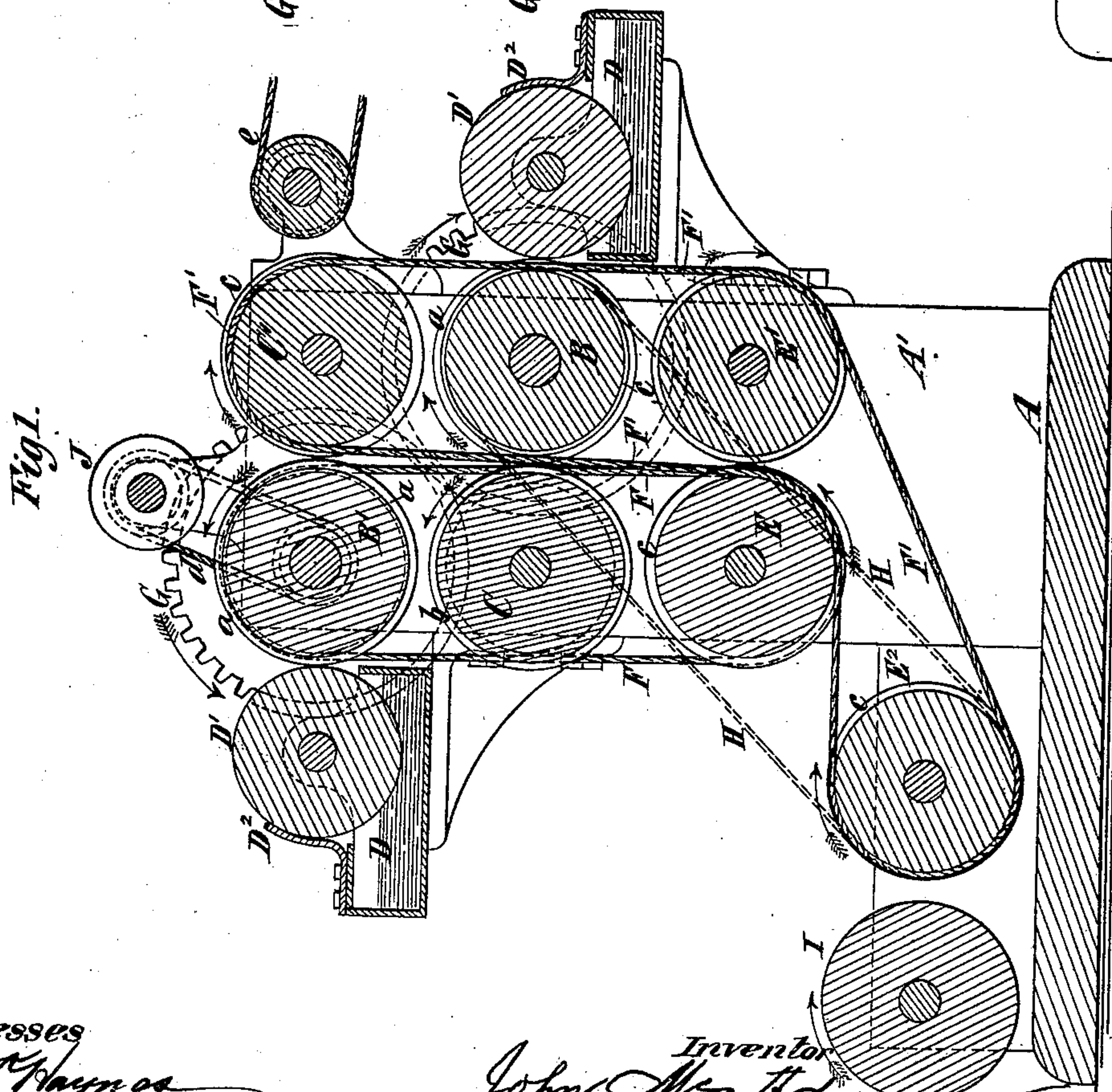
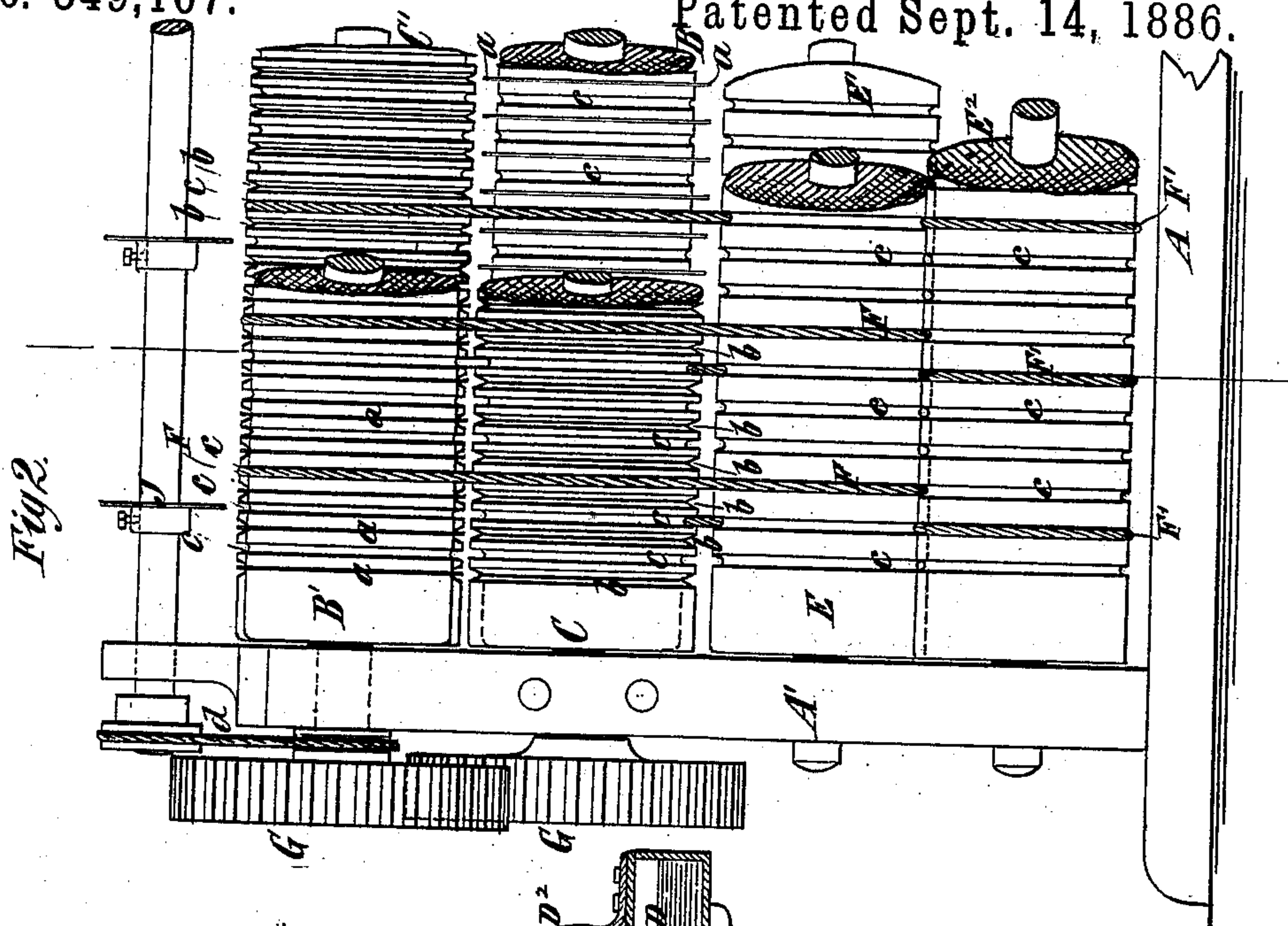


(No Model.)

J. McADAMS.
PAPER RULING MACHINE.

No. 349,167.

Patented Sept. 14, 1886.



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UNITED STATES PATENT OFFICE.

JOHN McADAMS, OF BOSTON, MASSACHUSETTS.

PAPER-RULING MACHINE.

SPECIFICATION forming part of Letters Patent No. 349,167, dated September 14, 1886.

Application filed August 15, 1883. Serial No. 103,791. (No model.)

To all whom it may concern:

Be it known that I, JOHN McADAMS, of the city of Boston, in the county of Suffolk and State of Massachusetts, have invented a new and useful Improvement in Paper-Ruling Machines, of which the following is a specification.

My invention relates to ruling-machines for performing what I term "line-printing," and in which the ruling or printing is produced by printing-disks operating in conjunction with an impression cylinder or roller, between which and the printing-disks the paper is passed. Such a machine may be used for ruling or printing cross-lines, and all lines which extend from edge to edge of the sheets of paper and are not stopped at head or column lines.

In the machines of this class heretofore employed an impression-cylinder having a smooth surface has been used, and it has been necessary to make said impression-cylinder of large diameter, say two or three feet, in order that any ink or color delivered on its surface by the printing-disks when there is no paper between said cylinder and disks may have an opportunity to dry, this being necessary in order to avoid smutting the sheets.

The principal objects of my invention are to enable the impression cylinders or rollers to be made of small size without danger of smutting the sheet, and to provide a very compact and simple apparatus, which may be used as a separate machine, or used as an attachment for ruling the cross-lines in a ruling-machine in which pens are used for the ruling of the column-lines.

The invention consists in the combination, with a printing-roller provided with printing-disks, of an impression cylinder or roller provided with grooves opposite the disks. The grooves opposite the disks allow the disks to exert a yielding pressure upon the paper, the paper itself being free to yield by reason of space afforded by the grooves, and the grooves also prevent the inking of the impression cylinder or roller when no paper is upon it. I preferably also employ with the printing-disks an inking-roller rotating in contact with them for delivering ink upon them. The two rollers are provided with grooves for carrying strings, the grooves in the printing-roller be-

ing between the disks, and those in the impression-roller being between the grooves which are opposite the disks.

The invention also consists in the combination, with two printing-rollers provided with printing-disks arranged to print or rule opposite sides of the paper, of impression cylinders or rollers arranged opposite the two printing-rollers and provided with grooves opposite the disks. The lines ruled by the first series of disks come opposite the grooves in the second impression-roller, and hence the smutting of said lines is prevented. I preferably arrange one series of disks and impression-roller above the other series of disks and roller, and the carrying tapes or cords carry the paper in an upward direction, and thus the ruling is effected without any bending of the paper.

In the accompanying drawings, Figure 1 is a vertical transverse section of a ruling or line-printing apparatus embodying my invention, and Fig. 2 is a front elevation of one end portion thereof.

Similar letters of reference designate corresponding parts in both figures.

The apparatus here represented is intended to form an attachment to a ruling-machine, and to be so connected therewith that it will receive the paper after the column-lines have been ruled, and after ruling the cross-lines will deliver the paper to carrying tapes or bands, which conduct it from the apparatus; but the same or a very similar apparatus may be used for ruling paper requiring only cross-lines.

A designates the base-frame, and A' designates the end frames or uprights, of the apparatus.

In the end frames or uprights, A', are journaled four rollers or cylinders, B B' C C', whereby the ruling or line-printing is performed, and the rollers or cylinders B' C' are arranged above and vertically in line with the rollers or cylinders B C. The rollers or cylinders B B' are each provided with a series of thin printing-disks, a, set at the desired distance apart, and the roller or cylinder may be made up of the required number of the disks a and intermediate spacing pieces or blocks, all secured together upon a shaft or arbor by means of a nut and end flanges, or otherwise.

The impression rollers or cylinders CC' each

consists of a plain roller or cylinder provided opposite the disks a of its companion roller or cylinder, B or B', with grooves b , so that when a sheet of paper is passed between the pair of rollers or cylinders the disks a of the printing-roller will bear on the paper directly opposite the grooves b of the impression-roller. The grooves allow the paper itself to yield slightly, and consequently the disks act with an elastic or yielding pressure upon the paper. As the disks are opposite the grooves b of the impression-rollers they never bear on the surface of said rollers, even when no paper is being ruled, and consequently the said rollers will not become smutted with ink or color. It will also be observed that the lines produced on one side of the sheet by the disks a of the lower roller, B, come opposite the grooves b of the upper impression-roller, C', and hence the lines first ruled cannot be smutted while ruling the lines on the opposite side of the paper.

Adjacent to each printing or ruling roller is placed an ink or color feeder consisting of a trough, D, and a fountain-roller, D', therein. Each roller D' has a wiper, D², applied to it, and the rollers D' turn in contact with the disks a of the rollers B B'. These fountain-rollers may be positively driven or they may turn by contact with the disks.

Below the rollers B C are arranged two tape or string rollers, E E', and in front of the machine is journaled a third tape or string roller, E².

F F' designate two sets of tapes or strings for carrying the paper between the printing and impression rollers. The strings F are carried around the rollers B' E and the strings F' are carried around the rollers E² C', and are deflected by the rollers E E' from a lateral to a vertical direction. The several rollers are all provided with grooves c for the strings F F', and in the printing-rollers B B' these grooves lie between the disks a , while in the impression-rollers they lie between the grooves b . As here shown, the two printing-rollers B B' are geared together by spur-wheels G, and are operated by a belt and pulley, or by any other system of gearing. I have also shown the string-roller E² as driven by a belt, H, from the lower printing-roller, B, and the two sets of strings F F' are therefore driven positively, and impart motion to the two impression-rollers C C'.

It will readily be understood that inasmuch as there is no liability of inking the impression-rollers the latter, as well as the printing-disks a , may be of small diameter. Indeed, they may be even as small as is represented in the drawings, supposing the drawings to be full size; hence it will be seen that I provide a very compact apparatus, which may be made at such small cost that an apparatus complete in itself may be used for each set of lines, and when the apparatus is used as an attachment

to a pen-ruling machine it may be detached and removed and another apparatus for a different set of lines quickly substituted.

When the apparatus is employed as an attachment to a ruling-machine, the paper after the column-lines are ruled is delivered over a roller, I, onto the strings F', and is carried upward between the printing-disks and impression-rollers. As the ruled sheet is delivered from the upper rollers, B' C', it comes in contact with a shedder, which consists of a roller, J, driven by a belt, ℓ , from the printing-roller B', and by this shedder the paper is directed over to the right and upon the tapes or strings e , which deliver it to the part of the ruling-machine for producing the head-lines.

I am aware that it is not new to employ in connection with ordinary ruling-pens a roller which supports the paper under the pens and is grooved opposite the pens; and I am also aware that printing-disks have been used in connection with an impression-roller having a straight surface destitute of grooves. I do not therefore claim either of the above combinations as of my invention. When ruling-pens are employed, their points must be on or near the periphery of the roller and spring against the paper or act with elasticity on the paper; but in a line-printing machine having disks the peripheries of the disks always occupy exactly the same position, and to get a full and perfect line it is necessary that the paper shall spring against and bear with elasticity against the peripheries of the disks. This I accomplish by forming grooves in the impression-roller opposite the disks and arranging the disks and impression-roller so that the paper will, by its spring, maintain constant contact with the disks.

In line-printing machines heretofore known, and which employ disks in connection with a smooth-surfaced roller destitute of grooves, the disks have of necessity been arranged with their edges removed from the roller only the thickness of a sheet of paper, and in order to prevent the disks from inking the roller when no paper is in the machine it has been necessary to apply the ink to the disks by a wiper, or to print with a "wiped line," and hence the printed line is always apt to be a broken one. This fact has prevented such line-printing machines from coming into general use. With such a machine it is impossible to "flood" the disks or print with a flooded line. When the roller is grooved as described by me—the grooves being opposite the disks—the disks may be flooded with ink or print a flooded line which will be solid and perfect and without a break.

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

1. The combination, with a printing-roller provided with disks for line-printing, of an oppositely-arranged impression-roller provided with grooves opposite said disks, where-

by a flooded line may be printed without danger of inking the impression-roller, substantially as and for the purpose described.

2. The combination, with a printing-roller provided with disks for line-printing, of an inking-roller turning in contact with the peripheries of the disks, and an impression-roller arranged opposite the printing-roller and provided with grooves opposite the disks, whereby a flooded line may be printed without danger of inking the impression-roller, substantially as herein described.

3. The combination, with a printing-roller provided with disks for line-printing and with grooves for carrying tapes or strings between the disks, of an oppositely-arranged impression-roller provided with grooves opposite said

disks, and with other grooves opposite the grooves in the printing-roller for tapes or strings, substantially as and for the purpose described.

4. The combination, with two printing-rollers provided with disks for line-printing, arranged to print or rule on opposite sides of the paper, of impression-rollers arranged opposite the two printing-rollers and provided with grooves opposite the disks of said printing-rollers, substantially as and for the purpose described.

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Witnesses:

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