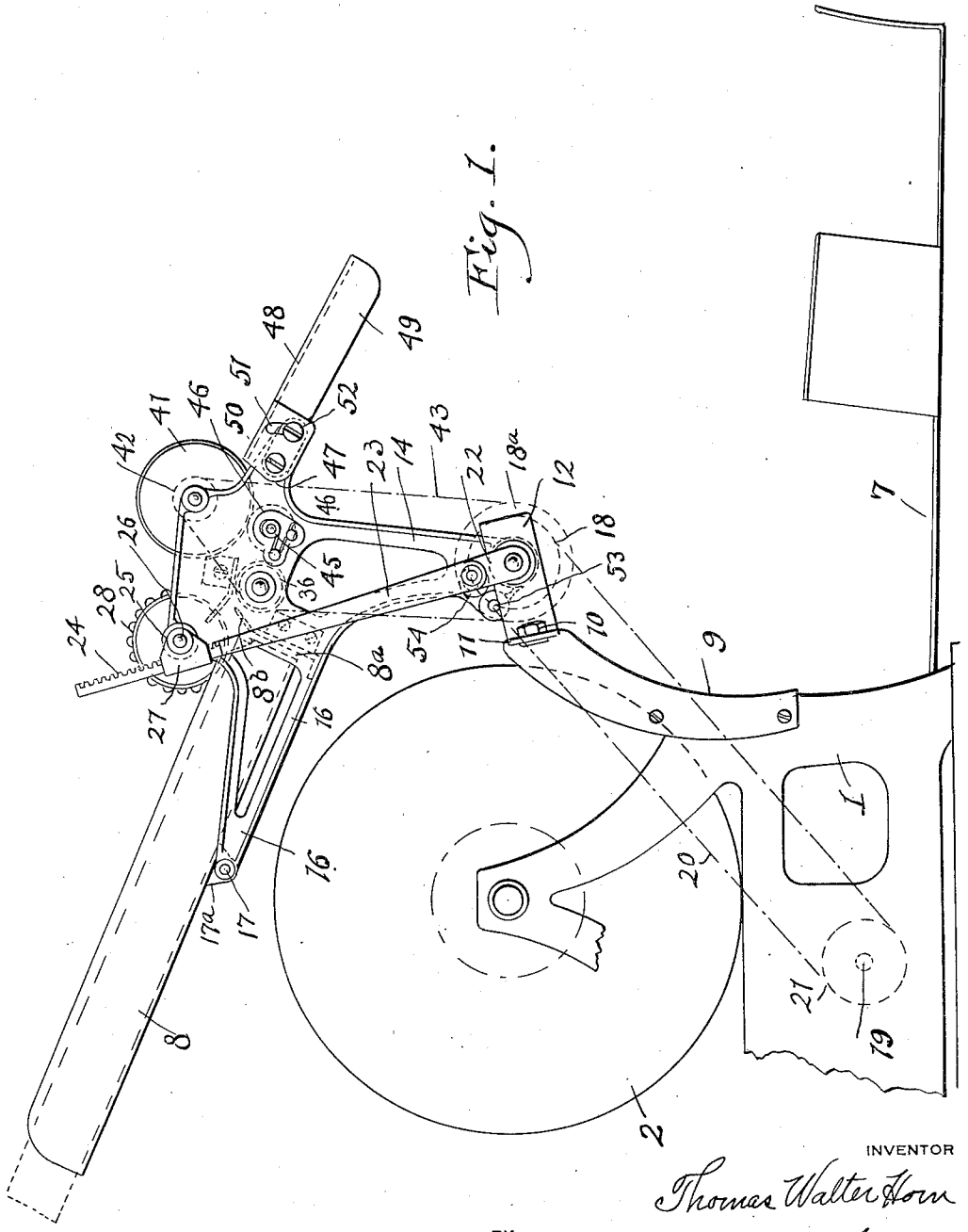
June 10, 1930. T. W. HORN 1,763,308

INTERLEAVING DEVICE FOR PRINTING MACHINES

Filed June 18, 1928 3 Sheets-Sheet 1



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INTERLEAVING DEVICE FOR PRINTING MACHINES

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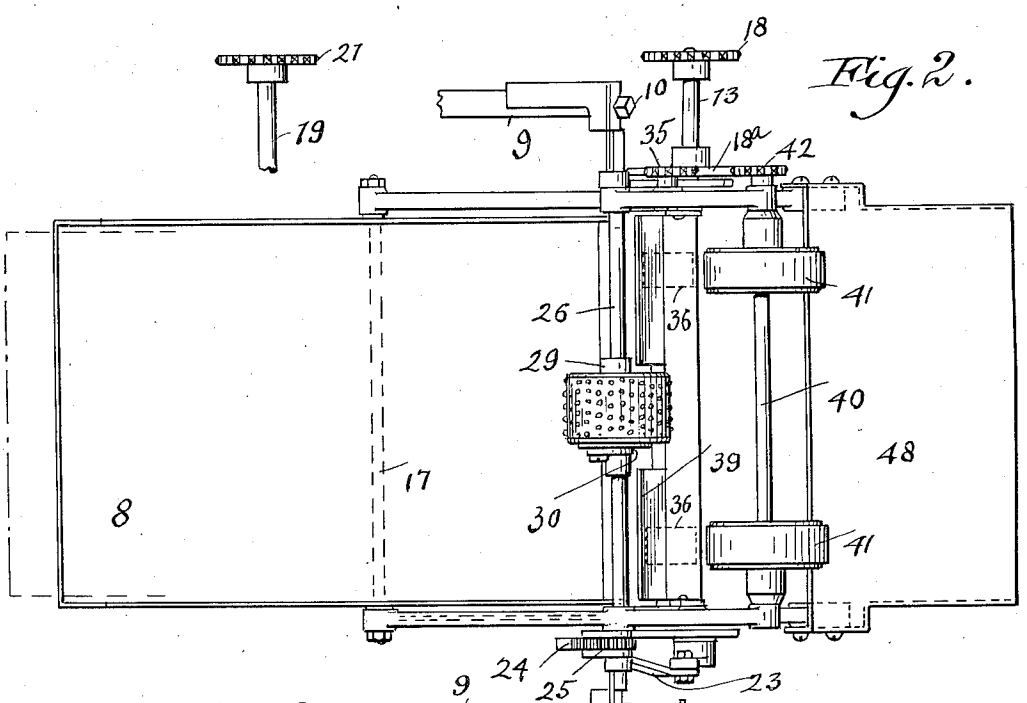


Fig. 2.

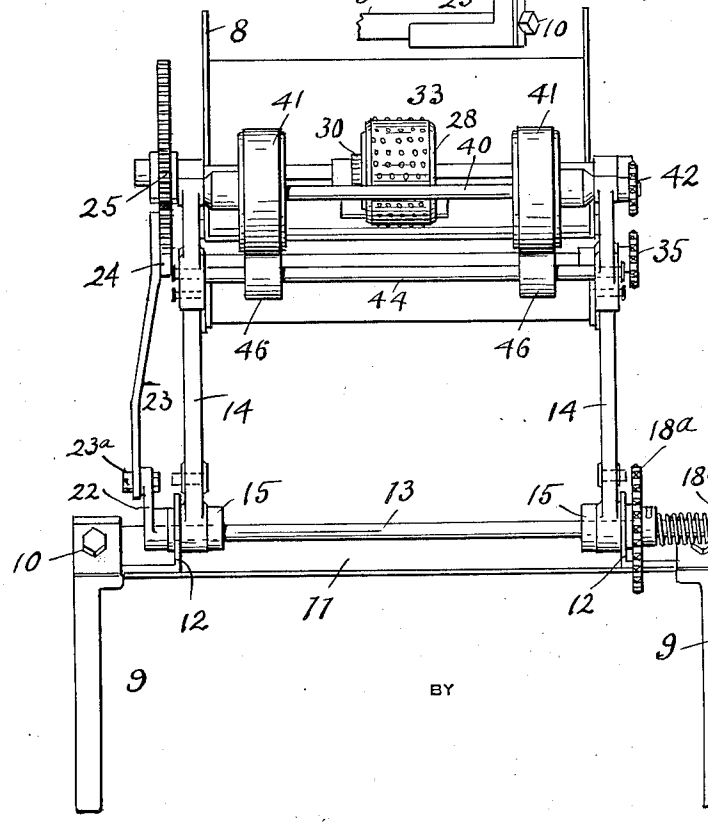


Fig. 3.

INVENTOR

Thomas Walter Horn

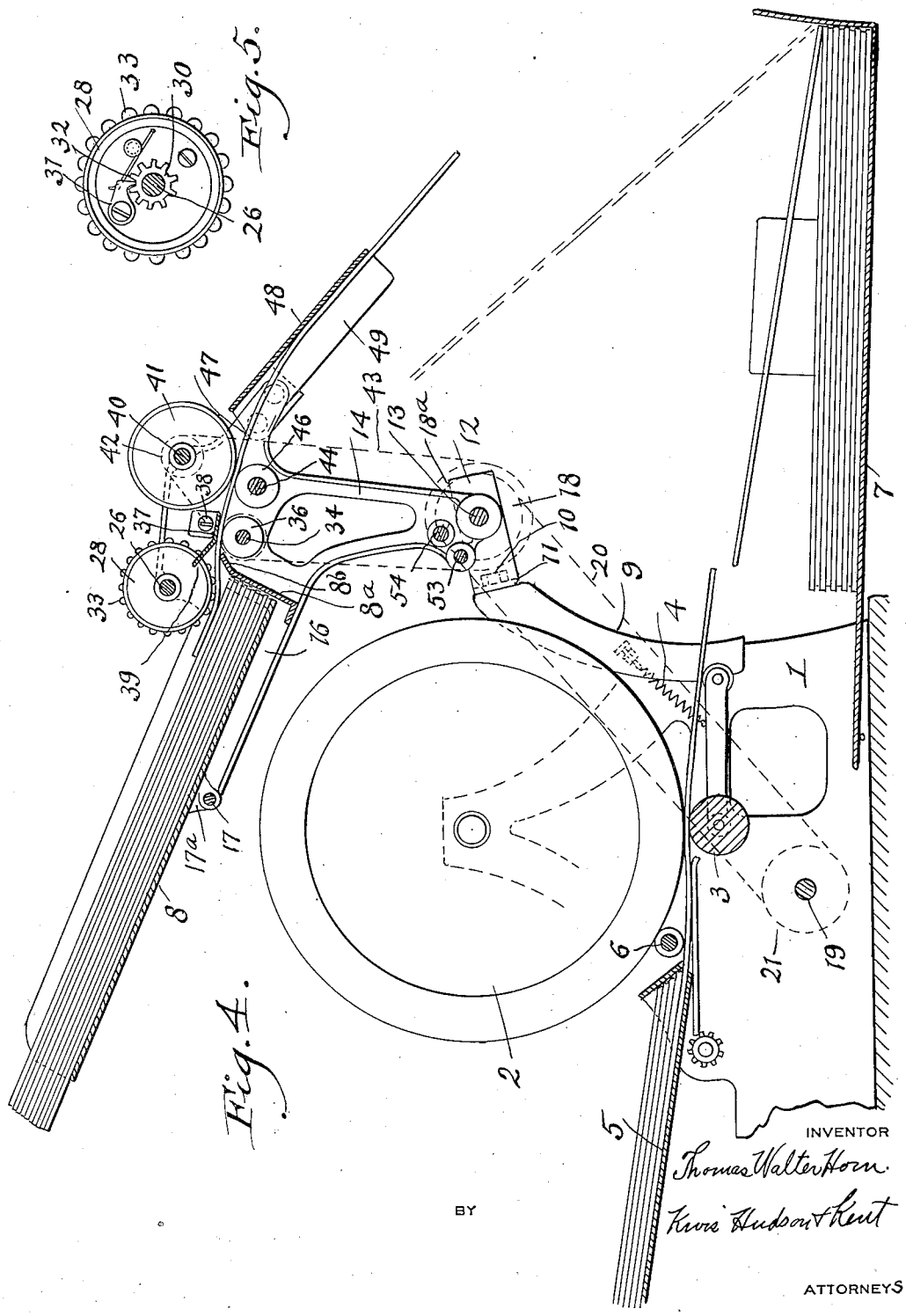
BY Kerr Hubbard Kent

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INTERLEAVING DEVICE FOR PRINTING MACHINES

Filed June 18, 1928 3 Sheets-Sheet 3



Patented June 10, 1930

1,763,308

UNITED STATES PATENT OFFICE

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INTERLEAVING DEVICE FOR PRINTING MACHINES

Application filed June 18, 1928. Serial No. 286,178.

This invention relates to an interleaving device for printing machines, and is herein illustrated as applied to a stencil machine of the rotary cylinder type with which it has particular utility. It is necessary to interleave slip sheets of absorbent paper between the freshly printed sheets delivered from a printing machine to prevent smearing of the printed sheets or off-setting of the impressions from the printed sheet to the back of a superimposed printed sheet.

An object of the present invention is to provide an interleaving mechanism which is simple in construction, inexpensive to manufacture, reliable in operation and easily attached to standard printing machines, particularly those of the rotary stencil duplicating type.

Another object is to provide a slip sheet feeding mechanism which will cooperate with the printing mechanism in such manner as to deliver the slip sheets onto the printed sheets without sliding of one sheet upon the other, and, therefore, without smearing the printed sheets.

A further object is to provide a slip sheet feeding mechanism which operates continuously and which delivers the slip sheets to the receiving receptacle substantially simultaneously with the delivery of the printed sheets thereto.

A still further object is to provide a slip sheet feeding attachment in which the slip sheet mechanism is so mounted upon the printing mechanism that it will be in a position convenient for the operator, and still not interfere in any way with the normal operation of the printing mechanism.

Another object is to provide an interleaving mechanism wherein the number of slip sheets which may be placed in the magazine substantially corresponds to the number of printed sheets which may be run through the printing machine between each loading of the automatic feed mechanism of the machine.

Another object is to provide an interleaving mechanism for a printing machine, which will increase the utility of the machine in that all grades of bond papers may be used therein without danger of smearing the printed sheets, and that, therefore, the use of the machine is not limited to papers which do not require slip sheeting.

Another object is to provide an interleaving mechanism for printing machines, which will effect a saving of labor, in that it is unnecessary to use the operator ordinarily employed for manually feeding the slip sheets.

Another object is to mount the interleaving unit so that it can be readily shifted to a position clear of the printing mechanism to permit access thereto.

Another object is to provide an interleaving mechanism adapted to be attached to and run from a printing machine which will not materially increase the operative load imposed upon the working parts of the machine.

Another object is to provide an interleaving mechanism adapted to be attached to and run from a printing machine in such manner that the speed of operation of the mechanism will always be in direct ratio to the speed of operation of the machine, thereby relieving the operator of the necessity of adjusting the timing of the delivery of the slip sheets.

Another object is to provide means mounted as a unit with the interleaving mechanism for directing the slip sheets into the proper position on the printed sheets.

With the above and other objects in view, the invention may be said to comprise a device as illustrated in the accompanying drawings hereinafter described and particularly set forth in the appended claims, together with such variations and modifications thereof as will be apparent to one skilled in the art to which the invention appertains.

In the accompanying drawings showing an embodiment of the invention,

Figure 1 is a side elevational view of the interleaving mechanism when the same is mounted upon a printing machine of the rotary stencil duplicating type, such machine being shown somewhat schematically.

Figure 2 is a top plan view of the interleaving mechanism.

Figure 3 is a front elevational view thereof.

Figure 4 is a longitudinal vertical section

through the interleaving mechanism and printing machine, and

Figure 5 is a detail view of a portion of the interleaving mechanism.

In the accompanying drawings the present invention is illustrated as applied to a stenciling machine of the rotary cylinder type; the machine shown herein having a suitable supporting frame 1, a printing cylinder 2, and an impression roller 3, yieldingly pressed against the underside of the cylinder 2 by means of a spring 4. The sheets to be printed upon are supported in a suitable magazine 5 at the front of the machine and are delivered one at a time to the printing cylinder by suitable feeding mechanism including a feed roller 6, by which the sheets are advanced into the space between the cylinder 2 and the roller 3 and from which they are delivered into a suitable adjustable receiving receptacle 7 at the rear of the printing machine. The printing machine so far described is old and well known and a more detailed description thereof is, therefore, thought to be unnecessary, it being sufficient for the purpose of illustrating the present invention to state that the sheets of paper are taken one at a time from the magazine 5, printed upon and delivered successively into the receiving receptacle 7.

The present invention relates to a means whereby a slip sheet is automatically positioned on top of each printed sheet delivered into the receptacle 7, and this means comprises a suitable magazine 8, which is adapted to be arranged in such position that a suitable feeding mechanism associated therewith will deliver the slip sheets on edge, or at an angle to the horizontal, into the receptacle 7 in such manner that the slip sheets will be interleaved between each pair of superimposed printed sheets.

In the present embodiment the magazine 8 is supported directly above the printing cylinder of the printing machine and forms a part of the slip sheet interleaving unit, which also includes the slip sheet feeding mechanism and the slip sheet deflector. The slip sheet interleaving device is mounted or attached to the printing machine by means of attaching brackets 9 preferably in the form of castings and adapted to be secured at their lower ends to each side of the frame 1 near the rear thereof and extending upwardly therefrom on a slight rearward curve. The upper ends of the brackets 9 are flanged inwardly so as to provide a supporting surface and are recessed to receive the ends of a cross bar 11, which are secured thereto by means of bolts or other suitable securing means 10. The cross bar 11 is a part of the interleaving unit and carries adjacent to its opposite ends angle brackets 12 which are welded or otherwise secured thereto, the free arm of these brackets extending upwardly and rearwardly from the cross bar and being provided with aligned openings which are bushed so as to form bearings for the opposite ends of a rotatable shaft 13.

The shaft 13, as already stated is rotatably journalled in the bushed openings of the brackets 12 and extends transversely of the interleaving mechanism and of the printing machine, one end of the shaft projecting considerably beyond a bracket 12 and being provided with a pair of sprockets 18 and 18^a rotatable therewith, the sprocket 18 being at the end of the shaft and operatively connected and disconnected therefrom by means of a spring tensioned clutch 18^b, and the sprocket 18^a, which is the larger one, being keyed or otherwise fixed to the shaft adjacent to the bracket 12. The sprocket 18 is operatively connected by means of a chain 20 to a sprocket 21 which is fixed to the end of a shaft 19 arranged in the operative gear train for driving the printing machine.

The supporting frames 14, which carry the slip sheet magazine 8, the slip sheet feed mechanism and the slip sheet deflector of the interleaving unit, are pivotally mounted in spaced relation upon the shaft 13, being held against axial movement thereon by the brackets 12 and collars 15 keyed or otherwise secured to the shaft. These supporting frames include an upwardly extending portion having an enlarged upper end providing bearing and attaching points for the slip sheet feeding mechanism and the slip sheet deflector, while arms 16 project from the frame toward the front of the printing machine and at an upwardly inclined angle thereto so as to be slightly above the printing cylinder 2. These arms 16 provide the support for the slip sheet magazine, which is pivotally supported upon a shaft 17, fixedly mounted in openings adjacent to the end of the arms, by means of apertured lugs 17^a extending downwardly from the underside of the magazine adjacent its opposite longitudinal edges. The pivotal connection between the magazine and the shaft 17 is arranged nearer to one end of the magazine than to the other, so that the weight of the slip sheets will rock the magazine about such pivot and always maintain the top slip sheet of the pile in engagement with the feed roller of the slip sheet feeding mechanism later to be described. The magazine 8 is preferably in the form of an upwardly presenting channel, the forward end of which is open so that the slip sheets may be readily inserted into the same, while the rearward end is closed by a transversely extending retaining member 8^a secured to the arms 16 and having its upper end angularly deflected as indicated at 8^b, whereby the retaining member will serve to maintain the slip sheets in the magazine while the angular deflection 8^b will serve to guide the same through the feeding mechanism.

A crank 22 is keyed or otherwise fixed to the end of the shaft 13 exteriorly of the bracket 12 and opposite to the end upon which the sprockets 18 and 18ª are arranged, this crank being pivotally connected by a pivot pin 23ª to the lower end of an arm 23 which is inwardly offset intermediate its ends so as to bring its other end nearer to the plane of the supporting frame 14. This arm 23 is adapted to be oscillated by the shaft 13 through its pivotal connection to the crank 22, and in order that this oscillatory movement may be imparted and translated into a rotary movement of certain other parts of the mechanism, it is provided adjacent to its upper end with a rack 24 welded or otherwise secured to the inner side thereof. The rack 24 is adapted to mesh with a pinion 25 fixed to the end of a transversely extending shaft 26 which is journalled in bearings provided therefor in the enlarged upper portions of the supporting frames 14, the rack being held in meshing engagement with the pinion by means of a guide 27 having spaced leg portions pivotally mounted on the shaft on each side of the pinion. Since the shaft 13 is connected through the sprockets 18 and 21 and the chain 20 with the shaft 19 of the printing machine, it is clear that each revolution of the shaft 19 will effect a revolution of the shaft 13 and, in turn, the shaft 26 will be rotated first in one direction and then in the other according as the arm 23 is moving upwardly or downwardly, and that each of these rotations take place approximately during one half of the period of each rotation of the shafts 19 and 13. Therefore, rotation of the shaft 26 in the anti-clockwise direction will serve to actuate a slip sheet feeding roller 28, and since such actuation of the feeding roll is occurring during only one half of the period of each rotation of the shafts 19 and 13, the slip sheets will be fed at the same speed at which the printed sheets are delivered into the receptacle 7 because ordinarily only approximately one half of the period of rotation of the machine cylinder effects feeding movement to the printed sheets, the other half of such period being utilized for the printing operation.

The feeding roller 28 is mounted on the shaft 26 midway between the supporting frames 14 and adjacent to the rear end of the slip sheet magazine 8, the mounting of the roller upon the shaft being such that it is actuated only during the anti-clockwise rotation of the shaft and is idle during the clockwise rotation thereof. In effecting this mounting of the roller 28 it is rotatably arranged on the shaft 26 between a collar 29 and a ratchet wheel 30 fixed thereto, while a pawl 31 pivotally carried by an end face of the roller is constantly pressed into engagement with the teeth of the ratchet wheel by means of a spring 32 also secured to the end face of the roller. Hence it will be seen that as the shaft 26 rotates in a clockwise direction during upward movement of the rack 24 that the ratchet 30 and pawl 31 will idly move relative to each other but that during the anti-clockwise rotation of the shaft upon downward movement of the rack 24 the pawl and ratchet will be in engagement and that, therefore, the roller 28 will be rotated in an anti-clockwise direction. The roller 28 is provided externally with a friction surface, preferably in the nature of a rubber surface having a plurality of sheet engaging knobs 33 projecting therefrom, and since the end of the slip sheet magazine 8 tends to constantly swing upwardly toward the roller because of its pivotal connection to the supporting frames 14, it is clear that the top sheet of the pile of slip sheets in the magazine will be always in operative engagement with the surface of the roller and will be moved or fed thereby toward the rear of the machine during anti-clockwise rotation of the roller. The transversely extending retaining member 8ª will guide the slip sheet thus fed, because of the angular deflection 8ᵇ on its upper edge, between reversing rollers and a guide or limiting plate now about to be described.

A shaft 34 is rotatably journalled in aligned bearings in the supporting frames 14 forwardly and downwardly of the position of the shaft 26, a sprocket 35 being fixed to the end of the shaft on the side of the mechanism with the sprockets 18 and 18ª. A pair of spaced friction rollers 36 are keyed to the shaft 34, the upper surface of these rollers being substantially on a line with the upper edge of the angular deflection 8ᵇ of the member 8ª. A transversely extending plate 37 having its opposite ends 38 flanged and secured to the supporting frames 14 overlies the rollers 36, a sufficient clearance being provided between the plate and the rollers to permit of approximately several slip sheets passing therebetween. An upwardly and forwardly extending portion 39 is arranged along the front edge of the plate so as to project toward the roller 28, an opening being provided in said portion to accommodate the roller. The purpose of the foregoing arrangement will be more fully explained during the description setting forth the operation of the mechanism.

Another shaft 40 is rotatably journalled in the supporting frames 14 adjacent the upper rear ends thereof, so as to be located slightly below and rearwardly of the shaft 26, although substantially on a line therewith. This shaft is provided with a pair of spaced relatively large rollers 41 preferably having friction material on their circumferential surfaces and is adapted to be driven by means of a sprocket 42 fixed on one end thereof. A chain 43 encircles the sprockets 18ª, 35 and 42, whereby anti-clockwise rotation of the shaft

13 will cause a similar rotation to be imparted to the shafts 34 and 40 and the rollers 36 and 41, but since the rollers 36 engage the underside of a slip sheet such rotation will tend to carry the slip sheet toward the front of the machine while the rollers 41 engaging the upper side of a slip sheet will serve as feed rollers. A transverse shaft 44 is journalled in yieldable bearings 45 carried by the supporting frames 14, so that idler rollers 46 carried thereby will engage each of the rollers 41 on their under side with a yielding pressure.

The upper portion of the supporting frames 14 are provided at their rear with a rearwardly and downwardly projecting part 47 to which the slip sheet deflector 48 is adjustably connected. This deflector is substantially channel shape and presents downwardly, the side flanges 49 of the channel being longer at their attaching end than at other points throughout their length, and is adapted to be adjusted upwardly or downwardly so that the slip sheets will be deflected on edge into the rear end of the printed sheet receptacle no matter to what length such receptacle is adjusted with respect to the printing machine. To this end the deflector is mounted so that the part 47 of the frames 14 extend into the channel adjacent to the side flanges thereof, while the side flanges are pivotally connected to the part 47 by pivot screws 50 and are held in different positions of pivotal adjustment by means of an arcuate slot 51 formed in the side flanges and a screw 52 passing therethrough and into the part 47.

The lower ends of the supporting frames 14 are each provided with a pair of arcuately spaced outwardly projecting pins 53 and 54 which engage the upper edge of the brackets 12 and serve to limit the movement of the interleaving mechanism or unit when it is swung bodily to the operative or inoperative positions.

The foregoing detailed explanation of the structural and operative parts of the interleaving unit is sufficient to make clear the following description covering the operation of the mechanism and the peculiar and novel advantages inherent therein.

In the operation of the machine the printing cylinder is continuously driven and the sheets, fed one at a time at intervals from the magazine 5, are printed upon and delivered into the receptacle 7. During the operation of the printing machine the shaft 19 in the rear train thereof is constantly rotating in an anti-clockwise direction and, of course, the sprocket 21 carried by said shaft rotates the sprocket 18 of the interleaving mechanism through the chain connection 20. As soon as the clutch device 18^b is moved to clutch the sprocket 18 to the shaft 13 this rotation is imparted to the shaft 13, the sprocket 18^a and the crank 22. The rotation of the sprocket 18 being in an anti-clockwise direction will rotate the shafts 34 and 40 in a similar direction because of its connection therewith through the chain 43, while the crank 22 will oscillate the arm 23 and rack 24, thereby rotating the shaft 26 in a clockwise direction during upward movement of the arm. The feed roller 28 will be intermittently rotated in an anti-clockwise direction by the movement of the shaft 26 because of the ratchet and pawl driving connection therebetween, while the reversing rollers 36 and the feed roller 41 will be constantly rotated in an anti-clockwise direction.

The slip sheet magazine 8 is of sufficient size to contain approximately the same number of slip sheets as the number of printed sheets which may be run through the machine at each loading, so that it is not necessary to stop the operation of the machine in order to supply more slip sheets to the interleaving mechanism. When the pile of slip sheets is placed in the magazine 8 the off-center pivotal mounting of the magazine will cause it to swing upwardly at its rear end so that the top sheet of the pile is always in engagement with the feed roller 28 as the pile diminishes in size. This arrangement enables the feeding of the slip sheets to be effected from the top of the pile so that the weight of the pile of slip sheets has no relation to the operation of the mechanism consequently imposing no material additional load upon the operative parts of the printing machine. The feeding of the slip sheets from the top of the pile also enables the position of the magazine 8 to be considerably lower or nearer to the cylinder 2 of the printing machine, thereby providing a more compact and convenient arrangement when the interleaving unit is combined with the printing machine.

The printing machine and the interleaving unit being in operation, the feed roller 28 will move the top slip sheet rearwardly during its anti-clockwise rotation, the angular deflection 8^b of the plate 8^a guiding such sheet so that it passes between the reversing rollers 36 and the plate 37, which members are spaced apart only sufficiently to admit of several slip sheets entering therebetween. Supposing that in addition to the top slip sheet several other sheets have been moved by the roller 28, it is clear that the reversing rollers 36 engaging the under side of such sheets in their anti-clockwise rotation will move the same forwardly again toward the magazine 8, while the top slip sheet will continue its feeding movement toward the rear of the machine. The leading end of the top slip sheet then passes between the feed rollers 41 and the idler rollers 46, the latter of which are mounted to be yieldingly pressed toward the former. The rollers 41 advance the sheet rearwardly while the deflector guide 48, which has been suitably adjusted, deflects the

rearward movement of the sheet downwardly whereby the same is delivered into the receptacle 7 adjacent the rear end thereof and on edge, or at an angle to the horizontal, after which the sheet falls forwardly upon the top of a printed sheet. The slip sheets being delivered on edge fall forwardly upon the printed sheets without any relative sliding movement thereon, as would be the case were the slip sheets delivered upon top of the printed sheets substantially parallel therewith, as a result of which all danger of smearing or blotting the printed sheets is obviated.

The operator of the machine is relieved of all responsibility of timing the delivery of the slip sheets in accordance with the delivery of the printed sheets, since the feed roller 28 being connected to the shaft 26 to rotate therewith only during its anti-clockwise rotation advances the slip sheets in time with the printed sheets, so that when the speed of operation of the printing machine varies the speed of delivery of the slip sheets varies in direct proportion thereto, as the relative speed of operation of the printing machine and of the interleaving mechanism is always unity.

The interleaving mechanism, including the supporting frames, the slip sheet magazine, the feeding mechanism, and the deflector or guide, is adapted to be mounted upon the printing machine as a self-contained unit, and when so mounted may be swung to the operative or inoperative position as a unit. The deflector or guide of the unit may be adjusted so that the slip sheets will be delivered on edge into the rear end of the receptacle 7, no matter what adjustment as to length has been made to said receptacle, while such deflector, when the unit is moved to the inoperative position, will not interfere with the delivery of the printed sheets to the receptacle when the machine is operating without the use of slip sheets.

From the foregoing detailed description of the structural parts of the mechanism and of the operation thereof, it will be seen that the interleaving mechanism is a self-contained unit all parts of which are connected in one operation to the printing machine; that such unit is compact and closely positioned upon the printing machine; that the operation of the mechanism does not impose a material additional load upon the printing machine since the slip sheets are fed from the top of the pile, that the number of slip sheets and the number of printed sheets which may be run through the mechanism and the machine at one loading thereof corresponds, thus eliminating the necessity of stopping the machine for reloading slip sheets; that the relative speed of operation of the mechanism and the machine is unity, thus relieving the operator of responsibility as to synchronizing the speed of delivery of the printed sheets and slip sheets; that even though the deflector or guide is attached to and a part of the interleaving unit, the unit may be moved to the inoperative position without hindering the normal operation of the printing machine; and in addition to the above that a number of other advantages are inherent therein which will be readily recognized by one skilled in the art.

Although a preferred embodiment of the invention has been illustrated and described, it should be understood that the same is not limited thereto but is susceptible of such modifications and adaptations as fall within the scope of the appended claims.

Having thus described my invention, I claim:

1. The combination with a printing machine having a printing cylinder, a magazine for the sheets to be printed upon in front of said cylinder, a receptacle for printed sheets in the rear of said cylinder, and means for feeding the sheets one at a time from the magazine and past the cylinder into the receptacle, of an interleaving mechanism adapted to interleave slip sheets with the printed sheets in the receptacle comprising a magazine adapted to receive a pile of slip sheets, means for feeding the slip sheets one at a time on edge into the receptacle for the printed sheets so that each sheet will fall downwardly about its edge upon the top of a printed sheet, said magazine being pivotally supported at a point beyond its center whereby it will always rock about its support so that the top sheet of the pile will be in engagement with the feeding means.

2. The combination with a printing machine having a printing cylinder, a magazine for the sheets to be printed upon in front of said cylinder, a receptacle for printed sheets in the rear of said cylinder, and means for feeding the sheets one at a time from the magazine and past the cylinder into the receptacle, of an interleaving mechanism adapted to interleave slip sheets with the printed sheets and comprising a unit attachable to and detachable from the printing machine, said unit including a magazine for the slip sheets, means for feeding the slip sheets one at a time from the magazine, and means for deflecting the slip sheets so fed on edge into the receptacle for the printed sheets, said magazine being pivotally supported at a point removed from its center whereby it will rock about its point of support and maintain the top slip sheet of the pile in engagement with the feeding means.

3. The combination with a printing machine having a printing cylinder, a magazine for the sheets to be printed upon in front of said cylinder, a receptacle for printed sheets in the rear of said cylinder, and means for feeding the sheets one at a time from the magazine and past the cylinder into the re-

ceptacle, of an interleaving mechanism adapted to interleave slip sheets with the printed sheets in the receptacle, said mechanism comprising a magazine adapted to contain a pile of slip sheets, means for feeding the slip sheets toward the receptacle for the printed sheets, means for causing the top sheet of the pile in the magazine to be in engagement with said last named means, means for preventing more than one slip sheet to pass through the feeding means at a time, and means for deflecting each slip sheet as it is passed through the feeding means on edge into the receptacle for the printed sheets so that the slip sheet will fall downwardly about its edge on the top of a printed sheet.

4. In combination with a printing machine of the type having a printing cylinder, a magazine for the sheets to be printed upon in front of said cylinder, a receptacle for the printed sheets in the rear of said cylinder, and means for feeding the sheets one at a time from the magazine and past the cylinder into the receptacle, of an interleaving mechanism adapted to interleave slip sheets with the printed sheets and to be attached to and detached from the printing machine as a unit, said mechanism comprising a pivotally supported magazine adapted to contain a pile of slip sheets and having its point of pivotal support in an off-center position so that it will rock in a predetermined direction, means for feeding the slip sheets one at a time toward the receptacle for the printed sheets and adapted to be always in engagement with the top sheet of the pile of slip sheets in the magazine, said means being operatively connected with the printing machine to operate in unity therewith, and means for deflecting the slip sheets as they are fed by the feeding means on edge into the receptacle for the printed sheet so that each slip sheet will fall downwardly about its edge upon the top of a printed sheet.

5. The combination with a printing machine having a printing cylinder, a magazine for the sheets to be printed upon in front of said cylinder, a receptacle for the printed sheets in the rear of said cylinder, and means for feeding the sheets one at a time from the magazine and past the cylinder into the receptacle, of an interleaving mechanism adapted to be attached to and detached from the printing machine as a unit, said mechanism comprising supporting frames, a magazine for containing a pile of slip sheets pivotally connected to said frames so as to always swing in a predetermined direction, feed rollers supported by said supporting frame, one of said rollers being always in engagement with the top sheet of the pile of slip sheets in the magazine and intermittently rotated in a predetermined direction, the other of said rollers being constantly rotated in the same direction, and means adjustably connected to the supporting frames for deflecting each slip sheet as it is fed by the feed rollers on edge into the receptacle for the printed sheets.

In testimony whereof, I hereunto affix my signature.

THOMAS WALTER HORN.