

(No Model.)

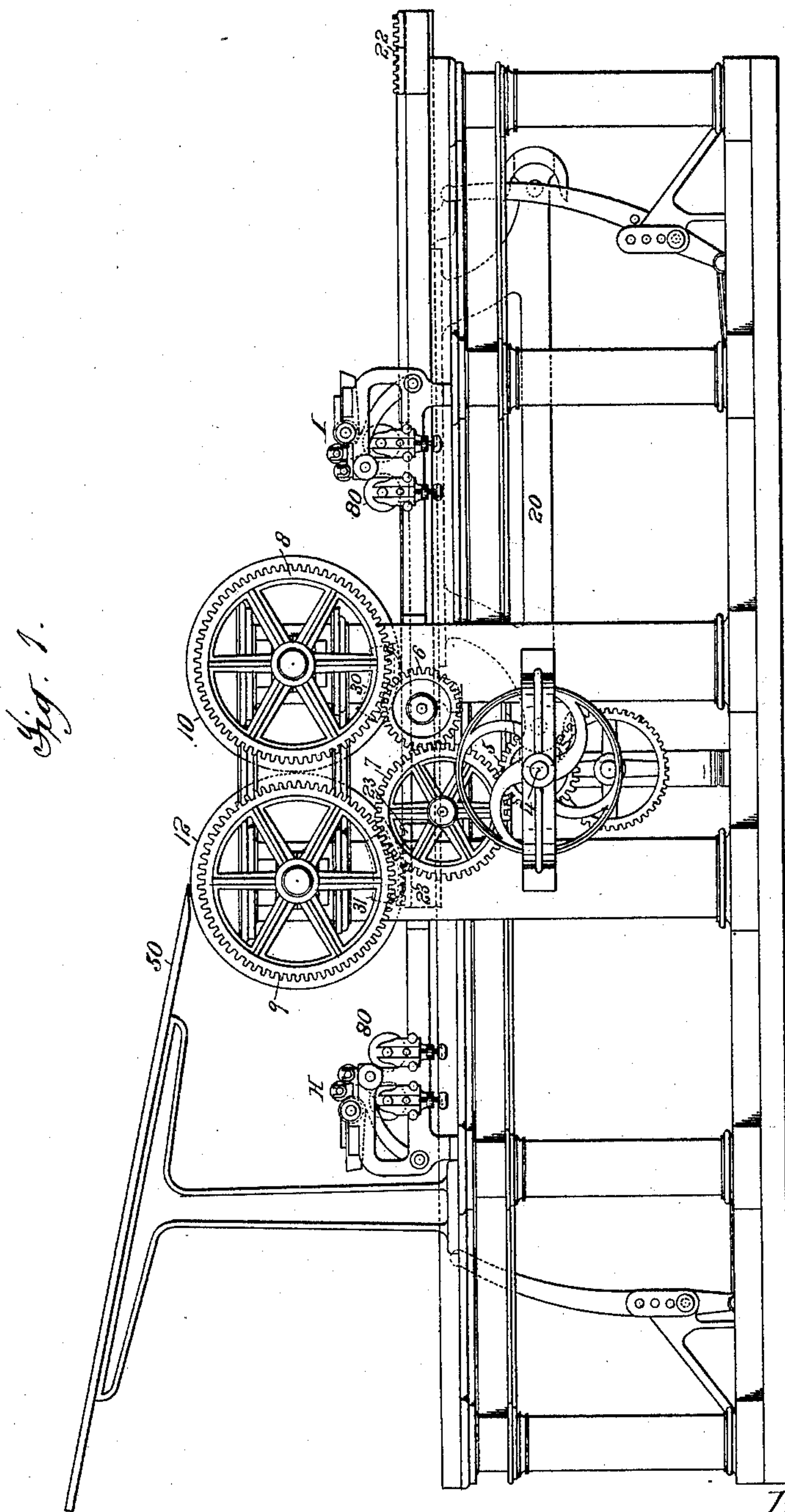
4 Sheets—Sheet 1.

S. D. TUCKER.

DOUBLE CYLINDER FLAT BED PRINTING MACHINE.

No. 473,484.

Patented Apr. 26, 1892.



Attest:
J. F. Kehoe
W. H. Kennedy

Inventor:
Stephen D. Tucker
by
Philip Munroe Phelps
Attys

(No Model.)

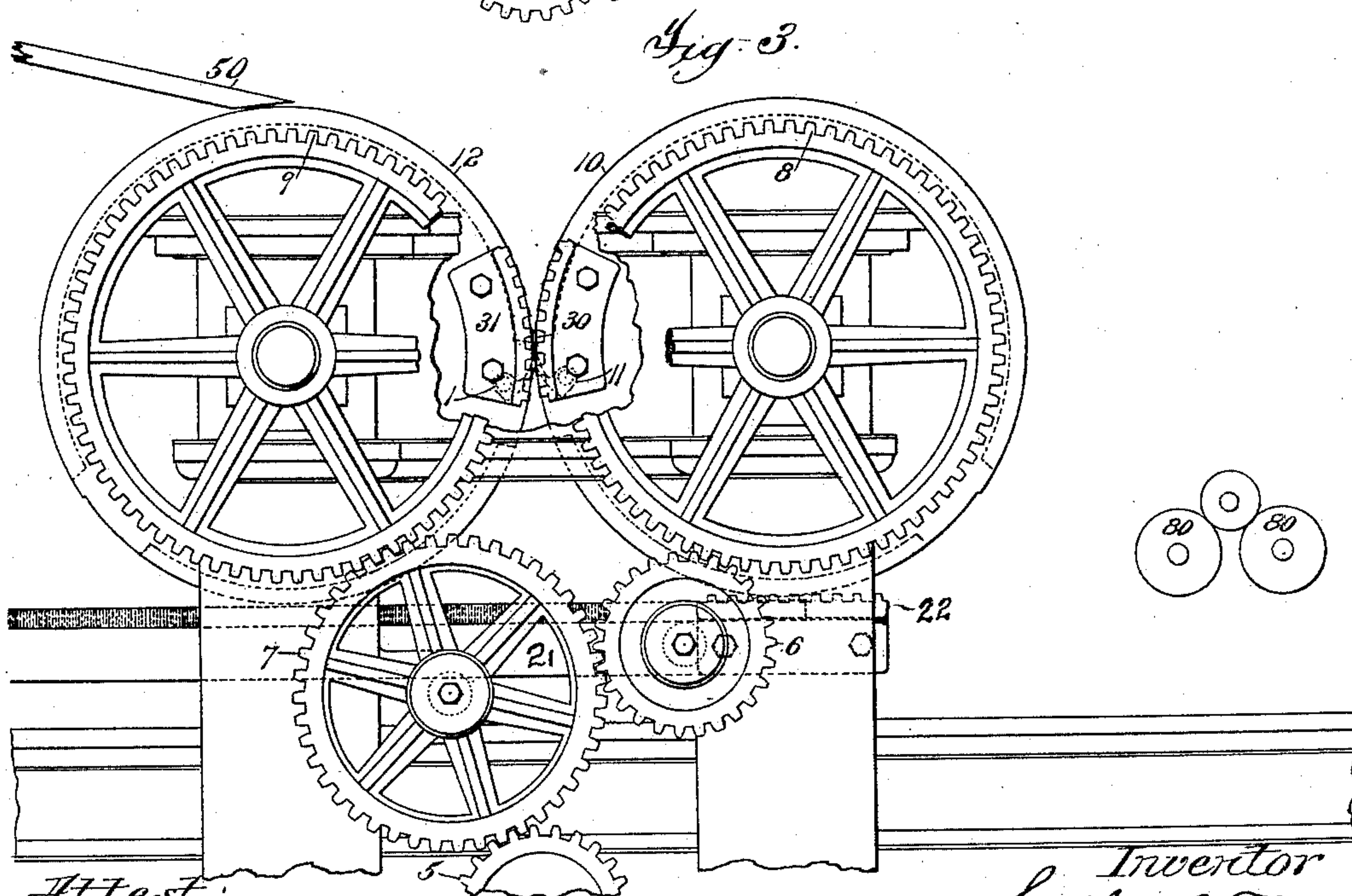
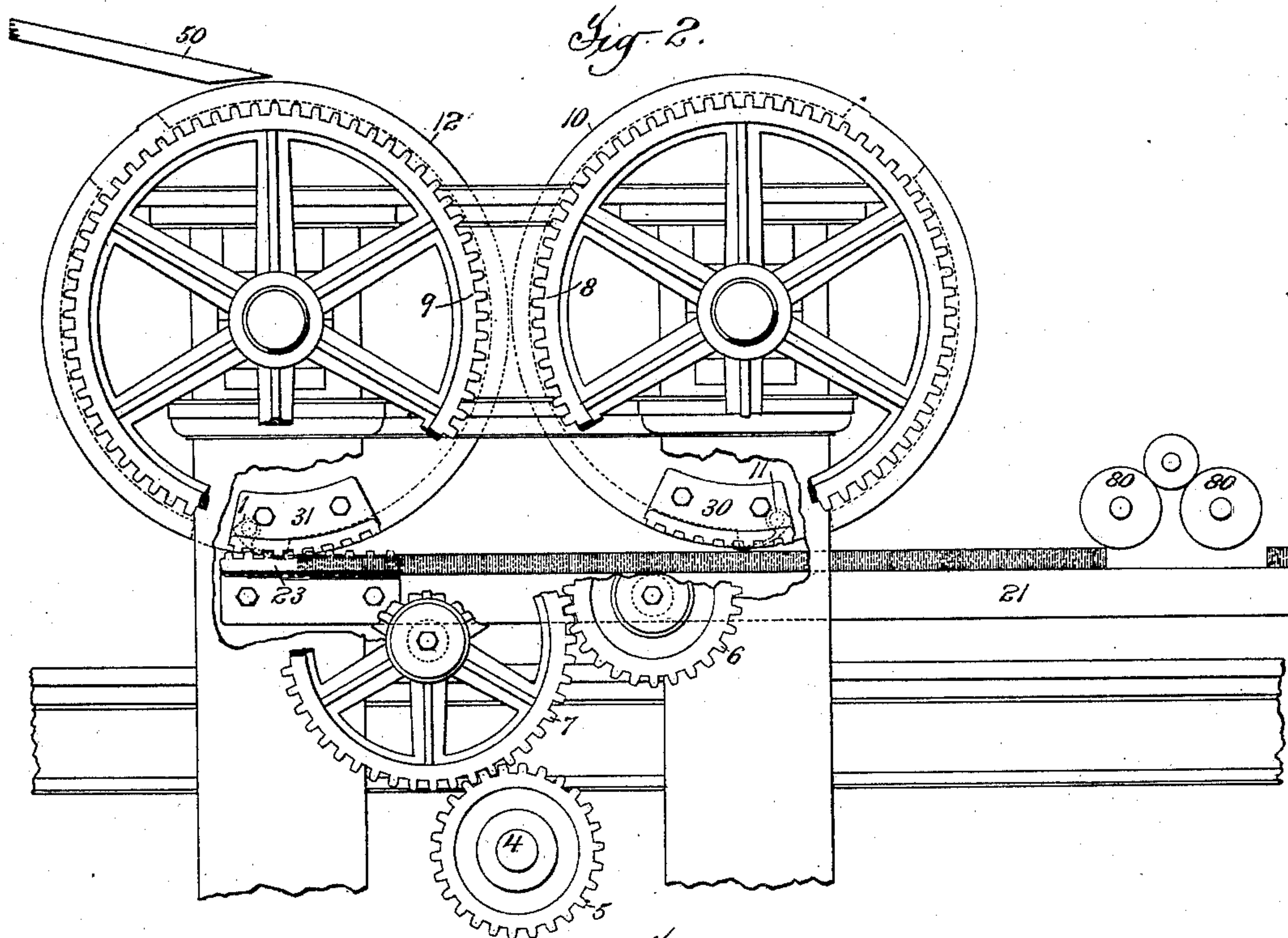
4 Sheets—Sheet 2.

S. D. TUCKER.

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(No Model.)

4 Sheets—Sheet 3.

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Fig 4.

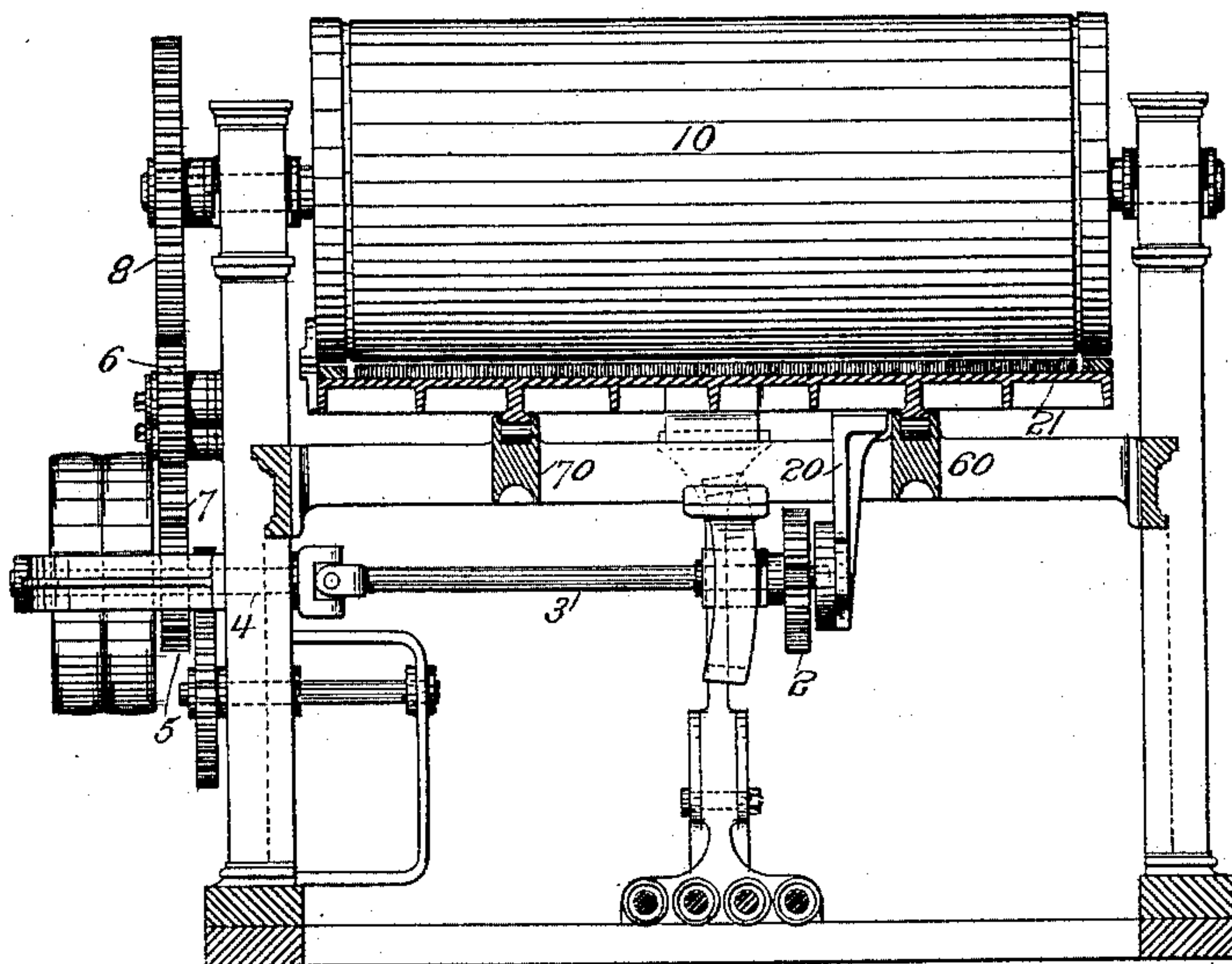


Fig 5.

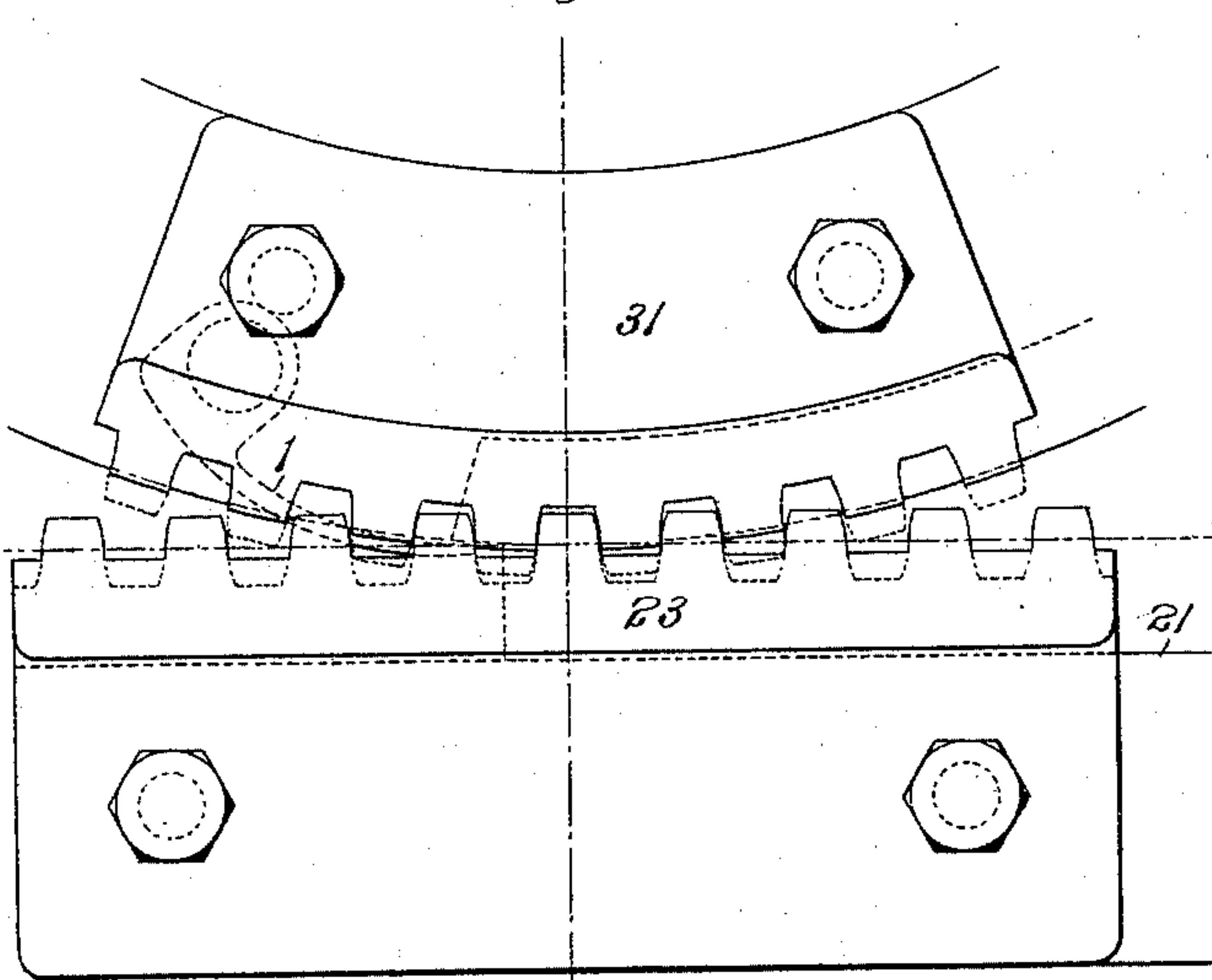
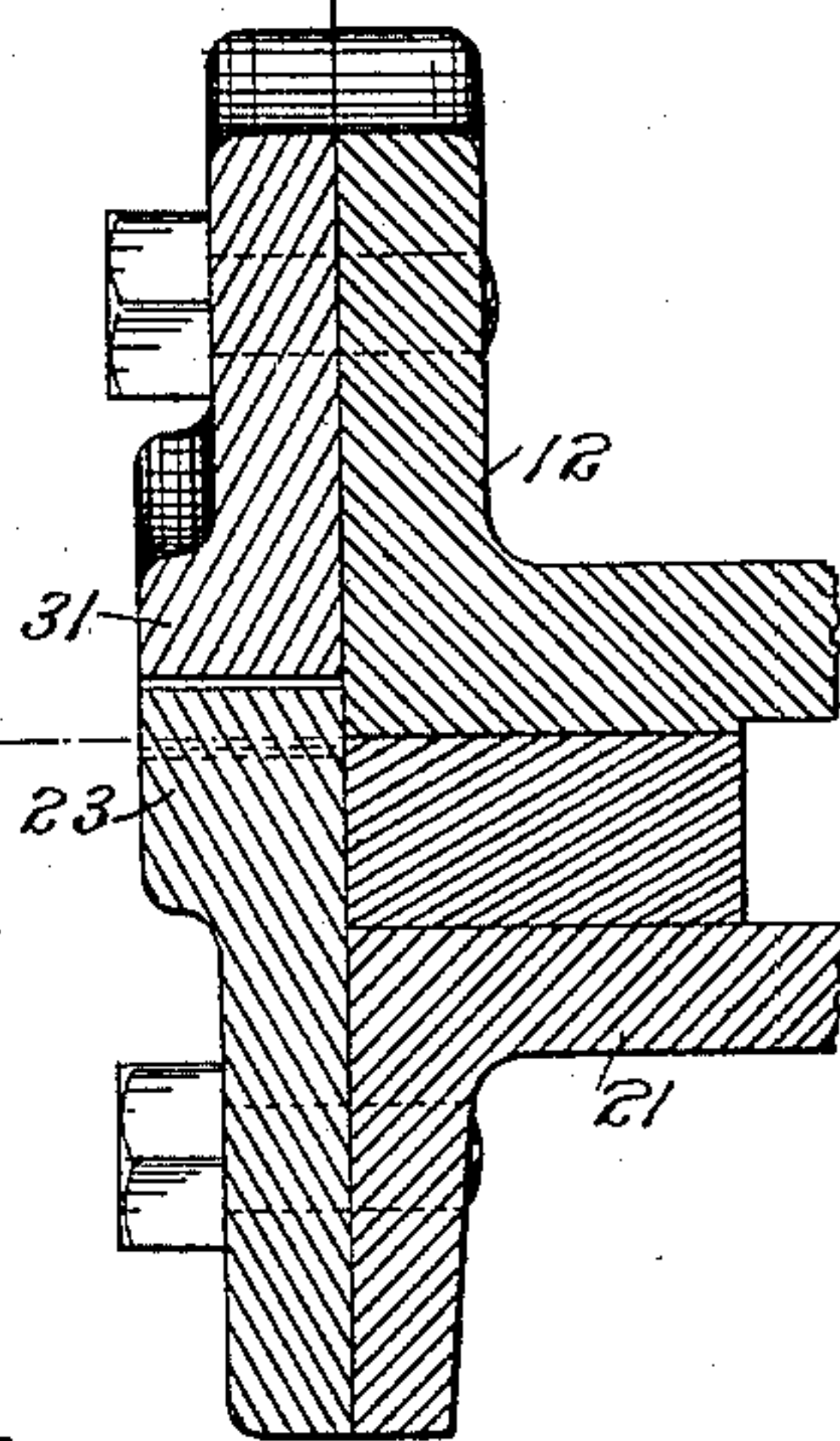


Fig 6.



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(No Model.)

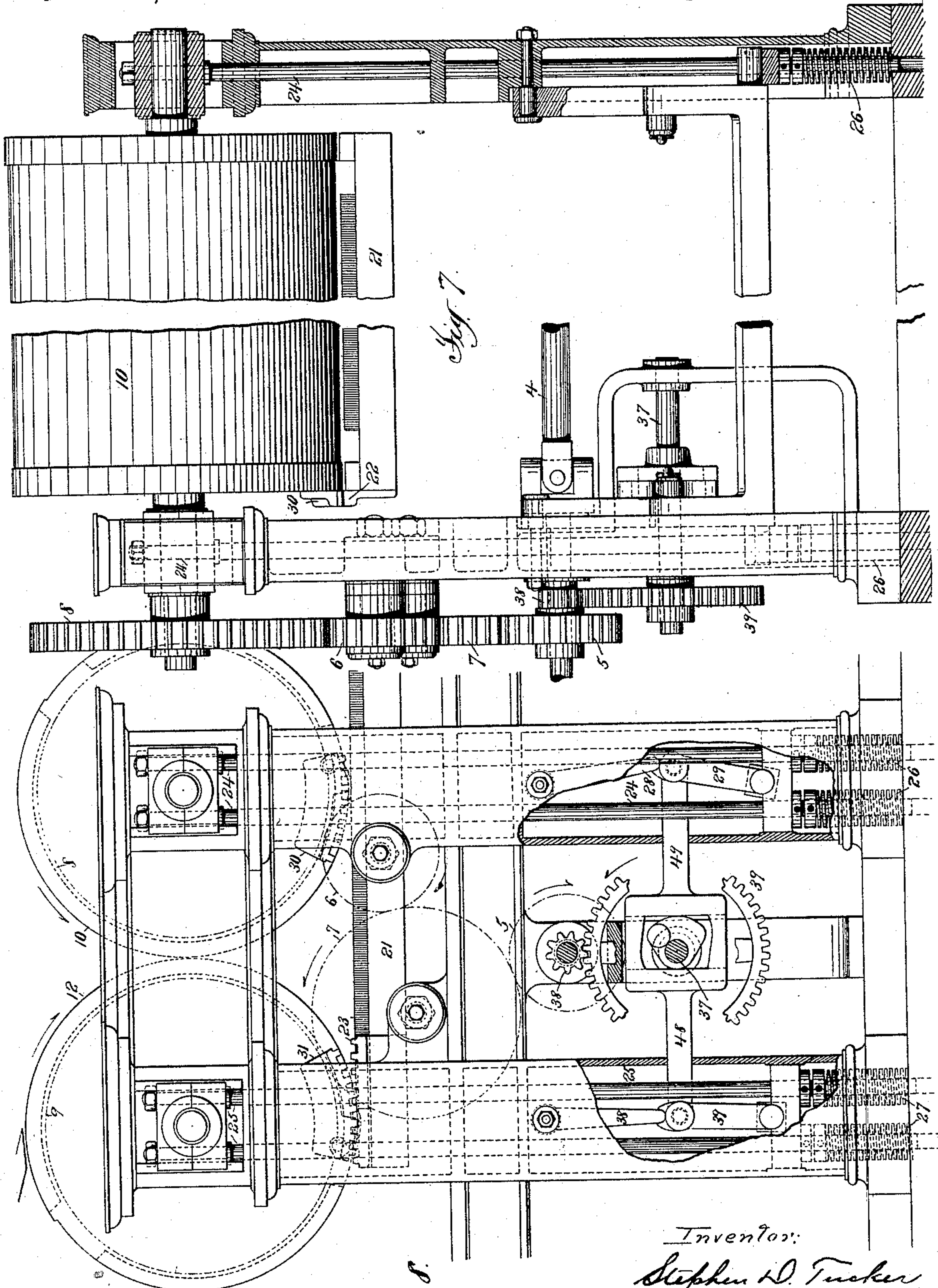
4 Sheets—Sheet 4.

S. D. TUCKER.

DOUBLE CYLINDER FLAT BED PRINTING MACHINE.

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S. Withal }
J. F. Kehoe } Witnesses:

Fig. 8.

Inventor:
Stephen D. Tucker
By Philipp Munson, Phil.
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UNITED STATES PATENT OFFICE.

STEPHEN D. TUCKER, OF NEW YORK, N. Y.

DOUBLE-CYLINDER FLAT-BED PRINTING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 473,484, dated April 26, 1892.

Application filed October 9, 1891. Serial No. 408,231. (No model.)

To all whom it may concern:

Be it known that I, STEPHEN D. TUCKER, a citizen of the United States, residing at New York, county of New York, and State of New York, have invented certain new and useful Improvements in Double-Cylinder Flat-Bed Printing-Machines, fully described and represented in the following specification and the accompanying drawings, forming a part of the same.

This invention relates to that class of printing-machines known as "double-cylinder presses." In these machines there are two impression-cylinders that co-operate with a flat reciprocating bed, upon which is carried one or two printing-forms, and each cylinder is provided with a set of grippers, each operating to take a sheet from a feeding-table and deliver it at the discharging-point, or one set of grippers of one cylinder operating to take a sheet from its feeding-table and deliver the same to the grippers of the companion cylinder, which operates to discharge it for delivery, these operations being performed according as the machine is to print two sheets upon one side only or one sheet upon both sides during each reciprocation of the type-bed, each cylinder having a feeding-table and delivery mechanism or one cylinder having a feeding-table and the other a delivery mechanism, as the case may be. When the printing is to be upon one side only, sheets are fed regularly from both feeding-tables to the grippers of both of the impression-cylinders, each of which automatically carries a sheet into contact with the appropriate form on the bed (usually a single form, but which may be two forms each equal to the printing of the full-sized sheet) during a complete reciprocation of the bed and discharges the once-printed sheet at its own delivery mechanism. When each sheet is to be perfected or printed first on one side and then upon the opposite side in passing once through the machine and during a complete reciprocation of the type-bed, but one feed-board and one delivery mechanism is required. In this case the grippers upon one impression-cylinder have operating means enabling them to open to receive the sheet from the feed-board and to close, seize, and carry the sheet in a circular path into print-

ing contact with one form upon the reciprocating bed, and when the impression-cylinder has completed the printing operation said grippers again open to deliver the sheet printed upon one side to the grippers of the companion impression-cylinder, and the grippers of this latter cylinder are provided with operating means, causing them to open and intercept the sheet upon the companion cylinder, then close to seize and carry said sheet, with its blank surface, into printing contact with the second form upon the type-bed, and thus having completed or perfected the printing of the sheet to open and discharge the same to the delivery apparatus. This perfecting of the sheet may also be accomplished when the type-bed carries but one form and each cylinder presses the same sheet over the whole form, which method is known as "backing upon the same form." A sheet thus printed will when cut in its transverse center make duplicates.

The delivery apparatus may be simply tapes leading the sheets out at one side of the cylinder to be taken by a fly-boy and laid upon a table, as in the earlier forms of cylinder-presses, or deliver the sheet down before a vibrating fly, which piles them upon a table, as in the modern forms of such machines.

The sheets may be perfected upon the first type of machine by feeding sheets from both feeding-tables when the bed carries a form adapted for printing the opposite sides of the sheet. In this case a sheet controlled by one of said cylinders will be printed upon one form, and the same sheet being fed to the other cylinder will be backed or printed upon its other side by contact with the other form, and vice versa, the feeding of sheets to both cylinders being thus carried on simultaneously.

In all forms of this printing-machine it is requisite that the impression-cylinders shall be lowered and raised at proper intervals by such timely automatic movements as to cause the appropriate impression-cylinder to be brought into or carried out of printing relation to the form on the moving type-bed passing beneath it. The raising and lowering of each cylinder is also preferably accomplished independently with respect to each cylinder, so as to be capable of performance by a throw-off that oper-

ates independently of the means that drives the type-bed, whenever for any reason it is desirable to suspend the impression.

While it has been usual to depend upon the driving-gearing connected with both the bed and the impression cylinders for the maintenance of proper register during the printing operations, it has long been deemed essential to the production of perfect work that the impression-cylinders shall be provided with segment-racks arranged to gear with toothed racks upon the type-bed at and during appropriate periods of time to cause such a co-operation of impression-cylinder and printing-form as will produce exact register without regard to the time when either impression-cylinder is raised or the period of time it is held in its raised position. In such an arrangement for the production of accurate register in these double-cylinder machines provided with means for raising and lowering them it follows, and especially when the impression-cylinders are independently geared with the driving-shaft, that the segment-racks upon the impression-cylinders are liable to be brought into meeting contact in passing a common point as the cylinders revolve and cause said segment-racks to thus either become injured or cause injury to the machine. Many constructions have been resorted to that are especially designed to avoid this injurious contact of the segment-racks on the impression-cylinders. In one form the segment-racks are fixedly placed and the impression-cylinders geared together, so as to cause the racks to mesh together as they meet in passing the point where the peripheries of the impression-cylinders are nearest each other; but in this form a disturbance of the true position of an impression-cylinder, which when raised and lowered must perform a slight rotative movement compelled by its being geared to its companion, is caused whenever either cylinder is tripped independently of its automatic rising and falling movements. Another form has included the staggering of the segment-racks in the same manner as the narrow gear-wheels which in double-cylinder presses drive the delivery-tapes have been staggered; but this, in consequence of the considerable width of the segment-gears, necessitates an objectionable increase of the total width of the press.

The present invention consists in a peculiar construction and an adjustment of the said segment-racks with the bed-racks, whereby the co-operating racks will suitably gear together in producing exact register, but said segment-racks in passing each other during the rotation of the impression-cylinders will neither interlock or injuriously engage with each other. These improved segment-racks that co-operate with the bed-racks may be called "half-toothed segments" to more particularly designate them, as is fully pointed out in the following description and claims.

Illustrating this invention, the accompany-

ing drawings show, in Figure 1, a double-cylinder flat-bed perfecting printing-machine. Figs. 2 and 3 are enlarged side elevations of the central portion of the machine. Fig. 4 is an enlarged cross-sectional elevation, and Figs. 5 and 6 are enlarged details. Figs. 7 and 8 illustrate mechanism for raising and lowering the cylinders.

The particular mechanism represented as embodying the present improvements is a double-cylinder flat-bed perfecting printing-press which may be fed either with a web of material or with sheets. It consists of two impression-cylinders 10 12, mounted in their journal-boxes so that their peripheries are contiguous, being slightly separated from each other, as is customary in machines of this description, and co-operating with a reciprocating type-bed 21, carrying the printing form or forms, which bed slides on ways 60 70 and is driven by a pinion 2 on an oscillating shaft and acting upon a double rack supported by a carrier, as 20, depending from the bed, all of which is of common construction.

Ordinary inking devices are shown at H I, Fig. 1, and their form-rollers are marked 80 in the other views. Co-operating bearers on the cylinders and bed are illustrated, and one form of spring-seated levers for taking up the bed motion also appears; but these are well known and in part make up an illustrative machine.

Each impression-cylinder is provided at one end with a toothed wheel made of such less diameter than its cylinder that said cylinders shall not be geared together, but be independently driven by toothed wheels 8 9, to which motion is communicated by wheels 6 7, that are geared together and respectively to said wheels 8 9, and the wheel 7 receives its motion from a wheel 5 on the main shaft 4, which is connected by a universal joint with the oscillating shaft 3 of the bed-driving pinion 2, which operates on the bed-driving rack, (the carrier-frame 20 of which is shown in Fig. 1.) The cylinders 10 12 are mounted in bearings carried by sliding bearers, to which vertical rising and falling movements are given at appropriate times by any common means whereby said cylinders may be raised and held out of or lowered into printing position relative to the type-bed. Any of the common means for effecting this may be employed.

The cylinder segment-racks designated "half-toothed racks" are preferably formed by having had full teeth cut so as to perfectly mesh with and fit into full-toothed bed-racks, (see dotted lines, Fig. 5,) then having cut away so much of the projecting ends of their teeth as projects beyond their pitch-line as is necessary, and these segment-racks are attached to the cylinders so that their ends project beyond the pitch-line of the cylinders a distance equal to nearly one-half the space between the cylinders, whence it results that when these racks are caused to pass each

other during the revolution of the cylinders at the central or meeting point they are enabled to pass each other without engagement in like manner as two pulleys roll in or nearly in contact. Thus constructed the destructive operation caused by the meeting of these segment-racks is avoided, while said segment-racks will engage and mesh sufficiently with the bed-racks as to cause a locking control of the one from the other at the beginning and for a suitable period of time during the impression. By this construction it follows that the impression-cylinders may be raised without regard to time and yet none but a practical operation of these segment-racks with respect to each other and to the bed-racks ensue.

The cylinders 10 and 12 are each provided with a half-toothed segment-rack 30 31, the outer ends of which segment-racks project slightly beyond the pitch-line of the cylinders, (see Figs. 5 and 6,) so that they will travel in a circular path that enables them to pass each other in or nearly in rolling contact without meshing or interlocking, thus forming no obstruction to each other. (See Fig. 3.)

The type-bed 21 is provided with two registering racks 22 23, with which the segment-racks engage when the cylinders are in their lowest position, as is best seen in Figs. 2 and 5, in which position the cylinders and type-bed will be so securely locked together, as is illustrated, as to insure a perfect register, and as the pitch-lines of the cylinders, segment-racks, and bed-racks coincide (see Figs. 5 and 6) it follows that when a cylinder is raised out of printing relation with the bed its segment-rack is also raised out of engagement with the bed registering rack, while the driving-gears, as 8 6 or 9 7, are not wholly separated, (see Fig. 3,) and hence it results that the segment-rack 31 or 30 will be brought fully into engagement with the bed-rack, as 22 or 23, and properly gear therewith whenever the cylinder is lowered, and thus secure register by compelling the cylinder and bed to timely interlock and travel in unison long enough to secure perfect register.

The bed-racks 22 23 may be full racks, as shown in dotted lines, Fig. 5, or have the spaces between their teeth cut only to a depth reaching their pitch-line and clearance, as is obvious, and either construction perfectly cooperate with the half-toothed segment-racks.

Whether or not the type-bed is provided with two registering racks—one on each end—or with one rack in its center, depends, as is well known, upon the way in which the cylinders revolve and the sheets are fed to them. If fed toward the center of the machine, two racks are required. If toward the end of the machine then a central rack will suffice. The expression "bed-rack" is therefore to be taken as covering both forms.

The grippers 1, their operation either in taking the sheet from the feed-board 50 or from the end of a web, and their delivery of

it after printing upon one cylinder to grippers 11 on the companion cylinder at their meeting-point, as in Fig. 2, and the release of the sheet therefrom after the second printing operation to the tapes for final delivery from the machine, are not specifically described, as the illustration shows these devices sufficiently to enable all of this to be well understood when it is stated that it is the same as in the double-cylinder perfecting-presses now well known.

The bed-racks 22 23 (one or the other) may be made capable of adjustment longitudinally by being provided with elongated holes and screw-bolts for this purpose, an example of which is shown in Patent No. 4,025 to R. M. Hoe, dated May 1, 1848.

Machines having rising and falling impression-cylinders ordinarily have either a hand or foot operated throw-off for independently raising one or both impression-cylinders at times other than when the machine is regularly operating, so that when for any cause, and though a sheet is regularly passing through the machine, it is desired to throw off the impression of either cylinder this may be quickly done. Such means being common in double-cylinder machines needs no illustration here.

It will now be understood that in the machine illustrated as embodying the present invention a sheet fed from the table 50 to the grippers 1 will be seized by them and carried around upon the cylinder 12, and that said cylinder being then in its lowest or printing position its segment 31 will meet and gear with the rack 23 on the bed, (see Fig. 2,) causing the cylinder and bed to travel in unison as the sheet is pressed by the cylinders onto the form carried by the bed, and that this sheet thus printed upon one side will be carried by the cylinders until the meeting-point of the two cylinders is reached, when the grippers 1 will open to release and the grippers 11 will close to seize the leading end of the sheet and carry it around upon the cylinder 10, which cylinder then being in its lowest position its segment 30 will meet and gear with the rack 22 on the bed, thus securing register as the grippers 11 carry the sheet into contact with the second form to print the opposite surface of the sheet. After this second printing the perfected sheet will be released from the grippers 11 and delivered out of the machine. This is accomplished as follows: The journal-boxes of the cylinders 10 12 are respectively supported by rods, as 24 24 25 25, that are seated upon and pressed upward by springs, as 26 27, so that normally said cylinders will be raised sufficiently to clear their surfaces from the forms on the bed. The said cylinders are depressed to printing position by means of toggles 28 29 and 38 39, that are connected together by the opposite arms 48 49 of a reciprocating lever, in the yoke of which a cam operates to impart a timely reciprocation

through said lever to appropriately straighten the toggles, and thus depress one or the other cylinder. This cam is carried by a short shaft 37, which is given the appropriate rotation from the bed-pinion shaft 4 through a pinion 38 and wheel 39. When the type-bed is making its printing-run in co-operation with the cylinder 10, as in Fig. 3, the cylinder 12 will be raised high enough to be removed from contact with the form on the type-bed as it passes beneath it, and when the type-bed is making its printing-run in co-operation with the cylinder 12, as in Fig. 2, the cylinder 10 will in like manner be raised out of printing position, and for this purpose there are many well-known mechanisms—*e.g.*, that illustrated in Patent No. 2,629 to R. M. Hoe, dated May 20, 1842. When a single type-form is used, each cylinder has a sheet fed to it and the grippers 11 and 1 will be made to operate to receive the sheets from the feed-boards at proper times to enable the bed to print in both directions, one cylinder being raised while the other is printing and two deliveries being provided for the sheets, as is well understood.

What is claimed is—

1. The combination, with two impression-cylinders and a reciprocating type-bed, of a half-toothed segment-rack upon each cylin-

der and co-operating toothed rack upon the type-bed, substantially as described.

2. The combination, with the two impression-cylinders, means for lowering and raising said cylinders, and a reciprocating type-bed, of a half-toothed segment-rack upon each cylinder and co-operating toothed rack upon the type-bed, substantially as described.

3. The combination, with the two impression-cylinders and a reciprocating form-carrying type-bed, of means for lowering and raising said cylinders, grippers for carrying the sheet upon one cylinder into printing contact with one form and delivering it to the grippers of the companion cylinder, which latter grippers carry said sheet into contact with the other form, and a half-toothed registering segment-rack upon each cylinder, co-operating with a rack upon the bed to secure register during both printing operations, substantially as described.

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

STEPHEN D. TUCKER.

Witnesses:

GEORGE F. READ,
T. F. KEHOE.