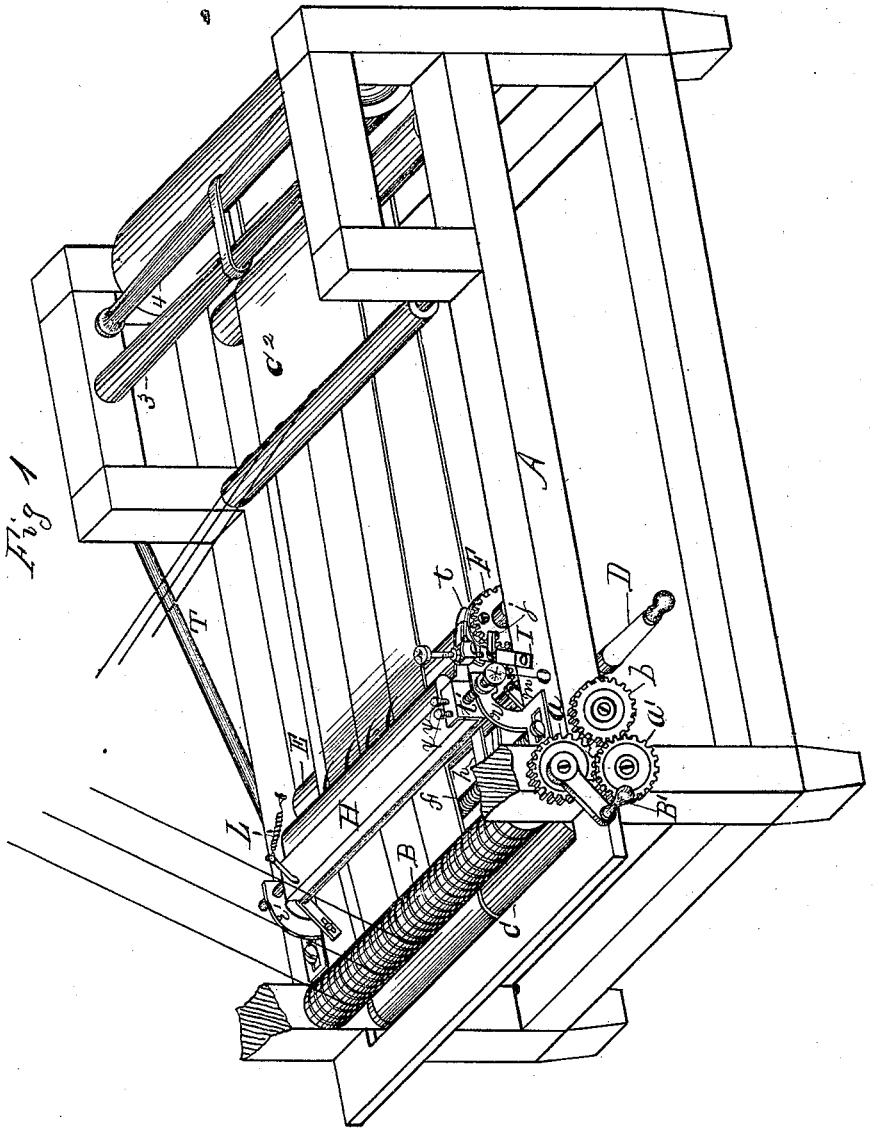
2 Sheets—Sheet 1.

E. J. PIPER.

Paper-Ruling Machine.

No. 205,502. Patented July 2, 1878.



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E. J. PIPER.

Paper-Ruling Machine.

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Fig 2

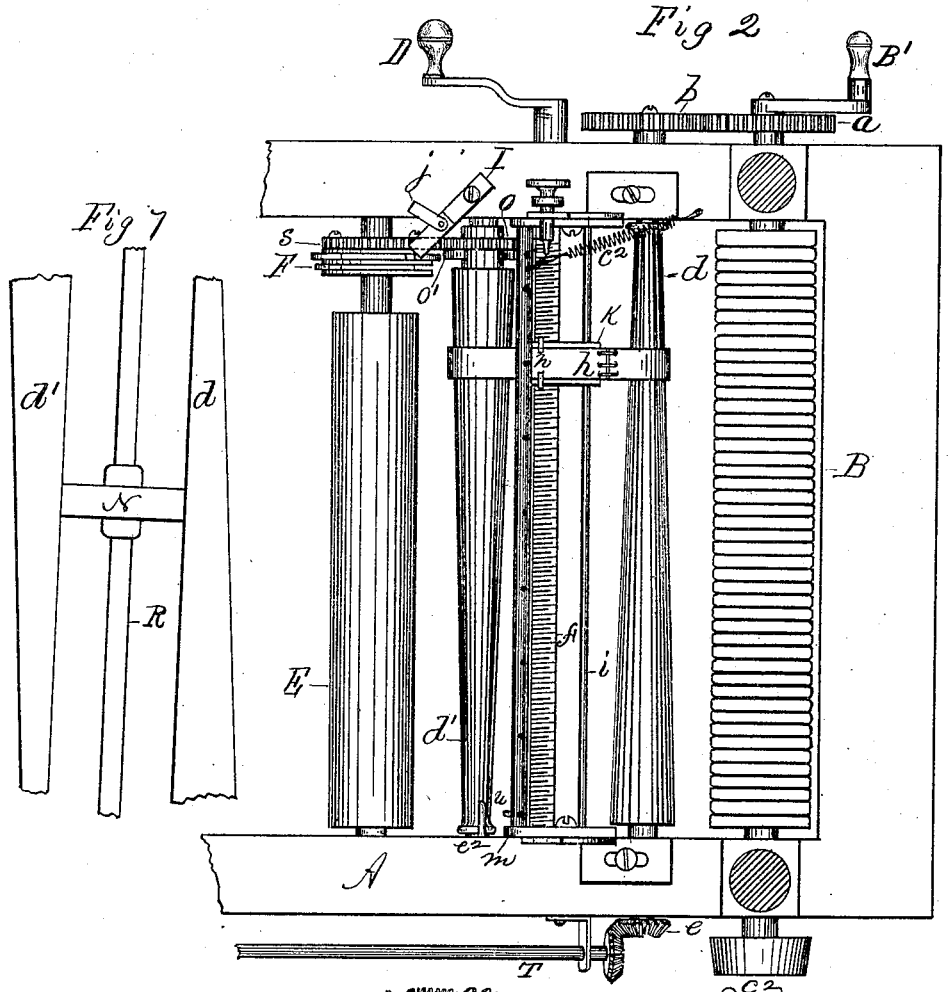


Fig 7

Fig 4

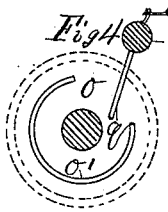


Fig 3

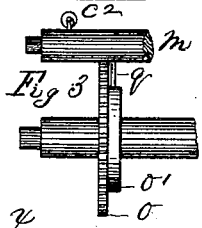


Fig 5

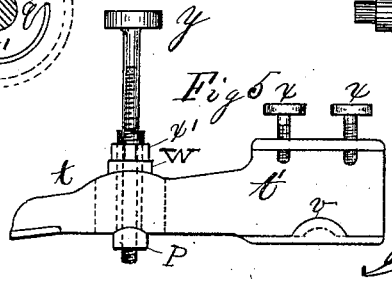
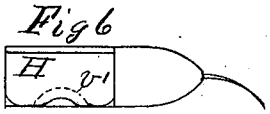


Fig 6



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UNITED STATES PATENT OFFICE.

EDWIN J. PIPER, OF SPRINGFIELD, MASSACHUSETTS.

IMPROVEMENT IN PAPER-RULING MACHINES.

Specification forming part of Letters Patent No. **205,502**, dated July 2, 1878; application filed January 5, 1878.

To all whom it may concern:

Be it known that I, EDWIN J. PIPER, of Springfield, county of Hampden, and State of Massachusetts, have invented certain new and useful Improvements in Paper-Ruling Machines, which improvements are fully set forth in the annexed specification and accompanying drawings.

The object of my invention is to provide better means for closely and accurately regulating the speed of the devices in paper-ruling machines which control the movements of the gate and striker than have heretofore existed; and, furthermore, to so simplify the construction, application, and operation of the above-mentioned speed-regulating devices as to cause them to be positive in their operation, productive of accurate results in ruling, and to make them instantly adjustable without the change of any parts on the machine, such as changing gears or pulleys.

Referring to the drawings, which consist of two sheets and seven figures, Figure 1 is a perspective view of my machine, showing the main frame part which embraces my improvements. Fig. 2 is a plan view of the front end of my machine with the beam and cloth removed, so as to show the arrangement of some of my improvements therein. Fig. 3 is a detached longitudinal end view of the gate and roller-shaft, with lateral rimmed gear-wheel thereon. Fig. 4 is an end view of the parts shown in Fig. 3. Fig. 5 is a longitudinal elevation of my beam-jaw and striker-arm. Fig. 6 is an end view of the beam which fits into the jaw, Fig. 5. Fig. 7 represents a different device for regulating the speed of the striker and gate parts from that shown in the model, and which might be substituted for the latter.

A is the frame of the machine. B is the driving-roller of the machine, to the outer end of which is attached a crank, B′. Directly under roller B is the cloth-driving roller C, and rollers B and C are connected by gears *a a′*, Fig. 1. C^2 is the cloth. Gearing into gear *a′* on the end of roller C is the gear *b*, which is secured to the end of a cone-shaped roller or shaft, *d*, Fig. 2, running in bearings on each side of the frame A, and to its opposite end is secured a bevel-gear, *e*, Fig. 2, the functions of which will be described farther on.

Running in bearings in frame A, parallel to roller *d*, is a second cone-shaped roller, *d′*, Fig. 2, like to roller *d*. By a belt, *h*, passing around cone-shaped rollers *d* and *d′*, roller *d′* is driven by roller *d*. Fixed across frame A, under belt *h* and rollers *d* and *d′*, is a belt-shifting device, consisting of a screw-shaft, *f*, operated by crank D, and a steadying-rod, *i*, running parallel to screw-shaft *f*. On the latter travels a nut, *k*, to which is attached a vertical belt-guide, *n*, which incloses belt *h*. Through the opposite end of nut *k* passes the steadying-rod *i*, which keeps nut *k* in a horizontal position.

On one end of roller *d′* is fixed a gear-wheel, *o*, on one face of which is formed a laterally-projecting rim, *o′*, a portion of which is cut away, forming an opening therein.

Running across frame A is a cloth-supporting roller-shaft or pen-cylinder, E, on the end of which is fixed a gear, *s*, which gear-wheel *o* on roller *d′* gears into; and on the side of gear *s* are fixed the striker-head and cams.

H is the striker-beam, pivoted in bracket-supports *r* and *r′* on the top of frame A. On the front end of striker-beam H is the striker-arm *t*, with an adjusting-jaw, *t′*, to receive and secure the end of the striker-beam in. Said jaw *t′* receives the end of the beam, and its lower inner portion, on which it rests, is provided with a half-circle bearing, *v*, for the latter, in shape like a longitudinal half-section of a wood-screw, with its head portion lying toward the center of the beam. The under side of the end of the beam, which rests upon said bearing *v*, has cut in it a recess, *v′*, somewhat conforming to the shape of said bearing, and its outer edges, each side of said recess, cut away to allow said beam to have a slightly-oscillating motion on said bearing. The upper portion of said jaw is provided with two screws, *x* and *x*, by which the beam is secured and adjusted therein. Reaching out horizontally from one end of said jaw the striker-arm lies over the striker-head F.

Through said arm vertically a rectangular opening is made, in which is fitted a long hollow tapped bolt, P, the inside faces of its head being half-rounded, as seen in Fig. 5, and the bearing for said half-rounded head on the under side of said arm is hollowed out to con-

form to the shape of the bolt-head. The upper side of said arm *t*, each side of said rectangular opening, is curved to the arc of a circle described by the swinging of said bolt P at that point. Around bolt P is placed a washer, W, its under side fitted to the curved sides of said opening, and on top of said washer is screwed a nut, *x'*.

An adjusting-screw, *y*, is screwed down through bolt P, its lower end projecting down below the lower end of said bolt and the striker-arm.

Screwed on top of the frame A is an elbow-support, I, on which is an auxiliary support, *j*, both of which above-named supports being arranged to swing under the bottom end of adjusting-screw *y* in arm *t*.

Under the beam, across the frame, is fixed the gate *m*, pivoted in proper end supports. Projecting downward from said gate is an arm, *q*, which is lifted and held up during a part of one revolution of gear-wheel *o* by resting upon the laterally-projecting rim thereon, heretofore mentioned, and said arm falls into the above-named opening in said rim at a proper point in the revolution of said gear-wheel.

When said gate-arm rides upon said rim *o'*, the gate is down against the cloth; but when said rim-opening reaches said arm the latter drops into it, assisted by a spring, c^2, or any convenient spring, and the gate is thereby lifted from the cloth.

Beam H is assisted to promptly fall by a spring, L, or it may be so weighted as to fall without a spring.

Near one end of gate *m* is inserted a pin, *u*, which, when arm *q* drops into the cut rim *o'*, prevents the gate from rocking too far by striking against pin e^2 in frame A.

Through the bevel-gear *e*, already mentioned as secured to one end of cone-shaped roller *d*, and shaft T, Figs. 1 and 2, on which are fixed other proper bevel-gears, motion is communicated to a second series of cone-shaped rollers, 3 and 4, above and on the opposite end of the frame, showing a manner of connecting the two series of adjustable cone-shaped rollers required in a ruling-machine with double strikers.

Instead of running a second series of cone-shaped rollers above and on the opposite end of the machine by bevel-gears and shaft connecting with roller *d*, as above described, the shaft to pen cylinder or roller E, whose revolutions are governed by those of the lower striker devices, may be extended quite through frame A, and have a bevel-gear fixed thereon, by means of which and a suitably-connected shaft and bevel-gears on it, and on a pen-cylinder shaft above, corresponding to E below, the entire upper striking devices may be regulated by the speed-adjusting devices between rollers *d* and *d'*, so that the two strikers would thus be simultaneously adjusted to their work by turning screw-shaft *f* and setting belt *h* at the requisite point on said rollers; or pulleys and a belt may be used instead.

The usual arrangement of cloth and cords is employed on this machine.

The operation of my machine with my improvements, which pertain especially to devices for controlling and regulating the operations of the gate and striker, is as follows, viz: The paper to be ruled is fed between rollers B and C, and is carried along by the cloth and cords until its edge strikes the gate *m*, the gate-arm *q* lying on rim *o'* of gear-wheel *o*. When gate *m* should lift to let the sheet of paper pass under the striker, the arm *q* drops suddenly into the opening cut in rim *o'*, thereby causing the gate *m* to be lifted instantly, and thus the sheets can be fed through the machine with almost no space between the one being drawn under the pens and the succeeding one behind the gate. This quick-lifting gate affords great advantages in this respect, and enables me to pass the sheets of paper through the machine in a continuous line almost, and consequently more of them in a given time.

The most common way of operating the gate is by a cam working against an arm on it to lift it; but the lifting motion thus imparted to the gate is too slow to produce the result accomplished by my improvements as described above.

As soon as the sheet of paper begins to pass under the gate and reaches the pens, the latter are adjusted to fall and rise at exactly the right point thereon by turning crank D and screw-shaft *f*, and so causing nut *k* and the belt-guide *u* to move horizontally across the frame, carrying with them belt *h*, which runs on cone-shafts *d* and *d'*. Thus the shaft *d'*, through gear *o* on its end gearing into gear *s*, to which is secured cam-head F, can be regulated with the greatest nicety as to its revolving speed, so as to drop and lift the pens just where required.

The general adjustment of the cams themselves in cam-head F is effected in the manner already well known.

The adjustment of varying speeds by the employment of my cone-shaped shafts *d d'* and their auxiliary devices above described can be made with much greater precision while the machine is running than by a gear-changing arrangement commonly applied to such machines, and much quicker.

Roller *d'* may have its speed adjusted by the revolution of roller *d* otherwise than by employing a belt, *h*, therefor, by running a shaft across the frame between said rollers, and by placing thereon a pulley movable from end to end of said shaft, said pulley being adjusted to bear equally against said rollers, and being movable between them by any convenient shipping device. Thus the said pulley would perform the office of a belt. This device is illustrated in Fig. 7, wherein N is the pulley, and R the shaft, and *d* and *d'* the cone-shaped rollers.

The beam H, to which are attached the pens, and the jaw *t'* and arm *t*, is operated, in the usual

way, by the revolutions of the cams in cam-head F under the end of said arm, and alternately causing it to rise and fall. Heretofore it has been customary to put a drop-motion adjusting-screw (represented by *y* in Fig. 5) into said arm in a fixed vertical position; but in such cases, where the arm must work so as to throw the screw very much out of a perpendicular position, its point does not strike squarely upon the elbow-support I under it, and if there are any imperfections on the end of said screw, as is often the case, proper bearing adjustments are more difficult of accomplishment.

To obviate the above difficulties, I make screw *y* adjustable vertically by making long hollow tapped bolt P, through which screw *y* operates, so that it may be swung over to the right or left, and so fix screw *y* in a vertical position, howmuchsoever arm *t* may be deflected. This result is accomplished by passing said bolt P up through a slot in arm *t* wide enough to allow said bolt to swing from right to left, forming the upper side of the head of said bolt in the shape of a segment of a circle on each side of said slot, cutting the portion of said arm next to said head, so as to conform to the shape of the latter, and by securing said bolt in the arm by a nut, *x'*, and a washer, W, on the top of the arm, the top of the arm and the washer being formed to the requisite curve to allow said bolt to swing, as before set forth, and when in a proper position they are secured in place by nut *x'*.

The end of beam H, Fig. 6, is placed in the jaw *t'* on arm *t*, its recess *v'* lying over and onto bearing *v* on the bottom of said jaw, and screws *x x* are turned down upon the top of the beam to hold it securely in the jaw.

It will be seen that by tightening and loosening said screws *x x*, beam H may be caused to rock on bearing *v*, and so raise or lower the pens attached thereto.

The before-mentioned construction of beam-connection to the arm, and of the arm itself, enables me to secure greater firmness and solidity, and to keep the arm more in a straight line from the beam-pivot to the cam-head.

The auxiliary latch *j* on elbow-support I is used for temporarily securing arm *t* in a raised position off from contact with cam-head F.

I do not confine myself to the use of a screw for moving the belt-guide *u;* but any convenient device may be employed which will permit of moving said guide to as nice adjustments as the work may require.

The upper second series of cone-shaped rollers, when run upon a machine with double strikers, are intended to have combined with them a belt and other devices, such as are described above as completing the equipment of the lower cone-shaped rollers, for the purpose specified, and the upper series of rollers are run by bevel-gear *e* on roller *d*, and by proper bevel-gear and shaft T connections therewith.

The upper cloth-roller is run by a belt running thereto from a pulley on the end of lower cloth-roller C.

What I claim as my invention is—

1. The combination of conical rollers *d* and *d'*, belt *h*, and a suitable belt-shipping device, the striker-head and cams F, striker-arm *t*, and pen or striker beam H, constructed and arranged substantially as and for the purpose set forth.

2. The combination of the gate *m*, arm *q*, gear-wheel *o*, with its broken lateral rim, rollers *d'* and *d*, and belt *h*, substantially as and for the purpose set forth.

3. In combination, the rollers B and C, rollers *d* and *d'*, belt *h*, gear-wheel *o*, with its broken lateral rim, striker-head and cams F, arm *q*, gate *m*, striker-arm *t*, and pen or striker beam H, all constructed and arranged substantially as and for the purpose set forth.

4. The combination, with roller *d'*, of gear-wheel *o*, with its lateral cut rim *o'*, arm *q*, on gate *m*, gate *m*, gear *s*, and cam-head F, substantially as set forth, and for the purpose specified.

5. The combination of beam H, striker-beam arm *t*, and jaw *t'*, cam-head F, gear *s*, gear-wheel *o* and its lateral rim *o'*, arm *q* on gate *m*, and gate *m*, substantially as set forth and described.

6. The combination of the pen or striker beam H, jaw *t'*, screws *x x*, and striker-arm *t*, substantially as and for the purpose set forth.

7. The combination, with arm *t*, of bolt P, washer W, nut *x'*, and screw *y*, substantially as specified and set forth.

8. The combination, in a paper-ruling machine, of the cone-shaped rollers *d* and *d'*, one driving the other by a belt or its equivalent, and the gate *m* and pen or striker beam H, and their intermediate connecting devices, substantially as and for the purpose set forth.

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Witnesses:
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