3 Sheets—Sheet 1.

S. D. TUCKER.

DELIVERY APPARATUS FOR PRINTING-MACHINES.

No. 192,954. Patented July 10, 1877.

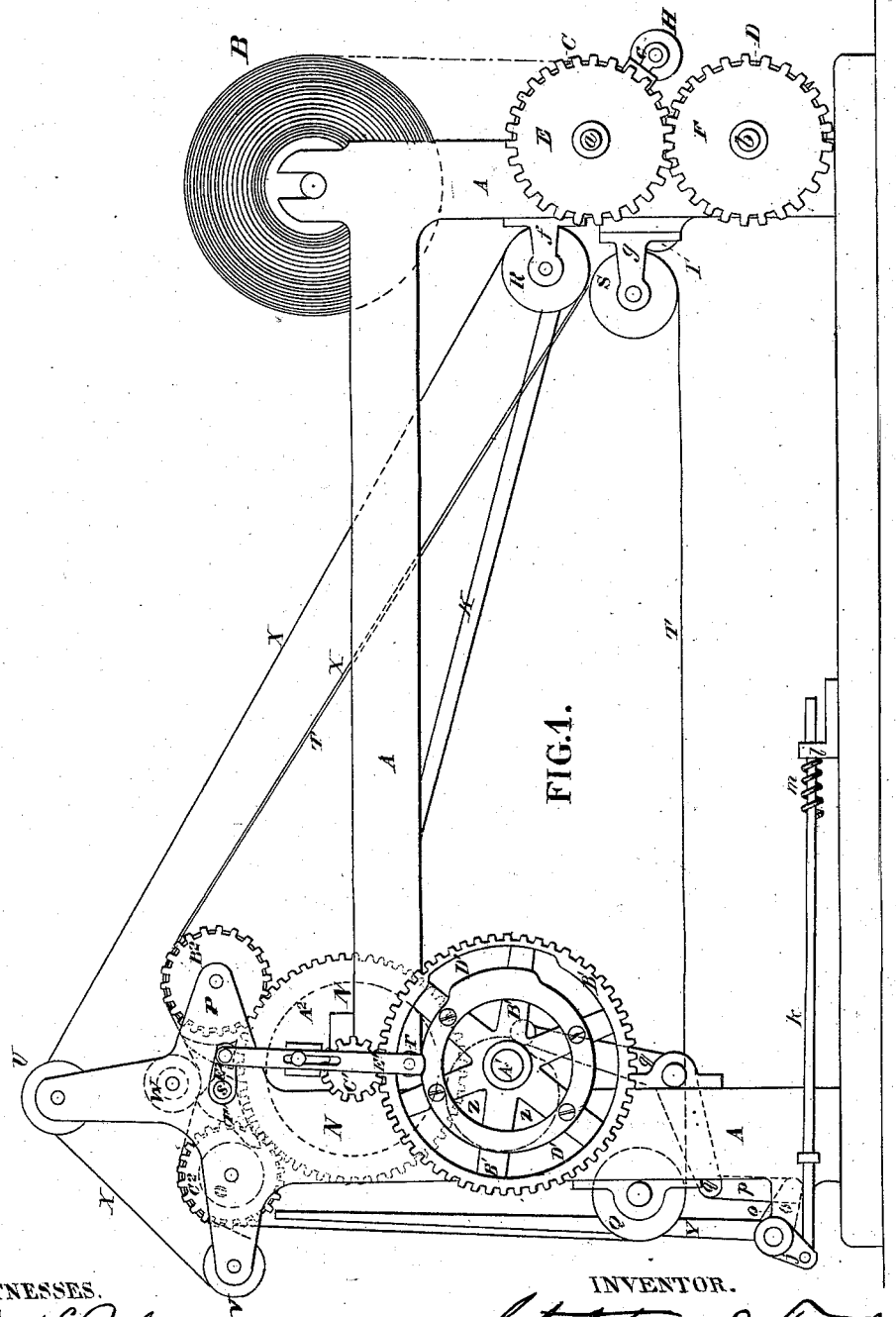

FIG. 1.

WITNESSES.

E. H. Johnson

C. C. Burgin.

INVENTOR.

Stephen D. Tucker

by C. C. Burgin

Atty.

3 Sheets—Sheet 2.

S. D. TUCKER.

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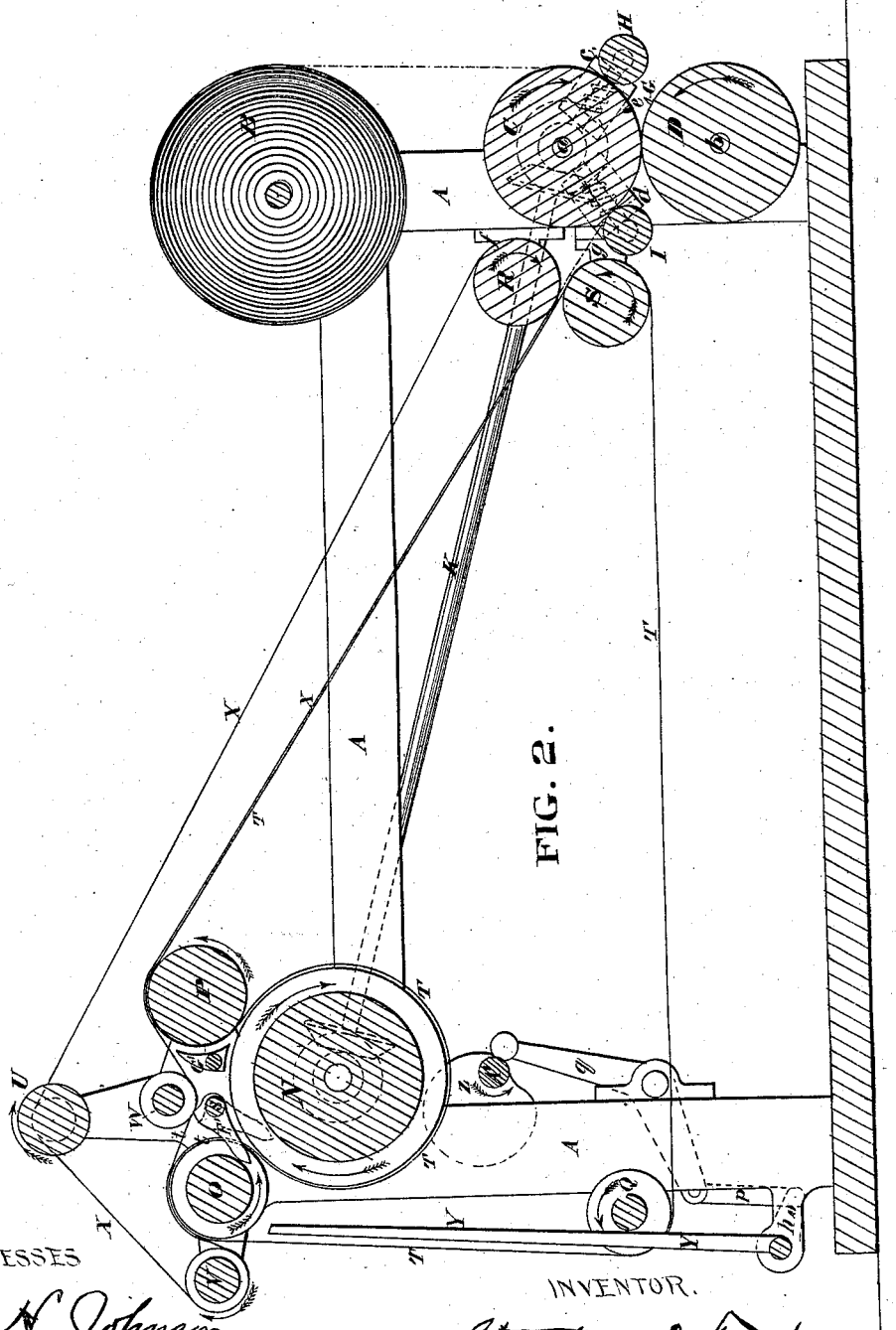

FIG. 2.

WITNESSES

E. N. Johnson

C. C. Durgin

INVENTOR.

Stephen D. Tucker

C. C. Durgin

Atty.

3 Sheets—Sheet 3.

S. D. TUCKER.

DELIVERY APPARATUS FOR PRINTING-MACHINES.

No. 192,954. Patented July 10, 1877.

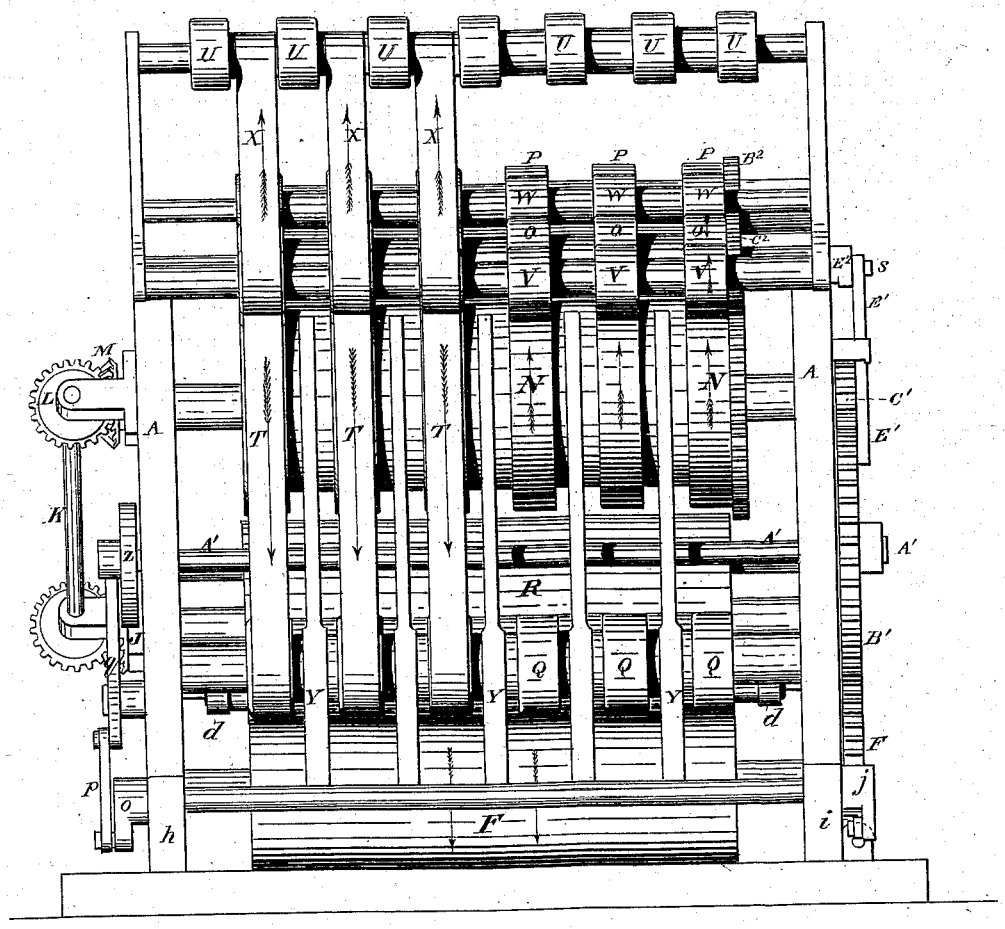

FIG. 3.

WITNESSES.

E. H. Johnson.

C. C. Durgin.

INVENTOR.

Stephen D. Tucker

by Munn & Co Atty.

UNITED STATES PATENT OFFICE.

STEPHEN D. TUCKER, OF NEW YORK, N. Y.

IMPROVEMENT IN DELIVERY APPARATUS FOR PRINTING-MACHINES.

Specification forming part of Letters Patent No. **192,954**, dated July 10, 1877; application filed May 4, 1874; patented in England, February 11, 1873, for fourteen years.

To all whom it may concern:

Be it known that I, STEPHEN D. TUCKER, of the city, county, and State of New York, have invented certain Improvements in Delivery Apparatus for Printing-Machines, of which the following is a specification:

Formerly there were no means by which sheets of paper could be delivered as rapidly as they could be produced by rotating printing mechanisms known as "web perfecting printing-machines," for while the speed of the printing-cylinders could be increased to a great number of revolutions, that of the delivering mechanism could only be increased to within certain limits, rendering its capacity to receive and pile the sheets far below that of the mechanism producing them. This defect in rotary machines whereby a web of paper is printed on both its surfaces and cut into sheets, such as are known as "web" or "perfecting" machines, was remedied to a large degree by an improved collecting and delivering apparatus, invented by Richard M. Hoe and Stephen D. Tucker, for which Letters Patent of the United States No. 192,510 were granted June 26, 1877, in which apparatus the web of paper, printed upon both its surfaces, is severed into sheets, said sheets directed upon a carrier, whereby they are collected or accumulated until a number lie one upon the other in a mass or body, and from whence they are guided off in a single mass or body, and directed before a vibrating fly-frame, which deposits them upon a piling-table.

By that apparatus the maximum speed of a vibrating fly-frame is utilized, and the rotating printing mechanism and collecting-cylinder or rotating carrier are operated at such corresponding speed as will produce and collect the greatest possible number of sheets during each single vibration of the fly-frame.

My invention relates to the said apparatus invented by Richard M. Hoe and Stephen D. Tucker; and it consists in details of construction and combinations and arrangements of devices, as will be hereinafter more particularly pointed out.

An apparatus embodying my invention is shown in the accompanying drawings, in which it is illustrated in side elevation in Figure 1, in longitudinal section in Fig. 2, and in end elevation in Fig. 3.

The main frame A supports in suitable bearings at one end a roll of paper, B, and cutting-cylinders C D. The shafts *a b* of the cutting-cylinders are geared together by toothed wheels E F. The cylinder D is provided with a cutting-blade, G, parallel with its axis, and projecting slightly from its surface. The edge of this blade is serrated, and has some of its teeth removed, so that it shall not make a continuous cut. The cylinder C has a longitudinal groove cut in its periphery, into which the blade in the cylinder D enters as the cylinders revolve. Web-distending rollers H I are placed upon each side of the upper cutting-cylinder C, and have their bearings in spring-boxes *c d*, by which they are kept in contact with the periphery of said cylinder with a certain degree of pressure.

Though the web of paper is, in practice, received directly from the printing-machine, as is shown in the Patent No. 192,510, hereinbefore referred to, it is, for the purpose of easy illustration, here shown as led from the roll B, and passed between the roller H and the cutting-cylinder C, then between the cutting-cylinders C D, and then between the cylinder C and roller I.

The circumference of each cutting-cylinder (it may be the male cutting-cylinder D only) equals the length of the sheet to be cut, and at each revolution the blade G on the cylinder D enters the groove *e* in the cylinder C, thus severing the paper while it is held distended and tightly over the groove by means of the pressure of rollers H I, which insures the passage of the knife through the web, so as to sever it instead of merely forcing it into the groove.

On the shaft *a* of the cutting-cylinder C is secured a bevel-gear wheel, J, which meshes with a similar wheel on the shaft K, and this latter shaft, by means of the bevel-gear wheels L M, rotates the grooved collecting-cylinder or rotating carrier N. A solid roller, P, and a grooved roller, O, are situated above and parallel with the cylinder N, and furnished with toothed wheels B^2 and C^2, which mesh with the toothed wheel A^2 on the shaft of the collecting-cylinder N, whereby they are driven in unison with the said cylinder N.

Another grooved roller, Q situated below the cylinder N, and two solid rollers, R S, are situated one above the other, and just in

advance of the cutting-cylinders, in bearings *f g*, secured to the side frames.

A series of conducting-tapes, T, pass around a roller, S, thence over a roller, P, thence around the collecting-cylinder N, thence over a grooved roller, O, thence down to and over a grooved roller, Q, and return back to the roller S.

Another series of conducting-tapes, X, pass around the roller R, thence up to and over the roller P, thence under a grooved roller, W, (which binds the tapes, so that they shall cover a large portion of the surfaces of the rollers P O,) and over the roller O, thence under a grooved roller, V, thence up to and over a grooved roller, U, and back to the roller R. The lower series, T, and upper series, X, constituting the sheet-conducting tapes, run in the same planes for a great part of their travel, so that where they pass over the same rollers they are in contact or lie one over the other. The collecting-cylinder N is geared to the cutting-cylinders, so that it revolves turn for turn therewith; but its diameter is larger, and, consequently, its surface-speed is greater, than that of the cutting-cylinders, and hence the tapes T X, which it drives, are caused to travel with the same velocity as the circumference of said collecting-cylinder, and, consequently, move faster than the peripheries of the cutting-cylinders.

A fly-frame, Y, has its bearings at *h i*, and when in a vertical position is parallel with and slightly in the rear of the tapes leading from the roller O to the roller Q. On one extremity of its shaft is secured an arm, *j*, to which a rod, *k*, is attached. This rod passes through a guide, *l*, and is pressed out by a spring, *m*, acting against a collar secured to the rod, and thus acts to keep the fly-frame in a vertical position.

A transverse shaft, A^1, carries at one extremity a toothed wheel, B^1, which meshes with a pinion, C^1, secured on the shaft of the collecting-cylinder N.

The wheel B^1, as shown in the drawings, contains four times as many teeth as the pinion C^1, and hence the collecting-cylinder will make four revolutions to one of the shaft A^1. On the other extremity of this shaft is secured a cam, Z, against which a stud on the upper end of the arm or bell-crank *q* presses. The other end of this arm is connected, by the link *p*, to the crank *o* on the end of the fly-frame spindle, and as the shaft A^1 revolves, the fly-frame is vibrated, which must be once to every four revolutions of the collecting-cylinder N. This ratio need not be observed, as the wheel B^1 and pinion C^1 may be proportioned so as to operate the fly at every sixth, eighth, or other number of revolutions of the collecting-cylinder.

On the outer side of the wheel B^1 is formed a cam-groove, D′, in which runs a stud, *r*, on the lower extremity of the bar E^1. The upper extremity of this bar is connected to an arm, E^2, secured to the rock-shaft *s*. This rock-shaft is situated between the rollers O P, and above the collecting-cylinder N, and has secured at intervals along it a series of toes or switches, F′, which, as the shaft *s* is rocked, alternately enter the grooves in the cylinder N and those in the tape-roller O. The cam-groove D′ is so formed that the switches shall be operated and moved into the grooves of the collecting-cylinder once for each revolution of the wheel B^1, and hence at every fourth revolution of the cylinder N; but, as in the case of the fly-frame, this ratio may be regulated as desired by altering the gearing.

A series of deflectors, G′, fixed upon a stationary shaft set before the roller P, insure the passage of the sheets around said roller, and thence onto the collecting-cylinder. The lower ends of these deflectors are curved to coincide with the periphery of the cylinder N, so that they act as guides, directing sheets carried by the said cylinder onward after the leading edges of such sheets have passed under the switches, where they are positioned so as to retain the sheets upon said cylinder.

Operation: The paper is led from the roll B, and passed between the cutting-cylinders C D, which, as before stated, are each equal in circumference to the length of the sheet to be cut, and as they revolve, the cutting-blade G severs the web, so as to form a sheet, which it leaves slightly connected to the web at one or more points by narrow uncut portions left at the points where the teeth are removed from the cutting-blade. This connection is for the purpose of causing the nearly-severed sheet to surely carry the end of the web which is to form the succeeding sheet between the rollers R S, for if the sheet were entirely severed from the web, the leading end of said web might not enter between the rollers R S, or if it did, it might be crushed or buckled, so as to obstruct the perfect operation of the apparatus; but if the cylinders are made to entirely sever the web, guides interposed between the peripheries of the cutting-cylinders and the rollers R S should be provided to insure the smooth passage of the end of the web into the rollers R S. The sheet, after entering the tapes T X at the rollers R S, is carried up to the collecting-cylinder N; but though said tapes come into surface-contact at the rollers R S, this contact is so slight that the said tapes can readily slide over the web, and on reaching the roller P, around which the series of tapes T X run, the web is seized by the nip of the tapes, which, as before stated, travel faster than the circumference of the cutting-cylinders, and carried forward with accelerated speed, while the sheet or web following it is held between the pressure-roller I and cutting-cylinder C, or between the two cutting-cylinders, as may be, and the connections joining the sheet to the succeeding web or sheet are broken.

The sheet, now separated from the web, is carried around the roller P, and directed onto the collecting-cylinder N by the tapes T and

deflectors G′. The succeeding web or sheet has in the meantime been carried up by the tapes T X to the roller P, and the succeeding sheet is torn or separated from the web in the manner just described, and is presented to the collecting-cylinder just as the preceding sheet comes around to the point occupied by the roller P, so that the leading edges of the sheets will coincide, and the two thus be laid one upon the other on the cylinder as it continues its rotation. In this manner any desirable number of sheets may be collected on the cylinder N. The circumference of the collecting-cylinder being, as before stated, greater than the length of the sheet produced by the cutting-cylinders, and, by reason of revolving turn for turn with said cutting-cylinders, causing the sheets to be accelerated in their speed of travel, and thus be separated a distance apart, there will be a portion of the surface of the collecting-cylinder left uncovered—that is to say, the space between the heads and tails or ends of the sheets collected upon it. This space is provided for the passage of the switches F′ in entering the grooves of the collecting-cylinder. The number of sheets to be collected on the collecting-cylinder having been determined upon, and the wheel B^1 and pinion C^1 proportioned accordingly, as the last sheet of the mass or body to be collected is carried upon the cylinder N, the cam D′ on the wheel B^1 elevates the bar E^1, and throws the switches into the grooves in the collecting-cylinder at the point where they are uncovered, and as the front edges of the mass or body of sheets are carried into contact with the switches, the mass or body of sheets will be deflected between the tapes X T at the points *t t*, and pass over the roller O, and down before the fly-frame, which at this moment commences its descent by the operation of the cam Z, and lays the sheets in a single mass or body upon the piling-table.

What therefore is claimed, is—

1. The combination of conducting-tapes which convey, separate, and accelerate the sheets, with a rotating carrier provided with mechanism adapting it to collect a number of sheets one on the other upon its surface, and with mechanism to discharge the collected sheets in a single mass or body therefrom, all substantially as described.

2. The combination, with a cutting mechanism for separating a web into sheets, of a rotating carrier whose circumference is greater than the length of the sheets, and which is provided with means for collecting a number of sheets one on the other upon its surface, and interposed carrying-tapes, whereby the sheets are separated from the web, and carried to and collected upon the delivering-cylinder, with their ends separated, so as to provide a space for the movements of devices acting upon their leading edges, all substantially as described.

3. The combination, with a rotating carrier provided with means for collecting many sheets thereon, of two sets of tapes conducting the sheets thereto, one of which sets of tapes nearly encircles said carrier, and forms a guard holding the sheets thereon, all substantially as described.

4. The combination, with the rotating carrier N, of roller P, tapes T X, and deflectors G′, for delivering the sheets to and piling them upon the revolving carrier N, substantially as described.

5. The combination, with the rotating carrier N, of rollers O P, tapes T X, and switches F′, for deflecting the collected sheets off from the carrier N, substantially as described.

6. The combination, with the rotating carrier N, of rollers O P, tapes T X, deflectors G′, switches F′, and fly-frame Y, substantially as described.

7. The combination, with the rotating carrier N and the pinion C^1, of the toothed cam-wheel B^1, bar E^1, and switches F′, substantially as described.

STEPHEN D. TUCKER.

Witnesses:

JOHN COCHRAN,

E. H. JOHNSON.