N. A. ANDERSON.

SHEET REGISTER.

1,300,235. APPLICATION FILED DEC. 7, 1915. Patented Apr. 15, 1919.

4 SHEETS—SHEET 1.

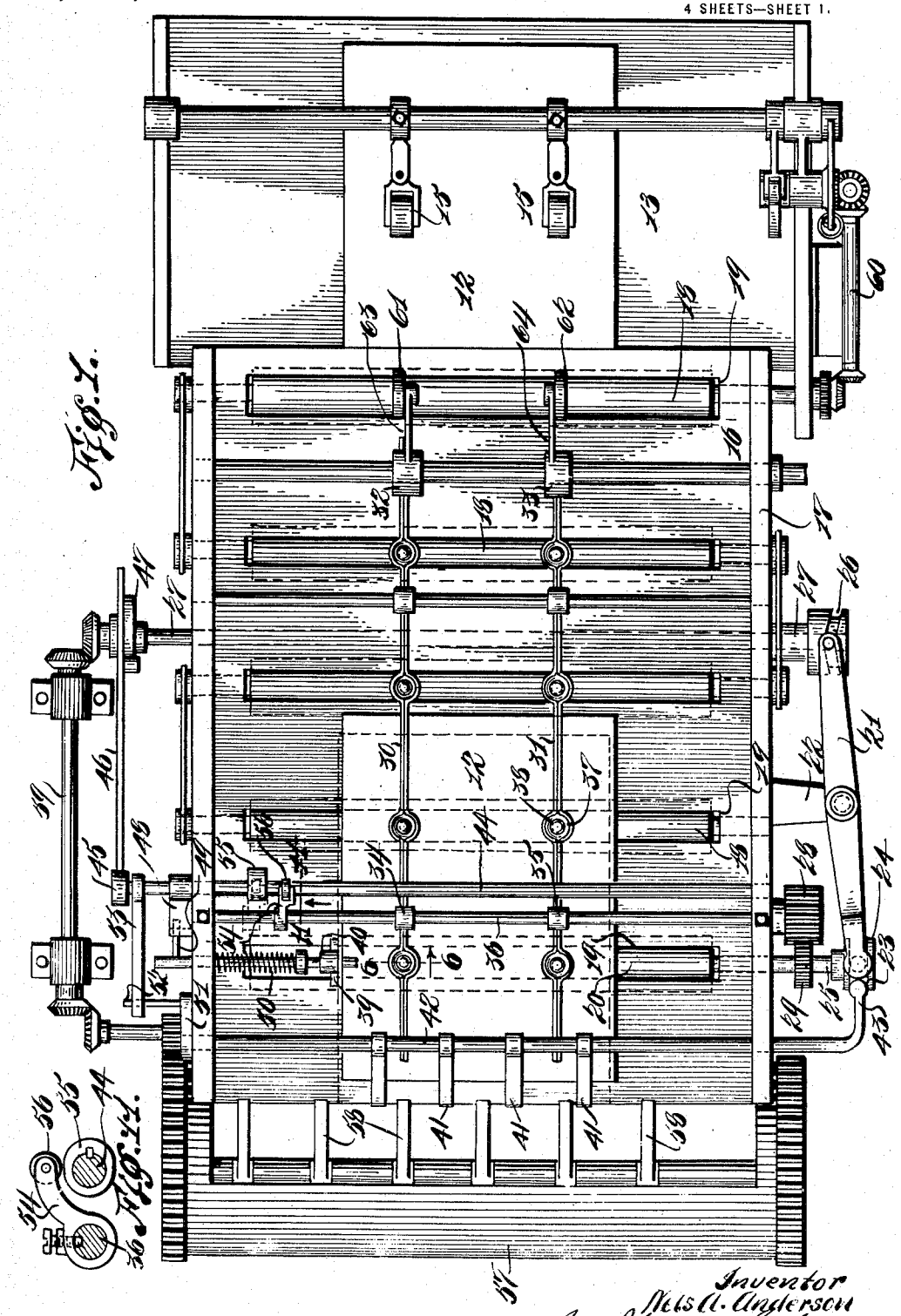


Fig. 1.

Fig. 2.

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4 SHEETS—SHEET 2.

Fig. 2.

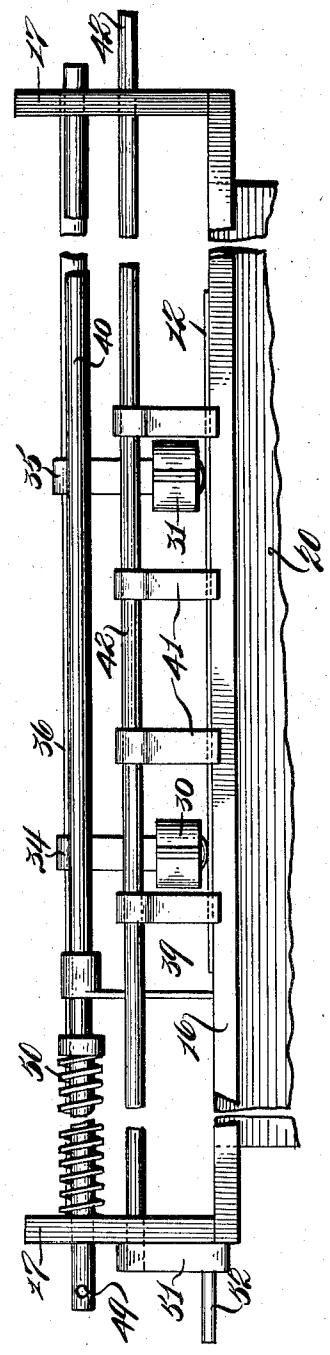
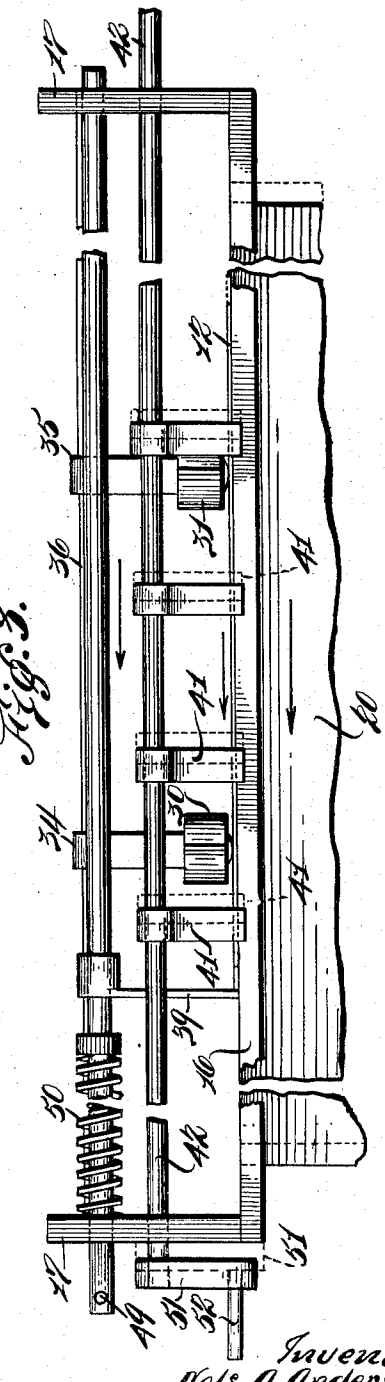


Fig. 3.



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4 SHEETS—SHEET 3.

Fig. 4.

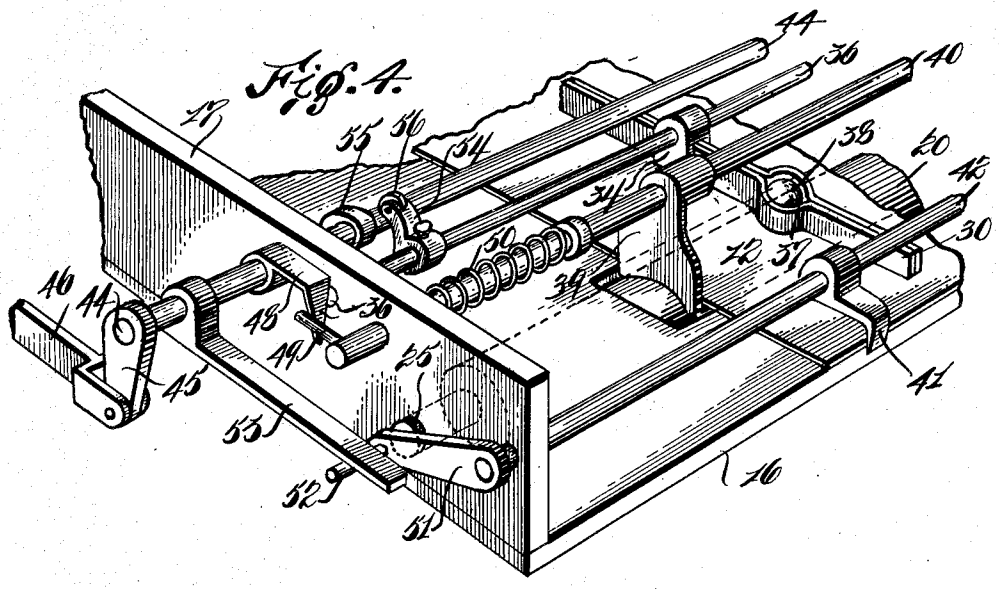
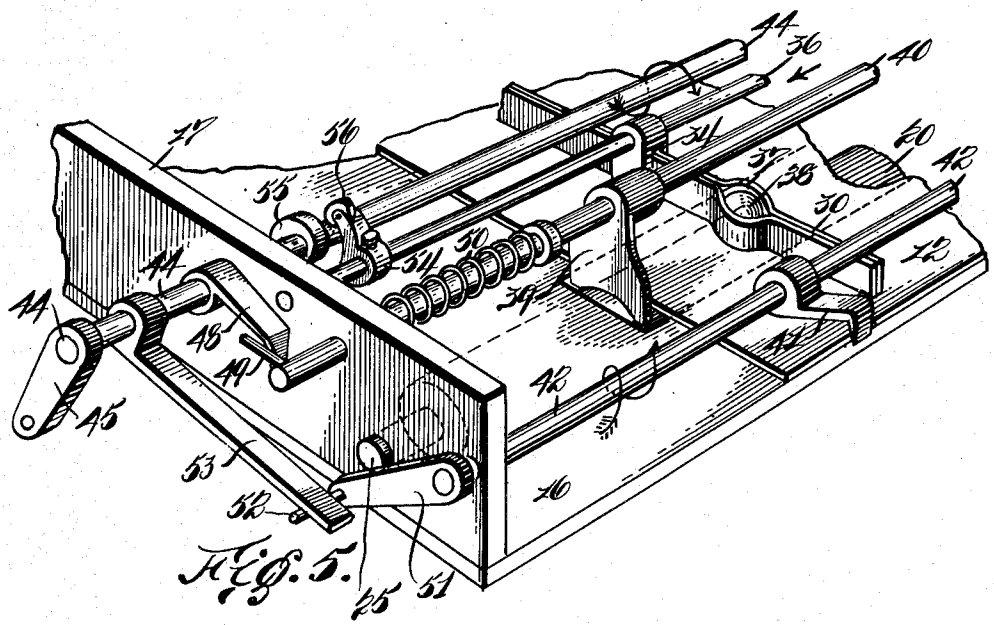


Fig. 5.



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4 SHEETS—SHEET 4.

Fig. 6.

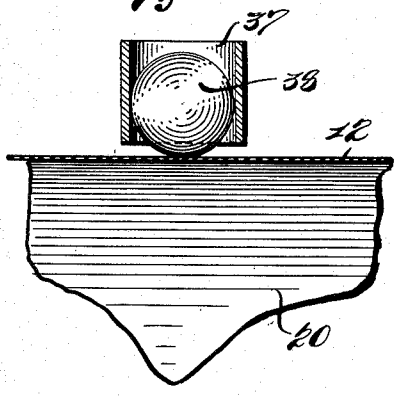
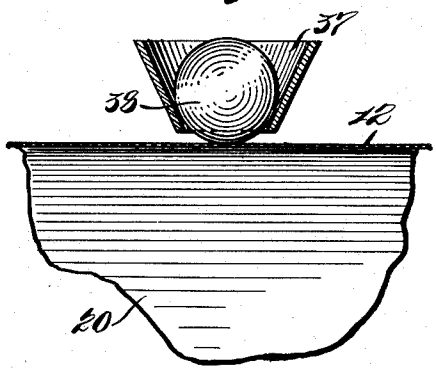


Fig. 7.



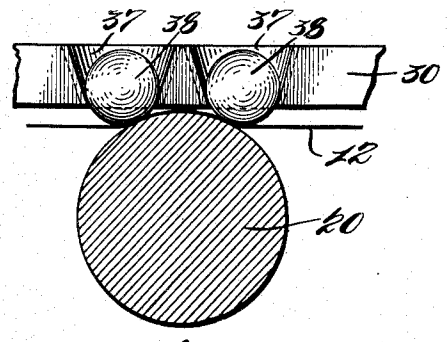


Fig. 8.

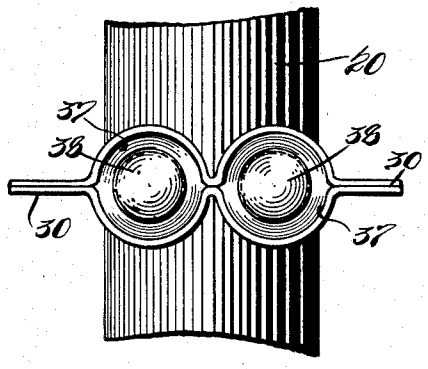


Fig. 9.

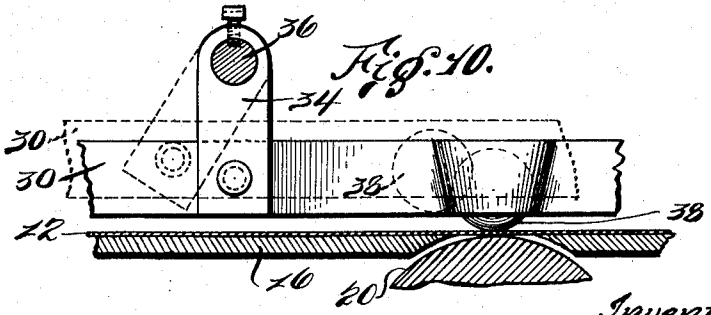


Fig. 10.

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UNITED STATES PATENT OFFICE.

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SHEET-REGISTER.

1,300,235. Specification of Letters Patent. **Patented Apr. 15, 1919.**

Application filed December 7, 1915. Serial No. 65,450.

To all whom it may concern:

Be it known that I, NELS A. ANDERSON, a citizen of the United States, and a resident of Warren, in the county of Trumbull and State of Ohio, have invented certain new and useful Improvements in Sheet-Registers, of which the following is a specification.

My invention relates to certain improvements in registering devices such as are particularly designed and adapted for employment in connection with sheet feeders, printing machines and the like, for gaging the position of the successive sheets in registry with the operative parts of such mechanisms.

The objects of my invention are, among other things, to provide a device of this general character of a simple and efficient construction whereby there is a minimum amount of contact between the parts of my device and the upper surface of the advancing sheets, which is particularly advantageous when such sheets are freshly printed.

My improved sheet-register is also of a strong and durable construction, and presents other features of novelty and improvement whereby the device is rendered simpler and otherwise better adapted and more convenient for use, all as will be hereinafter set forth and claimed.

In the accompanying drawings, Figure 1 is a top plan view of a portion of a printing press having my improved sheet-registering device applied thereto;

Fig. 2 is an enlarged end view of the feed table showing the sheet-registering mechanism in normal position before the sheet has been moved transversely to the side-guide;

Fig. 3 is a view similar to Fig. 2, showing the sheet-registering mechanism shifted sidewise to carry the sheet against the side-guide, as shown by the arrows;

Fig. 4 is a perspective view illustrating the parts in the positions shown in Fig. 3, with the sheet in contact with the side-guide and front-stops;

Fig. 5 is a perspective view illustrating the parts when operated to withdraw the side-guide and lift the front-stops approximately at the moment the grippers on the press-cylinder engage the front edge of the sheet;

Fig. 6 is an enlarged detail view taken on the line 6—6 shown in Fig. 1;

Figs. 7, 8, 9 and 10 are enlarged detail views of various arrangements of the pressure balls and carriers therefor; and

Fig. 11 is a detail side elevation taken on the line 11—11 shown in Fig. 1, looking in the direction of the arrow.

Similar numerals refer to similar parts throughout the several figures.

Referring to the drawings, 12 represents the top sheet of a pile of sheets resting on any suitable platform 13, ready to be separated and advanced by any suitable feeding device 15 on to the feed table 16 to be successively advanced forwardly to the printing press or other like machine. The feed table 16 secured in the frame 17 has a series of feed rollers 18 journaled in suitable transverse slots 19 in feed table 16, which feed-rollers are adapted to be constantly rotated to advance the separate sheets, one by one, forwardly to the printing press, the individual sheets passing in contact with the top peripheral surface of such rollers, as shown in Fig. 10. The foremost of these feed-rollers, which I have indicated by the numeral 20, is likewise rotatably secured in the frame 17, but is constructed so as to have, in addition to its constantly rotating movement, a longitudinal, sliding action within its transverse slot in the frame 17 beneath the surface of the feed-table 16, which sliding movement is accomplished by the following means.

A lever 21 is fulcrumed to the lug 22, secured to the frame 17, one end of which lever 21 engages the annular groove 23 in the collar 24 on the end of the shaft 25 upon which the roller 20 is mounted. The opposite end of the lever 21 engages an annular cam groove 26 formed in the end of the constantly rotating shaft 27, as shown in Fig. 1. The roller 20 is constantly rotated through the rotating gear 28 in mesh with the driven pinion 29, mounted on the shaft 25.

Extending longitudinally above the feed table 16, are provided two mutually parallel pressure ball-carriers 30 and 31, journaled on the reciprocating brackets 32 and 33 respectively, suitably mounted on the rear end of the feed table 16; at the forward end of the feed table the carriers 30 and 31 are pivotally secured to the reciprocating brackets 34 and 35 respectively secured to the shaft 36, as shown in Figs. 2 and 3. These carriers 30 and 31 are so constructed as to

form cylindrical spaces or open pockets 37 arranged directly above the periphery of the feed rollers 18 and 20, as shown in Fig. 1. These cylindrical spaces, or pockets, 37 are devised and formed so as to contain spherical pressure balls 38, preferably made of metal, adapted to rotate freely in their pockets, and through their weight to bear on the upper surface of the advancing sheet to hold same in frictional contact with the feed rollers 18 and 20, as particularly shown in Figs. 6 and 7. These pockets 37, acting as containers for the balls 38, may have their inner spaces cylindrical, as shown in Fig. 6, or in the form of truncated cones, as shown in Figs. 7 and 8, the object being to have the ball act, through its weight, with sufficient pressure to hold the sheet in frictional contact with the rotating feed roller directly beneath.

In Figs. 8 and 9, I have illustrated a modified form of the use of these pressure balls 38, whereby pairs of such balls are held over the feed roller 20 adjacent the vertical axis of such roller, as shown in Fig. 8. The object of having pairs of balls bear on the advancing sheet over each rotating feed roller beneath, as shown in Figs. 8 and 9, is to secure a slight crimping or corrugation transversely of the sheet, as shown in Fig. 8, which tends to stiffen same and assists in accurately registering same against the side-guide. This principle of stiffening the sheet by crimping or corrugation is substantially similar to that disclosed in the Charles G. Harris Patent No. 671,377, dated April 2, 1901, and this feature is not claimed herein except in connection with my improved construction herein shown and described.

39 is a vertical plate or side-guide mounted on an oscillating shaft 40, the side-guide 39 being normally stationary, against which the sheets are alined and registered through the sliding action of the feed roller 20. 41 represents a series of front stops mounted on the oscillating shaft 42, which shaft and stops are also arranged to reciprocate transversely in the frame 17, simultaneously with the feed roller 20, as will be hereinafter described. To accomplish this transverse movement, the shaft 42 carries at one end an arm 43 engaging the annular groove 23 in the collar 24 on the shaft 25 in the same manner that the arm 22 of the lever 21 also engages and travels in said groove 23. Through the action of this mechanism the shaft 42 with the front stops 41 is moved sidewise simultaneously with the transverse movement of the shaft 20. 44 is an oscillating shaft journaled in the frame 17 above the feed table 16. As shown in Figs. 4 and 5, one end of the shaft 44 carries an arm 45 and link 46 connecting same with the cam 47 mounted on the constantly rotating shaft 27 so that an intermittent, oscillating movement may thereby be given to the shaft 44. Also mounted on the shaft 44 is another arm 48 adapted to reciprocate transversely the shaft 40 upon which the side-guide 39 is mounted, by means of a pin 49 projecting from said shaft 40, as shown in Figs. 4 and 5. The shaft 40 is returned to normal position by a coil spring 50, operating against the frame 17; by this mechanism the side-guide 39 may be moved away from the path of the advancing sheet when desired, as will be hereinafter described. As shown in Figs. 4 and 5, the shaft 42 carries the arm 51 with the pin 52 projecting outwardly from its end upon which rests the arm 53 mounted on the shaft 44. By this connecting mechanism, shaft 42 is oscillated so as to raise the front stops 41 from the path of the sheet which is being fed forward to the printing press or other machine. The rotation of the roller 20 is constantly maintained during its transverse, sliding movement by any suitable means, such as the wide gear 28 actuating the driven pinion 29, as shown in Fig. 1.

The holders, or carriers, 30 and 31 are so constructed that the balls may be readily lifted out and others of different size and weight substituted therefor, according to the character of the stock being fed.

When it is desired to feed very thin paper, it is preferable that the balls 38 should be lifted from the peripheral surface of their respective feed rollers when the sheet is being fed off, lest their weight tear or otherwise injure the paper.

The means I have provided to lift the balls 38 resting in their pockets in their carriers, free from the surface of the sheet, consists of the mechanism more particularly shown in Figs. 4, 5, and 11. It comprises the arm 54 adjustably secured to the shaft 36, this shaft being oscillated through the cam 55 keyed to the shaft 44, the cam 55 engaging the roller 56 on the outer end of the arm 54, as shown in dotted lines in Fig. 1. The oscillation of the shaft 36, through the swinging brackets 34 and 35 swings the carriers 30 and 31 rearwardly and upwardly, as shown in dotted lines in Fig. 10, whereby the balls are raised out of frictional contact with the sheet, as clearly shown in this figure.

Referring to Fig. 1 57 represents the impression cylinder of a rotary press, provided with the usual grippers 58 adapted to seize the front edge of the sheet.

Suitable driving mechanism for the entire sheet-registering device is provided which may be of any convenient form, and no detailed description will be necessary. In the present embodiment, the spur gearing on the impression cylinder intermeshes with suitable gearing operating a connecting

shaft through miter gears to rotate the shaft 59, which, in turn, rotates the shafts 27, 42 and 44, as shown in the figures, and has been heretofore described. The feed rollers 18 are constantly rotated from the shaft 60, connected with the feeding devices, through suitable belts and pulleys, as shown in Fig. 1. 61 and 62 are two upper feed rollers journaled upon the arms 63 and 64 respectively, adapted to aid in carrying forward the separated sheet 12 in conjunction with the foremost of the series of feed rollers 18.

The manner of operation of my sheet-registering device is substantially as follows: When the advancing sheet 12 is separated from the pile, and is fed forward so as to reach the front stops 41, or preferably slightly before it reaches these stops, the roller 20, as well as the front stops 41, begin their sliding, transverse movement through the action of the cam 26 on the lever 21, which carries the advancing sheet against the normally stationary side-guide 39 through the combined friction of the rotating roller 20 underneath the sheet and the freely-rotating balls 38 resting on top of the sheet. As it will be readily understood, this movement may be either oblique or transverse, depending upon whether the roller 20 begins its transverse movement before the sheet actually reaches the front stops 41, or slightly afterward. The transverse movement of the roller 20 continues until the moment when the cylinder grippers 58 are about to grasp the front edge of the sheet, when it ceases, and simultaneously the oscillation of the shaft 44 through the arm 48, pin 49 on the shaft 40 draws the side-guide 39 a slight distance away from the lateral edge of the sheet (to the left in Fig. 1), and at the same time, through the arm 51, pin 52 and arm 53, oscillates the shaft 42 so as to lift the front stops 41 free from the path of the sheet. The oscillation of the shaft 44 is so timed that the side-guide 39 and the front stops 41 will return to their respective normal positions in time to meet and engage the next advancing sheet. When the arm 54 is in operative engagement with the cam 55 so as to lift the balls 38 through their carriers bodily from the surface of the feed roller 20, the parts are so positioned and timed that these balls are raised from the feed roller 20 during the return transverse movement (to the right in Fig. 1) of this feed roller, though ordinarily this is not necessary unless very thin paper is being fed through my device.

The mechanism employed to carry out my improvement is very simple and efficient, and provides for a combined rolling and sliding action upon the under surface of the sheet throughout its entire width, and the constant rotation of the rollers during the side registering movement tends to keep the advancing sheet at all times in contact with the front stops while moving sidewise. Furthermore, the use of spherical balls of different sizes and weights provides an easy method of adjustment for the varied requirements of stock of different qualities and characteristics.

The invention, in its broadest aspects, is not to be confined to the particular constructions herein shown and described, since many changes may be made in the structural parts without departing from the main principles of the invention and without sacrificing its chief advantages.

For example, it is obvious that all or a plurality of the feed-rollers for advancing the sheet may be arranged to reciprocate transversely in the feed-table, as I have already shown and described with reference to the feed-roller 20.

I claim as my invention:

1. A sheet-registering device comprising a normally stationary, transversely movable side-guide against which sheets are to be registered, means for advancing the sheet in one direction, means for moving said advancing means transversely of the path of the sheet, and means for thereafter withdrawing the side-guide from the lateral edge of the sheet.

2. A sheet-registering device comprising a normally stationary, transversely movable side-guide against which sheets are to be registered, rotary means for advancing the sheet in one direction, means for moving said rotary means transversely of the path of the sheet, and means for thereafter withdrawing the side-guide from the lateral edge of the sheet.

3. A sheet-registering device comprising a side-guide to contact with the sheets to be registered, means for advancing the sheet in one direction, means capable of universal rotation coöperating therewith to advance the sheet, means for moving said first-mentioned means transversely of the path of the sheet, and means for withdrawing the side-guide from the lateral edge of the sheet.

4. A sheet-registering device comprising a side-guide to contact with the sheets to be registered, rotary means for advancing the sheet in one direction, means capable of universal rotation coöperating therewith to advance the sheet, means for moving said rotary means transversely of the path of the sheet, and means for withdrawing the side-guide from the lateral edge of the sheet.

5. A sheet-registering device comprising a normally stationary, transversely movable side-guide against which sheets are to be registered, means for advancing the sheet in one direction, means for transversely reciprocating said advancing means across the path of the sheet once in each cycle of operation and means for thereafter withdraw-

ing the side-guide from the lateral edge of the sheet.

6. A sheet-registering device comprising a normally stationary, transversely movable side-guide against which sheets are to be registered, rotary means for advancing the sheet in one direction, means for transversely reciprocating said rotary means across the path of the sheet once in each cycle of operation, and means for thereafter withdrawing the side-guide from the lateral edge of the sheet.

7. A sheet-registering device comprising a side-guide to contact with the sheets to be registered, means for advancing the sheet in one direction, means capable of universal rotation coöperating therewith to advance the sheet, means for transversely reciprocating said advancing means across the path of the sheet once in each cycle of operation, and means for withdrawing the side-guide from the lateral edge of the sheet.

8. A sheet-registering device comprising a side-guide to contact with the sheets to be registered, rotary means for advancing the sheet in one direction, means capable of universal rotation coöperating therewith to advance the sheet, means for transversely reciprocating said rotary means across the path of the sheet once in each cycle of operation, and means for withdrawing the side-guide from the lateral edge of the sheet.

9. A sheet-registering device comprising a side-guide to contact with the sheet to be registered, means for advancing the sheet in one direction, a plurality of balls bearing on the sheet off the vertical axis of said sheet-advancing means and coöperating therewith to advance the sheet, and means for moving said sheet-advancing means transversely of the path of the sheet.

10. A sheet-registering device comprising a side-guide to contact with the sheets to be registered, rotary means for advancing the sheet in one direction, a plurality of balls coöperating therewith to advance the sheet, means for moving said rotary means transversely of the path of the sheet, and means for withdrawing the side-guide from the lateral edge of the sheet.

11. A sheet-registering device comprising a side-guide to contact with the sheets to be registered, means for advancing the sheet in one direction, a plurality of balls coöperating therewith to advance the sheet, means for transversely reciprocating said advancing means across the path of the sheet once in each cycle of operation, and means for withdrawing the side-guide from the lateral edge of the sheet.

12. A sheet-registering device comprising a side-guide to contact with the sheets to be registered, rotary means for advancing the sheets in one direction, a plurality of balls coöperating therewith to advance the sheet, means for transversely reciprocating said rotary means across the path of the sheet once in each cycle of operation, and means for withdrawing the side-guide from the lateral edge of the sheet.

13. In a sheet-registering device, the combination with a side-guide, of means for advancing the sheet in one direction comprising a plurality of revolving feed rollers, of means capable of universal rotation, and bearing on the sheet off the vertical axis of said sheet-advancing means and coöperating with the feed rollers to advance the sheet, and means for moving said sheet-advancing means transversely of the path of the sheet.

14. In a sheet-registering device, the combination with a side-guide, of means for advancing the sheet in one direction comprising a plurality of revolving feed rollers, of means capable of universal rotation, and bearing on the sheet off the vertical axis of said feed rollers and coöperating with the feed rollers to advance the sheet, and means for moving one of said feed rollers transversely of the path of the sheet.

15. In a sheet-registering device, the combination with a side-guide, of means for advancing the sheet in one direction comprising a plurality of revolving feed rollers, of a plurality of balls coöperating with each of the feed rollers to advance the sheet, means for moving said sheet-advancing means transversely of the path of the sheet, and means for withdrawing the side-guide from the lateral edge of the sheet.

16. In a sheet-registering device, the combination with a side-guide, of means for advancing the sheet in one direction comprising a plurality of revolving feed rollers, of a plurality of balls coöperating with each of the feed rollers, to advance the sheet, means for moving one of said feed rollers transversely of the path of the sheet, and means for withdrawing the side-guide from the lateral edge of the sheet.

17. In a sheet-registering device, the combination with a side-guide, of means for advancing the sheet in one direction comprising a plurality of revolveing feed rollers, of means capable of universal rotation coöperating with the feed rollers to advance the sheet, means for transversely reciprocating said sheet-advancing means across the path of the sheet once in each cycle of operation, and means for withdrawing the side-guide from the lateral edge of the sheet.

18. In a sheet-registering device, the combination with a side-guide, of means for advancing the sheet in one direction comprising a plurality of revolving feed rollers, of means capable of universal rotation coöperating with the feed rollers to advance the

sheet, means for transversely reciprocating one of said feed rollers across the path of the sheet once in each cycle of operation, and means for withdrawing the side-guide from the lateral edge of the sheet.

19. In a sheet-registering device, the combination with a side guide, of means for advancing the sheet in one direction comprising a plurality of revolving feed rollers, of a plurality of balls coöperating with each of the feed rollers to advance the sheet, means for transversely reciprocating said sheet-advancing means across the path of the sheet once in each cycle of operation, and means for withdrawing the side-guide from the lateral edge of the sheet.

20. In a sheet-registering device, the combination with a side guide, of means for advancing the sheet in one direction comprising a plurality of revolving feed rollers, of a plurality of balls coöperating with each of the feed rollers to advance the sheet, means for transversely reciprocating one of said feed rollers across the path of the sheet once in each cycle of operation, and means for withdrawing the side-guide from the lateral edge of the sheet.

21. In a sheet-registering device, the combination with a side-guide, of means for advancing the sheet in one direction comprising a plurality of revolving feed rollers, of means for moving one of said rollers transversely of the path of the sheet, and means for temporarily crimping or corrugating the sheet transversely as it travels over said feed rollers, and means for withdrawing the side-guide from the lateral edge of the sheet.

22. In a sheet-registering device, the combination with means for advancing the sheet in one direction comprising a plurality of revolving feed rollers, of means for moving one of said rollers transversely of the path of the sheet, and means, comprising a plurality of balls bearing on the sheet off the vertical axis of said feed rollers, for temporarily crimping or corrugating the sheet transversely as it travels over said feed rollers.

23. In a sheet-registering device, the combination with a side-guide, of means for advancing the sheet in one direction comprising a plurality of revolving feed rollers, of means for transversely reciprocating one of said rollers across the path of the sheet once in each cycle of operation, and means for temporarily crimping or corrugating the sheet transversely as it travels over said feed rollers, and means for withdrawing the side-guide from the lateral edge of the sheet.

24. In a sheet-registering device, the combination with means for advancing the sheet in one direction comprising a plurality of revolving feed rollers, of means for transversely reciprocating one of said rollers across the path of the sheet once in each cycle of operation, and means, comprising a plurality of balls bearing on the sheet off the vertical axis of said feed rollers, for temporarily crimping or corrugating the sheet transversely as it travels over said feed rollers.

25. A sheet-registering device comprising a side-guide to contact with the sheets to be registered, means for advancing the sheet in one direction, means for holding the front edge of the advancing sheet, and means for moving simultaneously said sheet-advancing means and said sheet-holding means transversely of the path of the sheet.

26. A sheet-registering device comprising a side-guide to contact with the sheets to be registered, means comprising a plurality of revolving feed rollers for advancing the sheet in one direction, means comprising a series of front-stops to engage the front edge of the advancing sheet, and means for moving simultaneously said feed rollers and said front-stops transversely of the path of the sheet.

27. A sheet-registering device comprising a side-guide to contact with the sheets to be registered, means for advancing the sheet in one direction, means for holding the front edge of the advancing sheet, and means for transversely reciprocating simultaneously said sheet-advancing means and said sheet-holding means across the path of the sheet once in each cycle of operation.

28. A sheet-registering device comprising a side-guide to contact with the sheets to be registered, means comprising a plurality of revolving feed rollers for advancing the sheet in one direction, means comprising a series of front-stops to engage the front edge of the advancing sheet, and means for transversely reciprocating simultaneously said feed rollers and said front-stops across the path of the sheet once in each cycle of operation.

29. A sheet-registering device comprising a side-guide to contact with the sheets to be registered, rotary means for advancing the sheet in one direction, means for holding the front edge of the advancing sheet, means for moving simultaneously said rotary means and said sheet-holding means transversely of the path of the sheet, and means for withdrawing said side-guide and removing said sheet-holding means simultaneously from contact with the sheet.

30. A sheet-registering device comprising a side-guide to contact with the sheets to be registered, means comprising a plurality of revolving feed rollers for advancing the sheet in one direction, means comprising a series of front-stops to engage the front edge of the advancing sheet, means for moving simultaneously said feed rollers and said front stops transversely of the path of the

sheet, and means for withdrawing said side-guide and lifting said front-stops simultaneously from contact with the sheet.

31. A sheet-registering device comprising a side-guide to contact with the sheets to be registered, rotary means for advancing the sheet in one direction, means for holding the front edge of the advancing sheet, means for transversely reciprocating simultaneously said sheet-advancing means and said sheet-holding means across the path of the sheet once in each cycle of operation, and means for withdrawing said side-guide and removing said sheet-holding means simultaneously from contact with the sheet.

32. A sheet-registering device comprising a side-guide to contact with the sheets to be registered, means comprising a plurality of revolving feed rollers for advancing the sheet in one direction, means comprising a series of front-stops to engage the front edge of the advancing sheet, means for transversely reciprocating simultaneously said feed rollers and said front-stops across the path of the sheet once in each cycle of operation, and means for withdrawing said side-guide and lifting said front-stops simultaneously from contact with the sheet.

33. A sheet-registering device comprising a side-guide to contact with the sheets to be registered, rotary means for advancing the sheet in one direction, a plurality of balls coöperating therewith to advance the sheet, means for holding the front edge of the advancing sheet, means for moving simultaneously said rotary means and said sheet-holding means transversely of the path of the sheet, and means for withdrawing said side-guide and removing said sheet-holding means simultaneously from contact with the sheet.

34. A sheet-registering device comprising a side-guide to contact with the sheets to be registered, means comprising a plurality of revolving feed rollers for advancing the sheet in one direction, a plurality of balls coöperating therewith to advance the sheet, means comprising a series of front-stops to engage the front edge of the advancing sheet, means for moving simultaneously said feed rollers and said front-stops transversely of the path of the sheet, and means for withdrawing said side-guide and lifting said front-stops simultaneously from contact with the sheet.

35. A sheet-registering device comprising a side-guide to contact with the sheets to be registered, rotary means for advancing the sheet in one direction, a plurality of balls coöperating therewith to advance the sheet, means for holding the front edge of the advancing sheet, means for transversely reciprocating simultaneously said sheet-advancing means and said sheet-holding means across the path of the sheet once in each cycle of operation, and means for withdrawing said side-guide and removing said sheet-holding means simultaneously from contact with the sheet.

36. A sheet-registering device comprising a side-guide to contact with the sheets to be registered, means comprising a plurality of revolving feed rollers for advancing the sheet in one direction, a plurality of balls coöperating therewith to advance the sheet, means comprising a series of front-stops to engage the front edge of the advancing sheet, means for transversely reciprocating simultaneously said feed rollers and said front-stops across the path of the sheet once in each cycle of operation, and means for withdrawing said side-guide and lifting said front-stops simultaneously from contact with the sheet.

37. A sheet-registering device comprising a side-guide to contact with the sheets to be registered, rotary means for advancing the sheet in one direction, means comprising a plurality of balls bearing on the sheet off the vertical axis of said rotary means for temporarily crimping or corrugating the sheet transversely as it travels over said rotary means, means for holding the front edge of the advancing sheet, means for moving simultaneously said rotary means and said sheet-holding means transversely of the path of the sheet, and means for withdrawing said side-guide and removing said sheet-holding means simultaneously from contact with the sheet.

38. A sheet-registering device comprising a side-guide to contact with the sheets to be registered, means comprising a plurality of revolving feed rollers for advancing the sheet in one direction, means comprising a plurality of balls bearing on the sheet off the vertical axis of said feed rollers for temporarily crimping or corrugating the sheet transversely as it travels over said feed rollers, means comprising a series of front-stops to engage the front edge of the advancing sheet, means for moving simultaneously said feed rollers and said front-stops transversely of the path of the sheet, and means for withdrawing said side-guide and lifting said front-stops simultaneously from contact with the sheet.

39. A sheet-registering device comprising a side-guide to contact with the sheets to be registered, rotary means for advancing the sheet in one direction, means comprising a plurality of balls bearing on the sheet off the vertical axis of said rotary means for temporarily crimping or corrugating the sheet transversely as it travels over said rotary means, means for holding the front edge of the advancing sheet, means for transversely reciprocating simultaneously said sheet-ad-

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vancing means and said sheet-holding means across the path of the sheet once in each cycle of operation, and means for withdrawing said side-guide and removing said sheet-holding means simultaneously from contact with the sheet.

40. A sheet-registering device comprising a side-guide to contact with the sheets to be registered, means comprising a plurality of revolving feed rollers for advancing the sheet in one direction, means comprising a plurality of balls bearing on the sheet off the vertical axis of said feed rollers for temporarily crimping or corrugating the sheet transversely as it travels over said feed rollers, means comprising a series of front-stops to engage the front edge of the advancing sheet, means for transversely reciprocating simultaneously said feed rollers and said front-stops across the path of the sheet once in each cycle of operation, and means for withdrawing said side-guide and lifting said front-stops simultaneously from contact with the sheet.

41. A sheet-registering device comprising a side-guide to contact with the sheets to be registered, means for advancing the sheet in one direction, means capable of universal rotation coöperating therewith to advance the sheet, means for moving said first-mentioned means transversely of the path of the sheet, and means for lifting said universal rotation means during the return transverse movement of said advancing means.

42. A sheet-registering device comprising a side-guide to contact with the sheets to be registered, rotary means for advancing the sheet in one direction, means capable of universal rotation coöperating therewith to advance the sheet, means for moving said rotary means transversely of the path of the sheet, and means for lifting said universal rotation means during the return transverse movement of said rotary means.

43. A sheet-registering device comprising a side-guide to contact with the sheets to be registered, means for advancing the sheet in one direction, means capable of universal rotation coöperating therewith to advance the sheet, means for transversely reciprocating said advancing means across the path of the sheet once in each cycle of operation, and means for lifting said universal rotation means during the return transverse movement of said advancing means.

44. A sheet-registering device comprising a side-guide to contact with the sheets to be registered, rotary means for advancing the sheet in one direction, means capable of universal rotation coöperating therewith to advance the sheet, means for transversely reciprocating said rotary means across the path of the sheet once in each cycle of operation, and means for lifting said universal rotation means during the return transverse movement of said rotary means.

45. A sheet-registering device comprising a side-guide to contact with the sheet to be registered, means for advancing the sheet in one direction, a plurality of balls coöperating therewith to advance the sheet, means for moving said sheet-advancing means transversely of the path of the sheet, and means for lifting said balls free from the sheet during the return transverse movement of said advancing means.

46. A sheet-registering device comprising a side-guide to contact with the sheets to be registered, rotary means for advancing the sheet in one direction, a plurality of balls coöperating therewith to advance the sheet, means for moving said rotary means transversely of the path of the sheet, and means for lifting said balls during the return transverse movement of said rotary means.

47. A sheet-registering device comprising a side-guide to contact with the sheets to be registered, means for advancing the sheet in one direction, a plurality of balls coöperating therewith to advance the sheet, means for transversely reciprocating said advancing means across the path of the sheet once in each cycle of operation, and means for lifting said balls during the return transverse movement of said advancing means.

48. A sheet-registering device comprising a side-guide to contact with the sheets to be registered, rotary means for advancing the sheets in one direction, a plurality of balls coöperating therewith to advance the sheet, means for transversely reciprocating said rotary means across the path of the sheet once in each cycle of operation, and means for lifting said balls during the return transverse movement of said rotary means.

49. In a sheet-registering device, the combination with means for advancing the sheet in one direction comprising a plurality of revolving feed rollers, of means capable of universal rotation coöperating with the feed rollers to advance the sheet, means for transversely reciprocating one of said feed rollers across the path of the sheet once in each cycle of operation, and means for lifting said universal rotation means during the return transverse movement of said feed roller.

50. In a sheet-registering device, the combination with means for advancing the sheet in one direction comprising a plurality of revolving feed rollers, of a plurality of balls coöperating with each of the feed rollers to advance the sheet, means for transversely reciprocating one of said feed rollers across the path of the sheet once in each cycle of

operation, and means for lifting said balls during the return transverse movement of said feed roller.

51. A sheet-registering device comprising a side-guide to contact with the sheets to be registered, means for advancing the sheet in one direction, means capable of universal rotation coöperating therewith to advance the sheet, means for moving said first-mentioned means transversely of the path of the sheet, means for withdrawing the side-guide from the lateral edge of the sheet, and means for lifting said universal rotation means during the return transverse movement of said advancing means.

52. A sheet-registering device comprising a side-guide to contact with the sheets to be registered, rotary means for advancing the sheet in one direction, means capable of universal rotation coöperating therewith to advance the sheet, means for moving said rotary means transversely of the path of the sheet, means for withdrawing the side-guide from the lateral edge of the sheet, and means for lifting said universal rotation means during the return transverse movement of said rotary means.

53. A sheet-registering device comprising a side-guide to contact with the sheets to be registered, means for advancing the sheet in one direction, means capable of universal rotation coöperating therewith to advance the sheet, means for transversely reciprocating said advancing means across the path of the sheet once in each cycle of operation, means for withdrawing the side-guide from the lateral edge of the sheet, and means for lifting said universal rotation means during the return transverse movement of said advancing means.

54. A sheet-registering device comprising a side-guide to contact with the sheets to be registered, rotary means for advancing the sheet in one direction, means capable of universal rotation coöperating therewith to advance the sheet, means for transversely reciprocating said rotary means across the path of the sheet once in each cycle of operation, means for withdrawing the side-guide from the lateral edge of the sheet, and means for lifting said universal rotation means during the return transverse movement of said rotary means.

55. A sheet-registering device comprising a side-guide against which sheets are to be registered, means for advancing the sheet in one direction, means for holding the front edge of the advancing sheet, means for moving simultaneously said sheet-advancing means and said sheet-holding means transversely of the path of the sheets, and means for withdrawing the side-guide from the lateral edge of the sheet.

56. A sheet-registering device comprising a side-guide against which sheets are to be registered, rotary means for advancing the sheet in one direction, means for holding the front edge of the advancing sheet, means for moving simultaneously said sheet-advancing means and said sheet-holding means transversely of the path of the sheets, and means for withdrawing the side-guide from the lateral edge of the sheet.

57. A sheet-registering device comprising a side-guide against which sheets are to be registered, means for advancing the sheet in one direction, means for holding the front edge of the advancing sheet, means for moving simultaneously said sheet-advancing means and said sheet-holding means transversely of the path of the sheets once in each cycle of operation, and means for withdrawing the side-guide from the lateral edge of the sheet.

58. A sheet-registering device comprising a side-guide against which sheets are to be registered, rotary means for advancing the sheet in one direction, means for holding the front edge of the advancing sheet, means for moving simultaneously said sheet-advancing means and said sheet-holding means transversely of the path of the sheets once in each cycle of operation, and means for withdrawing the side-guide from the lateral edge of the sheet.

59. A sheet-registering device comprising a side-guide against which sheets are to be registered, means for advancing the sheet in one direction, coöperating means capable of universal rotation to hold the sheet against said advancing means, means for moving said advancing means transversely of the path of the sheet, and means for withdrawing the side-guide from the lateral edge of the sheet.

60. A sheet-registering device comprising a side-guide against which sheets are to be registered, rotary means for advancing the sheet in one direction, coöperating means capable of universal rotation to hold the sheet against said advancing means, means for moving said rotary means transversely of the path of the sheet, and means for withdrawing the side-guide from the lateral edge of the sheet.

61. A sheet-registering device comprising a side-guide against which sheets are to be registered, means for advancing the sheets in one direction, coöperating means capable of universal rotation to hold the sheet against said advancing means, means for transversely reciprocating said advancing means across the path of the sheet once in each cycle of operation, and means for withdrawing the side-guide from the lateral edge of the sheet.

62. A sheet-registering device comprising a side-guide against which sheets are to be

registered, rotary means for advancing the sheet in one direction, coöperating means capable of universal rotation to hold the sheet against said advancing means, means for transversely reciprocating said rotary means across the path of the sheet once in each cycle of operation, and means for withdrawing the side-guide from the lateral edge of the sheet.

NELS A. ANDERSON.

Witnesses:
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