(No Model.) 2 Sheets—Sheet 1.

J. BROOKS.

CYLINDER PRINTING MACHINE.

No. 489,431. Patented Jan. 3, 1893.

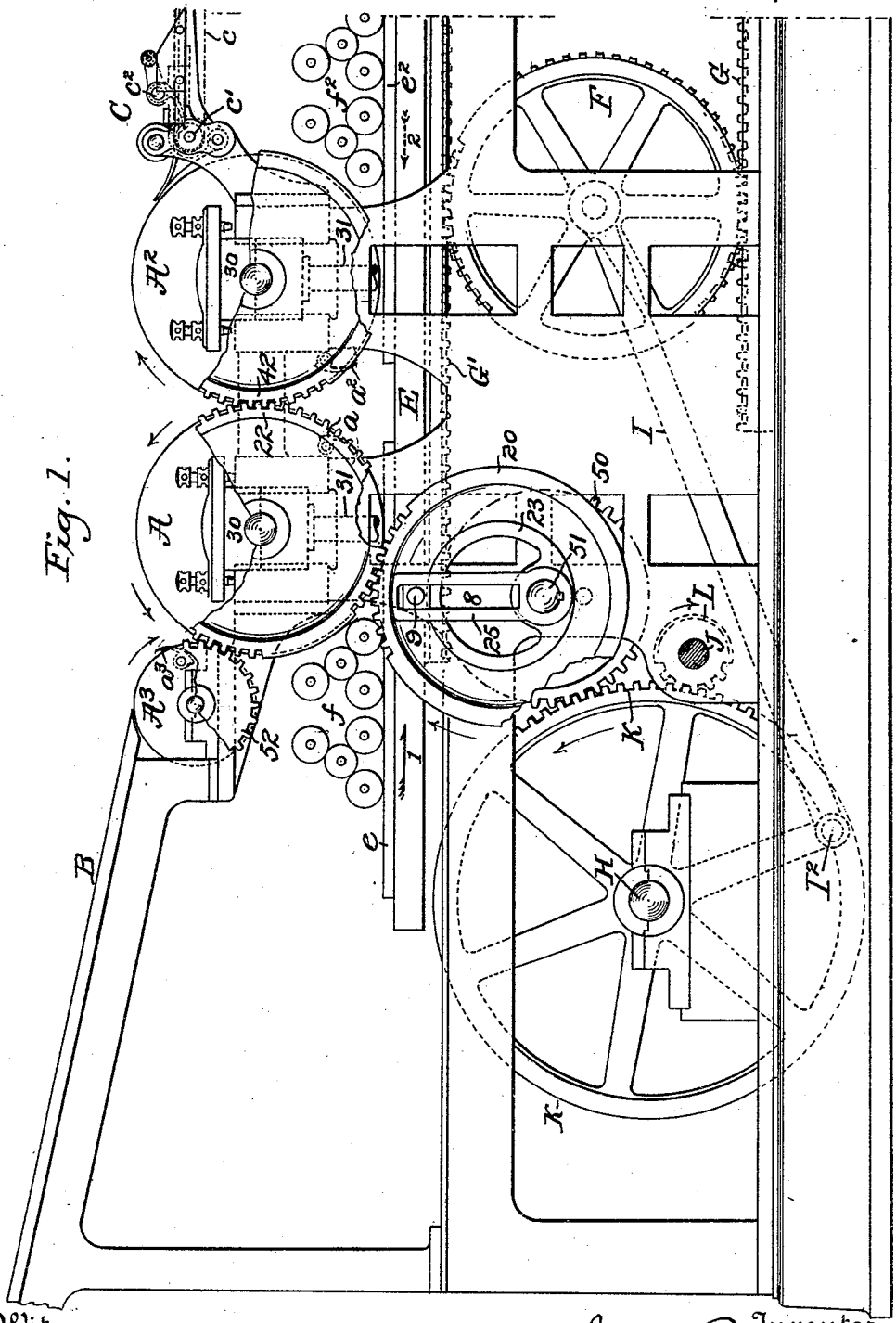

Fig. 1.

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

(No Model.)

2 Sheets—Sheet 2.

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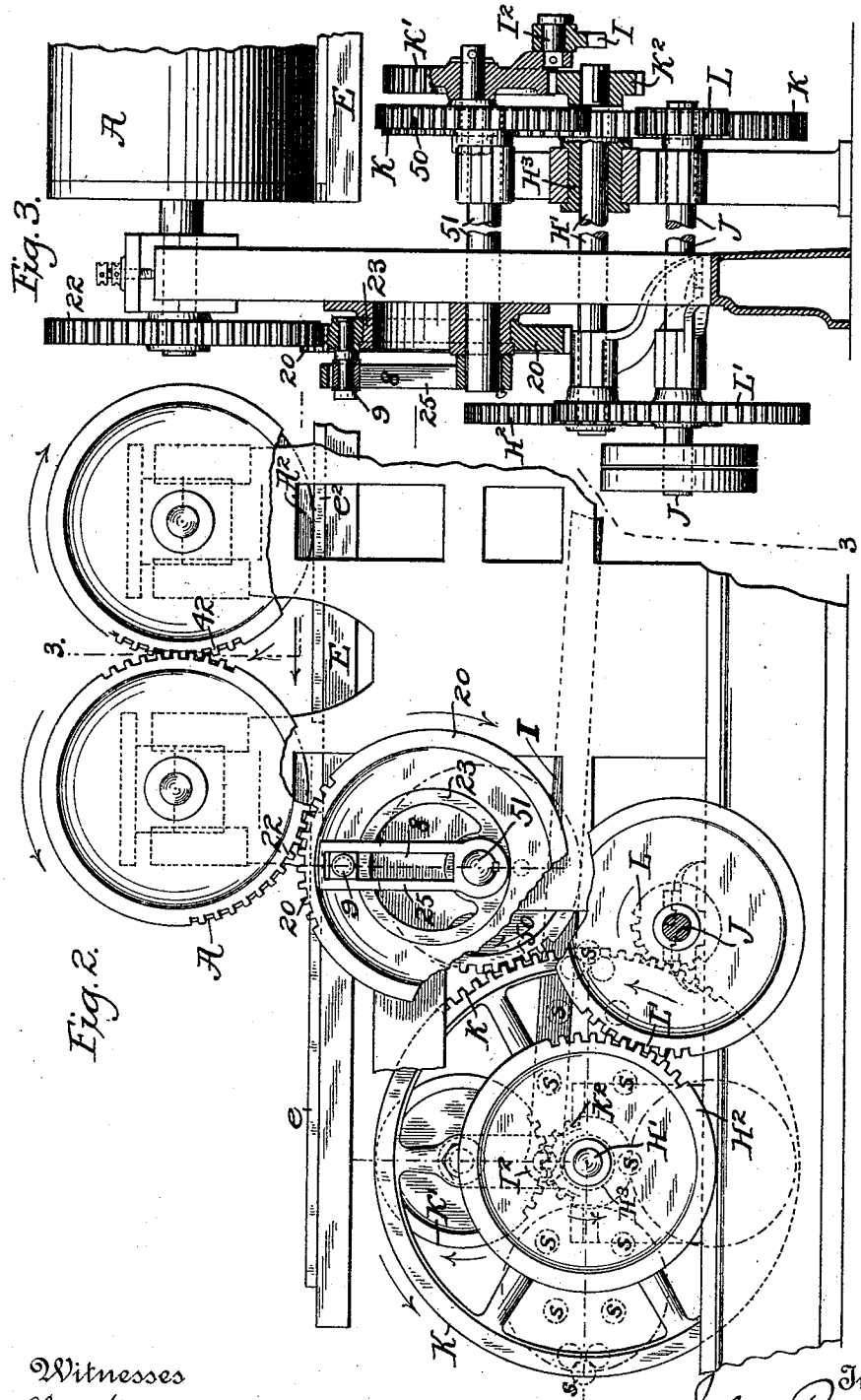

Fig. 3.

Fig. 2.

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UNITED STATES PATENT OFFICE.

JOHN BROOKS, OF PLAINFIELD, NEW JERSEY, ASSIGNOR TO CHARLES POTTER, JR., HORACE W. FISH, JOSEPH M. TITSWORTH, AND DAVID E. TITSWORTH, OF SAME PLACE.

CYLINDER PRINTING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 489,431, dated January 3, 1893.

Application filed April 11, 1892. Serial No. 428,601. (No model.)

To all whom it may concern:

Be it known that I, JOHN BROOKS, of Plainfield, county of Union, and State of New Jersey, have invented certain new and useful Improvements in Cylinder Printing-Machines, of which the following is a specification.

This invention relates generally to single or double cylinder printing machines, and more particularly to the means for operating and controlling the motion of the operative parts of such machines.

The present improvements have for their object to provide means whereby the impression cylinder or cylinders and bed are caused to travel with the same surface speed during the time of impression whereby efficient work and accurate register of the sheets with the form are provided.

In another application for Letters Patent filed by me December 31, 1891, Serial No. 416,652 there is set forth and shown a means for causing the impression cylinder and bed to move during impression at the same surface speed, and the improvements now to be described herein are a further means for effecting the same result, the organization and arrangement however being different.

As a clearer understanding of the invention may be had from a detailed description of a practical embodiment thereof, such description will now be given, reference being had to the accompanying drawings, in which:—

Figure 1, is a side elevation of so much of a double cylinder printing machine as is necessary to show the construction, arrangement and function of the improvement. Fig. 2, is a similar view of a slightly modified form of the crank motion by which the form bed is driven; and Fig. 3, is a vertical cross-sectional elevation on the line 3, 3, of Fig. 2, the parts being broken away and foreshortened for the sake of economy in space.

Briefly, the improved machine embraces a reciprocating form bed with a coacting impression cylinder as is usual in cylinder printing machines. The form bed is reciprocated from a crank shaft through a traveling gear that engages with a fixed rack at the base of the machine frame and also a rack on the under side of the form bed. The motion transmitted by the crank to the bed, as is well known, is an irregular motion having periods of fast and slow time with intervening periods of gradual acceleration and retardation so that in structures in which the impression cylinder or cylinders receive motion direct from the driving shaft instead of through the bed, some means is necessary to impart to the cylinder or cylinders so much of the irregular speed of the bed as is required to effect the proper printing of the sheet (or web, if the latter is used) without danger of blurring. To this end there is interposed between the driving shaft or any other shaft in the machine having a constant speed of rotation, an irregularly driven gear or shaft that has connection with the impression cylinder to rotate it, such irregular motion being of course a counterpart of the irregular movement of the bed at least so far as during the taking of the impression.

In the present embodiment of the invention, the driving shaft is geared with a toothed wheel that carries the crank for reciprocating the form bed, and this toothed wheel in turn is in gear with a smaller wheel, the shaft of which carries at its end a radially slotted arm. This radial slot is engaged by a stud projecting from a toothed wheel that is mounted eccentrically to the axis of the shaft carrying the slotted arm and by reason of the connection is caused to rotate at an irregular speed; and this eccentrically-mounted toothed wheel is in gear with the impression cylinder gear whereby the irregular speed is transmitted to said cylinder. In the case of a double cylinder machine, the cylinder just referred to will preferably be the first impression cylinder and the second impression cylinder will be in gear with the gear of said first cylinder whereby both cylinders will be moved at irregular speeds during the taking of the impressions.

The present embodiment of the invention is shown in connection with a double cylinder printing machine although it is obvious that a single cylinder machine may be employed.

The machine frame supports the usual impression cylinders A, A^2, having sheet grasp-

ing grippers a, a^2, respectively, that may be opened and closed in any proper manner. With the first impression cylinder A there co-operates a feeding-in cylinder A^3, having a set of grippers a^3, operated in the usual manner and adapted to take the sheets fed to said cylinder from the feed table B or from any other source of supply, as, for instance, an automatic feeding and cutting mechanism as shown in my Letters Patent No. 433,715, and in an application filed in the United States Patent Office May 8, 1890, Serial No. 351,052.

With the two impression cylinders there co-operates a reciprocating form bed E, carrying two forms e, e^2, inked by ink rolls f, f^2, respectively, the form e co-operating with the first impression cylinder A and the form e^2 with the second impression cylinder A^2.

The form bed E, referring now to Fig. 1, is reciprocated back and forth beneath the impression cylinders in the usual manner by means of a traveling gear F, that engages with a fixed rack G, and a rack G′, on the underside of the form bed. The traveling gear in turn receives motion through a connecting rod I from a crank shaft H, the crank wrist I^2 of which is carried by a toothed wheel K, the latter and the crank shaft being driven by a pinion L on the driving shaft J. The toothed wheel K meshes with and drives a toothed wheel 50 that is fast to a shaft 51 mounted in bearings in the machine frame and carries at one end an arm 25 keyed thereto, and having a radial slot 8. This end of the shaft 51 projects through an annular bearing 23, fixed to the machine side-frame so that the slotted arm 25 extends upon the outside of said bearing. This annular bearing 23 is arranged eccentric with respect to the axis of the shaft 51, and supports a toothed wheel 20 which is thus eccentrically set with respect to said shaft 51. This toothed wheel 20 carries a stud 9, having a box fitting the radial slot 8, of the arm 25 and will thus be rotated on its annular bearing 23 from the shaft 51, which latter of course might be the driving shaft of the machine in lieu of the shaft L. By reason of the eccentric setting of the toothed wheel 20, with respect to its driver, and the slotted connection between said wheel and driver, the toothed wheel will have imparted to it an irregular speed of rotation the proportions of the parts and the degree of eccentricity being such as that such irregular speed will correspond to the speed of the form bed during the time of impression with each of the impression cylinders and their respective forms, so that the proper and accurate register of the sheets may be maintained and no blurring of the printing occur. The eccentrically arranged toothed wheel 20 is in mesh with a gear 22 fast to the shaft of the first impression cylinder A to drive the latter, which gear 22 also acts as an intermediate in mesh with the gear 42 fast to the shaft of the second impression cylinder A^2, communicating the irregular speed of the wheel 20 to that cylinder. The cylinder gear 22 also acts as an intermediate between the wheel 20 and the gear 52 fast to the feeding-in cylinder shaft for rotating that cylinder at irregular speed; the rotations of each of the said three cylinders being in unison, the feeding-in cylinder making two revolutions to one revolution of the impression cylinder.

The sheet to be printed will be conveyed in any proper manner to the grippers a^3 of the feeding-in cylinder A^3 every second revolution and be carried by said cylinder onward until the grippers a, of the first impression cylinder A takes said sheet, whereupon it is carried around by said impression cylinder in contact with the form e, as the form bed travels in the direction of the arrow 1. The sheet once printed is taken by the grippers a^2 of the second impression cylinder A^2 and taken around by said cylinder in contact with the form e^2 as the form bed travels in the opposite direction, indicated by the arrow 2, and being printed on its second side is delivered to any suitable delivery mechanism, C. During the taking of the first impression, the second impression cylinder has been raised out of the plane of impression, with the form bed, and likewise during the second impression the first impression cylinder has been raised out of the plane of impression. For this purpose the cylinders are mounted in vertically movable boxes 30, operated at the proper times by raising and lowering mechanism through rods 31. This mechanism and its function and operation is now so well known in the art as not to need further description or illustration. An example of one such form of mechanism adapted for use in the present construction is shown in my United States Patent No. 274,558, to which reference may be had for a complete description.

The delivery mechanism referred to forms no part of the present invention and hence is not fully illustrated herein. It may be stated that it consists, briefly, of a traveling belt or carrier c, that is stretched around rolls c', and supports and carries a set of grippers or other sheet holding devices c^2 that take the sheet delivered from the second impression cylinder and carry it outward, either direct to a piling table, to a fly, or to a folding machine that may be intimately associated with said carrier c, as a part of such delivery mechanism, or as a separate machine; the carrier being reciprocated by a driving connection with the form bed or otherwise moved by connection for instance with the second impression cylinder gear.

In the modified construction shown in Figs. 2 and 3, the parts are arranged and operate substantially as herein described, the change being in the form of crank for driving the traveling gear F, whereby a more uniform motion is imparted to the form bed. The crank wrist I^2, to which the connecting rod I of the traveling gear is attached, instead of

being carried directly by the toothed wheel K, as before, is carried by a planet wheel K′ that is in turn supported by the toothed wheel K and revolves therewith. The planet wheel K′ is in mesh with a rotating sun-pinion K^2 so that in addition to its motion with the wheel K, it is also rotated on its own axis. The sun-pinion K^2 is fast to the shaft H′, the outer end of which carries a toothed wheel H^2 that is in mesh with a similar wheel L′ on the driving shaft J. The toothed wheel K is carried by sleeve H^3 surrounding the shaft H′ and supported to rotate in suitable bearings in the machine frame; said wheel K being driven as before by the pinion L on the driving shaft J. The proportions of this gearing is such that for each complete turn of the toothed wheel K, the form bed will have been reciprocated once in each direction; and by reason of the epicyclic motion imparted by the sun and planet wheels, the crank wrist I^2 has been caused to travel nearly in straight line from right to left and back to right with respect to the horizontal plane through the axis of the sun wheel, such path of movement, however, to be more accurate, being in two flat curves indicated by the series of dotted circles *s*, in Fig. 2.

The construction and arrangement of the eccentrically mounted toothed wheel 20, and the radially slotted driving arm 25, are the same as shown in Fig. 1, and need not be further described.

What is claimed is:—

1. The combination with the impression cylinder and reciprocating form bed, of a toothed wheel having a crank-wrist, connections between said wrist and the bed for driving the latter, a second toothed wheel in mesh with said first mentioned wheel, a radially slotted arm connected with said second wheel, an eccentrically mounted toothed wheel having a stud engaging the slot of said arm and in mesh with the impression cylinder gear, substantially as described.

2. The combination with the first and second impression cylinders and the reciprocating form bed, of a crank, connections between said crank and the bed for driving the latter, a driver of constant speed, an eccentrically mounted toothed wheel connected with one of the impression cylinders and slotted connections between the driver and said toothed wheel, whereby both the cylinders are driven with the same surface speed as the bed during the taking of the impression, substantially as described.

3. The combination with the feeding-in cylinder, the first and second impression cylinders in gear with each other and the reciprocating form-bed, of a crank, connections between said crank and the bed for driving the latter, a driver of constant speed, an eccentrically mounted toothed wheel connected with one of the impression cylinders, and slotted connections between the driver and said toothed wheel whereby said three cylinders are driven with the same surface speed as the bed during the taking of the impressions, substantially as described.

4. The combination with the reciprocating bed, epicyclic gearing and connections with the bed for driving it, of the impression cylinder and gearing for driving the cylinder at the same surface speed as the bed during the taking of the impressions, substantially as described.

5. The combination with the reciprocating bed, epicyclic gearing connected with the bed for driving it and a toothed wheel carrying part of the epicyclic train, of the impression cylinder, a slotted driving arm connected with said toothed wheel, and an eccentrically mounted toothed wheel having a stud engaging said arm and connected with the impression cylinder for driving the latter at the same surface speed as the bed during impression, substantially as described.

6. The combination with the reciprocating form bed carrying two forms, epicyclic gearing and connections with the bed for driving it, of the first and second impression cylinders and gearing for driving both cylinders at the same surface speed as the bed during the taking of the impressions substantially as described.

7. The combination with the reciprocating form bed and the impression cylinder, of a rotating toothed wheel, a planet toothed wheel carried thereby, a rotating sun-pinion engaged by the planet wheel, connections between the planet wheel and the bed for reciprocating it and connections between said rotating toothed wheel and the cylinder for moving it at the same surface speed as the bed during impression, substantially as described.

8. The combination with the reciprocating form bed and the impression cylinder, of a driving shaft, a rotating sun-pinion connected with said shaft, a rotating toothed wheel sleeved on the shaft of the sun-pinion and also connected with said driving shaft, a planet toothed wheel in gear with the sun-pinion, connections between the planet wheel and the bed and connections between said rotating toothed wheel and the cylinder for moving the latter at the same surface speed as the bed during impression, substantially as described.

In testimony whereof I have hereunto set my hand, this 9th day of April, 1892, in the presence of two witnesses.

JOHN BROOKS.

Witnesses:
GEO. H. GRAHAM,
N. MARLER.