699,333

APPARATUS AND METHOD FOR FEEDING SHEETS TO PRINTING PRESSES

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Application March 27, 1952, Serial No. 278,921

17 Claims. (Cl. 271—51)

This invention relates to feeding sheets to a printing press and more particularly to an apparatus and a method for feeding sheets to a rotary press to increase production of the press.

Experience has taught that rotary printing presses can be operated as fast as sheets can be fed to the presses. The difficulty has been in attempts to increase the feed rate rather than the printing rate. Existing feeding devices can only handle sheets at limited rates due to many factors, one of which is the surface velocity at which the sheet can be advanced toward the printing cylinders. Most feeders require that the sheet be stopped for alignment before advancing on to the printing cylinders and the permissible rate of advance has placed definite limitations on printing press capacity.

In general, the present invention provides means for overcoming the previous difficulties. A single sheet feeder may be used in the manner taught herein to increase the production of the press. In addition, a plurality of sheet feeders may be concurrently used with a single press and driven in timed relation to the printing cylinders. In the applications of the present invention, the sheets are fed toward the press at a predetermined rate which is considerably slower than the printing rate; the sheets are accelerated to the printing rate and then fed to the printing cylinders.

The invention will be described with reference to a preferred embodiment illustrated in the accompanying drawings, in which:

Fig. 1 is a diagrammatic side elevational view of a rotary press showing the relative location of the printing cylinders, sheet feeders and apparatus of this invention; Fig. 2 is an enlarged fragmentary side elevational view of the sheet transferring means of this invention in position to pick up a sheet from the sheet feeder; Fig. 3 is a view like Fig. 2 showing the transfer device in position to release a sheet to the feed-in cylinder; Fig. 4 is a fragmentary sectional view taken substantially along line 4—4 in Fig. 3; Fig. 5 is a fragmentary sectional view taken substantially along line 5—5 in Fig. 4; Fig. 6 is a fragmentary top plan view of the transfer device as seen in Fig. 3; Fig. 7 is a fragmentary sectional view taken substantially along line 7—7 in Fig. 3 and correspondingly along line 7—7 in Fig. 4; and Fig. 8 is a fragmentary sectional view through the sheet gripping device taken substantially along line 8—8 in Fig. 4.

The rotary press as diagrammatically shown in Fig. 1 includes an impression cylinder **10** against which plate cylinders **11** and **12** are pressed to print the sheets. Two plate cylinders are shown since the illustrated press may print two colors and the color rolls (not shown) will be in contact with the plate cylinders off the right-hand side of the figure. Near the top of the figure, a chain **13** provided with grippers passes around rolls **14** and **15** for taking printed sheets off the impression cylinder. These sheets are passed to a delivery chain **18** and carried out of the press.

The sheets to be printed are advanced toward the press on sheet feeders **19** and **20** which are sloped downwardly toward transfer devices **21** and **22**. In the case of the upper sheet feeder **19**, sheets are taken from the feeder by the transfer device **21** and delivered to the feed-in cylinder **23** from which they are transferred to the impression cylinder. In the case of the lower sheet feeder **20**, the sheets are delivered by transfer device **22** to feed-in cylinder **24** and then to the impression cylinder.

The feed-in cylinders and impression cylinder are provided with grippers for grasping the sheets and holding them in aligned position through the press. Ordinarily the impression cylinder is cast iron while the feed-in cylinders may be steel or aluminum.

In normal operation of presses in the past the sheets traveling in on the sheet feeder proceed toward the press at a given rate which rate was also the printing rate of the press. The incoming sheets were usually stopped for purposes of alignment and then picked up and fed into the printing cylinders of the press. In the present device the sheets are fed toward the press at a given rate and then are accelerated to a much higher rate, for example to a surface velocity double that corresponding to the feed rate, and then fed into the printing cylinders. By this means the capacity of the printing press may be doubled and in any event increased materially.

The particular means herein employed for transferring the sheets from the sheet feeder to the printing cylinders and accelerating the sheets to the printing rate is shown in detail in Figs. 2–8. Since both transfer devices **21** and **22** are alike only one will be described in detail with the understanding that the other is a duplicate of it.

A plate **25** is secured to the frame of the press and has formed therein a marginal circular groove **26** forming a path or track about which the transfer means rotates. Within the confines of the track **26** is a shaft **27** mounted with its axis eccentric to the track. The eccentricity in the particular instance illustrated is such that the distance between the shaft and the nearest point on the track is exactly one half the distance between the shaft and the point on the track farthest therefrom. The shaft is carried in a bearing **28** in the press frame and has a stub **29** on its inner end to which a pair of parallel plates **30** are securely fastened. While only one end of the shaft **27** and the plates **30** are shown, it will be understood that a similar end is present on the other side of the press and that the shaft has a similar portion for supporting the plates **30**.

An arm **31** is mounted between the plates **30** in a manner that will permit it to move radially of the shaft **27**. This arm is in two parts with one part **32** firmly secured between the plates **30** and separated from the arm **31** by ball bearings **33** placed in a carrier **34**. This construction is most easily seen in Fig. 4. The bearings are pressed into the carrier and the arms **31** and **32** form the races for the bearings.

At the outer end of the arms **31** are mounted the sheet gripping means and the means for following the circular track **26**. A boss **35** carries a number of rollers **36** which run in the confines of the track **26** upon rotation of the arm **31**. The driving force is supplied in the shaft **27** to rotate the arm **31** at a constant angular velocity. Since the shaft is eccentric to the circular path which the outer end of arm **31** follows, the linear velocity of the outer end of the arm will vary in proportion to the distance between the outer end and the axis of shaft **27**. In accordance with the location shown, the linear velocity of the outer end of the arm will be doubled between the positions shown in Fig. 2 and that shown in Fig. 3. In Fig. 2 the sheet grasping device, hereinafter described, is about to pick up sheet S and is traveling at a linear velocity which is half the linear velocity in the position of Fig. 3 where the sheet gripping device is about ready to release a sheet to the feed-in cylinder **23**. As will be well understood the arm **31** travels radially relative to the shaft on the ball bearings **33** as rollers **36** follow the track.

The sheet gripping devices are operated by a pair of cam surfaces **40** and **41** which are secured to the face of the plate **25**. The grippers **42** themselves are mounted on a cross member **43** carried on the outer end of a pair of arms **31**, one arm being on each side of the press. Bell crank arms **44** are mounted adjacent the ends of arm **31** and carry a follower **45** adapted to engage the cam surfaces **40** and **41** to operate the gripping mechanism to pick up and release sheets S when desired. In the present instance the cam plates **40** and **41** are located so that sheet S is picked up by the transfer device at its lowest lineal velocity and released to feed-in cylinder **23**

at the highest lineal velocity. The inner end of bell crank 44 has a segment gear 46 in mesh with spur gear 45 on shaft 48 which carries the inner ends of gripper fingers 42. The grippers are pivotally mounted at 49 on the cross member 43. Movement of the bell cranks thus operates the grippers to catch and release sheets.

An example of the operation of the present invention to double the capacity of a printing press may be noted by referring to Fig. 1. If the impression cylinder is run at a printing rate of 5,000 sheets per hour the sheet feeders 19 and 20 may be operated at a feeding rate of only 2,500 sheets per hour. Each sheet must be fed at a velocity to the impression cylinder equal to the surface velocity of the cylinder. The disclosed transfer devices can double the velocity of the sheet transferring it to a feed-in cylinder and thus the velocity of each sheet will be accelerated to the velocity of the impression cylinder. In handling certain types of paper it may be possible to increase the number of sheet feeders by the provision of additional devices or with other papers it may be possible to speed up both the sheet feeders and the printing cylinders. It will be noted that the transfer device will have an arm length from the axis of the shaft 27 to the sheet gripper equal to the radius of the impression cylinder upon the release of a sheet S. This insures that the velocity of the sheet is the same as the surface velocity of the impression cylinder since shaft 27 and the impression cylinder are driven at the same speed. The sheet transfer devices are driven in timed relation to the printing cylinders so that the sheets are fed both alternately and intermittently to the printing cylinders.

While we have shown and described certain embodiments of our invention, it is to be understood that it is capable of many modifications. Changes, therefore, in the construction and arrangement may be made without departing from the spirit and scope of the invention as disclosed in the appended claims.

We claim:

1. In a sheet printing press having a plurality of feed mechanisms and an impression cylinder adapted to run at a velocity substantially in excess of the velocity at which said sheets are fed by said feed mechanism, separate means for transferring sheets from each feed mechanism, each of said means being adapted to accelerate the sheets during transfer to the impression cylinder, each of said means including a transfer cylinder adapted to perform one rotation during transfer of one sheet to said impression cylinder, whereby the impression cylinder prints sheets at a rate substantially in excess of the velocity of which sheets are fed by said feed mechanisms, and means for driving said transfer means in timed relation to the rotation of the impression cylinder.

2. Apparatus as set forth in claim 1 wherein the press is provided with two feed mechanisms with a separate sheet transfer means between each feed mechanism and the impression cylinder, said transfer means including accelerating means secured thereto, and means are provided for driving each feed mechanism at a rate corresponding to substantially one half the printing rate of the impression cylinder.

3. Apparatus for transferring sheets from a source of sheets on a sheet feeder to a printing press cylinder comprising means forming a circular path, a rotary member mounted for travel at a constant angular velocity about an axis eccentric to the circular path, said axis lying between the center of the circular path and a position where a sheet is picked up, means for picking up a sheet from said source at one position during a revolution of a member and the means for releasing the sheet at another position during the same revolution of a member, said means being adapted to transmit continuous acceleration to said sheet.

4. Apparatus for changing the rate of feed of sheets from a source to a printing press comprising means forming a circular path, a rotary member mounted for travel at a constant angular velocity about an axis eccentric to the circular path, said axis lying between the center of the circular path and a position where a sheet is picked up, sheet gripping means on said rotatable member adjacent said path moveable at a variable linear velocity, and means for picking up and releasing a sheet at selected positions about said path.

5. Apparatus for transferring sheets from a source of sheets on a sheet feeder to a printing press cylinder comprising, means forming a circular path, an arm having means for following said path, said arm being rotatable about an axis eccentric to the path at a constant angular velocity whereby the means following said path moves at variable linear velocity, means on the arm adjacent said circular path for picking a sheet from the sheet feeder at one linear velocity and means for releasing the sheet at another linear velocity.

6. Apparatus for transferring sheets from a source of sheets on a sheet feeder to a printing press cylinder comprising, means forming a circular path, an arm having a follower adapted to track in said path, arm driving means including a shaft eccentric to said path, said arm being secured to the shaft and being slidable radially of the shaft, and sheet grasping means on the arm adjacent the circular path position to take sheets from said source and release them to the press.

7. Apparatus as set forth in claim 6 wherein the press has a plurality of sheet feeders, a sheet transferring means is provided for each sheet feeder and means are provided for driving said transferring means in timed relation to the press cylinder.

8. Apparatus for transferring sheets from a sheet feeder to a printing press cylinder, means for rotating said cylinder, said transfer apparatus comprising, means forming a circular track, a shaft within the track arranged eccentric thereto, an arm mounted on the shaft, sheet gripping means on the arm adjacent the track and following said track, and means for driving said shaft in timed relation to rotation of said printing press cylinder, said sheet gripping means having a variable linear velocity less than or equal to the linear velocity of said printing press cylinder.

9. Apparatus for transferring sheets from a sheet feeder to a printing press cylinder comprising, means forming a circular track, a shaft within the track with its axis eccentric thereto, an arm slidably secured to the shaft for movement laterally of the shaft, a roller on the outer end of the arm adapted to roll in said track, drive means for turning said shaft and arm at constant angular velocity and sheet gripping means on the outer end of the arm adjacent said track.

10. Apparatus as specified in claim 9 wherein said shaft is bifurcated and the arm has two parts with one part secured between the bifurcations, the other part being aligned with said one part and being spaced therefrom by anti-friction bearings.

11. Apparatus as specified in claim 9 wherein a pair of parallel spaced plates are axially secured to the shaft, said arm is slidably receivable between the plates and anti-friction bearings are provided for supporting said arm against the shaft.

12. In a sheet printing press having an impression cylinder and a sheet feeder having a source of sheets, apparatus for transferring sheets from the feeder to said cylinder comprising, means forming a circular path extending generally between the feeder and press, a rotary member adapted to travel around said path at a constant angular velocity about an axis eccentric to the path, and sheet gripping means on the rotary member for grasping and releasing sheets, said axis being spaced from said sheet gripping means during a portion of each revolution of the rotary member a distance equal to the radius of the impression cylinder.

13. In a sheet printing press having an impression cylinder and a sheet feeder, means for driving the impression cylinder at a rate substantially in excess of the feed rate, means for transferring sheets from the sheet feeder to the impression cylinder including a rotary member adapted to travel around a circular path at a constant angular velocity about an axis eccentric to the path, said angular velocity being equal to the angular velocity of the impression cylinder, and means on the rotary member adjacent the path for picking a sheet from the sheet feeder in one position and for releasing the sheet in another position when the distance between said picking means and said axis equal the radius of the impression cylinder.

14. The method which comprises providing a sheet transferring device between a sheet feeder and the printing cylinders of a press, rotating the transferring device at a constant rate of revolution, operating the transferring device to pick sheets from the sheet feeder at one linear velocity and to accelerate them to a different linear velocity equal to the surface velocity of the printing cylin-

ders, and then feeding the sheets at the accelerated velocity to the press.

15. The method which comprises providing a sheet printing press with a plurality of sheet feeders, providing a sheet transferring device between each sheet feeder and the printing cylinders of the press to deliver sheets from the feeder to the press cylinders, rotating the transferring devices at a constant rate of revolution, running the press cylinders at a velocity substantially greater than the velocity corresponding to the rate of feed of sheets on the sheet feeder, transferring and accelerating the sheets from the sheet feeder rate to the press velocity while rotating each of the transferring devices at constant angular velocity.

16. The method which comprises providing a rotary printing press having an impression cylinder with a plurality of sheet feeders, running the impression cylinder at a surface speed substantially in excess of the speed at which sheets are drawn from the feeders, providing a sheet transfer device for each sheet feeder, operating the transferring devices at a constant angular velocity and in timed relation to the rotation of the impression cylinder, picking sheets from the feeders with said transfer devices and delivering said sheets sequentially to the impression cylinder at a surface speed equal to the surface speed of said impression cylinder while rotating each of said transfer devices one complete rotation during pick up of one sheet to pick up of succeeding sheet.

17. The method which comprises providing a rotary press having a single impression cylinder with a pair of sheet feeders, driving the impression cylinder at a rate in excess of the speed at which sheets are drawn from the feeders, providing a sheet transfer device for each sheet feeder operating the transferring devices at a constant angular velocity and in timed relation to the rotation of the impression cylinder to transfer sheets from the feeder to the impression cylinder, and operating the transferring devices to pick sheets from the sheet feeder and deliver them to the impression cylinder at an accelerated rate while rotating said transferring devices during partial rotation during delivery of one sheet to said impression cylinder.

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