2 Sheets--Sheet 1.

W. H. DOANE & W. P. McKEE.

Band Sawing-Machines.

No. 151,106. Patented May 19, 1874.

FIG. 1.

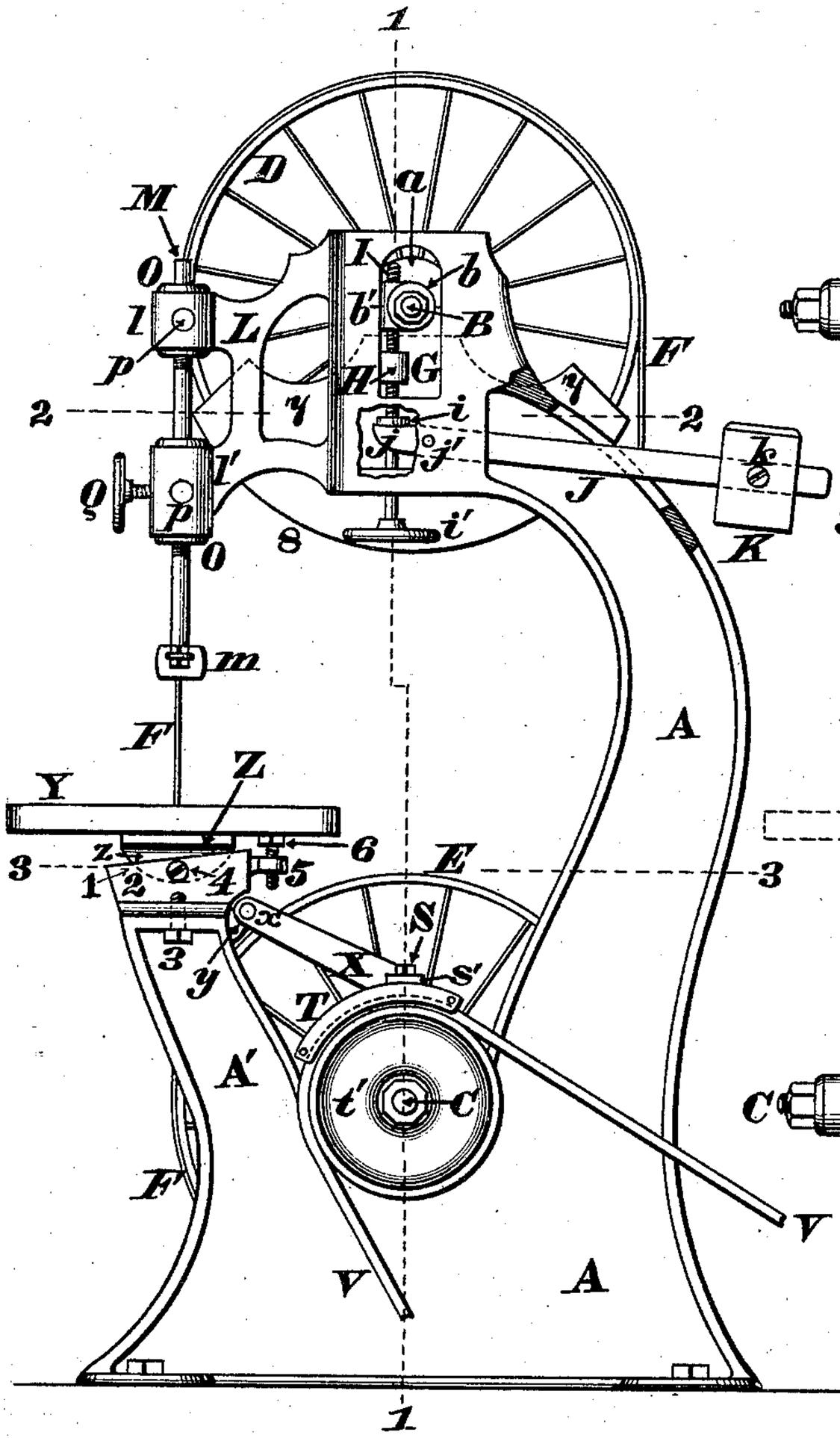


FIG. 2.

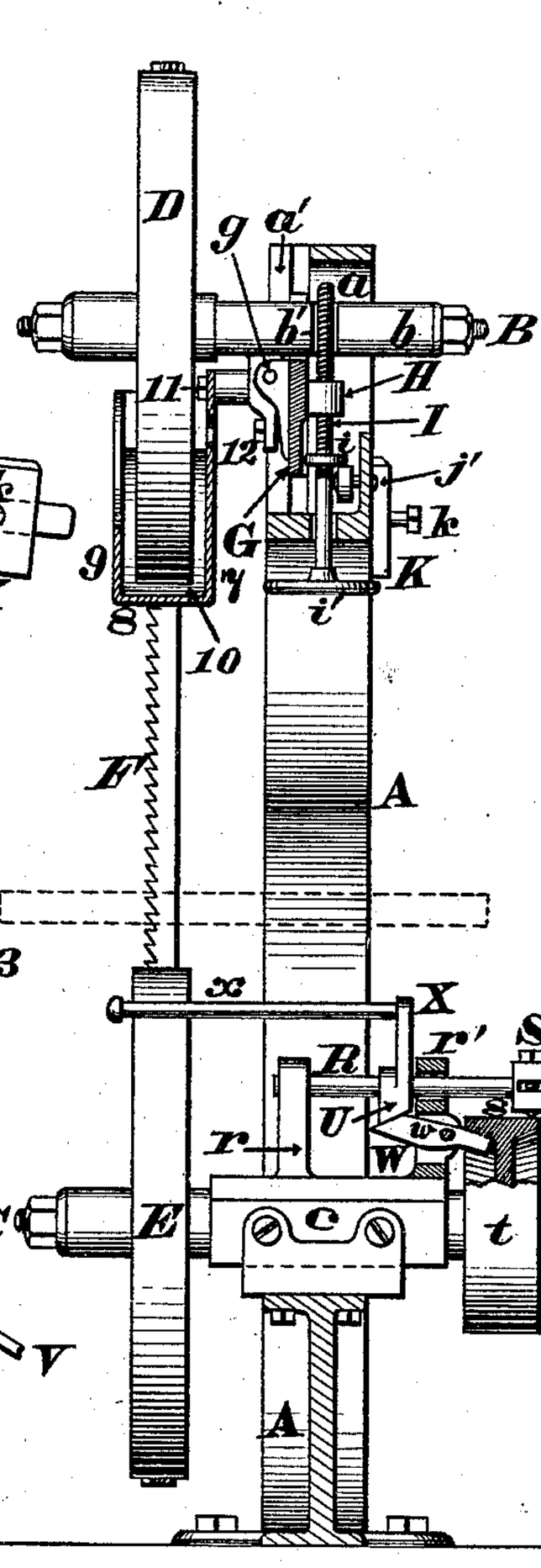
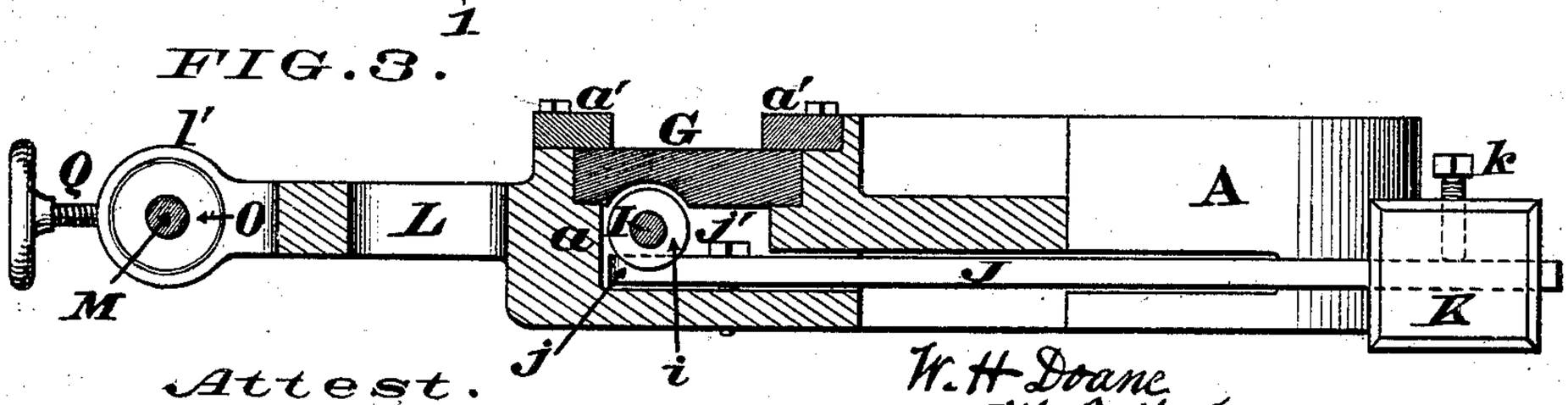


FIG. 3.



Attest.
Jas. H. Layman.
H. G. Farmer

W. H. Doane
W. P. McKee
By Knight Bros Att'ys.

2 Sheets--Sheet 2.

W. H. DOANE & W. P. McKEE.

Band Sawing-Machines.

No. 151,106. Patented May 19, 1874.

FIG. 4.

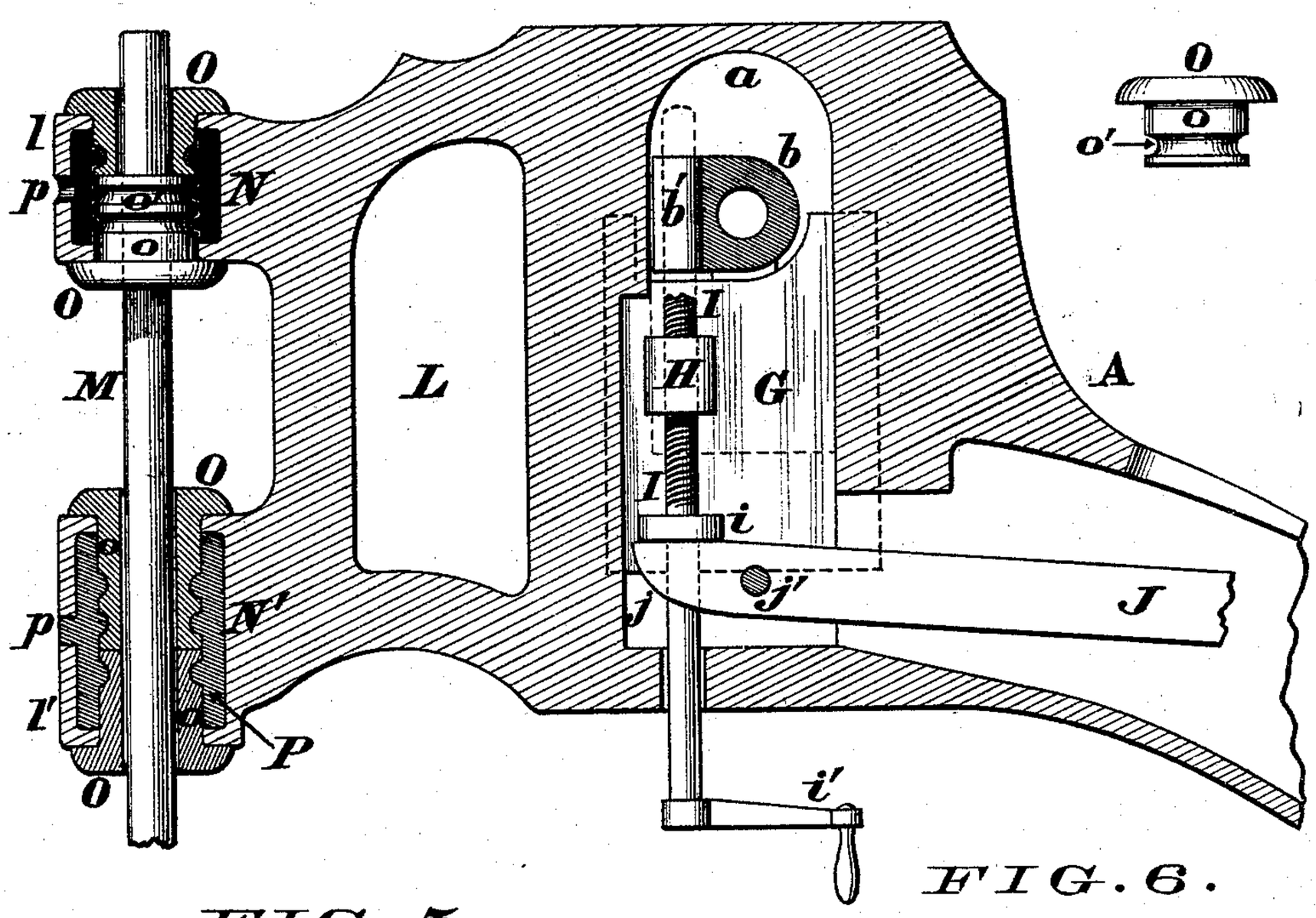
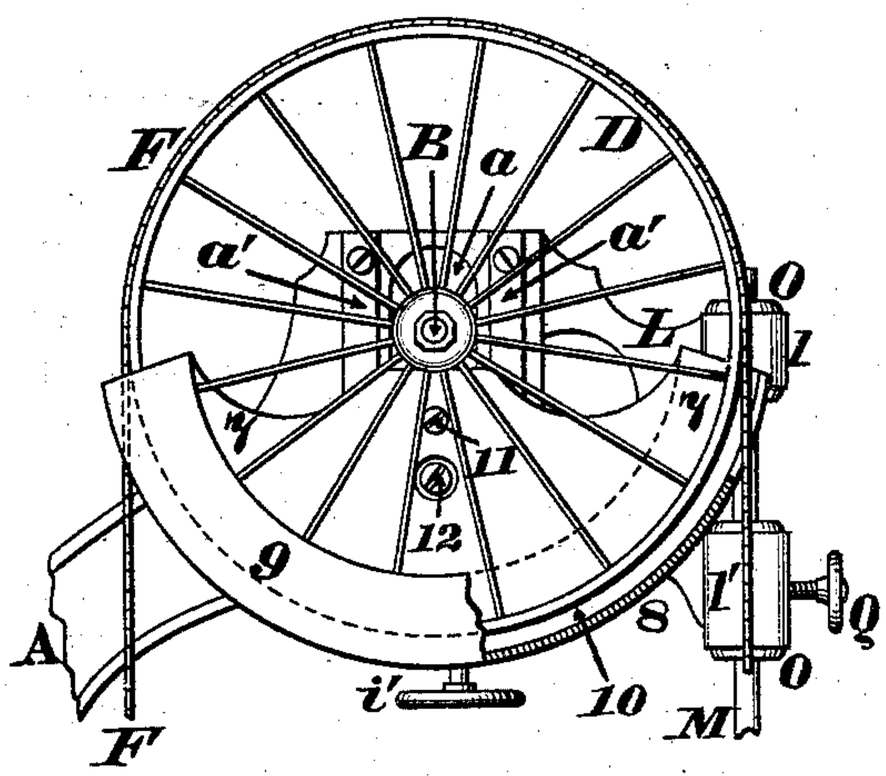


FIG. 6.

FIG. 5.



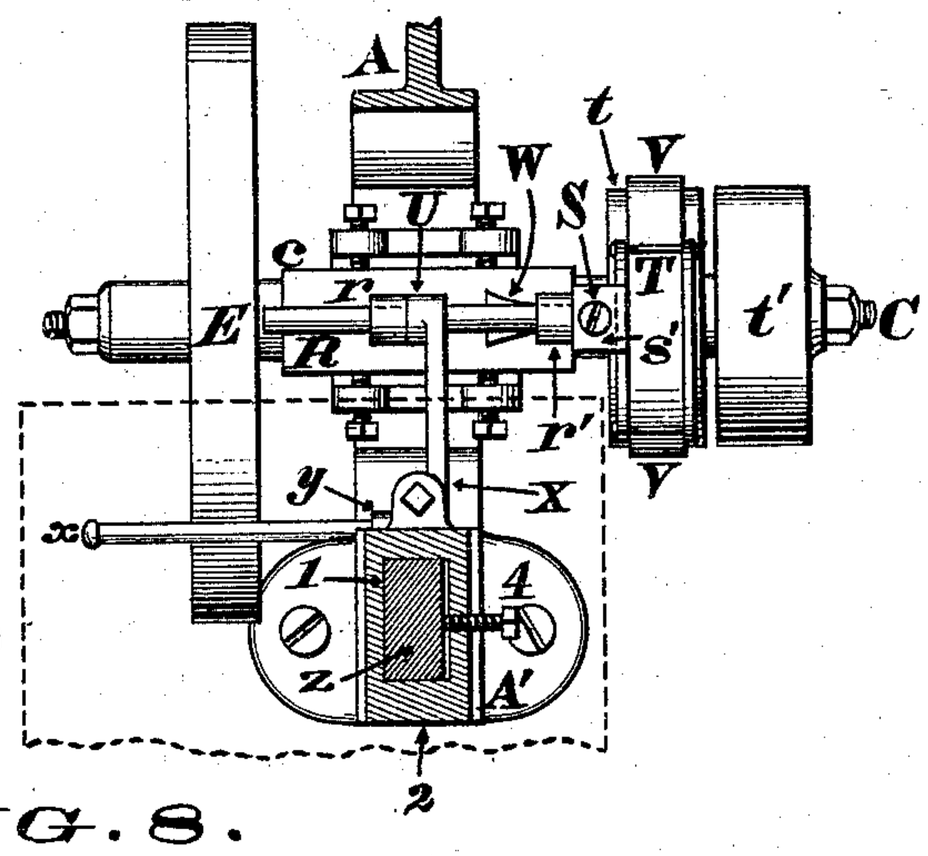


FIG. 7.

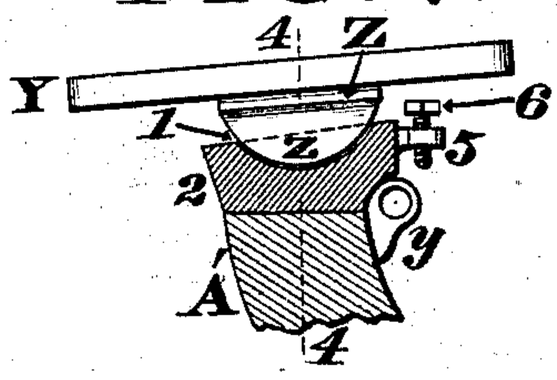
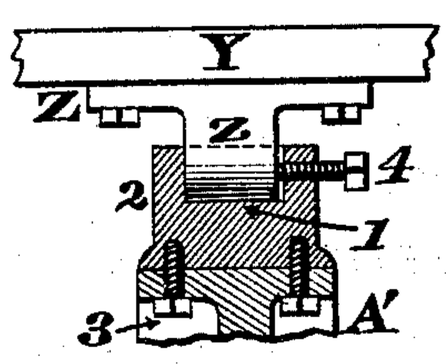


FIG. 8.



W. H. Doane
W. P. McKee
By Knight Bros. Att'ys.

Attest.
Jas. A. Layman.
H. J. Tanner.

UNITED STATES PATENT OFFICE.

WILLIAM H. DOANE AND WILLIAM P. McKEE, OF CINCINNATI, OHIO,
ASSIGNORS TO J. A. FAY & CO., OF SAME PLACE.

IMPROVEMENT IN BAND SAWING-MACHINES.

Specification forming part of Letters Patent No. **151,106**, dated May 19, 1874; application filed March 2, 1874.

To all whom it may concern:

Be it known that we, WILLIAM H. DOANE and WILLIAM P. MCKEE, both of Cincinnati, Hamilton county, Ohio, have invented certain new and useful Improvements in Band Sawing-Machines, of which the following is a specification:

This invention relates to that class of wood-working appliances commonly known as "band-saw machines," which consist essentially of a stout frame having journaled in it two wheels or pulleys, around whose peripheries the continuous saw-blade is passed.

The first part of our improvements comprises a novel arrangement of devices for automatically operating the bearing or box of the upper pulley, in such a manner as to maintain a regular tension upon the blade or saw at all times. Of these devices, the principal one is a vertically-sliding block, that is confined to a rectilinear path by suitable guides bolted to the main frame, said block being provided with a laterally-projecting lug, which is tapped to receive the adjusting-screw wherewith to elevate or depress this vertically-sliding member of the machine. The adjusting or temper screw is furnished with an annular flange, ledge, or collar, which is supported upon the toe of a pivoted lever, whose rear portion carries a sliding weight or counter-balance, that is maintained in any desired position by a set-screw or its equivalent device. This lever has its bearing upon a fulcrum or pivot secured to the main frame, which fulcrum is located as near the temper-screw as practicable, in order that a comparatively light weight may exert the greatest possible upward pressure against the collar of said screw, and the sliding block with which the latter engages. As the bearing or box for the mandrel of the upper pulley is pivoted to the aforesaid vertically-sliding block, it will be readily understood that the counter-balance at the rear end of the short-coupled lever exerts a continual and uniform upward pressure upon said bearing, and, consequently, acts in an automatic manner to maintain the blade at any determined tension. This short connection or coupling of the lever not only obviates the necessity of employing links and other complicated appliances for communicating motion to the upper bearing, but it also allows the use of a much lighter counter-balance, and on this account there is no danger of the machine being rendered top-heavy, and therefore liable to such vibrations as would cause it to oscillate and become unsteady when run at the high speeds that band-saws are usually driven at.

The second part of our invention comprises a novel method of fitting the front guide of the band-saw to the machine, which mode of construction we will now proceed to describe. As is well known, the mandrel or vertical shaft of the front guides have heretofore been fitted within a bracket or supplemental frame, which bracket must be bolted to the main frame in the most secure manner, or the saw will not run true. These brackets, no matter how accurately they are applied when the machine is built, are liable to lose their proper position very soon, and thereby throw the mandrel out of line, besides which the fitting up of said separable members of the machines requires considerable time and labor. Hence, it is evident that it would be a great advantage if these brackets could be cast with the main frame, as such a procedure would entirely obviate the above-described objections to the separable brackets; but then the casting would be so heavy as to render it a difficult matter to drill accurately the necessary bearings for the mandrel of the guide. Our bracket is cast in one piece with the main frame, and the enlarged portions of said bracket, which are to serve as the boxes or bearings for the shaft of the guide, have chambers formed in them which require no finishing whatever, but are left just as the casting comes from the sand, and the upper and lower ends of these chambers have brass or other suitable caps or fastenings applied to them. These caps or bushings, before being applied to the above-described chambered enlargement of the bracket, are bored out accurately to receive the guide-mandrel, and after being inserted in said chambers, they are immovably

secured in position by pouring in soft metal around their shanks or stems, as will presently appear.

The third part of our invention comprises a chute or deflector, which is applied to the frame in such a manner as to divert away from the attendant the powerful blast or current of wind created by the pulley at the top of the machine. As these pulleys are driven at a very high velocity, it is evident a powerful current of air is produced by them, and, owing to the direction in which the upper pulley necessarily rotates, this blast is discharged directly down upon the head and shoulders of the operator, to his great annoyance at all times, and in the winter season rendering it impossible for him to remain at his post with any degree of comfort. We overcome this difficulty by providing a light and simple "wind-chute," which is secured to the frame, and extends around a sufficient portion of the periphery of the upper pulley to insure the complete deflection of the blast to the rear of the machine, as hereinafter fully described.

A combined belt-shifter and brake constitutes the fourth novel feature of our improvements, the essential member of which is a horizontally-sliding rod that is located a slight distance above the driving-shaft or arbor of the lower saw-pulley. The end of this shaft that is most remote from the saw-pulley is furnished with two jaws, clamped together with a screw or bolt, so as to take hold of an ordinary yoke or shifter, that changes the driving-belt from the loose to the fast pulley of the machine, and vice versa. This jaw and retaining-screw enable the shifter to be adjusted circumferentially around these driving-pulleys, so as to be effective in whatever position the belt may be applied. When this horizontal shaft is shifted so as to throw the driving-belt off from the fixed pulley and onto the loose one, a sloping shoulder or inclined plane attached to said shaft or its arm comes in contact with a pivoted shoe in such a manner as to cause one end thereof to bear up against the inner periphery of the fast pulley, thereby instantly arresting the rotation of the lower arbor, and thus stopping the motion of the blade. This longitudinally-shiftable shaft is manipulated by a handle or lever that is located under the table of the machine, in close proximity to the operator, so as to enable him to control the belt-shifting apparatus without quitting his post.

A simple, effective, and readily applicable coupling for the table constitutes the fifth part of our improvements, said coupling being arranged as follows: The table for supporting the stuff to be sawed has bolted to its under side a plate having a segmental flange or rib projecting from it, which segment plays within a concave recess in a casting or block that is secured to the main frame of the machine. As this segmental flange is capable of rolling within the recess of the aforesaid block, it will be seen that the table can be pitched at any required angle, either toward or away from the operator, and after being thus adjusted it can be maintained in position by a set-screw. This recessed block, being a separate casting, is capable of being fitted up in a more perfect manner, and with less labor and inconvenience, than is required to form said recess in a projecting portion of the main frame, which is the usual mode of construction.

Having thus briefly indicated the leading features of our improvements, we will now proceed to give a detailed description of the same, together with the manner of applying them to the machine and operating them.

Figure 1 is an elevation of a band-saw machine embodying our improvements, the table being represented in a horizontal position, the band shown on the remote side of the frame, and a portion of the latter broken away, so as to exhibit more clearly the action of the lever upon the collar of the regulating-screw. Fig. 2 is a vertical section of the machine at the line 1 1. Fig. 3 is a horizontal section at the line 2 2. Fig. 4 is a vertical section through the elevated part of the main frame and its bracket, the upper chamber of said bracket being shown empty, while the lower chamber thereof is represented with the filling poured in around the caps. Fig. 5 represents the upper wheel or pulley of the machine with its accompanying wind-chute, the latter being shown partly in elevation and partly in section. Fig. 6 is a horizontal section at the line 3 3, the position of the table being indicated by dotted lines. Fig. 7 is a vertical section through the table and its accessories, and Fig. 8 is a vertical section of the same parts at the line 4 4.

Of the above illustrations, Figs. 3, 4, and 8 are drawn on an enlarged scale.

The main frame A, together with its front limb or branched projection A′, and also the upper bearing *b* and lower bearing *c*, being essentially the same as described in the patent issued to William H. Doane and William P. McKee, November 14, 1871, needs no further explanation in this specification. Journaled respectively in these bearings *b* and *c* are the shafts, mandrels, or arbors B C of the pulleys or wheels D E, around which the band-saw F is passed. The pulleys D E of the saw may be of the represented or any other suitable form; but we prefer to use such a wheel as described in Letters Patent No. 127,033, issued May 21, 1872, to W. H. Doane, as the wheel which is the subject of the aforesaid patent combines the maximum of strength and rigidity with the minimum of weight and material. The upper portion of the main frame is slotted at *a* to receive a vertically-adjustable block, G, to which the upper bearing *b* is pivoted at *g*, said block being confined to a proper path by guides *a′*, which are bolted

to the frame A, Fig. 2. Projecting laterally from this block G is a stout ear or lug, H, which is tapped to receive a screw, I, wherewith said block and its accompanying saw-mandrel bearing B *b* may be adjusted within the slot *a* of the frame. The lug H and adjusting or temper screw I are not situated in the same vertical plane as the mandrel B, but are located at one side of this shaft, preferably in front of the same, the bearing of said shaft being notched at *b'*. This notch allows said bearing G to be adjusted the entire length of slot *a* without bringing the temper-screw I in contact with the shaft B, and it will be seen that a greater range of movement is thereby permitted than could be obtained if said screw and pulley-shaft were situated in the same vertical plane. If thus constructed, it is evident the screw would strike against the lower side of bearing *b* before the latter had described one-half the length of the slot *a*. This temper-screw I is provided near its lower end with an annular or other suitable flange or collar, *i*, which serves as the bearing of said screw, while it leaves the latter free to be rotated either to the right or left, as occasion may require. A hand wheel or crank, *i'*, enables the screw to be rotated with the greatest facility. The collar *i* does not rest upon the main frame or other fixed member of the machine, but is supported upon the short end or toe *j* of a lever, J, that is pivoted to the frame A at *j'*. The pivot or fulcrum *j'* of this rearwardly-projecting lever is located as near the temper-screw I as practicable, only sufficient room being allowed between these two members *j'* and I to permit the latter to rotate freely.

This close connection or short coupling not only enables us to dispense entirely with links and other appliances for communicating motion from the compensating-lever to the temper-screw, but it also permits the use of a much lighter counter-balance.

It has heretofore been customary to load the lever J with a weight varying from fifty to one hundred pounds, according to the size of the machine, which weight, being necessarily elevated some distance above the base of the frame, rendered the machine top-heavy, and was the cause of injurious vibrations, besides which such a weight was inconvenient to handle.

We are enabled to dispense with this heavy counter-balance, and its attendant difficulties and annoyances, by the peculiar manner in which we apply the lever J to the frame, the fulcrum of said lever being located in such close proximity to the temper-screw I as to render a comparatively light weight as effective as the heavy ones have been.

In practice we have found that a counter-balance weighing only about one-third as much as ordinary ones is sufficient to impart a thorough and uniform tension upon the blade, and, owing to the lever being pivoted near the screw, the former is made much shorter than usual.

By thus diminishing the length of the lever we not only economize space, but also reduce weight at the top of the machine, and thereby overcome any tendency to vibration. The machine, being free from such vibrations, does not require such an extended base as has heretofore been needed; neither is there any necessity for making the frame heavy. This reduction in the weight of the frame facilitates the handling of the machine both in construction and transportation, and it also diminishes the cost of production.

K represents the light counter-balance, which can be readily adjusted to any required position upon the supporting-lever J, and maintained there by a set-screw, *k*, although pins, wedges, keys, or other convenient appliances may be substituted for said set-screw. L represents the customary bracket, which is employed for supporting the mandrel or arbor M of the front guide *m* of the band-saw F, and it will be seen, by referring to Figs. 3 and 4, that said bracket or projection is cast in one piece with the main frame of the machine.

By thus casting the bracket in one piece with frame A, the utmost rigidity is secured, and consequently it is impossible for said bracket to work loose or otherwise deviate from its proper position, and thereby throw the mandrel out of line. This mode of construction also obviates the necessity of fitting the bracket to the frame, which operation requires time and accurate workmanship to perform.

The mandrel M is applied to this bracket L in the following manner: Cast with the bracket are two enlargements or bosses, *l l'*, which are, in fact, mere shells, said bosses being furnished, respectively, with chambers N and N', as shown more fully in Fig. 4. These chambers are not drilled or turned out in the shells, but are formed with suitable covers when the main frame is cast, and are left in the same rough and unfinished condition they are in when taken out of the sand; in fact, the rougher the interior of said chambers the better they are adapted for the anchoring process, which will soon be explained. The tops or bottoms or both ends of these bosses may be dressed down with a file, so as to remove any projections from the casting, and thereby insure a better seat for the caps of said chambers. Applied to each of these chambers are brass or other suitable caps or bushings O, which constitute the boxes or bearings proper for the mandrel M, said boxes being bored out accurately before insertion in the chambers N and N', so as to receive this mandrel. Each cap or separable member of the mandrel-boxes is furnished with a stem or shank, *o*, and a collar or groove, *o'*, to enable them to be anchored securely within the chambered bosses *l* N and

l' N′. To anchor these caps immovably in the bracket L, they are first applied to the chambers N N′ of the bosses l l', after which the mandrel M is passed through the axial bores of said caps. Soft metal P is now poured in through apertures p in the shells l l', and allowed to flow in around the stems o of the caps, and completely fill up the chambers N N′.

As this filling is confined between the ledges at the tops and the bottoms of the bosses, and also between the grooves and flanges of shanks o, it will be seen that the caps O are so firmly embedded in the bracket L as to render any accidental displacement of the same an impossibility. The mandrel is thus accurately located in its proper position without drilling the main frame, which, on account of its weight, would be a difficult thing to handle, and in small shops could not be accomplished on account of a deficiency of the proper tools.

Q is a set-screw for retaining the guide-mandrel at any desired position within the bushings O o. The adjustable bearing c of the lower pulley-arbor C has cast or otherwise secured to it two upwardly-projecting lugs or short brackets, r r', which are bored out to receive a longitudinally-shiftable bar, R, which is thus maintained in a position about parallel with but above said arbor C, as clearly shown in Fig. 2. One end of this bar or rod is furnished with two jaws, s s', and a clamping-screw, S, for attachment of an ordinary yoke or belt-shifter, T. By this arrangement the yoke T can be shifted circumferentially with reference either to the fast pulley t or to the loose pulley t', both of which are applied to the lower or driving shaft C in the usual manner. This circumferential adjustment of said yoke is necessary, in order that it may operate upon the driving-band V in whatever position the latter may be applied to the machine. Projecting from the lower side of rod R, or its arm X, and located between the two standards r r', is an oblique shoulder or inclined plane, U, which is adapted at the proper moment to impinge upon a shoe or brake, W, which is pivoted at w to the bracket r'. Extending from the rod R is an arm, X, which is carried up in an oblique manner toward the table Y of the machine, where it is provided with a horizontal lever or handle, x, which is at all times convenient to the operator. This lever, being situated beneath the table, is never in the way either of the operator or any of the moving parts of the machine, and at the same time it allows the workman to control the saw without quitting his position. A staple or guide, y, preserves the lever x in its proper position.

From the above description, it will be seen that the operator can at any moment stop the blade by simply shoving the lever x toward the right, which act will throw the driving-band V off from the fixed pulley t onto the loose one t', and simultaneously with this shifting of said belt the inclined plane U will be brought in contact with the shoe W. One end of the shoe being thus depressed, the other end will be elevated, and will bear against the inner periphery of the fast pulley t with sufficient friction to instantly arrest the rotation of shaft C and pulley E, and thereby stop the blade. The end of the shoe which bears against said pulley may be shod with wood or other material that can be readily replaced when worn. As this combined movement of shifting the belt and braking the driving-shaft can be performed without the operator quitting his post, it will be found a great advantage peculiar to our improved band-saw machine.

The table Y, upon which the stuff is placed, is applied to the frame of the machine in the following manner: Securely bolted to the under side of said table is a plate, Z, having a segmental rib, web, or flange, z, cast with it, which flange is adapted to rest in the concave recess 1 of a block, 2, which latter is secured to the projection A′ of the main frame by bolts 3. The concavity of recess 1 corresponds exactly with the convexity of rib z, in order that said rib may roll within the recess, and thereby pitch the table Y at any desired angle. After being thus adjusted, said table may be secured immovably in position by a set-screw, 4, that is tapped into the side of block 2.

By referring to the vertical section of the table-coupling, as shown on an enlarged scale in Fig. 8, it will be seen that this retaining device 4, when screwed up, forces the rib z against the opposing side or cheek of the recess 1 with sufficient friction to prevent the table tipping either toward the front or back of the machine.

By thus making the bearing-block 2 a separate and distinct casting from the frame of the machine, the recess 1 can be excavated more accurately and conveniently than if formed in the upper end of projection A′. This arrangement of separable block also allows the table, with its rolling bearing, to be applied to the ordinary form of band-saw machines.

The inner end of block 2 is provided with a lug, 5, for the reception of a set-screw, 6, upon whose head the table Y rests when in a horizontal position. This screw is first properly adjusted, and, whenever the rear of table Y is depressed far enough to come in contact with the head of said screw, the operator knows that said table is then at right angles with the blade, and he is not compelled to "level up." This screw 6, being located beneath the table, is not liable to be accidentally shifted, and, after being once set, requires no further adjustment.

The wind-chute or blast-conveyer previously alluded to is arranged as follows: Secured to the bearing b, so as to be elevated and depressed therewith, is a plate, 7, which depends some distance below the periphery of the wheel

D, where it is joined to another plate, 8, whose curvature is concentric with the shaft B. Secured to this plate 8 is a marginal flange, 9, that projects inwardly or toward the shaft B, and these three members, 7, 8, and 9, are so arranged as to leave an annular passage, 10, around a portion of the periphery of the wheel D, as shown in Figs. 2 and 5. In this annular passage or channel the blast created by the wheel D is conducted, and, owing to the direction in which said wheel rotates, the current of air is drawn through the channel and discharged at the rear of the machine, where it will not inconvenience or injure the operator. This conductor may extend entirely or only partially around the periphery of the wheels, but for all practical purposes it will be found sufficient to inclose about one-half the periphery of said pulley. If arranged to pass completely around the pulley, the rear edge of the conductor should have a suitable opening made in it to permit the escape of the blast, and it must also be provided with two slots to allow the saw to run upon said wheel. By simply slackening a screw, 11, the conductor can be detached from the machine when its services are no longer required. 12 is the screw which regulates the inclination of upper bearing *b*.

When set in order, ready for running, the temper-screw I is first adjusted so as to impart the desired tension to the blade F; but it is evident that said blade, as soon as it becomes heated, will expand, and consequently become too slack, unless some take-up motion is arranged in the machine. The weighted lever J K effectually takes up this slack of the saw, and at all times maintains said blade at a uniform and proper tension; and, as this result is acomplished in an automatic manner, the machine does not require the constant attention of the operator. As the blade expands, the weighted lever elevates the bearing of the upper pulley-arbor; but when the blade cools and contracts, then said bearing descends to its proper position within the slot *a*. By thus maintaining a perfectly-uniform tension upon the blade, it will last much longer and perform more satisfactory service than when it is alternately too slack and too tight.

The compensating-lever, being operated on by a weight, exerts a positive and unvarying pressure upon the upper mandrel of the machine, which desirable result cannot be obtained by cushioning said bearing upon springs, as such devices are too unreliable, being themselves subjected to continual changes, and therefore not capable of exerting a constant and reliable tension upon the blade.

The high velocity at which these machines are driven frequently causes their blades to run several minutes after the band has been thrown off onto the loose pulley of the lower arbor, and as said arbor is the driving-shaft of the apparatus, it will be readily understood that the moment the rotation of this shaft is stopped the blade will at once cease to run. As our belt-shifter operates simultaneously with the brake, it will be seen that no time is lost in stopping the saw, which can be brought to a state of rest in a few seconds at will.

The above is a description of our band-saw machine in its complete form; but it is evident we may modify the details of its construction without abandoning the essential features of our improvements—as, for example, first, the temper-screw I may be located in the rear of instead of in front of the shaft B; second, the fulcrum *j'* of the lever J may be located nearer the rear of the machine than is shown in the drawings; third, instead of two caps for each of the shells *l l'* N N', only one may be employed; fourth, any approved form of guide *m* may be applied to the foot of arbor M; fifth, the shifting-rod R may be supported in bearings projecting horizontally, vertically, or otherwise from the main frame of the machine, instead of in the lugs *r r'*, as shown; sixth, the blast-conductor may be applied to the lower pulley as well as to the upper one; seventh, said conductor can be made in sections or segments, hinged or bolted together, so as to be readily attached to or removed from the machine, as occasion may require; eighth, the upper bearing *b*, instead of being pivoted to the vertically-sliding block G, may be coupled to the same in any suitable manner, or may be rigidly united thereto. Our lever, by its own gravity, bears directly upward on the regulating-screw. Our band-tightening device is essentially different from that set forth in Patent No. 110,236, and we do not claim or use the devices covered by the said patent.

We claim as new and of our invention—

1. The sliding block G, constructed with threaded lug H, and the temper-screw I, constructed with a fixed collar, *i*, in combination with the weighted lever J, bearing directly on said fixed collar, substantially as set forth.

2. The recess or notch *b'* in the side of bearing *b*, for the free passage of temper-screw I, in the manner herein explained, and for the object stated.

3. The chambered shells or enlargements *l* N *l'* N' *p*, cast with the supplemental frame L, and having single or double caps or bushings O *o* anchored in the same with soft-metal filling P, substantially as herein described and set forth.

4. The combination of the shifting-rod R, arm X, incline U, brake W, and fast and loose pulleys *t t'*, all constructed and operating as described.

5. The combined belt-shifter and brake, consisting essentially of suitable supports *r r'*, sliding bar R, yoke T, inclined plane U, pivoted shoe W, arm X, and operating-handle *x*

the latter being located beneath the table Y, and in close proximity to the attendant, substantially as explained.

6. In combination with the shiftable rod R and its yoke T, the jaws *s s'* and clamping device S, wherewith said yoke is adjusted circumferentially of the driving-pulleys *t t'*, for the object stated.

7. The combination of the table Y, flanged plate Z *z*, recessed block 1 2, and set-screws 4 and 6, substantially as and for the purposes specified.

8. The conductor 7 8 9 10, constructed and applied as described, to divert the current of air away from the operator, as explained.

In testimony of which invention we hereunto set our hands.

WILLIAM H. DOANE.
WM. P. McKEE.

Witnesses:
GEO. H. KNIGHT,
JAMES H. LAYMAN.