

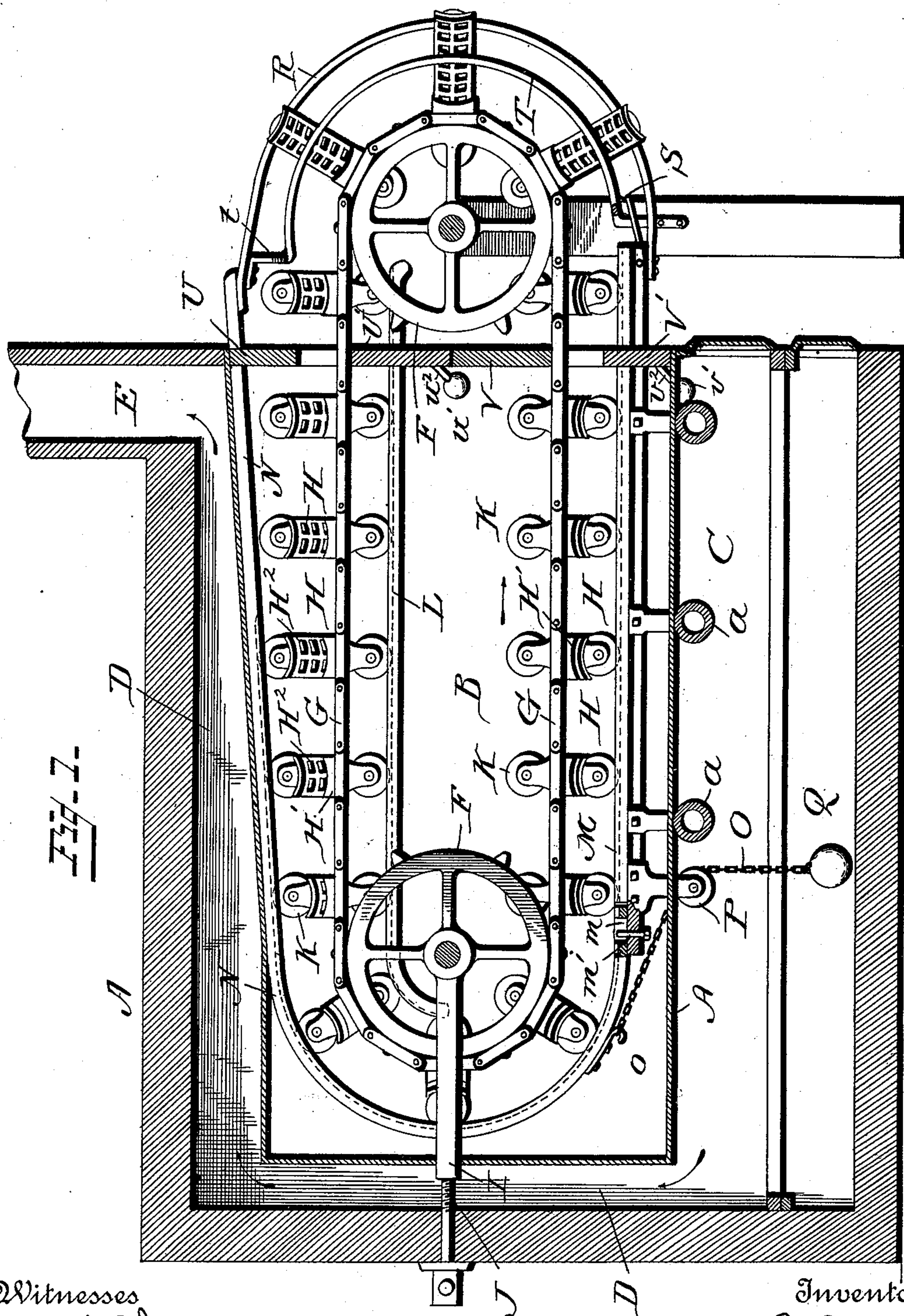
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4 Sheets—Sheet 1.

T. J. SULLIVAN.  
APPARATUS FOR FORMING STAVES.

No. 506,280.

Patented Oct. 10, 1893.



Witnesses  
Albert Spiden.  
M. J. McMahon.

Inventor  
Timothy J. Sullivan  
By Attorney  
J. R. Little,

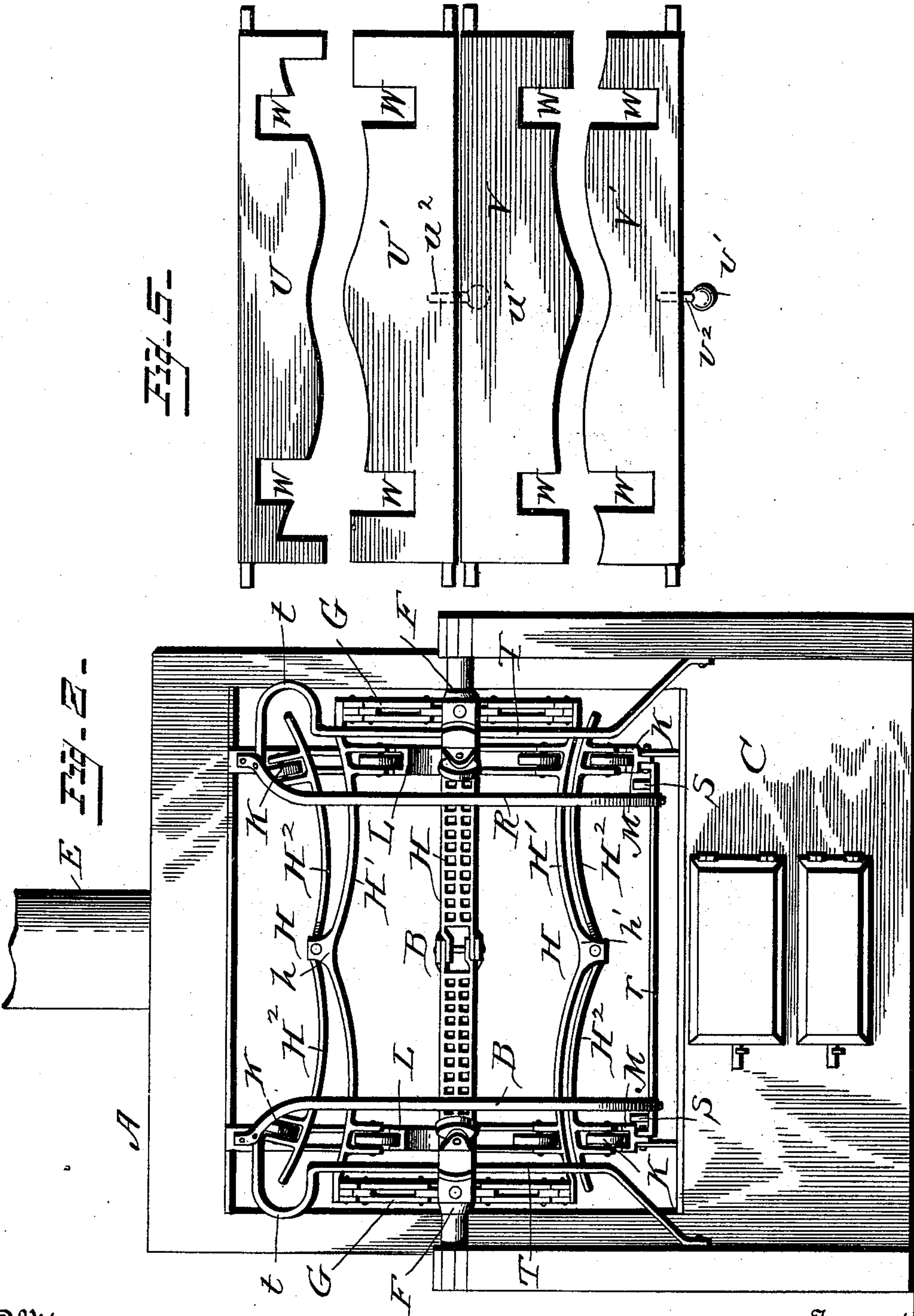
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Albert Spiden  
M. J. McMahon,

Inventor  
Timothy J. Sullivan  
By Attorney J. R. Littell,



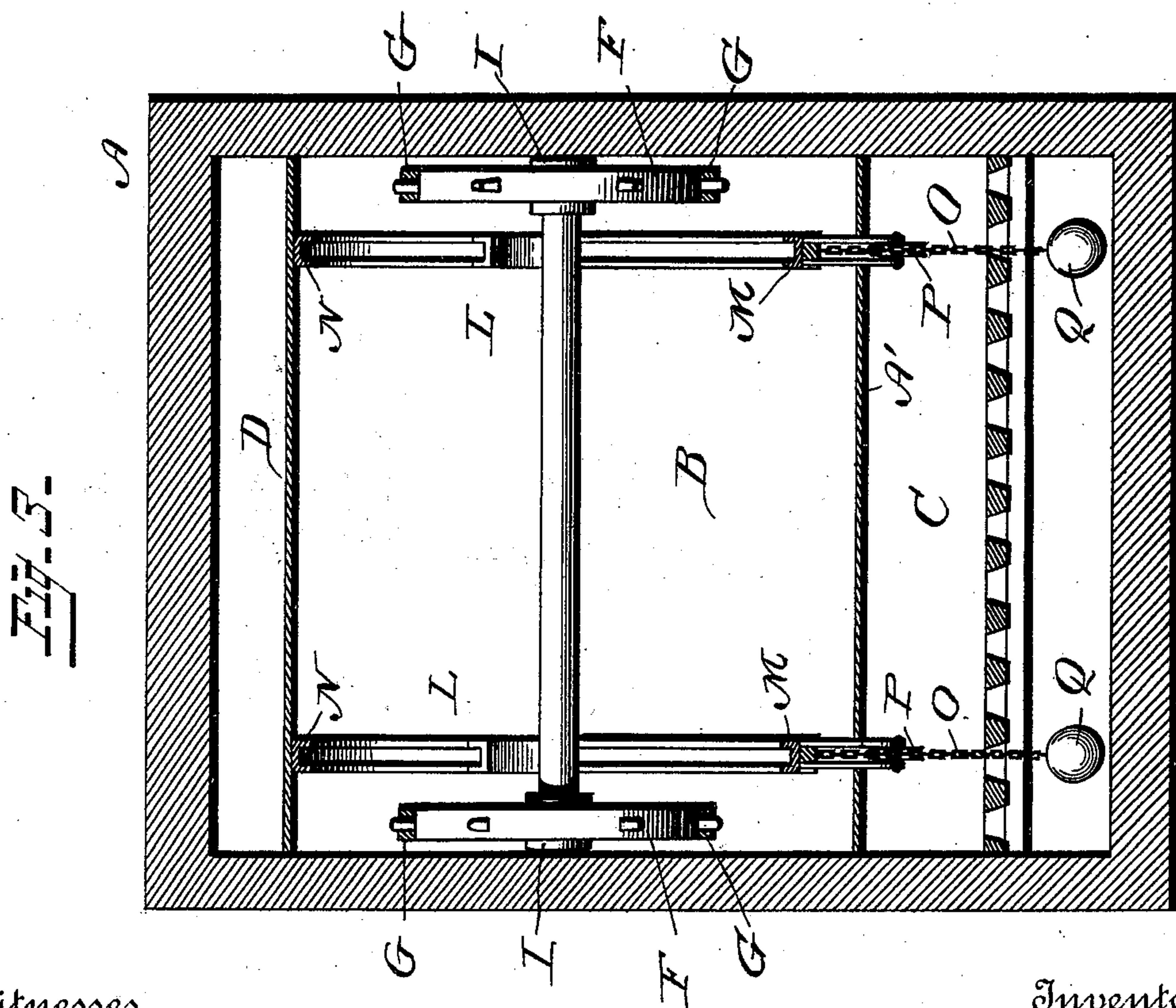
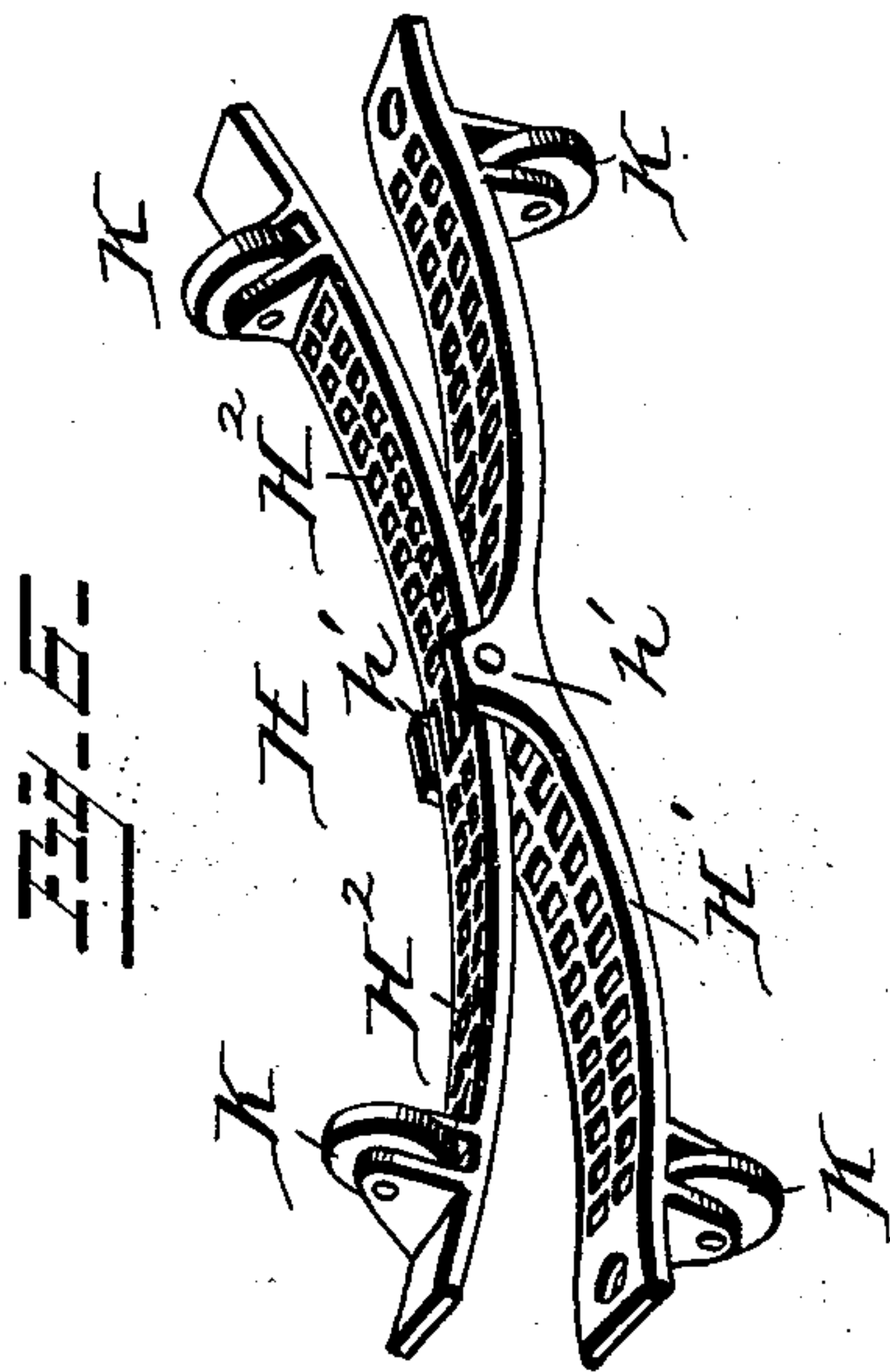
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Albert Spiden.  
M. McMahon

Inventor  
Timothy J. Sullivan  
By Attorney L. R. Pettit,

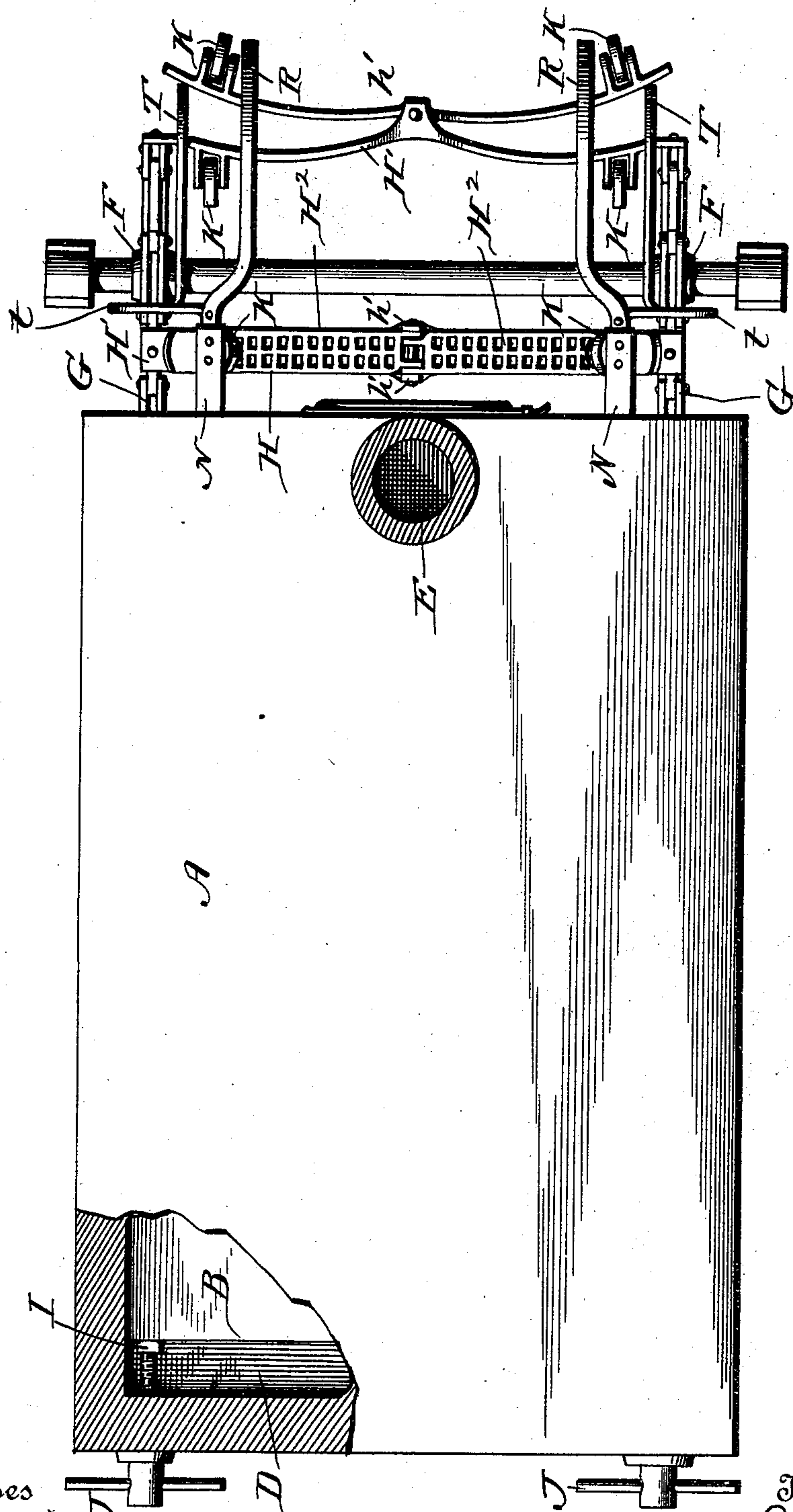
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## Witnesses

Albert Spinden -  
M. J. McMahon

Inventor

Timothy J. Sullivan  
By Attorney J. P. Littell



# UNITED STATES PATENT OFFICE.

TIMOTHY JAY SULLIVAN, OF NEW ORLEANS, LOUISIANA.

## APPARATUS FOR FORMING STAVES.

SPECIFICATION forming part of Letters Patent No. 506,280, dated October 10, 1893.

Application filed September 15, 1892. Serial No. 445,961. (No model.)

*To all whom it may concern:*

Be it known that I, TIMOTHY JAY SULLIVAN, a citizen of the United States, residing at New Orleans, in the parish of Orleans and State of Louisiana, have invented certain new and useful Improvements in Apparatus for Forming Staves; 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 appertains to make and use the same.

This invention relates to an improved apparatus for forming staves, and it has for its object to provide simple and efficient means for uniformly and automatically curving the staves and subjecting them to the action of heat, whereby the contour of the staves is preserved for an indefinite period.

A further object of the invention is to provide an improved apparatus of this character which will be automatic and practical in its action, which is rapid and inexpensive in its operation, and which will furthermore possess advantages in point of durability and general efficiency.

To this end, the invention consists, substantially, in the construction, combination and arrangement of parts as will be hereinafter more fully described and particularly pointed out in the claims.

In the drawings—Figure 1 is a vertical longitudinal sectional view of an apparatus, embodying my invention. Fig. 2 is a forward end view thereof. Fig. 3 is a transverse sectional view. Fig. 4 is a top or plan view with parts broken away. Fig. 5 is a plan view of the gates for closing the forward end of the heating chamber. Fig. 6 is a detail perspective view of one of the formers.

Corresponding parts in the figures are denoted by the same letters of reference.

Referring to the drawings, A designates a drying kiln which comprises a longitudinal heating chamber, B, and a furnace, C, located beneath the same, said furnace being separated from the heating chamber by a floor, A', supported upon transverse tubular cross bars, a, secured in the sides of the kiln. Leading from the rear end of the furnace is a smoke flue, D, which passes in rear, and over the top, of the heating chamber, to the forward end of the kiln where it communicates with

a smoke stack, E. By this arrangement the chamber B is heated at the under side by the furnace proper and at the back and top by the smoke and products of combustion passing through the flue D. Sprocket wheels, F F, are arranged at opposite ends of the heating chamber and carry chains, G G, passing entirely through the latter and provided with stave formers, H. The wheels F at the rear end of the kiln are each carried by a hanger-yoke, I I, which are adjustable by means of screws, J J.

The formers H each consist of a base portion, H', connected at its ends to the chains G. These base portions are of a double pattern, each side of which conforms in curvature to a completed stave. Centrally from the base portion project two lugs  $h' h'$ , between which are pivoted the opposing ends of two lids,  $H^2 H^2$ , said lids conforming approximately to each side of the base portion H'. Upon the under side of the base portion and the upper side of each lid, and near the ends thereof, are provided rollers, K K, the rollers of the lids and base portion projecting respectively in opposite directions.

L L designate two parallel, grooved tracks, arranged near the top of the heating chamber and upon which the rollers of the formers proper are adapted to be guided. The tracks L extend from the front end of the heating chamber to near the rear end thereof and the rear ends of said tracks are curved downwardly and terminate at about the vertical center of the heating chamber. At the bottom of the heating chamber, parallel and in vertical alignment with the tracks L are two grooved tracks, M M, the latter being straight throughout their length and extending from a point slightly in advance of the rear ends of the tracks L to a short distance beyond the front end of the kiln. Arranged above the tracks L are two flat tracks, N N, which are inclined from their outer ends inwardly, said tracks being adapted to be engaged by the rollers of the former lids. Near the rear end of the heating chamber these tracks are then curved downwardly and segmentally, and are connected with the opposing or inner tracks M. The ends of the tracks M which are connected with the tracks N are provided with longitudinally elongated slots,  $m m$ , which are



engaged by bolts,  $m' m'$  rigidly secured to the tracks N. By this means a loose connection is formed between the tracks M and N whereby the latter is capable of limited longitudinal play. To control this movement of the curved portion of the tracks N, I provide tension devices which consist of chains, O O which are respectively attached to hooks, o o, carried by the tracks N near their lower ends. These chains pass over pulleys, P P, arranged in advance of the lower ends of the tracks N, and said chains carry at their free ends weights, Q Q.

In practice, the formers are carried inwardly at the upper, front end of the kiln and between the tracks L and N. The formers being supplied with stave blanks are supported in their passage by the tracks L, the rollers of the lids being free from contact with the tracks N. During their inward progress the rollers of the former lids come in contact with the tracks N at or near the longitudinal center of the kiln, and owing to the inclination of the tracks N said lids are gradually closed upon the stave blanks until the rear end of the kiln is reached. At the latter point the formers are completely closed. The tension device above described serves to draw the curved portions of the tracks N with sufficient tension against the lid rollers to retain said lids in closed position and prevents any of the staves from being released from the formers. But in the event that two stave blanks should by accident have been placed in one side of the former, or in the event of a thick stave being used the tension devices permit the curved portions of the track's end to yield backward sufficiently to permit the passage of the former containing the same.

R R designate two guide bars which are secured at their lower ends to a cross bar,  $r$ , the ends of the latter being secured to the tracks M. The rods R project upwardly, parallel with each other, and have their upper ends curved outwardly and secured to the tracks N. These rods are also segmentally curved throughout their length and are designed to receive the lids of the formers when released from the tracks M and support the same in partially open position. To ease the fall of the former lids when released from the tracks M two flat springs, S S are secured to the cross bar  $r$  between the guide rods and tracks M, said springs projecting outwardly at a higher elevation than the adjacent portions of the guide rods. Thus upon leaving the tracks M the former lids fall upon the springs S which yield under the weight of the lid and deposit the latter easily upon the guide rods.

To prevent the lids from closing upon the formers proper when the latter have reached a point directly above the front chain wheels, and also to prevent accident to the hands of the operator while placing the staves in the formers, I provide two guide rods T T. The central portions of the latter are parallel with

the adjacent portions of the guide rods R, but are located beyond the same and at a point nearer to the front end of the kiln. To permit the lids of the formers to pass between the guide rods R and T, the lower ends of the latter are curved from each other and secured to the supports of the forward chain-wheel shaft. Thus the former lids are received in a partially open position between the guide-rods R and T and retained in such position until they clear the guide rods T, when they then fall upon the stave blanks which have in the meantime been placed within the formers. To permit the former lids to pass the guide-rods T at the proper point, the upper ends of the latter are formed with reversely-projecting, approximately U-shaped bends,  $t t$ , the extreme, opposing ends of said rods intersecting the guide-rods R and are secured thereto. For closing the apparatus at the forward end, I employ hinged gates, U, U', V and V'. Each pair of gates are curved at their opposing edges to conform to the shape of the stave formers, said gates being provided at their opposing edges and near their ends with notches, W, for the passage of the former-rollers. The gates U' and V' are held in position by means of weights,  $u' v'$  carried at the ends of crank arms  $u^2, v^2$ , respectively.

The operation and advantages of my invention will be readily understood by those skilled in the art to which it appertains. The formers being in continuous motion, the stave blanks are fed to the same by the operator while the lids are held in a partially open position during their passage between the guide rods R and T. After passing the latter the lids fall upon the stave blanks, and serve to partially compress the blanks as the same are heated during their passage through the forward portion of the heating chamber. While the blanks are becoming thoroughly heated the lids of the formers come in contact with the overhead tracks N, and by reason of the inclination of the latter, the lids are gradually closed upon the blanks. In this condition, the formers are carried forwardly through the heating chamber to the ends of the tracks M, when the former lids are liberated and fall by gravity upon the springs S, thus discharging the completed staves.

I do not wish to be understood as limiting myself to the precise construction herein shown and described and adapted for forming staves only, as modifications may be made in the forms whereby the apparatus is equally as well adapted for the forming of other articles, such as wooden butter dishes and similar wooden-ware. I therefore reserve the right to all such modifications as properly fall within the spirit and scope of my invention.

I claim as my invention—

1. In an apparatus for forming staves, the combination, with a heating chamber, of a carrier provided with stave formers comprising pivoted lids, and means for automatically



closing and releasing said lids; substantially as set forth.

2. In an apparatus for forming staves, the combination, with a heating chamber, of a carrier provided with stave formers comprising hinged lids, of means for gradually closing the lids during the inward passage of the carrier, retaining the same in closed position during the outward passage thereof, and finally effecting the discharge of the completed staves; substantially as and for the purpose set forth.

3. In an apparatus for forming staves, the combination, with a heating chamber, of a carrier provided with stave formers comprising pivoted lids controlled by the tracks, supporting tracks, base tracks parallel therewith and overhead tracks arranged above said supporting tracks and at an inward incline thereto, said overhead tracks being segmentally curved at the inner end of the chamber and having their inner ends intersecting the corresponding ends of the base tracks; substantially as and for the purpose set forth.

4. In an apparatus for forming staves, the combination, with a heating chamber, of carrier wheels arranged at the front and rear ends thereof, endless chains mounted on said wheels, stave formers carried by said chains and provided with pivoted lids, controlled by the tracks, supporting tracks, base tracks, and overhead tracks arranged above the supporting tracks and at an inward incline thereto, said overhead tracks being segmentally curved in rear of the inner carrying wheels and having their inner ends intersecting the corresponding inner ends of the base tracks; substantially as and for the purpose set forth.

5. In an apparatus for forming staves, the combination, with a heating chamber, of a carrier provided with stave formers comprising pivoted lids controlled by the tracks, of inwardly-inclined overhead tracks, having a rearwardly yielding, segmentally curved portion at the inner end of said chamber, and base tracks forming continuations of the curved portions of said overhead tracks; substantially as and for the purpose set forth.

6. In an apparatus for forming staves, the combination, with a heating chamber, of a carrier provided with stave formers comprising pivoted lids controlled by the tracks, inwardly inclined overhead tracks arranged in said chamber and provided at the rear end of the latter with longitudinally adjustable, segmentally curved portions, base tracks leading from the latter, and tension devices connected with said segmentally curved portions of the overhead tracks; substantially as and for the purpose set forth.

7. In an apparatus for forming staves, the combination, with a heating chamber, of a carrier provided with stave formers comprising pivoted lids controlled by the tracks, of rearwardly inclined overhead tracks arranged in said chamber and above the carrier and provided at the inner end of the chamber

with segmentally curved portions provided at their free ends with longitudinally elongated slots, base tracks provided at their inner ends with rigid bolts engaging said slots, chains attached to said curved portions and passing over pulleys in advance thereof, and weights carried by the free ends of said chains; substantially as and for the purpose set forth.

8. In an apparatus for forming staves, the combination, with a heating chamber, of a carrier provided with stave formers comprising pivoted lids, means for closing and releasing said lids, and guide rods arranged at the forward end of the heating chamber and adapted to receive and temporarily retain the lids in partially open position; substantially as and for the purpose set forth.

9. In an apparatus for forming staves, the combination, with a heating chamber, of a carrier provided with stave formers comprising pivoted lids, said formers and lids carrying rollers, of supporting tracks arranged in said chamber, inwardly inclined overhead tracks arranged above said supporting tracks and projecting beyond the forward end of the heating chamber, said overhead tracks being downwardly and segmentally curved at the rear end of the chamber, base tracks extending from the free ends of the curved portions and beyond the chamber, guides adapted to receive the lids when released from engagement with the base tracks, and supplementary guides for temporarily retaining the lids in partially open position; substantially as and for the purpose set forth.

10. In an apparatus for forming staves, the combination, with a heating chamber, of a carrier provided with stave formers comprising pivoted lids, said formers and lids carrying rollers, of supporting tracks arranged in said chamber, inwardly inclined overhead tracks arranged above said supporting tracks and projecting beyond the forward end of the heating chamber, springs for receiving the lids of the formers when released from engagement with the base tracks and guides for limiting the movement of the former lids and for temporarily retaining the same in a partially open position; substantially as and for the purpose set forth.

11. In an apparatus for forming staves, the combination, with a kiln comprising a heating chamber, a furnace located there-under, a smoke stack at the forward end of the kiln and a flue connecting the furnace and stack and passing around the rear and upper sides of the heating chamber, of a carrier passing through said chamber and provided with stave formers comprising adjustable lids, and means for closing and releasing said lids during the movement of the carrier; substantially as and for the purpose set forth.

12. In an apparatus for forming staves, the combination, with a kiln comprising a heating chamber, of sprocket wheels arranged in the rear end of the latter and longitudinally adjustable, similar wheels arranged in ad-



vance of the heating chamber, sprocket chains mounted on said wheels, transversely arranged stave formers carried by said chains and provided with pivoted lids, means for  
5 closing and releasing the former lids during the movement of the chains, and self-closing doors arranged at the forward end of the heating chamber; substantially as and for the purpose set forth.

10 13. In an apparatus for forming staves, the combination, with a kiln comprising a heating chamber, of sprocket wheels arranged at the forward and rear ends of the latter, sprocket chains mounted on said wheels,  
15 stave formers carried by said chains and provided with pivoted lids, rollers mounted upon said formers and lids, and grooved supporting tracks arranged in the heating chamber, inwardly inclined overhead tracks having seg-  
20 mentally curved extensions located in rear of the inner sprocket wheels, and grooved base tracks extending forwardly from the ends of said extensions; substantially as and for the purpose set forth.

25 14. In an apparatus for forming staves, the combination, with a kiln comprising a heating chamber, of sprocket wheels arranged at the forward and rear ends of the latter, sprocket chains mounted on said wheels,

stave formers carried by said chains and pro- 30  
vided with pivoted lids, said formers and lids having rollers, supporting tracks, inwardly inclined overhead tracks projecting beyond the forward end of said chamber and pro- 35  
vided at the inner end of the latter with segmentally curved extensions located in rear of the inner sprocket wheels, base tracks extending from said extensions and projecting beyond the forward end of the chamber, seg- 40  
mentally curved guide rods adapted to receive the former lids when released from the base tracks, and similarly curved supplementary guide rods adapted to temporarily retain said lids in a partially open position; substantially  
45 as and for the purpose set forth.

15. As an improvement in apparatus for forming staves, a stave former consisting of the former properly curved from its center to each end, and curved lids pivotally connected at their opposing ends to the center of the 50  
former proper; substantially as set forth.

In testimony whereof I affix my signature in presence of two witnesses.

TIMOTHY JAY SULLIVAN.

Witnesses:

FRANK. P. SMITH,  
J. H. VINCENT.