C. H. Delamater,

Bending Metal Plates,

No. 39,382. Patented Aug. 4, 1863.

Fig 3

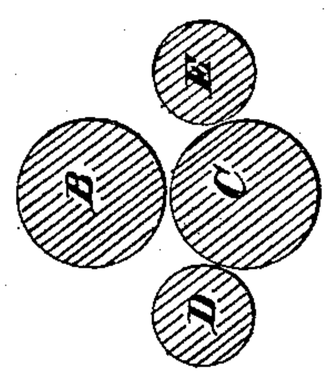


Fig 2.

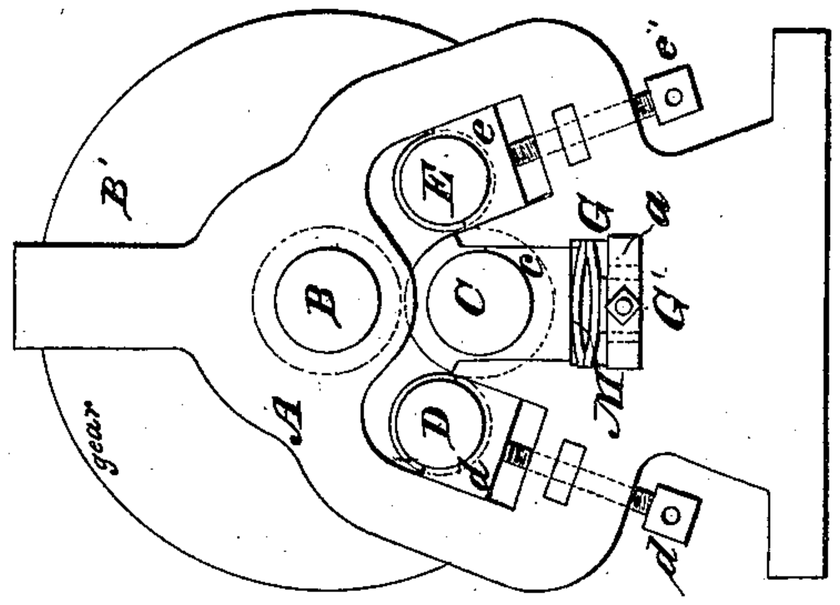
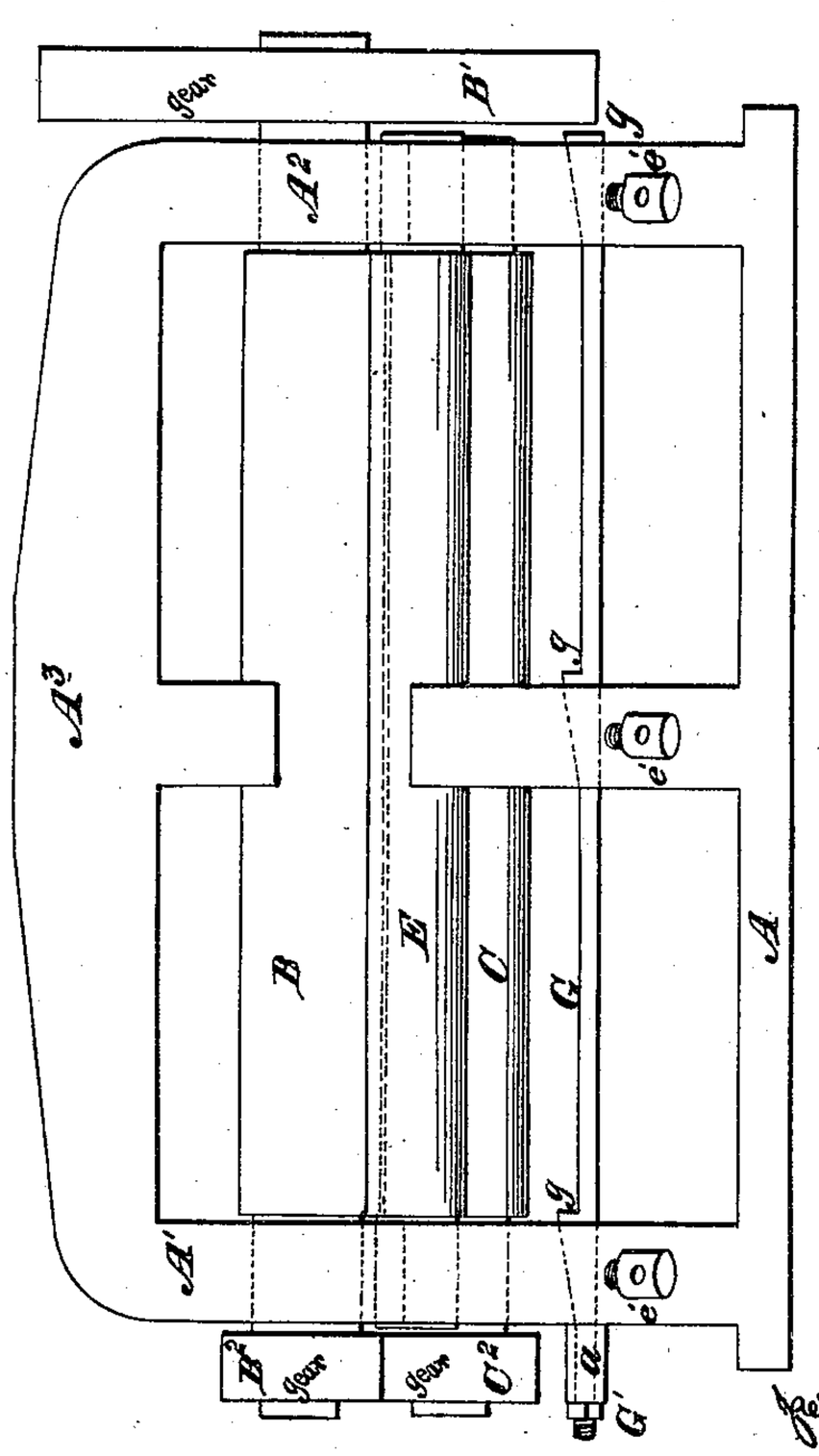


Fig 1



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UNITED STATES PATENT OFFICE.

CORNELIUS H. DE LAMATER, OF NEW YORK, N. Y.

IMPROVEMENT IN MACHINES FOR BENDING METALS.

Specification forming part of Letters Patent No. **39,382,** dated August 4, 1863.

To all whom it may concern:

Be it known that I, CORNELIUS H. DE LAMATER, of the city of New York, in the county and State of New York, have invented a certain new and useful improvement in bending-machines, intended more especially for bending the thick iron plates employed in the construction of iron vessels, but useful also for bending iron for the manufacture of steam-boilers and for other purposes; and I do hereby declare that the following is a full and exact description of the same, which is prepared with a view to the obtaining of Letters Patent therefor.

The accompanying drawings form a part of this specification. In these drawings, different tints indicate different parts without reference to the material used.

Figure 1 is a side elevation showing the entire novel parts of my machine with so much of the driving-gear as is necessary to understand it. Fig. 2 is an end elevation of the same. Fig. 3 is a cross-section through the rolls.

Similar letters of reference indicate corresponding parts in all the figures.

The bending-machines in common use, composed of three rolls with suitable means of adjusting and supporting them, fail to bend the sheets properly near their ends. My invention overcomes this difficulty and bends the entire sheet from one end to the other.

To enable others skilled in the art to make and use my invention, I will proceed to describe its construction and operation by the aid of the drawings, and of the letters of reference marked thereon.

A A′ A² is a stout framing of cast-iron. B, C, D, and E are stout rolls of the same material, smoothly finished and supported in the framing in the manner represented. B is mounted in fixed bearings. C is mounted directly beneath B in boxes, which rest on stout springs M. By the yielding of these springs the boxes *c*, which support the bearings of the roll C, may sink slightly to accommodate the machine to a thicker part or bunch which may chance to exist in the iron which is being bent.

G is a rod, mounted horizontally in the framing beneath and parallel to the lower roll, C. It is adapted to move longitudinally in the framing, and is formed with wedge-shaped surfaces *g*, working in contact with the under sides of the springs M, so that by moving the rod G in one direction the springs M will be all uniformly elevated, and by moving G in the opposite direction the springs M will all be allowed to sink uniformly. A strap, *a*, fixed on the outer face of the upright part A of the framing receives the outer projecting end of the rod G, and a nut, G′, threaded upon such end in the manner represented, allows the position of the rod G and the elevation of the boxes *c c*, &c., to be controlled very accurately by turning the nut.

In the use of the machine the rod G is moved and adjusted in such position that the space between the roll B and the roll C is a very little less than the thickness of the iron plate which is to be bent when the springs M are not compressed. The yielding of the springs M allows the iron to enter, and a further yielding allows any irregularities in the thickness of the plates without breaking the machine; but the tension of the spring is such that the plate is pressed very tightly between these two rolls at every point from one extreme to the other.

D and E are side rolls, mounted, as represented, in boxes *d d* and *e e*, the position of which may be controlled by the stout screws *d′ e′*. To prepare the machine for use, these rolls are elevated either at the commencement or as the work proceeds, the extent of the elevation depending on the curvature required to be given to the plate. If the plate is to be bent so as to form a portion of a cylinder, as is usually required in boiler-work, the two ends of each roll are elevated alike. If, on the contrary, the plate is to be bent so as to form a portion of the surface of a cone, or if the plate is to be twisted in any manner, the ends of the rolls D and E may be raised unevenly, or one end of each roll more than the other.

My machine is adapted by well-known means (not represented) for running in either direction at will, and for changing with facility from one direction to the other. I prefer to do this by the use of belts with fast and loose pulleys, the belts being controlled by a convenient shifter or shipper, and giving motion to a small pinion, (not represented,) which gears into the large spur-gear wheel B′, keyed on one end of the roll B. The other end of the roll B carries a smaller spur-gear, B², which gears into

a similar gear, C^2, keyed on the corresponding end of the roll C. The rolls B and C are thus driven slowly in either direction at will, and the plate is thus passed backward and forward between them, touching all the time one or both the side rolls, D E, until it is properly bent. The side rolls, D E, may be driven by gears, if desired, but I do not find it necessary.

I have represented all the rolls B, C, D, and E as supported each in three bearings—to wit, at or near each end and at the middle. It is evident that a less number—that is to say, one at each end—might suffice for each of these rolls, and especially for the side rolls, D and E, on which the strain is less than on the rolls B and C; and, also, that a greater number of bearings may be employed, if desired, especially for the rolls B and C. I propose to employ any number of bearings which shall be found most expedient in any given machine, in order most satisfactorily to perform the work for which it is intended; but in all cases I arrange them as represented, so as to realize the advantages due to the peculiarities described.

In order to support one or more bearings along the middle of the upper roll, B, a very stout beam, A^3, may be bolted upon A' and A^2, in the manner represented.

One or more anti-friction rolls, arranged in any approved manner, may be substituted in place of ordinary boxes to support the several rolls along the working part of their length. These will allow of a very efficient bearing at these points, and allow the friction to be borne on well-lubricated surfaces without danger of the oil coming in contact with the plate which is being bent.

In order to compensate for partial failures or changes in the tension in one or more of the springs M, so that its base should be elevated more than the base of the other or others, I can make the wedge-surfaces, *g g* adjustable on the rod G. I have not represented any means of effecting this, but it is a matter easy of accomplishment by any good mechanic, the end desired being to so change the position of the wedge that in a given position of the rod G the weak spring shall be held higher than the strong spring or springs, in order that all may support the roll C equally.

It is evident that I can, if preferred, dispense with the advantage due to the single adjustment of the whole by means of the rod G, and can raise and lower each spring M by an entirely independent wedge or screw.

I find in practice that it is difficult to introduce thick iron into the machine when the rolls are all in the proper position to effect the bending. I usually operate by introducing the first edge of the plate while the roll D over which it is passed is low, and afterward turn the screws *d' d' d'* and elevate the roll D to its proper position. In such case I roll the plate forward and backward one or more times, and effect the complete bending of the first edge, not on its introduction into the machine, but at a subsequent period, usually on its coming out of the machine, taking care in all such cases to bring the plate out on the same side of the machine on which it entered.

Some of the advantages due to different features of my invention may be separately enumerated as follows:

First. By my four rolls B, C, D, and E, arranged as represented, the rolls B and C pressing very firmly upon the opposite faces of the plate at points directly opposite each to the other, and with sufficient force to effect the bending of the plate, and the rolls D and E being arranged to control the extent of the bending as they are elevated and depressed, I am able to bend each plate quite to the end, instead of leaving a portion at each end to be bent by hand. If a plate is rolled through and bent at a single operation, entering on the left-hand side, the roll D controls the position of the plate while the rolls B and C bend the first edge; then the rolls D and E are both more or less effective while the rolls B and C bend the middle portion of the plate; and, finally, the roll E controls the position of the plate while the rolls B and C bend the last edge, and all is uniformly bent from the first to the last edge. Ordinary bending-machines, on the contrary, cannot bend the plate at the first edge, because the bending does not commence until all the rolls are in contact with the plate, and then the bending commences at the point which is in contact with the middle roll. Neither can they bend the plate at the last edge, because the bending ceases when the plate ceases to touch all the rolls, and then it is found that the bending action has been continued only to the point which was then under the middle roll. Ordinary bending-machines have been adapted to traverse the plate backward and forward, so as to bend the plate to the proper curvature by several operations instead of by one operation, being in this respect analogous to mine, but no amount of such management could cause an ordinary machine to bend the plate to its ends. My machine alone can effect that.

Second. By my rod G and wedge-formed parts *g*, arranged as represented relatively to the several bearings of the roll C, I am able by a single adjustment to raise uniformly all the springs M, and consequently all the boxes *c* and all the bearings of the roll C, so as to tend to hold the latter strictly parallel to the roll D in accommodating the machine to various thicknesses of iron. This saves labor in adjusting the bearings, and insures that all the bearings—the middle one or ones, as well as the end—are supported in the right positions to bite evenly and to bend uniformly the entire breadth of the plate.

Having now fully described my invention, what I claim as new therein, and desire to secure by Letters Patent, is—

1. In machines for bending metal, the arrangement of the rolls B, C, D, and E, and

of suitable means of adjusting the same, substantially as and for the purpose herein set forth.

2. In machines for bending metal, containing four rolls, arranged substantially as hereinabove described, the employment of the rod G, with its several wedge-formed portions *g g*, adapted to act uniformly on the several bearings of the lower bending-roll, C, by a single adjustment, in the manner and with the advantages herein set forth.

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Witnesses:

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