(No Model.) 4 Sheets—Sheet 1.

J. T. HAWKINS.

OSCILLATING CYLINDER PRINTING MACHINE.

No. 346,911. Patented Aug. 10, 1886.

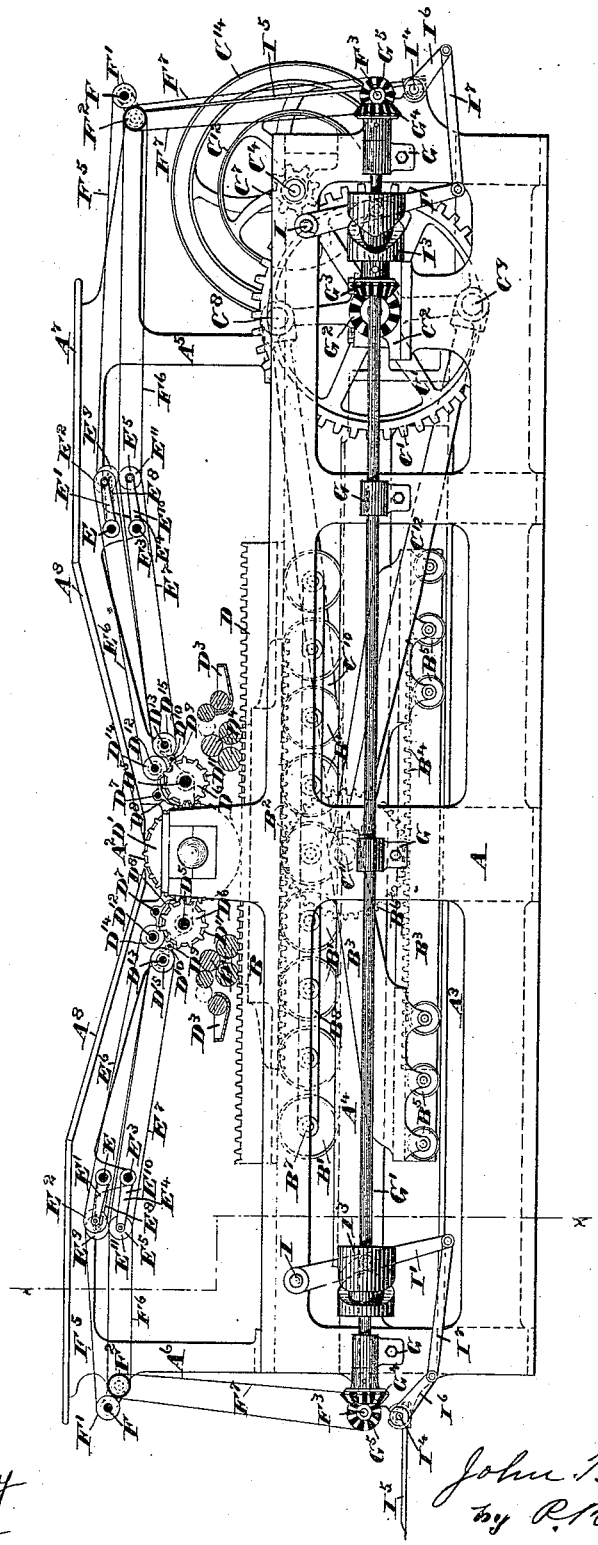

Fig. 1.

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(No Model.) 4 Sheets—Sheet 2.

J. T. HAWKINS.

OSCILLATING CYLINDER PRINTING MACHINE.

No. 346,911. Patented Aug. 10, 1886.

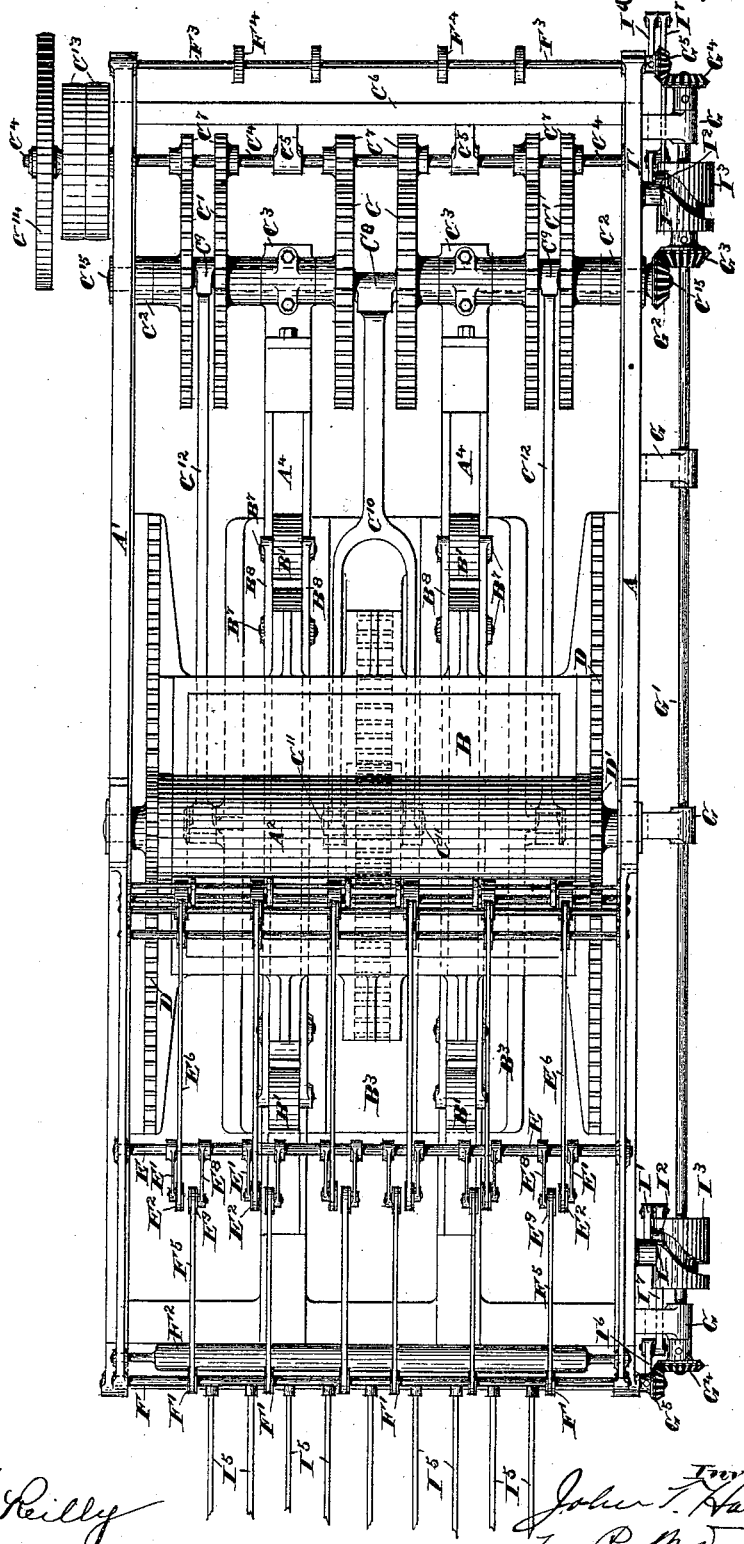

Fig. 2.

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(No Model.) 4 Sheets—Sheet 3.

J. T. HAWKINS.

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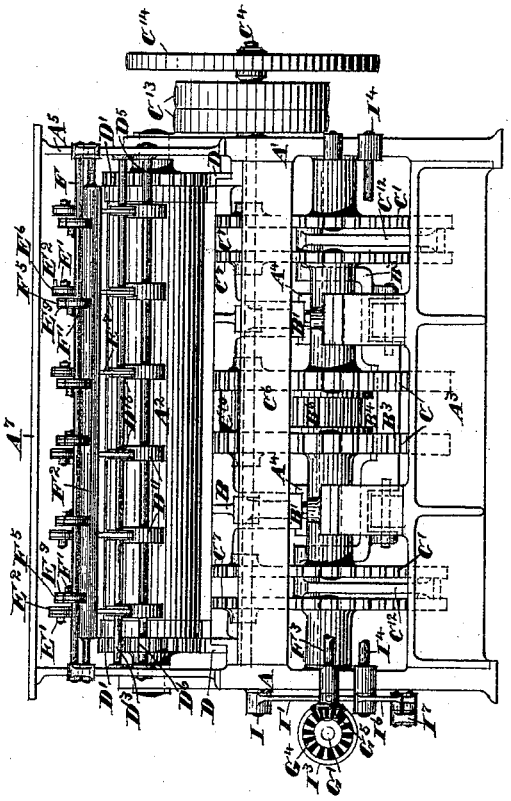
No. 346,911. Patented Aug. 10, 1886.

Fig. 3.



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(No Model.) 4 Sheets—Sheet 4.

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OSCILLATING CYLINDER PRINTING MACHINE.

No. 346,911. Patented Aug. 10, 1886.

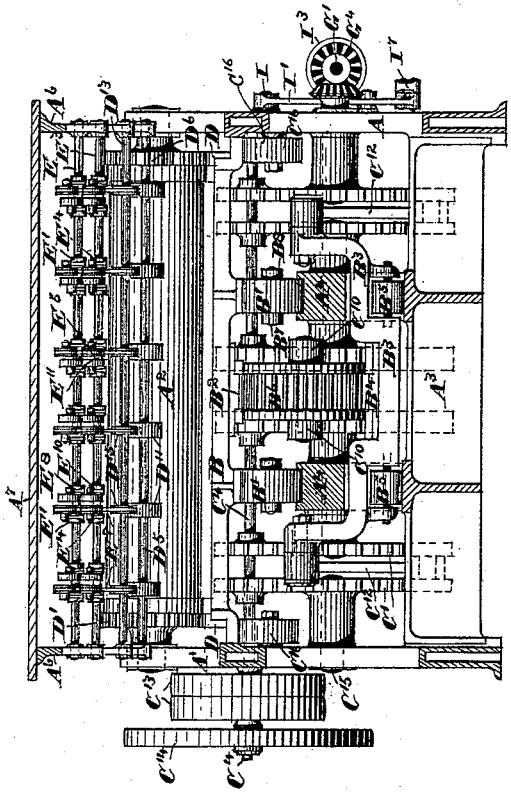

Fig. 4.

Section on x. x. Fig. 1.

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UNITED STATES PATENT OFFICE.

JOHN T. HAWKINS, OF TAUNTON, MASSACHUSETTS.

OSCILLATING-CYLINDER PRINTING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 346,911, dated August 10, 1886.

Application filed March 16, 1886. Serial No. 195,400. (No model.)

To all whom it may concern:

Be it known that I, JOHN T. HAWKINS, of Taunton, in the county of Bristol and State of Massachusetts, have invented certain new and useful Improvements in Oscillating-Cylinder Printing-Machines, which invention or improvements are fully set forth and illustrated in the following specification and accompanying drawings.

The object of the invention is to provide an oscillating-cylinder printing-machine which shall print a sheet for each single excursion of a flat type-bed operated at a high rate of speed.

The invention consists in certain novel modifications, as hereinafter described, of Patent No. 257,580, granted to me May 9, 1882, for equilibrating the movements of the moving parts. Said modifications effect a greater reduction of the radii of the cranks, as compared with the travel of the bed, and, in combination with a double-acting oscillating impression-cylinder and reciprocating type-bed, constitute a machine so equally balanced in all its movements and so simple in operation as to be capable of being run at very high speeds.

In the accompanying drawings, Figure 1 is a side elevation of the machine with the feed-board stands removed on the sight side, the more clearly to show the inner parts. Fig. 2 is a plan with both feed-boards omitted, in order to show the parts beneath, the delivery apparatus also being omitted from the driving-gear end of the machine, in order the more clearly to exhibit said driving-gear. Fig. 3 is an end elevation from the driving-gear end, with the sheet-flier and downtapes removed. Fig. 4 is an end elevation in section on line *x x*, Fig. 1, viewed from the left hand of Figs. 1 and 2.

In said figures the several parts are indicated by letters, as follows:

A A′ are the main frames; A^2, the impression-cylinder; A^3, the bed-plate, and A^4 a rib-girder, upon which the bed-rollers run.

A^5 A^6 are frame-standards for carrying the feed-boards and delivery apparatus, and are secured to the top of the frames A A′.

A^7 A^8 are the feed-boards.

B is the type-bed; B′, the bed-rollers.

B^2 is a toothed rack, secured to the under side of the bed B.

B^3 is a weighted carriage, carrying a toothed rack, B^4.

B^5 are rollers supporting the carriage B^3, and running on suitable ways on the bed-plate A^3.

B^6 is a rolling gear-wheel engaging both of the racks B^2 B^4.

C C′ are pairs of spur-gears secured to short shafts C^{15}, journaled in suitable bearings, C^2, secured to the frames A A′, and in similar bearings, C^3, secured to the rib-girder A^4.

C^4 is a shaft journaled in the frames A A′, and in suitable brackets, C^5, secured to a cross-girt, C^6, connecting the frames A A′. The shaft C^4 has secured to it a series of spur-pinions, C^7, engaging the spur-gears C C′.

In the pair of spur-gears C is secured a crank-pin, C^8, and similarly in each pair of gears C′ a crank-pin, C^9.

C^{10} is a forked connecting-rod articulated at the single end to the crank-pin C^8 of the gears C, and at the forked end to a shaft, C^{11}, secured in the rolling gear-wheel B^6.

C^{12} are connecting-rods articulated at one end to the crank-pins C^9, and at the other to the carriage B^3.

Outside of the frame A′ tight and loose pulleys C^{13} and a fly-wheel, C^{14}, are mounted on the shaft C^4, by means of which power is applied to operate the whole machine.

C^{16}, Fig. 4, are rollers for the support of the outer edges of the type-bed, immediately under the impression-cylinder, which rollers run upon studs secured in the frames A A′.

The bed-rollers B′ are run loosely upon pins B^7, carried in frames B^8.

To the upper side of the type-bed B are secured two racks, D, which engage two corresponding gear-wheels, D′, secured to the ends of the impression-cylinder A^2.

D^3 are the ink-fountains, and D^1 the usual inking-rollers.

In the upper frames, A^5 A^6, are journaled two shafts, D^5, each carrying a gear-wheel, D^6, engaging one of the cylinder-gears D′.

Upon two shafts, D^7, secured in the frames A^5 A^6, are mounted a series of curved strippers, D^8. Upon two similar shafts, D^9, are secured a series of curved strippers, D^{10}.

Shafts D^5 carry a series of pulleys, D^{11}.

In the frames A^5 A^6 are journaled two pairs

of shafts, D^{12} D^{13}, carrying, respectively, each a series of pulleys, D^{14} D^{15}. The pulleys D^{14} are driven by frictional contact with the pulleys D^{11}, and the pulleys D^{15} by frictional contact with the pulleys D^{14}. The strippers D^8 enter at one end between the pulleys D^{14}, and at the other end lie close to the surface of the impression-cylinder A^2. The cylinder A^2 carries a series of sheet-lifter fingers and a series of grippers, both operated in any well-known way, (not shown,) the lifter-fingers at the proper time elevating the head of the sheet from the surface of the impression-cylinder, so as to pass over pulleys D^{11} and under the strippers D^8.

Upon two shafts, E, secured in the frames A^5 A^6, are adjustably secured a series of arms, E', each carrying a tape-pulley, E^2. Upon two similar shafts, E^3, are adjustably secured a series of arms, E^4, each carrying a tape-pulley, E^5. A series of tapes, E^7, run over pulleys D^{15} and E^5, and a series of tapes, E^6, run over pulleys D^{14} and E^2. The tapes E^6 and E^7 are in contact where pulleys D^{11} and D^{15} meet, but diverge from that point toward pulleys E^2 E^5.

Upon shafts E are adjustably secured another series of arms, E^8, carrying a series of tape-pulleys, E^9, and upon shafts E^3 are adjustably secured a series of arms, E^{10}, carrying a series of tape-pulleys, E^{11}.

Journaled in the outer ends of the frames A^5 A^6 are two shafts, F, carrying a series of tape-pulleys, F', and two rollers, F^2. (The rollers F^2 may be replaced by a shaft carrying tape-pulleys, when desirable.)

Journaled in the frames A A' are two shafts, F^3, each carrying a series of tape-pulleys, F^4. A series of tapes, F^5, run over pulleys F' and E^9, a similar series, F^6, run over pulleys E^{11} and rollers F^2, and a third series of tapes, F^7, run over rollers F^2 and pulleys F^4.

Journaled in brackets G, secured to the frame A, is a shaft, G', extending from end to end of the machine.

Upon one end of shaft C^{15} is secured one of a pair of miter-wheels, G^2, the other of the pair, G^3, being secured upon the shaft G'.

Upon each extremity of shaft G' is secured a bevel-wheel, G^4, engaging a similar bevel-wheel, G^5, secured to one end of each of the shafts F^3. The shaft G', being continuously rotated, imparts continuous motion to the tapes F^7, F^5, and F^6. The shafts D^5, being reversibly rotated simultaneously with the oscillating cylinder A^2, run alternately in the directions imparted to them.

Fulcrumed upon two studs, I, secured to frame A, are two levers, I', carrying rollers I^2.

Secured to shaft G' are cams I^3, the grooves of which the rollers I^2 engage.

Journaled in the frames A A' are two rock-shafts, I^4, to which are secured a series of fly-fingers, I^5.

Secured to one end of the rock-shafts I^4 are lever-arms I^6.

To the free ends of levers I' and I^6 are articulated the connecting-rods I^7.

By the rotation of the cams I^3 the fly-fingers I^5 are operated to deposit the sheets upon a suitable receiving-table. (Not shown.)

In Fig. 3 the tapes F^7 F^6 are omitted.

It is understood that there are two sets of grippers and two sets of sheet-lifter fingers in the cylinder A^2, so as to take a sheet from each feed-board and deliver said sheets to each of the series of pulleys D^{11} and strippers D^8. It is not necessary to show said grippers and fingers, as they are well known in the art, and may be operated in divers well-known ways.

The complete operation of the machine is as follows: Power being applied to shaft C^4, it is transmitted through the gears C^7 to the crank-gears C C'. The crank-pins C^9 being placed opposite the crank-pin C^8, the rolling gear-wheel B^6 is moved in one direction while the carriage B^3 is moved in the opposite direction a like distance. If the carriage B^3 and its rack B^4 remained at rest, the bed B would have a rectilinear motion equal to double the diameter of the circle described by the crank-pin C^8. The rack B^4, being, however, moved in the opposite direction, imparts one-half more motion to the bed in each direction. The carriage B^3 is made of sufficient weight, as compared with the type-bed B, to have equal momentum with it, or sufficiently greater to also compensate for the rotary momentum of the cylinder A^2 and other rotating parts driven by it, this rotary momentum being imparted to and absorbed from the type-bed B. The effect of the above-described operation of the parts is, therefore, to equilibrate the momentum of the moving parts, transmitting the strains to the crank-gears C C', and through them to the shaft C^4, while requiring a radius of crank but a small fraction of the travel of the type-bed. The impression-cylinder A^2 is of such diameter as to make nearly two revolutions in each direction, so that a sheet taken from either feed-board will be printed and its head end carried to the point of contact of the tapes F^5 F^6, where they run over the pulleys E^9 E^{11}, and the distance between the centers of pulleys E^9 and the point of contact of tapes E^6 E^7, where they run over the pulleys D^{14} D^{15}, is made greater than the length of a sheet. The grippers of cylinder A^2 release the sheet at the nearest point of approach of pulleys D^{11} to cylinder A^2, the lifter-fingers causing it to pass under the strippers D^8, over pulleys D^{11}, under pulleys D^{14}, where it is deflected upward by strippers D^{10}, over pulleys D^{15}, and between tapes E^6 E^7. The tapes E^6 E^7, diverging, will not hold the sheet after the head end has passed into the bite of tapes F^5 F^6, where they run over pulleys E^9 E^{11}, and at this point the bed B, cylinder A^2, and all the reversibly-moving parts will have reached the extremity of motion in one direction. From this point the tapes E^6 E^7 move in a contrary direction

to the sheet, but no longer holding it, the sheet being thereafter carried to the flier by the continuously-moving tapes F^5, F^6, and F^7. The cams I^3 are properly timed upon the shaft G' to cause the fly-fingers I^5 to lay the sheet down upon a receiving-board upon its arrival down in front of said fly-fingers.

I do not herein claim the parts described as constituting the sheet-delivery, reserving all such for another application filed herewith, and numbered 195,399; but,

As of my invention, I herein claim—

1. In a cylinder printing-machine printing from a reciprocating flat form, in combination with an impression-cylinder, as A^2, provided with two feed-boards, as A^7 A^8, and two sets of inking apparatus, as D^5 D^4, a reciprocating loaded carriage, as B^3, carrying a toothed rack, as B^4, a reciprocating type or form bed, as B, carrying a toothed rack, as B^2, a rolling gear-wheel, as B^6, engaging said two racks, and oppositely-set cranks, as C C', provided with crank-pins, as C^8 C^9, connected by rods, substantially as described, to said rolling gear-wheel and said carriage, whereby a sheet is printed ready for delivery for each single excursion of the said type-bed or oscillation of said cylinder, and the moving parts mutually equilibrated, substantially as and for the purposes set forth.

2. In a cylinder printing-machine printing from a reciprocating flat form, the combination of a reciprocating loaded carriage, as B^3, carrying a toothed rack, as B^4, a reciprocating type or form bed, as B, carrying a toothed rack, as B^2, a rolling gear-wheel, as B^6, engaging said two racks, and oppositely-placed cranks, as C C', provided with crank-pins, as C^8 C^9, said crank of one side being connected by a suitable connecting-rod, as C^{10}, to said rolling gear-wheel, and said crank of the opposite side similarly connected by rods to said carriage, whereby the loaded carriage and the reciprocating bed are simultaneously moved in opposite directions and their momenta mutually equilibrated, while the lengths of said cranks may be made of any desirable radius less than one-quarter of the travel or stroke of the type-bed, substantially as and for the purposes set forth.

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