No. 745,572. PATENTED DEC. 1, 1903.

T. COSSAR.

REGISTER GEAR FOR WEB PRINTING MACHINES.

APPLICATION FILED DEC. 17, 1902.

NO MODEL. 3 SHEETS—SHEET 1.

Fig. 2.

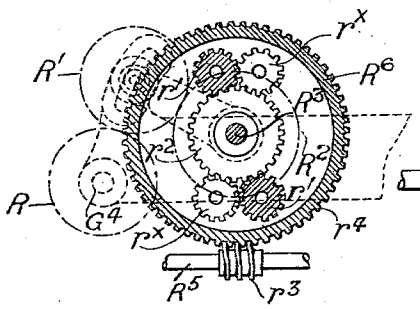


Fig. 1.

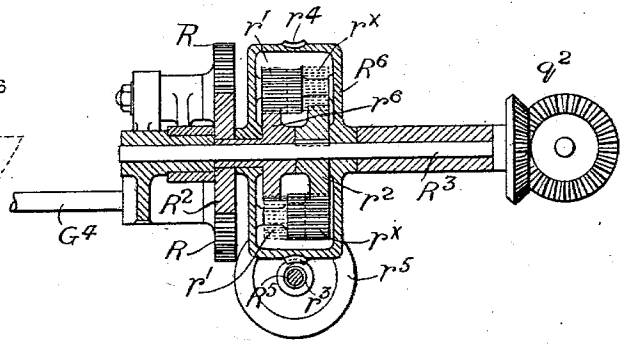
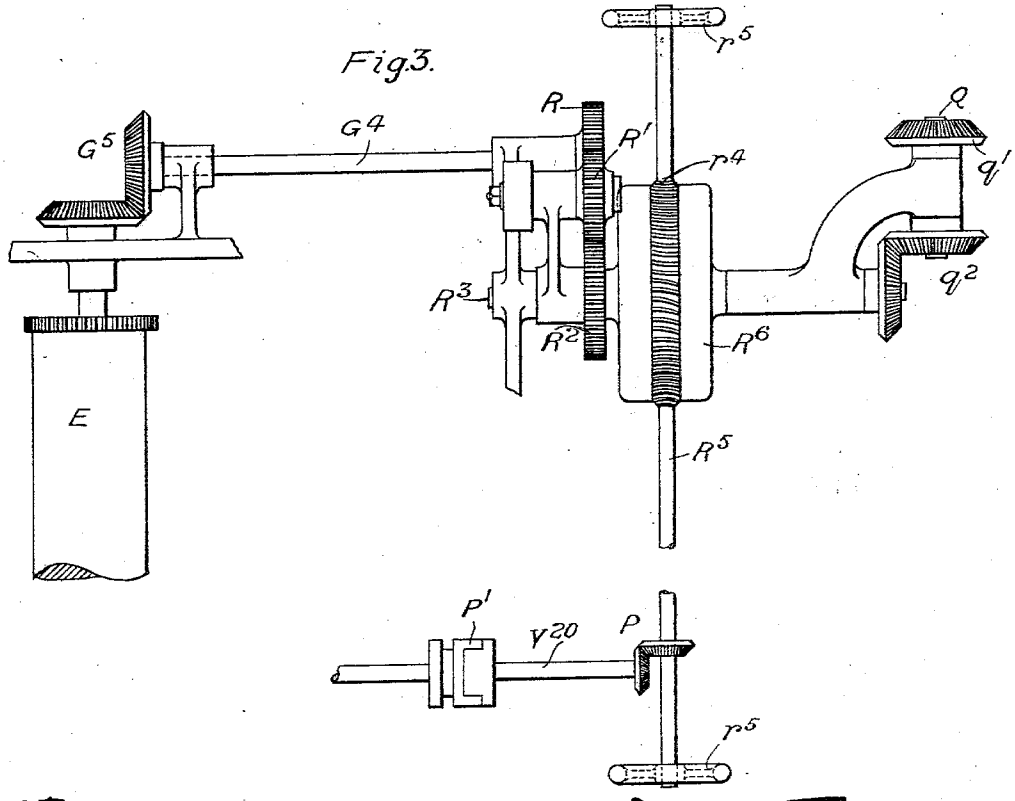


Fig. 3.



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THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

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NO MODEL. 3 SHEETS—SHEET 2.

FIG. 6.

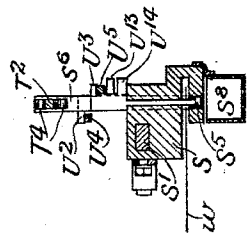


FIG. 4.

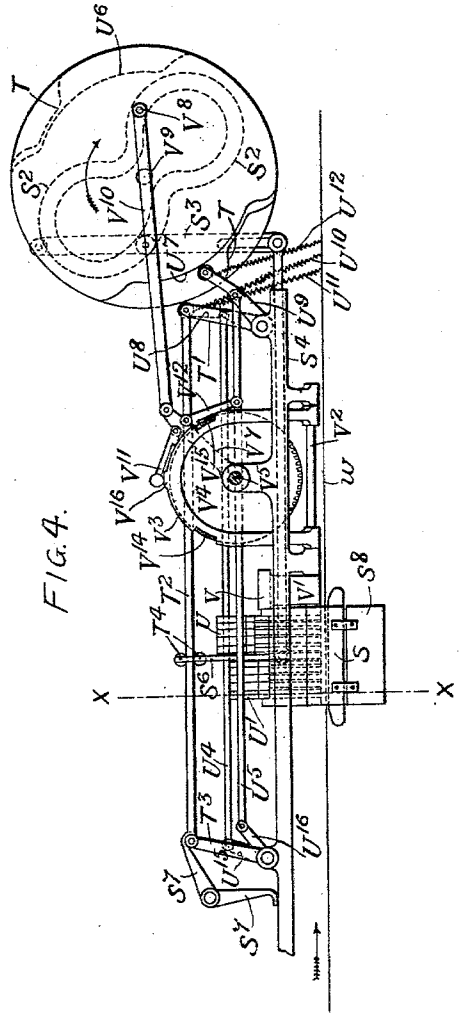
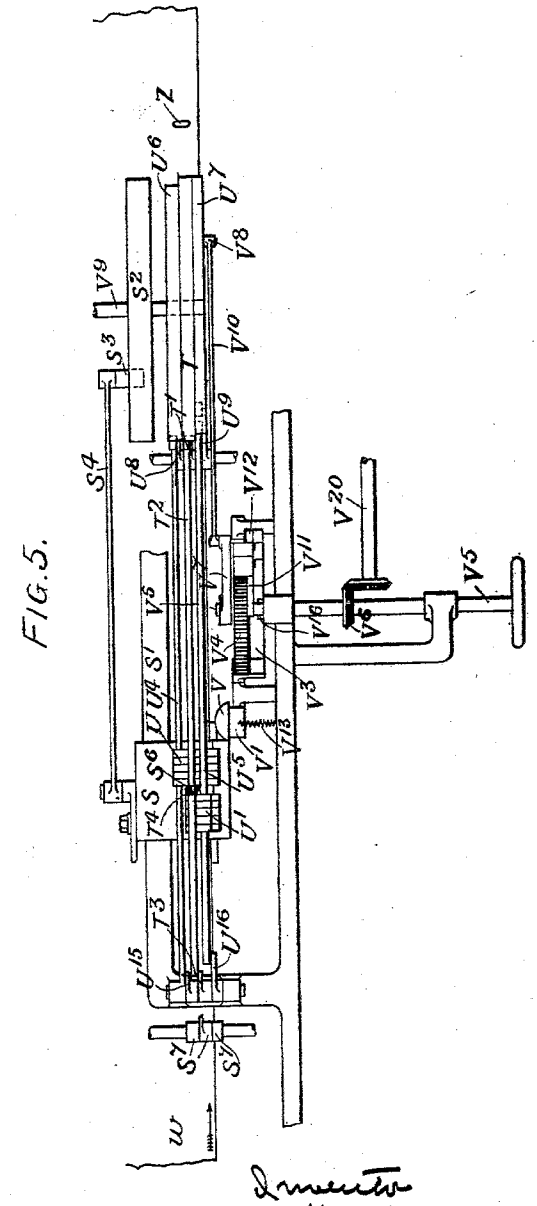


FIG. 5.



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No. 745,572. PATENTED DEC. 1, 1903.

T. COSSAR.

REGISTER GEAR FOR WEB PRINTING MACHINES.

APPLICATION FILED DEC. 17, 1902.

NO MODEL. 3 SHEETS—SHEET 3.

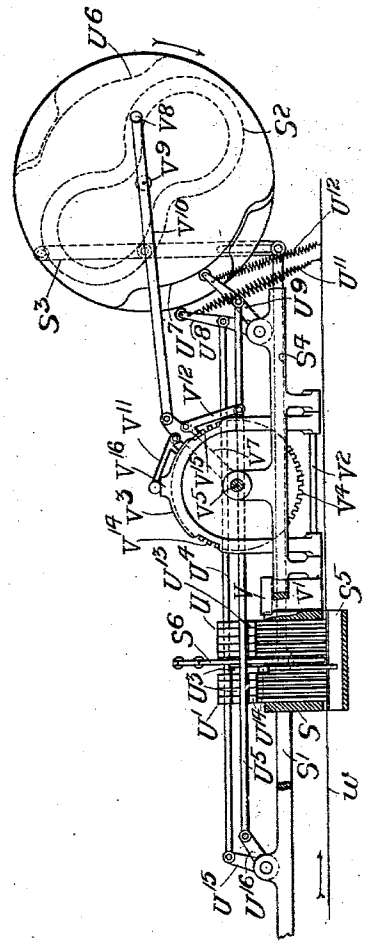


Fig 7.

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No. 745,572. Patented December 1, 1903.

UNITED STATES PATENT OFFICE.

THOMAS COSSAR, OF GOVAN, SCOTLAND.

REGISTER-GEAR FOR WEB-PRINTING MACHINES.

SPECIFICATION forming part of Letters Patent No. 745,572, dated December 1, 1903.

Application filed December 17, 1902. Serial No. 135,599. (No model.)

To all whom it may concern:

Be it known that I, THOMAS COSSAR, a subject of the King of the United Kingdom of Great Britain and Ireland, and a resident of 6 Osborne Place, Govan, county of Lanark, Scotland, have invented certain new and useful Improvements in Register-Gear for Web-Printing Machines, (for which applications for patent have been made in the following countries, viz: Cape Colony, dated October 9, 1902; Transvaal, dated October 14, 1902; Victoria, dated October 24, 1902; New South Wales, dated October 24, 1902; Canada, dated November 18, 1902, and Great Britain, dated November 27, 1902,) of which the following is a specification.

This invention has for its object to provide in connection with the feed-rollers of web-printing machines improved apparatus by means of which the rate of movement of the feed-rollers is accelerated or retarded for the purpose of maintaining proper register in perfecting a printed web or for keeping one printed web in register with another in feeding it forward to the folding apparatus of the printing-machine.

The improved apparatus comprises register gear or mechanism which may be actuated by a hand-wheel and shaft for acting on the feed-rollers to vary as required their ordinarily uniform speed of rotation, but which is connected to devices arranged to perforate at suitable intervals the margin of the web during the printing of one side of the paper, and to be operated during the perfecting or printing of the reverse side of the paper through the medium of said perforations, so as to transmit movement to the aforementioned register-gear and automatically maintain proper register of the printed web.

The invention is illustrated by the accompanying drawings, in which—

Figure 1 is a longitudinal sectional elevation of the register gear or mechanism for accelerating or retarding the motion of the feed-rollers which feed forward the paper web in a printing-machine. Fig. 2 is a cross-sectional elevation, and Fig. 3 is a plan of the same. Fig. 4 is an elevation, Fig. 5 a plan, and Fig. 6 a cross-section, as at the line X X in Fig. 4, showing the arrangement of devices employed for perforating the web as it is first printed and for automatically actuating the register-gear. Fig. 7 is a longitudinal sectional elevation showing the feeler mechanism acting on a perforated web, one of the feelers having dropped through a perforation in the web.

Referring particularly to Figs. 1, 2, and 3 of these drawings, E is the rotating feed-roller or one of the feed-rollers for feeding forward the paper web in a printing-machine, the said roller being driven through a shaft G^4 and gearing G^5 by a spur-wheel R, carried by a shaft journaled in the framing of the printing-machine, said spur-wheel R being interchangeable with others of different diameters to vary the speed for varying sizes of sheets to be printed. The spur-wheel R is geared through an intermediate wheel R′ with a spur-wheel R^2 on a shaft R^3, driven by bevel-gearing q^2 from a shaft Q, which is in turn driven by a bevel-gear q' from the main or other rotating shaft of the printing-machine.

The spur-wheel R^2 is not directly fixed to the shaft R^3, but is keyed on the boss of a spur-wheel r^6, loose on the shaft R^3, with which are geared two spur-pinions r' r' on studs within a casing R^6, also loose on the shaft and carrying a second pair of spur-pinions $r^\times$ $r^\times$, which mesh with a spur-wheel r^2, keyed to the shaft R^3, and also mesh with the pinions r' r'. The shaft R^3 thus drives the spur-pinion R^2 (and therefrom the shaft G^4, from which the feed-roller E is operated) through the intermediary of the pinions $r^\times$ $r^\times$, which are made of such length as to mesh with the pinions r' r', in gear with the loose spur-wheel r^6, to which the spur-wheel R^2 is secured.

By turning the casing R^6 in one direction or the other the speed of rotation of the spur-wheels R^2 and R and of the feed-roller E, and therefore the rate of feed of the web of paper, may be more or less accelerated or retarded during such action on the casing, which is effected by means of a shaft R^5, having on it a worm r^3, meshing with worm-wheel teeth r^4, formed on the casing R^6.

The shaft R^5 is furnished with hand-wheels r^5 at each end, by means of which the machine-man may turn it to act on the casing for the purpose above set forth; but in order

to provide for automatically operating this gearing to vary the speed of rotation of the feed-roller E the shaft R^5 is connected by bevel or other gearing P to a shaft V^{20} of the automatic registering apparatus represented at Figs. 4, 5, and 6, a clutch P′ being fitted on said shaft or otherwise interposed to permit of throwing the automatic apparatus into or out of operation. This automatic registering apparatus consists of a reciprocating block S, sliding on a fixed bar S′, attached to the framework of the machine and reciprocated by a cam S^2, acting through levers S^3 and S^4, the forward reciprocation—*i. e.*, in the direction of travel of the web—being at a slightly-greater or slightly-less speed than that of the web during the first portion of the stroke and at exactly the same speed as the web during the remainder of the stroke. The lever S^3 is slotted, so that by altering the position of the lever S^4 along this slot the speed of travel of the reciprocating block S can be altered to suit different sizes of work being printed. The lever S^4 is adjustably pivoted to the sliding block S, so that the punch and fingers hereinafter mentioned may be set to act on the proper point of the web. The reciprocating block S is formed to embrace the edge of the web *w*, the part below the web acting as a support to the web and having a slot S^5 formed on it below the fingers to allow them to pass through the web and also carrying a die, through which a punch S^6, moving vertically in the upper part of the reciprocating block S, passes. This punch S^6 is raised and lowered to punch or perforate the web by a cam T, acting through levers T′ T^3 and rod T^2, this rod T^2 passing through the punch S^6, the punch S^6 being provided with rollers T^4 to engage the top and bottom sides of the rod. Two sets of vertically-movable fingers U U′ are also carried in the reciprocating block S, one set, U, in advance of and the other set, U′, in the rear of the punch. The fingers U U′ are provided with projections U^2 U^3, which rest on rods U^4 U^5, respectively. The fingers are raised and lowered by the action of cams U^6 U^7 on levers U^8 U^9, attached to the rods U^4 U^5, the rods U^4 U^5 being attached at their other end to levers U^{15} U^{16}, pivoted on the framework of the machine. The levers controlling the punch and fingers are kept in contact with the cams by springs U^{10} U^{11} U^{12}. The fingers U U′ are raised by the rods U^4 U^5 and descend by gravity when the rods are lowered by the cams. Each finger is also provided with a projection U^{13} U^{14}, which when the finger is lowered acts in the travel of the sliding block S on a projection V on the lever V′. This lever V′ is keyed to a shaft V^2, journaled in the frame of the machine, this shaft also having a piece V^3 secured to it. A toothed wheel V^4 is provided keyed to a shaft V^5, journaled in the frame of the machine, which through bevel-gear V^6 and the shaft V^{20} aforesaid is geared to the register-shaft R^5. An arm V^7 is loosely journaled on the shaft V^5 at the side of the toothed wheel V^4. This arm is rocked by a crank-arm V^8 on a shaft V^9, acting through a rod V^{10}. The pawls V^{11} V^{12} are pivoted on the arm V^7, so that one pawl will engage the teeth of the toothed wheel V^4 when the arm V^7 is rocked in one direction, and the other pawl will engage the toothed wheel when the arm is rocked in the opposite direction. These pawls are formed so that they are kept out of contact with the toothed wheel V^4 by the piece V^3 when the latter is in its normal position and act on the toothed wheel only when the piece V^3 is moved away from under them by the action of any one of the finger projections U^{13} U^{14} on the projection V on the lever V′. The piece V^3 is kept in its normal position by a spring V^{13}. This piece V^3 is cut away at V^{14} and V^{15} and is provided with a projection V^{16}, which acts on projections fixed to arms on the pawls V^{11} and V^{12}, so that at the end of the movement of the arm in either direction the one pawl is lifted clear of the piece V^3, while the other has come opposite the cut-away portion, thus allowing the piece V^3 to be pushed back to its normal position by the spring V^{13}, and so keep the pawls clear of the toothed wheel V^4 during the next stroke of the arm V^7 until again knocked out from under the pawls by the action of any one of the finger projections U^{13} U^{14} on the projection V on the lever V′.

The shaft V^9, on which are keyed the cams for working the sliding block, punch, and the fingers and crank for moving the rocking lever, is journaled in the frame of the machine and geared by toothed gearing to any of the principal shafts of the printing-machine, preferably the crank-shaft, and arranged to make half a revolution for each complete reciprocation of the sliding block S. Catches S^7 are provided and pivoted to the machine-framing to engage the rods actuating the punch and fingers, so that they may be put out of action when required.

A hand-wheel is keyed to the shaft V^5 for the convenience of the attendant. The shaft V^5 is geared through bevel or other gearing V^6 and shaft V^{20} to the shaft, which actuates the register-gearing. A clutch P′ is provided on the shaft V^{20}, which may be thrown out of gear should the automatic register not be required. A box S^8 may be attached to the sliding block S below the die to catch the paper punched out and prevent it from falling into the machine. The sliding piece S may be marked to show where the margin between the printings should come when the web is in proper register.

The automatic registering-gear described may be fixed to operate on the web at any point in proximity to the feeding-in rollers of the machine.

The action of the apparatus is as follows: When printing the first side of the web *w*, the two sets of fingers U U′ are kept out of ac-

tion by the catches S^7 and only the punch S^6 allowed to operate on the web. Supposing the sliding block S to be at the commencement of its stroke in the forward direction—*i. e.*, in the direction of travel of the web indicated by the arrow—by the revolution of the cam-shaft V^9 the sliding block is caused to move forward at a slightly-less or slightly-greater speed than that of the web until about three-fourths of its stroke is finished, the punch S^6 meanwhile being held up by the rod T^2. The speed of the sliding block now becomes exactly the same as that of the web, and the cam T, actuating the punch, causes it to descend and perforate the web, the apparatus being arranged so that this perforation is made in one of the margins between the printings. The perforation Z is preferably of the shape shown in the drawing Fig. 5, so that the fingers may enter it, though the web may wave a little sidewise in its passage through the machine. As the sliding block S reaches the end of its stroke in this direction the cam T acts to lift the punch S^6 clear of the paper and hold it so during the stroke of the sliding block in the backward direction, the punch again perforating the web in the next forward stroke. This cycle of operations continues until the required number of copies are printed. When printing the second side of the paper, the punch is held out of operation by the catch S^7, and the catches which during the first printing held the fingers U U′ out of operation are disconnected and the fingers allowed to operate on the web. Supposing the sliding block to be starting its movement in the forward direction, the cam U^7, acting through the levers U^9 U^{16} and rod U^5, allows the set of fingers U′ to descend on the web on which they rest. Should the web be behind its proper position—*i. e.*, the position in which the second printing will print back to back with the first printing—one of the fingers U′ will pass through the perforation Z, and in the forward movement of the sliding block the projection U^{14} on such finger will act on the projection V on the lever V′, push it outward, and so allow the pawl V^{11} on the rocking arm V^7 (which about this point is just starting its movement in the direction which, were the pawl acting on the toothed wheel, would cause the speed of the web to be accelerated) to act on the toothed wheel V^4 and so accelerate the speed of the web to bring it to proper register. Toward the end of the stroke of the sliding block the cam U^7 acts to lift the set of fingers U′ clear of the web and keep them so during the return stroke and also during the second forward and return strokes of the sliding block. When the second forward stroke is starting, the cam U^6 acts to lower the set of fingers U, which then rest on the web, and should the web be farther forward than its proper position one of them will pass through the perforation, and in the forward movement of the sliding block the projection U^{13} on such finger will act on the projection V on the lever V′, push it outward, and so allow the pawl V^{12} on the rocking arm V^7 (which about this time is starting its return stroke) to engage the toothed wheel V^4 and so retard the web to bring it to proper register. Toward the end of the stroke of the sliding block the cam U^6 acts to lift the fingers U clear of the web and to keep them so during the return stroke and also during the following forward and return strokes of the sliding block. It will thus be seen that each set of fingers acts alternately on the web, one acting on the web while the other is inoperative.

The sliding piece S is moved slightly slower or faster than the web during the first portion of its stroke to make it more certain that one of the fingers will pass through the perforation, as the perforation might come between two of the fingers and both would rest on the web and neither pass through the perforation, the amount of such difference of speed being about the thickness of one finger.

Having now described my invention, what I claim, and desire to secure by Letters Patent, is—

1. In a printing-machine, the combination with a feed-roller and a driving-shaft, of a casing loose on said driving-shaft, a spur-wheel fixed on said shaft, a spur-wheel loose on said shaft, pinions carried by said casing and transmitting motion from said fixed spur-wheel to said loose spur-wheel, a gear connection between said loose spur-wheel and the feed-roller and means for turning said casing on the driving-shaft as and for the purpose set forth.

2. The combination with the feeding-roller E, and a driving-shaft R^3 of a casing R^6 loosely mounted on said shaft, an external worm-wheel r^4 formed on said casing, gear-wheels r', $r^\times$ carried on said casing, a gear-wheel r^3 fast on the shaft R^3, a gear-wheel r^6 loose on said shaft, a gear-wheel R keyed to the boss of said wheel r^6, gear for transmitting motion from the wheel R to the feeding-roller E, and external shaft R^5 having a worm r^3 engaging said worm-wheel r^4, whereby the casing may be turned in either direction while the driving-shaft transmits motion to the gear-wheel R as and for the purpose set forth.

3. In a printing-machine having a punch operated to perforate the margin of a paper web, the combination with the feed-roller, a driving-shaft and speed-varying mechanism operating said feed-roller from said shaft, of a sliding block, feelers carried by said sliding block and traversed over the perforated margin during the travel of the web in the second printing or perfecting operation, a shaft transmitting motion to said speed-varying mechanism a toothed wheel on said shaft, and pawls acting on said toothed wheel under the action of said feelers, as described.

4. In automatic register-gear for printing-machines the combination with a sliding

block of devices for traversing said block over the paper web, two sets of feelers carried by said block, a cam-shaft and cams operating said feelers, and means actuated by said feelers to accelerate or retard the speed of travel of the web.

5. In a printing-machine the combination with a driving-shaft, feed-rollers and speed-varying mechanism interposed between said driving-shaft and said feed-roller, of a sliding block carrying two sets of feelers, a cam-shaft and cams on said shaft, a shaft transmitting motion to said speed-varying mechanism, a ratchet-wheel on said shaft, pawls engaging said ratchet-wheel, and operated from a cam on the cam-shaft, and mechanism controlled by the feelers for throwing one or other of the pawls out of engagement as and for the purpose set forth.

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

THOMAS COSSAR.

Witnesses:
WALLACE FAIRWEATHER,
WALLACE CRANSTON FAIRWEATHER.