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Patented Dec. 19, 1899.

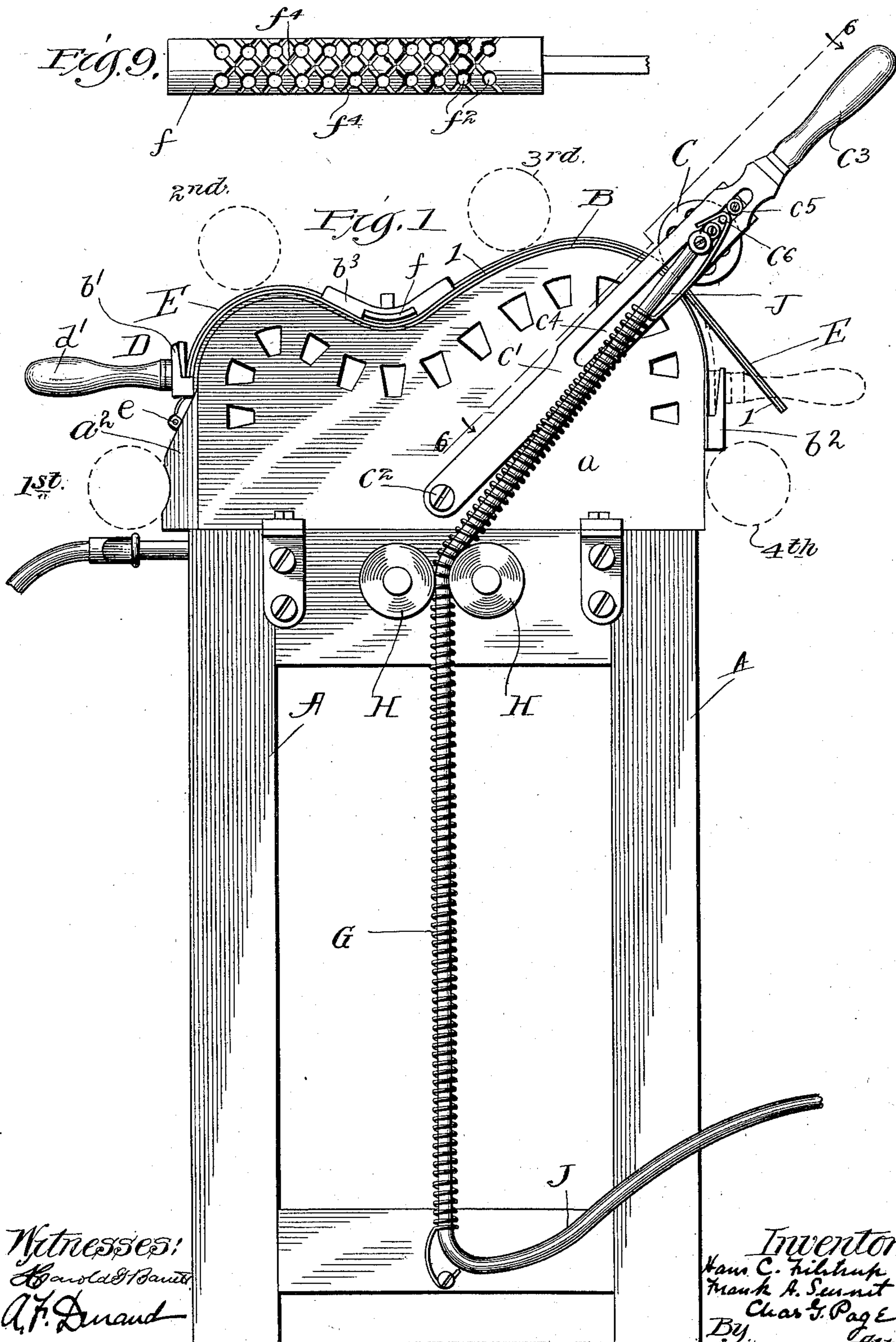
H. C. FILSTRUP & F. A. SENNET.

BENDING MACHINE.

(Application filed June 22, 1899.)

(No Model.)

3 Sheets—Sheet 1.



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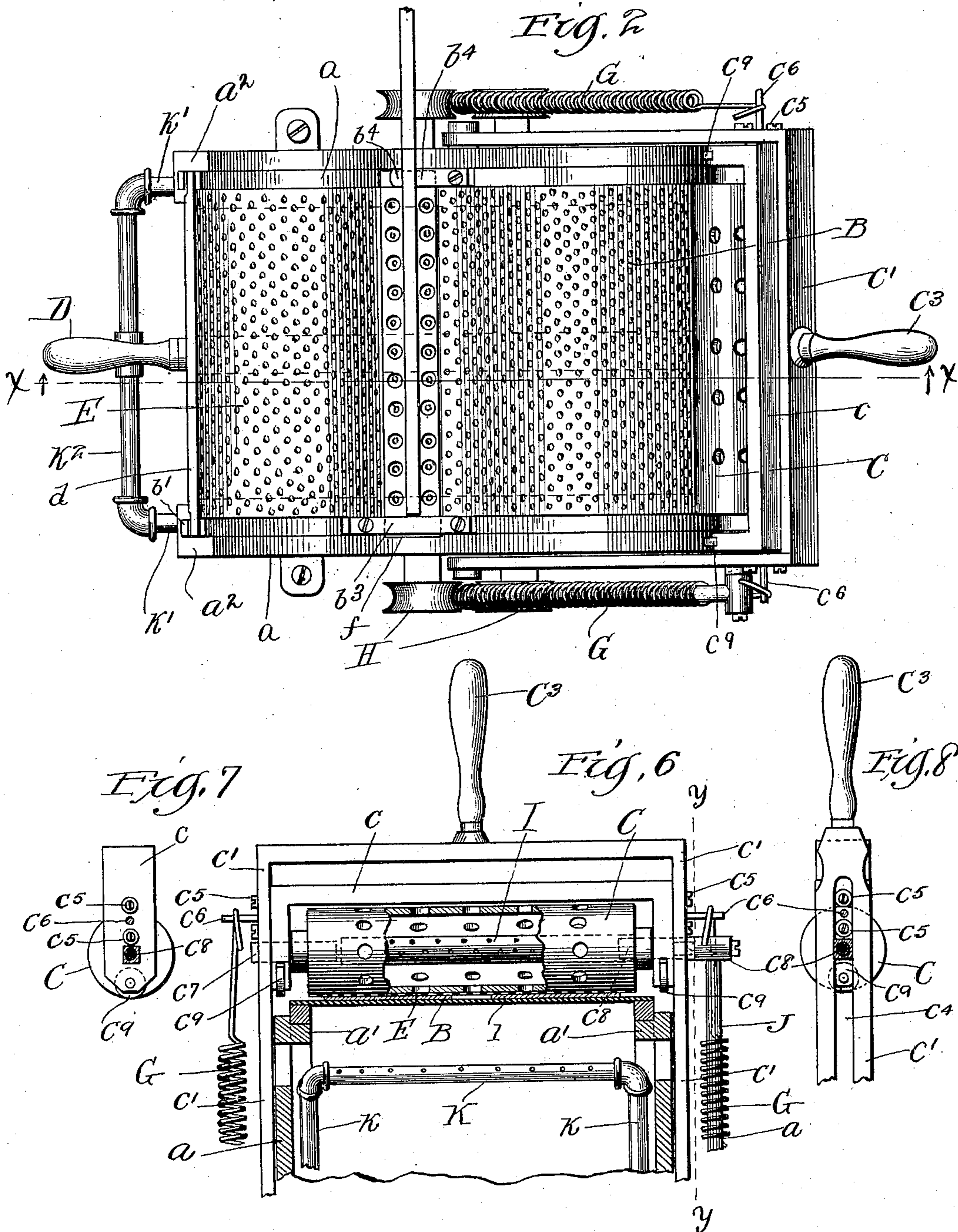
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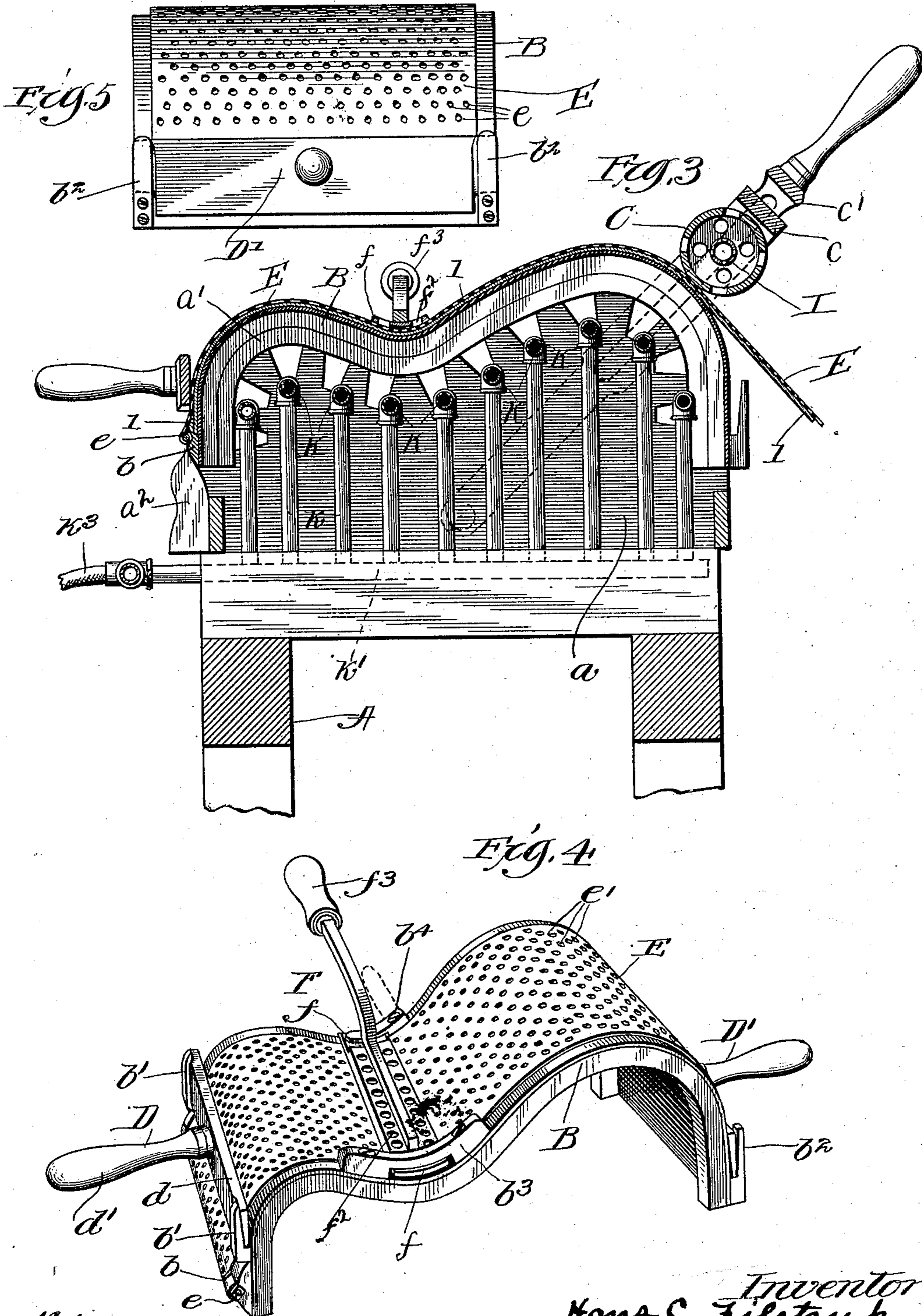
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UNITED STATES PATENT OFFICE.

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ASSIGNORS TO THE LYON & HEALY, OF SAME PLACE.

BENDING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 639,221, dated December 19, 1899.

Application filed June 22, 1899. Serial No. 721,444. (No model.)

To all whom it may concern:

Be it known that we, HANS C. FILSTRUP and FRANK A. SENNET, citizens of the United States, and residents of Chicago, in the county of Cook and State of Illinois, have invented a certain new and useful Improvement in Bending-Machines, of which the following is a specification.

The objects of our invention are to provide a simple and effective machine for bending different materials, but more particularly adapted for bending and shaping wood; to provide an improved method whereby a uniform bending may be obtained—that is to say, whereby the boards or strips of wood may be bent accurately and exactly alike; to provide a machine particularly adapted for bending the ribs, side boards, and other curved portions of musical instruments and designed to overcome or obviate the difficulties attending the old method, which consists in bending and shaping such portions by hand; to provide a method which will permit an economical use of wood, and to provide certain details and features of improvement tending to render a machine of this character efficient and thoroughly effective.

To the attainment of the foregoing and other useful ends our invention consists in matters hereinafter set forth and claimed.

In the accompanying drawings, Figure 1 is a side elevation of a bending-machine embodying the principles of our invention. Fig. 2 is a plan of the machine shown in Fig. 1. Fig. 3 is a section on line *xx* in Fig. 2. Fig. 4 is a perspective of the removable former upon which the wood is bent and showing also the retainers employed for holding the wood in place. Fig. 5 is an end view of the former shown in Fig. 4. Fig. 6 is a view showing a portion of the former and side walls of the machine in transverse section on line 6 6 in Fig. 1 and showing also the bending-roll and a portion of the swinging frame upon which the same is mounted, the central portion of the roll being shown in longitudinal section for the purpose of showing the inclosed burner by which it is heated. Fig. 7 is an end view of the frame upon which the roll is mounted. Fig. 8 is a section on line

yy in Fig. 6. Fig. 9 is a view of the under side of one of the retainers shown in Fig. 4.

As thus illustrated our invention comprises a body frame or stand A, a removable former B, and a bending-roll C. The body frame or stand is preferably of a height to support the bending roll and former in suitably-elevated positions, and the upper portion of such stand or body frame is preferably composed of a couple of oppositely-arranged and parallel side walls *a a*. The machine which we have illustrated is designed for bending side boards of guitars, and accordingly the former B, it will be observed, has the shape or contour of the side portions of such instrument. Preferably the upper portions of the side walls *a a* are provided with inwardly-projecting ledges *a' a'*, as best shown in Fig. 6, and the former is of a width to extend across and permit its marginal portions to seat and rest upon these ledges. We provide the said former B at one end with a cleat *b* and also with a couple of brackets *b' b'*. The opposite end of the former is provided with a couple of similar brackets *b² b²*. The said cleat serves to provide a narrow slot or recess into which one end of the board *l* can be inserted, and the brackets serve as supports for the retainers D and D', by which the end portions of the board are held in place and which are hereinafter more fully described. A perforated metal sheet E is also provided and arranged over the boards to prevent their edges from curling up, and the same is preferably hinged to one end of the former by means of a small rod *e*. A third retainer F is employed to hold the wood down into the depression or reverse bend of the former, and this retainer can be maintained in place by a clip *b³* and a pivoted catch *b⁴*. The bending-roll C is preferably hollow and mounted for rotation upon a yoke-like frame *c*. The said frame and roll are supported and carried by a swinging bail-shaped frame *c'*, which latter is pivoted to the machine-body at *c²* and provided with a handle *C³*, and each side portion of this swinging bail-shaped frame is provided with a slot *c⁴*, adapted to receive the small studs or rolls *c⁵* on the frame *c*. With this arrangement the bending-roll can be made to traverse the

former for the purpose of bending or conforming the boards thereto. The slots c^4 permit a relative shift on the part of the roll and frame c' during the operation of swinging the said frame about its points of pivotal connection with the body, and to insure a requisite degree of pressure on the part of the roll the ends of the same are preferably connected with the body-frame by means of a couple of coil-springs G. These springs are preferably of some length and have their upper ends secured to pins c^6 on the yoke c and their lower ends secured to the lower portion of the frame A. The sheaves or grooved rolls H, arranged at each side of the springs, keep the upper portions of the springs substantially parallel with the side portions of the swinging frame c' , and with this arrangement the pull or tension of the springs will be at all times substantially parallel with the slots c^4 . The depression or reverse bend in the former B makes it preferable to heat the bending-roll, and accordingly we arrange within the said roll a tubular burner I. Gas or hydrocarbon may be supplied to this burner in any suitable manner, but preferably by means of a flexible tube J, arranged within the coil-spring G. The yoke c is provided with a couple of studs c^7 c^8 , which serve as arbors for the roll and which extend outwardly through the slots in the swinging frame. The stud or arbor c^8 is made hollow and has its outer end suitably connected with the upper end of the flexible supply-pipe and its inner end suitably connected with the burner. In this way the roll is heated without in any way interfering with its operation, and as a further advantage the flexible supply-pipe is protected against injury. The yoke c is preferably provided with rolls c^9 c^9 , which are in line with the tops of the side walls a and which roll thereon when the bending-roll is returned to its starting-point. It is desirable to heat the former, so as to facilitate the bending of the wood, and to such end we arrange a number of burners K between the walls a and directly beneath the said former. These burners are fed from vertical pipes k , which rise from a couple of horizontal pipes k' , and the latter can be connected by a pipe k^2 , having suitable connection with a supply-pipe k^3 .

The operation of the machine thus constructed is as follows: First the flexible and perforated metal sheet E is thrown back from the surface of the former B, and one end of the strip of wood is then inserted back of the cleat b and the metal sheet swung over to cover the wood. Next the bending-roll is moved to its second position, (see Fig. 1,) and the retainer D, which, it will be observed, consists simply of a flat bar d , provided with a handle d' , is then placed in position, it being also observed that the end portions of the bar d are wedge-like in form and that consequently its insertion back of the brackets b' operates to crowd the retainer tightly against

the end portion of the board—that is to say, against the metal sheet E and the board. After this the roll is moved to its third position and the retainer F then inserted in place to hold the board tightly against the surface of the former, and at this juncture it will be seen that the heating of the roll is an important feature of our invention, as without so doing there would be some liability of the board being broken or cracked during the passage of the roll over the depression or reverse curve in the surface of the former. The retainer F consists of a bar f ; but in this case the bar is provided with a number of openings f^2 , and it is preferable to provide a handle f^3 , which extends from one end of the bar rather than from its back, and, furthermore, the under surface of this retainer is provided with a number of grooves f^4 , (see Fig. 9,) which, together with the said openings, afford passages for the escape of the steam, which results either from wetting the wood preparatory to bending or merely from the natural moisture contained in the wood, for it will be understood that it is desirable that the wood be permitted to dry quickly and that it is for a like reason that the flexible metal sheet, which covers the boards and prevents their edges from turning up, is provided with perforations e' . After the insertion of the retainer F the roll is moved to the fourth and last position and the retainer D' then placed in position to hold the end of the board against the surface of the former. The said former is then removed in the condition shown in Fig. 4, and the wood and former permitted to cool together. The retainers serve to maintain the conformity thus established between the board and former while the two are cooling and the wood becoming set, and in this way the bending will necessarily be of a uniform and positive character. It will also be seen that with the foregoing method the boards may be cut the exact size desired, whereas with the old hand method it is necessary, for various reasons, to cut the boards somewhat longer and wider than desired and to then trim them down after bending. This involves considerable loss, as the wood from which musical instruments are made is valuable, and for the further reason that such trimming down involves a waste of time and labor. With our improved method, however, the boards can be cut the exact length and width desired. Each machine is provided with a number of formers, so as to permit several to be cooling while one is on the machine and the others in readiness for use, and as several boards can be placed side by side upon a former and bent simultaneously it is obvious that our method is not only practical and highly effective, but economical as well. In returning the roll to its original or first position the small rolls c^9 will travel along the tracks afforded by the tops of the walls a , and in this connection it will be seen that the

broadened end portions a^2 of these tracks provide a sort of approach for enabling the roll to pass to the former smoothly and without difficulty.

5 While we have illustrated and described a machine for making the side boards of guitars, it will readily be understood that the principles of our invention are equally applicable to the bending of mandolin-ribs, and
10 that in the latter case it would be unnecessary to heat the bending-roll. We also contemplate using certain features of our invention in connection with other machines, and we may also employ our invention for bending
15 materials other than wood.

What we claim as our invention is—

1. A machine for bending wood comprising a suitable frame or body having a chamber which incloses one or more burners, a removable former which is seated upon the said
20 frame or body and which is arranged over the said chamber in such manner as to be heated by the said burner or burners, means for bending or conforming the wood to the
25 outer surface of said removable former, and means for clamping or maintaining the wood in contact with the former, whereby the latter and the wood can be removed from the machine and permitted to cool together.

30 2. A machine for bending wood comprising a former having one or more reverse bends, means for heating the said former, a bending-roll adapted and arranged to traverse the former for the purpose of bending or conforming the wood thereto, and means for heating
35 the bending-roll for the purpose of preventing the latter from breaking the wood while conforming the same to the reverse bend or bends of the said former.

40 3. In a machine for bending wood, the combination of a frame or body having a chamber wherein are inclosed one or more burners, a removable forming-plate provided with one or more reverse bends and seated upon the
45 said chamber in such manner as to be heated by the said burner or burners, and a heated bending-roll arranged to traverse the said reversely-curved former and adapted to cooperate with the latter in bending the wood into
50 the desired shape.

4. A wood-bending machine comprising a suitable frame or body, a removable former, means mounted upon said frame or body for heating the said removable former, and a roll
55 adapted and operative to conform the wood to the said removable former.

5. A wood-bending machine comprising a suitable frame or body, a removable former, means for heating the latter, a roll for conforming the wood to the said former, and one
60 or more springs for securing a requisite degree of pressure on the part of the roll.

6. A wood-bending machine comprising a former, means for heating the same, a pliable
65 and perforated metal sheet arranged to cover the wood, and means for bending and con-

forming the wood and metal sheet to the said former.

7. A wood-bending machine comprising a former, means for heating the same, a flexible
70 and perforated metal sheet arranged to cover the wood, and a roll arranged to traverse the outer surface of the metal sheet for the purpose of conforming both the latter and the wood to the said former.

8. A wood-bending machine comprising a former, means for heating the same, a perforated sheet-metal cover for the wood, and a spring-roll for conforming the wood and sheet
80 metal to the said former.

9. A wood-bending machine comprising a suitable frame or body, a removable former, means for heating the latter, a perforated and pliable sheet-metal cover for the wood, and means for bending and conforming the wood
85 and sheet metal to the said former.

10. A wood-bending machine comprising a suitable frame or body, a removable former, means for heating the latter, a perforated metal sheet arranged to cover the wood, and
90 a roll arranged to traverse the outer surface of the metal sheet for the purpose of conforming both the latter and the wood to the said former.

11. A wood-bending machine comprising a
95 suitable frame or body, a removable former fitted and seated upon the said frame or body, means for heating the latter, a roll for conforming the wood to the said former, and one or more retainers for holding the wood in contact with the former after the passage of the
100 roll and adapted for maintaining the conformity between the wood and the former after the latter's removal from the machine.

12. A wood-bending machine comprising a
105 suitable frame or body, a removable former, means for heating the latter, a pliable and perforated metal sheet arranged to cover the wood, a bending-roll for conforming the wood and metal sheet to the said former, and a plurality of retainers for maintaining the conformity between the wood, the sheet metal
110 and the former.

13. A machine for bending wood comprising a reversely-curved former, means for heating
115 the same, a spring-held bending-roll arranged to traverse the said reversely-curved former, for the purpose set forth, and a gas-burner arranged within and adapted to heat the said roll.

14. A wood-bending machine comprising a former, means for heating the same, a swinging support, a roll mounted to slide in guides on said swinging support and adapted and operative to conform the wood to the said former,
125 and one or more springs arranged to connect the said roll with the body of the machine for the purpose described.

15. A wood-bending machine comprising a former, a pair of connected swinging arms, a
130 roll mounted to slide in slots in said arms and adapted and operative to conform the wood

to the said former, a pair of sheaves at each side of the machine, and a long coil-spring for connecting each end of said roll with the body-frame and arranged between the members of one of said pairs of sheaves.

16. In a bending-machine, a shifting support, a bending-roll mounted to slide on said shifting support, a coil-spring for connecting each end of said roll with the body-frame, and a pair of sheaves or rolls applied to each spring at a point between its ends.

17. A bending-machine comprising a hollow bending-roll, a burner arranged within said roll, a shifting support upon which the roll is slidably mounted, a coil-spring for connecting each end of said roll with the body-frame, and a flexible tube arranged within one of said coil-springs and connected with said burner.

18. A wood-bending machine comprising a former, a spring-held roll adapted and operative to conform the wood to the said former, and a burner arranged within and adapted for heating said roll.

19. A wood-bending machine comprising a former, a perforated sheet-metal cover for the wood, a bending-roll, and means for heating the latter.

20. The combination of a former, a suitable frame or body upon which said former is mounted, one or more gas-burners which are also mounted upon said frame or body and which are arranged to heat the said former, a bending-roll, and a gas-burner arranged within and adapted for heating the said roll.

21. In combination with a former having a reverse bend or curve, a removable retainer which is adapted to be arranged transversely across the former for the purpose of keeping the wood in contact with the reversely curved or bent portion of the said former, and which has its under surface provided with grooves communicating with apertures or openings extending through the thickness of the said retainer, substantially as and for the purpose set forth.

22. A wood-bending machine comprising a former, a body-frame provided with tracks, a bending-roll carried by a frame which is provided with rolls arranged in line with said tracks, and a shiftable support upon which said frame is slidably mounted, substantially as and for the purpose described.

23. In a machine for bending the side boards of guitars or other musical instruments, the combination of a suitable frame or body, a removable and reversely-curved forming-plate, a gas-burner mounted upon a swinging support, a hollow bending-roll which is rotatably mounted upon said swinging support and arranged to inclose the said gas-burner, by which arrangement the roll may be made to traverse the said forming-plate, means for supplying gas to the said burner for the purpose of heating the said roll, and means whereby the roll will exert a constant pressure upon the forming-plate when it is caused to traverse the latter.

24. A machine for bending the side boards of guitars comprising a suitable frame or body provided with a removable former having the proper shape, means for heating the said former said heating means being mounted upon the said frame or body, means for bending or conforming the boards to the said former, and means for retaining the conformity thus obtained between the former and boards.

25. A machine for bending the side boards of guitars comprising a suitable frame or body provided with a removable former having the proper shape or contour, means for heating the said removable former said heating means being mounted upon the said frame or body, a heated roll arranged to traverse the former and adapted for bending or conforming the boards to the said former, and a plurality of retainers for clamping the boards down upon the said former, substantially as and for the purpose described.

26. In a machine for bending wood a frame or body having a chamber wherein are arranged one or more burners, a removable forming-plate arranged above the said burner or burners, a spring-held bending-roll arranged to traverse the said former and mounted upon a shiftable frame which is provided with small rolls, the latter being arranged in line with tracks formed on the upper portion of the said frame or body, substantially as and for the purpose set forth.

27. In a bending-machine the combination of a removable former B, a sheet-metal covering E hinged or flexibly-connected with one end of said former, the retainers D, D' and F, and a bending-roll for conforming both the wood and metal sheet E to the said former.

28. A machine for bending wood comprising a suitable frame or body, a removable forming-plate fitted and seated upon the said frame or body, a pliable metal sheet which is hinged to one end of said forming-plate and which is perforated for the purpose set forth, and means for bending or conforming both the wood and the pliable metal sheet to the outer surface of the said forming-plate.

29. In a wood-bending machine the combination of a former, a bending-roll and a pliable metal sheet arranged between the said roll and former and hinged or otherwise flexibly connected with one end of the latter, substantially as described.

30. In a bending-machine, and in combination with a suitable former, a hollow bending-roll arranged to traverse the said former and having a gas-burner arranged within its interior, a coil-spring for keeping the roll in contact with the former, and a flexible tube which is arranged within the convolutions of said coil-spring and by which gas is supplied to the said burner within the bending-roll.

31. A wood-bending machine comprising a body composed of a couple of side walls, a removable former adapted to seat upon said walls, a plurality of tubular burners arranged beneath the former and between said walls,

means for conforming the wood to said former, and means for retaining the conformity between the wood and former.

32. A bending-machine comprising a former, and a spring-roll for bending or conforming the material to the said former.

33. A bending-machine comprising a former, means for heating the same, and a spring-roll for bending or conforming the material to the said former.

34. A bending-machine comprising a removable former, a spring bending-roll, means for heating said roll, and means for retaining the conformity between the material and former.

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