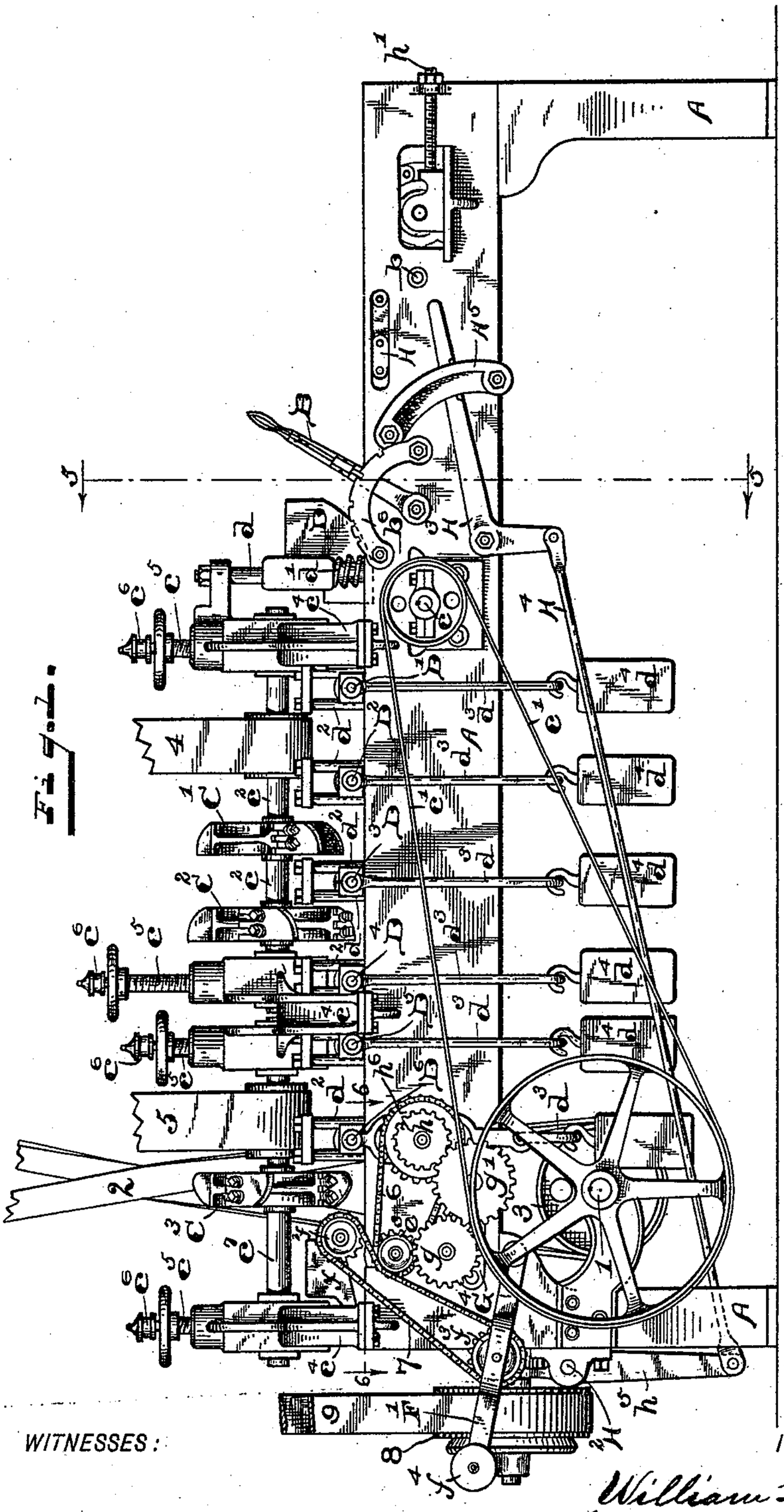
(No Model.) 4 Sheets--Sheet 1.

W. L. KELLOGG.

STAVE MAKING MACHINE.

No. 492,905. Patented Mar. 7, 1893.

Fig. 1.



WITNESSES:

F. W. Warner.

J. A. Walsh.

INVENTOR

William L. Kellogg,

per

Edw. E. Bradford.

ATTORNEYS.

(No Model.)

4 Sheets—Sheet 2.

W. L. KELLOGG.

STAVE MAKING MACHINE.

No. 492,905. Patented Mar. 7, 1893.

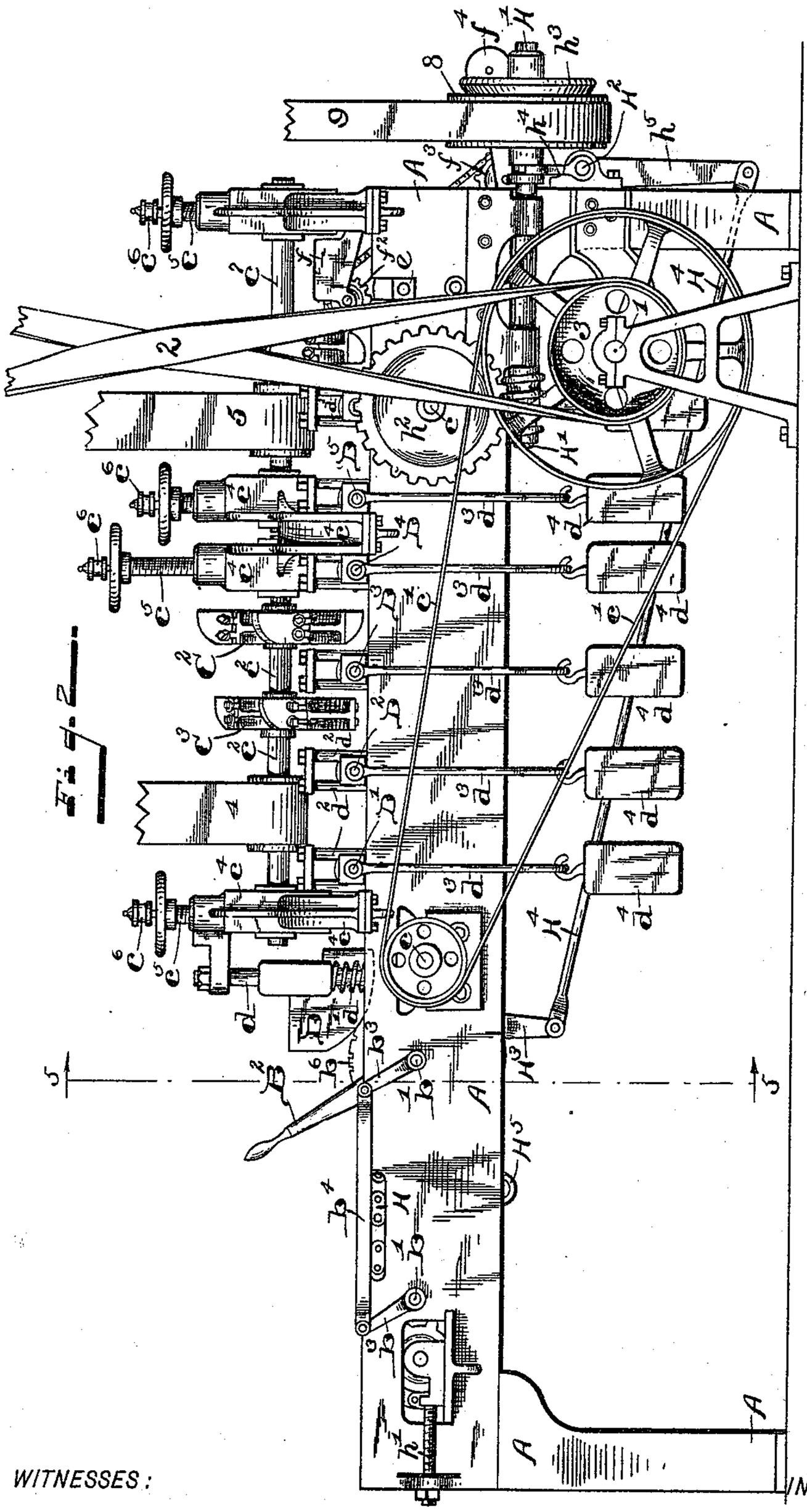


Fig. 2.

WITNESSES:

F. W. Warner.

J. M. Walsh.

INVENTOR

William L. Kellogg,

per C. E. W. Bradford.

ATTORNEYS.

(No Model.)

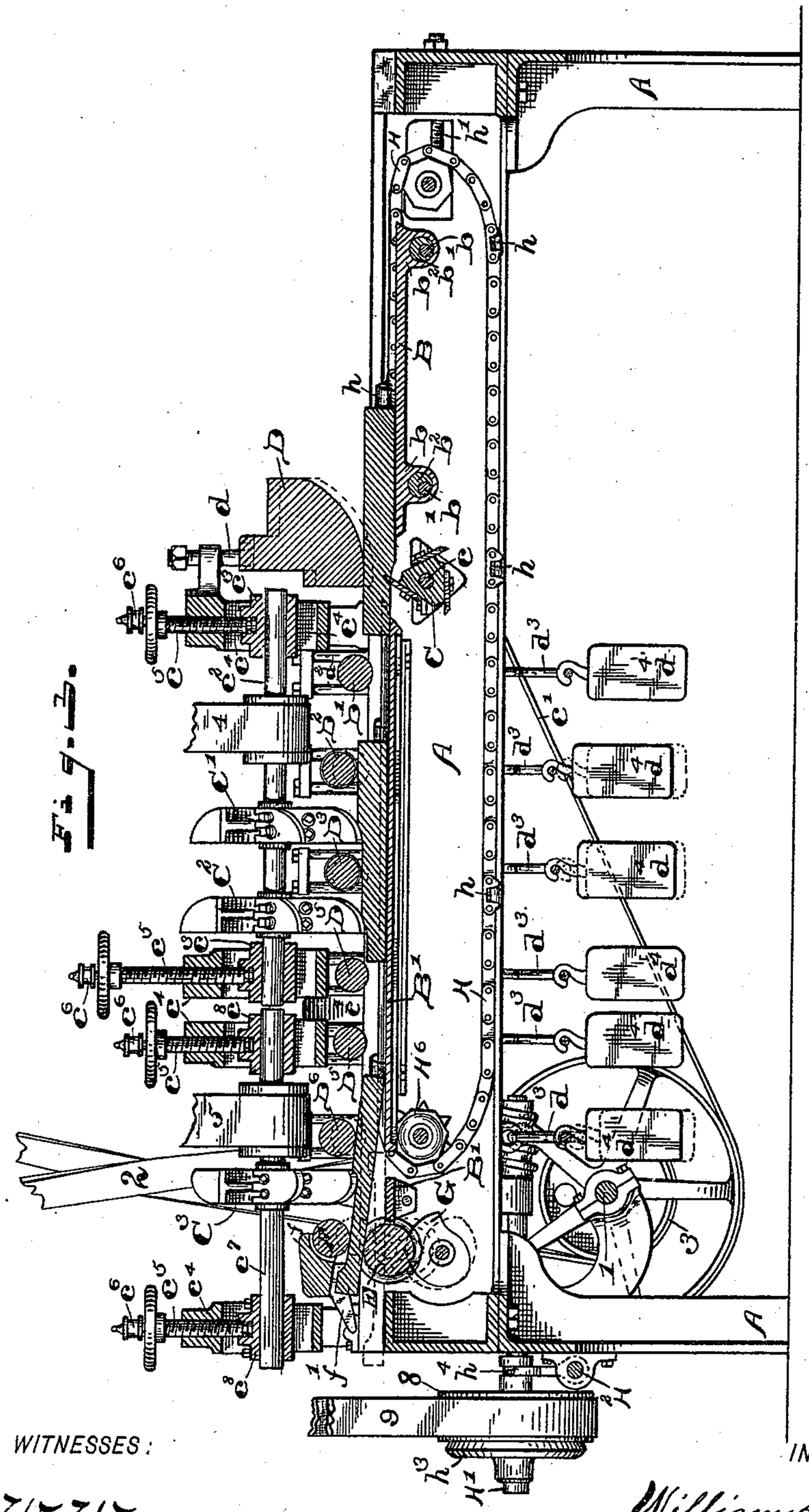
4 Sheets—Sheet 3.

W. L. KELLOGG.

STAVE MAKING MACHINE.

No. 492,905. Patented Mar. 7, 1893.

Fig. 7.



WITNESSES:

F. W. Warner.

J. A. Walsh.

INVENTOR

William L. Kellogg,

per C. A. & W. Bradford.

ATTORNEYS

(No Model.) 4 Sheets—Sheet 4.

W. L. KELLOGG.

STAVE MAKING MACHINE.

No. 492,905. Patented Mar. 7, 1893.

Fig. 4.

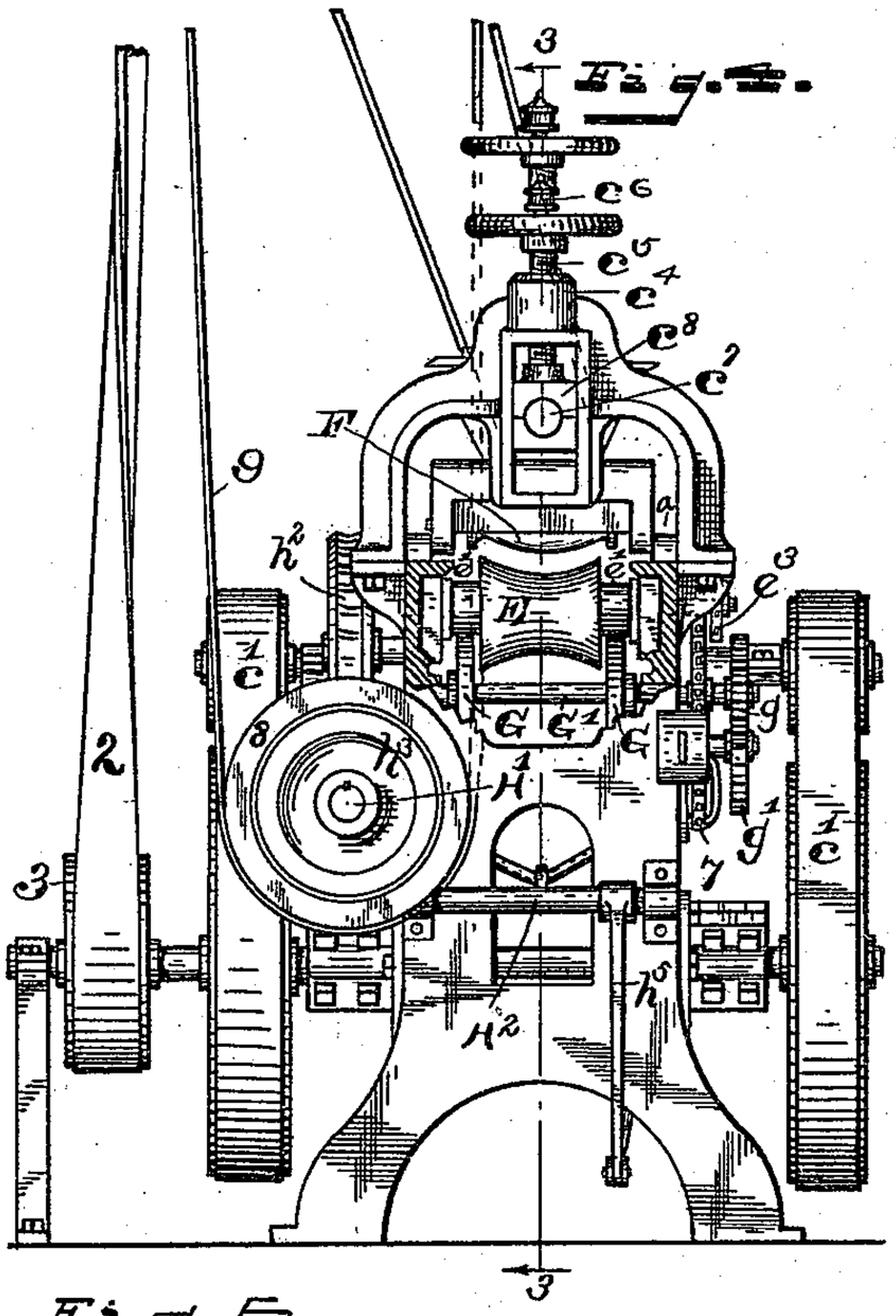


Fig. 5.

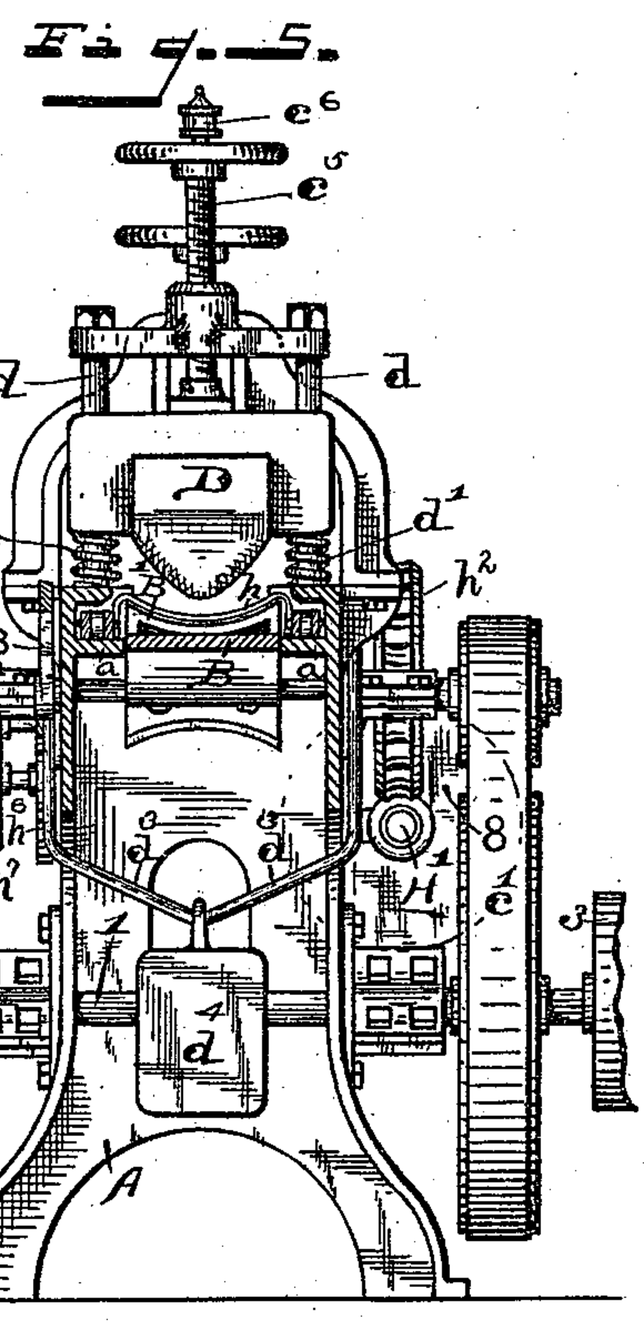


Fig. 6.

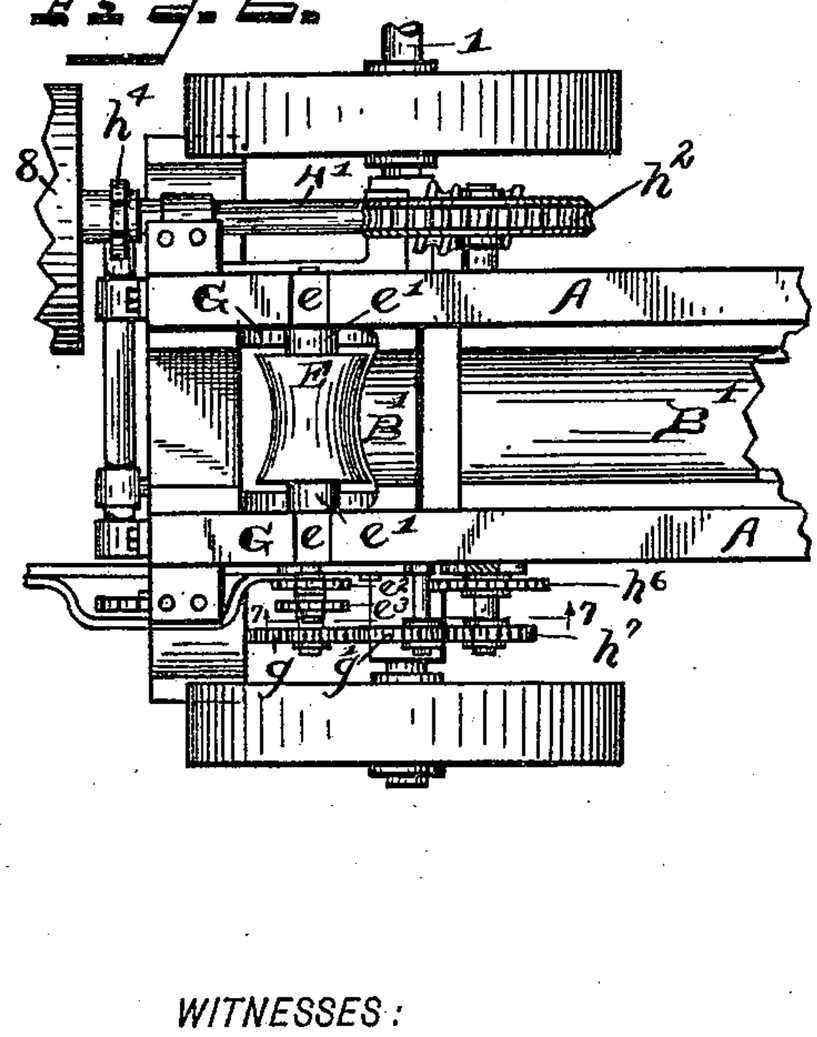
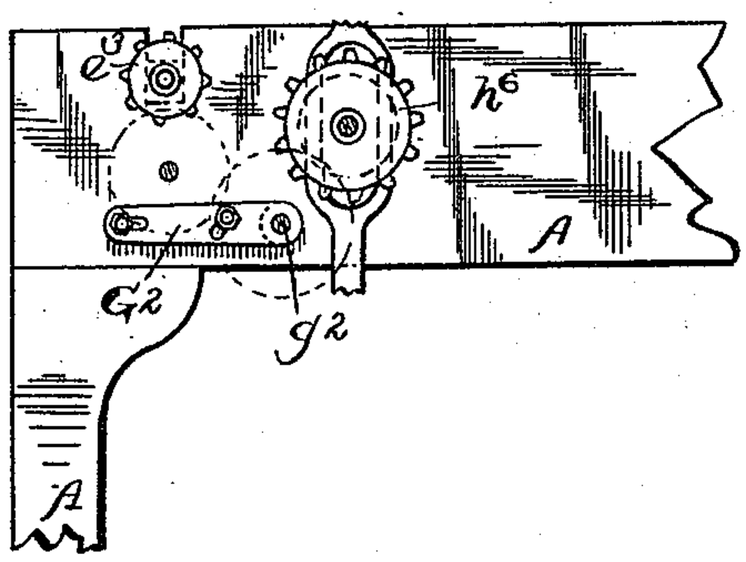


Fig. 7.



WITNESSES:

F. W. Warner.

J. A. Walsh.

INVENTOR

William L. Kellogg,

by C. A. & W. Bradford

ATTORNEYS

UNITED STATES PATENT OFFICE.

WILLIAM L. KELLOGG, OF INDIANAPOLIS, INDIANA.

STAVE-MAKING MACHINE.

SPECIFICATION forming part of Letters Patent No. 492,905, dated March 7, 1893.

Application filed June 28, 1892. Serial No. 438,280. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM L. KELLOGG, a citizen of the United States, residing at Indianapolis, in the county of Marion and State of Indiana, have invented certain new and useful Improvements in Stave-Making Machines, of which the following is a specification.

My said invention consists in various improvements in the details of construction of that machine for making staves for which Letters Patent of the United States No. 399,670 were issued to me on March 19, 1889, by which it is rendered more efficient in operation and perfect in result, as will be hereinafter more fully described and claimed.

Referring to the accompanying drawings, which are made a part hereof, and on which similar letters and numerals of reference indicate similar parts, Figure 1, is an elevation of the front side of the machine; Fig. 2 a similar view of the rear side; Fig. 3 a central longitudinal section through the same looking in the direction indicated by the arrows from the dotted line 3 3 in Fig. 4; Fig. 4 a front end elevation with a portion of the frame broken away to more clearly show portions of the operating mechanism; Fig. 5 a transverse vertical section looking in the direction indicated by the arrows from the dotted line 5 5 in Fig. 1; Fig. 6 a detail horizontal sectional view looking in the direction indicated by the arrows from the dotted line 6 6 in Fig. 1, and Fig. 7 a detail view looking in the direction indicated by the arrows from the dotted line 7 7 in Fig. 6.

In said drawings the portions marked A represent the frame of the machine; B and B′ bed plates for supporting the stave therein; C the cutter-head for dressing off the under side of the stave, C′ and C^2 cutter-heads for dressing off the upper side of the stave, and C^3 a cutter head for hollowing or cutting out the stock between the thick ends; D a weighted clamp for holding the stave-block to the bed plate as it is started into the machine; D′, D^2, D^3, D^4, D^5 and D^6 weighted clamping rollers arranged above the bed plate in position to hold said block securely upon the bed plate while being operated upon as it passes through the machine; E an adjustable roller located at the front end of the bed plate to receive the stave-block as it leaves said bed-plate and support it in proper relation to the cutter-head C^3 and then guide it out of the machine; F a companion roller to said roller E which bears upon the upper side of the stave while said roller E engages with its under side; G cams arranged beneath the shaft carrying said roller E for supporting and adjusting the same, and H an endless chain belt for feeding the stave-blocks through the machine.

The frame A is of cast metal, consisting of suitable side and end pieces supported on legs, as shown, and provided with suitable journal boxes, brackets and other means for attaching the various portions of the mechanism thereto as will be hereinafter described.

The bed plate B has a substantially flat top surface, and on its under side is provided with downwardly extended portions *b* in which shafts *b′* provided with cams b^2 are journaled, as shown. On one end of each of said shafts is mounted a crank arm b^3, and said crank arms are connected by a link b^4, an operating lever B^2 being provided on the opposite end of the forward shaft, which is provided with a spring pawl b^5 which engages with notches in a notched segment b^6 secured to the side of the frame. By this means, as will be readily understood, said bed plate is rendered adjustable vertically, and may be raised or lowered at will to secure the removal of more or less of the under surface of the stave block by the cutter-head C. Said bed plate extends from near said cutter-head C back toward the rear end of the machine a sufficient distance to receive said stave-blocks.

The bed-plate B′ extends from just in front of the cutter-head C to near the front of the machine, a transverse opening being formed therein at a point just behind the cutter-head C^3 to permit the feed belt H to pass through. Its upper face is concave to correspond with the formation of the knives of the cutter-head C, and the consequent form of the back of the stave-block, which, after leaving said cutter-head C thus fits to and rests firmly upon said bed-plate to which it is securely held by the weighted rollers above.

The cutter-head C is of substantially the same construction as that shown in my patent before mentioned. It is secured on the shaft *c*, which is journaled in suitable boxes

in the sides of the frame. Pulleys are provided upon its outer ends which are geared by belts c' to pulleys on the counter shaft 1 which is journaled in suitable boxes attached to the front portion of the frame-work. Said counter shaft is driven by a belt 2 running from any convenient power shaft to a pulley 3 on one of its ends. The power for driving said cutter-head is thus applied to its shaft equally at both ends. Its knives, as will be readily understood, are formed of that concavity which it is desired to give the back of the stave, which is formed by said cutter-head.

The cutter-heads C′ and C^2 are rigidly secured upon the shaft c^2, which is journaled in suitable boxes c^3, which boxes are mounted to be vertically adjusted in suitable ways in brackets c^4 secured to the top of the frame, being connected to the lower ends of hollow screw rods c^5 which engage with screw-threaded perforations in the top portion of said brackets. Oil cups c^6 are mounted on the top of said screw rods and connected with the perforation therein for supplying oil to the shaft bearings, and hand wheels are provided thereon by which said boxes may be adjusted up and down to adjust said cutter heads to secure the thickness of stave desired. Said cutter-heads are formed substantially as shown consisting of a series of knives rigidly bolted to the several arms of a central hub which is keyed to the shaft. The cutting edges of said knives are formed with their rear corners rounded off, as shown, which form adapts them to strike the wood substantially across its grain, thus facilitating the operation of cutting, and securing a smoother and better result. The knives of the cutter-head C^2 project a little farther from the center than do the knives of the cutter-head C′, thus removing more of the stock and finishing the block to the desired thickness. As will be readily understood, more than the two cutter-heads might be provided if desired, or in some kinds of lumber one might be sufficient to do the work. I have shown two as the number usually employed. Said shaft is driven from a convenient power shaft by a belt 4 which engages with a suitable pulley thereon.

The cutter-head C^3 is mounted upon a shaft c^7 journaled in boxes c^8 which are also mounted in vertical ways in the brackets c^4 on the lower end of adjusting screws c^5, the center bracket c^4 affording the way both for the box for the forward end of the shaft c^2 and that of the rear end of the shaft c^7. The two shafts c^2 and c^7 are substantially in line, and extend longitudinally of the machine over its center, but are thus made independently adjustable thereby securing a better result inasmuch as the making of different lengths of staves requires the cutter-head C^3 to be raised or lowered to accommodate the greater or less angle of the stave block, while the cutter-heads C′ and C^2 only need to be adjusted to secure the desired thickness. The knives of the cutter-head C^3 are ground with oval cutting edges, the front corner being ground off considerably more than the rear corner, inasmuch as this cutter-head operates while the stave-block is at an angle, in which position this formation of knife will strike the wood across its grain, and cut it in a smoother and better manner and leave shoulders at the ends of equal concavity. Said shaft c^7 is driven by a belt 5 running from any suitable power shaft to a suitable pulley thereon.

The weight D is mounted above the bed plate B to slide on vertical posts d which are secured in the sides of the frame at their lower ends and supported by being connected to the rear bracket c^4 at their upper ends. A spring d' is interposed between said weight and the frame at each side, as shown, which prevents it from falling with undue force after a stave-block has passed under it. This weight rests upon the top side of a stave-block as it starts into the machine, substantially above the cutter-head C, thus holding it down to said cutter-head while its under side is being dressed thereby.

The rollers D′, D^2, D^3, D^4, D^5 and D^6 are each journaled in suitable boxes mounted in vertical ways formed by two upright pins or posts d^2 secured to the sides of the machine and connected at their tops by cap pieces, as shown. The outer ends of the journals of said rollers have bail-like rods d^3 connected therewith which extend down under the machine, and have weights d^4 hung thereon which operate to hold said rollers upon the top side of the stave-block while being fed through, thus securing said stave block rigidly in position while being operated upon with the knives of the several cutter-heads. They are formed convex in longitudinal section, and the rollers D′, D^2 and D^3 are preferably corrugated circumferentially to better perform their function, while the rollers D^4, D^5 and D^6 are formed smooth and fit into the concave face of the stave which has been formed by the cutter-heads C′ and C^2, before reaching them, after which it is thus held between the concave face of the bed plate and the convex face of said rollers.

The roller E is concave in longitudinal section, the concavity corresponding to that of the bed-plate B′, its top being in the plane of the top of said bed-plate when in its lowest adjustment. Its shaft is journaled in suitable boxes e which are mounted to move vertically in ways formed in the side pieces of the frame. The roller proper is of a length corresponding substantially to the width of the bed-plate, and between each end and the sides of the frame are collars or enlarged portions e' on the shaft against which the cams G bear and operate. One end of said shaft projects beyond the front side of the machine and is provided with sprocket wheels e^2 and e^3. Said sprocket e^2 is geared to a sprocket on the outer end of the shaft which drives the feed belt or chain H by a chain belt 6.

The roller F is formed convex in longitudi-

nal section and is journaled in suitable bearings in the lower rear corners of a weighted housing *f*. Said weighted housing has forwardly extending arms *f'* the outer ends of which are hinged to the frame, which thus provides for the upward and downward movement of said roller, and at the same time holds it with sufficient gravity against the stave to clamp it securely between its convex face and the concave face of the roller E. On the outer end of the shaft of said roller F is mounted a sprocket wheel f^2, and a sprocket chain 7 passes over the same, engaging on one side with the sprocket e^3, and passing over a sprocket f^3 which is journaled on a stud shaft intermediately of a pivoted lever F', which lever is provided with a weight f^4 on its outer end which holds said chain tight, while at the same time permitting the upward and downward movement of the rollers E and F.

There are two of the cams G mounted securely on a shaft G' which is journaled in suitable bearings in the sides of the frame. One of said cams is arranged just beneath each collar or enlarged portion *e'* of the shaft of the roller E. They are each of substantially the form shown in Fig. 3, which is such that they operate to raise the roller E and through it and the stave block thereon and the roller F and guide said block forward in that relative position to the cutter-head C^3 which will enable said cutter-head to cut out a portion of the stock between the ends, leaving thick portions at each end of equal length, and uniformly formed concave shoulders between said thick ends and the thinner middle portion, which form of stave is the most perfect, and therefore the most desirable. In said Fig. 3 I have shown in whole lines a stave block in the position it occupies while the cutter-head C^3 is operating upon it, its operation being about two thirds completed, the position of the cam and other parts at such time being also shown. In dotted lines I have indicated the position which the stave and the mechanism occupy just after the operation of said cutter-head is completed. The cams are of such a form that they permit the rollers E and F to move sufficiently from this position to discharge the stave from the machine before raising them again. The mechanism is so arranged and timed that at the moment when the forward end of the stave block reaches the roller E the cams are in that position to abruptly raise said roller and throw the block into the path of the cutter head, which then begins to cut at the proper distance from the end, forming the concave shoulder to the depth desired, from which the cams are of a form to support the block in such a position that it will be hollowed out to a uniform depth until that point is reached that distance from the rear end which the shoulder in the forward end occupies when the abrupt offset in the cam is reached and permits the roller E to fall into a position in line with the bed plate B', which brings the now finished stave into a horizontal position in which it is fed out of the machine, when another block is in position for the cutter head C^3 and the operation is repeated continuously. On the other end of the shaft G' is provided a gear wheel *g* which, by means of the gear wheel *g'*, is geared to another gear wheel on the end of the shaft, which drives the feed belt, as will be presently described. The speed at which the cam shall be driven is regulated by the size of said wheel *g* which is removable and different sizes of which may be substituted one for another. The wheel *g'* is journaled on the stud g^2 on an adjustable bar G^2 secured to the side of the frame by means of bolts and slots, as shown in Fig. 7, which provides for the meshing of the chain of gear regardless of the size of the wheel *g* being used. This variation in speed is made necessary in making staves of different lengths inasmuch as the cams must make one revolution for each stave made. Thus when short staves are being made, the feed belt is spaced to carry through a larger number of blocks at each circuit than when long staves are being made, and said cams must travel at a higher speed to make its revolutions correspond in number during each circuit of said belt to the number of spaces and stave blocks, as they must travel at a slower speed for the same reason when staves of a greater length are being made, and the chain belt is divided into a consequently less number of spaces.

The feed chain or belt H consists of two endless chains resting upon suitable ledges *a* on the side pieces of the frame. It passes over a roller H^6 provided with sprockets located beneath the bed-plate B', which is formed with a transverse opening near its front end to permit said belt to pass through, as shown in Fig. 6. Each chain engages with the sprockets of said roller and passes back over an idler roller at the rear of the machine. It is provided with numerous cross-bars *h* the ends of which are formed as links of the chains, which adapts them to be readily taken from one place and put in another dividing the belt into as many spaces as desired to accommodate the length of stave being made. Said bars are adapted to come against the rear end of the stave-blocks, and push or feed them through the machine. Its tension may be adjusted by means of the adjusting screws or bolts *h'*, which are connected to the boxes of the journals of the idler roller, the same being mounted in longitudinal ways or slots in the sides of the frame. On the rear side of the machine the shaft of the forward roller is provided with a gear wheel h^2 with which a worm on the short shaft H' engages. Said shaft H' is journaled in suitable bearings on the rear side of the frame at its front end, and is provided with a pulley 8 thereon driven by a belt 9 running from any suitable power shaft. Adjacent to said pulley a cone-faced clutch h^3 is rigidly secured to said shaft H', and said pulley 8 is adapted to engage there-

with, being mounted to slide on said shaft, having a circumferential groove in its hub with which a shifting fork h^4 engages. Said shifting fork is secured rigidly on a rock-shaft H^2 which is provided with a downwardly-extending arm h^5 which is connected to a hand lever H^3 by means of a connecting rod H^4. Said hand lever is provided with a catch on one side adapted to engage with the notches of a notched segment H^5 secured to the side of the frame. By this means, as will be readily understood, the operator is enabled to set the shaft H′, and through it the feeding belt, in motion, or stop it at will. On the opposite end of the shaft of the driving roller of the feeding belt is provided a sprocket wheel h^6 with which the chain belt 6 engages, and also a gear wheel h^7 with which the gear wheel g' engages thus providing for the driving of the rolls E and F, and the shaft carrying the cams, as has before been described.

The operation of my said invention is as follows: The rough block from which the stave is to be made is placed in the machine upon the bed-plate B. The feeding belt being in motion one of the cross-bars h comes against the rear end of said block and forces it under the weighted clamp D against the cutter-head C, said weight operating to hold the block in position and said cutter-head operating to dress off the back side thereof and give it the desired convex form. When the first block has passed forward sufficiently another is placed upon the bed-plate B in front of the next cross-bar h, and so on. After passing the cutter-head C each block then passes under the cutter-head C′ and has a portion of the surplus stock removed from its top side, then under the cutter-head C^2 which reduces the block to the desired thickness and gives it the desired concavity. It is then forced forward until its front end has passed the cutter-head C^3, and comes in contact with the roller E, which is raised by the cam G abruptly (the apparatus being so geared and timed as to effect this result), bringing the block into contact with said cutter-head C^3 that distance behind the front end where it is desired the shoulder shall be formed. The cams then maintain said roller in the proper relative position to said cutter-head to enable it to cut out an equal amount of stock until it has reached that point where the shoulder should be formed at the other end when the roller E is permitted to fall abruptly by the formation of the cam the stave falling with it to a horizontal position out of the reach of said cutter-head, and being then fed out of the machine by the rollers E and F. A stave is thus produced of that form which permits the best results to be secured in forming them into the articles manufactured, as has been hereinbefore specified. By reason of having the shaft carrying said cutter-head C^3 adjustable independently of the other its position may be altered to accommodate long or short blocks as has been before described, and by regulating the speed of the cams which support the roller E, the same machine is adapted for the manufacture of staves of various lengths. By the peculiar form and arrangement of the knives as shown, they are adapted to cut out the stock across the grain of the wood, thus making a smooth and finished job without danger of slivering and injuring the blocks.

Having thus fully described my said invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In a stave making machine, the combination of the frame, the feeding belt, the cutter head or heads for dressing the top of the stave to its proper thickness being mounted upon one adjustable shaft, and that for hollowing out the portions between its ends being mounted upon another adjustable shaft, both of said shafts being arranged longitudinally of the machine whereby said cutter heads operate transversely of the blocks and may be independently adjusted, substantially as set forth.

2. In a stave making machine, the combination of the frame, the bed plates, the feeding mechanism, the cutter head located beneath the bed plate for forming the back of the stave, a series of cutter heads arranged on longitudinal shafts above the bed plate for forming the inside of said stave, and an adjustable roller at the forward end of said bed plate for receiving said stave, and suitable means for raising and depressing said roller during the passing of the stave thereover as desired, substantially as set forth.

3. In a stave making machine, the combination of the frame, the bed plate, the feeding mechanism, the cutter heads, the roller located at the front end of the bed plate mounted to be vertically adjusted, a shaft located beneath said roller, and cams mounted on said shaft and adapted to bear against portions of the shaft of said roller, and suitable gearing for driving the same, whereby said roller is raised and lowered to guide said stave-block in proper relation to the cutter-head, substantially as set forth.

4. In a stave making machine, the combination of the frame, the bed plates, the feeding mechanism, the cutter heads, and the vertically adjustable roller located at the front end of said bed-plate substantially in line therewith when in its lowest position, the weighted roller mounted above said other roller, and adapted to rest upon the top side of the stave-block, said weighted roller being hinged and adapted to move therewith, said rollers being connected by suitable gearing, whereby they are adapted to feed the stave-block out of the machine, substantially as set forth.

5. In a stave making machine the combination of the frame, the bed-plates, the cutter-heads, the adjustable roller E located in front of the bed-plates, mechanism for raising and lowering said roller, and the feed belt

H for feeding the stave-blocks through the machine provided with cross-bars *h* which are so spaced throughout the length of said belt that the mechanism for raising and lowering the roll E will complete one operation while said belt is moving a distance equal to the length of the space between said bars, substantially as set forth.

6. In a stave making machine, the combination with the frame, the bed-plates, the cutter-heads, the feeding belt provided with cross bars for pushing the stave-blocks along, the roller E located in front of the bed-plate and mounted to be vertically adjusted, and the cams G located beneath said roller and bearing against portions thereof, whereby it is supported and adjusted, said cams being geared to make one revolution while the feed belt is advancing a distance equal to the length of the space between the cross-bars, substantially as set forth.

In witness whereof I have hereunto set my hand and seal, at Indianapolis, Indiana, this 22d day of June, A. D. 1892.

WILLIAM L. KELLOGG. [L. S.]

Witnesses:

E. W. BRADFORD,

J. A. WALSH.