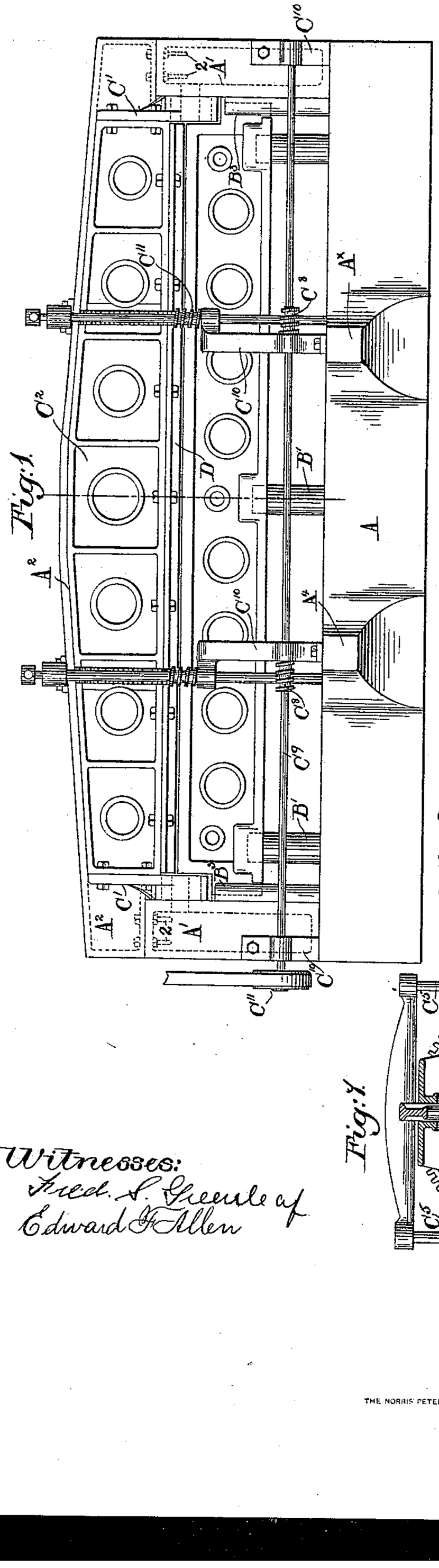
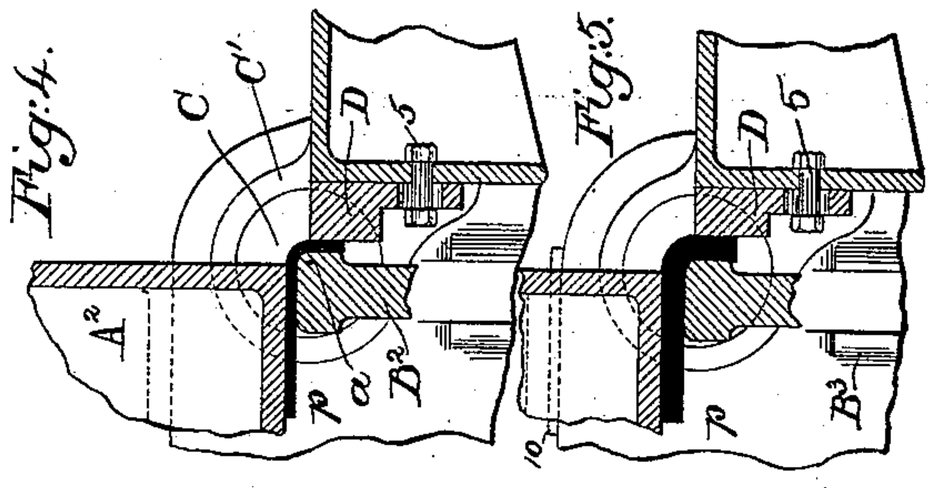
(No Model.)

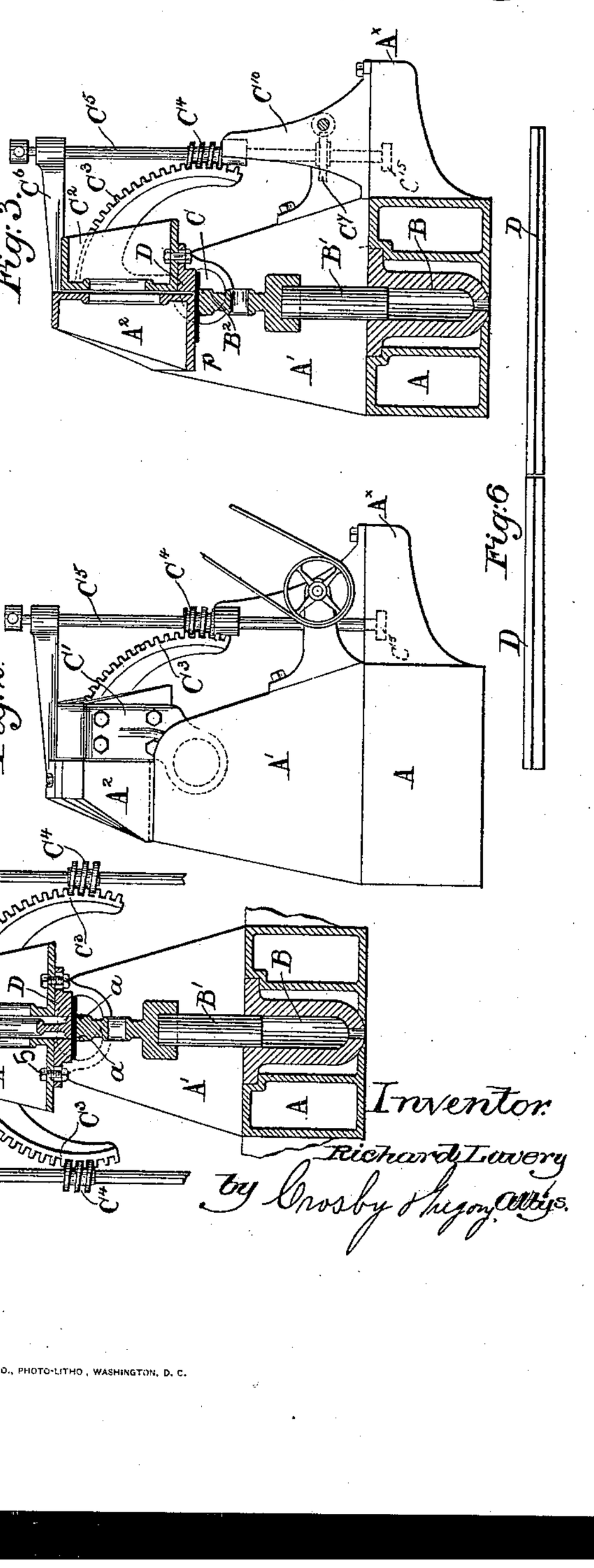
R. LAVERY.

METAL FLANGING MACHINE.

No. 450,240. Patented Apr. 14, 1891.







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UNITED STATES PATENT OFFICE.

RICHARD LAVERY, OF BOSTON, MASSACHUSETTS.

METAL-FLANGING MACHINE.

SPECIFICATION forming part of Letters Patent No. 450,240, dated April 14, 1891.

Application filed June 20, 1890. Serial No. 356,077. (No model.)

To all whom it may concern:

Be it known that I, RICHARD LAVERY, of Boston, county of Suffolk, State of Massachusetts, have invented an Improvement in Machines for Bending and Flanging Metal, of which the following description, in connection with the accompanying drawings, is a specification, like letters and figures on the drawings representing like parts.

This invention has for its object to improve machines for bending and flanging metal, and is particularly adapted to bending or shaping sheet or plate metal to form hollow-box keels for ships or girders of great length.

In machines as at present constructed for bending metal great difficulty is experienced in obtaining a true and regular curve where the metal is bent, as any weakness in the metal will cause it to bend sharply at that point, leaving a sharp and irregular curve.

In accordance with this invention the metal, which is clamped firmly in position, is acted upon by a wiper pivoted to move in the arc of a circle whose radius is identical with the radius of the curve which it is desired the outside curvature of the bend shall assume, the wiper thus positively acting upon and bending the metal at every point in the line of the curve, thus insuring a perfect uniform curve or bend.

One part of my invention in a metal-bending machine consists in the bed or frame and adjustable means carried thereby for holding the metal, combined with an adjustable wiper, the acting surface of which is adapted to be moved in the arc of a circle coincident with the desired outside curvature of the bend, substantially as will be described.

Other features of my invention will be hereinafter pointed out in the claims at the end of this specification.

Figure 1 shows in side elevation a metal-bending machine embodying this invention; Fig. 2, a left-hand end elevation of the same; Fig. 3, a vertical section taken on the dotted line $x\,x$, Fig. 1; Figs. 4 and 5, enlarged sectional details to be referred to; Fig. 6, a detail showing a modified form of wiper-block, and Fig. 7 a modification to be described.

Referring to the drawings, the bed A carries at each end the standards A′, to which is secured by bolts 2 the girder A^2, which may be of any desired form, preferably such as shown in the drawings, the bolts 2 being made sufficiently long, as shown, to permit the girder to be raised for adjustment, as will be described. The bed A is formed to receive the hydraulic or other cylinders B, fitted with plungers B′, which at their upper ends enter suitable sockets in the under side of the former B^2, movable vertically by the said plungers in the guides B^2, formed in the standards A′. The former B^2 may be of any desired shape, it being herein represented as rectangular in cross-section, with its upper or bending corner rounded off in the arc of a circle having its center at a.

The standards A′ are provided upon their inner faces with cylindrical studs or projections C, whose centers are in line or coincident with the centers a of the former B^2 referred to, the said studs having loosely mounted upon them arms C′, between which are bolted or otherwise secured a wiper C^2. The wiper C^2 is herein shown as a rocking beam provided with a detachable face D. (Shown as a block or beam.) The wiper is provided with toothed sectors C^3, meshing with the worms C^4, fast on the vertical shafts C^5, journaled at their upper ends in the brackets C^6, secured to the girder A^2, and at their lower ends in the brackets $A^\times$, preferably formed integral with the bed A, the said shafts C^5 having formed upon their lower ends collars or heads C^{15}, to restrain them from lifting, and at or near their lower ends being provided with worm-wheels C^7, in mesh with the worms C^8, fast on the horizontal shaft C^9, supported in suitable brackets or standards C^{10}, the said shaft C^9 at one end being represented as provided with a pulley C^{11}, driven by a belt. The two intermediate brackets or supports c^{10} are preferably extended up to form bearings for and to brace the worm-shafts C^5. (See Figs. 1, 2, and 3.) Rotation of the shaft C^9, acting through the intermediate worms and gears and the sectors C^3, causes the wiper to be turned down into a horizontal position, the under side face D of the wiper then describing an arc which is uniformly distant from the curved portion of the former B^2.

The face or block D may be in one or more pieces adjustably secured in place by means

of bolts 5, the said blocks acting upon the metal, as will be described. Assuming the former B^2 to be in its lowermost position with the plungers at or near the bottoms of the cylinders B, the operation of the machine will be as follows: The plate *p* of metal to be flanged is placed upon the former B, with the portion of the plate to be bent over projecting at one side thereof. Pressure being admitted to the cylinders B forces the plungers carrying the former up, clamping the metal firmly against the rigid girder A^2, as shown in Fig. 3. The shaft C^9 is now rotated, which, acting as described, turns the wiper C^2 on its pivots C down into a horizontal position, the blocks D describing an arc about the center *a* and bending or wiping the metal around in a perfect arc. After the wiper has been returned to its normal position the former may be dropped and the flanged plate removed.

In bending-machines as at present constructed the wiper, usually in the form of a large roll, engages the metal first at a point remote from where it is held or clamped with the result that the metal is liable to take a sharp bend along any line of weakness lying between the point of support and the point of contact of the wiper.

Referring to Figs. 3 and 4 it will be seen that the wiper-blocks move in the arc of a circle coincident with that in which it is desired that the bent surface of the metal will occupy, and in its movement the wiper first acts upon the metal lying in a straight line tangent to that arc, and that the unbent portion of the metal always occupies a tangential position with relation to the arc described and of the portion already bent, so that the amount of curvature which can be given to the metal between any two points can never be greater than the difference between a straight line tangent to the arc and the arc itself, which difference always remaining constant throughout the operation of bending insures a perfect and regular curve to the bend.

It is desirable to use a former the contour of which corresponds to the desired inner curvature of the bend, yet the metal may be uniformly bent without such a former, for each point in the metal is acted upon in succession and curved a certain uniform amount with relation to the previous point, thus insuring a perfect curvature. By utilizing this latter feature of the machine I am enabled to bend the metal on an irregular or curved line, which in ship construction is very desirable in shaping the metal to the lines of the ship. To accomplish this I employ wiper-blocks with irregular wiping-faces, (see Fig. 6,) the contour or periphery of the bent portion of the metal in each case corresponding to the arc described by the various points in the wiper-blocks. It is obvious that the blocks D may be made of any desired length and that one or more may be removed to thus leave portions of the metal unbent. When it is desired to bend a thicker plate—such, for instance, as shown in Fig. 5—the bolts securing the rigid girder A^2 to the standards A′ are slacked, the girder lifted by means of the hydraulic pistons, and a strip of metal 10, equal in thickness to the increased thickness of the plate to be bent, is placed under the girder when it may be again clamped firmly in place. A thinner wiper-block D is also used, (see Fig. 5,) reduced in thickness an amount equal to the increased thickness of the plate to be bent. This mode of adjustment is employed in order to keep the relative positions between the former and the center of rotation of the wiper the same, so that the wiper-blocks may always describe a true arc starting from a tangential point.

In order to bend the metal upon both sides of the former at once to form a U-shaped section, I construct a machine, as shown in Fig. 7, wherein two wipers are employed, one upon each side of the rigid girder A^2 and moving in opposite directions, one of the girders being pivoted on the outside of the standards A′, as represented. By dropping the wiper-blocks and the girder A^2 down to the center of rotation *a* and substituting for the former B^2 shown a former of suitable shape, a perfectly-square corner may be turned, which is impossible with any machine at present constructed.

I do not desire to limit myself to the precise construction shown, as it is evident the same may be varied without departing from the scope of this invention.

I claim—

1. In a metal-bending machine, a bed, standards thereon provided with pivots, a girder supported by said standards, and means to clamp the metal against said girder, combined with a girder or wiper supported at its ends on the said pivots, about which it is adapted to swing, to operate substantially as described.

2. In a metal-bending machine, the bed A, standards A′, having pivots C, the girder A^2, carried by said standards, means whereby the distance between the said pivots and girder may be varied, and the girder B^2, combined with a wiper hinged on the said pivots and provided with a removable face or block, whereby the arc through which the acting surface of said face or block moves may be varied, substantially as described.

3. In a metal-bending machine, the bed A, standards A, and girder A^2 carried thereby, combined with the girder B^2, cylinders B, having plungers B′ to operate said girder B^2 to clamp the metal, and a wiper pivoted to move in the arc of a circle coincident with the desired outside curvature of the bend, substantially as described.

4. In a metal-bending machine, the bed A, the standards A′, and the girder A^2, adjustably carried thereby, and means for clamping the metal against the said girder, combined with a wiper C^2 and the wiper-blocks

D, secured thereto, having a face adapted to move in the arc of a circle coincident with the desired outside curvature of the bend, substantially as described.

5. In a metal-bending machine, the bed A, standards A′ thereon, having pivots C, the girder A^2, supported by the said standards, strips 10 between the said standards and girder, and the bolts 2, combined with the wiper C^2, hinged on the pivots C and provided with the removable wiper face or block D, all to operate substantially as described.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

RICHARD LAVERY.

Witnesses:
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EMMA J. BENNETT.