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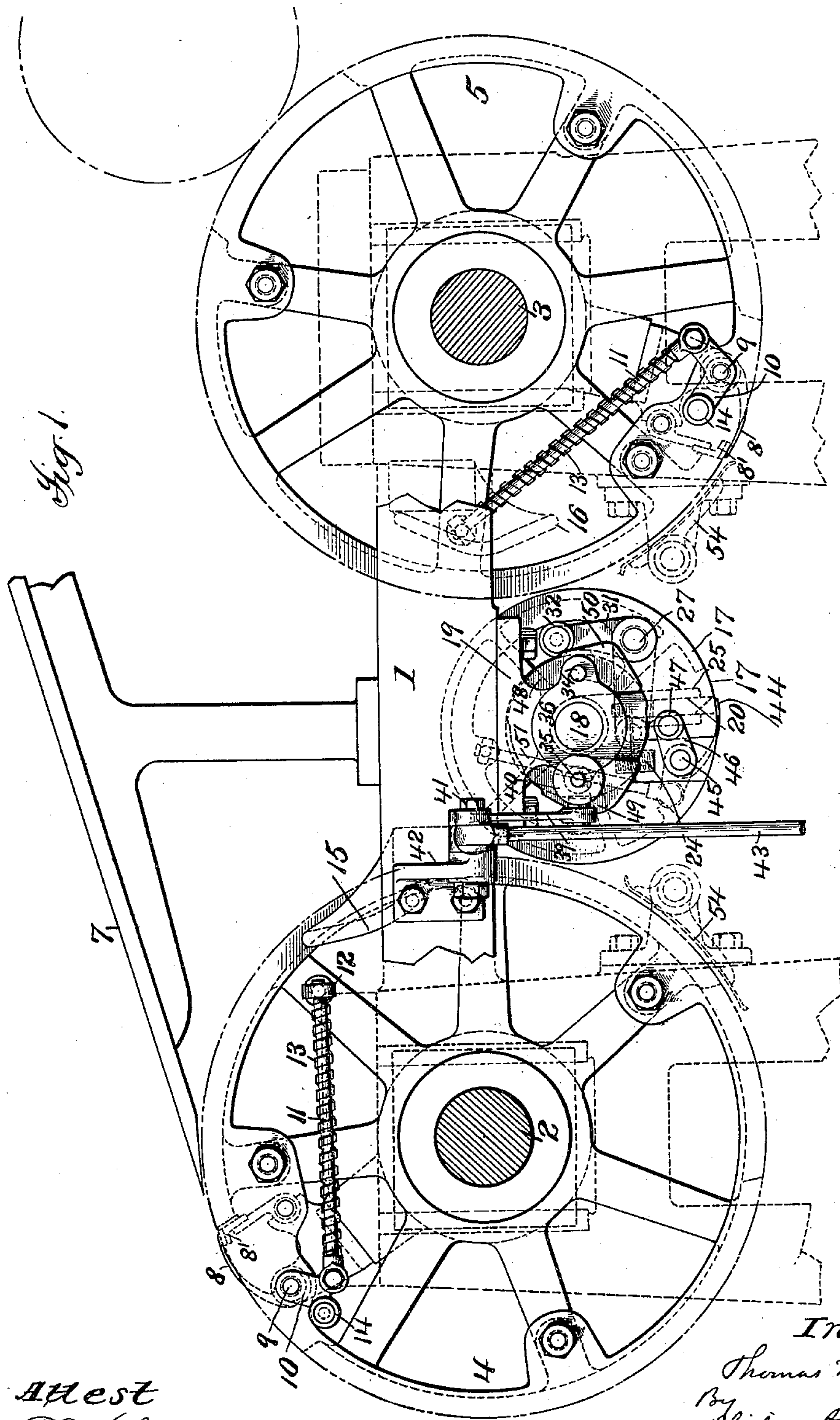
Patented Jan. 9, 1900.

T. M. NORTH.  
SHEET TRANSFERRING MECHANISM.

(Application filed Feb. 24, 1899.)

(No Model.)

5 Sheets—Sheet 1.



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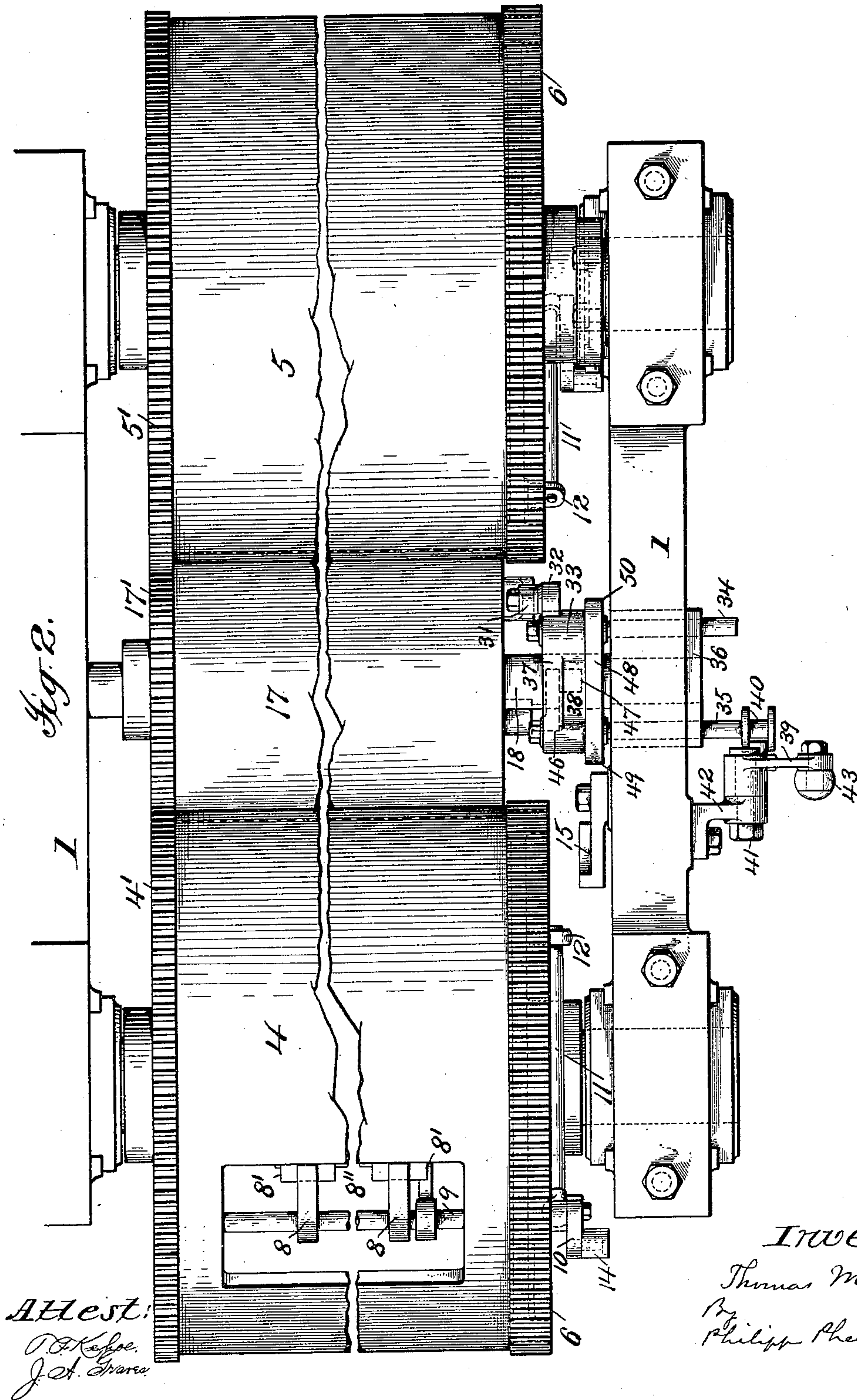
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5 Sheets—Sheet 2.





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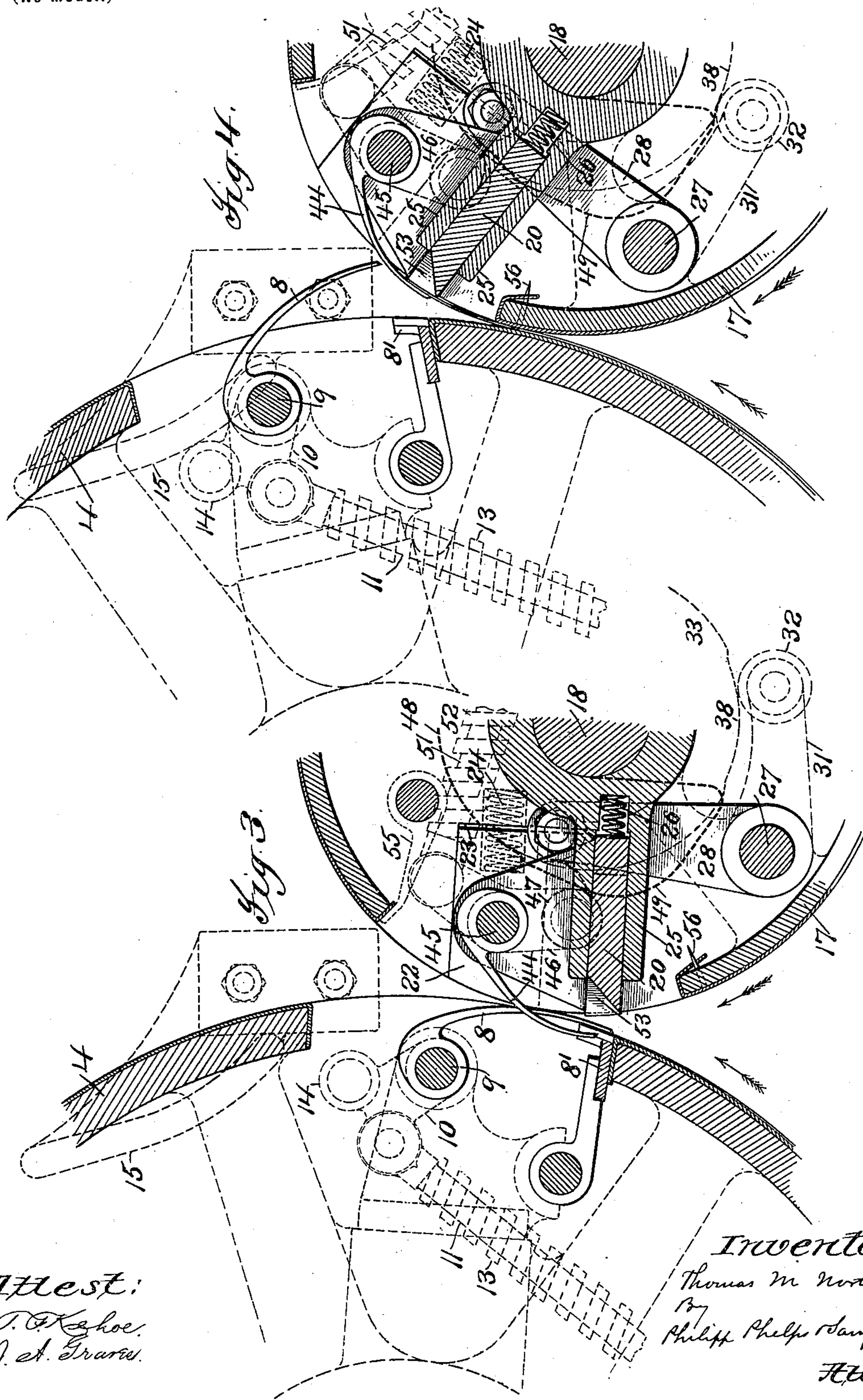
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(No Model.)

5 Sheets—Sheet 3.



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5 Sheets—Sheet 4.

Fig. 5.

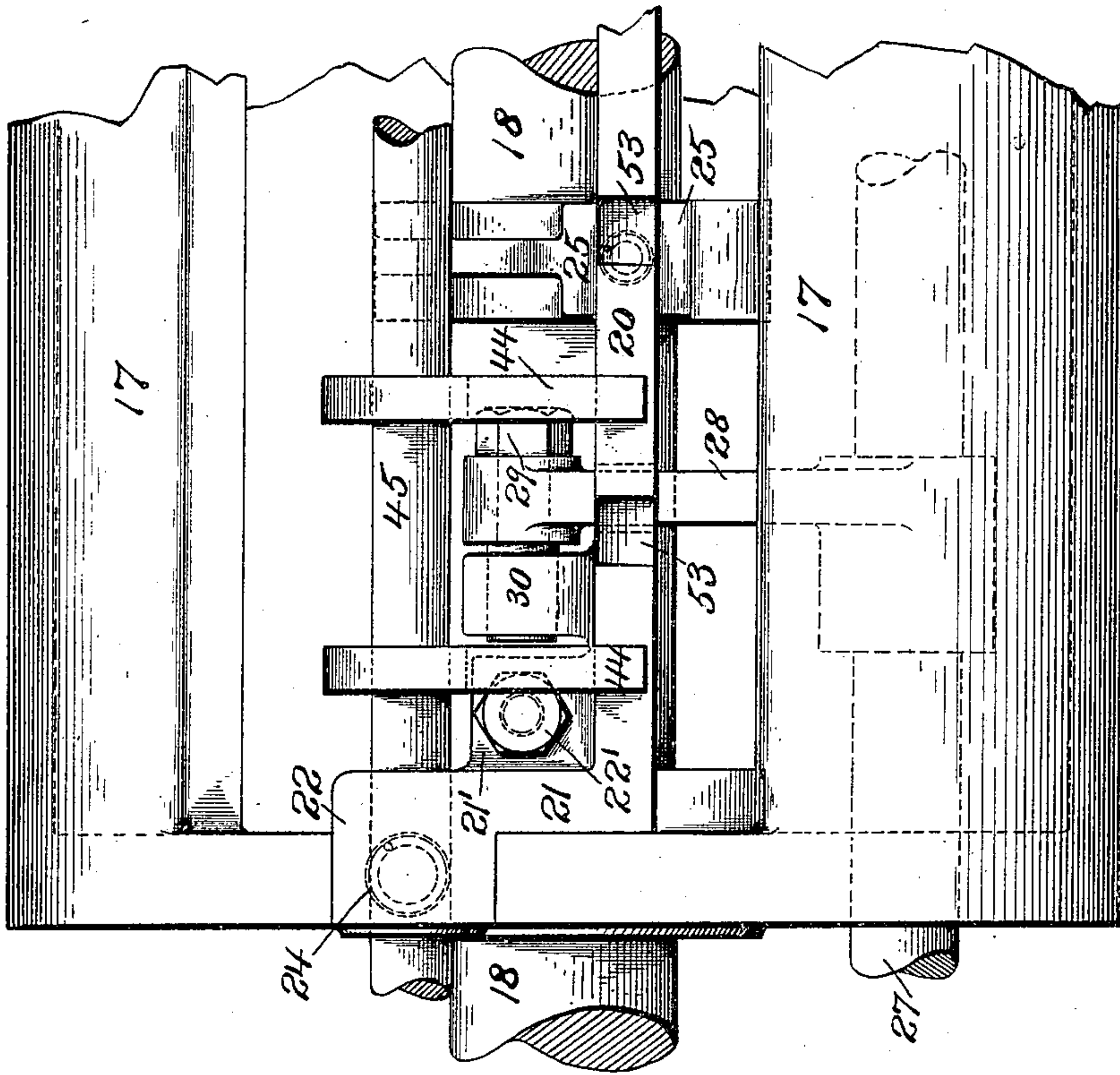
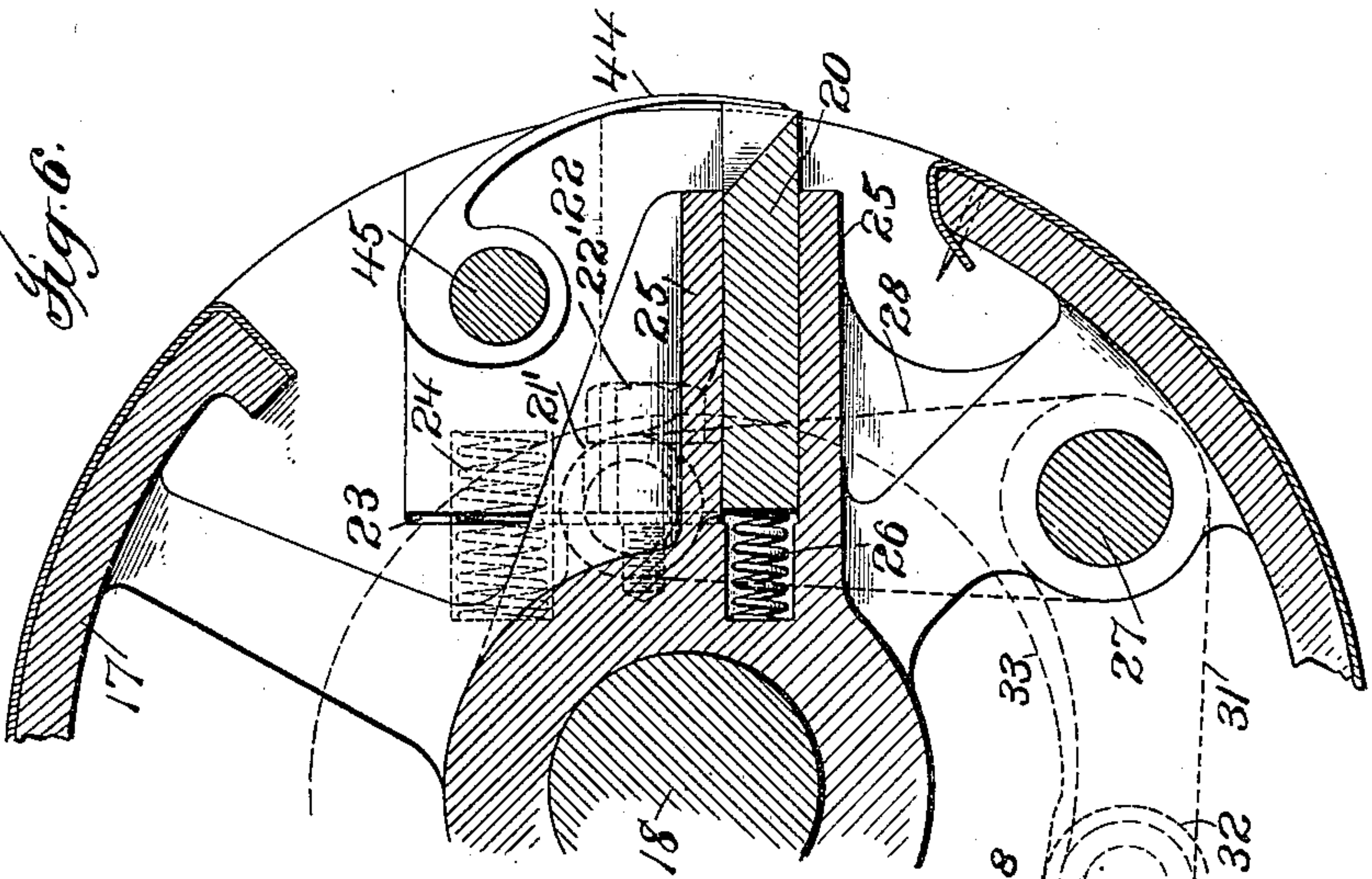


Fig. 6.



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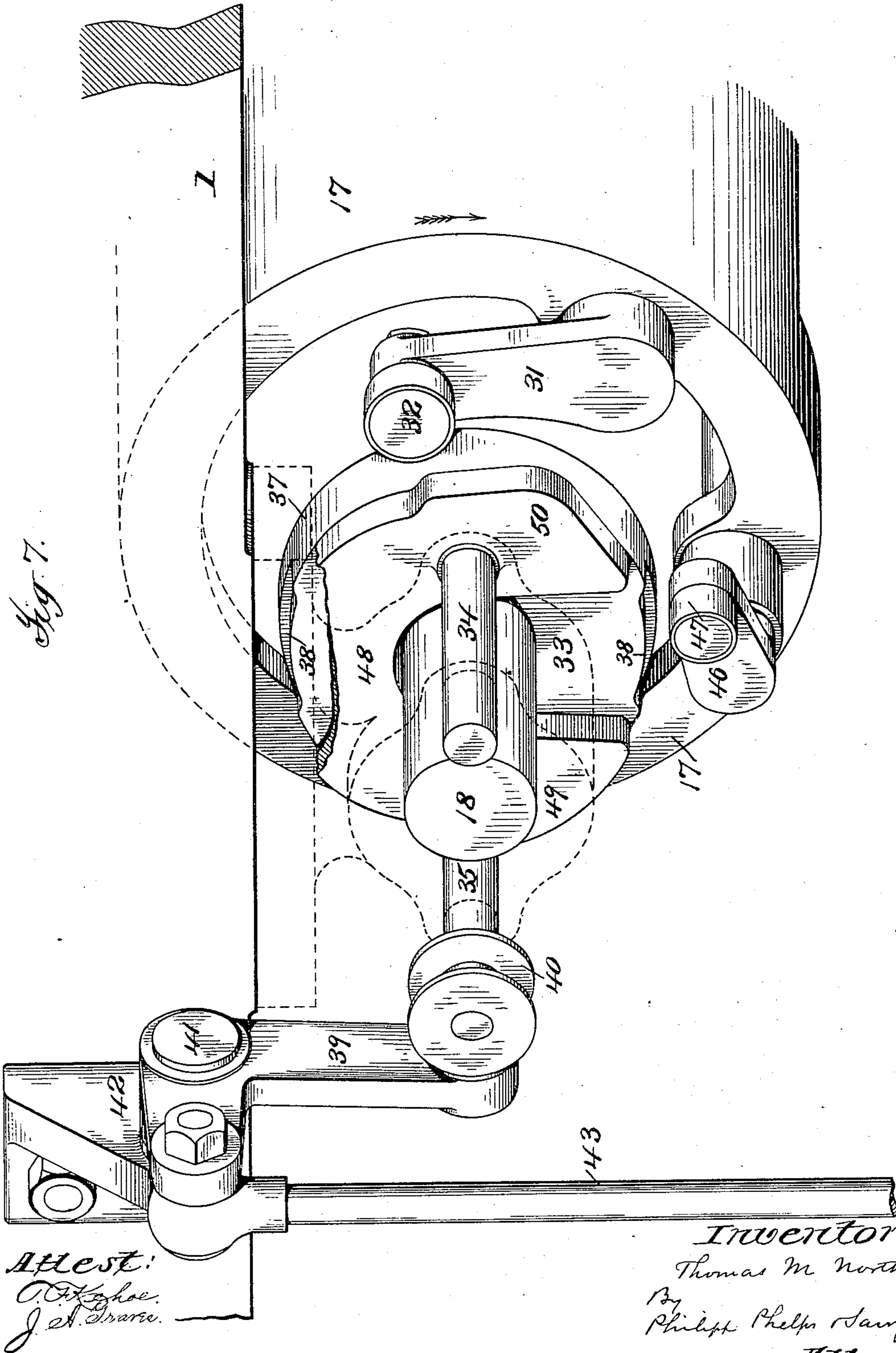
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T. M. NORTH.  
SHEET TRANSFERRING MECHANISM.

(Application filed Feb. 24, 1899.)

(No Model.)

5 Sheets—Sheet 5.





# UNITED STATES PATENT OFFICE.

THOMAS M. NORTH, OF NEW YORK, N. Y., ASSIGNOR TO ROBERT HOE,  
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## SHEET-TRANSFERRING MECHANISM.

SPECIFICATION forming part of Letters Patent No. 640,798, dated January 9, 1900.

Application filed February 24, 1899. Serial No. 706,655. (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-Transferring Mechanism, 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-transferring mechanism.

In some types of printing-machines employing grippers or other analogous means for holding sheets on cylinders the sheets are transferred from one cylinder to another. In such cases, and more particularly in the cases in which grippers are employed to hold the sheets on the cylinders, it frequently happens that there is a slight slip in the sheet as it is transferred from one cylinder to the other. This is due to the fact that there is a slight space between the circumferences of the cylinders, and it follows that the grippers which are to release the sheet must let go of the sheet before the grippers which are to take the sheet can close upon it, for if the receiving-grippers close before the releasing-grippers open the sheet would be torn, since the grippers are located and move in different circumferences. There is therefore necessarily a time in the transfer of the sheet when the sheet is not clamped by either set of grippers, and it frequently happens that at this instant the head of the sheet slips slightly. The second set of grippers do not therefore close upon it at the same distance from the margin that it was held by the first set. This slip, especially in the finer kinds of multicolor-printing, is often sufficient to throw the sheet out of register and produce bad printing.

It is the object of this invention to construct an improved gripper mechanism which may be operated to transfer the sheet in such a way as to avoid the slip heretofore referred to, the grippers being so constructed that the second set, or the set which is to receive the sheet, shall close upon it before the first set of grippers is operated to release the sheet.

With this and other objects in view the in-

vention consists in constructions and in certain parts, improvements, and combinations, as will be hereinafter fully described and then pointed out in the claims hereunto appended.

In the accompanying drawings, which form part of this specification and in which like characters of reference indicate the same parts, Figure 1 is a side view of so much of a multicolor-printing machine as is necessary to illustrate the invention. Fig. 2 is a plan view of the construction shown in Fig. 1, the feed-board being omitted. Fig. 3 is a detail sectional view of portions of the impression and transfer cylinders, the gripper mechanisms of the two cylinders being shown in the position which they occupy just before the sheet is to be transferred. Fig. 4 is a detail view similar to Fig. 3, illustrating the gripper mechanisms and the position they occupy after the sheet has been transferred. Figs. 5 and 6 are respectively plan and detail sectional views illustrating the construction of the gripper mechanism of the transfer-cylinder. Fig. 7 is a detail view, on a much larger scale, of one end of the transfer-cylinder, illustrating the gripper-operating mechanism.

The machine which has been selected to illustrate the concrete embodiment of this invention is a multicolor-machine of the type which employs two impression-cylinders. The form-carrying members with which these cylinders coöperate may be either flat beds or cylinders. Inasmuch, however, as the construction of the form-carrying members has no relation to the present invention, they have been omitted from the illustration.

In the machine shown, 1 indicates the frame of the machine, provided with suitable bearings, in which are mounted shafts 2 and 3, carrying, respectively, the impression-cylinders 4 and 5. These impression-cylinders are provided with gears 6, which mesh with gears or racks on the form-carrying members, according as such members consist of cylinders or flat beds. The cylinder 4 is the cylinder which receives the sheet in the first instance, the sheet being fed thereto from the feed-board 7 or in any other suitable manner, and the cylinder 5 is the cylinder upon which the sheet is supported when it receives its second



impression. Each of these cylinders carries a set of sheet-receiving grippers of any approved type. In the machine shown these grippers consist of fingers 8, mounted upon a gripper-carrying shaft 9, the said shaft being suitably journaled in bearings in or connected to the cylinder. The gripper-carrying shaft 9 carries an arm 10, which arm has connected thereto a spring-rod 11, which at its other end is supported in a suitable loop 12, connected to the cylinder. The rod is surrounded by a spring 13, which operates to hold the grippers closed. The arms 10 also carry bowls 14, which cooperate with suitable fixed cams, by which the grippers are opened at proper times to receive the sheet and to deliver it. Each of the cylinders 4 and 5 is provided with a pair of these cams. As these cams are a well-understood feature of printing-machines, only one of each pair is, however, shown in connection with each cylinder. The cam shown in connection with the cylinder 4 is marked 15 and is the cam which operates to open the grippers to deliver the sheet to the transfer-cylinder. The cam shown in connection with the cylinder 5 is marked 16 and is the cam by which the grippers are opened to receive the sheet.

Intermediate the two cylinders is located a transfer-cylinder 17, this cylinder being mounted on a shaft 18, which is located in suitable bearings 19, bolted or otherwise suitably secured to the under side of the cross-bars of the frame 1 and revolved by a gear 17', which meshes with gears 4' and 5' on the impression-cylinders. The transfer-cylinder 17 carries a bar 20, which is suitably mounted therein. This bar is located in the gripper-gap and preferably has forwardly-extending portions 21 and outwardly-extending portions 22. (See Fig. 5.) The said parts 21 and 22 are preferably integral with the bar 20, and the parts 22 are preferably received in slots 23, formed in the ends or heads of the transfer-cylinder.

The bar 20, with its connected portions 21 22, is designed to have a reciprocating movement in and out or toward and away from the shaft 18 of the cylinder, and consequently toward and away from the circumferences of the impression-cylinders 4 and 5. This movement may be produced in various ways and by various mechanisms. Preferably, however, springs 24 are located in the slots 23 in the cylinder ends, in which slots the parts 22 are located, said springs bearing against the underside of the parts 22. Sockets are preferably formed in the bottoms of the slots and in the parts 22, so that the springs are housed at each end in these sockets. The transfer-cylinder is also preferably provided with a series of guide-bars 25, which are preferably formed integral with the hub of the cylinder. These bars 25 are located on each side of the bar 20 and serve to guide it in its movement. Other auxiliary springs 26 are preferably lo-

cated in the bottom of the recess between the guide-bars, which also bear upon the under side of the bar 20 and tend to force it outward.

Means are preferably provided to limit the outward movement of the bar under the stress of the springs. Various constructions may be devised for this purpose. Preferably, however, the bar 20 is provided with ears 21', which are preferably integral with the bar and extend from it at the point of juncture between it and the part 21. Through these ears 21' pass screws 22', said screws engaging tapped apertures in the hub of the cylinder. When the springs 24 26 are free to move the bar outward, the ears 21' engage the heads of these screws, and thus limit its outward movement. Means are also provided to move the bar 20 inwardly and hold it against the stress of the springs 24 26. These means may also be constructed in various ways. Preferably, however, the transfer-cylinder 17 is provided with a shaft 27, from which extend arms 28. These arms are secured to the bar 20 in any suitable manner, as by means of bolts 29 and ears 30, which ears extend from the bar 20. The shaft 27 (see dotted lines in Figs. 3, 4, 5, and 7) is provided with an arm 31, carrying a bowl 32, which engages a stationary cam-block 33, slidingly supported by means of steady-pins 34 35 in a collar 36, which surrounds the shaft 18 and which is located in front of and is preferably a part of the hanger 19. This cam-block 33 has its inner part, or the part which is nearest the cylinder 17, formed to provide a circular track 37, on which the bowl 32 runs. In its outer part there are two depressions 38.

The cam-block 33 is moved in and out by means of a bell-crank lever 39, one arm of which engages a collar 40, formed on the steady-pin 35. The bell-crank is pivoted on a bolt 41, which passes through a bracket 42, secured to the frame 1 in any suitable manner, as by bolts. The other arm of the bell-crank has connected to it a rod 43, which extends downward and is operated by a cam on a way cam-shaft. (Not shown.)

When the cam-block 33 is in the position shown in Fig. 2—that is, in its outer position—the bowl 32 on the arm 31 will engage the concentric track 37, and consequently there will be no movement of the shaft 27 and no movement of the bar 20. When, however, the position of the cam-block 33 is shifted and it occupies its inner position, as the cylinder 17 revolves and the depressed portions 38 come opposite the bowl 32 the bowl will drop into one or the other of the depressed portions and permit the springs 24 26 to force the bar outwardly.

The bar 20 preferably serves as the surface or abutment against which the grippers of the transfer-cylinder clamp the paper. In the present form of machine the grippers consist of fingers 44, which are mounted upon a shaft 45, the said shaft being journaled in the



extensions 22 of the bar 20. Other forms of gripper mechanism may be used, but the rocking gripper-fingers are simple and efficient and constitute the preferred gripping means.

The shaft 45 may be rocked in various ways. Preferably, however, it has at one end an arm 46, which carries a bowl 47. This bowl is so arranged that at certain times it is brought into contact with a cam 48, which is mounted upon the steady-pins 34 35, which carry the cam-block 33, and is connected to these pins, so that it moves with the said block when the same is operated by the bell-crank 39 before described.

The cam 48 is provided with two eccentric portions 49 50, the eccentric portion 49 being arranged to open the grippers to receive the sheet from the impression-cylinder 4 and the eccentric portion 50 being arranged to open the grippers to deliver the sheet to the impression-cylinder 5.

The grippers may be closed in any suitable manner. Preferably, however, they are closed by a spring-rod 51, surrounded by a spring 52, the construction and operation being the same as that employed in the gripper-closing mechanism on the cylinders 4 and 5.

The gripper-fingers 44 are arranged so that they will alternate in the direction of the width of the cylinder with the gripper-fingers 8, carried by the cylinders 4 and 5—that is to say, they will operate to take and hold a sheet at points intermediate those at which it is held by the gripper-fingers 8.

The position of the parts at the time the sheet is delivered to and taken from the transfer-cylinder is such that the construction should be arranged to allow space for the gripper-fingers 8 to swing toward and away from the fingers 44 in the taking and delivering operations. This space may be provided for in various ways. Preferably, however, the bar 20 will be cut away at points 53, which points are intermediate the places where the gripper-fingers 44 rest upon the bar 20. These cut-out places 53 will preferably be formed as shown—that is, the bottom of said cut-out spaces will be at an angle to the edge, thus forming a space having a beveled bottom.

The abutments 8', with which the grippers 8 cooperate, are also preferably provided with cut-away portions 8'' to allow space for the movement of the gripper-fingers 44. The impression-cylinders 4 and 5 will preferably be provided with sheet-supports 54, (see dotted lines in Fig. 1,) which act in an obvious manner to support the sheet while it is being delivered to and received from the transfer-cylinder. These impression-cylinders will also be provided with any usual means for holding the tympan, such as clamps 55 or pins 56. As both these constructions are common and have no relation to the present invention, an extended description thereof is not deemed necessary. The transfer-cylinder may also be

provided with similar means for holding any suitable covering material on the cylinder.

The operation of the construction is as follows: The sheet having been fed to the impression-cylinder 4 from the feed-board 7 or in any other suitable manner is taken by the gripper-fingers 8 and is carried around by the cylinder, thus receiving its impression from a suitable form-carrying member. (Not shown.) The printing operation having been completed, the sheet is carried onward by the cylinder into position where it is to be delivered to the transfer-cylinder. While the sheet is being printed and brought around to the transfer-point, the transfer-cylinder is revolved by means of its gear, so as to bring its grippers to the point where they are to take the sheet. Shortly before the grippers on the transfer-cylinder reach the position shown in Fig. 3 the bell-crank 39 has been actuated to move the steady-pins 34 35 and carry the cam-block 33 and the cam 48 into their inner position—that is, the position which is nearest the transfer-cylinder. The bowl 47 on the arm 46 now comes in contact with the eccentric portion 49 of the gripper-operating cam 48, and the gripper-fingers 44 are opened through the rocking of the shaft 45. As the grippers near the sheet-taking point the bowl 32 on the arm 31 drops into the depressed portion 38 of the cam-block 37, thus permitting the springs 24 26 to force the bar 20 and its connected parts, including the grippers 44, forward, the bar moving in a line which would, if produced, be a secant to the circumference of the cylinder 4. The movement of the bar 20 is a slight movement, but it is sufficient to carry the edge of the bar into a position where in the further revolution of the transfer-cylinder the top or face of the bar will be tangent to the circumferential line of the cylinder 4. The position of the parts just described is indicated in Fig. 3. In the further movement of the cylinders 4 and 17 the sheet being still held by the gripper-fingers 8 against the abutment 8' is carried forward until the radii of the cylinders, which pass through the points where the grippers of each cylinder rest upon the sheet, form a straight line between the centers of the two cylinders. At this point the bowl 47 on the arm 46 of the shaft 45 passes off the eccentric portion of the cam 49 and allows the rod 51 and spring 52 to rock the shaft 45 and close the gripper-fingers 44. At this point, therefore, the sheet is held both by the gripper-fingers 8 on the cylinder 4 and by the gripper-fingers 44 on the transfer-cylinder. Immediately after the gripper-fingers 44 have closed upon and seized the sheet the arm 10 on the shaft 9, which carries the gripper-fingers 8, runs in contact with the fixed cam 15 on the frame of the machine and the gripper-fingers 8 are opened, these gripper-fingers swinging back through the cut-away places 53 of the bar 20. At the same time the bowl 32 on the arm 31 runs out of the depressed



part 38 of the cam-block 33 onto its high part, and the bar 20 and its connected parts, including the gripper-fingers 44, are thus moved onward into the circumferential line of the cylinder 17. The purpose of thus moving the grippers 44 and bar 20 onward is to avoid giving the sheet any increased speed while it is on the transfer-cylinder, which would be the case if the grippers were allowed to project beyond the circumference of the cylinder while they were holding the sheet. The transfer-cylinder now having control of the sheet continues its revolution until it reaches the point where it is about to deliver the sheet to the cylinder 5, the grippers 8 of which have been opened to receive it by the fixed cam 16. At this point the bowl 32 on the arm 31 drops into the other depressed portion 38 and permits the springs 24 26 to force the bar 20 forward toward the circumferential line of the cylinder 5. At the time when the radii passing through the points in the cylinders upon which the grippers rest come into a straight line, the bowl 10 runs off the fixed cam 16 and permits the springs 13 to close this set of grippers 8 onto the sheet. At this instant, therefore, both the grippers 8 and the grippers 44 are holding the sheet, as described, in connection with the transfer of the sheet from the cylinder 4 to the cylinder 17. The instant the grippers 8 have closed upon the sheet the bowl 47 upon the arm 46 of the shaft 45 runs onto the eccentric portion of the cam 48 and opens the gripper-fingers 44, the grippers backing between the cut-away points 8' on the gripper-abutment 8'. The sheet is now transferred to the cylinder 5, as indicated in Fig. 4, by which it is carried around, receives its second impression, and is delivered in any desired manner. The cylinder 17 is proportioned so that it makes two revolutions for each revolution of the cylinders 4 and 5. One of these revolutions is necessarily, therefore, an idle revolution, and it is desirable to keep the bar 20 and its connected parts from any operation during this idle revolution in order that it may not contact with the surface of either of the cylinders 4 and 5. In order to effect this, the bell-crank 39 is accordingly rocked and the steady-pin 35 is actuated to move the cam-block 43 and the cam 48 into the position shown in Fig. 2. In this position of the parts the bowl 47 is out of the path of the cam 48, and the gripper-fingers 44 will consequently not be operated. The bowl 32 of the arm 31 is running upon the concentric portion 37 of the cam-block 33, and consequently holds the bar 20 against the stress of the springs and prevents any outward movement of the bar.

While the invention has been shown in connection with a transfer-cylinder operating in connection with the cylinders of a multi-color-press, it is obvious that it is not limited to this particular use, but that it may be used

wherever it is desired to transfer a sheet from one rotating gripper-carrier to another and in many other relations—as, for instance, it might be used in cases where it is desired to take a sheet from a feed-board or other position of rest. Furthermore, it is also obvious that many changes may be made in the mechanical details by which the invention is carried into effect. The invention is not, therefore, to be limited to the specific construction shown and described nor to the specific uses described, but is to be regarded as covering all changes and modifications which fall within its spirit and scope.

What I claim is—

1. In a sheet-transferring mechanism, the combination with a rotating cylinder having sheet receiving and retaining devices, of a second rotating cylinder also having sheet receiving and retaining devices which take the sheet from the first cylinder, and means whereby the retaining devices on the second cylinder are caused to take the sheet before the retaining devices of the first carrier release it, substantially as described.
2. In a sheet-transferring mechanism, the combination with a rotating cylinder having grippers, of a second rotating cylinder also having grippers, and means for causing the grippers of the second cylinder to close upon the sheet before the grippers of the first carrier release it, substantially as described.
3. In a sheet-transferring mechanism, the combination with a rotating cylinder having sheet receiving and retaining devices, of a second cylinder rotating in the opposite direction and also having sheet receiving and retaining devices which take the sheet from the first cylinder, and means whereby the retaining devices on the second cylinder are caused to take the sheet before the retaining devices of the first cylinder release it, substantially as described.
4. In a sheet-transferring mechanism, the combination with a rotating cylinder having grippers, of a second cylinder rotating in the opposite direction and also having grippers, and means for causing the grippers of the second cylinder to close upon the sheet before the grippers of the first cylinder release it, substantially as described.
5. In a sheet-transferring mechanism, the combination with a rotating carrier having sheet receiving and retaining devices, of means for operating the same to take and release a sheet, a second rotating carrier having sheet receiving and retaining devices, means for causing said devices to take and release the sheet, and means for giving said devices a movement in a line which if produced would be a secant to the circumference of the first carrier, substantially as described.
6. The combination with a carrier, having a single set of grippers, of means for operating the grippers to take and release a sheet, and means for moving the set of grippers in



a right line toward and away from the line of movement of the carrier, substantially as described.

7. The combination with a rotating carrier  
5 having a single set of grippers, of means for operating the set of grippers to take and release a sheet, and means for moving the grippers in a right line toward and away from the circumference of the carrier, substantially as  
10 described.

8. The combination with a rotating carrier,  
of a bar mounted thereon, grippers connected  
to the bar and operating in connection with  
the bar to take a sheet directly from the feed-  
15 board or original source of supply and hold the sheet, means for opening and closing the grippers, and means for moving the bar and the grippers in a right line toward and away from the circumference of the carrier, substantially  
20 as described.

9. The combination with a rotating carrier,  
of a bar mounted in the carrier, said bar having extensions by which it is guided in its  
movements, a gripper-shaft journaled in the  
25 extensions, grippers on the shaft, means for rocking the shaft to take a sheet directly from the feed-board or original source of supply and release the same, and means for moving the bar in a right line toward and away from  
30 the circumference of the carrier, substantially as described.

10. The combination with a rotating carrier,  
of a set of grippers thereon, a second rotating carrier having a set of bodily-movable grippers  
35 thereon, means for moving the grippers on the second carrier toward the first carrier, and means for operating both sets of grippers so that they will be closed upon the sheet when the radii of the two carriers which pass  
40 through the points of the carriers on which the grippers hold the sheet are substantially in the same straight line, substantially as described.

11. The combination with a rotating carrier  
45 having grippers, of a second rotating carrier having a bar thereon, means for moving the bar, a set of grippers moving with the bar and operating in connection therewith to take and release a sheet, and means for moving the bar  
50 and grippers toward the first carrier so that the bar is substantially tangent to the circumferential line of said carrier, and means for operating the grippers so that both sets of grippers will be closed upon the sheet when  
55 the bar is in this position, substantially as described.

12. The combination with a rotating cylinder,  
of a set of grippers which hold a sheet  
substantially on the circumference of said  
60 cylinder, a second rotating cylinder having a set of grippers, means for moving the grippers on the first cylinder in a right line and into a position where it is substantially tangent to the circumferential line of the other  
65 cylinder, and means whereby both sets of grippers are caused to be closed upon the sheet at the same time, substantially as described.

13. The combination with a rotating cylinder,  
of a set of grippers which hold a sheet  
substantially on the circumference of said cylinder, a second rotating cylinder having a  
movable bar mounted thereon, a set of grippers moving with the bar and operating in  
connection therewith to take and hold the  
sheet, and means for giving the bar and  
75 grippers a right-line movement toward and away from the circumference of the cylinder, substantially as described.

14. The combination with a rotating carrier  
having a gripper mechanism, of a second carrier rotating in the opposite direction, a gripper mechanism mounted therein, means for  
opening and closing the grippers, means for  
moving the gripper mechanism toward and  
away from the circumference of the carrier,  
85 operating devices for said means, and means whereby the operating devices may be caused to effect the movement of the gripper mechanism and the opening and closing of the grippers once in a predetermined number of  
90 revolutions of said carrier, substantially as described.

15. The combination with a rotating carrier  
having a gripper mechanism mounted therein, of a second rotating carrier also having a  
95 gripper mechanism mounted therein, means for moving the gripper mechanism toward and away from the circumference of the carrier, said means including a cam, a cam for opening and closing the grippers, and means  
100 for moving said cams into and out of operative position whereby the movement of the gripper mechanism and the opening of the grippers may take place once in a predetermined number of revolutions of said carrier,  
105 substantially as described.

16. The combination with a rotating carrier,  
of a second rotating carrier having a bar mounted therein, grippers coöperating with  
the bar, a cam and connected devices for  
110 moving the bar and grippers in one direction with respect to the line of movement of the carrier, means for moving them in the opposite direction, and means for moving the cam into and out of operative position so that the  
115 movement of the bar and grippers may take place once in a predetermined number of revolutions of said carrier, substantially as described.

17. In a printing-machine, the combination  
120 with a rotating carrier having grippers, a second rotating carrier, a gripper mechanism mounted thereon, means for moving said gripper mechanism outward until the surfaces against which the grippers clamp the sheets  
125 substantially touch each other, means whereby one set of grippers is opened and the other closed when the surfaces are in position, and means for withdrawing the movable gripper mechanism, substantially as described.  
130

18. The combination with a rotating carrier,  
of a gripper mechanism having a cut-away abutment, a second rotating carrier, a bar  
having cut-away portions therein, grippers



connected to the bar, means for moving the bar outward until it is substantially in contact with the cut-away abutment, and means for closing one set of grippers and opening the other when the bar and abutment are in this position, each gripper mechanism working through the cut-away spaces in the other, substantially as described.

19. The combination with a rotating carrier, of a bar mounted therein, a gripper-shaft mounted in the bar, gripper-fingers mounted on the shaft, means including a cam by which the shaft is rocked to open and close the grippers to take a sheet directly from the feed-board or original source of supply and release the same, means for moving the bar toward and away from the circumference of the carrier, said means including a shaft mounted in the carrier, an arm on the shaft connected to the bar, and means for rocking the shaft, substantially as described.

20. In a multicolor-printing machine, the combination with the impression-cylinders, of sheet receiving and retaining devices mounted thereon, a cylinder by which the sheet is transferred from one impression-cylinder to the other, said cylinder having sheet receiving and retaining devices, means for causing the sheet receiving and retaining devices on the transfer-cylinder to take the sheet before it is released by the sheet-retaining devices of the first impression-cylinder and to retain the sheet until after it has been taken by the sheet-receiving devices of the second cylinder, substantially as described.

21. In a multicolor-printing machine, the combination with the first and second impression-cylinders, of a cylinder for transferring a sheet from one to the other, gripper mechanism on each of the impression-cylinders, gripper mechanism on the transfer-cylinder, means for opening and closing the gripper mechanisms of the impression-cylinders, means for causing the gripper mechanism of the transfer-cylinder to take the sheet while it is still held by the gripper mechanism of the first impression-cylinder and to retain it until after it has been taken by the gripper mechanism of the second impression-cylinder, substantially as described.

22. In a multicolor-printing machine, the combination with the first and second impression-cylinders, of a cylinder for transferring a sheet from one cylinder to the other, sheet receiving and retaining devices on each of the impression-cylinders, means for causing said devices to take and release a sheet, sheet receiving and retaining devices on the transfer-cylinder, means for moving said devices toward and away from said impression-cylinders in turn on lines which if produced would be secants to the circumferences of said cylinders, means for causing said sheet receiving and retaining devices to take and release the sheet after it has been moved toward and

before it has been moved away from the circumference of the cylinder, substantially as described.

23. In a multicolor-printing machine, the combination with the first and second impression-cylinders, of a cylinder for transferring a sheet from one to the other, gripper mechanisms on the impression-cylinders, means for opening and closing the gripper mechanisms, a gripper mechanism on the transfer-cylinder, means for moving said gripper mechanism toward and away from the circumferences of the impression-cylinders on lines which if produced would be secants to said circumferences, and means for causing said gripper mechanism to take and release the sheet after it has been moved toward and before it has been moved away from said cylinders, substantially as described.

24. In a multicolor-printing machine, the combination with the first and second impression-cylinders, of a cylinder for transferring the sheet from one to the other, gripper mechanisms on the impression-cylinders, means for opening and closing them, a gripper mechanism on the transfer-cylinder, means for opening and closing it, means for moving the gripper mechanism on the transfer-cylinder toward and away from each of the impression-cylinders, means for causing said gripper mechanism to seize and release the sheet after it has been moved toward and before it has been moved away from said cylinders, and devices whereby the means for moving the gripper mechanism are caused to operate once in a predetermined number of revolutions of the transfer-cylinder, substantially as described.

25. The combination with a carrier, of a gripper mechanism mounted therein, devices including a cam for opening and closing the gripper mechanism, devices also including a cam for moving the gripper mechanism with reference to the carrier, a common support for the cams, and means operating upon the cam-support for moving the cams into and out of operative position, substantially as described.

26. The combination with a rotating carrier, of a gripper mechanism mounted therein, devices including a cam for opening and closing the gripper mechanism, devices also including a cam for moving the gripper mechanism with reference to the carrier, a common support for the cams, and means operating upon the cam-support for moving the cams into and out of operative position, 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.