

(No Model.)

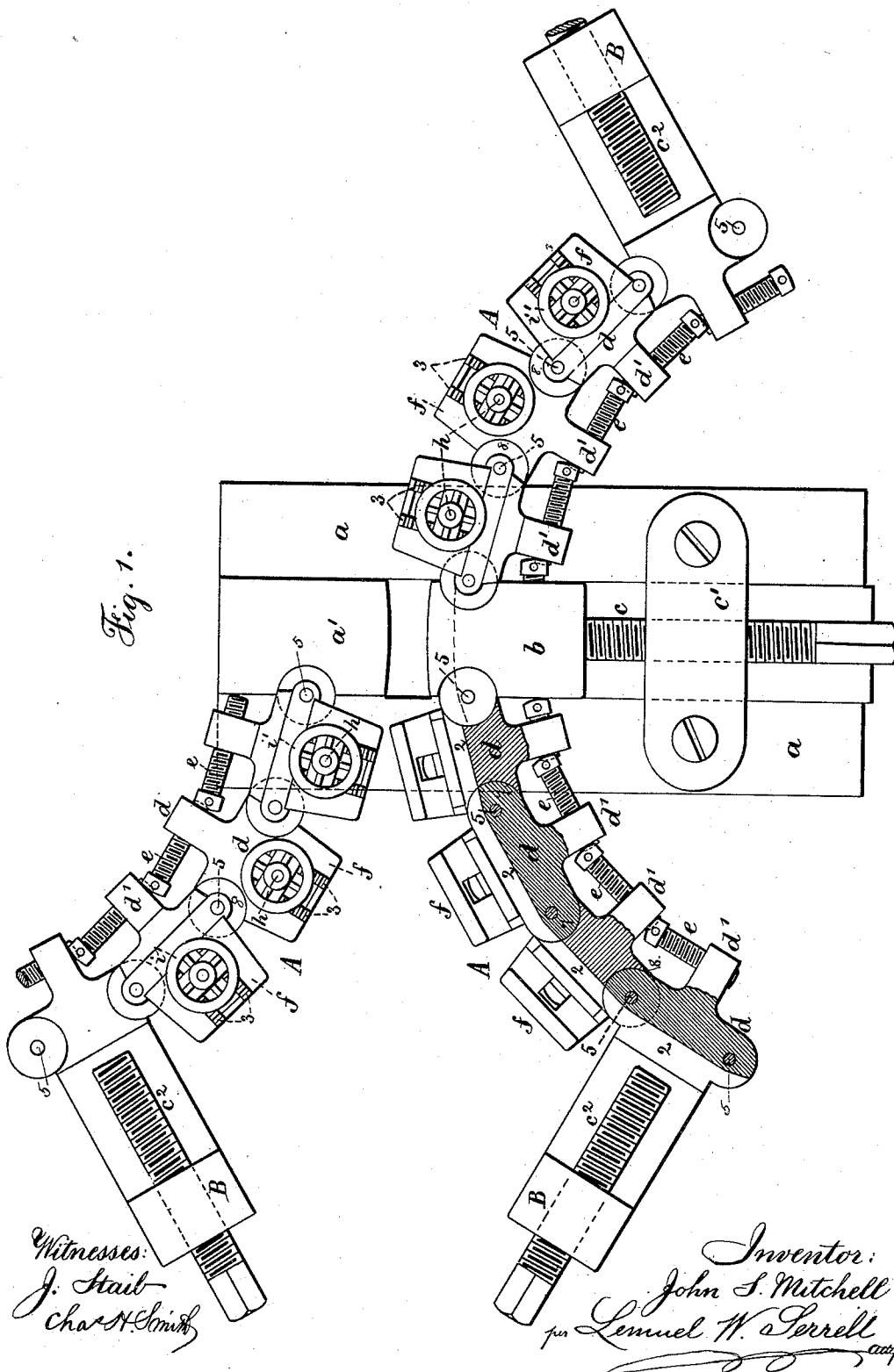
2 Sheets—Sheet 1.

J. S. MITCHELL.

MACHINE FOR BENDING RIBS OR FRAMES OF SHIPS.

No. 401,509.

Patented Apr. 16, 1889.

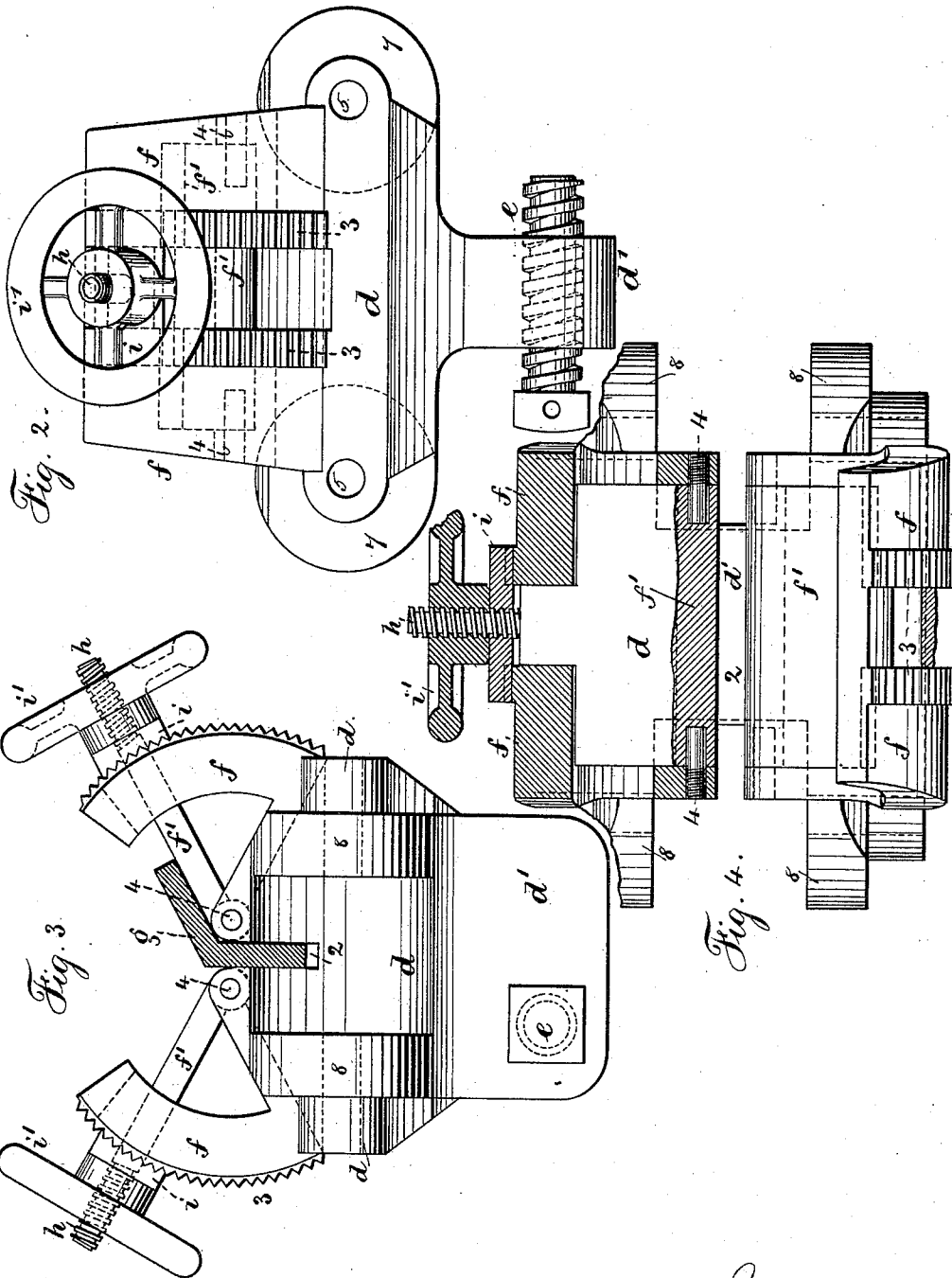


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MACHINE FOR BENDING RIBS OR FRAMES OF SHIPS.

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Patented Apr. 16, 1889.



Witnesses:
J. Staib
Chas H. Smith

Inventor:
John S. Mitchell
per Lemuel W. Torrell atty

UNITED STATES PATENT OFFICE.

JOHN S. MITCHELL, OF MILFORD, ASSIGNOR TO HIMSELF, AND CHARLES
COUPLAND, OF SEYMOUR, CONNECTICUT.

MACHINE FOR BENDING RIBS OR FRAMES OF SHIPS.

SPECIFICATION forming part of Letters Patent No. 401,509, dated April 16, 1889.

Application filed June 5, 1888. Serial No. 276,118. (No model.)

To all whom it may concern:

Be it known that I, JOHN S. MITCHELL, of Milford, in the county of New Haven and State of Connecticut, have invented an Improvement in Machines for Bending the Ribs or Frames of Ships or other Vessels, of which the following is a specification.

The method of bending the ribs or frames of ships, especially of metallic ships, has usually been conducted in the following manner: A carpenter or cabinet-maker first constructs a wooden model of one-half of the ship, the perfect outline of the proposed ship being shown in the model, and said model made to a scale of one-quarter of an inch to the foot. This model is lined off to represent the shape of the ribs or frame of the vessel, and in a room designed for the purpose a full-sized pattern of the ship is marked off upon the floor, the measurements being made from the model, and from which pattern the wooden pattern forms are made full size. These wooden patterns are afterward brought to a smithing-shed, and upon an iron floor perforated with holes and made for the purpose, these patterns are laid down and their shape chalked off, and pins are set in the floor in the holes made therein corresponding nearest with the chalk-lines of the frame. The L-shaped iron bars to form the frame or ribs of the vessel are then heated to a red heat, one end fastened in position on the floor, and with sledges, prys, hammers, and other tools the workmen force the heated bars up to the pins in the floor into the shape of the rib marked thereon. Two of these ribs are made of corresponding shape—one for each side of the vessel—after which the pattern on the floor is changed for another set of ribs, and so on the ribs are bent to form the shell of the vessel. This is a slow, laborious, and inexact method of hand-work, and is correspondingly expensive. Some ineffectual attempts, however, have been made to bend ribs by machinery, but these have failed.

The object of my invention is to perform the bending operation and to shape the ribs of vessels by machinery in a manner that is more exact and less expensive, and more rapid and with less labor, and it dispenses at

the same time with the making of the wooden pattern and the marking of the same upon the floor of the smithery.

My improved device consists of a horizontal frame or support having a sliding head-block, adjusting-screw, and cross-head, and formers connected to the frame or to the sliding head-block, which formers are composed of grooved blocks hinged together and having a slightly-curved working-surface, and provided with means of adjustment, the pivots of the hinged blocks being by preference an exact twelve inches or one foot from center to center, and I provide each grooved block with toothed sector-frames upon its sides and with swinging hinged leaves and means for securing the same to provide for the differences in angle which are imparted to the ribs in the bending operation.

My improved device is adapted for holding the angle-iron to form the ribs by clamping the same centrally or at its outer ends, and the shape to be given to the rib is ascertained by measurement from the wooden model of the vessel which is made to scale, my improved device being set to the desired form before securing the rib to be bent, after which the parts are brought into alignment and the rib secured at its central portion or ends and power applied to bend the rib and swing the hinged blocks into the curved position to which they have been set, the rib being conformed thereto as they are swung around.

In the drawings, Figure 1 is a plan of my improved device, in which, for economy of room, I have shown only a few of the hinged blocks which compose the formers, some of the formers being shown in section. Fig. 2 is a side elevation of a single block. Fig. 3 is an end view of the same, and Fig. 4 is a plan of one of said blocks with one side portion in section.

In Fig. 1, *a* represents the horizontal slotted frame or support having a stationary head, *a'*, and a sliding head, *b*, working in the slotted frame, and *c* is an adjustable screw working in the stationary cross-head *c'*, which screw *c* can be operated in any desired manner to move the sliding head in the slotted frame and bring the opposing

faces of the stationary and sliding head together to clamp the **L** or **T** shaped rib to be bent between them.

A represents a series of grooved blocks, which I term "formers," three sets of three each being shown in Fig. 1, and the desired number of these formers are to be set together, the number being governed by the length of the rib or bar to be bent, and on the extreme end of each range of formers is a head-block or clamp, B, in which an adjusting-screw, c^2 , works, preferably against a clamping-block, to securely hold the outer ends of the **L** or **T** rib while the same is being bent. The ranges of formers occupy a horizontal position, and I prefer to place at intervals upon their under side wheels or rollers which shall run over the floor of the smithery and act to keep the parts of the former in a horizontally true position. These formers A are composed of the grooved blocks d , which are hinged together by a joint similar to an ordinary hinge, which consists of the circular knuckles 7 on the ends of each alternate former and the circular pairs of lugs 8 on the ends of each of the other alternate formers, the hinge-pins 5 being equidistant from one another and preferably an even twelve inches apart. The ranges of blocks d may be hinged to the sliding head b at each side thereof, as well as to one side of the stationary head a' . These blocks are of the shape shown in Figs. 2, 3, and 4, and through the central portion there is a groove at 2, which groove is adapted to receive one portion of the **L** or **T** rib in the bending operation, which portion is generally upon the inner side of the curve, and said blocks have central flanges, d' , through which pass the adjusting-screws e . These blocks are each provided with toothed sector-frames f , which extend out from the top and bottom portions of the faces of the blocks, and they are slotted and provided with teeth upon the outer surface at 3 at each side of the slot, and there are swinging hinged leaves f' , each of which is pivoted to the main central portion of the block at each side of the central groove, and each leaf is provided with a stem, h , passing through the slot of the sector-frame, the outer ends of which stems h are threaded and pass freely through toothed blocks i , and are provided with hand-wheels i' . Each toothed sector-frame is an arc of a circle whose center is the pivot 4, and said leaves f' can be set at any desired angle to the slot 2 passing through the block, the hand-wheels i' being first screwed back to loosen the toothed blocks, so that the leaves can be swung on their pivots 4, after which the leaves are held by screwing in the hand-wheels and clamping the toothed blocks on the toothed sectors. The screw-bolts e , passing through the flanges d' of the blocks d , are not placed centrally, but are set alternately higher up and lower down, so as not to come into contact with each other, but the heads bear against the flanges of the adjoining blocks. By adjust-

ing these screws the curvature of the range of former-blocks can be varied to correspond to the shape required for the rib that is to be bent, but the flanges swing away from the bolt-heads when the range of formers is moved into a straight line. It is now to be understood that the **L** or **T** rib may be bent at one or two operations, and that it may be either a simple or a compound curve. If the rib is inserted with the middle thereof between the clamping-blocks $a' b$, the two end portions may be bent from that point as a curve in one direction, as illustrated by the two portions of the former that are in the arc of a circle, Fig. 1, or if the rib is to be bent as a compound curve in opposite directions the former that is curved in the opposite direction may be used for bending the reverse curve. The screws e form stops between one former or block and the next, and by adjusting these screws the curvature of the hinged row or chain of formers can be varied to correspond to the shape that is to be given to the rib, and this adjustment can be made by measurements from the vessel's model, or so as to conform to the wooden pattern usually laid off from the vessel's model. If one range or chain of former-blocks is as long as the rib or article to be bent, then one end of such article is clamped between the blocks $a' b$ and the other end by the screw c^2 of the block B at the end of such range of former-blocks, the range or chain of blocks being swung into a straight line, and then by suitable power the range of former-blocks is swung into a curved line until further movement is stopped by the flanges d' and screws e coming together, and during this movement the article is bent to the curvature of the range of former-blocks. With **L** or **T** ribs for vessels they are to be introduced into the machine in a sufficiently-heated condition to be bent properly.

In bending ribs for vessels the body of the **L** or **T** rib will usually be inserted into the grooves 2, which grooves are of the proper width to receive it, and the block b also has a groove similar to the grooves 2 in the formers, because the body of the rib in vessels is usually on the concave side of the rib; but if the flange or head of the **L** or **T** rib rests upon the faces of the former-blocks the grooves will not be in use.

If the rib is firmly clamped between a' and b and by the screw c^2 , then the rib will be stretched in bending, because it occupies a longer arc of a circle than the arc passing through the hinge-pins 5; but the screw c^2 may press upon the rib and the rib slide against its end as the bending progresses. If the rib is clamped in the middle by the blocks $a' b$, then the two end portions can be bent into a simple curve or arc, or one end can be bent one way and the other end the other way to form a compound curve.

The leaves f' are made use of when the flange or head of the **L** or **T** is to be bent to

an inclination to the body instead of standing at right angles, and in some instances the flange or head has to have a twisted form. With this object in view the leaves f' are set and clamped at the desired angle or inclination to the grooves 2, and the leaves are all set at the same angles or at progressively greater or less angles to the surface of the blocks along the chain of formers, and as the heated rib is bent the flange or head is drawn forcibly against the leaves, so as to bend it from a right angle to an obtuse angle, and this operation may be helped by the attendants hammering upon the rib and driving the body farther down into the grooves 2 and bending the flange or head so that it lies flat against the leaves f' .

One chain of blocks or formers only may be provided, because by the removal of the end pin, 5, the chain can be applied at either of the three places indicated in Fig. 1, because either edge of the chain can be placed uppermost.

The chain of former-blocks is adapted to bending pairs of ribs for opposite sides of the vessel, because the L-rib can be put into the machine with the flange either upwardly or downwardly.

I claim as my invention—

1. The range or chain of formers composed of blocks hinged together and the clamping devices at the ends of such chain for holding the rib or other article to be bent, in combination with adjusting-screws, forming stops for determining the curvature to which the chain may be swung in bending the article, substantially as specified.

2. The combination, with the clamp $a' b$, of

the range of hinged former-blocks composing the bending-chain, the clamp at the outer end of such chain, and the adjusting-screws passing through flanges on the former-blocks, substantially as set forth.

3. The combination, with the bed plate or frame and a stationary head and sliding head connected therewith for holding the article to be bent, of a range of hinged former-blocks secured to one of the heads, each block having a flat or nearly flat face and grooved in the center of the face, substantially as set forth.

4. The combination, with clamps $a' b$, for holding the article to be bent, of a range of hinged former-blocks and an adjustable leaf, f' , applied to each block to vary the inclination or angle of the surfaces against which the article is bent, substantially as set forth.

5. The combination, with the horizontal frame and stationary head and a sliding head and adjusting-screw, of formers composed of grooved blocks hinged together and having slightly-curved working-surfaces, a flange to each block, an adjusting-screw passing through the same, toothed sector-frames upon the side of each block, swinging leaves pivoted to the blocks d at each side of the central groove and having threaded stems on their outer ends, and the toothed blocks i and wheels i' , for securing the hinged leaves at any desired angle, substantially as set forth.

Signed by me this 31st day of May, A. D. 1888.

JOHN S. MITCHELL. [L. S.]

Witnesses:

GEO. H. MERIM,
GEO. E. PLATT.