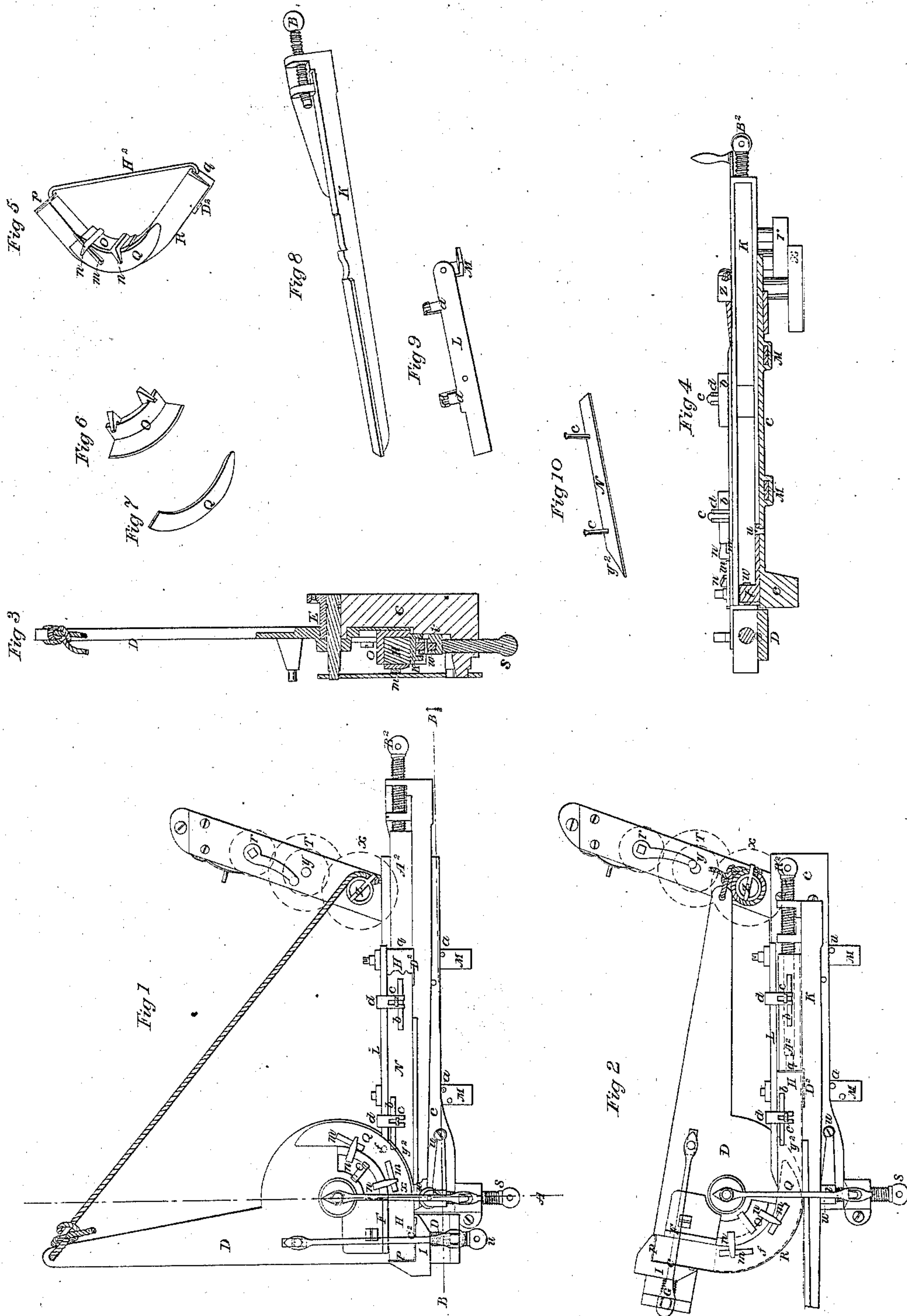


T. Blanchard,
Bending Wood,

No 15,944,

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Fig 13

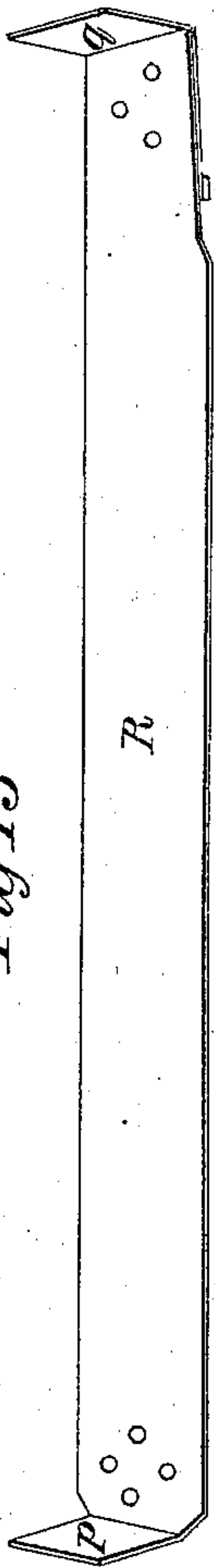


Fig 12

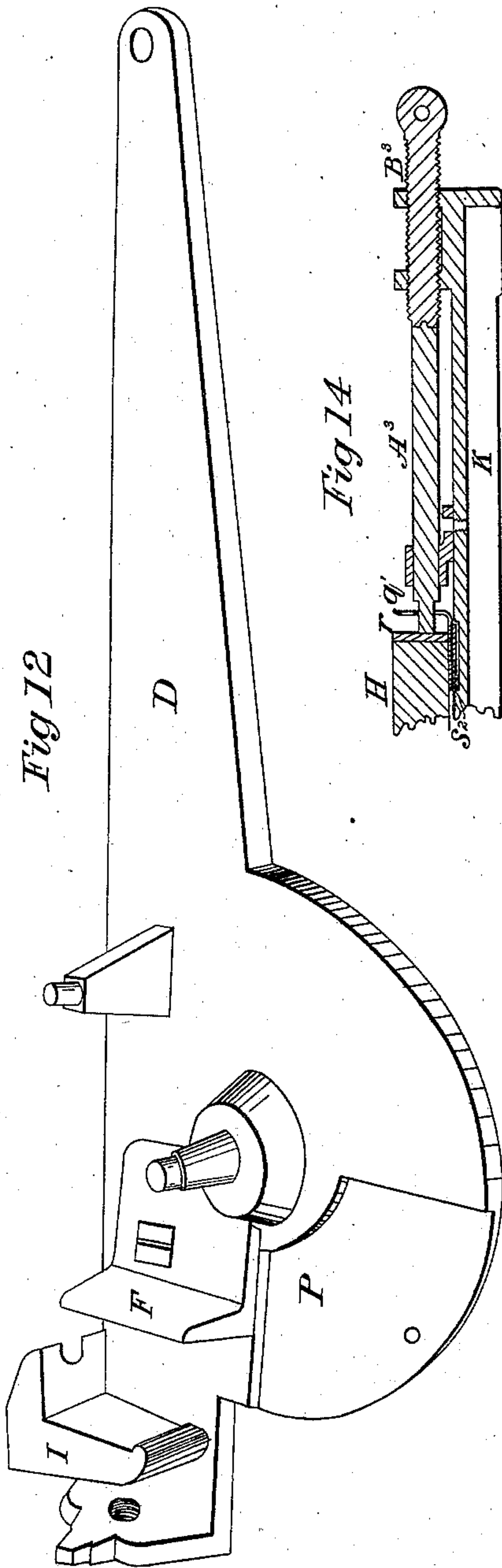


Fig 14

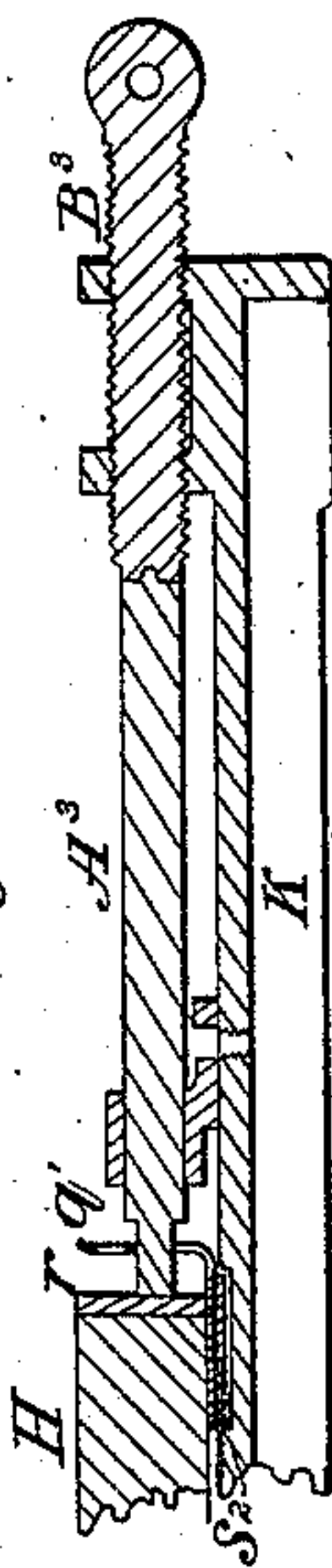
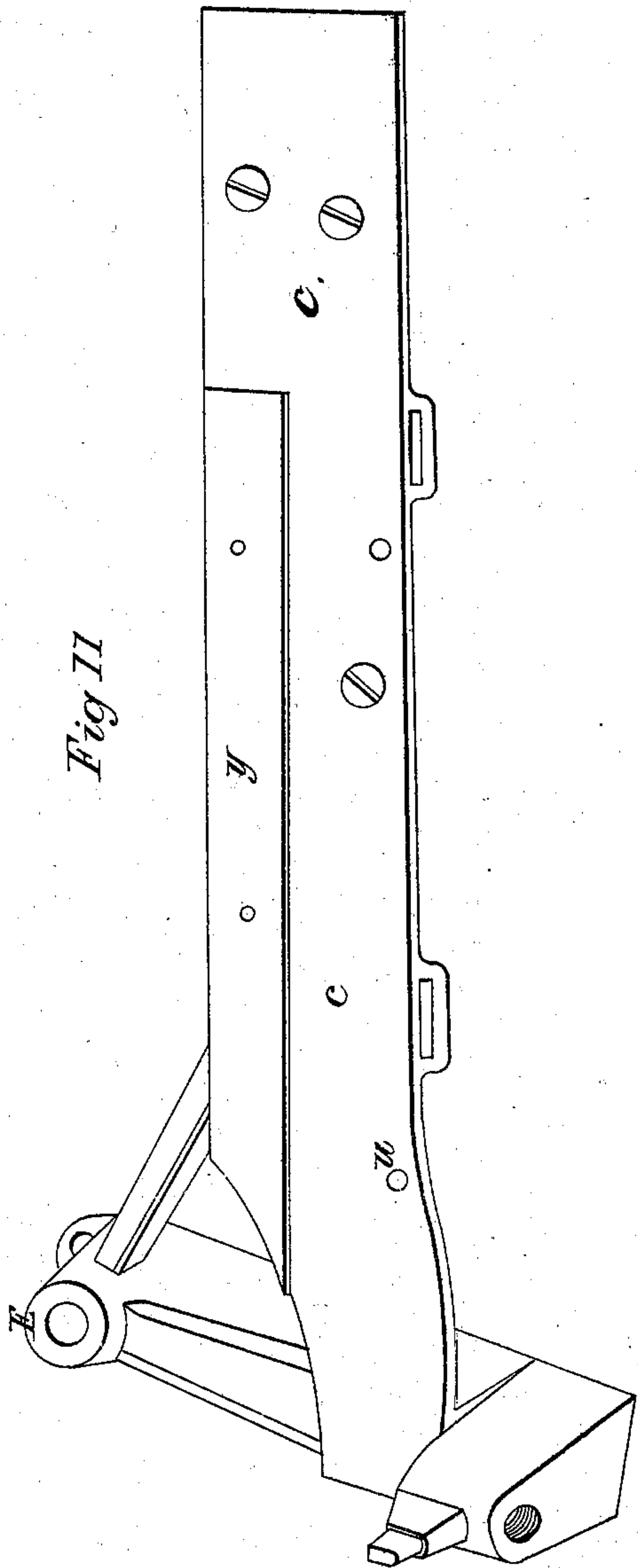


Fig 11



UNITED STATES PATENT OFFICE.

THOS. BLANCHARD, OF BOSTON, MASSACHUSETTS.

METHOD OF BENDING WOOD.

Specification of Letters Patent No. 15,944, dated October 21, 1856.

To all whom it may concern:

Be it known that I, THOS. BLANCHARD, of Boston, in the county of Suffolk and State of Massachusetts, have invented a new and Improved Method of Bending Timber, of which the following is a full, clear, and exact description, reference being had to the annexed drawings, making part of this specification, in which—

Figure 1 is a plan showing the timber confined in the machine preparatory to bending; Fig. 2, a plan showing the timber after the bending is completed; Fig. 3, a section upon the line A A of Fig. 1; Fig. 4, a section upon the line B B of Fig. 1; Figs. 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, details which will be referred to hereafter.

My invention has for its object the bending of timber both of small and large dimensions, and consists in submitting it to pressure upon every side, and upon the ends during the operation of bending, by which means it is prevented from swelling, bursting or cracking at the point bent, as would otherwise be the case were the timber bent without being thus confined.

To enable others skilled in the art to understand my invention I will proceed to describe the manner in which I have carried it out, and the construction of my machine.

C, Fig. 11, is the bed piece or foundation of the machine, upon which are secured the operating parts.

D, Fig. 12, is the bending lever, which turns upon the center E rising from the bed piece.

F is an abutment rising from the bending lever D against which the end of the timber is pressed by the bending screw G, which bears upon the clamping piece I, the end of the timber being firmly and securely held to the bending lever by the pressure between the abutment F and the clamping piece I as seen in Figs. 1 and 2. Immediately back of the portion thus held the timber is slightly confined in a trough or box for the purpose as before mentioned of preventing it from swelling or bursting.

This is accomplished in the following manner. The bottom surface of the timber rests upon the bed piece C or upon the plate Y' interposed between it and the bed piece. Upon one side it is supported by the truss beam K seen in perspective in Fig. 8, and upon the opposite side by the back support

L (Fig. 9). Attached to this back supporting plate are two sliding clamps M which pass through mortises in the bed piece (Fig. 4) and serve when drawn up to the bed piece by the keys *a* to hold the back support rigidly in place, and compress the timber between it and truss beam.

The timber is confined and compressed in a vertical direction by the following means: N (Fig. 10) is a metallic plate which I call the "straight follower" (seen in plan in Fig. 1 and in red outline in Fig. 2), which is placed upon the upper surface of the timber. *c* are upright rods which rise from the surface of the straight follower and enter the slots in the hooked uprights *d* attached to the top edge of the back support L. The follower N is thus prevented from being drawn longitudinally out of place—it is forced down upon the timber by the wedge shaped keys *b*, whereby the latter is compressed between it and the bed piece of the machine. The timber is thus held compressed in a trough formed by the bed piece C or the interposing plate Y, the straight follower N, the truss beam K, and the block support L. Out of this trough it is drawn as it is bent into a circular mold which will be presently explained. The bed piece, straight follower and back support remain stationary, while the timber is withdrawn, but the truss beam follows on with the timber as will be hereafter more fully described.

The circular mold which receives the timber as it is drawn out of the straight trough is constructed as follows: It is evident that the curve of this mold must be struck from the center of motion of the bending lever D, and as it is necessary to retain the pressure upon the timber for some hours after the bending is completed, in order to prevent it from returning to its former shape or from bursting, or cracking, it is desirable that while this circular mold is capable of being so adapted to the bending lever as to partake of all its motions it should at the same time be so constructed that it may be removed from the machine with the timber without relieving the latter from the compression to which it is subjected, this is accomplished in the following manner: The bottom and one side of the circular mold are formed by what I denominate the mold O seen in perspective in Fig. 6 and in section in Fig. 3. This mold is adapted to a recess P formed for the purpose in the bending

lever D, and is furthermore secured thereto by a pin attached to the mold which enters the hole g in the bending lever. When this mold is in place, the timber placed in the machine ready for the bending operation is slightly entered into one end of the mold O as at x Fig. 1. The "circular follower" Q seen in red in Fig. 2, and in perspective in Fig. 7 is then placed upon the timber upon which it is confined by the wedge keys m driven beneath the hooks n .

I have now described the means by which the timber is confined and prevented from cracking and splitting upon every side except upon the outside or convex part of the bend; this portion of the timber is confined and prevented from bursting out as it is bent by the following means: R (Fig. 13) is a chain or strap which is made to embrace the timber upon the outside as seen in Fig. 2. This strap or chain is flexible, and may be made of iron or of steel. p and q are returns at right angles to the strap, which pass over the ends of the timber and against which the upsetting or end pressure is made to bear. S is the clamping screw; the end of which bears against a block t , this block pivots around the point u and carries the roller w which by the operation of the screw S is forced against the truss beam K; this latter while it is held up tightly against the timber is thus permitted to slide past the roller as the timber is drawn out of the machine. V, T, Y, X—V, T, Y, X, is a train of gear wheels actuated by any sufficient power and giving motion to a shaft Z by the revolution of which through a rope or chain the bending lever is set in motion. Any other efficient means may be employed for the purpose of actuating this lever.

By the means above described the timber is confined on every side and compressed while being bent; this is necessary for all large timber to prevent it from cracking and bursting, but it is absolutely essential for all timber small as well as large that it be compressed upon the ends previous to the commencing of the operation or that it be not allowed to elongate upon the outside; this I effect in the bending of timber of moderate size in the following manner: The timber is cut of a length just to fit between the return p, q , of the strap R. The follower or plunger A^2 is then caused to rest against the end of the timber, the return q of the strap R interposing between the two; a sufficient amount of end pressure is then put upon the timber by the upsetting or beam screw B^2 , which works in the truss beam K, the other end of the timber being held by the clamping piece I. For most light work and for nearly all small articles this upsetting or end pressure is all that is necessary to enable the wood to be bent to any required curve; among such articles may be enumer-

ated plow handles, fellies of wheels, and the different parts of furniture.

Where ships' knees and other heavy timber are to be bent it becomes necessary in addition to the end pressure to submit the wood to side pressure in the manner already described, otherwise there is danger that it will swell and crack during the bending process, by which its integrity and strength are greatly impaired, if indeed it be not rendered useless.

Operation.—The timber having been squared or brought into the required form is cut of a length that shall just fit into the strap R; it is then placed upon the bed piece as seen in Fig. 1, one end of it being clamped to the bending lever between the abutment F and the clamping piece I operated by the screw G. The mold O is then inserted in the recess in the lever D one end of it just entering beneath the timber at x ; the curved follower Q is placed upon the timber and keyed down by the keys m as already described; the "back support" I, is then placed behind the timber it being made to enter in between the mold and the curved follower Q as seen in dotted line, in Fig. 1. That no considerable portion of the timber may be left unsupported the back support is drawn up to the timber by the keys a which pass through the sliding clamps M projecting from its lower edge and serve to hold it to the bed piece. The straight follower N which covers the timber is so made as to adapt it to the curved follower Q at the point y^2 , that the timber may at no moment be relieved from pressure as it is drawn from the straight follower and enters beneath the curved follower Q. To the other side of the timber is applied the truss beam K which unlike the other side supports of the timber is not made fast to the bed piece, but moves with the timber as the bending proceeds; the truss beam is made to bear upon the timber by the key and also by the clamp screw S, the roller W permitting the truss beam to move freely along with the timber. The plunger A^2 , is now laid in as seen in Figs. 1 and 2 and by means of the upsetting screw B^2 , is made to bear against the end of the timber with the required force.

Upon the outside of the strap R are projections C^2, D^2 , which enter corresponding recesses in the clamping piece I and truss beam K by which means not only is the timber forced to move with the bending lever D but the truss beam and upsetting screw are caused to follow and move with the timber.

In bending heavy timber and where great strength is required a strong flat chain may be employed to surround the outside of the timber. This may be used either in conjunction with the strap R or it may be employed alone; in such case, as the chain can-

not yield it is evident that the outside of the timber as well as the inside will be compressed, unless some means be resorted to to relieve the end pressure as the bending proceeds; this may be effected by turning back the upsetting screw, by hand or by self acting machinery actuated by the motion of the bending lever. To facilitate this operation I have adopted the arrangement represented in Fig. 14, in which H is the timber to be bent; A³, a metallic plunger which receives the pressure of the upsetting screw B³, this plunger passes through the return *q* of the strap which encircles the timber and bears upon the metallic follower *r* which rests against the end of the timber. Outside of the interior strap, is a secondary strap or chain S², which is secured, as before explained of the strap R to the beam K and clamping piece I. As now the bending proceeds, and it becomes necessary to permit the timber to elongate, to prevent the compression and crippling of the outer surface, the end pressure is gradually relieved by relaxing the screw B³, and is thus prevented from increasing to an injurious or useless degree.

The parts being arranged as above described, motion is communicated to the lever D around its center E by the means described or in any other suitable manner, and this lever is brought into the position seen in Fig. 2, the timber being gradually bent and drawn out of the straight box in which it was first confined and transferred to the circular mold O in which it still remains clamped. It is now necessary that the timber remain compressed and confined for several hours and in order that the machine may be used for the purpose of bending another stick the bent timber is removed in the following manner from the machine: H², is a bar having hooks upon its ends, which are made to enter holes or eyes in the returns *p* and *q* of the strap R. The timber is thus prevented from springing back when it is relieved from the end pressure, and it may then with the parts in which it is confined (Fig. 5) be removed from the machine.

Instead of one bending lever as shown in

Figs. 1 and 2 there may be two levers turning on the same center shaft, and standing in opposite directions. The timber must be placed with the center of the curve against the center of the mold and be there made fast by the fastening screw or key. These levers may be drawn around by a chain or rope attached at the outer end of each lever, and drawn toward each other by one windlass. In this case there must be an upsetting screw or key at each end of the timber, and two truss beams with their fixtures, also two bending chains, but only one inside strap.

On the 18th December, 1849, Letters Patent of the United States were granted to me for a method of bending fibrous materials by compressing the ends of the stick. This I have found to be sufficient for the purpose of bending sticks of small size. I have however discovered that in order to bend sticks of larger dimension for ship timber or other purposes, it is necessary not only to submit it to end compression, but also to confine it upon every side to prevent it from bursting out laterally.

I do not therefore now claim submitting the timber to compression upon its ends, but

What I claim as my invention and desire to secure by Letters Patent is—

1. Subjecting the timber to pressure upon all sides and containing the same while it is being transferred from the straight trough to the curved mold as set forth.

2. The within described machine for the purpose of bending timber consisting essentially of the following elements or their equivalents in combination: 1st, the bending lever; 2d, the device for compressing the timber while it is being bent; 3d, the curved mold in which the pressure is continued and in which the timber is removed from the machine after the bending operation is completed.

THOMAS BLANCHARD.

Witnesses:

SAM. COOPER,

THOS. R. ROACH.