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W. L. KELLOGG.

STAVE BENDING MACHINE.

No. 564,203. Patented July 21, 1896.

Fig. 1.

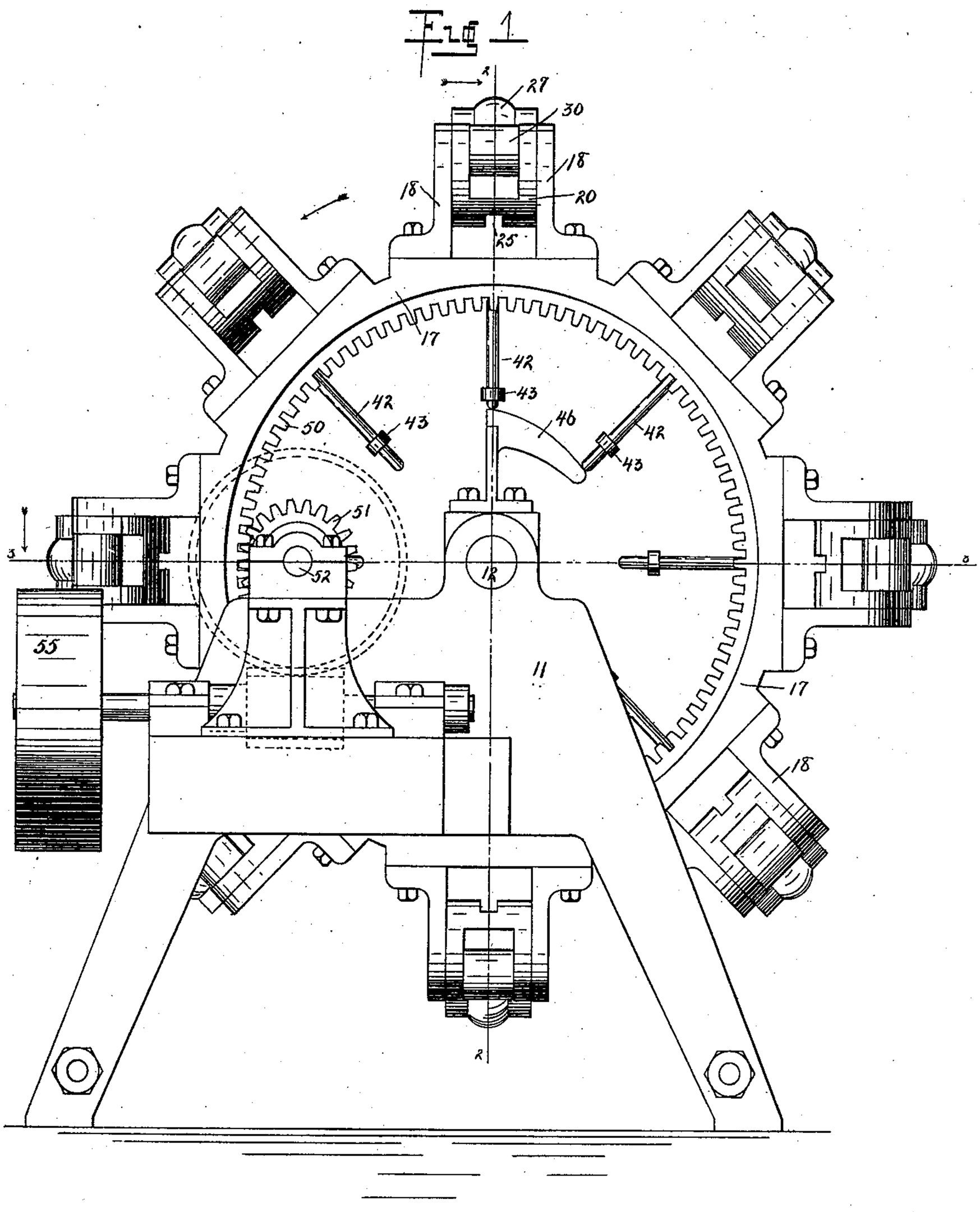

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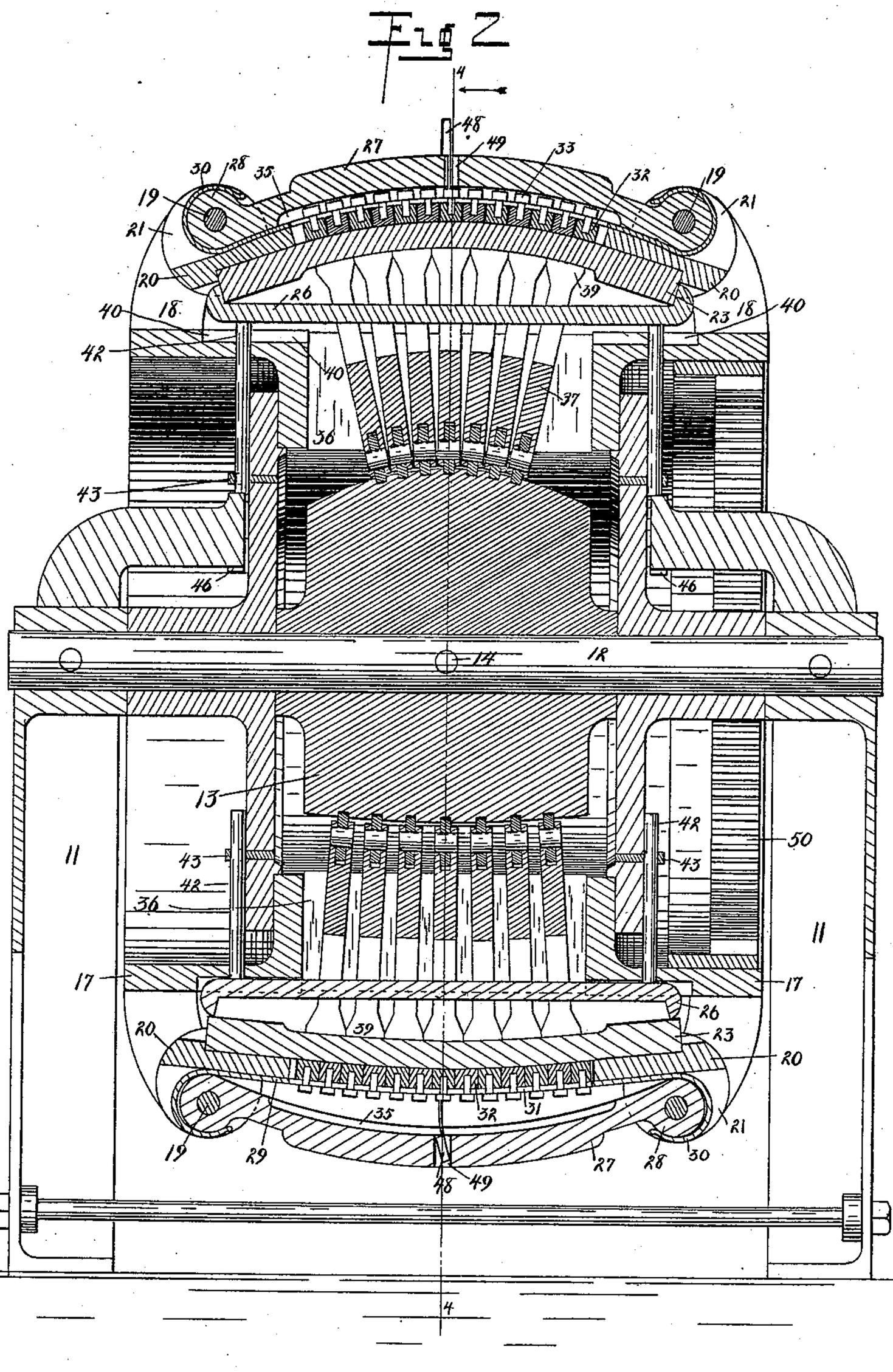
Fig 2



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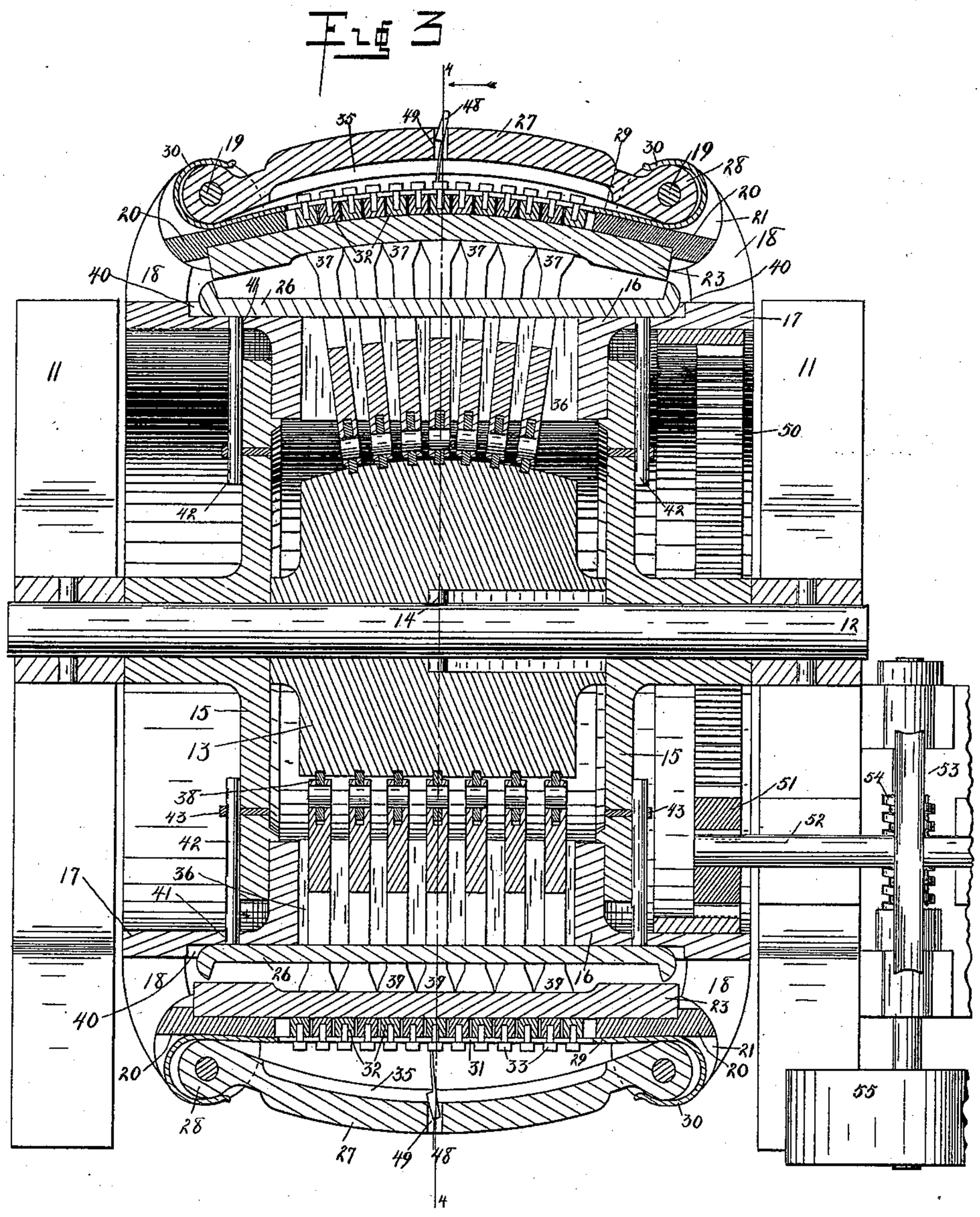

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STAVE BENDING MACHINE.

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Fig 4

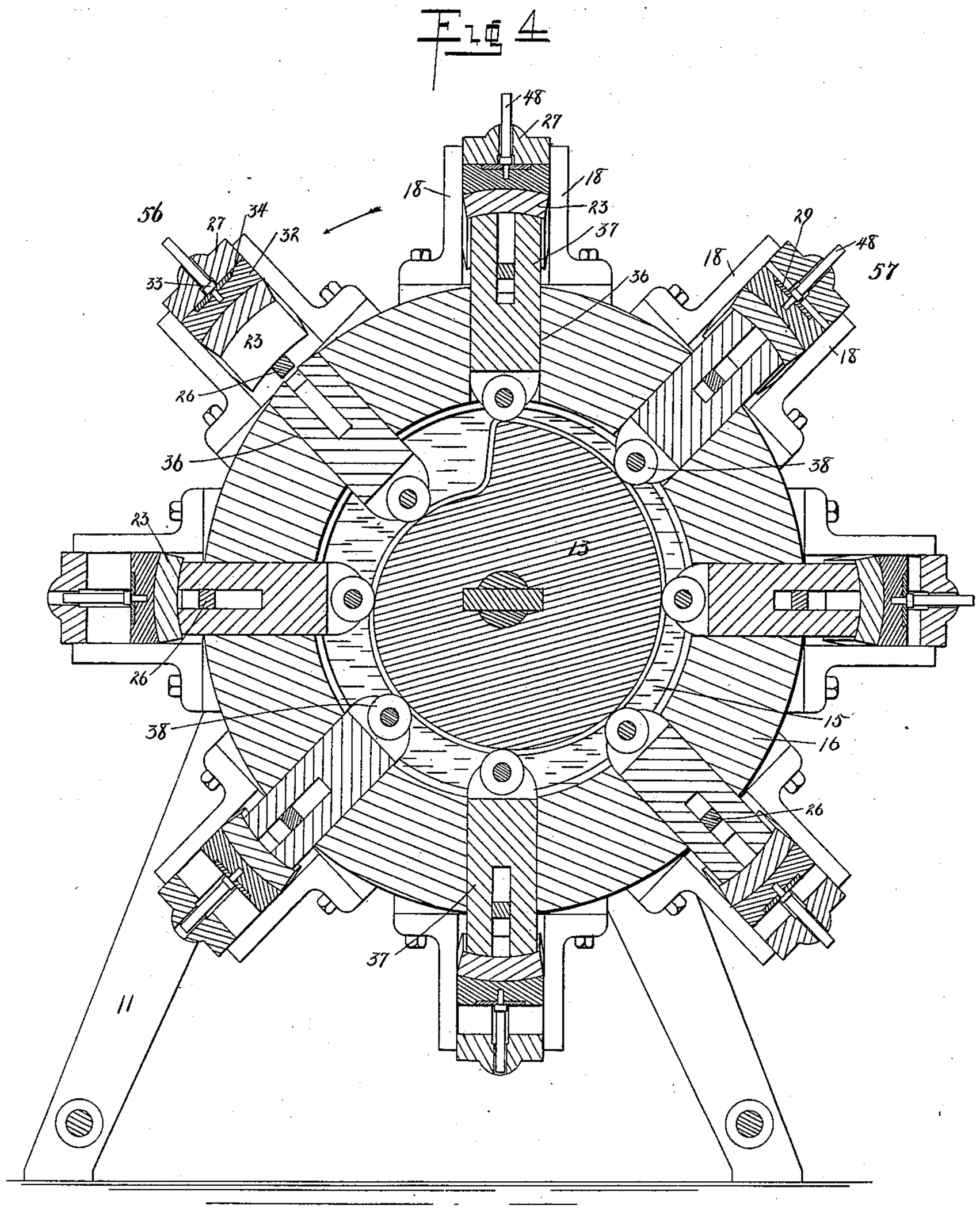

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Fig 5

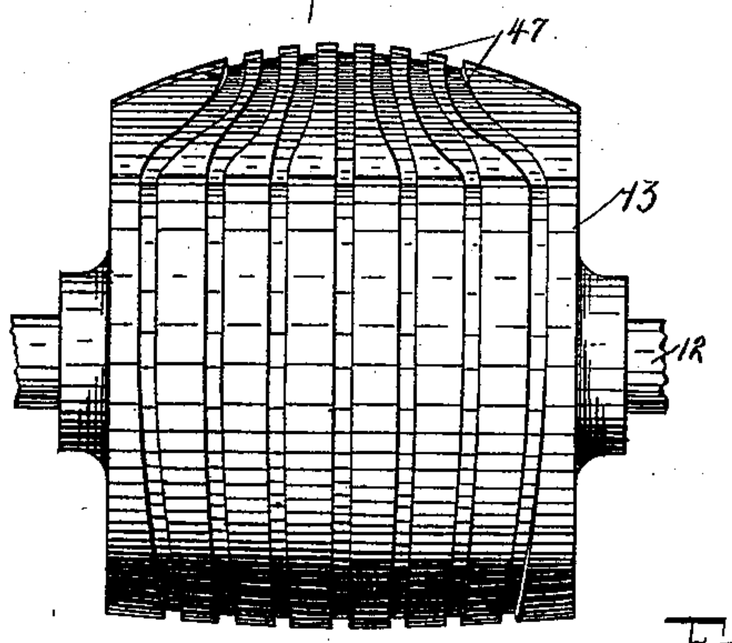


Fig 7

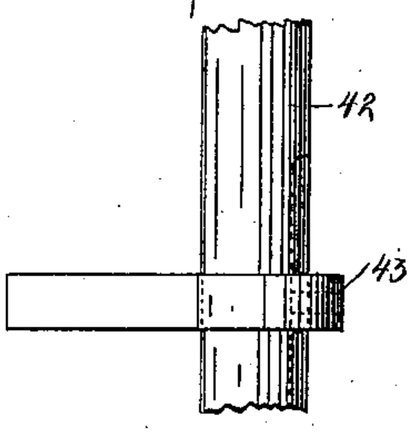


Fig 8

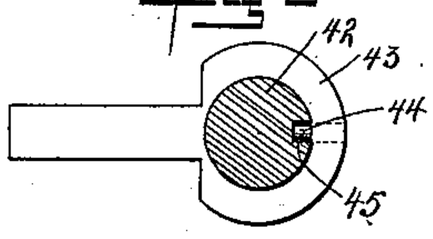


Fig 6

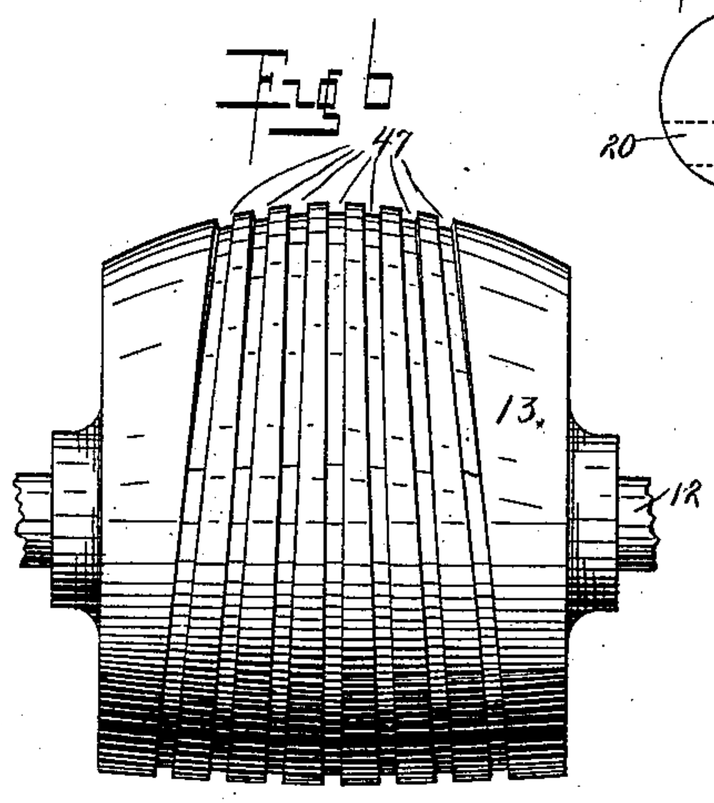


Fig 9

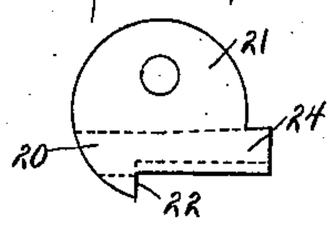


Fig 10

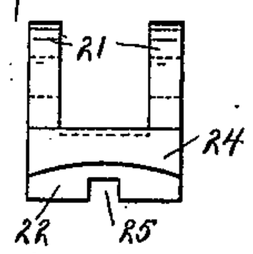


Fig 11

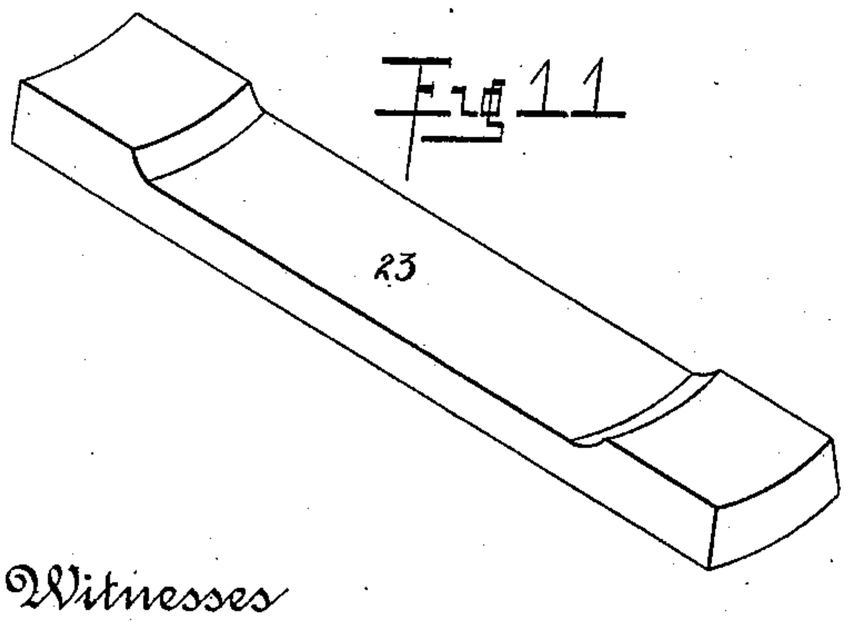
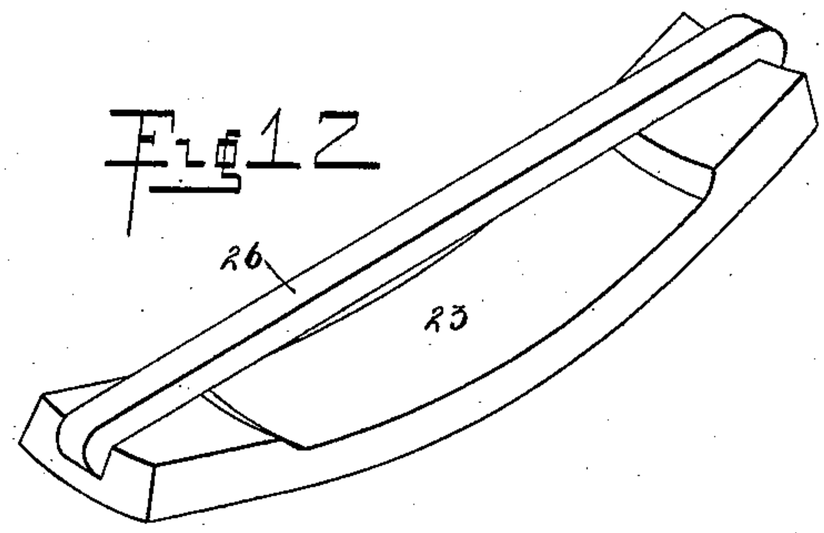


Fig 12



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UNITED STATES PATENT OFFICE.

WILLIAM L. KELLOGG, OF INDIANAPOLIS, INDIANA.

STAVE-BENDING MACHINE.

SPECIFICATION forming part of Letters Patent No. 564,203, dated July 21, 1896.

Application filed January 20, 1896. Serial No. 576,159. (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 a new and useful Stave-Bending Machine, of which the following is a specification.

My invention relates to an improvement in machines for bending the staves used in the manufacture of beer and other similar barrels, thereby providing said staves with the proper bilge.

The object of my invention is to provide a machine in which the stave will be constantly supported both upon its inner and outer surfaces during the entire process of bending.

The accompanying drawings illustrate my invention.

Figure 1 is a side elevation of my machine. Fig. 2 is a central vertical section on line 2 2 of Fig. 1. Fig. 3 is a central horizontal section on line 3 3 of Fig. 1. Fig. 4 is a central transverse section on line 4 4 of Figs. 2 and 3. Figs. 5 and 6 are side elevations, respectively, of the front and rear sides of the main cam. Figs. 7 and 8 are details of a portion of one of the clamp-lifting pins. Figs. 9 and 10, respectively, are side and end elevations of one of the guide-shoes. Fig. 11 is a perspective view of a stave before it has been bent, and Fig. 12 is a similar view of the stave after it has been bent.

In the drawings, 11 indicates a pair of base-frames, the upper portion of said frames being connected by a stationary shaft 12, which carries near its middle a cam 13, rigidly secured thereto by any suitable means, such as key 14.

Mounted so as to revolve on shaft 12, one at each end of cam 13, are a pair of disks 15, and between these disks and secured thereto, so as to revolve therewith, is an annular ring 16, whose internal diameter is greater than the diameter of cam 13.

Secured to or formed integral with ring 16 are a pair of flanges 17, and upon the outer periphery of these flanges are secured a series of standards 18, said standards being arranged in pairs opposite each other. The upper ends of each pair of standards are connected by a pin 19, and on each of these pins is pivoted a guide-shoe 20 by means of the upwardly-extending ears 21.

Guide-shoes 20 are each provided with a shoulder 22, adapted to engage one end of the stave 23, and are also provided with a projecting flange 24, the under side of which is hollowed out so as to fit the outer surface of the stave end. In shoulder 22 is formed a slot 25, said slot allowing the end of clamps 26 to engage with the ends of the stave after it has been sufficiently bent.

Upon pin 19, between ears 21, is mounted one end of a forming-bridge 27, said bridge extending across the machine and being mounted in a similar manner upon the pin 19, carried by the opposite pair of standards 18.

The inner surface of each bridge 27 is curved to conform to the curvature to which the stave is to be bent, and each end of said bridge is rounded, as at 28.

Mounted between the forming-bridge 27 and the guide-shoes 20 is a flat spring 29, said spring being provided with upturned ends 30, which are adapted to embrace the rounded ends 28 of the forming-bridges, and being also provided with a longitudinal slot 31, which extends between the opposed ends of guide-shoes 20. Carried by spring 29 between the opposed ends of the guide-shoes are a series of forming-blocks 32, said blocks being secured to the spring by means of the screws 33, which pass down through slot 31 and into the blocks. The inner surface of each block 32 is curved so as to fit the rounded outer surface of the stave, and each of said blocks is preferably provided upon its outer surface with a groove 34, adapted to receive spring 29.

In order that spring 29 may come directly into contact with the inner curved surface of the forming-bridge, I form in said inner surface a recess 35, which is adapted to receive the heads of screws 33. In ring 16, directly under each forming-bridge, I form a longitudinal slot 36, and through each slot is passed a series of plungers 37. Each plunger 37 is provided at its inner end with a roller 38, which engages cam 13, and is bifurcated at its outer end, the opening between the two fingers thus formed being sufficient to admit clamps 26.

The outer ends of plungers 37 are broadened, as at 39, so that the series will form a

practically continuous surface, and the said broadened ends are rounded, as shown in Fig. 4, so as to fit the inner surface of the stave.

In the outer periphery of each flange 17, opposite each end of each slot 36, and connecting therewith, is formed a shallow recess 40, each pair of recesses being adapted to receive and support the ends of clamps 26. Mounted below each recess 40, and communicating therewith through holes 41, formed in the bottoms of said recesses, is a clamp-lifting pin 42. The outer end of said pin is supported in hole 41, and may play freely therethrough. The inner end of pin 42 is supported in a bearing 43, carried by disks 15, and to prevent said pins from dropping out of place stud 44 is extended into the opening of bearing 43, and engages a short slot 45, formed in the said pin.

For the purpose of lifting pins 42 and thereby forcing clamps 26 into engagement with the stave, a pair of cams 46 are provided, said cams being carried by castings secured to the base-frames. Cam 13 is so formed that the pressure exerted through plungers 37 to the stave will be a gradual one, said pressure beginning when the plungers lie substantially in a horizontal plane at the front of the machine, and continuing until the said plungers lie in a vertical plane in their extreme upward position, as shown in Figs. 3 and 4. The surface of said cam is from this point brought suddenly toward the axis a sufficient distance to allow the plungers, as they pass the extreme upward position, to quickly drop from engagement with the inner surface of the stave.

It is desirable that the pressure against the stave be at all times normal thereto, and it is therefore necessary as the plungers are carried about the cam that their inner ends be forced nearer together, and that when the stave has been bent the said inner ends be forced apart.

To positively insure the above-mentioned movement, the cam 13 is provided with a series of tracks or grooves 47, the central track being straight and lying in a plane at right angles to the axis thereof, while the other tracks are arranged symmetrically on each side of said central track. It is also advisable to so form the cam 13 that the plungers will at all times lie normal thereto, and for that reason the said cam for the first ninety degrees is made parallel to the axis, but from that point through the other two hundred and seventy degrees the cam is given a gradually-increasing bilge, as shown in Figs. 5 and 6.

For the purpose of holding spring 29 in its extreme upward position, I secure to one of screws 33 a spring-catch 48, which extends outward through an opening 49 in the forming-bridge, and is adapted, when forced to its extreme upward position, to engage with the outer surface of said forming-bridge.

Ring 16, disks 15, and the various attached parts are rotated about the shaft 12 in any snitable manner, preferably by means of an internal gear 50, secured to the inner periphery of one of the flanges 17, a spur-gear 51, carried by a shaft 52, mounted in suitable bearings on the main frame, a worm-gear 53, secured to said shaft, a worm 54, engaging said worm-gear, and a driving-pulley 55, secured to the worm-shaft.

In operation, ring 16, carrying the series of forming-bridges and attached parts, is caused to slowly revolve about cam 13, in the direction indicated by the arrow in Figs. 1 and 4. All of catches 48 are released and the springs 29 assume their normal straight position, as indicated in the lower part of Fig. 3. The operator, having been previously provided with a number of clamps 26, and also a number of staves 23, formed as shown and thoroughly steamed, places one of the clamps in recesses 40 under the forming-bridge, which lies in about the position 56 in Fig. 4, and then introduces one of the staves 23, the ends of said stave being received and engaged by the guide-shoes and the outer central portion of said stave being in engagement with the forming-blocks 32, carried by spring 29. As the machine advances, the plungers under the before-mentioned bridge are forced outward by cam 13 into engagement with the stave, the bifurcated ends of said plungers straddling the central portion of the clamp. A farther advance of the machine causes the plungers to be forced outward by cam 13, the inner ends of said plungers being at the same time drawn toward each other by tracks 47, so that the said plungers will always lie substantially normal both to the stave and to the cam.

It will be noticed that during the entire operation of bending both the inner and outer surfaces of the stave, through the entire portion which is being bent, are supported and held between the plungers and the inner surfaces of block 32, said blocks conforming to the bend by means of the spring 29. While the machine advances another forming-bridge is brought into the position 56 and another clamp and stave are inserted, and this operation is repeated until all of the forming-bridges have passed this position. When the first-mentioned forming-bridge has reached the position 57, Figs. 1 and 4, the inner ends of the pins 42 which lie thereunder come into engagement with the cams 46 and are thereby forced outward and lift clamp 26 from recesses 40 and force it into engagement with the ends of the bent stave. The stave in the meantime has been forced into its extreme outward position and bent, and catch 48 has come into engagement with the outer surface of the bridge, thereby holding the spring in its extreme flexed position. A farther advance of the machine causes the inner ends of plungers 37 to be carried beyond the largest

radius of the cam and they are allowed to drop suddenly out of engagement with the stave and free from the clamp, the said inner ends being forced apart at the same time by means of the tracks 47. The stave and attached clamp is then removed, catch 48 is released, and a new clamp and stave introduced. The operation of the machine is a continuous one, the bending is done by a normal pressure, every part of the inner and outer surfaces of the bent portion of the stave is supported during the entire operation, and there is no friction between the stave and any part of the machine.

I claim as my invention—

1. In a stave-bending machine, the combination with means for supporting a stave, of a series of independent plungers each adapted to engage at one end with the stave and at the other end with a cam lying substantially normal thereto, the cam, and means for causing a relative rotative movement between the plunger and the cam, whereby the plungers are forced outward into engagement with the stave and remain substantially normal thereto during the process of bending, substantially as set forth.

2. In a stave-bending machine, a spring supported near its ends and carrying intermediate thereof a series of independent forming-blocks adapted to engage and support the outer surface of a stave during the process of bending, substantially as set forth.

3. In a stave-bending machine, the combination with the main frame, of a cam supported thereby, a series of plungers supported, in a guide, substantially normal to said cam, the inner ends of said plungers engaging with said cam and the outer ends of said plungers being adapted to engage with the inner surface of a stave, a spring, lying substantially parallel to said stave, supported by its ends on the frame and carrying means for engaging and supporting the outer surface of the stave, and means for causing a relative rotative movement between the plungers and the cam, substantially as described.

4. In a stave-bending machine, the combination with the main frame, of a cam provided with a series of peripheral tracks supported thereby, a series of plungers supported, in a guide, substantially normal to said cam, the inner ends of said plungers engaging with the tracks formed on said cam and the outer ends of said plungers being adapted to engage with the inner surface of a stave and to remain substantially normal thereto, a support for the stave, and means for causing a relative rotative movement between the plungers and the cam, substantially as and for the purpose set forth.

5. In a stave-bending machine, the combination with the main frame, of a cam supported thereby, a series of plungers supported, in a guide, substantially normal to said cam, the inner ends of said plungers engaging with the said cam and the outer ends of said plungers being adapted to engage with the inner surface of the stave, a support for the stave, means for causing a relative rotative movement between the plungers and the cam, whereby the plungers are forced outward against the stave and the stave is thereby bent, and means for automatically forcing a clamp into engagement with the ends of said bent stave during said relative rotation, substantially as set forth.

6. In a stave-bending machine, the combination with the main frame, of a cam supported thereby, a series of plungers supported, in a guide, substantially normal to said cam, the inner ends of said plungers engaging with said cam and the outer ends of said plungers being adapted to engage with the inner surface of a stave, a pair of pivoted guide-shoes adapted to receive and support the ends of said stave, and means for causing a relative rotative movement between the plungers and the cam, whereby the plungers are forced outward against the stave and the stave is thereby bent, substantially as described.

7. In a stave-bending machine, the combination with the main frame, of a cam supported thereby, a series of plungers supported, in a guide, substantially normal to said cam, the inner ends of said plungers engaging with said cam and the outer ends of said plungers being adapted to engage with the inner surface of a stave, a pair of pivoted guide-shoes adapted to receive and support the ends of said staves, a spring supported at its ends and carrying a series of forming-blocks adapted to engage and support the outer surface of the stave, and means for causing a relative rotative movement between the plungers and the cam, substantially as and for the purpose set forth.

8. In a stave-bending machine, the combination with the main frame, of a cam supported thereby, a series of plungers supported, in a guide, substantially normal to said cam, the inner ends of said plungers engaging with said cam and the outer ends of said plungers being adapted to engage with the inner surface of a stave, a pair of pivoted guide-blocks adapted to receive and support the ends of said stave, a forming-bridge extending between said guide-blocks, a spring supported at its ends by said forming-bridge and carrying a series of forming-blocks adapted to engage and support the outer surface of the stave, and means for causing a relative rotative movement between the plungers and the cam, substantially as and for the purpose set forth.

9. In a stave-bending machine, the combination with the main frame, of a cam supported thereby, a series of plungers supported, in a guide, substantially normal to said cam, the inner ends of said plungers engaging with said cam and outer ends of said plungers be-

ing adapted to engage with the inner surface of a stave, a pair of pivoted guide-blocks adapted to receive and support the ends of said stave, a forming-bridge extending between said guide-blocks, a spring supported at its ends by said forming-bridge and carrying a series of forming-blocks adapted to engage the outer surface of the stave, means for holding said spring in its extreme flexed position, and means for causing a relative rotative movement between the plungers and the cam, substantially as described.

10. In a stave-bending machine, a yielding former mounted therein and adapted to support the outer surface of the stave during the process of bending, and means for holding said former in its flexed position so that the stave may be removed therefrom, substantially as set forth.

11. In a stave-bending machine, the combination of the main frame carrying a stationary shaft, a cam carried by said shaft and rigidly secured thereto, a ring carried by said shaft and revoluble thereon about said cam, a guide formed in said ring, a series of plungers mounted so as to move in said guide, the inner ends of said plungers engaging the cam and the outer ends of said plungers being adapted to engage the inner surface of a stave, means for supporting said stave, and means for rotating said ring about the cam, substantially as described.

12. In a stave-bending machine, the combination of the main frame carrying a stationary shaft, a cam carried by said shaft and rigidly secured thereto, a ring carried by said shaft and revoluble thereon about said cam, a guide formed in said ring, a series of plungers mounted so as to move in said guide, the inner ends of said plungers engaging the cam and the other ends of said plungers being adapted to engage the inner surface of a stave, a yielding support for the outer surface of the stave, and means for rotating said ring about the cam, substantially as set forth.

13. In a stave-bending machine, the combination of the main frame carrying a stationary shaft, a cam carried by said shaft and rigidly secured thereto, a ring carried by said shaft and revoluble thereon about said cam, a series of guides formed in said ring, a series of plungers mounted in each guide so as to move therein, the inner ends of said plungers engaging the cam and the outer ends of each series of said plungers being adapted to engage the inner surface of a stave, a yielding support mounted over each series of plungers and adapted to support the outer surface of a stave, and means for rotating said ring about the cam, substantially as described.

14. In a stave-bending machine, the combination of the main frame carrying a stationary shaft, a cam carried by said shaft and rigidly secured thereto, a ring carried by said shaft and revoluble thereon about said cam, a series of guides formed in said ring, a series of plungers mounted in each guide so as to move therein, the inner ends of said plungers engaging the cam and the outer ends of each series of said plungers being adapted to engage the inner surface of a stave, a yielding support mounted over each series of plungers and adapted to support the outer surface of the stave, means for holding a clamp under each stave, a pair of pins mounted below said clamp-receiving means and adapted to be forced outward by means of a pair of cams carried by the frame, whereby the said clamp may be forced into engagement with the bent stave, and means for rotating said ring about the cam, substantially as set forth.

15. In a stave-bending machine, the combination of the main frame carrying a stationary shaft, a cam carried by said shaft and rigidly secured thereto, a ring carried by said shaft and revoluble thereon about said cam, a series of guides formed in said ring, a series of plungers mounted in each guide so as to move therein, the inner ends of said plungers engaging the cam and the outer ends of each series of said plungers being adapted to engage the inner surface of a stave, a pair of pivoted guide-shoes mounted over each guide in the ring, and adapted to receive and support the ends of a stave, a spring supported at its ends and carrying a series of independent forming-blocks extending between the guide-shoes and adapted to engage the outer surface of a stave, a forming-bridge extending between each pair of guide-shoes, means carried by the spring for engaging with said forming-bridge and thereby holding the said spring in its flexed position, means carried by the ring for holding a clamp under each stave, a pair of radially-movable pins carried by said ring under each clamp-holding means in a position to engage said clamp, a pair of cams mounted on the base-frame in a position to engage with and force said pins outward, thereby forcing the clamp into engagement with the bent stave, and means for rotating said ring about the cam, substantially as and for the purpose set forth.

16. In a stave-bending machine, means for holding a clamp under the stave, a pair of radially-movable pins mounted under said clamp in a position to engage therewith, and a pair of cams secured to the main frame and adapted to engage the inner ends of said pins, whereby, as the pins are carried past said cams, the clamp is forced outward into engagement with the stave, substantially as and for the purpose set forth.

17. In a stave-bending machine of the class described, a cam for bending the stave, said cam having a portion of its periphery parallel with the axis of the cam, and another portion of its surface provided with a gradually-increasing bilge, substantially as set forth.

18. In a stave-bending machine of the class described, a cam for bending the stave, said cam having a portion of its periphery parallel

with the axis of the cam, and another portion of its surface provided with a gradually-increasing bilge, and a series of tracks formed on or in the surface of said cam, whereby the ends of a series of plungers operated upon by said cam are alternately drawn together and forced apart thereby causing the said plungers to remain substantially normal to the surface of the cam and to the stave during the process of bending, substantially as and for the purpose set forth.

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