No. 648,985.

Patented May 8, 1900.

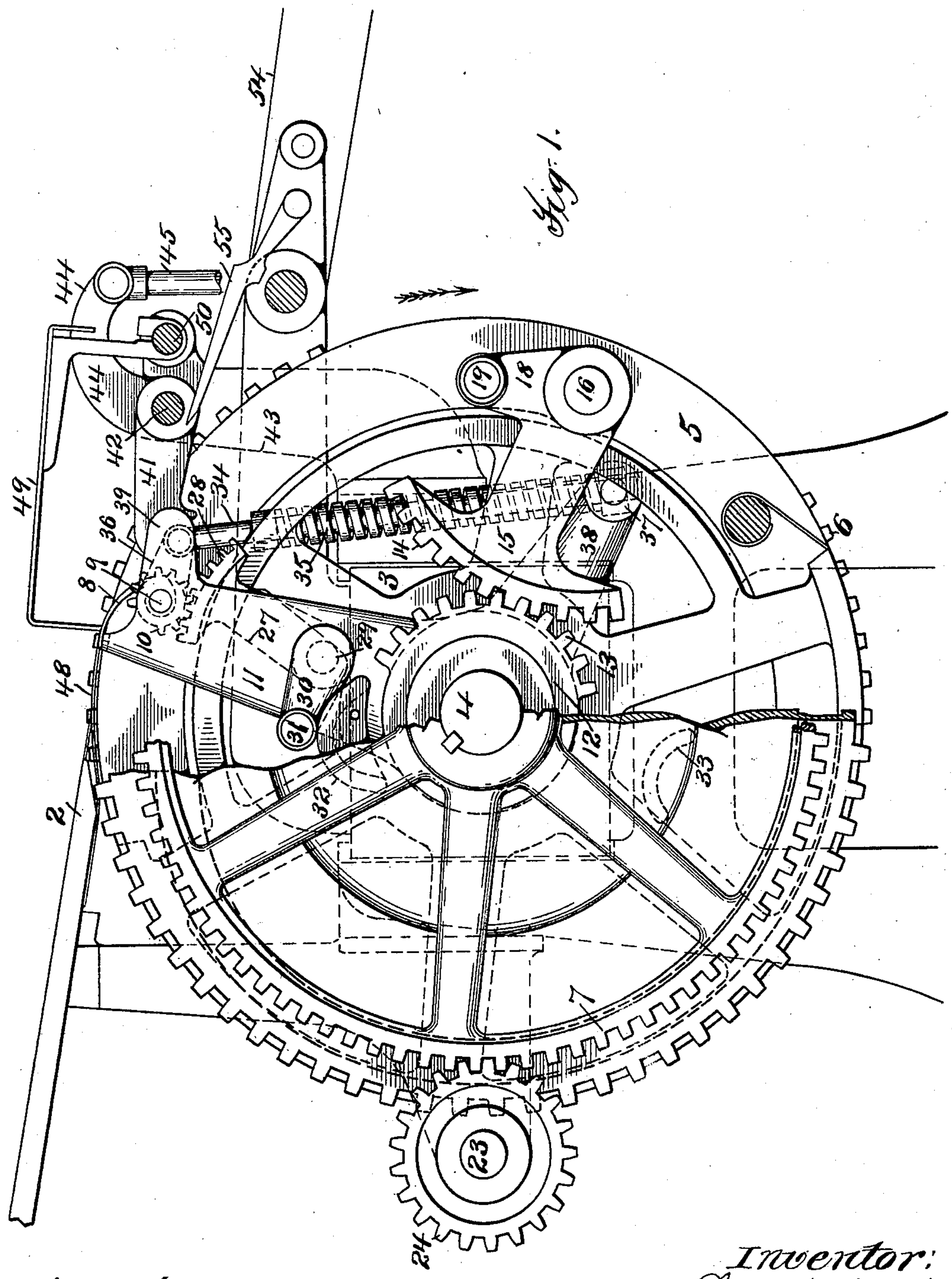
T. M. NORTH.

SHEET TAKING DEVICE.

(Application filed June 19, 1899.)

(No Model.)

5 Sheets—Sheet 1.



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No. 648,985. Patented May 8, 1900.

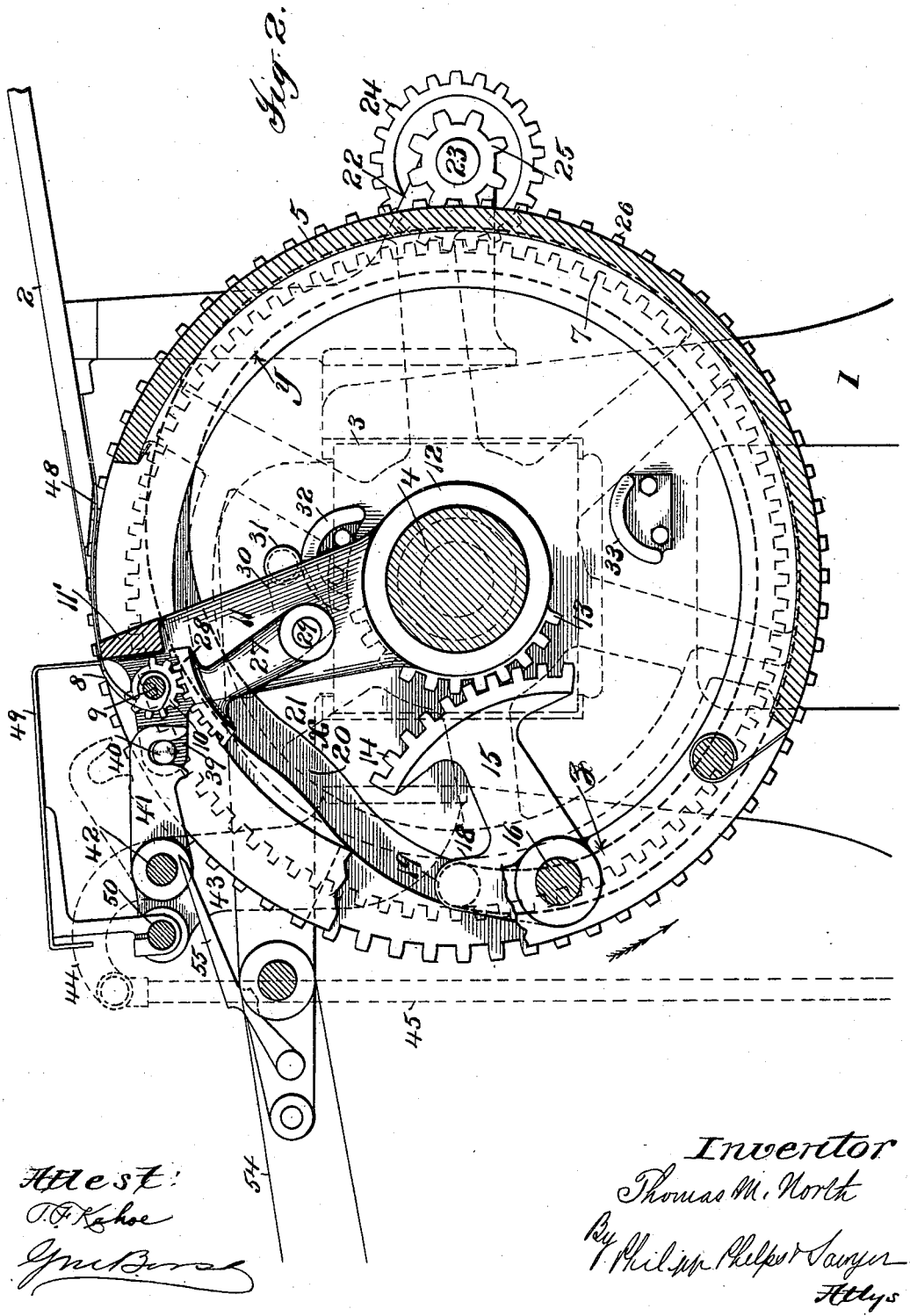
T. M. NORTH.

SHEET TAKING DEVICE.

(Application filed June 19, 1899.)

(No Model.) 5 Sheets—Sheet 2.

Fig. 2.



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No. 648,985.

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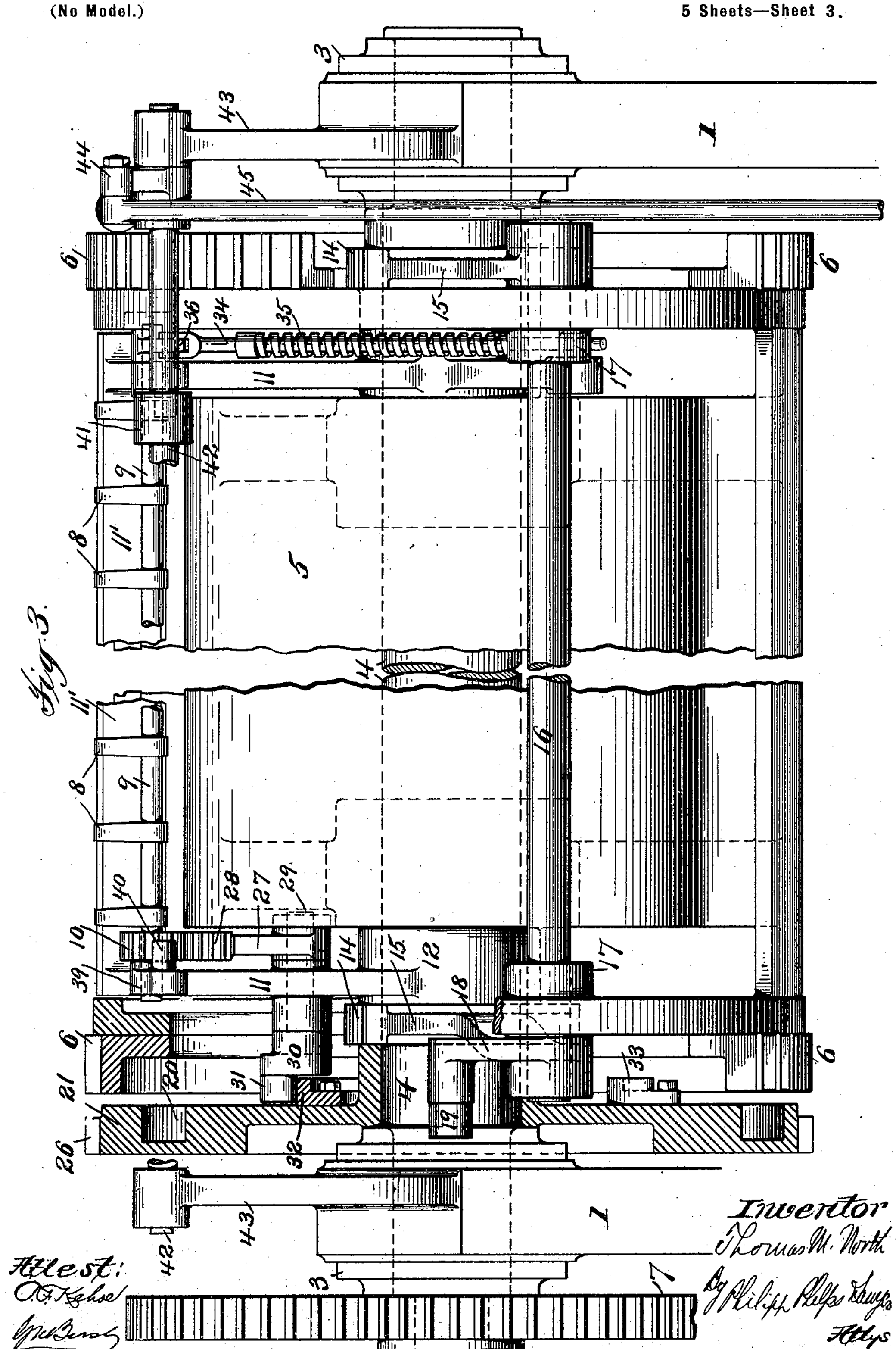
T. M. NORTH.

SHEET TAKING DEVICE.

(Application filed June 19, 1899.)

(No Model.)

5 Sheets—Sheet 3.



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No. 648,985. Patented May 8, 1900.

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SHEET TAKING DEVICE.

(Application filed June 19, 1899.)

(No Model.) 5 Sheets—Sheet 4.

Fig. 4.

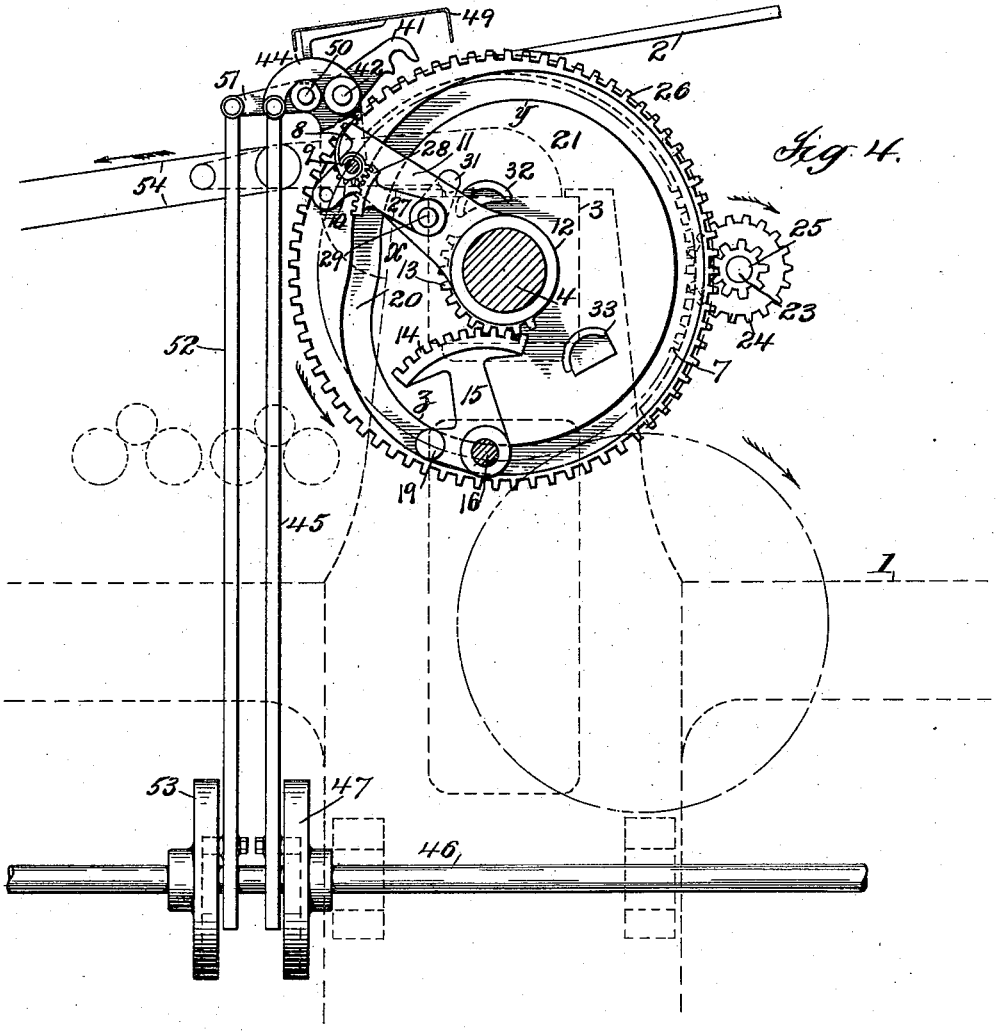
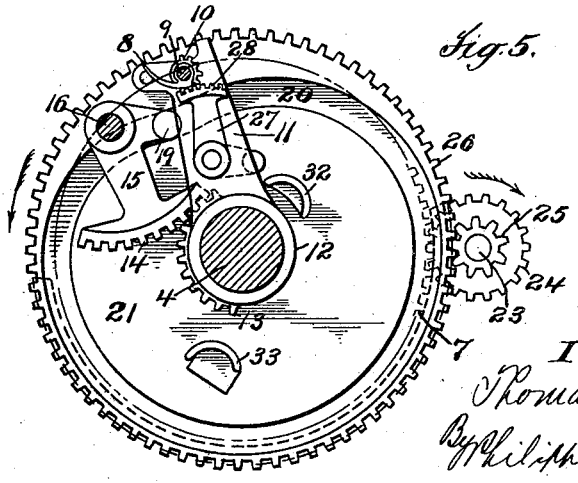


Fig. 5.



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No. 648,985. Patented May 8, 1900.

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SHEET TAKING DEVICE.

(Application filed June 19, 1899.)

(No Model.) 5 Sheets—Sheet 5.

Fig. 6.

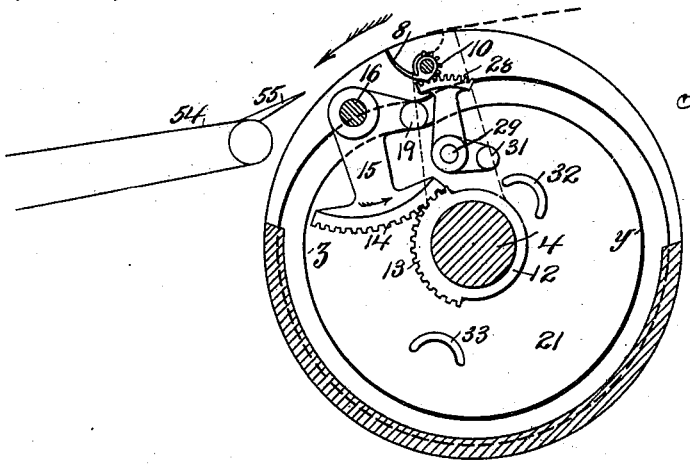


Fig. 7.

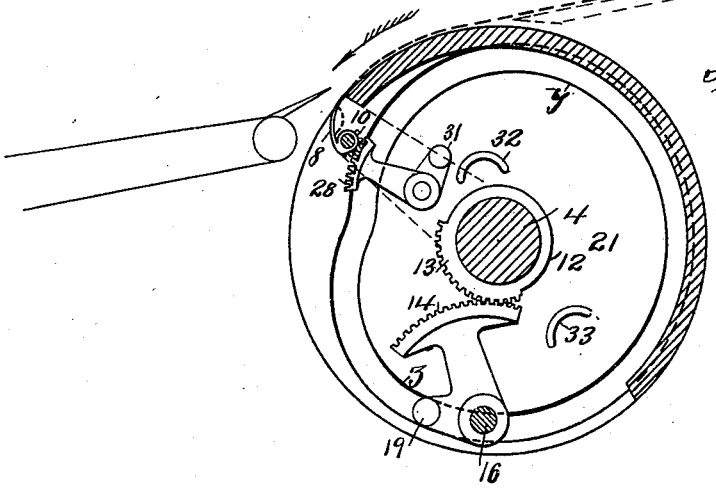
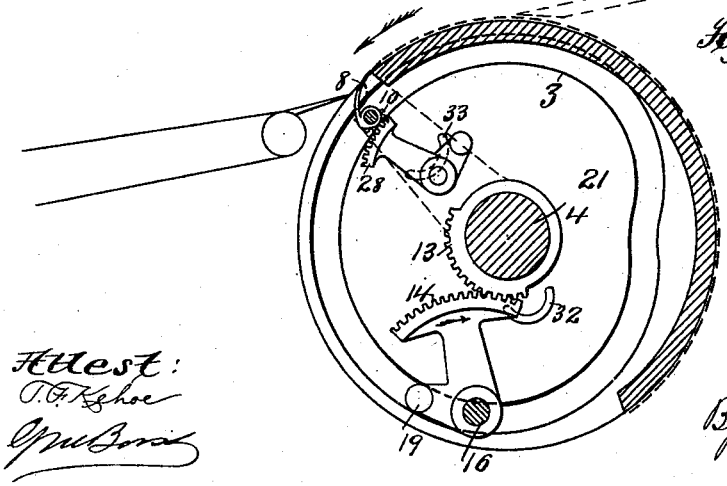


Fig. 8.



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UNITED STATES PATENT OFFICE.

THOMAS M. NORTH, OF NEW YORK, N. Y., ASSIGNOR TO ROBERT HOE, THEODORE H. MEAD, AND CHARLES W. CARPENTER, OF SAME PLACE.

SHEET-TAKING DEVICE.

SPECIFICATION forming part of Letters Patent No. 648,985, dated May 8, 1900.

Application filed June 19, 1899. Serial No. 721,048. (No model.)

To all whom it may concern:

Be it known that I, THOMAS M. NORTH, a subject of the Queen of Great Britain and Ireland, residing at New York city, county of Kings, and State of New York, have invented certain new and useful Improvements in Sheet-Taking Devices, fully described and represented in the following specification and the accompanying drawings, forming a part of the same.

This invention relates to certain improvements in sheet-taking devices and is more especially intended for use in printing-machines, though it is not necessarily confined to such use.

It is a well-known fact that in all printing-machines and other similar machines it is desirable to keep as many as possible of the parts of the machine, and particularly the impression members, running, and running at as nearly a constant speed as may be, in order to avoid the shocks, jars, and strains incident to stopping, starting, or varying the speed of either or both of the heavy impression members. Of course no difficulty is experienced in keeping the impression members or printing-couples of web-printing machine constantly running, because the feed of the web thereto is constant. In machines for printing on sheets, however, the problem is altogether different, since in these machines there is great difficulty, if the sheet-taking member of the printing-couple is kept in constant motion, in feeding the sheets to the sheet-taking devices with that accuracy which is an absolute necessity in good printing. Many constructions have been devised having for their object to keep the sheet-taking member of the printing-couple of such machines in constant motion and at the same time permit the sheet to be properly fed thereto. Among the more common devices of this class is the well-known feeding-cylinder, which is stopped in order that the sheet may be fed to it and is then speeded up to deliver the sheets to the sheet-taking devices on the sheet-taking member of the printing-couple. The transfer of the sheet from the feeding-cylinder to the sheet-supporting cylinder in such machines is, however, attended with difficulties, as the sheet is liable to slip in being transferred from one set of grippers to the other, and, furthermore, the addition of the feeding-cylinder, together with the necessary parts for operating it, to the machine produces a complicated and expensive construction.

The object of this invention is to provide the sheet-receiving member of the printing-couple of a sheet-printing machine with sheet-taking devices to which the sheet may be fed in the first instance, said devices being arranged so that they may be brought to a full stop and be locked in this position to receive the sheet and to accomplish this without in any way affecting the continuous movement of the sheet-taking member.

With this and other objects in view the invention consists in certain constructions and in certain parts, improvements, and combinations, as will be fully described in the following specification, and more particularly pointed out in the claims hereunto appended.

In the accompanying drawings, which form a part of this specification, and in which like characters of reference indicate the same parts, Figure 1 is a side view of the machine, taken from the gear side, certain parts being broken away to show the construction more clearly. Fig. 2 is a sectional side elevation of the machine, taken from the feeder side, certain parts being broken away. Fig. 3 is an end view of the machine looking at it from the delivery side, certain parts being shown in section. Fig. 4 is a diagrammatic side elevation illustrating the parts in the position they occupy after the sheet-taking devices have closed upon the sheet and have advanced some distance from the feed-board. Fig. 5 is a detail sectional elevation illustrating the sheet-taking devices in the position they occupy just as the sheet is about to be fed thereto and showing also the operating-cams and connections therefor. Figs. 6, 7, and 8 are diagrams illustrating the sheet-taking devices in different positions in the revolution of the cylinder.

Referring to the drawings, 1 indicates the frame of a sheet-printing machine, provided with the usual feed-board 2. In the machine selected to illustrate the invention the sheet-taking member is a cylinder, though the in-

vention in its broadest form is not confined to machines in which the sheet-taking member is a cylinder. In the frame of the machine shown are located the usual boxes 3, in which is journaled the cylinder-shaft 4, which supports the impression-cylinder 5 in the usual manner.

It may be here remarked that the form-carrying mechanism, which coöperates with the impression-cylinder 5 in the printing operation, has been omitted in the interest of clearness; but any form-carrying member may be used.

The impression-cylinder 5 may be rotated in any usual manner. The impression-cylinder shown is intended to coöperate with a reciprocating bed in bed-and-cylinder machines of the multirevolution type and is therefore provided with segment-gears 6, which are intended to mesh during the printing operation with register-racks on the bed. (Not shown.) The cylinder-shaft is also provided with a gear 7, which is in mesh with any suitable mechanism for driving the cylinder when it is not driven by the bed. The cylinder may be provided with any suitable form of sheet-taking devices, and these sheet-taking devices are preferably so constructed and arranged that they may be stopped during the time the sheet is to be fed to them. The sheet-taking devices may, however, be arranged so that they will not be brought to an actual stop, but be simply slowed down to receive the sheet. In the machine shown the sheet-taking devices consist of the usual gripper-fingers 8, mounted on a shaft 9, the said shaft being provided with a segmental gear 10, by which the grippers are opened and closed, as will be hereinafter described.

It is obvious from what has been before said that in the machine shown the shaft on which the grippers are mounted must be constructed so as to have a movement independent of the movement of the cylinder. While various devices may be used for mounting the shaft so that it may have the independent movement referred to, it is preferably journaled in arms 11, said arms having hubs 12, which loosely surround the cylinder-shaft 4.

Various constructions may be used for giving the arms which carry the gripper-shaft a movement independent of the cylinder. In the machine shown, however, the hubs 12 are provided with segmental gears 13, said gears being in constant mesh with segment-racks 14, which racks are secured to or form a part of arms 15. One of the arms 15 is preferably located on each end of the cylinder. The segment-carrying arms 15 are preferably secured to a shaft 16, said shaft extending through the cylinder from side to side and finding its bearings in hubs 17, which are preferably a part of the cylinder-heads. It is obvious that as the segment-carrying arms 15 are moving to and fro the arms 11 and the grippers carried thereby will be moved with respect to the cylinder. It is also obvious that since the arms 15 are mounted on a shaft which is located in and carried by the cylinder and since the racks 14 on the arms are constantly in mesh with the segmental gears 13 the arms are always rotating with the cylinder as the same turns upon its shaft. When, however, the segment-carrying arms are rocked upon the shaft 16, the arms 11 will be given a movement independent of the cylinder and additional to the rotating movement given them by the cylinder through the segment-racks 14 and gears 13. In other words, the said arms 11, while they rotate continuously with the continuously-rotating cylinder, at the same time may by rocking the arms 15 be given a movement which is independent of their rotating movement. The arms 11 are preferably connected by a web 11′, which normally rests against the shoulder of the sheet-supporting surface on the cylinder and which forms an abutment against which the grippers hold the sheet.

Various means may be provided for rocking the arms 15, and thus producing the independent movement of the arms 11. Preferably, however, one of the arms 15 is provided with an extension or rocker-arm 18, said extension being provided with a cam-roll 19, which engages a cam-groove 20 in a closed or island cam 21, which in the machine shown is mounted loosely on the cylinder-shaft 4.

The impression-cylinder shown is intended to coöperate, as has been stated, with a reciprocating bed in what is ordinarily known in the art as a "two-revolution" machine—that is to say, the cylinder makes a revolution during which the sheet is fed thereto and printed and a second revolution while the bed is making its return stroke after the printing operation, during which revolution the sheet is delivered. The grippers must therefore take the sheet on the first revolution and remain closed on the sheet for some time more than a complete revolution or until they have reached the delivery-point on the second revolution. The peculiar movement, which will be hereinafter more specifically described, which is given the grippers during the sheet-taking operation needs, therefore, in this type of press to be produced only on every second revolution of the cylinder.

While various devices may be constructed which will effect the results desired, in the machine shown the cam 21 is preferably given a rotary movement with the cylinder and at half the speed thereof, so that it will only be in position to effect the operation of the grippers once in two revolutions of the cylinder. Various mechanisms may be provided for rotating the cam at half the speed of the cylinder. In the machine shown the frame is provided with a bracket 22, in which is mounted a short shaft 23. This short shaft 23 carries on one of its ends a gear 24, which meshes with the gear 7, before referred to as mounted on the end of the cylinder-shaft. The other

end of the shaft 23 is provided with a pinion or gear 25, which meshes with gear-teeth 26, preferably formed on the exterior of the cam 21. The teeth on the gear 7 and cam 21 and the teeth on the gears 24 and 25 are so proportioned that the cam will be given one revolution as the cylinder makes two. The eccentric portion of the cam 21 lies substantially between the points marked *y* and *z* and practically consists of two cam portions, the junction of which is marked *x*.

Any suitable form of grippers may be employed, and any suitable means may be used for opening and closing the grippers. In the machine shown the grippers are opened and closed by a segment 28, said segment being mounted on an arm 27 and meshing with the segmental gear 10 on the shaft 9, before referred to. The arm 27 is preferably mounted on a short shaft 29, which is journaled in suitable bearings in one of the arms 11, said shaft being provided with an arm 30, carrying a bowl 31. It is obvious that by rocking the shaft 29 backward and forward the grippers will be opened and closed.

Any suitable means may be provided for acting on the bowl 31, and thus rocking the shaft 29. Preferably, however, the cam 21 carries two small cams 32 and 33, the function of the cam 32 being to close the grippers to take the sheet and the cam 33 to open the grippers to deliver the sheet. The grippers are preferably held either in their open or closed position by a spring-rod 34, which is surrounded by a spring 35, said rod being connected at one end to an arm 36, secured to the gripper-shaft, and having its other end located in a loop or puppet-head 37, carried on an arm 38, which projects from one of the hubs 12 before referred to. The spring-rod is arranged to pass the center in a well-known manner as the grippers are opened and closed, and thus hold them in either position.

In the machine shown and as will be hereinafter described the arms 11, which carry the gripper-shaft, are by the operation of the cam 21 brought to a full stop and held stationary while the sheet is fed thereto. In order that the arms 11 may be held against any movement while the sheet is fed to them, a suitable locking device for the arms is provided. While this locking device may be constructed in various ways, each of the arms 11 is preferably provided with an extension 39, said extensions carrying pins 40. The pins 40 are in the machine shown engaged by hooks 41, said hooks being suitably secured to a rock-shaft 42, which is suitably located in brackets 43, extending from the machine-frame. The rock-shaft 42 is preferably provided with an arm 44, which has secured to it a cam-rod 45, said rod being preferably forked at its lower end, so as to straddle a way cam-shaft 46, and being provided with a suitable roller which runs in a groove of a cam 47, located on the shaft 46. The cam-shaft 46 may be driven in any suitable manner, but in the machine shown must be geared so as to make one revolution to each two revolutions of the cylinder.

The feed-board 2 is preferably provided with suitable sheet-supports, which in the present machine are shown as fingers 48, secured to the under side of the feed-board and extending beyond its forward edge, as is clearly shown in Fig. 2.

Any suitable form of front-stop mechanism may be used in the machine—in the machine shown a front stop consisting of angular arms 49, which when in operation rest on the fingers 48, these angular arms being carried on a shaft 50, which is operated through an arm 51 and a cam-rod 52 from a cam 53 on the way cam-shaft 46.

Any suitable form of delivery mechanism may be used with the machine. In the machine shown, however, the sheet is fed onto tapes 54 by a switch 55. Inasmuch as these tapes and switch are of common construction, a further description of them is unnecessary.

The construction being as before described, the operation is as follows: Referring to the diagram shown in Fig. 8 and it being remembered that the cylinder 5 and the cam 21 are both rotating at different speeds, the cylinder traveling at twice the speed of the cam, it will be seen that the arms 11 are resting against the shoulder of the sheet-supporting surface on the cylinder 5 and that the grippers are closed and holding a sheet which has been printed on the previous revolution of the cylinder. The grippers are approaching the delivery-point, and the switch 55 has been lowered to take the sheet from the cylinder. As the cylinder gains on the cam 21 the bowl 31 on the arm 30 is caused to run up on the small cam 33, which is mounted on the cam 21, and the segment-carrying arm 27 is rocked, thus opening the grippers and permitting the switch to direct the sheet onto the tapes 54. Immediately after the cam 33 has operated the grippers, as before described, and as the cylinder and cam continue their rotation the cylinder gaining on the cam causes the roll 19 on the extension 18 of the segment-carrying arm 15 to run against the low part of the cam, which is located between the points *y* and *x*. This causes the segment-carrying arms to move in the direction of the arrow in Fig. 8 and causes the segment-racks 14 to rotate the hubs 12 about the cylinder-shaft, and therefore gives the arms 11 a movement about the shaft in the direction of the arrow in Fig. 8 and causes them to carry the gripper-shaft and grippers away from the sheet-supporting surface. This movement continues while the cylinder is rotating from the position shown in Fig. 8 to the position shown in Fig. 6, at which time it will be seen that the arms 11 have been given a movement which has carried them nearly ninety degrees away from the shoulder on the sheet-supporting surface. When the parts reach the position shown in Fig. 6, the roll 19 has

reached the lowest point of the cam, which is marked *x*. At this point the contour of the cam changes and the movement of the segment-carrying arms 15 is reversed, as indicated by the arrow in Fig. 6. The segment-racks 14 are now rocked in the opposite direction and the arms 11 are caused to reverse their movement about the shaft. The contour of the cam is such that for a short time the backward movement of the arms 11 produced by rocking the segment-carrying arms 15 is equal to the forward movement of the cylinder. In other words, at this time the cylinder tends to move the arms 11 forward or away from the feed-board at a given rate of speed, and at the same time the segment-carrying arms 15 are tending to move the arms backward at the same rate of speed. The result is that so long as the contour of the cam is such that it has a tendency to move the arms backward at the same rate of speed that the cylinder tends to move them forward there will be no movement of the arms relative to the feed-board, and at this time the sheet is fed to the grippers. The position of the parts referred to is shown in Fig. 6. As the bowl 19 reaches the low part of the cam (marked *x*) and the arms 11 come to a stop beneath the feed-board the cam 47 is operated through its connections and throws the hooks 41 down over the pins 40, thus locking the arms 11 firmly in position, and thereby insuring that they remain perfectly stationary, so that the sheet may be fed thereto. As the sheet is being fed the cylinder and the cam are both advancing and the small cam 32 runs under the bowl 31 and the grippers are closed upon the sheet. The bowl 19 is now carried over that part of the cam 21 lying between the points *x* and *z*. The cam is so shaped, as has been before said, that during the time when the sheet is fed the movement given to the arms 11 by the first part of it is just sufficient to neutralize the tendency of the cylinder to move these arms forward. The last part of the cam, however, is of such a shape as to cause the arms 11 to move slowly backward, or, in other words, to permit the cylinder to overtake the arms. As soon therefore as the bowl 19 reaches that part of the cam 21 whereby the backward movement of the arms is to begin (see Fig. 2) the cam 47 again operates through its connections and raises the hooks 41, at which time the movement given to the bowl 19, and consequently through the several connections to the arms 11, begins to be slower than the movement of the cylinder. The cylinder therefore gradually overtakes the arms 11, and when the bowl 19 has reached the point *z* the cylinder has overtaken the arms 11 and the arms and the web 11′ are resting against the shoulder of the sheet-supporting surface. This position of the parts is shown in Fig. 7, at which time the bowl 19 is running in the concentric part of the cam or the part between the points *z* and *y*. The points *z* and *y* are, however, separated by a distance which is a little more than half the circumference of the cam, and as the cam is running at half the speed of the cylinder the cylinder will make a complete revolution and something more before there is any further movement of the bowl 19 tending to produce a movement of the arms 11. During the time the cylinder makes this complete revolution and something more the sheet is printed and brought to the delivery-point, at which time the bowl 31 runs upon the cam 33 and opens the grippers, the position being that shown in Fig. 8. The sheet is now delivered and the cycle of movements before described is now repeated.

It is desirable that some means be provided for holding the arms 11 and the web 11′ firmly against the shoulder of the sheet-supporting surface during the time when the grippers are holding the sheet. While this may be accomplished in various ways, preferably the concentric portion of the cam will be formed so as to exercise a slight outward pressure on the bowl 19. The cam 21 will thus act through the connections to hold the arms 11 snugly against the shoulder of the sheet-supporting surface.

It will of course be understood that the front stops are operated by their cam at the proper time and in the ordinary manner.

While the gripper mechanism before described has been shown in connection with an impression-cylinder, it is to be understood that the invention may be applied to any form of sheet-carrier, and this no matter whether the carrier has a rotary movement or a movement of any other description.

The mechanism by which the invention is carried into effect may be widely varied. The invention is not, therefore, to be limited to the particular details hereinbefore described, and illustrated in the accompanying drawings, but is to be broadly construed and as covering all changes and modifications which fall within its spirit and scope.

What I claim is—

1. The combination with a moving sheet-support, of sheet-taking devices moving with the support, means for giving the sheet-taking devices a movement independent of and away from the support and for bringing them to a stop to receive the sheet, locking devices operating to hold the sheet-taking devices stationary while the sheet is being fed thereto, and means for again causing the sheet-taking devices to move with the support, substantially as described.

2. The combination with a rotating sheet-support, of sheet-taking devices rotating with the support, means for giving the sheet-taking devices a movement independent of and away from the support and for bringing them to a stop to receive the sheet, locking devices operating to hold the sheet-taking devices stationary while the sheet is being fed thereto,

and means for again causing the sheet-taking devices to rotate with the support, substantially as described.

3. The combination with a rotating sheet-support, of a set of sheet-taking devices rotating with the support, means for increasing the rate of movement of the sheet-taking devices so as to cause them to run ahead of the support, means for bringing them to a stop in order that a sheet may be fed thereto, locking devices operating to hold the sheet-taking devices stationary while the sheet is being fed, and means for causing them to rotate at the same rate of speed as the sheet-support, substantially as described.

4. The combination with a moving sheet-support, of a set of grippers moving therewith, means for opening and closing the grippers, means for giving them a movement away from the support and for bringing them to a stop in order that a sheet may be fed thereto, locking devices operating to hold the grippers stationary while the sheet is being fed to them, and means for again causing the grippers to move with the support, substantially as described.

5. The combination with a rotating sheet-support, of a set of grippers rotating with the support, means for opening and closing the grippers, means for giving them a movement away from the support and for bringing them to a stop in order that a sheet may be fed thereto, locking devices operating to hold the grippers stationary while the sheet is fed to them, and means for again causing the grippers to rotate with the support, substantially as described.

6. The combination with a frame, of a rotating sheet-support mounted therein, a set of grippers rotating with the support, means for giving the grippers a movement away from the support and for bringing them to a stop so that a sheet may be fed thereto, locking devices mounted on the frame and operating to hold the grippers stationary while the sheet is being fed, and means for causing the grippers to again rotate with the support, substantially as described.

7. The combination with a rotating sheet-support, of a set of grippers rotating therewith, means for increasing the rate of movement of the grippers so as to cause them to run ahead of the support, means for bringing them to a stop in order that a sheet may be fed thereto, locking devices operating to hold the grippers stationary while the sheet is being fed, and means for causing them to rotate at the same rate of speed as the sheet-support, substantially as described.

8. The combination with a rotating carrier having a sheet-supporting surface, of a set of arms loosely mounted on the shaft of the carrier and carrying sheet-taking devices, means whereby the arms are caused to rotate with the carrier, means for giving the arms a movement away from the sheet-supporting surface of the carrier, means for bringing them to a stop in order that a sheet may be fed to the sheet-taking devices, locking devices for the arms and means for causing the arms to move toward the sheet-supporting surface of the carrier, substantially as described.

9. The combination with a rotating carrier having a sheet-supporting surface, of a set of arms loosely mounted on the shaft of the carrier and carrying sheet-taking devices, means whereby the arms are caused to rotate with the carrier, means for giving the arms a constantly-increasing rate of speed to cause them to move away from the carrier, means for bringing them to a stop in order that a sheet may be fed to the sheet-taking devices, locking devices for holding them stationary while the sheet is being fed, and means for causing them to move toward the sheet-supporting surface of the carrier at a constantly-decreasing rate of speed, substantially as described.

10. The combination with a continuously-rotating carrier having a sheet-supporting surface, of a set of arms loosely mounted on the shaft of the carrier and carrying sheet-taking devices, means whereby the arms are caused to rotate with the carrier, means for giving the arms a constantly-increasing rate of speed to cause them to move away from the carrier, means for bringing them to a stop in order that a sheet may be fed to the sheet-taking devices, locking devices for holding them stationary while the sheet is being fed, and means for causing them to move toward the sheet-supporting surface of the carrier at a constantly-decreasing rate of speed, substantially as described.

11. The combination with a rotating carrier having a sheet-supporting surface, of a set of arms rotating with the carrier, a set of grippers carried in the arms, means for opening and closing the grippers, means for causing the arms to rotate about the shaft of the cylinder, whereby they are given a movement away from the sheet-supporting surface, means for bringing the arms to a stop so that a sheet may be fed to the grippers, locking devices for holding them stationary while the sheet is being fed, and means for causing them to rotate around the axis of the carrier in a reverse direction at a less rate of speed than the carrier, substantially as described.

12. The combination with a continuously-rotating carrier having a sheet-supporting surface, of a set of arms mounted on the shaft of the carrier, sheet-taking devices mounted in the arms, means for giving the arms a constantly-increasing rate of movement, whereby they are caused to rotate away from the sheet-supporting surface, means for bringing them to a stop in order to permit a sheet to be fed to the sheet-taking devices, locking devices for holding them stationary while the sheet is being fed, and means for giving them a constantly-decreasing rate of movement toward

the sheet-supporting surface, substantially as described.

13. The combination with a rotating carrier having a sheet-supporting surface, of a set of arms loosely mounted on the carrier and moving therewith, sheet-taking devices mounted in the arms, means for holding the arms snugly against the edge of the sheet-supporting surface, means for causing the arms to advance away from the surface at a constantly-increasing speed, means for bringing the arms to a stop so that a sheet may be fed to the sheet-taking devices, locking devices for holding them stationary while the sheet is being fed, and means for thereafter causing the arms and carrier to move together at the same rate of speed with the arms resting against the edge of the sheet-supporting surface, substantially as described.

14. The combination with a continuously-rotating carrier having a sheet-supporting surface, of a set of arms rotating with the carrier, a set of grippers carried by the arms, a cam rotating at a rate of speed different from that of the carrier, connections whereby the cam is caused to move the arms and grippers first away from the sheet-supporting surface and then toward it, and opening and closing cams for the grippers carried by the rotating cam, substantially as described.

15. The combination with a continuously-rotating carrier having a sheet-supporting surface, of a set of arms rotating therewith, a set of grippers mounted in the arms, a cam rotating at a different rate of speed from the carrier, connections whereby the cam is first caused to move the arms and grippers away from the sheet-supporting surface at a constantly-increasing speed, then bring them to a stop, then move them toward the sheet-supporting surface at a constantly-decreasing rate of speed, and opening and closing cams for the grippers carried by the rotating cam, substantially as described.

16. The combination with a continuously-rotating carrier having a sheet-supporting surface, of a set of arms rotating therewith, a set of grippers mounted in the arms, a cam rotating at a different rate of speed from the carrier, connections whereby the cam is first caused to move the arms and grippers away from the sheet-supporting surface at a constantly-increasing speed, then bring them to a stop, then move them toward the sheet-supporting surface at a constantly-decreasing rate of speed, opening and closing cams for the grippers carried by the rotating cam, and locking devices for holding the arms and grippers in their stationary position while the sheet is being fed, substantially as described.

17. The combination with a continuously-rotating carrier having a sheet-supporting surface, of a set of arms moving with the carrier, sheet-taking devices mounted in the arms, a rotating cam driven from the carrier at a different rate of speed, connections whereby the cam is caused to move the arms first away from the sheet-supporting surface and then toward it, and controlling devices for the sheet-taking devices carried by the cam, substantially as described.

18. The combination with a rotating carrier having a sheet-supporting surface, of a set of sheet-taking devices rotating with the carrier, a cam, and suitable connections whereby the sheet-taking devices are caused to move ahead of the carrier and then come to a stop, and locking devices, substantially as described.

19. The combination with a continuously-rotating carrier having a sheet-supporting surface, of a set of sheet-taking devices rotating with the carrier, a cam, and suitable connections whereby the sheet-taking devices are caused to move ahead of the carrier and then come to a stop, and locking devices, substantially as described.

20. The combination with a continuously-rotating carrier having a sheet-supporting surface, of a cam driven from the carrier but at a different rate of speed, a set of movable grippers supported in the carrier and rotating therewith, means whereby the cam is caused to move the grippers first away from the sheet-supporting surface and then toward it, and opening and closing cams for the grippers carried by the rotating cam, substantially as described.

21. The combination with a continuously-rotating carrier having a sheet-supporting surface, of a cam rotating with the carrier but at a different rate of speed, a pair of arms loosely mounted on the shaft of the carrier and carrying sheet-taking devices, segmental gears connected with the arms, arms suitably mounted in the carrier and carrying segments meshing with the segmental gears, and extensions from said arms carrying bowls, the cam being so shaped as to cause the segment-carrying arms to rock the arms carrying the sheet-taking devices first forward at a constantly-increasing rate of speed, then bring them to a stop, and then cause them to move backward at a constantly-decreasing rate of speed, substantially as described.

22. The combination with a continuously-rotating carrier having a sheet-supporting surface, of a cam rotating with the carrier but at a different rate of speed, a pair of arms loosely mounted on the shaft of the carrier and carrying sheet-taking devices, segmental gears connected with the arms, arms suitably mounted in the carrier and carrying segments meshing with the segmental gears, and extensions from said arms carrying bowls, the cam being so shaped as to cause the segment-carrying arms to rock the arms carrying the sheet-taking devices first forward at a constantly-increasing rate of speed, then bring them to a stop, then cause them to move backward at a constantly-decreasing rate of speed, and then hold them snugly against the edge of the sheet-supporting surface, substantially as described.

23. The combination with a continuously-rotating carrier having a sheet-supporting surface, of a cam rotating with the carrier but at a different rate of speed, arms loosely mounted on the carrier, grippers suitably supported in the arms, gripper opening and closing cams carried by the rotating cam, and means whereby the rotating cam is caused to move the gripper-carrying arms and grippers first away from the sheet-supporting surface, then bring them to a stop, and then move them toward said surface, substantially as described.

24. The combination with a continuously-rotating carrier having a sheet-supporting surface, of a set of arms loosely mounted on the shaft of the carrier, a set of grippers mounted in the arms, segmental gears on the arms, arms mounted in the carrier, segments on said arms meshing with the segmental gears, a cam constantly rotating but at a different rate of speed from the carrier, said cam operating to rock the segment-carrying arms and thus move the gripper-carrying arms toward and away from the sheet-supporting surface, the cam being formed so as to cause a dwell in the movement, locking devices operating to hold the gripper-carrying arms stationary during the occurrence of the dwell, and opening and closing cams for the grippers carried by the rotating cam, substantially as described.

25. The combination with a rotating carrier having a sheet-supporting surface, of a set of arms loosely mounted on the shaft of the carrier, grippers mounted in the arms, segmental gears on the gripper-shaft, segment-carrying arms coöperating with the segmental gears, a rotating cam, segment-carrying arms controlled by the cam, said segment-carrying arms operating to move the gripper-carrying arms first away from the sheet-supporting surface at a continuously-increasing rate of speed, then bring them to a stop, then to move them toward said surface at a continuously-decreasing rate of speed, an extension on one of the gripper-carrying arms, a cam-operated hook coöperating with a pin on said extension, and opening and closing cams carried by the rotating cam and operating on the segment-carrying arms which move the gripper-carrying arms, substantially as described.

In testimony whereof I have hereunto set my hand in the presence of two subscribing witnesses.

THOMAS M. NORTH.

Witnesses:
F. W. H. CRANE,
L. ROEHM.