(No Model.) 4 Sheets—Sheet 1.

C. B. COTTRELL.

PRINTING MACHINE.

No. 453,757. Patented June 9, 1891.

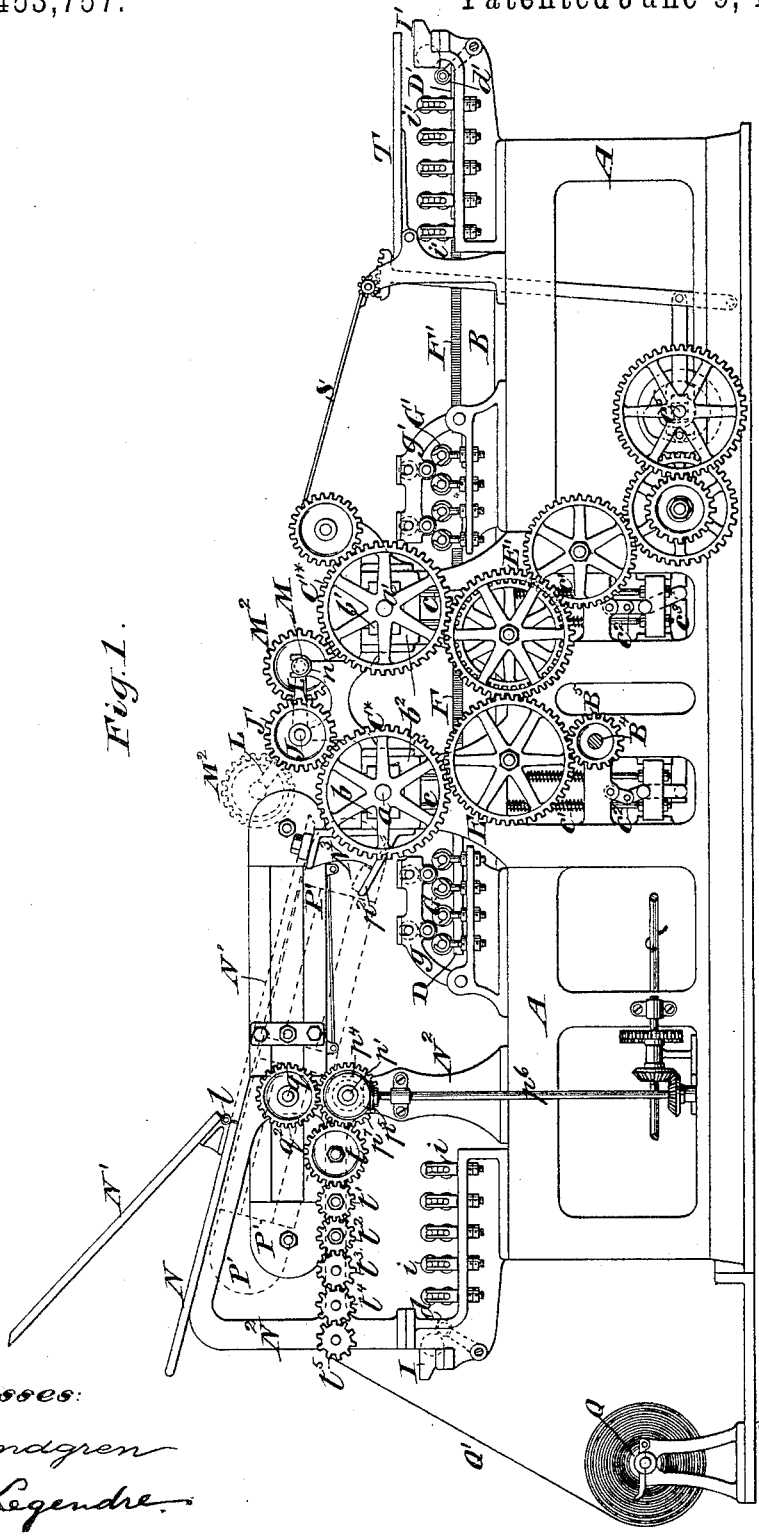

Fig. 1.

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(No Model.) 4 Sheets—Sheet 2.

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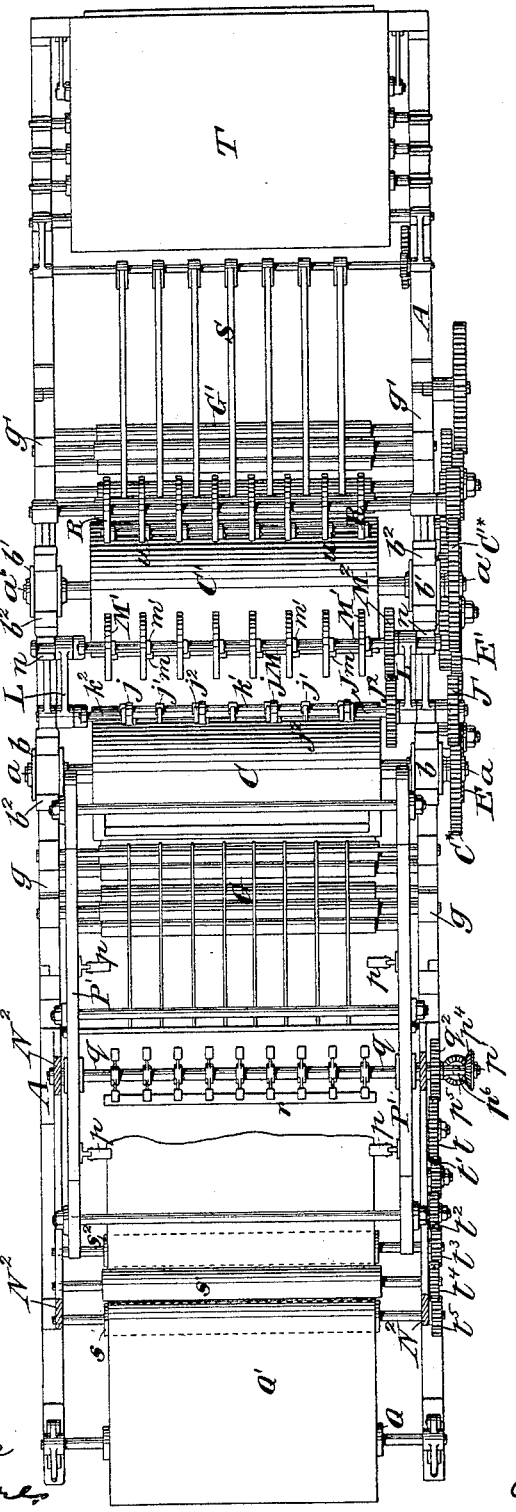
Fig. 2.



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(No Model.) 4 Sheets—Sheet 3.

C. B. COTTRELL.

PRINTING MACHINE.

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Fig. 4.

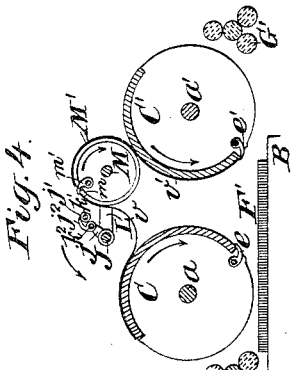
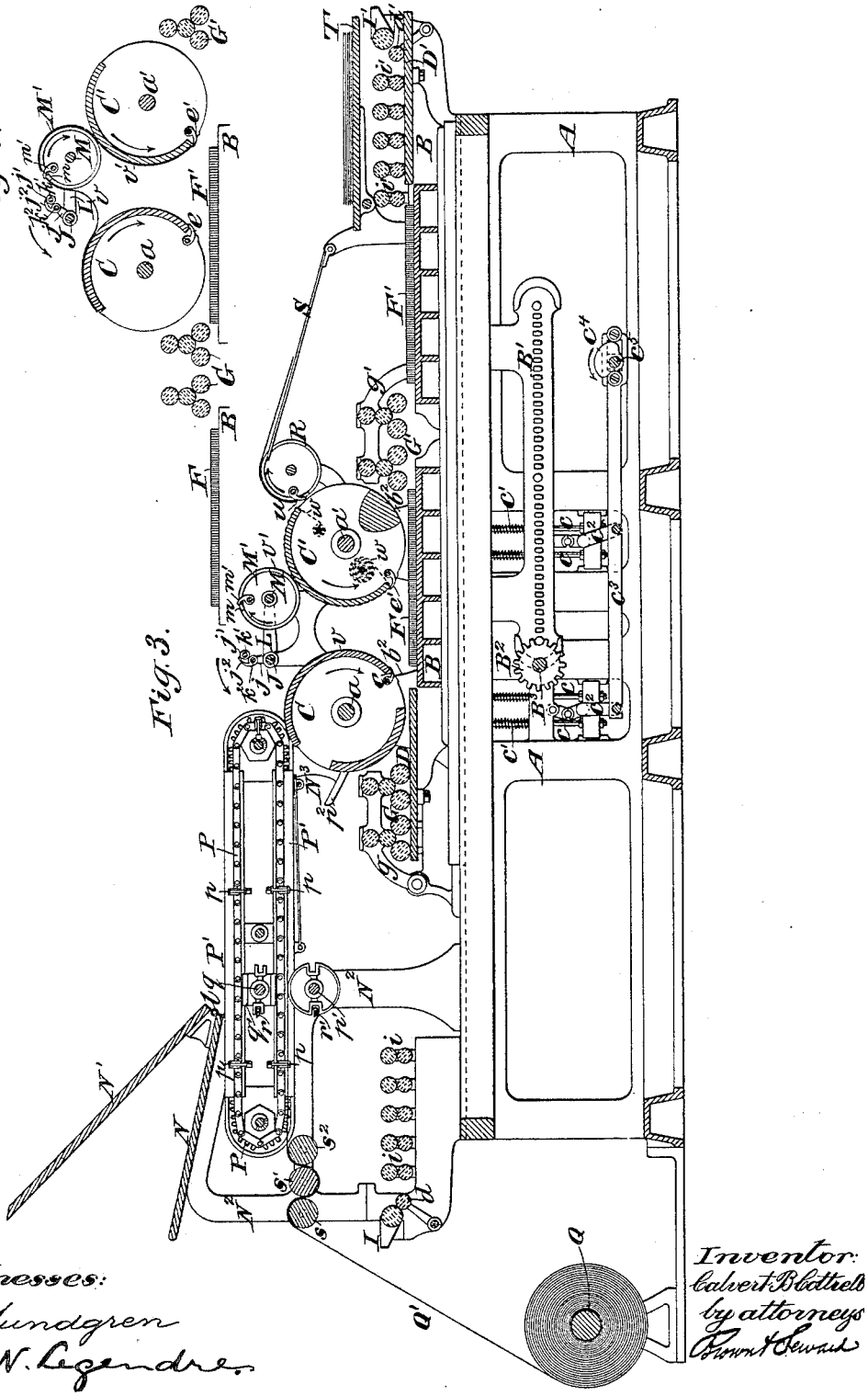


Fig. 3.



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(No Model.) 4 Sheets—Sheet 4.

C. B. COTTRELL.

PRINTING MACHINE.

No. 453,757. Patented June 9, 1891.

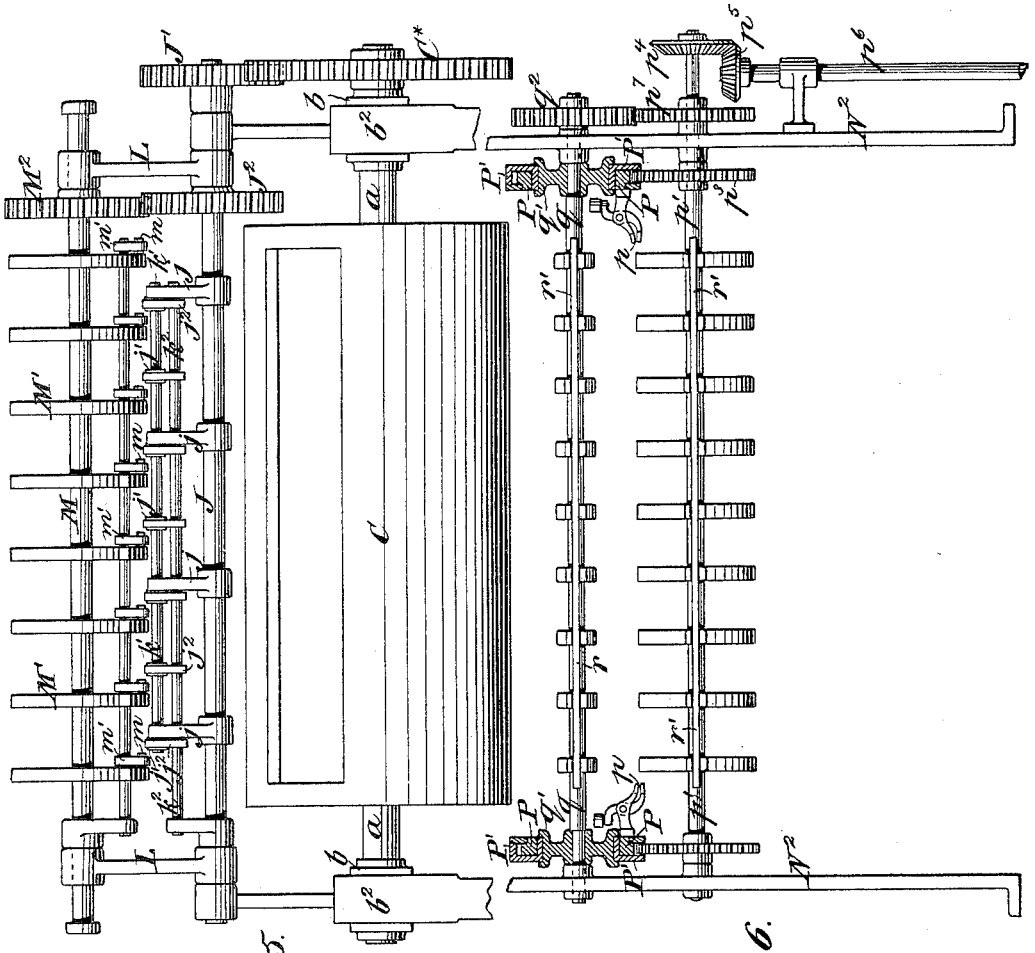

Fig. 5.

Fig. 6.

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UNITED STATES PATENT OFFICE.

CALVERT B. COTTRELL, OF WESTERLY, RHODE ISLAND.

PRINTING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 453,757, dated June 9, 1891.

Application filed January 23, 1891. Serial No. 378,786. (No model.)

To all whom it may concern:

Be it known that I, CALVERT B. COTTRELL, of Westerly, in the county of Washington and State of Rhode Island, have invented a new and useful Improvement in Printing-Machines, of which the following is a specification, reference being had to the accompanying drawings.

This invention relates in part to transferring apparatus for transferring sheets from the first impression-cylinder to the second impression-cylinder of a perfecting printing-machine.

The improvement also relates to provisions for feeding sheets either by hand or mechanically, according as may be desired.

Figure 1 represents a side view of those parts of a flat-bed perfecting-machine which are necessary to illustrate my invention. Fig. 2 is a plan of the same. Fig. 3 represents a longitudinal vertical section of the same. Fig. 4 is a diagrammatic view corresponding with Fig. 1 of the principal parts of the machine, but showing the bed at the opposite end of the stroke to that in which it is shown in Fig. 1. Fig. 5 represents a view taken at right angles to Fig. 1 from the feed side of the first impression-cylinder, showing the said cylinder and part of the mechanism for transferring the sheet therefrom to the second impression-cylinder. Fig. 6 represents a transverse sectional view of the feeding apparatus. Figs. 1, 2, 3, and 4 are on the same scale. Figs. 5 and 6 are on a larger scale.

A designates the framing of the machine.

B is the reciprocating form-bed fitted to run in the usual way on ways provided on the framing and represented as having attached to it for the purpose of driving it a mangle-rack B′, gearing with a mangle-wheel B^2 on an oscillating mangle-shaft B^3, which is connected with the main shaft B^4 of the machine, as is common. This bed carries the two forms F F′, and is furnished at its ends with two ink-distributing beds D D′, one for each form.

C is the first impression-cylinder, and C′ the second impression-cylinder, the shafts *a* *a′* of which are fitted to journal-boxes *b* *b′*, capable of a rising and falling motion in housings b^2, provided on the framing A, the said boxes having applied to them a lift mechanism, which may be and is represented as like that commonly applied to the cylinder-boxes of two-revolution presses, consisting of rods *c*, springs *c′*, toggle-levers c^2, a rod c^3, a cam c^4, and a shaft c^5, which carries the said cam. The said cylinders C C′, which rotate in opposite directions, may be and are represented as driven in the usual manner by a spur-gear B^5 on the main shaft B^4 through the intermediation of spur-gears E E′, gearing with the said gear B^5 and with gears C* C′* on the shafts of the cylinders. The housings b^2 are so arranged in or on the framing A that the cylinders are separated at a considerable distance from each other to afford facility for making ready, and for another reason to be hereinafter explained.

At opposite ends of the machine are arranged two ink-fountains I I′, two sets of ink-distributing rollers *i* *i′*, two ductors *d* *d′*, one fountain, one set of rollers, and one ductor and one fountain for each form-bed, and near the cylinders are two sets of inking-rollers G G′, the set G being behind the first impression-cylinder C and the set G′ being in front of the second impression-cylinder C′. At opposite ends of the bed are two ink-distributing tables D D′, which receive ink from the ductor and upon which the ink is distributed. These tables give the ink to the inking-rollers G G′, from which it is taken by the forms.

All the inking apparatus above described is similar to that in use in other printing-machines. I will here remark that the frames *g* *g′*, which carry the inking-rollers G G′, are stationary during the operation of the press—that is to say, they have no rising and falling motion, such as is common to them in some perfecting-presses—for the purpose of allowing the passage under them without inking of the form which is to be inked by the other set, the necessity for this lifting being obviated by the setting of the cylinders C C′ at a distance apart, as hereinabove mentioned, and properly proportioning the length of stroke of the bed, which must be such that when the bed runs in one direction the first form F may run under the second impression-cylinder C′, but not under the inking-rollers G′ of the second form, and that when the bed runs in

the other direction the second form F′ may run under the first impression-cylinder C, but not under the inking-rollers G of the first form. This is illustrated by Figs. 3 and 4, which represent the bed at opposite ends of its stroke. It may be observed that each form runs under the impression-cylinder of the other form at the time when that cylinder is lifted. The cylinders C C′ are furnished, respectively, with gripper-shafts and grippers *e e′*, like those of the cylinders of ordinary two-revolution printing-presses, the said grippers being operated by any suitable mechanism—such, for instance, as that commonly employed in those presses.

I will now describe the mechanism for transferring the sheet from the first impression-cylinder C to the second impression-cylinder C′.

J is a rotary gripper-shaft working in fixed bearings on the framing of the machine, and furnished with arms *j*, carrying a set of grippers *j′ j²*, which may be and are represented as like those commonly employed in the rotary feeding and delivery apparatus of printing-presses, the jaws *j′* being fast to a rod *k′*, which is fixed in the arms *j*, and the jaws *j²* being carried by a rod *k²*, which turns in bearings in the arms *j*. The purpose of these grippers is to take from the first impression-cylinder the sheets which have been printed thereon from the first form F on one side and give them to a substantially similar set of rotary grippers *m m′*, carried by a reel or series of disks M′ on a rotary shaft M, for the purpose of turning over the said sheets and so presenting them to the grippers of the second impression-cylinder that they are taken on the said cylinder with the unprinted side outward, to be printed thereon from the second form F′. The rotary shaft M is fitted to work in bearings *n* (see Figs. 1 and 2) in the framing A; but it is connected with the shaft J, carrying the grippers *j′ j²*, by means of arms L, which are fitted to swing on the said shaft J for the purpose of lifting the said shaft M out of the said bearings *n*, which are open at the top for the purpose, and throwing back the said shaft M and its reel and grippers, as shown in dotted outline in Fig. 1, over the cylinder C to afford convenience for getting at the cylinder C′. It is in order to permit this swinging back of the gripper-shaft M and its reel and grippers that the grippers *j′ j²* are carried by arms *j* instead of by a reel or disks. The grippers *j′ j²* and *m m′* are to be opened at the proper time to take and release the sheets by properly-timed mechanism which I have not thought it necessary to show, but which will be substantially like what is employed in two-revolution printing-machines for opening and closing the rotary grippers which feed and deliver the sheets in such machines.

The gripper-shafts J and M are represented as driven in the proper directions (indicated by the arrows in Figs. 3 and 4) from the gear C* on the first impression-cylinder, which gears with and drives a spur-gear J′ on the shaft J, the latter shaft in turn transmitting motion to the shaft M through a gear J² on shaft J and a gear M² on shaft M, the proportion of said gears to each other being of course such that the points of the grippers *j′ j²* and *m m′* will move at the same velocity as the surfaces of the cylinders. In the example represented the grippers *j′ j²* and *m m′* make two revolutions for every revolution of the cylinders, and the time intervening between the beginning of the printing of the first side of the sheet and the beginning of the printing of the second side of the sheet is equal to the time occupied for three revolutions of either of the cylinders, and hence the ink on the first printed side of the sheet has three times as long to set before the second side is printed as it has in the ordinary flat-bed perfecting-press, in which the time for setting is only equal to that occupied in one revolution of the cylinders.

I have shown in the drawings a feed-board, from which sheets may be fed to the cylinder C by hand, and have also shown means of supplying paper from a roll, cutting it into sheets, and feeding the cut sheets to the cylinder automatically or mechanically. The feed-board N N′, which is supported upon standards N², is like the feed-board commonly employed in printing-presses which are fed by hand, except that it is made of two parts hinged together at about the middle of its length, as shown at *l* in Figs. 1 and 3, so that the portion N′ of it may be brought down on brackets N³, secured to the framing A, as shown in dotted outline in Fig. 1, when it is desired to feed by hand, or may be thrown back, as shown in bold outline in Figs. 1 and 3, when it is desired to feed mechanically or automatically.

The mechanical feeding apparatus, consisting of endless toothed chains or racks P with attached grippers *p*, is carried by a frame P′, which is supported in part on the standards N² and in part by the brackets N³. The endless toothed chains or racks P and their grippers *p* are substantially like what are commonly used in both feeding and delivery apparatus, and therefore need no particular description.

The frame P′, which carries the feeding apparatus, is not supported fixedly upon the standards N² N³, but is supported at a point in rear of the center of its length upon a pivot *q*, which is supported in bearings in the standards N², and which in the example represented is also a rotary cutter-shaft. The said frame is capable of a longitudinal movement as well as an upward and downward swinging movement on the said pivot or shaft *q*, so that it may be brought to the horizontal position shown in Fig. 3 and in bold outline in Fig. 1 in a position for feeding the sheets to the cylinder C, and in the inclined position shown in dotted outline in Fig. 1, in which latter po-

sition it permits the hinged portion N′ of the feed-board to be brought down to the top of the brackets N^3 in proper position for feeding sheets by hand.

In order to give stability to the pivotal support of the frame P′ and to permit of its longitudinal movement, the said frame is fitted to slide on blocks q', which are fitted to turn upon the pivot or shaft q. By sliding the frame longitudinally on its blocks it may be brought far enough forward to rest on the tops of the brackets N^3 in the position for the operation of the feeding apparatus P p, or may be slid back far enough to clear the tops of the said brackets to permit its lugs to drop down to shoulders p^2 on the lower parts of these brackets, in which position it permits the hinged portion N′ of the feed-board to be brought down upon the tops of the said brackets.

Q is a roller, from which a web of paper Q′ is supplied to the feeding apparatus P p to be cut into sheets, while carried by said feeding apparatus, by means of two co-operating rotary cutters r r', of which one r is carried by the shaft q and the other r' by the shaft p', supported in bearings in the standards N^2 below the feeding apparatus. These rotary cutters are alike and operate in the same way as other rotary cutters employed with endless-chain feeding apparatus, as is well understood. The paper of the roll Q on its way from the roll to the feeding apparatus and cutters passes over a series of feed-rolls s s' s^2. The endless toothed chains or racks are here represented as driven by a spur-gear p^3, Fig. 6, on the lower cutter-shaft p', the said shaft p' being also furnished with a bevel-gear p^4, which derives motion from a bevel-gear p^5 on an upright shaft p^6, which may derive motion from the main shaft of the machine through any suitable train of gearing. The lower cutter-shaft p' is geared with the upper cutter-shaft q by means of spur-gears p^7 q^2. The spur-gear p^7 also serves to drive the feed-rolls s s' s^2 by means of a train of gearing t t' t^2 t^3 t^4 t^5, as shown in Fig. 1.

The delivery apparatus herein represented consists of a rotary gripper-carrier R and attached grippers u for taking the printed sheets from the cylinder C′ and fly S, which receives the sheets from the grippers u and throws them over onto a receiving-table T. This delivery apparatus is such as is well known and needs no further description.

Having described the construction and operation of the several parts of the machine, I will describe the operation of printing with reference to Figs. 3 and 4, in which v v' designate the sheets. A sheet v, fed to the first impression-cylinder C, passes down in the direction of the arrow represented on said cylinder in Fig. 3 and receives an impression from the form F, which is moving to the left, after which the said cylinder rises to be out of the way of the form F′. When the head of the advancing sheet v comes opposite the gripper-shaft J, it is taken by the grippers j' j^2 and carried to the grippers m m' on the reel M′, as shown in Fig. 4. The sheet is wound around the reel M′ on the first revolution of the latter after taking the sheet, and the said reel makes about two and two-thirds further revolution before the sheet is taken by the grippers of the cylinder C′ with the unprinted side outward. The sheet so taken by the grippers of the cylinder C′ is designated by v' in Fig. 4. It is carried by the said cylinder in the direction of the arrow shown upon it and receives the second impression from the form F′, while the latter is moving to the right, after which the said cylinder C′ rises and the form F passes under it and clear of it. The said cylinder C′ then carries the sheet to the grippers u of the gripper-carrier R, which takes it to the fly S, by which it is deposited on the receiving-table T with the last printed side upward. The cylinder C′ then makes a second revolution and takes another sheet from the reel M′. I will here state that the cylinder C′ is intended to be provided with an automatic shifting tympan, as indicated at w w in Fig. 3, and that this tympan is to be shifted during the aforesaid second revolution of the said cylinder C′.

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

1. The combination, in a perfecting printing-machine, of two impression-cylinders arranged at a distance apart and two rotary sets of grippers arranged to operate over the space between said cylinders for transferring a sheet from one cylinder to the other, and a swinging support for one of said rotary sets of grippers, substantially as herein set forth.

2. The combination, with the impression-cylinder of a printing-machine, of a feeding apparatus consisting of an endless chain or rack and attached grippers and a frame for carrying the same, a pivot upon which the said frame is capable of both moving lengthwise and swinging, a rest or support for supporting the front end of said frame in a position for feeding the cylinder, and a rest or support for supporting the said end of the frame in a lower position, substantially as and for the purpose herein set forth.

3. The combination, with the impression-cylinder of a printing-machine, of a feeding apparatus consisting of an endless chain or rack and attached grippers and a frame for carrying the same, and two rotary cutter-shafts and cutters for cutting a roll of paper into sheets in said feeding apparatus, one of said cutter-shafts constituting a pivot upon which the said feeding apparatus is capable of both a longitudinal movement and a swinging movement, substantially as and for the purpose herein set forth.

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