No. 667,714. Patented Feb. 12, 1901.

M. KOENIG.

AUTOMATIC APPARATUS FOR FEEDING SHEETS OF PAPER TO PRINTING MACHINES.

(Application filed May 15, 1900.)

(No Model.) 3 Sheets—Sheet 1.

FIG. 1.

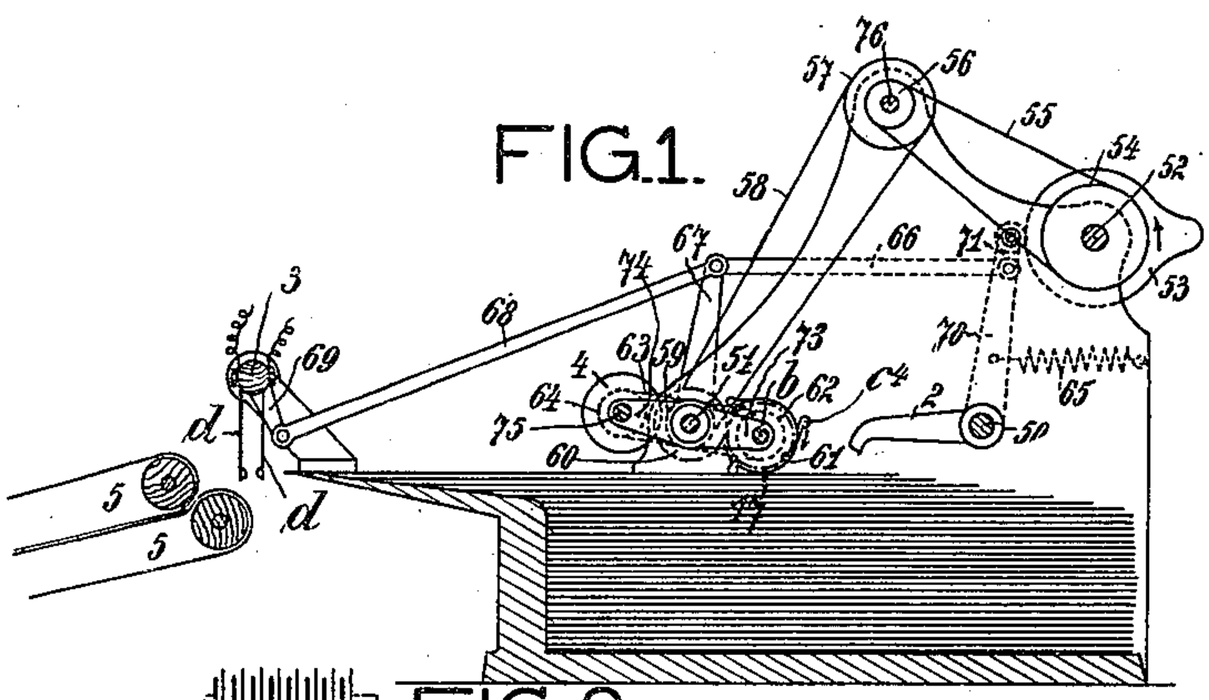


FIG. 2.

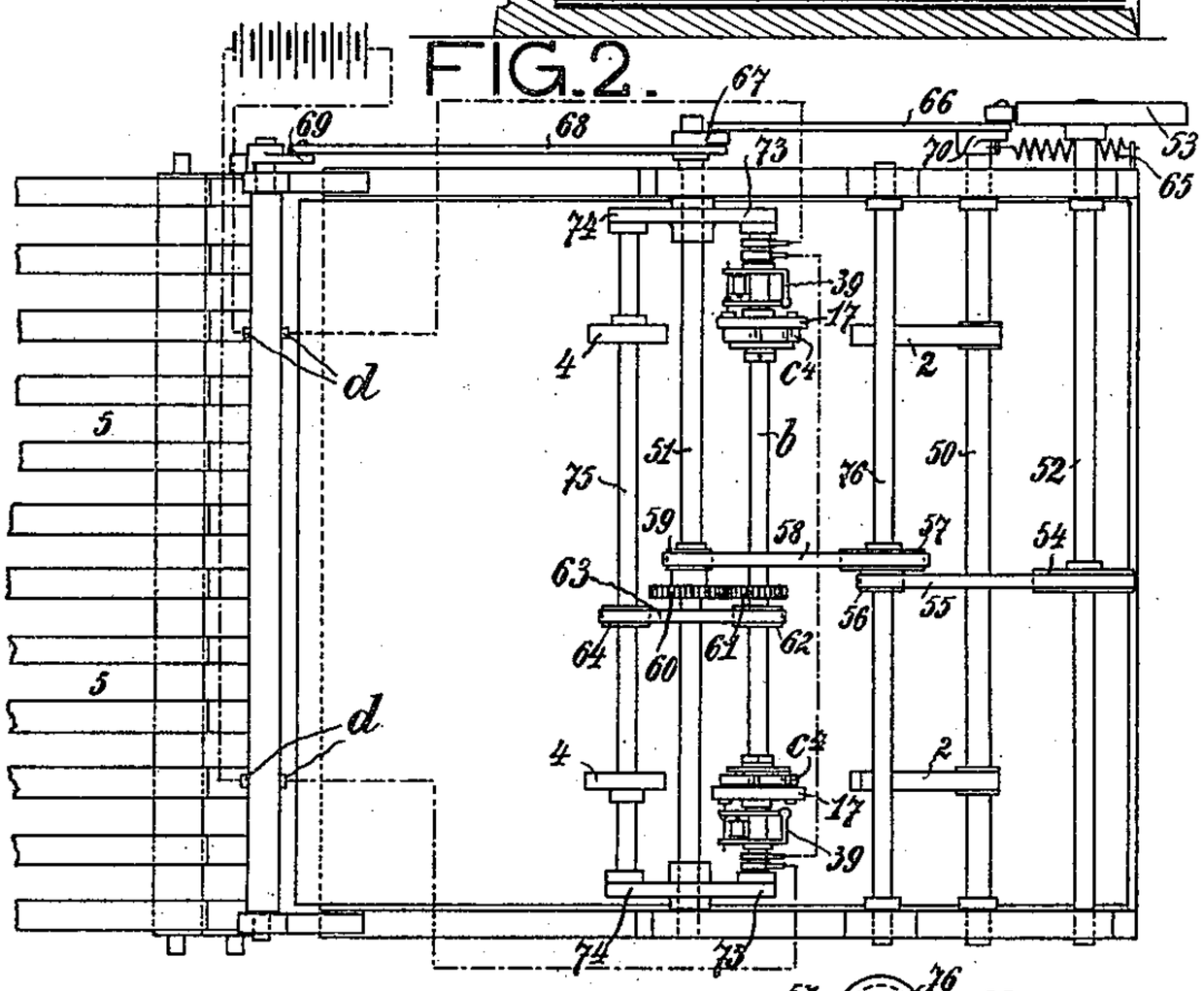
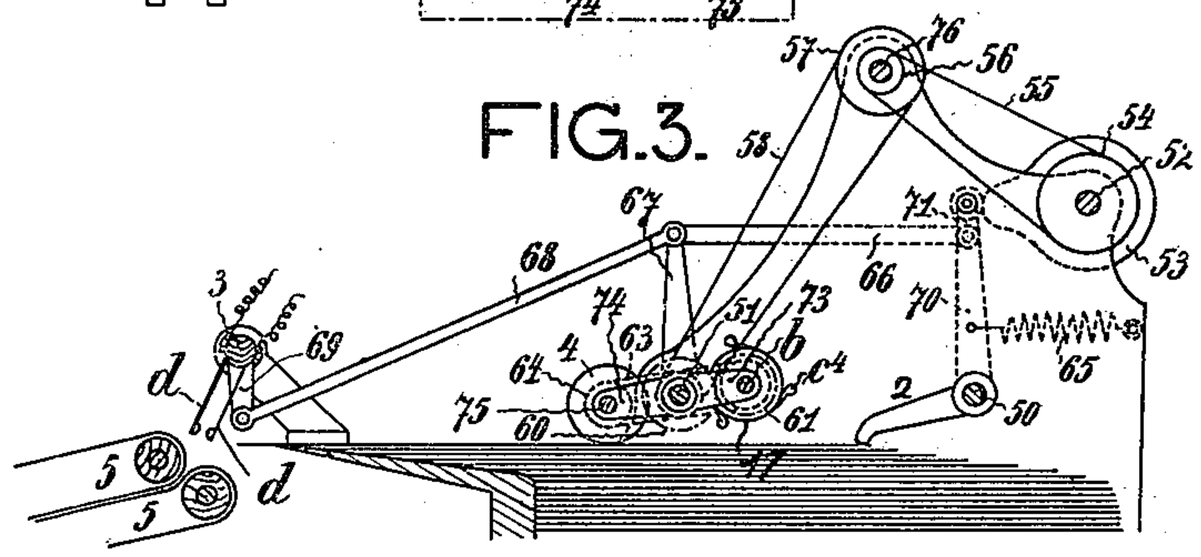


FIG. 3.



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(No Model.) 3 Sheets—Sheet 2.

FIG. 4.

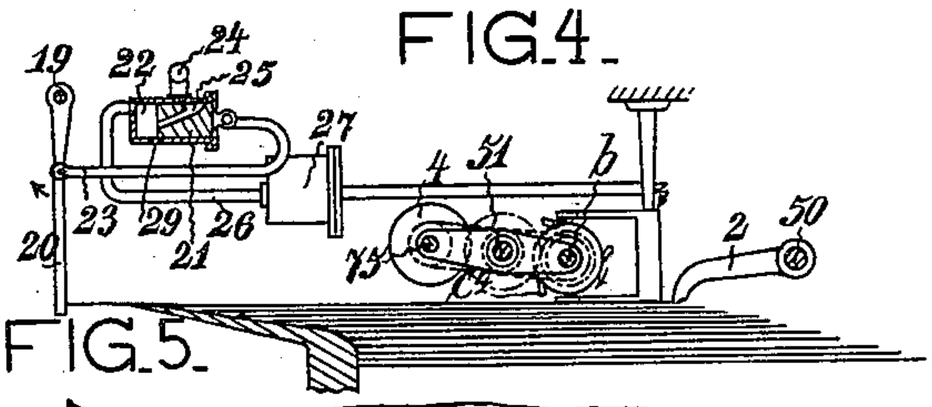


FIG. 5.

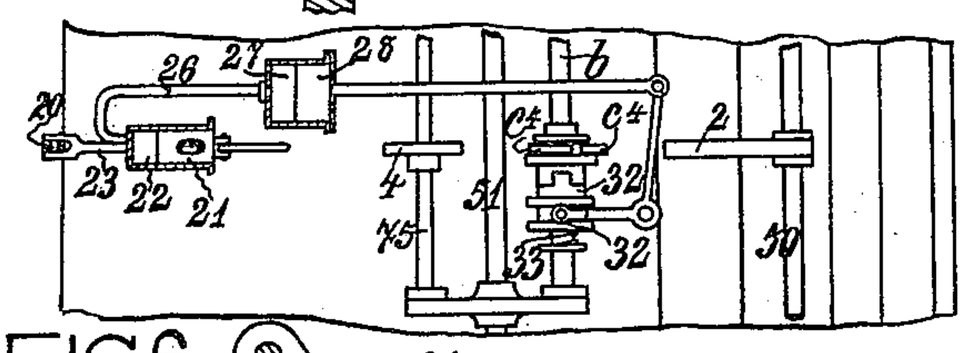


FIG. 6.

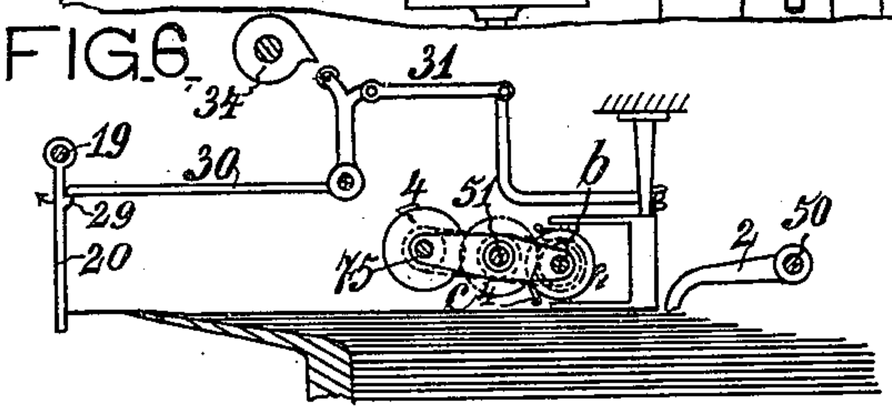
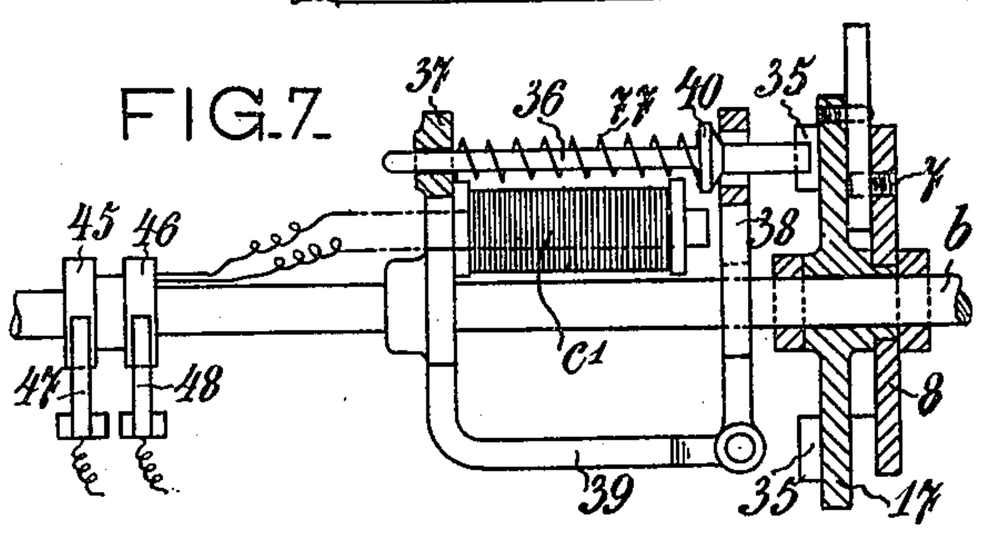


FIG. 7.



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(Application filed May 15, 1900.)

(No Model.) 3 Sheets—Sheet 3.

FIG. 8.

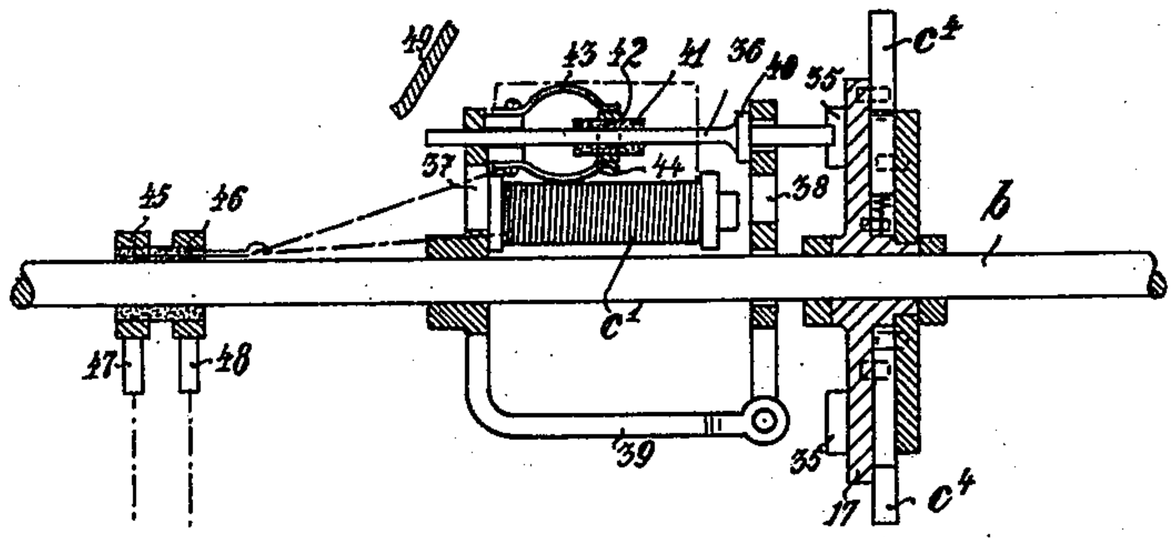


FIG. 9.

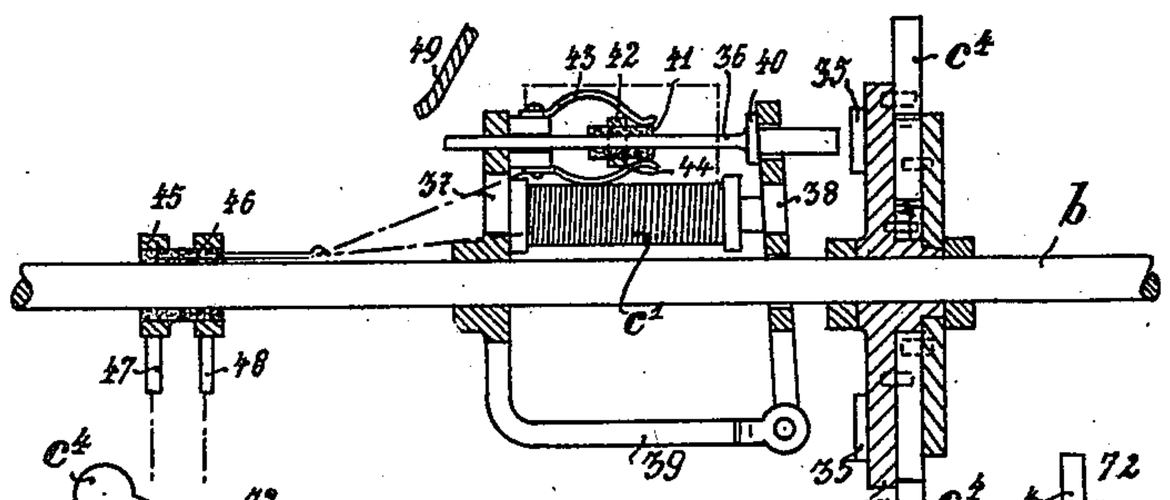


FIG. 11.

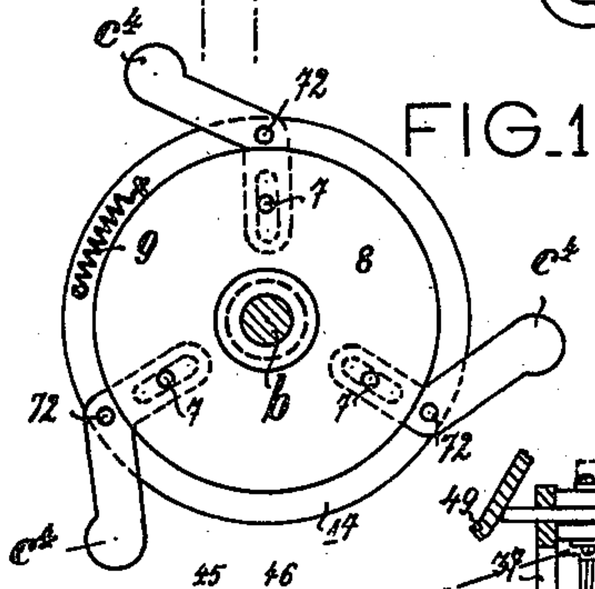


FIG. 12.

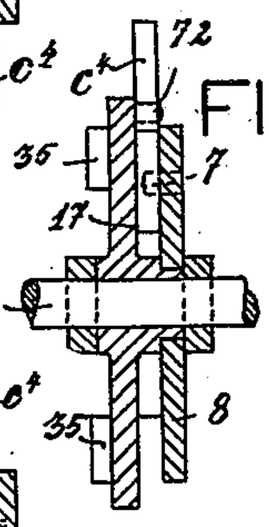
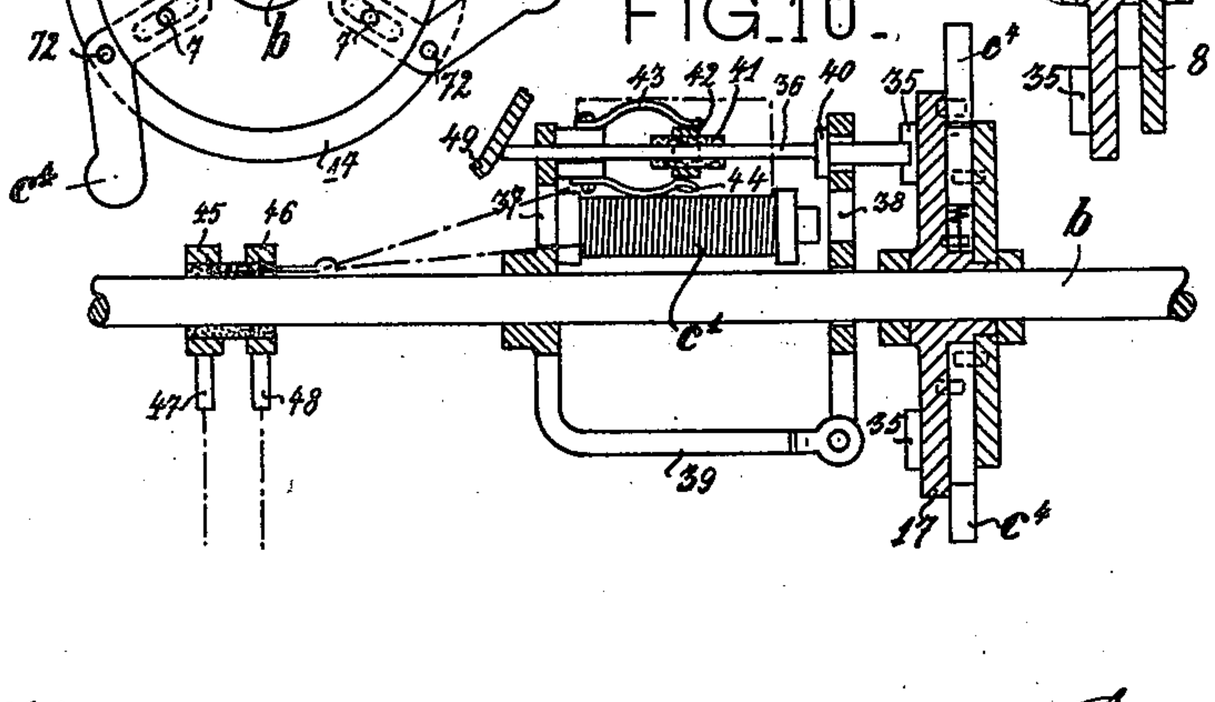


FIG. 10.



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Roedder & Briesen

UNITED STATES PATENT OFFICE.

MAX KOENIG, OF GUBEN, GERMANY.

AUTOMATIC APPARATUS FOR FEEDING SHEETS OF PAPER TO PRINTING-MACHINES.

SPECIFICATION forming part of Letters Patent No. 667,714, dated February 12, 1901.

Application filed May 15, 1900. Serial No. 16,732. (No model.)

To all whom it may concern:

Be it known that I, MAX KOENIG, a subject of the King of Prussia, German Emperor, residing at Guben, Prussia, Germany, have invented a new and useful Automatic Apparatus for Feeding Sheets of Paper to Printing-Machines, Calendering-Machines, Folding-Machines, and the Like, of which the following is a specification.

My invention relates to apparatus for feeding sheets of paper to quick-printing machines, calendering-machines, folding-machines, and the like of the kind in which the uppermost sheet of the pile is pushed forward by continuously rotating friction apparatus and a contrivance is put out of engagement by the sheet pushed completely forward and holds the friction apparatus at a standstill until the sheet that has been pushed forward is removed from the pile by means of one of the well-known laying-on arrangements.

Apparatus of the kind above indicated for feeding sheets of paper is described in the British Patent No. 7,168 of 1899. The apparatus therein described, however, does not always work with the requisite certainty of action. It happens frequently that several sheets are pushed forward at once. Moreover, the consumption of electric current for the contrivance which brings the friction apparatus to a standstill is considerable, owing to the length of time during which the current is closed, and thus only current which is produced by means of dynamo-electric machines can be employed. This in itself is sufficient to exclude the general employment of the sheet-feeding apparatus mentioned above.

The obviating of the before-mentioned drawbacks is the object of this invention, which is illustrated in a number of forms, shown by way of example in the accompanying drawings and described in the following specification.

The essential feature of the present invention is that the friction apparatus which pushes the top sheet is raised from the sheet after the latter has been brought to a standstill and in place thereof friction-rollers, which likewise continuously rotate, are lowered onto the sheet and at the same time an apparatus which keeps all the rest of the sheets firmly on the pile is set in operation.

In the drawings, Figure 1 is a side elevation with partial longitudinal section. Fig. 2 is a plan of one form of the new sheet-feeding apparatus in which the electric disengaging of the contrivance which stops the friction device is retained. Fig. 3 is a view similar to Fig. 1. Fig. 4 is a diagrammatic elevation, and Fig. 5 is a diagrammatic plan, of a form of the invention in which the friction device is actuated by a fluid under pressure. Fig. 6 is a diagrammatic elevation of a form of the invention in which the contrivance for stopping the friction device is disengaged by mechanical means. Fig. 7 is an enlarged longitudinal section of the form of the contrivance illustrated in Figs. 1 to 3 for stopping the friction device. Figs. 8, 9, and 10 are longitudinal sections in three different working positions of a modification of the contrivance shown in Fig. 7. Fig. 11 is an end view, and Fig. 12 is a longitudinal section, of a form of the friction device given by way of example.

In the form of the friction device shown in Figs. 11 and 12 the rubbers c^4 are but levers which oscillate around a pin 72, arranged near the circumference of a disk 17, loosely pivoted on the shaft b, that arm of each of the levers which does not come into contact with the sheet having a slot in which engages a pin 7, attached to a further disk 8, loosely pivoted on the hub of the disk 17. (See Fig. 12.) This disk 8 is constantly under the influence of a spring 9, Fig. 11, one end of which is attached thereto, while the other end is attached to the disk 17 in such a manner that it acts contrary to the rotation of the disk 8 caused by the rubber c^4 acting at the time. When the disk 17 is coupled to the shaft b in manner hereinafter described and is rotated together therewith, the rubbers c^4 when coming in contact with the paper will turn on their fulcrums 72. Thus the pins 7 of disk 8, which are engaged by the slotted ends of such rubbers, will tend to turn the disk 8 against the action of spring 9, and consequently a yielding pressure will be imparted to the rubbers c^4. This simple arrangement is employed in all the forms shown of the improved sheet-feeding apparatus. Several such friction devices are mounted, Figs. 1 to 3, on a common shaft arranged transversely above the pile of paper. The shaft b is

mounted in one arm 73 of a lever with two arms 73 74, which is fixed to a shaft 51, which is seated so as to oscillate in the frame. In the other arm 74 of this two-arm lever a shaft 75 is mounted, which has more than one—for example, two—friction-disks 4. To the shaft 51 an arm 67 is fixed, which is connected by means of a rod 66 with an arm 70. The arm 70 is attached to a shaft 50, arranged parallel to the shaft 51. The end 71 of the arm 70, furnished with a roller, is continuously pressed against a cam-disk 53 by the power of a spring 65. On the shaft 50 several—for example, two—pressing-arms 2 are seated, which being lowered onto the pile of paper serve for holding the sheets not pushed forward. The shaft 52 is continuously and uniformly rotated from the machine on which the sheet-feeding apparatus is arranged. It transmits its rotary motion by means of a belt-and-pulley gearing, consisting of a pulley 54, belt 55, and pulley 56, to an intermediate shaft 76. On the last-mentioned shaft is a pulley 57, which drives the shaft 51 by means of a belt 58 and a pulley 59. (See Fig. 2.) The pulley 59 is firmly connected with a spur-wheel 60 and rotates freely with the same on the shaft 51. The spur-wheel 60 engages with a second spur-wheel 61, seated on the shaft b of the friction device, and from the latter the rotary motion is transmitted by means of pulleys 62 and 64 and belt 63 to the shaft 75, which carries the friction-wheels 4. Thus the shafts b and 75 likewise continuously rotate.

The arrangement just described is precisely the same in the remaining two forms illustrated in Figs. 4 to 6, and therefore is partially not shown in those figures.

The contact-springs d d, against which the sheet is pushed forward by the friction apparatus c^4, are both attached to an oscillating shaft 3, made of non-electric-conducting materials. There are several of such springs. Two are shown for example. On the shaft 3 an arm 69 is fixed, which is connected with the arm 67 on the shaft 51 by means of a connecting-rod 68. As long as the top sheet pushed forward by the friction device c^4 has not reached the contact-springs d d the several parts of the apparatus are in the position shown in Fig. 1. If, however, the sheet strikes against the foremost of the contact-springs d, the current by means of which the friction device is stopped in a manner to be described farther on is closed. The cam-disk 53 presses the arm 70 into its other end position, Fig. 3, and thereby lowers the pressing-arm 2 onto the pile of paper, whereby the sheets not pushed forward are held. At the same time the shaft b, carrying the friction contrivances c^4, is raised, and the shaft 75, furnished with the friction-wheels 4, is lowered, so that these friction-wheels 4 now come into contact with the top sheet in order to push it on further. The contact-springs d d likewise swing forward under the influence of the cam-disk 53 and give a free path for the sheet to the guide (or feed) arrangement 5, by which it is conveyed to the laying-on apparatus. The friction contrivances c^4 are pivoted loosely on the shaft b. They are coupled with the shaft b by means of an electric magnetically-disengageable coupling. A coupling of the kind is illustrated in longitudinal section by way of example in Fig. 7.

On the free side of the disk 17 are projections 35, with which corresponds a pin 36, which is movable on its longitudinal axis, this pin being guided at one end in an immovably-fixed arm 37 on the shaft b, while the other end—that turned toward the disk 17—is loosely grasped by the armature 38 of the electromagnet c'. The armature 38 is linked to an arm 39, also immovably fixed on the shaft b and having the same hub as the arm 37. The armature 38, attracted by its electromagnet c', acts on a collar 40 on the pin 36 and draws the latter against the action of the spring 77 back out of the projections 35, when the circuit of the electromagnet c' is closed by the striking of the sheet of paper against the contact-springs d. Thereby the coupling between the friction apparatus and the shaft b is released. The supply of current to the electromagnet is effected by contact-rings 45 and 46 on the shaft b, insulated from the latter and from each other, and to which the current is conducted by means of contact-springs 47 or 48. This coupling arrangement has the advantage over that described in the patent referred to in the introduction, that it is disconnected more easily, and thus weak currents can be employed. With the modification of this coupling, which is illustrated in Figs. 8 to 10 in three different working positions, there is a further economy in the consumption of current. The arrangement of this coupling is substantially the same as that previously described. The spring 77, which presses the pin 36 into its working position, is omitted, and a cylindrical piece 41, made of insulating material, is attached to the pin 36. On the piece 41 a metal casing 42 is firmly arranged, on which two circuit-closing springs 43 44, insulated from each other, slide one against the other. One of these, 43, is connected with the one end of the electromagnet-coil and the other, 44, with the one slide-ring 45. The other end of the coil of the electromagnet is in direct connection with the second slide-ring 46. The slide-springs 43 and 44 (or one of the two) are so calculated that as long as the pin 36 is in engagement with the lie on the metal casing 42, as shown in Fig. 8, but projections 35 of the disk 17, the circuit-closers upon the pin 36 being drawn back by means of the armature of the electromagnet c', when the circuit of the latter is closed, they leave the casing 42, as shown in Fig. 9, whereby the current is again interrupted. The pin 36 remains in the drawn-back position, Fig. 9, until its free end, which projects from the seating in the arm 37, strikes

against a suitably-formed fixed detent 49 then projecting into its path and is pressed back thereby upon the shaft *b* being raised, Fig. 10. The other end of the pin 36 thereby comes again within the range of the projections 35 on the disk 17 and carries the last-mentioned along with it. Meanwhile the nose of the cam-disk 53 again releases the arm 70 and the apparatus resumes the position indicated in Fig. 1, whereupon the process commences afresh with the following sheet.

If an air-pump be available, the arrangement illustrated in elevation in Fig. 4 and in Fig. 5 in plan is employed for stopping the friction device. Two levers 20, pivoted to a fixed pin 19 and which replace the contact-springs *d d*, Fig. 1, are placed before the edge of the top sheet and connected by means of a rod 23 with the piston 21 of a small cylinder 22. (Shown in the drawings on an enlarged scale.) In the position of rest the pipe 24 of the cylinder 22 is closed by the piston 21. The last-mentioned, however, has a peculiar boring 25, which will be seen from Fig. 4, and is connected with the interior of the cylinder by means of a small channel. If the pipe 24 be connected with an air-suction pump and the lever 20 turned somewhat in the direction of the arrow, Fig. 4, by the sheet pushed forward by the rubber arrangement, the piston 21 is pushed somewhat inward, whereby the pipe 24 is connected with the interior of the cylinder. Thereby a partial vacuum is produced in the cylinder, which completely draws in the piston 21, further rotates the lever 20, and thus sets the edge of the paper free. At the same time the rubber arrangement (friction device) is momentarily stopped in consequence of the connecting with the bottom of the cylinder of a pipe 26, which runs to a second somewhat-larger cylinder 27, the piston 28 of which is driven inward through the vacuum created and by means of a simple lever mechanism disengages the coupling 32, and thus breaks the connection between the rubber arrangement c^4, Fig. 4, and the shaft *b*, whereby the former is brought to a standstill. In order that any deficiency as regards impermeability of the piston 21 may be rendered harmless, a small air-hole is made at 29, which is at once closed by the piston when moving out of the position of rest. The starting position of the whole apparatus is obtained by the introduction at the suitable movement of air under pressure through the pipe 24. The stopping of the friction device can, however, be also effected by purely mechanical means, as shown by way of example in Fig. 6. This arrangement, nevertheless, can only be employed with machines which do not work with too thin paper, as such paper is not capable of exercising a suitably-strong pressure with the edge. The levers 20, which replace the contact-springs *d d*, Fig. 1, are seated so as to rotate easily at 19. A hardened additional piece 29 serves as support to the point of a bent lever 30. The lever 30 is connected by a rod 31 with the clutch-coupling 32, which impels the friction device c^4, Fig. 5. If the lever 20 be turned in the direction of the arrow, Fig. 6, by the edge of the paper, the bent lever 30 falls away from 29, and the connecting-rod 31 disengages the coupling 32, which is under the influence of a spring 33, whereby the friction device is stopped. The starting position is reproduced by means of a suitable cam-disk 34, the bent lever 30 being again turned until it is held by the piece 29.

What I claim, and desire to secure by Letters Patent, is—

1. In an automatic paper-feeding apparatus, the combination of an oscillating shaft 51, with a pair of rotating shafts *b*, and 75, connected thereto, friction devices mounted upon the rotating shafts, pressing-arms 2, and means for operatively connecting said arms to the oscillating shaft, substantially as specified.

2. The combination of an insulating-shaft 3, with contact-springs *d*, mounted thereon, and with friction-disks 4, and pressing-arms 2, operatively connected to said shaft, substantially as specified.

3. A friction contrivance consisting of a disk 17 pivoted loosely on the shaft *b* on the hub of which disk rotates another disk 8 furnished with pins 7 which engage in slots of the bent levers forming rubbers c^4, which oscillate around pins 72 in the disk 17, the disk 8 being under the influence of a spring 9 fixed on the disk 17, substantially as described.

4. An electromagnetically-detachable coupling of the friction contrivance c^4 with the shaft *b*, consisting of an electromagnet *c'*, which like its armature 38, is arranged in arms 37 or 39 immovably fixed to the shafts *b*, the oscillating armature 38 acting against a collar 40 of a spring-pin 36, one end of which is guided in the arm 37 and the other projects into the path of the projections 35, arranged in the disk 17 of the friction contrivance when the armature is not attracted, substantially as described.

5. An electromagnetic coupling in which a cylindrical piece made of insulating material with a metal casing 42 is fixed on the pins 36 on which casing two contact-rings 43 and 44 lie opposite to and insulated from each other, one of which 43 is connected with the one end of the coil of the magnet *c'* and the other with the ring 45, both (or one) of which are so calculated that, when the pins 36 are drawn back by the armature 38 they leave the casing 42, substantially as described.

6. The combination in a paper-feeding machine of an oscillating frame with front and rear feed-disks carried thereby, a contact in the path of the top sheet, and a connection between said contact and the rear feed-disk whereby said disk is uncoupled from its shaft when the contact is engaged by the sheet, substantially as specified.

7. The combination in a paper-feeding machine of an oscillating frame with front and rear feed-disks carried thereby, a pressure-arm adapted to engage the pile back of the rear feed-disk, a contact in the path of the top sheet, means for withdrawing said contact from the path of said sheet, and a connection between said contact and the rear feed-disk whereby said disk is uncoupled from its shaft when the contact is engaged by the sheet, substantially as specified.

In witness whereof I have hereunto set my hand in presence of two witnesses.

MAX KOENIG.

Witnesses:
GUSTAV POTTIUS,
J. D. MURPHY.