

Hoe & Tucker Sheet 1. 3 Sheets.
Printing Press.

N^o 108,785. Patented Nov. 1, 1870.

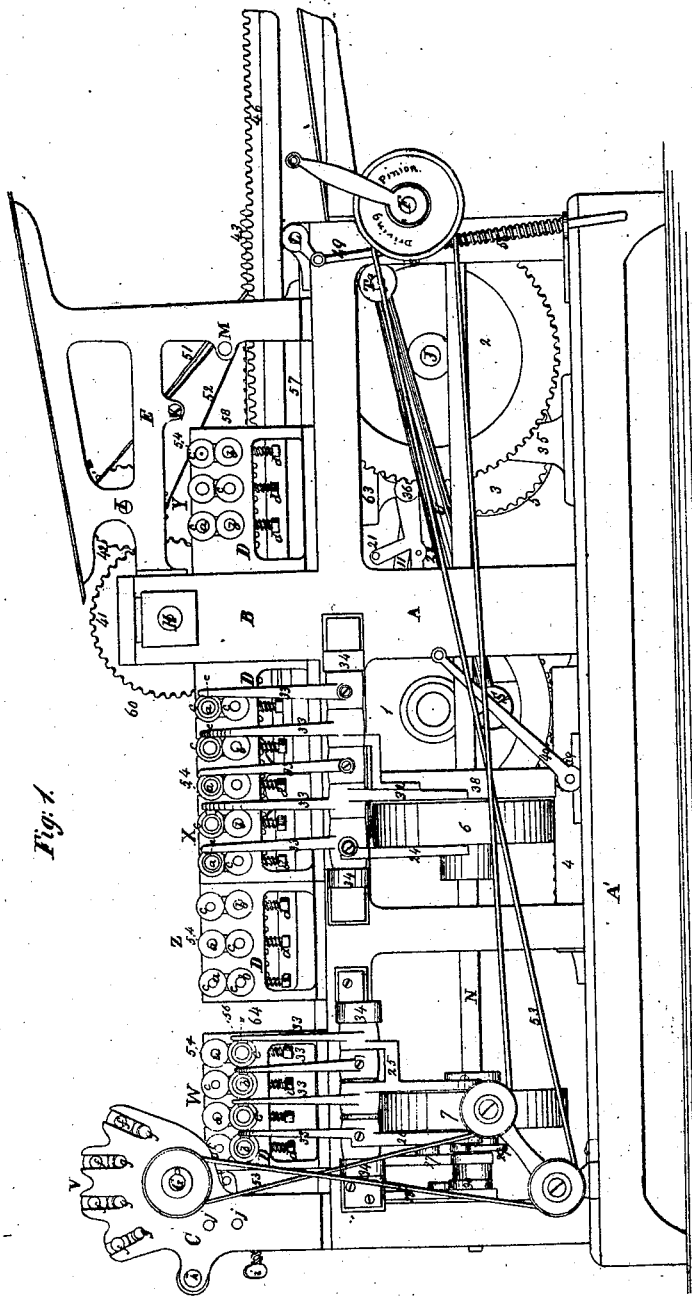


Fig. 1.

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Stephen H. Tucker } *Inventors.*

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Fig. 3.

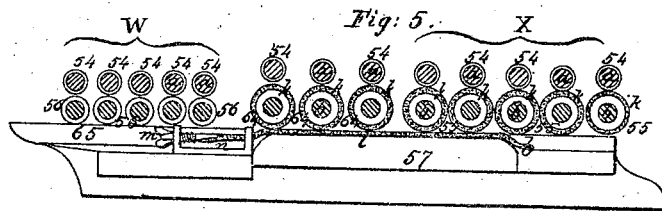
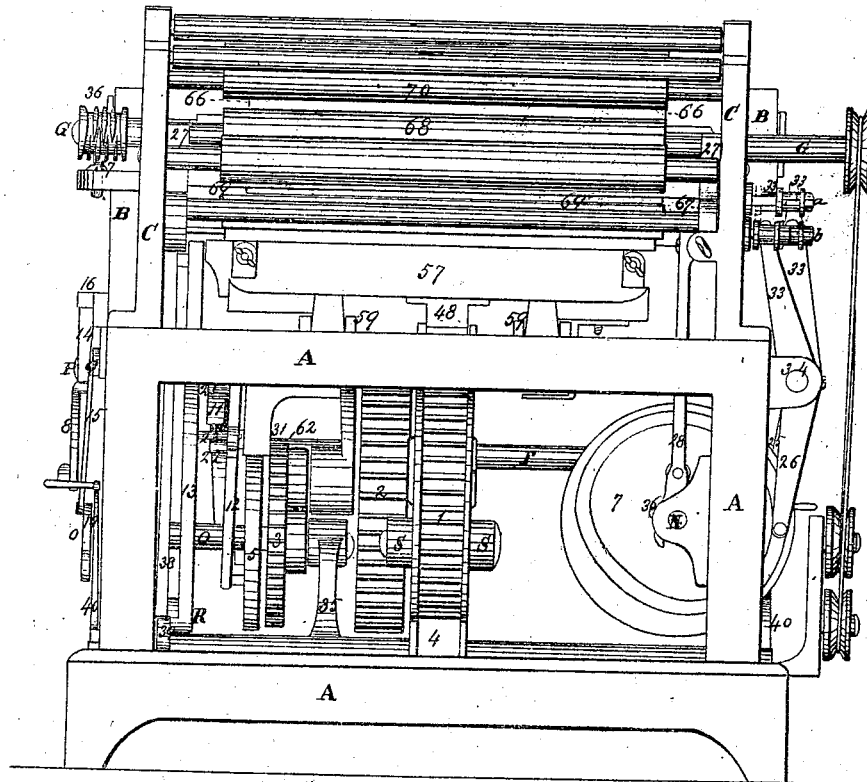


Fig. 6.

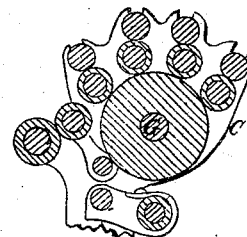
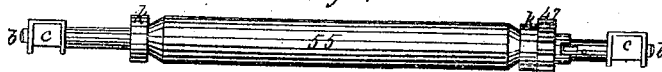


Fig. 4.



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UNITED STATES PATENT OFFICE.

RICHARD M. HOE AND STEPHEN D. TUCKER, OF NEW YORK, N. Y.

IMPROVEMENT IN PRINTING-PRESSES.

Specification forming part of Letters Patent No. 105,735, dated November 1, 1870.

To all whom it may concern:

Be it known that we, RICHARD M. HOE and STEPHEN D. TUCKER, of the city, county, and State of New York, have invented certain Improvements in Printing-Machines, of which the following is a specification:

Our invention consists in certain new combinations and arrangements of parts, whereby we are enabled to make an improved printing-machine, as will be hereinafter fully set forth.

Figure 1 is an elevation of the machine, showing that side which is at the right hand in Fig. 3. Fig. 2 is an elevation of the opposite side of the machine. Fig. 3 is an end elevation of the machine at the right hand in Fig. 1. Fig. 4 is a view of one of the geared form-inking rollers. Fig. 5 is a vertical transverse section of the type-bed and the inking and riding rollers, taken through the line *x x*, Fig. 3. Fig. 6 is a vertical transverse section of the inking-rollers.

A A are the side frames, mounted upon the bed-plate A', and constructed to properly support and resist the vibrations of the operative parts. 59 59, Fig. 3, are two ribs, which are supported by the side pieces and extend the full length of the frame, forming the track upon which the type-bed 57 runs. The mechanism by which this type-bed, which carries the form, is impelled back and forth consists of the rack 4, secured to the bed-plate, the rack 48, fixed to the under side of the type-bed, and the toothed wheel 1, which fills the space between and gears into these two racks. The forked ends of a connecting-rod, U, are attached to the axle S of this toothed wheel, and the opposite end is jointed to a wrist-pin, T, in the toothed wheel 2. This wheel is driven by a pinion on the driving-shaft F.

Now, the rack 4, secured to the bed-plate, being immovable, it follows that, as motion is imparted to the toothed wheel 2, the type-bed 57 will be moved back and forth. If the connecting-rod U were attached to an axle in the center of the wheel 1, the rack 48, and, of course, the type-bed 57, would move at just double the speed of the axle, and with an ever-varying motion derived from the crank T; but if the axle be placed eccentrically in the wheel and the connecting-rod attached to it, then when the axle is above the center of the wheel during its rotation the upper rack and type-

bed will move with less than double the speed of the axle; when it is level with the center they will move at just double the speed; when below the center they will move at more than double the speed. These variations of speed will be more or less, according as the axle is placed more or less eccentrically in the wheel 1.

In this machine advantage is taken of this principle of construction by so combining the eccentricity of the axle S with the position of the wheel 1 as to retard the motion of the type-bed 57 when the crank T is at its half-stroke, and to increase its motion when the crank is approaching the dead-points. A nearly-uniform motion is thus given to the type-bed while the form is passing under the impression-cylinder 60.

The circumference of this cylinder is just equal to the travel of the type-bed in one direction. It is driven forward by a rack, 43, bolted to one side of the type-bed, which gears into a toothed wheel, 41, secured to one end of the cylinder 60; and, in order to prevent a retrograde motion of the cylinder when the motion of the type-bed is reversed, the teeth of the cylinder-wheel 41 are cut away at the point that would be in gear with the rack when the bed arrives at the end of its travel, so that the bed returns and leaves the cylinder stationary; but to assure the perfect completion of the revolution of the cylinder, to hold it stationary while the bed returns, and to start it forward at the proper time so as to make the wheel 41 gear correctly with the rack 43, a toothed segment, 44, is bolted to the side of the cylinder-wheel, and a sector-lever, 13, provided with a toothed segment, 45, is jointed to the side frame of the machine at B, the sector-lever being operated through the connecting-rod 11 by the cams 9 10, secured to the shaft J of the crank-wheel 2. One end of the connecting-rod 11 is formed of a hook-shape, and fits over the stud 23 on the sector-lever, and the other end is slotted and slides over the shaft J, and is furnished with two friction-rollers, 17 18, against which the cams 9 10 revolve. The shape of these cams and their position on the shaft J is such that just as the type-bed and cylinder are together arriving at the end of their forward movement, the teeth 45 of the sector-lever are drawn into gear with those of the segment 44 on the cylinder-wheel, and the

cylinder is brought to the proper stopping-point. The sector-lever also holds the cylinder stationary while the type-bed returns, and then starts forward, so that the cylinder-wheel 41 gears correctly into the side rack 43, and while the cylinder and type-bed are again making their forward movement the sector-lever returns, so as to be again in position to gear into the segment 44.

The fingers that clasp the sheet to be printed are placed in the impression-cylinder at 61 in such a position that when the cylinder is stationary they are directly over its center, as that is the most convenient position for them to receive the sheet from the feed-table. The cylinder, therefore, will have to make one-half a revolution before the sheet will meet the form, and as the bed and cylinder start together the bed will have traveled the same distance. They will have an equal distance yet to travel before the bed will have completed its stroke and the cylinder its revolution, and this determines the largest form that can be printed on the machine, as when the cylinder stops the lower end of the sheet must be lifted entirely clear of the form.

The space in front of the cylinder that is traversed by the bed is occupied by the rollers X, that ink the form; but for ordinary printing the number of rollers required may occupy a less space than equal to one-half the circumference of the cylinder. In that case additional speed of the machine is obtained by shortening the travel of the bed in front of the cylinder until the form just passes beyond the inking-rollers and then returns, while the cylinder, from its having a greater distance to travel, is caused, by the action of the cams 9 10, connecting-rod 11, sector-lever 13, and segment 44, to start forward a certain distance in advance of the bed and then fall in gear and run with it.

For the better kinds of printing the number of rollers required will sometimes occupy a greater space than equal to one-half the circumference of the cylinder. The travel of the bed in that case is lengthened in front of the cylinder only until the form just passes beyond the inking-rollers; and as the bed will have a greater distance to travel, it might then commence to return in advance of the starting-cylinder; but as the bed would be moving with a constantly-increasing speed, it would be difficult to make the cylinder, through the action of the cams, sector-lever, and segment, attain an equal speed, so as to gear into the rack of the type-bed without a shock. We therefore prefer to increase the size of the cylinder until its half-circumference is equal to the space occupied by the inking-rollers X, so that the bed and cylinder can start slowly together, and the fingers at 61 will be in proper position over the center of the cylinder to receive the sheet from the feed-table.

When the cylinder and bed have met each other, the former will have made just half a

revolution and will have the balance of its revolution yet to make; but the travel of the bed having been increased only in front of the cylinder, it follows that, when it has met the cylinder, it will have traveled over more than half its distance, and the remainder of its travel will not be sufficient to make the cylinder complete its revolution. The sector-lever 13, therefore, is operated by the cams 9 and 10 at this time, so that its segment 45 gears into the cylinder-wheel segment 44, and the cylinder is carried around to finish its revolution and bring the fingers at 61 again to the proper point.

Additional inking-rollers Z are placed in front of the rollers X, when required; but as they would ink but a portion of the form, an additional set, Y, are placed behind the cylinder, which ink the remaining portion of the form. In this way the form can receive additional inking without the travel of the bed being increased or the speed of the machine diminished.

When it may be necessary to subject the form to a further inking process, the bed is caused to run back and forth twice to one movement of the cylinder by the following mechanism: A pinion, 62, fixed on the crank-wheel shaft J, gears into a toothed wheel, 3, of twice its size, keyed on the shaft O. This shaft runs in bearings 35, bolted to the bed-plate, and carries a grooved cam, 5, fitted to slide on a feather in the shaft and held by a set-screw. The lower end of the bent lever 12, that is pivoted at 31 to a support, 63, secured to one of the ribs, carries a roller which runs into the grooved cam 5. The upper end of the lever 12 has two projecting rollers, 21 22, and between these the end of the connecting-rod 11 slides. Therefore, as the cam 5 slowly revolves under the action of the wheel and pinion 5 and 62, the form of its groove is such that the bent lever 12 causes the connecting-rod 11 to alternately rise off of and drop over the stud 23 in the sector-lever.

During the return of the type-bed, after a sheet has been printed, and while the cylinder is held stationary by the connecting-rod and sector-lever, as before described, the connecting-rod is lifted off the stud 23 by the cam 5, so that as the bed commences its forward movement the connecting-rod 11 is drawn forward by the cams 9 10 without moving the sector-lever, and the cylinder remains stationary. After the bed completes its forward movement, and during the time it is returning again, the cam 5 drops the connecting-rod over the stud, and the bed and cylinder commence their forward movement, as before.

To prevent the cylinder being accidentally turned while the connecting-rod is disconnected from the sector-lever, the end of the bent lever 12 is formed at 20 in the shape of a hook, so that as it lifts the connecting-rod off the stud in the sector-lever the hook rises over it and grasps it from below. When the connect-

ing-rod is brought down over the stud 23 the hook 20 recedes from it, and the sector-lever is left to be acted upon by the connecting-rod.

If it is required to cause the bed to run three or more times to one revolution of the cylinder—that is, to one sheet printed—then the wheel 3 and the pinion 62 must be in that same proportion to each other, and the form of the groove in the cam 5 must consequently be slightly varied to operate the bent lever 12 with the proper intervals.

The shafts *a* of the riding rollers and those *b* of the inking-rollers turn in adjustable bearings *c*, which slide in suitable recesses in the supports *D*, and are adjusted to the proper height by the set-screws *d*.

The form-inking rollers 55 are fitted with toothed driving-wheels 47, Fig. 4, which gear into a rack, 46, on the side of the type-bed 57, by which they are driven. If these rollers are constructed of such material that they will not decrease in size by wear, only one wheel will be required to each roller; but if they do decrease in size, then two or three change-wheels, having, say, one tooth difference in each to agree with the size of the roller, may be required. The inking-rollers are thus made to revolve with a positive motion, and riding rollers 54 can be placed upon them to increase the distribution of the ink without retarding their motion, as would occur if they were driven by surface-contact alone.

The toothed wheels 47 are placed loosely on the roller-shafts, and are held by feathers *o*, fixed in the shafts; but the grooves in the wheels are made wider than the feathers on which they fit, so that the rollers can turn backward and forward a certain distance independent of the shafts, some more and some less, as may be required. Consequently, when the type-bed has arrived at the end of its stroke in either direction and commences its return, the rollers will remain stationary until the toothed wheels have revolved the limit of the side play allowed by the grooves, and a new surface will thus be presented to the form of type.

The inking-rollers have also friction-rollers *k* fixed on their shafts, one at each end, that run on tracks or bearers *l*, laid at each side of the type-bed. The surfaces of the rollers *k* and tracks *l* are covered with leather, rubber, cloth, or any suitable material drawn tightly over them, so as to make the friction-rollers and tracks adhere to each other and run more smoothly together.

When it may be required, in printing, to have the inking-rollers touch more lightly on one part of the form than on another, it is accomplished by slipping a piece of card-board or other similar material of the proper thickness and length between the leather covering and the track upon which the friction-rollers run.

A receiving-cylinder, 42, is placed just behind the impression-cylinder, the bearings *I* of which are supported in the frame *E*, which

holds the feeding-table. It is driven by a toothed wheel, which gears into a similar wheel on the impression-cylinder. The sheet of paper, as it is printed and drawn off the form by the impression-cylinder, is taken by the fingers of the receiving-cylinder and delivered to the sheet-flier 51.

When the bed is running twice to each impression, the sheet-flier 51 is caused to operate only at every second run of the bed, the mechanism by which this is produced consisting of the following parts, operating as follows: A cam, 19, fixed on the outer end of the shaft *O*, operates a catch-lever, 15, pivoted to a plate on the side-frame at *Q*. A projection on this lever, catching under the segment-lever 14, after it is raised by the fly-cam 8, holds up the fly during one complete run of the type-bed.

When the bed is running only once to each impression, the cam 19 is removed from the shaft *O* and the sheet-flier is operated by the cam 8, in the usual manner.

At each side of the machine is placed a T shaped piece, 38, for lifting the inking-rollers up clear from the form and inking-table. The horizontal arms are just below the shafts of the inking-rollers, and the vertical stems are held in slots on the side frames and rest on eccentric-shaped cams, 39, secured to a shaft extending across the machine. Each end of this shaft is provided with a lever, 40, by turning which the rollers can be raised or lowered from either side of the machine.

N is a shaft running lengthwise of the machine and held in bearings on the side frame. It is driven by a worm on the driving-shaft *F* working into a wheel on the end of the shaft; and the worm and wheel are so proportioned as to cause the shaft to make one revolution to every revolution of the crank-wheel 2. This shaft carries the cams 6 7. 56 are vibrating rollers for redistributing the ink on the inking-table 65, Fig. 5. They turn in adjustable bearings *c*, sliding in recesses in the frames of the machine, and are adjusted to the proper height by set-screws *d*. They turn simply by their contact with the inking-table, and are caused to operate with a lateral reciprocating movement back and forth, each in a direction opposite to that of its neighbor, by means of the rocking levers 25 26, the lower ends of which are actuated by the double cam 6 on the shaft *N*. The lever 26 is fixed to its shaft, held in the bearings 34, and from the shaft a branch, 33, projects upward to every second roller, while the lever 25 rocks freely on the shaft, and has its upper end also branched to every intermediate roller. The ends of these branches take into grooved collars *e* on the outer ends of the roller-shafts.

The riding rollers 54, that lie on and turn by contact with the rollers 56, are held in movable bearings *c*, but have no lateral motion, so that the rollers 56 reciprocate both against the inking-table and against these riding rollers. The riding rollers that lie on

and are driven by the form-rollers 55 have a lateral reciprocating movement given to them by means of the rocking levers 24 32, operated by the double cam 6 on the shaft N in the same manner as the distributing-rollers 56.

The mechanism for receiving and distributing the ink is arranged and operates as follows: The ink is received from the fountain 71 by the taking-roller 68 and deposited on the distributing-cylinder 66. The shaft G is held in bearings in the frame C, which is also arranged to support the shafts of the other rollers, and the cylinder receives motion from a pulley on one end of this shaft, to which motion is communicated, through the belt 53, from the pulley on the driving-shaft F. The other end of the cylinder-shaft has a short right and left hand screw, 36, working in a forked nut, 37, which imparts to the cylinder a slow lateral reciprocating motion.

Other rollers, 70, having their bearings at *g* in the side frames C, are placed around the cylinder to aid the distribution of the ink. Another taking-roller, 69, Fig. 3, rises up in contact with the cylinder 66, becomes charged with ink, and at the proper time drops down and deposits it on the inking-table 65 as the latter passes back and forth.

The taking-rollers 68 69 both receive their rising and falling motions from the cams 29 30, the former raising and lowering the stem 28, which operates the bent bearings 67 of the roller 69, and the latter performing a similar office to the stem 27, which operates the bearings 67 of the roller 68. Both of these bearings are pivoted in the side frames at *jj*, and

that one, 67, the taking-roller 69, is controlled by a set-screw, *i*, so that the extent of its motion may be regulated as required, and the roller adjusted to take the proper amount of ink from the cylinder.

We claim as our invention—

1. The method of driving the bed of a printing-machine, consisting of a crank, T, connecting-rod U, and a toothed wheel, 1, gearing into a fixed rack, 4, and movable rack 48, when the axle to which the connecting-rod is attached is arranged eccentrically in said wheel, so as to give a differential movement to the bed, substantially as described and specified.

2. So arranging the pinions on the inking-roller shafts that they will have a rotary motion independent of the shaft, whereby the rollers will change their position on the form at each movement thereof, substantially as described and specified.

3. The bearing-straps *l*, applied to the ways 57, in combination with the bearing-wheels *k* upon the inking-rollers, to admit of adjusting the pressure of the rollers upon the form, substantially as described and specified.

4. Controlling the fly so that its movements shall coincide with the movement of the impression-cylinder, by the mechanism and substantially in the manner described and specified.

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