(No Model.)

3 Sheets—Sheet 1.

E. E. FITZGERALD.

BAND SAW MILL.

No. 491,047.

Patented Jan. 31, 1893.

Fig. 3.

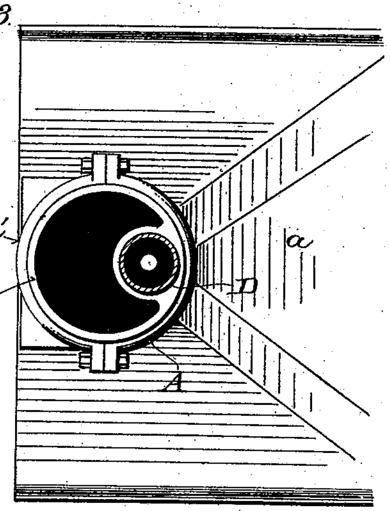


Fig. 1.

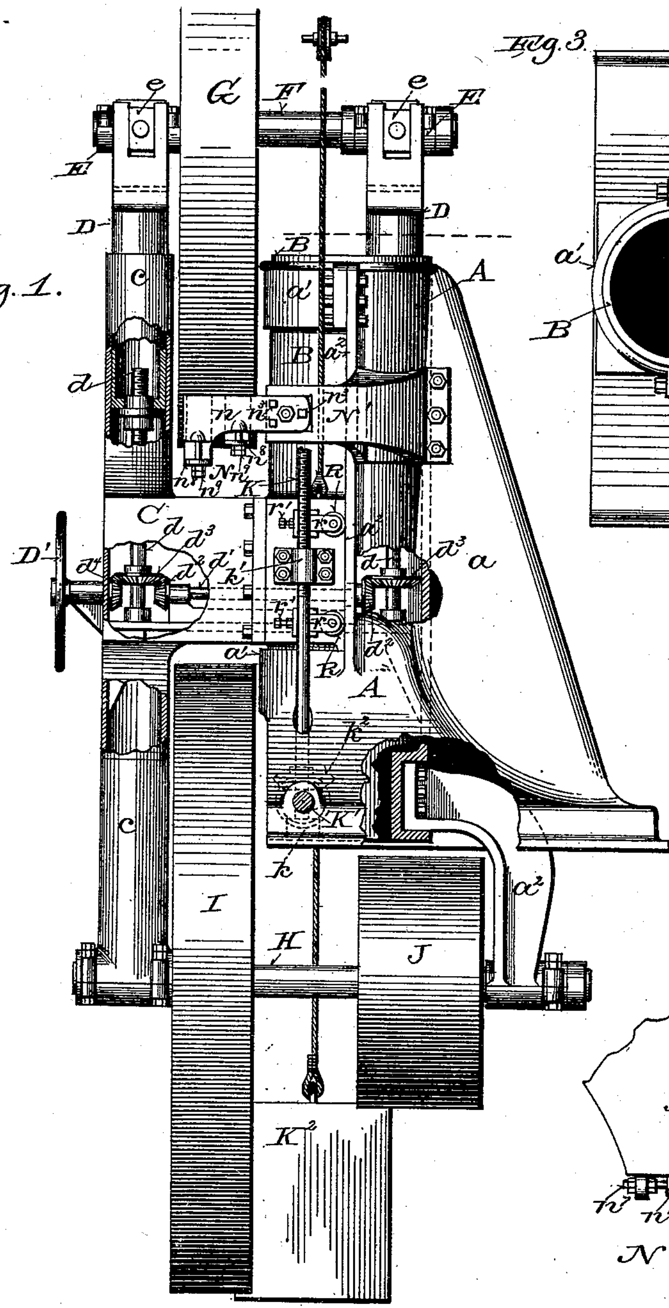
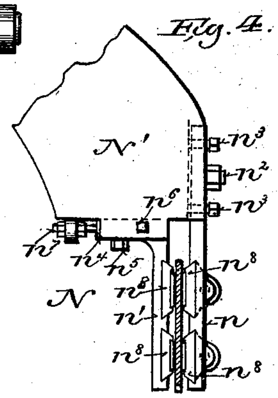


Fig. 4.



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(No Model.)

3 Sheets—Sheet 2.

E. E. FITZGERALD.

BAND SAW MILL.

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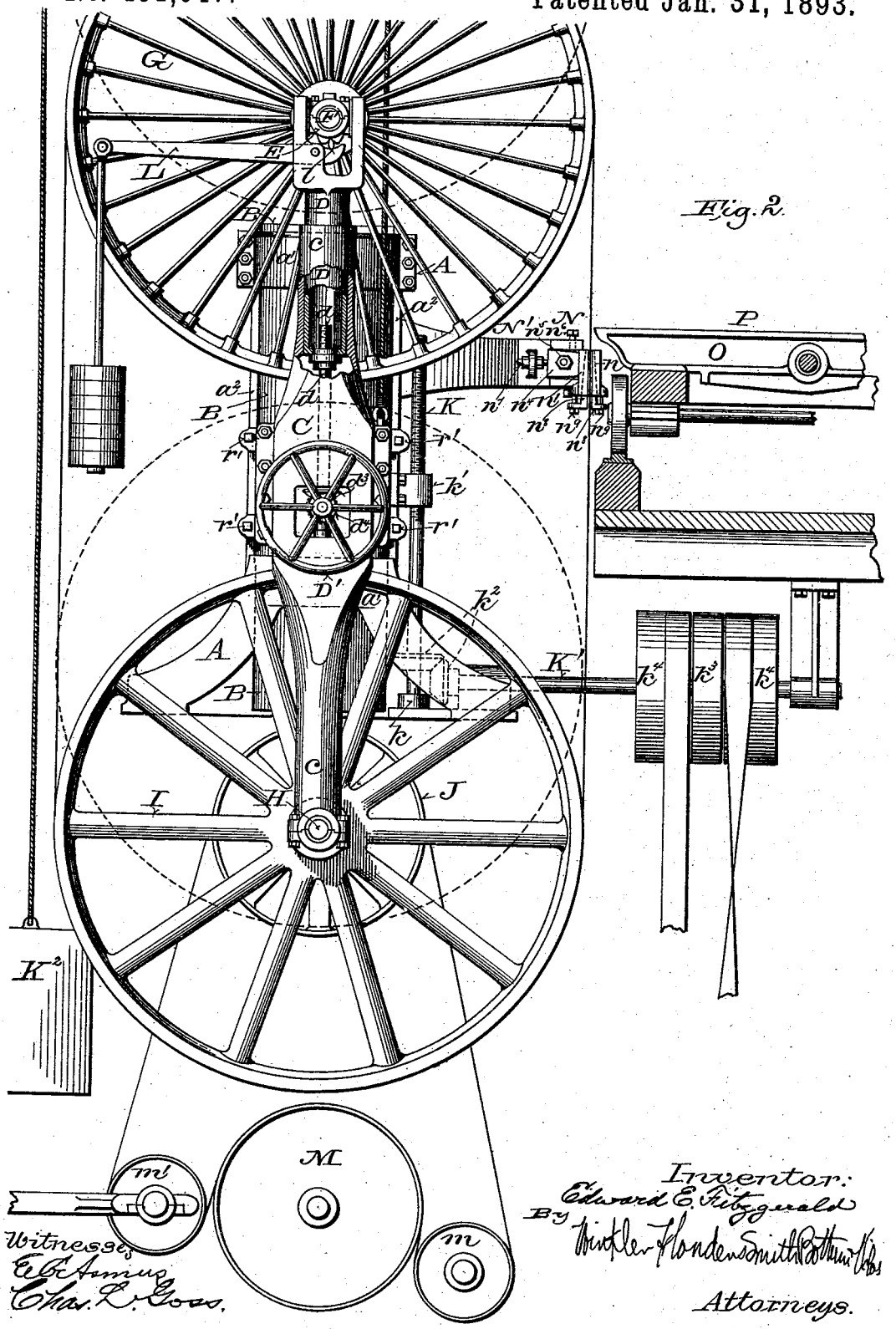
Fig. 2.



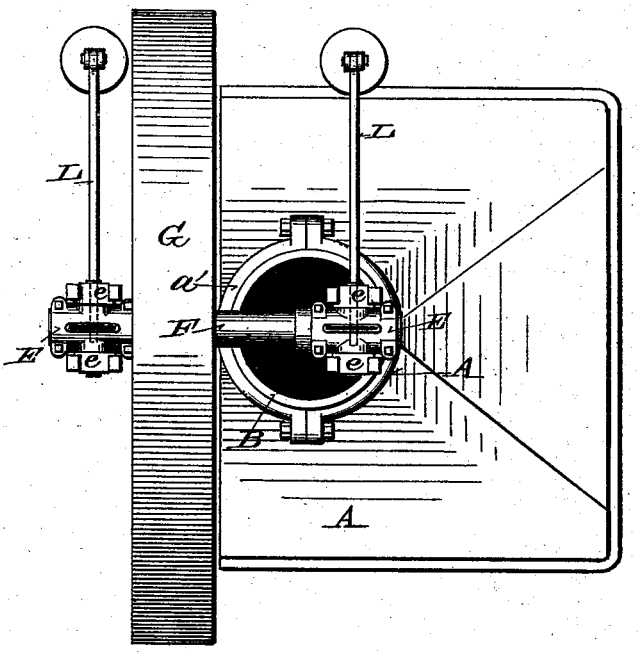
(No Model.) 3 Sheets—Sheet 3.

E. E. FITZGERALD.

BAND SAW MILL.

No. 491,047. Patented Jan. 31, 1893.

Fig. 5.



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UNITED STATES PATENT OFFICE.

EDWARD E. FITZGERALD, OF WEST DULUTH, ASSIGNOR OF ONE-HALF, BY MESNE ASSIGNMENTS, TO FRANK W. MERRITT, OF DULUTH, MINNESOTA.

BAND-SAW MILL.

SPECIFICATION forming part of Letters Patent No. 491,047, dated January 31, 1893.

Application filed November 9, 1891. Serial No. 411,348. (No model.)

To all whom it may concern:

Be it known that I, EDWARD E. FITZGERALD, of West Duluth, in the county of St. Louis and State of Minnesota, have invented certain new and useful Improvements in Band-Saw Mills; and I do hereby declare that the following is a full, clear, and exact description of the invention, which will enable others skilled in the art to which it pertains to make and use the same, reference being had to the accompanying drawings, and to the letters of reference marked thereon, which form a part of this specification.

The main object of my invention is to prevent deflection of the saw, and to increase the feed of the mill by keeping the point of contact between the upper wheel and working side of the saw as close as possible to the work in sawing lumber of varying dimensions.

It consists essentially of making the mill vertically adjustable bodily, with reference to the carriage or support on which the work is carried; of providing the upper band wheel shaft with vertically movable bearings and with independently yielding connections, whereby a uniform tension is maintained throughout the width of the saw blade, and a uniform contact between the face of the upper band wheel and the entire width of the saw; of providing the mill with a cross line adjustment for changing the lead of the saw, whereby the plane of both band wheels is changed without changing their adjustment relative to each other; and of certain other peculiarities of construction and arrangement hereinafter particularly described and pointed out in the claims.

In the accompanying drawings like letters designate the same parts in the several figures.

Figure 1 is a side elevation of my improved band saw mill; Fig. 2 is a front elevation thereof; Fig. 3 is a plan view of the supporting frame or column; Fig. 4 is a plan view on an enlarged scale of the guide, and Fig. 5 is a plan view of the mill.

A represents a fixed frame or column formed or provided with a suitable base, which is permanently secured to the frame of the mill or any suitable foundation. It is preferably formed with a semi-cylindrical upright or standard, which is strengthened on the rear side by a hollow web *a*, and is provided at or near the top and base with boxes or bearings *a' a'* for a vertically movable column B, which carries the band wheels and their connections. The column B is formed on the front side with a plane face to which is bolted, or otherwise attached, a bracket C, having upwardly and downwardly extending arms *c c* in front of the band wheels, carrying the front bearings of the upper and lower band wheel shafts.

D D are stems inserted and adjustable vertically in sockets or bearings formed for their reception in column B and the upwardly extending arm *c*. They are forked at their upper ends to receive the trunnioned boxes E E, which have bearings therein in lines transverse to the axis of the upper band wheel shaft F supported in said boxes, so as to permit of a slight vertical movement of either end of said shaft independently of the movement of the other end without causing it to bind in said boxes. The upper band wheel G is mounted upon the shaft F between the boxes E E and the extensible stems D D, by means of which it is raised or lowered to accommodate saws of different lengths. The lower band wheel shaft H is supported at the front end in a box attached to the lower end of the descending arm *c* and at the rear end in a box at the lower end of a depending bracket a^2, which is secured to the lower part of the sliding column B. Upon the shaft H, between its supporting boxes, are mounted the lower band wheel I and the pulley J. The sliding column B, together with both band wheels and their connections, are carried and adjusted vertically by means of a screw K, which bears at the lower end in a step *k* provided in the base of the fixed frame or column A, and engages with a nut *k'* formed with or attached to said column B. The screw K is operated by means of a horizontal shaft K' connected therewith by bevel gears k^2 and provided with a tight pulley k^3 and loose pulley k^4 placed on opposite sides thereof and connected by straight and crossed belts with a driving pulley on a countershaft. By shifting the belts in the usual way upon these pulleys, the screw K may be turned in either direction and the mill thus raised or lowered bodily.

To facilitate the vertical adjustment of the mill, I provide a counter-weight K^2 which is connected by a cord or cable passing over sheaves located above the mill frame with the sliding column B.

d d are vertical screws bearing at their lower ends in steps provided therefor in the vertically movable frame B, C of the mill, and engaging with nuts formed in or attached to the extensible stems D D. They are connected by a horizontal shaft *d'* provided at the ends with bevel gears d^2, engaging with similar gears d^3 on said screws. A hand wheel D' mounted upon a short shaft having a bearing in bracket C in line with the shaft *d'*, and provided with a bevel gear d^4 engaging with the adjacent gear d^3, affords means for turning said screws and simultaneously extending and withdrawing the stems D D and correspondingly raising and lowering the upper band wheel G.

To produce and maintain the desired tension upon the saw, I journal the trunnions of boxes E in blocks *e* having vertically sliding bearings in the forked arms of stems D, as shown in Fig. 1, and provide in connection with each box a weighted lever L which is fulcrumed in the upper end of the corresponding stem D and acts through its shorter arm upwardly against said box, a short post, block or ball *l* being preferably interposed between said lever and the under side of said box. The levers L, being separately weighted and independent of each other, permit the ends of the band wheel shaft F to rise and fall independently of each other, according to the pull exerted thereon through the band saw.

The toothed edge of the saw, by which the work is done, frequently becomes heated and expands more than the back of the saw and thereby produces greater strain or tension upon the saw toward its back edge when the bearings of the band wheels are held in relatively fixed positions or are compelled to rise and fall together. By my arrangement of the straining levers above specified, the upper wheel adjusts itself automatically to any inequality of strain upon the saw and maintains perfect and uniform contact and engagement between its face and the entire width of the saw blade.

To permit of raising and lowering the mill bodily for sawing lumber of different dimensions, an extensible or self adjusting driving connection is necessary. Various devices may be employed for the purpose, including that shown in the drawings, which consists of a driving pulley M on a countershaft parallel with the lower band wheel shaft, a fixed idler *m* located below and at one side of said countershaft, a tightening pulley *m'* supported in a vertically swinging weighted frame on the opposite side of the countershaft, and a belt passing over the pulley J on the band wheel shaft H, thence around and underneath the idler *m* and tightening pulley *m'*, and thence over the driving pulley M. The tightening pulley *m'* is arranged to swing in rising and descending clear of the pulley M. The idler *m* and tightening pulley *m'*, arranged as set forth with reference to the driving pulley M, produce and maintain the required wrap of the belt around said driving pulley, and at the same time allow the pulley J to rise and descend in the vertical adjustment of the mill without interrupting its operation.

It being one of the prime objects of my invention to bring the point where the working side of the saw leaves the periphery of the upper band wheel as near as possible to the work, the upper saw guide usually employed in band mills is dispensed with, and a lower guide N is alone used. It is supported in a fixed position, relative to the carriage way or bed upon which the work is carried, by an arm or bracket N' permanently attached to the frame or column A a little below the plane of the upper faces of the head blocks O of the carriage P, as shown in Fig. 2.

It is well known that a comparatively small force or pressure, applied to the edge of the band saw at or near the point where it runs upon either band wheel, is sufficient to throw it off from said wheel or carry it away from its proper position thereon. It is also a well understood fact that the greater the distance between the point where the working side of the saw leaves the upper wheel and the point where it enters a cut, the greater will be the tendency of the saw to buckle and deviate from its proper line or plane, since the lower wheel, through which the saw is driven, strains that portion of the saw between it and the work, while the inertia of the upper wheel tends to slacken that portion of the saw between it and the work. It follows, therefore, that the farther the work is from the point where the saw leaves the upper wheel, the greater will be the tendency of the saw to buckle and deviate from its proper line of work and the greater will be the liability of its being thrown off from or carried out of place upon the band wheels.

Heretofore it has been attempted to obviate the foregoing difficulties by providing an upper guide which could be readily raised and lowered, according to the diameter of the logs or the thickness of the stuff to be sawed; but while an adjustable upper guide has to a certain extent obviated the defects referred to, it is attended with certain disadvantages, such as binding upon and heating the saw, and has not proved to be a complete and satisfactory remedy for the objections specified. In the operation of my improved mill, the work being presented to the saw as far as possible from the lower wheel, the tendency which it has to crowd the saw off from or out of place upon the band wheels is greatly diminished.

For the purpose of swinging the mill slightly on a vertical axis to change the lead of the saw, and to hold it firmly in place when properly adjusted, I form vertical ways a^2 on the sides of the frame or column A and provide

the sliding column B with friction rollers R journaled in horizontally adjustable blocks r, so as to bear upon said ways. The blocks r are held in recesses or grooved ways provided therefor on the sides of column B and are adjusted and held in place by screws r'. By turning out the screws r' on one side and turning them in on the other side of said column, the mill may be swung bodily around the axis of said column B in either direction, and the working side of the saw accurately adjusted to the proper plane without disturbing the relative positions of the two band wheels.

The guide N, especially adapted for use with my improved mill, is composed of two check pieces n n', the outer of which is extended in a plane parallel with the saw blade and inserted in a recess in the guide arm N′ and attached thereto by a central bolt n^2 around which are threaded in said cheek piece adjusting screws n^3 bearing at their points against the face of said guide arm and affording means for adjusting the cheek piece n to the desired plane. The inner cheek piece n' is formed with a plate n^4, at right angles thereto, which is inserted in a recess in the guide arm N′ and held in place therein by a bolt n^5 passing through it, bolts n^6 n^6 threaded in vertical holes in the guide arm and bearing at their points against the upper and lower edges of said plate n^4, and a screw n^7 secured therein, passing loosely through an ear on said guide arm and provided on each side of said ear with adjusting nuts. The bolts n^6 afford means for tipping the cheek piece n' around the bolt n^5 and by means of the screw n^7 said cheek piece is moved toward or from the saw. When properly adjusted, the cheek pieces are secured firmly in place by tightening the bolts n^2 n^5. They are formed on their inner faces adjacent to the sides of the saw blade with dovetailed grooves or recesses which are inclined toward the upper edges of said cheek pieces toward the saw, and in these grooves or recesses are inserted from underneath wedge shaped bearing pieces n^8 n^8 preferably made of brass and faced with Babbitt-metal or other suitable wearing material. They are held in place and adjusted to take up wear by means of screws n^9 n^9 secured in the cheek pieces n n' and projecting through perforated ears on the lower edges or ends of the bearing pieces below which they are provided with nuts.

Various changes may be made in the details of construction and arrangement of my improved mill within the spirit and intended scope of my invention.

I claim:—

1. In a band saw mill, the combination with a work support or carriage upon which the work is movable horizontally past the saw, of vertically movable band wheels located one above the other, and a band saw mounted thereon and movable therewith so as to bring the point where said saw leaves the upper wheel as close as possible to the work and thereby dispense with the upper guide, substantially as and for the purposes set forth.

2. In a band saw mill, the combination of band wheels located one above the other, a band saw mounted thereon, a fixed frame or column and a vertically movable frame or column supported thereby and carrying said band wheels and saw, whereby the upper wheel is brought close to the work and buckling and deflection of the saw is prevented without the use of an upper guide, substantially as and for the purposes set forth.

3. In a band saw mill, the combination with a support or carriage on which the work is moved horizontally past the saw, of band wheels located one above the other, a band saw mounted thereon with its working side in a vertical position, a fixed frame or column, a vertically adjustable frame or column supported thereby and carrying said band wheels and saw, and a screw for raising and lowering said movable frame or column, substantially as and for the purposes set forth.

4. In a band saw mill, the combination with a carriage or support upon which the work is moved horizontally past the saw, of band wheels located one above the other, a band saw mounted thereon with its working side in a vertical position, a fixed frame or column, a vertically adjustable frame or column supported thereby and carrying said band wheels and saw, a screw having a bearing in said fixed frame or column and engaging with a nut on said adjustable frame or column, and a reversible driving connection for turning said screw in opposite directions, substantially as and for the purposes set forth.

5. In a band saw mill, the combination with the upper band wheel and its shaft, of vertically movable boxes for said shaft and independent straining levers fulcrumed to the box supports and acting upwardly against said boxes independently of each other, whereby the upper wheel is permitted to accommodate itself to variations of strain in the front and rear edges of the saw, substantially as and for the purposes set forth.

6. In a band saw mill, the combination with the upper band wheel and its shaft of trunnioned boxes journaled in vertically movable slides whereby either end of said shaft is permitted to rise or fall without causing it to bind in said boxes, and straining levers fulcrumed in the box supports and acting independently of each other upwardly against said boxes so as to maintain a uniform tension in the front and rear edges of the saw, substantially as and for the purposes set forth.

7. In a band saw mill, the combination with the upper band wheel and its shaft of extensible stems carrying the journal boxes of said shaft, vertical screws having step bearings at their lower ends in the frame of the mill and engaging with nuts in said stems, a cross shaft above said step bearings in the same vertical plane with said screws provided at the ends

with bevel gears working with similar gears on said screws, and a hand wheel or lever mounted upon a shaft in line with said cross-shaft and provided with a bevel gear working with a gear on one of said screws, substantially as and for the purposes set forth.

8. In a band saw mill, the combination with the upper band wheel and its shaft of trunnioned boxes supporting said shaft, extensible stems forked at their upper ends to receive said boxes, vertically movable trunnion blocks having sliding bearings in the forked arms of said stems, and straining levers fulcrumed in said stems and bearing upwardly against said boxes, substantially as and for the purposes set forth.

9. In a band saw mill, the combination of band wheels located one above the other, a fixed frame or collar having vertical ways on the sides, a vertically movable cylindrical column adapted to and supported by said fixed frame or column and carrying the band wheels, and bearings on said vertically movable column, working with the vertical ways on the fixed frame or column and holding the one from turning in the other, substantially as and for the purposes set forth.

10. In a band saw mill, the combination of a fixed frame or column having vertical ways on the sides, a vertically movable frame or column supported by said fixed frame or column and carrying the band wheels, and adjustable bearings on said vertically movable frame or column arranged to bear against the vertical ways on the fixed frame or column, substantially as and for the purposes set forth.

11. In a band saw mill, the combination of a fixed frame or column having vertical ways on the sides, a vertically adjustable cylindrical column carrying the band wheels one above the other and fitted in said fixed frame or column, and provided on opposite sides with friction rollers which bear upon said vertical ways and thus hold the vertically adjustable column from turning in the fixed frame or column and facilitate its vertical adjustment, substantially as and for the purposes set forth.

12. In a band saw mill, the combination with a vertically movable frame or column carrying the band wheels and having on opposite sides horizontally adjustable roller blocks provided with friction rollers, and a fixed frame or column supporting said adjustable frame or column and provided with vertical ways for said friction rollers, substantially as and for the purposes set forth.

13. In a band saw mill, the combination of a vertically adjustable cylindrical column carrying the band wheels provided on opposite sides with horizontally adjustable friction rollers, a fixed frame or column provided with bearings for said cylindrical column, which is capable of turning and sliding vertically therein, and with vertical ways against which said rollers bear thereby preventing the mill from turning, substantially as and for the purposes set forth.

14. In a band saw mill, the combination with a vertically adjustable frame carrying the band wheels, one above the other, and a band saw mounted thereon with its working side in a vertical position; of a self adjusting driving connection comprising a counter-shaft and driving pulley mounted thereon, below the mill a fixed and a vertically movable idler on opposite sides of the counter-shaft, and a belt passing over the driving pulley, thence under the idlers and thence over a pulley on the lower band wheel shaft, substantially as and for the purposes set forth.

15. In a band saw mill, the combination with a work support or carriage occupying a fixed position vertically with relation to the saw, of band wheels located one above the other, a band saw mounted thereon with its working side in a vertical position, a vertically movable frame or column carrying the band wheels, and a self adjusting driving connection whereby the mill may be raised or lowered without interrupting its operation, substantially as and for the purposes set forth.

16. In a band saw mill, the combination with a vertically movable frame carrying the band wheels, one above the other, the band saw mounted thereon with its working side in a vertical position and mechanism for raising and lowering said frame, of a counterweight connected with said frame and acting upwardly thereon, a counter-shaft below the mill and a self adjusting driving connection between the lower band wheel shaft and said counter-shaft substantially as and for the purposes set forth.

17. In a band saw mill, the combination of a vertically movable frame carrying the band wheels, a fixed frame supporting said vertically movable frame, and a lower guide permanently attached to said fixed frame, substantially as and for the purposes set forth.

In testimony that I claim the foregoing as my own I affix my signature in presence of two witnesses.

EDWARD E. FITZGERALD.

Witnesses:

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CLARA J. JANECK.