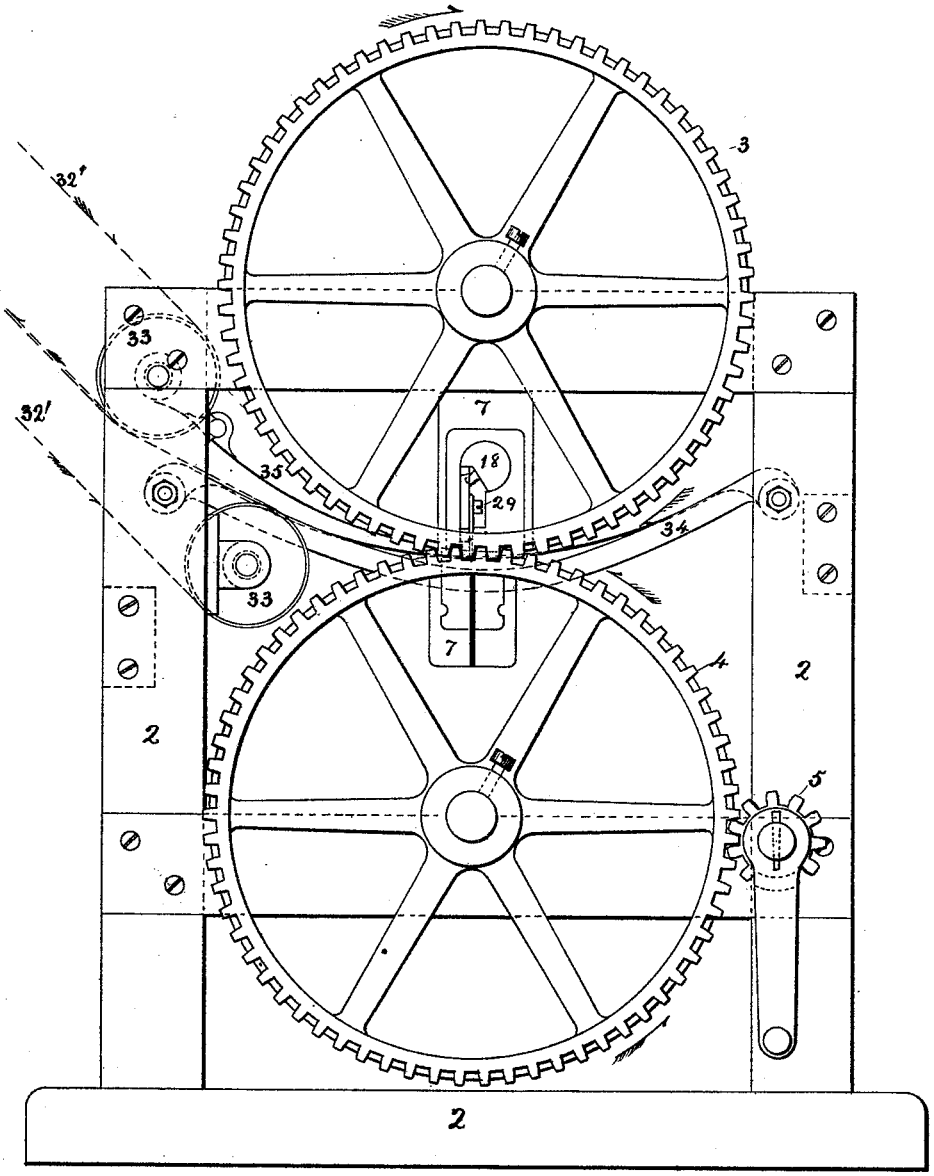
5 Sheets—Sheet 1.

S. D. TUCKER.

CUTTING-CYLINDERS FOR PRINTING PRESSES.

No. 180,966. Patented Aug. 8, 1876.

Fig. 1.



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5 Sheets—Sheet 2.

S. D. TUCKER.

CUTTING-CYLINDERS FOR PRINTING PRESSES.

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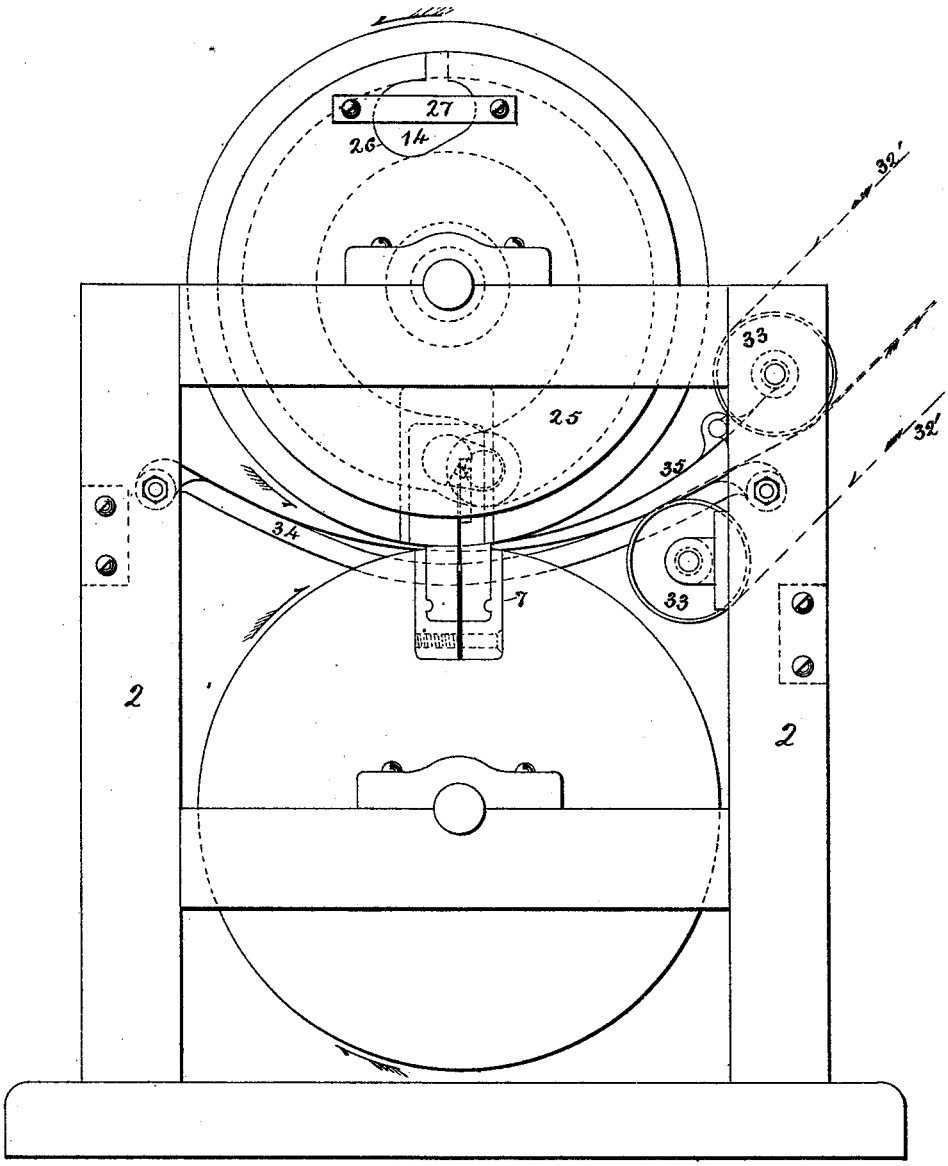
Fig. 2.



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5 Sheets—Sheet 3.

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CUTTING-CYLINDERS FOR PRINTING PRESSES.

No. 180,966. Patented Aug. 8, 1876.

Fig. 4.

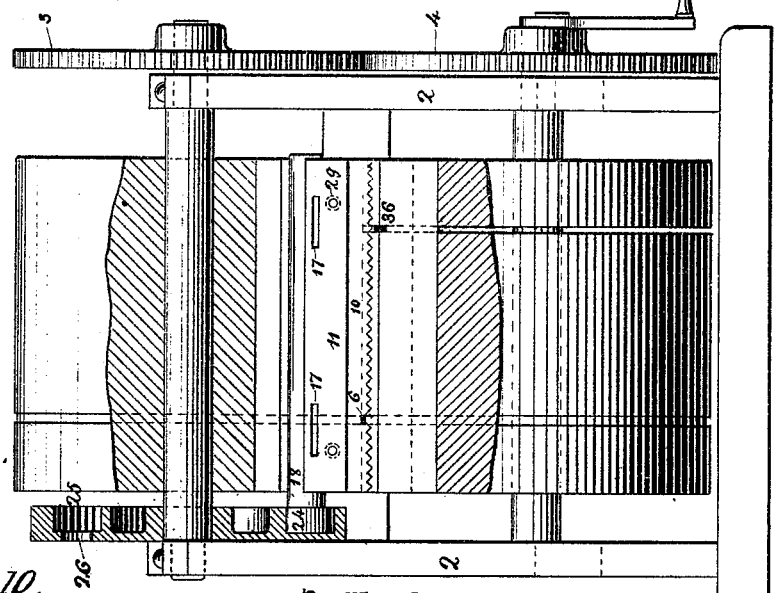


Fig 10.

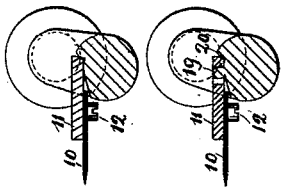


Fig 9

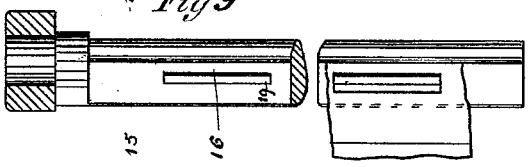


Fig 11

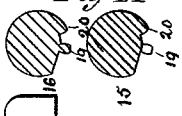
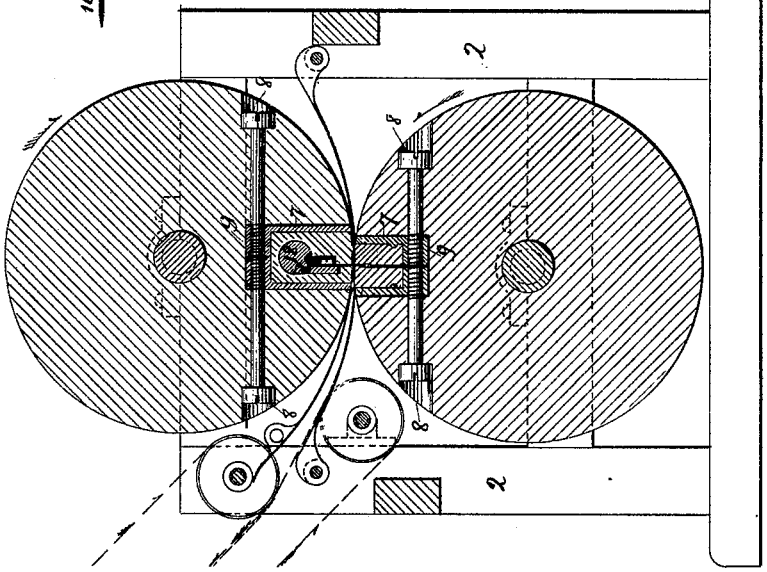


Fig. 5.



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5 Sheets—Sheet 4.

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CUTTING-CYLINDERS FOR PRINTING PRESSES.

No. 180,966. Patented Aug. 8, 1876.

Fig. 4.

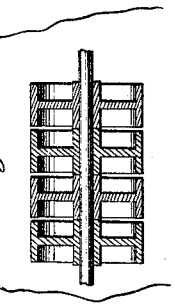


Fig. 7.

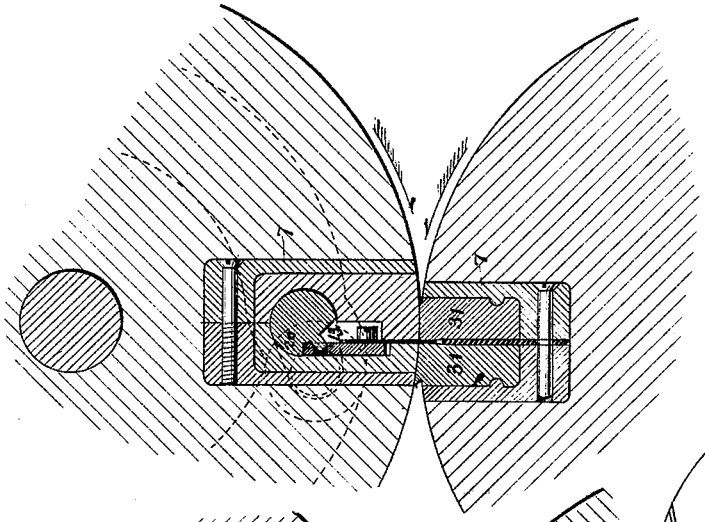


Fig. 6.

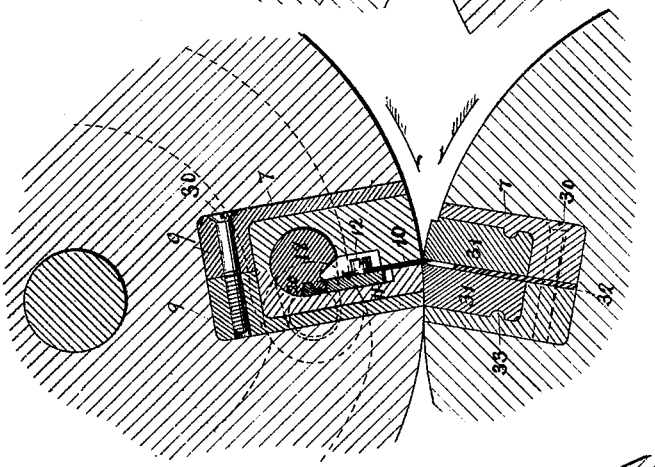


Fig. 8.

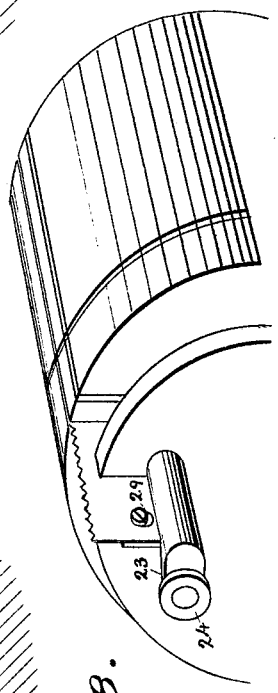


Fig. 5.

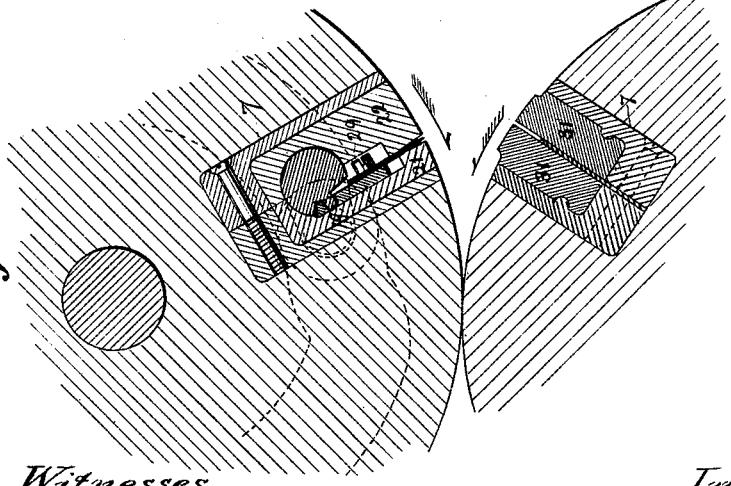
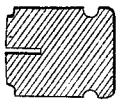


Fig. 13.



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5 Sheets—Sheet 5.

S. D. TUCKER.

CUTTING-CYLINDERS FOR PRINTING PRESSES.

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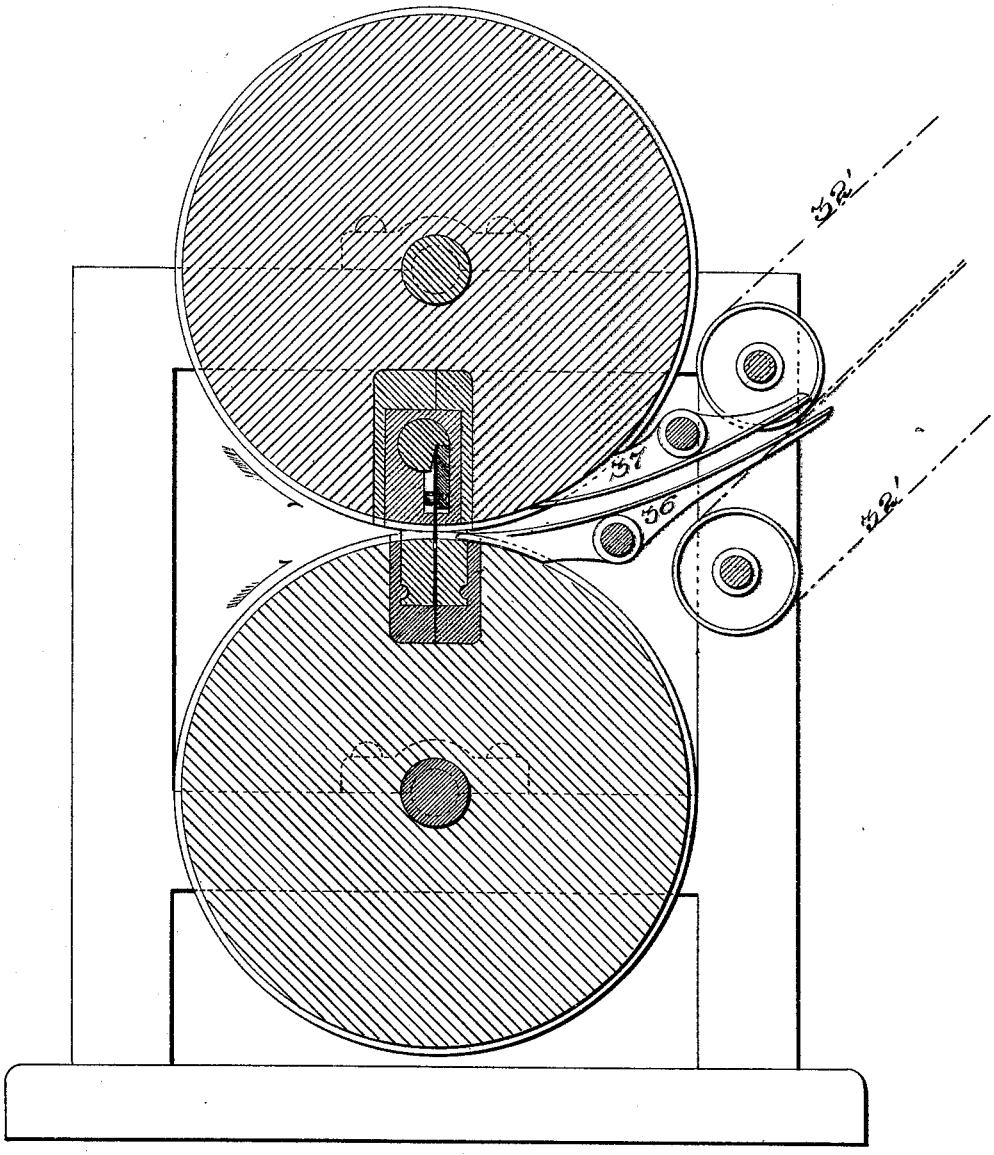
Fig. 12.



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UNITED STATES PATENT OFFICE.

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

IMPROVEMENT IN CUTTING-CYLINDERS FOR PRINTING-PRESSES.

Specification forming part of Letters Patent No. **180,966**, dated August 8, 1876; application filed November 27, 1875.

To all whom it may concern:

Be it known that I, STEPHEN D. TUCKER, of the city, county, and State of New York, have invented an Improvement in Cutting-Cylinders for Printing-Presses, of which the following is a specification:

In the accompanying drawings, which constitute a part of this specification, and in which the same devices are indicated by like figures, is represented, in Figure 1, a right-hand-side view, showing the driving-gears; Fig. 2, a left-hand-side view; Fig. 3, a sectional view through the cutting-cylinders of Fig. 4; Fig. 4, a front view, with cutter-actuating cam and parts of the cylinders in section; Figs. 5, 6, and 7, sectional views of portions of the cylinders, showing several positions of the cutters during the operation of severing the web; Fig. 8, a perspective view of that portion of the cylinder carrying the cutter; Fig. 9, views of the cutter-shaft naked; Fig. 10, said shaft with cutter and cutter-bar hung thereon; Fig. 11, sections of Fig. 9 on lines 15 and 16; Fig. 12, a sectional view through the cutting-cylinders, showing the conductors placed at the delivering side of the cylinder; Fig. 13, a modification of the female cutter; and Fig. 14, a detailed view of one construction of the cutting-cylinders.

The invention relates to the revolving cutting-cylinders of that class of printing-machines which operate upon a web or continuous sheet of paper; and consists in novel features of construction too particularly hereinafter explained to need preliminary description.

As represented in Fig. 1, the two cylinders, carrying, respectively, the male and female cutting devices, are mounted in a frame-work, 2, and are geared together by toothed wheels 3 and 4, so as to run with uniform surface speed. Motion is imparted to one of the said toothed wheels by an intermediate gear-wheel, 5, or a train of such wheels, connecting with a toothed wheel upon a revolving shaft of the printing-press. These cutting-cylinders are provided with longitudinal mortises, cut into their bodies, and extending from end to end thereof, into which the boxes or cases 7, supporting the male and female cutting devices, are adapted to slide, and out of which they may be drawn when it is required to remove them. These boxes are made of metal, and are of ⊔ form. They are so constructed as to hold and support the cutting devices, as will be presently explained, and are themselves retained in position in the cylinder by means of screw-bolts 8, Fig. 3, extending through transverse holes, with which these cylinders are pierced or bored, which screw-bolts enter screw-threaded holes in the bottom plates 9 of the cases 7.

The cutter 10 is a simple blade or plate of steel, preferably with a serrated or saw-toothed edge, having slots in or portions removed from it at suitable points of its cutting-edge, if it is desired to leave small portions of the paper web uncut at the line of severance which divides sheet from sheet, which cutter is detachably fastened to the cutter-bar 11 by means of screws 12. The cutter-bar 11 is provided with two or more short slots, 17, parallel with and near its inner edge, by which it is hung upon its actuating-shaft 18.

The outer edge of the cutter-bar may form the cutting-edge; but it is preferable to attach a thin cutting-blade to the bar, as described. In practice I prefer to make the cutting-blade in sections, whose ends abut against each other, and which are secured to the cutter-bar by the screws 12. In this way they are easily removed and replaced.

The cutter-actuating shaft is of circular form, cut away on one side, so as to provide two or more teeth, 19, and an abutment, 20, which latter is, in reality, the side of a long tooth. These teeth 19 enter the slots 17 in the cutter-bar, (see Figs. 4 and 10,) and when thus mounted upon it the inner edge of the cutter-bar is seated upon and bears against the said abutment 20, as in Figs. 5, 6, and 7. This abutment 20 and the teeth 19 together govern the movements of the cutter as the cutter-shaft is rocked, as will presently appear.

The cutter-shaft 18 is also cut away in front of the teeth 19, so as to clear the cutter-bar when it is in the position shown in Fig. 5, for a purpose hereinafter explained. This cutter-shaft 18 is supported in wooden bearings 21 22, which are cut away on their inner faces to accommodate the cutter-bar and cutter, and

the movements thereof. These wooden bearings are adapted to fit snugly within the box or case 7, where they may be held by pins or screws, and they securely hold the cutting devices in operative position. These wooden bearings for the shaft, and the guideway they form for the cutter-bar and cutter, remove the necessity of lubricating such parts, and thus the presence of oil at a point where it would readily reach and soil the paper operated upon is dispensed with. The shaft 18 projects beyond one end of the cylinder, as in Fig. 4, where it carries a crank, 23, (see Fig. 8,) which runs in the groove 25 of a cam-plate fixed to the frame 2. The shape of this cam-groove is such that it will vibrate the shaft 18 with such a motion as to force the cutter out quickly and draw it back slowly, the form thereof being shown in dotted lines, Fig. 2. When this shaft is thus rocked outward the abutment 20 upon it bears against the upper or inner edge of the cutter-bar 11, acting as a lever to thrust it and the cutter it carries outward, and the sudden impulse and force thus imparted to the cutter drive it quickly through the paper, which it severs by means of the co-action of the female cutting device, presently to be explained. The return movement of the cutter, not required to be quick, is accomplished by the gradual curve of the cam-groove. (See Fig. 5.) The cutter, together with the cutter bar, shaft, and crank, while connected together, may be withdrawn endwise from the cylinder for the purpose of repair or adjustment, as is seen in Fig. 8, and the cam 25 is pierced with a suitably-shaped aperture, 26, to permit their passage through it, as seen in Figs. 2 and 4. When the parts are in working position, however, this aperture in the cam is filled by a plug, 14, which fits into it and has its inner face shaped to form a part of the cam-groove. This plug 14 is attached to a bridge-bar, 27, which is secured by screws to the exterior surface of the cam, thus holding the plug 14 in place. The abutment 20 upon the shaft 18, which actuates the cutter in its outward movement may be continuous—that is, extend throughout the length of the shaft—or it may be broken up or divided into a series of short abutments, pins, studs, or teeth, it being imperative that there shall be a bearing-surface for the cutter-bar at such a number of points on the shaft as will insure a parallel movement of the entire edge of the cutter, or such bearing-points for it as will not strain either the cutter or its bar.

It is evident that teeth on the cutter-shaft can be made to work in the slots in the cutter-bar, so as to move it both out and in; but I prefer the abutment to move it out, as described, it being more durable than isolated teeth.

The cutter is attached to its supporting-bar by screws 12, which project through oblong holes in the cutter, whereby it is adapted to be adjusted as may be required. The teeth 19, which draw the cutter back into the cylinder, may, like the abutments 20, be of any number, so long as sufficient bearings for the cutter are provided to insure the durability and precision of this movement.

The cutter is guided in its movements out of and into the cylinder by the parallel faces of the bearing-blocks 21 22, which form its guiding-slot, and its motion relative to its actuating-shaft is such that the teeth 19 are nearly disengaged from its bearing-slots 17 as it reaches its extreme outward throw. When its actuating shaft is so rocked as to carry it into the cylinder the surface of its supporting-bar just clears the cut-away portion of the said shaft, as seen in Fig. 5. For convenience of construction, the boxes 7 may be divided longitudinally through their base-plates, 9, as in Figs. 5, 6, and 7, and held together by screws 30. In the box 7, holding the female cutting devices, this construction has positive advantages, as will presently appear. This female cutting device consists of a groove or slot adapted to receive the cutter, which slot is formed by the adjacent faces of two blocks of rubber, 31, which are separated a suitable distance apart by a plate, 32, and held in place by ledges 33. These ledges 33 extend inwardly from the sides of the box 7, and enter properly-shaped recesses, or embed themselves in the sides of the rubber blocks. The metal separating-plate 32 is of a thickness somewhat greater than that of the cutter, is supported between the edges of the two parts of the box 7, and projects toward the periphery of the female cylinder to a distance which will properly support the rubber blocks apart at their upper edges, and yet not interfere with the cutter when it enters the groove thus formed. Said separating-plate is perforated at its base to admit the screws 30, which fasten together the two sections of the box in like manner, as are the sections of the box in the male cylinder, between which sections said plate is thus clamped. The outer surfaces of the rubber blocks 31 extend beyond the periphery of the female cylinder for the purpose of engaging with and pressing the web of paper between them and the face of the cutting-cylinder, and thus to stretch it tightly over their face ends during the time the cutter is severing the web, and also to hold the leading or severed end of the web, and insure its being drawn forward until it is securely caught and held between the peripheries of the two cylinders. Like the cutter and its appurtenances, the cushions or blocks forming the cutting-groove may be removed from the box 7. Though, when this is necessary, it is preferable to remove them, together with their holding-box, after it has been relieved from its holding-screws 8. The cutting-groove in the female cylinder may be formed in a single piece or block of rubber, provided with a central longitudinal slot or recess for co-operation with the cutting-blade, in which case the plate 32 would be omitted. When the web has passed the cutting-cylin-

ders, and is severed into sheets, they are directed to the printing-machine, if unprinted; but if printed, then to the flying or folding mechanism by means of tapes 32′ running over pulleys 33. To facilitate their delivery to these tapes, especially when the broken or fresh end of a web is entered, or when it is desired that the sheets shall be completely severed from the web, conductors 34 and 35 are provided, that reach from the cutting cylinders to the tapes, and these conductors may be tapes or cords, wires, bars, plates, or strips of metal.

When the cuttter is slotted, as at 6, Fig. 4, to allow the web to remain continuous at two or more points of its width, both cylinders may be grooved circumferentially at such points, and tapes or cords running in such grooves may provide the means of conducting the web. This, however, is shown in the extended Patent No. 25,199, granted Richard M. Hoe, August 23, 1859, and reissued June 30, 1874.

Fixed strips or guides of metal are used in the present instance, and possess advantages over running cords or tapes. Such conductors may extend through between the cylinders, from side to side, or they may be on the delivering side of the cylinders only, and they may be supported on rods attached to the frame-work, on one or both sides of the cylinders, or in any other manner be secured in place, and they may occupy the space just described as provided for the passage of the cords or tapes. The conductors 34 and 35 extend through from side to side of the cylinders, and are attached to rods at each side, while, in Fig. 12, the conductors 36 and 37 are placed at the delivering side of the cylinder only. In both arrangements the conductors are both above and below the web, and will not only guide it into the tapes 32′, but if, in printing, the web breaks, they will prevent the paper winding around the cutting-cylinders, as sometimes happens with the cutting devices at present in use.

To sever the sheets completely from the web when the conductors extend across the cylinders, the grooves, conductors, and slots in the cutter of the male cylinder must be quite narrow, and the grooves in the female cylinder must be opposite those in the male cylinder, and the conductors must be so thin that the slots in the cutter will straddle them in passing; but a preferable manner is to have deep grooves in the female cylinder, and to sink the conductors of this cylinder below the reach of the cutter of the male cylinder when it is projected out to cut the sheet, as shown at 38, and then the grooves and conductors in this female cylinder may be of the ordinary width. To favor this construction of cylinders they may be made up of a series of sections or short cylinders, but with a narrow space left between them, in which spaces the conductors are placed.

Cutting-cylinders thus arranged will sever the sheets from the web as completely as if no grooves existed and the cutter was left entire.

With the conductors placed in front of the cylinders, as shown at Fig. 12, the grooves need not be deep in either cylinder. If it be desired to sever the sheet completely from the web, and the cutter of the male cylinder is of the stationary kind, then the grooves, conductors, and slots in the cutter of that cylinder must be quite narrow, as above described; but if the cutter has a reciprocating movement, and draws in beyond the bottom of the grooves when passing the conductors, then the cutter may be left entire, and the grooves and conductor be of the ordinary width, the same as in the female cylinder.

The office of the cylinders is to support the cutting devices, and by their rotation to bring said cutting devices into operative contact to sever the paper, and it is obvious that such a rotating carrier made up of short cylinders, as has been described, will serve the purpose equally well.

Having thus described the construction and operation of my improved cutting mechanism, what I claim is—

1. The combination of a cutter-blade with a carrying-cylinder, a rocking-shaft, operating directly upon the cutter-bar and stationary actuating-cam, substantially as shown and described.

2. A revolving carrying-cylinder, a cutting-blade, a rocking-shaft operating directly upon the cutter-bar, and an actuating-cam, combined, substantially as shown and described.

3. A cutter-driving rock-shaft mounted in a revolving carrier, and having a cranked end, combined with and running in a stationary grooved cam, whereby the cutter is projected without and drawn within the periphery of the carrier, substantially as shown and described.

4. In combination with the cutter, a rock-shaft provided with an abutment for driving said cutter in one direction, and with projections engaging with the cutter-bar to draw it in a contrary direction, substantially as shown and described.

5. The combination of the shaft-abutments 20, teeth or projections 19, and slotted cutter-bar, substantially as shown and described.

6. The combination of a cutter-actuating shaft with its cutter by means of the teeth 19 and slots 17, substantially as shown and described.

7. A cutter, operated directly from a rock-shaft without the intervention of rods, levers, springs, or other connecting media, substantially as shown and described.

8. A cutter-actuating shaft, provided with the abutment 20, teeth 19, and removed face, as at 13, Fig. 7, substantially as shown and described.

9. Wooden bearings and guideway for the cutter and cutter-bar, substantially as shown and described.

10. The combination of two blocks or cushions of rubber and a separating-plate, forming a cutter-groove for co-operation with a cutting-blade, substantially as described.

11. The combination of a longitudinally-divided case or box, 7, blocks 31 of elastic material, and separating-plate 32, substantially as shown and described.

12. In combination with the cushion-blocks 31, and the sides of their holding-box 7, the ribs, shoulders, or projections 30, substantially as shown and described.

13. The combination of boxes or cases 7, which support the movable male or female cutting devices, with the revolving carrier, the construction being such that the said boxes or cases are removable from the carrier, substantially as shown and described.

14. The combination of the box-sections, cushions 31, and separating-plate 32, the said parts being constructed so as to be removable from the cylinder while adjusted in their relative operative positions, substantially as shown and described.

15. The combination of a cutter or cutters, cutter-bar, and actuating rock-shaft, the said parts being removable, while attached together, from their bearings and guiding-groove in the revolving carrier, substantially as shown and described.

16. A cam, provided with an aperture to permit the passage of the cutter-shaft it actuates when said shaft is removed bodily from the machine, in combination with said shaft, substantially as shown and described.

17. The stationary grooved cam, apertured at 26, in combination with the cranked shaft and cutter, substantially as shown and described.

18. The combination of an apertured cam and a closing-block, with the cutter-shaft, substantially as shown and described.

19. A block for closing the aperture through a grooved cam, which is so constructed that its inner surface shall form part of the cam-groove, in combination with the cutter-shaft, substantially as shown and described.

20. The combination of a stationary grooved cam, a vibrating cutter-shaft, and a revolving carrier, the cam-groove being shaped to force the cutter out quickly and return it slowly, substantially as shown and described.

21. The combination, with the cutting-cylinders, of the rigid conductors extending into the grooves in the said cylinders, the construction and arrangement being such that the conductors shall clear the cutting-blade when it is projected in the act of cutting, substantially as shown and described.

22. The combination of the rigid sheet-conductors, the slotted cutter, and the grooved cylinder, substantially as shown and described.

23. The combination, with a cutting-blade, of the cylinder, constructed of independent sections hung upon their shaft, so as to form an intervening space between them, which space constitutes the conductor-grooves, substantially as shown and described.

24. The combination of a reciprocating cutter, whose edge is entire, a grooved cylinder and conductors, the combination being such that the inner ends of said conductors are supported outside of the line of motion of said cutter when drawn into the cylinder, substantially as shown and described.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

STEPHEN D. TUCKER.

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