

(No Model.)

4 Sheets—Sheet 1.

J. H. BUXTON, D. BRAITHWAITE & M. SMITH.
PRINTING MACHINE.

No. 407,393.

Patented July 23, 1889.

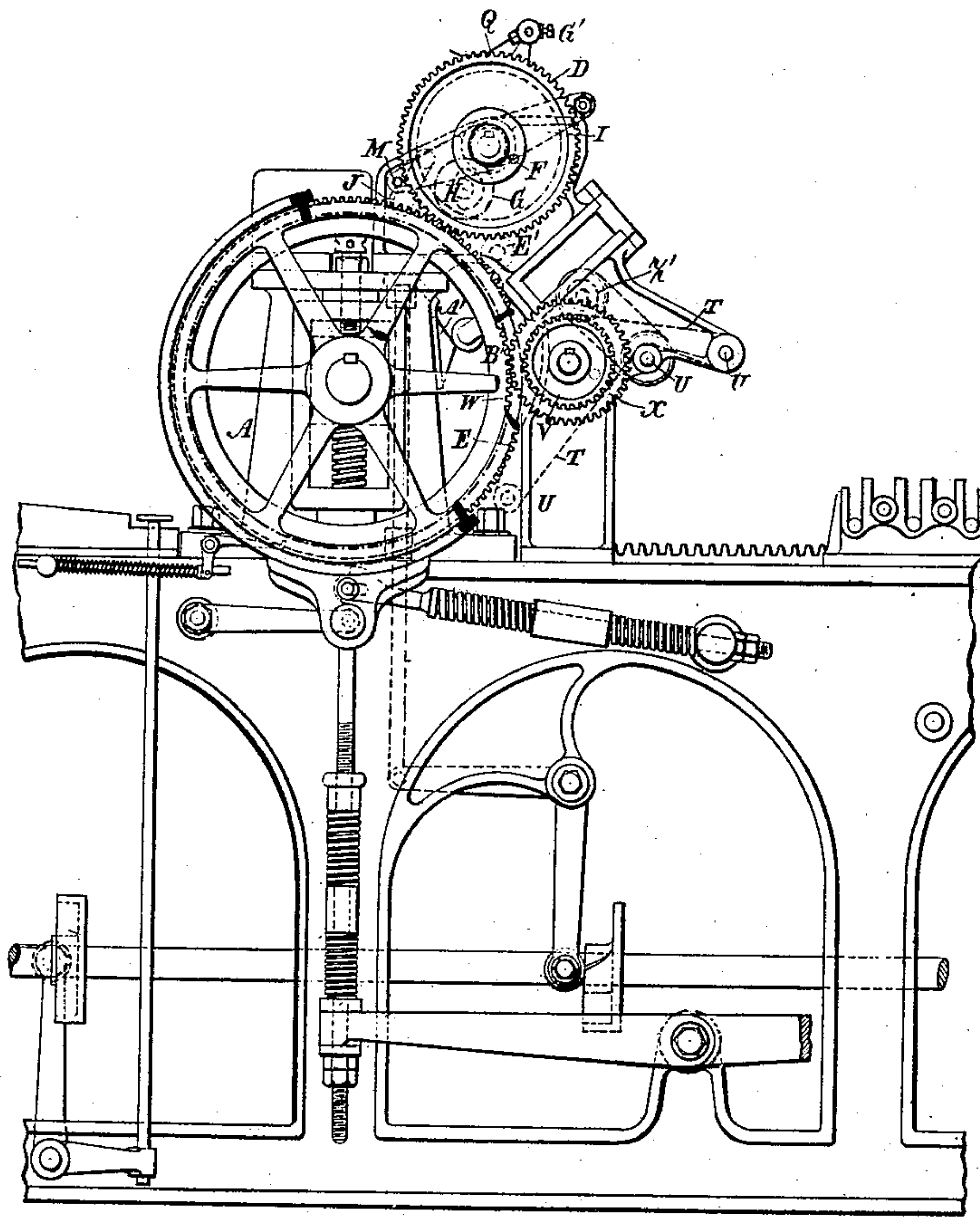


Fig. 1.

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by their Atty *W. D. Johnston*

(No Model.)

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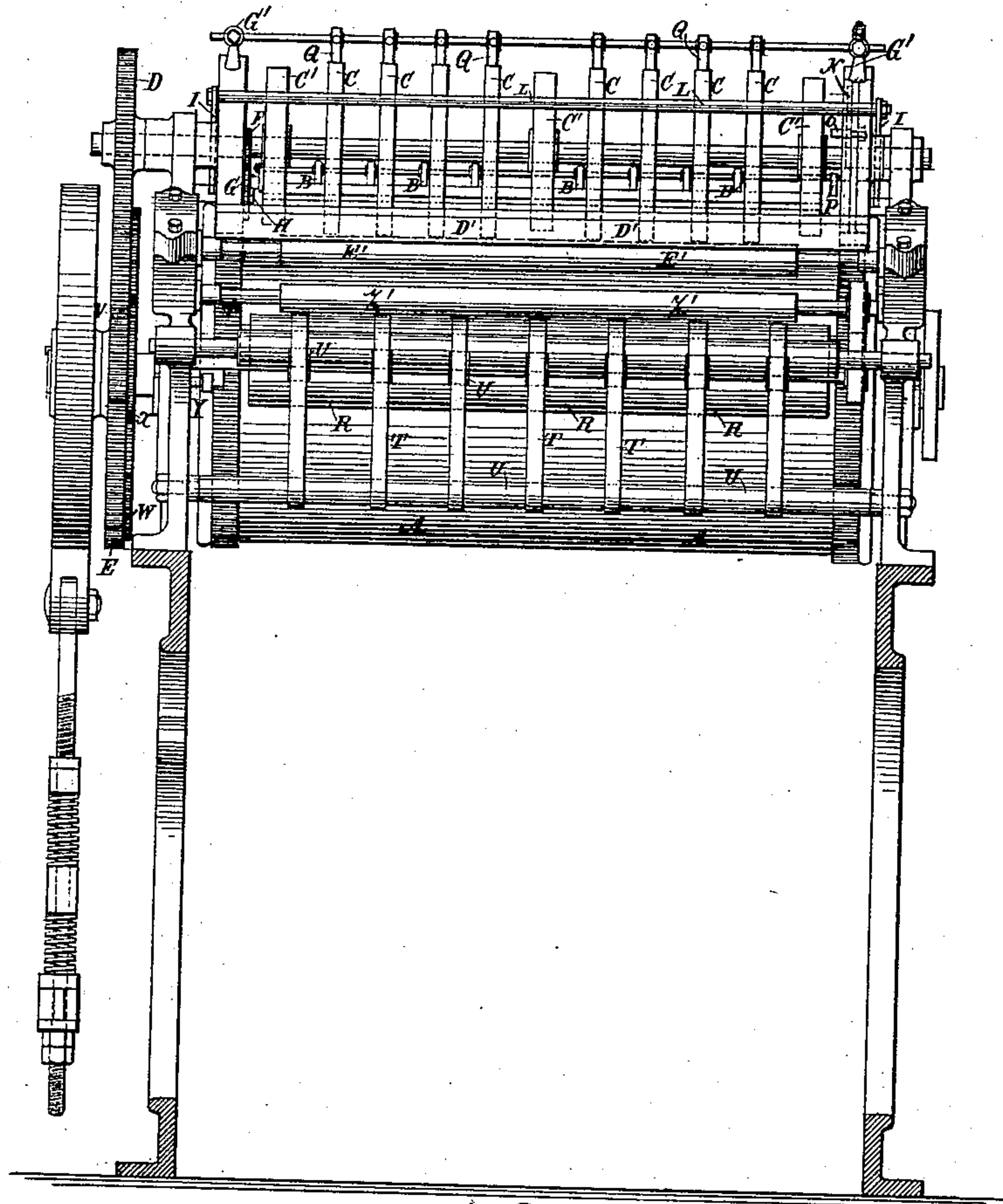


Fig. 2.

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(No Model.)

4 Sheets—Sheet 3.

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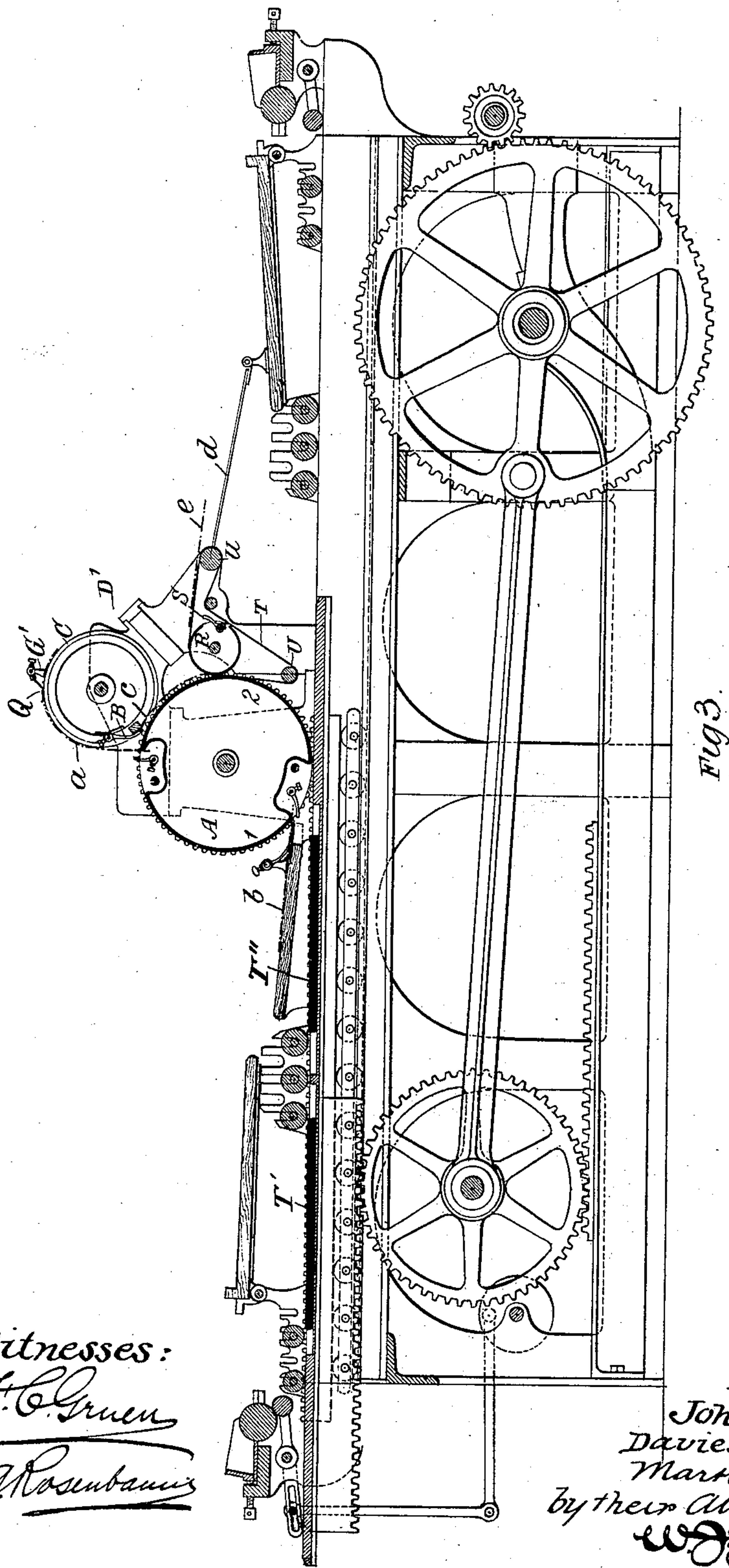


Fig. 3.

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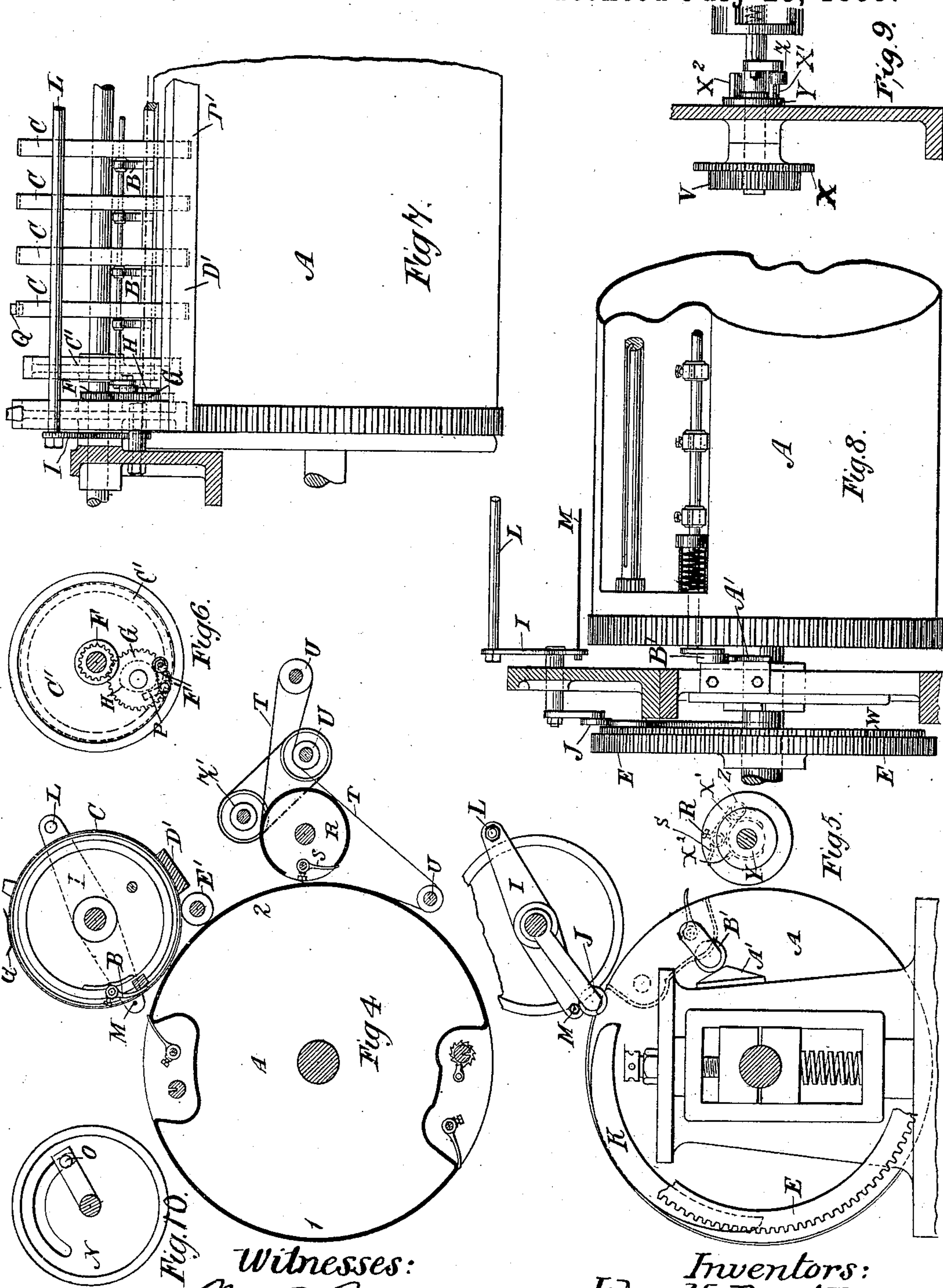
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4 Sheets—Sheet 4.

J. H. BUXTON, D. BRAITHWAITE & M. SMITH.
PRINTING MACHINE.

No. 407,393.

Patented July 23, 1889.



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UNITED STATES PATENT OFFICE.

JOHN H. BUXTON, DAVIES BRAITHWAITE, AND MARK SMITH, OF
MANCHESTER, COUNTY OF LANCASTER, ENGLAND.

PRINTING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 407,393, dated July 23, 1889.

Application filed February 9, 1888. Serial No. 263,540. (No model.) Patented in England December 10, 1884, No. 16,201, April 20, 1886, No. 5,469, and November 22, 1887, No. 16,022.

To all whom it may concern:

Be it known that we, JOHN HENRY BUXTON, DAVIES BRAITHWAITE, and MARK SMITH, all subjects of the Queen of Great Britain, and
5 all residents of Manchester, in the county of Lancaster, England, have invented certain new and useful Improvements in Printing-Machines, of which the following is a specification.

10 This invention relates to typographic and similar printing machines having a single "impression-cylinder," and in or by means of which a sheet of paper may be imprinted upon both its sides or surfaces during its
15 passage through the machine. Such a machine is commonly known as a "perfecting-machine."

In a machine to which these improvements relate the impression-cylinder has two gaps
20 diametrically opposite to each other, and in each of these gaps there is a set of grippers. Upon the axis of the impression-cylinder there is fixed a spur-wheel. The printing surface or surfaces—such as forms of type—
25 are carried upon a reciprocating table, upon which there is fixed a longitudinal rack, which is so constructed and arranged that its teeth are capable of gearing with the teeth of the spur-wheel on the axis of the impression-cyl-
30 nder. The impression-cylinder is operated so as to be driven or rotated through one complete revolution during the backward stroke of the reciprocating table and to remain stationary during the forward stroke.
35 The sheet of paper to be imprinted is fed to and gripped upon the impression-cylinder. After being imprinted on one side the sheet of paper is removed from the cylinder, reversed, and refed to the following portion of
40 the impression-cylinder by means of apparatus and devices to be hereinafter described, and after being imprinted upon the other side it is removed from the cylinder by means of a delivering apparatus. During the period
45 of rest of the impression-cylinder, therefore, a sheet of unprinted paper is fed to the lower set of grippers by hand in the usual manner, and at the same time a sheet of paper which has already been printed upon one side is fed
50 to the upper set of grippers by the reversing

and refeeding apparatus, and it follows that for every revolution of the impression-cylinder a sheet of paper is imprinted upon both its surfaces.

We have appended hereto four sheets of
55 drawings, and hereinafter make reference to the various figures thereon.

In each of the figures similar parts or elements, when they are represented, are distinguished by similar letters of reference. 60

Figure 1 is a side elevation, and Fig. 2 is an end elevation, of a portion of a perfecting-machine having these improvements applied thereto. Fig. 3 is a longitudinal section of the machine. Figs. 4 to 10, inclusive, repre-
65 sent various elements or details of these improvements.

Above the impression-cylinder A we mount a set of rotating grippers B, which intermittently revolve in one direction within a series
70 of fixed rings C, all of which are concentric with the path of rotation of the grippers B. These fixed rings are mounted or secured upon a bearer D', which is attached to and carried by the framing of the machine. The
75 spindle or axis upon or with which the grippers rotate has secured to it a pinion D, which gears with a wheel E, fixed upon the spindle or axis of the impression-cylinder. The wheel E has twice as many teeth as the pinion, so
80 that the rotary grippers make two complete revolutions for each complete revolution of the impression-cylinder. Upon the axis of the rotary gripper there is also secured a second pinion F, which gears into a wheel G upon a
85 fixed axis. This wheel carries a tappet or cam H, and has twice as many teeth as its pinion, and consequently the tappet on the wheel makes one revolution for two revolutions of the rotary grippers. As the tappet
90 H operates the grippers B, it results that as the gripper-bowl and the tappet coincide at alternate revolutions only, the grippers will be operated at every second revolution only, and therefore also at every complete revolution
95 of the impression-cylinder. Methods of operating grippers in printing-machines are well understood and are adopted by us. Thus at the end of the gripper-bar there is fixed an
100 arm F', carrying a bowl, which at the desired

moment moves over a fixed projection, or is operated by a cam, tappet, or similar device H. The grip of the grippers upon the paper is maintained by known means, such as a spiral spring or other equivalent and similar device.

Upon each end of the rotary gripper-shaft there is freely mounted a lever I, upon the pivot of which is mounted, so that it may rotate, a bowl J, and upon one of the wheels on the impression-cylinder shaft there is fixed a cam K, so that for every revolution of the impression-cylinder a slight angular motion is given to the levers I, which are connected together by the rod L. The ends of the levers I opposite to the connecting-rod L are connected by a cord or wire M, and the cam K is so constructed and arranged that the cord or wire M is moved just before the impression-cylinder stops, so as to throw the free edge of the paper which has been released by the rotary grippers over the gap in the impression-cylinder in a position to be seized by its grippers. This cord or wire M is not essential and may be omitted. When used, it simply acts as a secondary means for insuring the seizure of the paper by the grippers.

At one end of the rotary grippers there is fixed upon the bearer D' a plate or disk N, Fig. 10, having a curved slot concentric with the path of the grippers. In this slot there is a stud or finger O, which may be secured in the slot in any desired position. At the same end there is attached to the gripper-shaft of the rotary grippers a lever, arm, or tappet P, which, coming into contact with the finger O, operates to instantaneously release the grippers, and consequently also to release the sheet of paper held by them. The position of the finger O is adjusted so that the grippers are released when the free end of the sheet of paper held by them arrives in a position to be seized by the grippers of the impression-cylinder. Light flat springs Q, attached to the fixing G', or equivalent straps, tapes, or other supports, may be mounted so as to press lightly upon or partly around each of the fixed rings C, to hold or support the paper thereon during its reversal. The combination and arrangement of elements and devices just described constitute the apparatus for removing the paper from the impression-cylinder after it has been imprinted upon one side, for reversing the paper, and for refeeding it to the impression-cylinder to be imprinted on the other side.

The operation of this apparatus may be described with reference to Fig. 3 and to the diagram Fig. 4. The impression-cylinder A has two imprinting-surfaces 1 and 2. Assuming that the impression-cylinder A has come to rest during the forward stroke of the reciprocating table of the machine, there will be a sheet of paper *a* printed upon one side on the rings, which sheet has been removed from the impression-cylinder grippers by the rotary grippers during the previous revolu-

tion of the impression-cylinder. This sheet lies over the fixed rings, with its edge in a position to be seized by the grippers in the upper gap of the impression-cylinder.

Simultaneously a plain sheet of paper *b* is fed to the grippers of part 1 of the impression-cylinder. Upon the starting of the impression-cylinder the two sheets of paper are taken by its grippers, and during the complete revolution they are imprinted, the plain sheet *b* upon its outer surface and the sheet *a*, already printed upon one side, upon its other surface. The reversal of the sheet by the reversing apparatus is consequent upon the action of the rotary grippers B. These seize the sheet of paper which has just been printed on one side by its leading edge—that is to say, by the edge just released from the impression-cylinder grippers—and carry it over the fixed rings until its back edge is in a position to be seized by the impression-cylinder grippers when next they come round. The unprinted sheets of paper are always seized by the grippers of the part 1 of the impression-cylinder, and the sheets upon the rings C, which have already been printed upon one side, are always seized by the grippers upon part 2 of the impression-cylinder. The release of the paper at the proper moment is effected by the finger O' in the curved slot, as already described. The paper is maintained in contact with the impression-cylinder after it is released by the grippers by means of the roller E'.

An apparatus for removing the perfected sheets from the impression-cylinder is shown in the drawings, Figs. 2, 4, 5, and 9. This is placed below the reversing and refeeding apparatus.

R is a cylinder carrying the grippers S. A series of endless tapes T T pass over and in contact with the cylinder R and around the rollers U U, which are thus driven by the tapes from the cylinder R, which is driven by means of a pinion V, fixed upon its shaft. This pinion has one-fourth of the number of teeth contained on the wheel E, and consequently revolves four times for every revolution of the impression-cylinder, to the shaft of which wheel E is fixed. Upon the shaft of the impression-cylinder another wheel W is fixed, which gears into a second pinion X, loose upon the shaft of the cylinder R. The wheel and pinion W X have respectively such a number of teeth that pinion X makes three revolutions for every revolution of the impression-cylinder and for every four revolutions of the pinion V. Therefore any given points upon each of the pinions X V will coincide at every fourth revolution. The pinion X is provided with a long boss carrying the cam or tappet Y, which operates a bowl Z, fitted on an arm secured to the gripper-shaft, and therefore actuates the grippers. Since a given point on the pinion X coincides with a given point on the pinion V once only for every complete revolution of the impression-cylinder,

der, it is obvious that if those two points are the cam Y and the bowl Z the gripper will be operated at the like intervals. The cam is adjusted so that the grippers seize the leading edge of the perfected sheet on the impression-cylinder as soon as it comes within their range, and by its rotation carries the sheet upon the endless traveling tapes T T, from which it is removed by the ordinary "fly" or "gate" d. If the grip of the grippers S is not quickly released, it will tend to be carried around with them, instead of being carried forward by the tapes. This release is effected by the cam Y on the boss of the pinion X, which is double-acting, as shown in Figs. 5 and 9. The cam has two swells or projections, of which the leading one X' opens the grippers to receive the perfected sheet from the impression-cylinder, and the following one X² to release the sheet immediately on its leading edge passing between a roller Z' above the taking-off cylinder upon the tapes.

The grippers of the impression-cylinder are released for the removal of the perfected sheet by means of a fixed projection A', Fig. 5, against which a bowl carried by an arm B', fixed to the gripper-shaft, works at the proper time.

The grippers of the reversing apparatus may be carried by the disks C', or by similar and suitable means.

Since the impression-cylinder is driven intermittently in one direction only—that is to say, from one complete revolution at each backward stroke of the table—and since the reversing and refeeding apparatus and the take-off apparatus are geared to and driven by the impression-cylinder, it is obvious that these two apparatus are operated by and simultaneously with the impression-cylinder and have like periods of rest and motion.

The intermittent motion of the impression-cylinder may be conveniently obtained by lifting it during the forward stroke, so that its wheel is then out of gear with the rack. Devices for this purpose are in use and well known.

The parts or elements in the machine which are not lettered and hereinbefore referred to are such as are commonly employed in "Wharfedale" and other machines of a similar type or description.

It will be understood that we do not limit ourselves to the precise construction, arrangement, and proportions of the various details or elements of the apparatus hereinbefore described, and illustrated by the accompanying drawings, as it will be evident that these may be varied considerably without departing from our invention.

What we claim is—

1. In a typographic and similar perfecting machine, the combination of a cylinder having two impression-surfaces with a reversing and refeeding apparatus consisting, essentially, of a rotary gripper, fixed rings concentric with the path of the gripper, gearing and devices, substantially as described, for operating the gripper, and an adjustable finger for releasing the gripper, and with a taking-off apparatus consisting, essentially, of rotating grippers, gearing and devices, substantially as described, for operating the grippers, endless traveling bands, and devices for releasing the grippers of the impression-cylinder, substantially as hereinbefore described, and as illustrated by the accompanying drawings.

2. In a typographic and similar perfecting machine, the combination of a cylinder having two impression-surfaces with a rotary gripper, fixed rings concentric with the path of the gripper, gearing and devices, substantially as described, for operating the gripper, and an adjustable finger for releasing the gripper, substantially as hereinbefore described.

3. In a typographic or similar perfecting machine, a series or set of fixed rings upon or over which the paper is laid for reversal after being removed from the impression-cylinder, in combination with a series of grippers arranged to take the sheet from the impression-cylinder, for the purpose described.

In testimony whereof we affix our signatures in presence of two witnesses.

J. H. BUXTON.
D. BRAITHWAITE.
M. SMITH.

Witnesses:

JOHN BORBER,
WM. E. HEYS.