(No Model.) 2 Sheets—Sheet 1.

G. H. CORLISS, Dec'd.

E. A. Corliss, Administratrix.

MACHINE FOR FINISHING SIDE FLANGES OF CYLINDERS OF STEAM ENGINES.

No. 450,399. Patented Apr. 14, 1891.

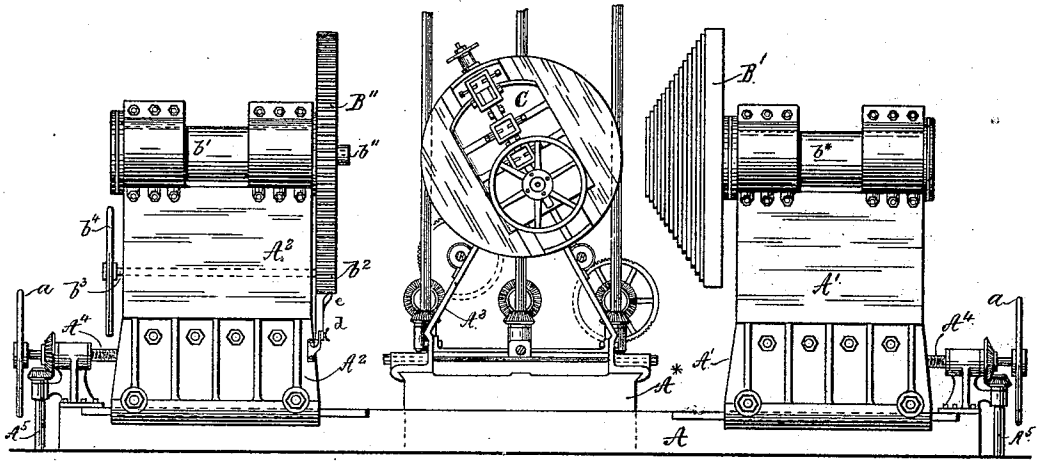


Fig. 1.

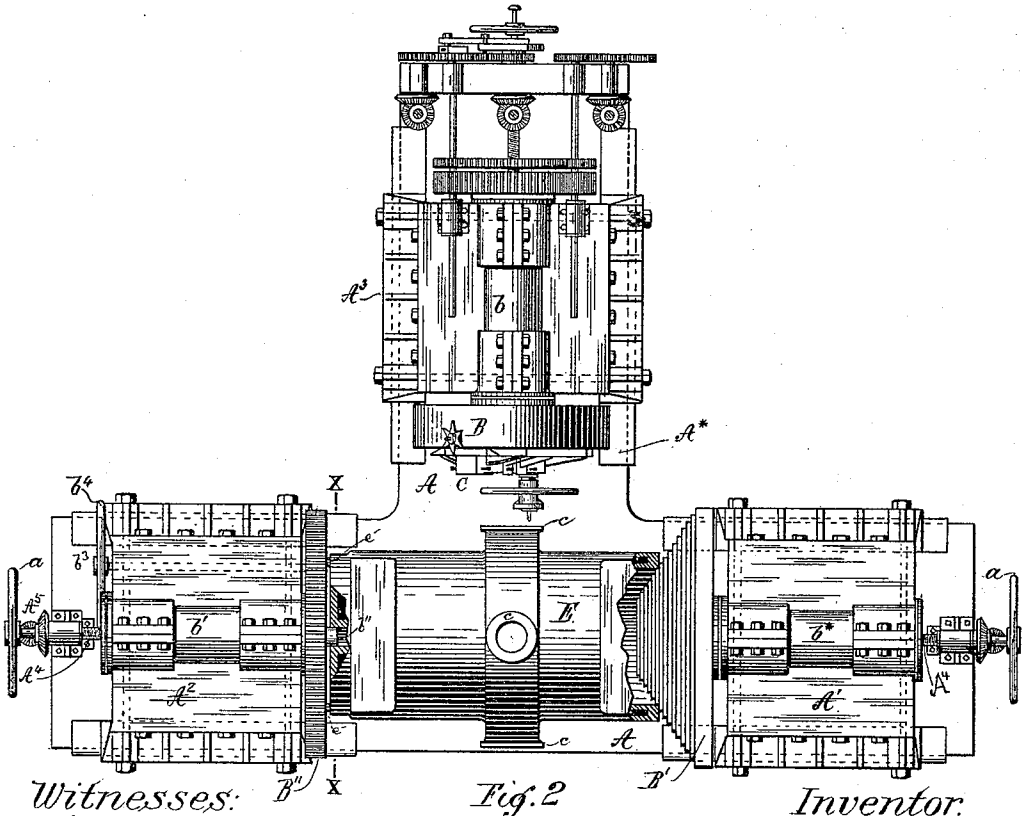


Fig. 2

Witnesses:
Henry Marsh Jr.
Maria L. Corliss

Inventor:
Emily A Corliss
Administratrix of the Estate of
George H. Corliss

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

(No Model.) 2 Sheets—Sheet 2.

G. H. CORLISS, Dec'd.

E. A. CORLISS, Administratrix.

MACHINE FOR FINISHING SIDE FLANGES OF CYLINDERS OF STEAM ENGINES.

No. 450,399. Patented Apr. 14, 1891.

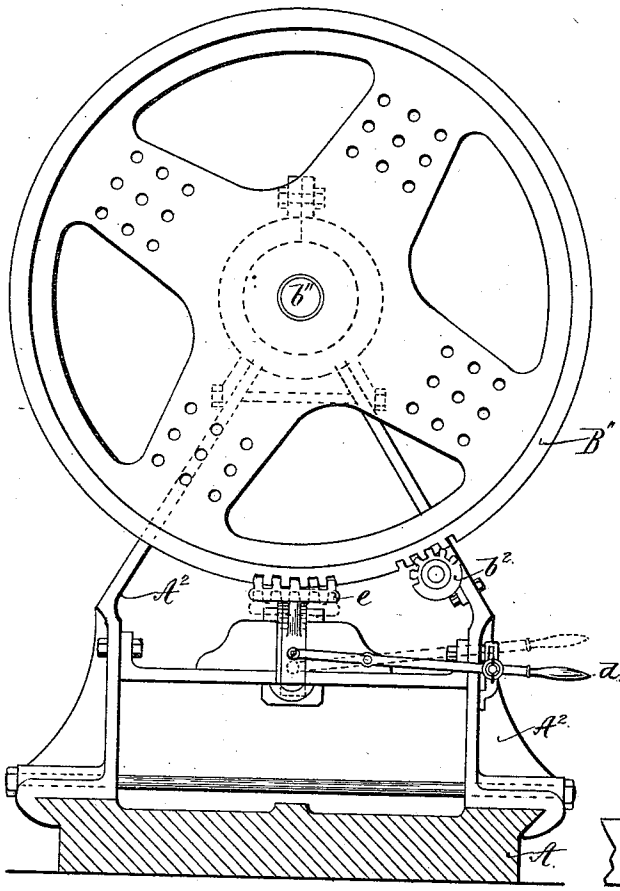


Fig. 3

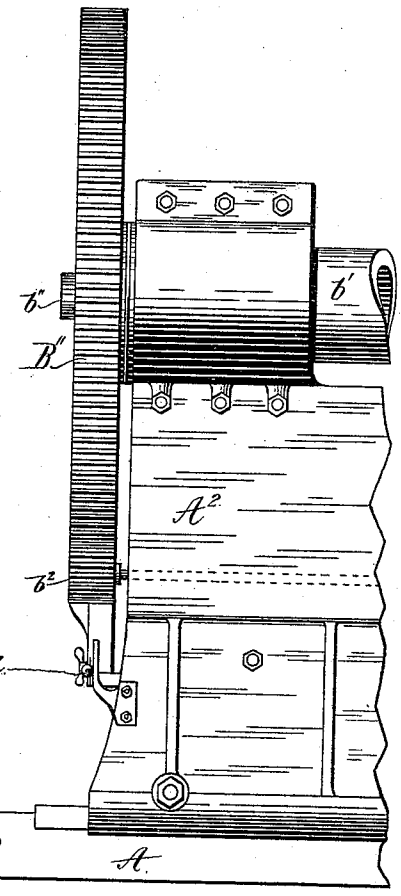


Fig. 4

Witnesses:
Henry Marshall Jr.
Maria L. Corliss

Inventor:
Emily A. Corliss,
Administratrix of the Estate of
George H. Corliss.

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

UNITED STATES PATENT OFFICE.

EMILY A. CORLISS, OF PROVIDENCE, RHODE ISLAND, ADMINISTRATRIX OF GEORGE H. CORLISS, DECEASED.

MACHINE FOR FINISHING SIDE FLANGES OF CYLINDERS OF STEAM-ENGINES.

SPECIFICATION forming part of Letters Patent No. 450,399, dated April 14, 1891.

Application filed December 18, 1889. Renewed November 6, 1890. Serial No. 370,450. (No model.)

To all whom it may concern:

Be it known that GEORGE H. CORLISS, deceased, late a citizen of the United States, and a resident of the city and county of Providence, in the State of Rhode Island, (represented by EMILY A. CORLISS, administratrix,) invented a new and useful Machine for Finishing the Side Flanges of Cylinders of Steam-Engines, of which the following is a specification.

In the jacketed cylinder as constructed by Mr. CORLISS there is an expansion-section or annular ring extending entirely around the waist or mid-length of the cylinder and forming an integral part of the same. Upon this expansion-ring are cast four equal and equidistant nozzles or "cylinder side flanges," as they are termed, which serve several important uses after the cylinder is finished, one of which is to support the center of the wrist-lever, which operates the valves; another is to support the bracket carrying the cylinder-relief, invented and patented by Mr. CORLISS, and either of the remaining two are to be used to admit steam through the top or bottom of the jacket on its way to the piston-chamber. When an engine receives the steam from below, as in some forms of compound, the bottom "side flange" is utilized for that purpose. Usually the engine receives the steam through the top side flange. When the engine is set what is termed "left-handed" the wrist-lever center is on the opposite side from that when it is set right-handed. All four of these side flanges are to be faced, drilled, and tapped, and those two of them on the same sides of the cylinder as the ends of the valve-boxes are also counterbored, and thereby made to serve to center the wrist-lever. There are therefore three or more separate and distinct operations to be performed upon each side flange, not counting the repetitions of certain of them.

Prior to the present invention of Mr. CORLISS he had, in finishing the side flanges of cylinders of steam-engines, employed two separate machines—namely, the well-known planer for facing the side flange, and the ordinary drilling-machine for drilling the bolt-holes in the flange, the bolt-holes being afterward tapped. These operations necessitated moving the heavy cylinders from one machine to the other; and since it is absolutely necessary to have the plane of the side flanges parallel with the center line of the cylinder, such changes from one machine to another were found not only to be a slow and inconvenient method of working, but also to result often in inaccuracy, which caused further inconvenience and delay; and the tapping of the bolt-holes by hand was another source of inaccuracy and inconvenience.

The purposes of the present invention are threefold—namely, first, to provide a machine which, with a single setting of the cylinder, will perform with accuracy and precision the several successive operations of facing, counterboring, drilling, and tapping the side flanges; second, to provide means for adjusting such machine for operation upon cylinders of different sizes; and, third, to insure interchangeability of all cylinders of the same size, so far as the finishing of the side flanges will effect it. These purposes are accomplished by the special mechanisms hereinafter described.

In the accompanying drawings, Figure 1 is an elevation of the entire machine. Fig. 2 is a top plan of same, with a cylinder in position, portions of each end of the latter being broken away to show the manner of supporting it in the machine. Fig. 3 is an end elevation of a part of the machine, the bed being shown in section on line $x\,x$ of Fig. 2. Fig. 4 is a side elevation of the same portion of the machine.

Similar letters of reference indicate like parts where they occur in the drawings.

A A* represent the stationary bed of the machine, the part A* being located mid-length of the part A, with its center line at right angles to the center line of the latter. Housings A′ A^2 are gibbed upon the part A of the bed in line with each other, and are movable longitudinally thereon for purposes of adjustment either by power conveyed to the traversing-screws A^4 through bevel-gears connecting with the upright driving-shafts A^5, or by hand by means of the hand-wheels a, keyed or otherwise secured upon the outer ends of the traversing screws, the automatic feed being disconnected by slipping a belt

upon a loose pulley (not shown) and thus liberating the shaft A^5. A shaft b^*, having its bearings in the housing A', carries a jig B', which is provided with a concentric series of projections or steps, each step corresponding in diameter with a standard diameter of cylinder. This jig from its form may be termed a "step-cone."

The shaft b', having its bearings in the housing A^2, carries a jig, which may be termed a "trunnion" or "axial pivot" b''. The gear B'', keyed upon the shaft b', has holes arranged in concentric circles in its arms or spokes, which afford means of bolting one end of the cylinder firmly to the gear. Said gear meshes with a pinion b^2, operated by the shaft b^3 and hand-wheel b^4 to revolve the head B'' and thereby revolve the cylinder upon its axial pivots b'' and B'. When the cylinder has been revolved to bring another side flange into the proper position to be finished in this machine, a toothed pawl e, operated by a hand-lever d, meshes with the gear B'' and thereby holds the cylinder immovable.

The housing A^3, head B, tool-carriage C, and all their connections and operating mechanisms for driving the several tools and for securing radial and endwise feed of such of them as require it are similar in all respects to the same parts which are more fully described in another application for Letters Patent of even date herewith, December 16, 1889, Serial No. 334,157. The head B, it will be observed, is set with its axial line at right angles to the axial line of the jigs B' B'', and its housing A^3 is movable longitudinally along the part A* of the bed, and thereby brings the head B nearer to or farther from the axial line of the jigs, according as a larger or small cylinder is to be operated upon.

The shaft b^*, carrying the conical jig B', revolves freely in its bearings in the housing A' whenever the shaft b' is revolved by means of the hand-wheel b^4. When the shaft b' is held stationary by the action of the dog e and the cylinder suspended between the jigs, the shaft b^* is also stationary.

In practical operation of this invention the housings A' A^2 are by their respective traversing screws A^4 moved along the bed A and made to approach or recede from each other to accommodate the length of the cylinder about to be operated upon. The cylinder E is then lifted upon the machine and the housings A' A^2 moved toward each other until the pivot b'' engages the bore in the "closed" end of the cylinder and the appropriate step of the jig B' engages the counterbore in the open end of the cylinder. Bolts e' e' are inserted through the proper holes in the arms of the gear B'' and into stud-holes in the end of the cylinder, which cylinder, with its attached gear B'', is then turned to bring one of the side flanges c into the proper position before the finishing-tools carried on the head B. The cylinder is then held firmly in the correct position by the dog e, operated by the hand-lever d to mesh with the gear B''. The head B is adjusted by moving its housing A^3 backward or forward upon the bed A* to accommodate the diameter of the cylinder. Power is then applied to operate successively the facing, counterboring, drilling, and tapping tools carried on the head B, as more fully described in the application for Letters Patent, Serial No. 334,157. After that side flange has been finished, the pawl is released by raising the hand-lever d, and the cylinder partially revolved, as already described, to bring the next side flange into position before the tools. The lever d is then depressed and secured, and this side flange is finished. This is repeated until all four of the side flanges have been treated.

By the use of this invention it has been demonstrated that the side flanges are made parallel with the center line of the cylinder, and that the counterbore and the stud-holes in the side flanges are at right angles to said center line, and that all cylinders of the same size finished in this machine are interchangeable so far as the operations upon the side flanges are concerned, and also that a single setting of the cylinder suffices for the completion of all the operations upon the four side flanges.

I claim as the invention of the said GEORGE H. CORLISS and desire to secure by Letters Patent—

1. In a machine for finishing the side flanges of steam-engine cylinders and for analogous purposes, the step-cone jig B', shaft b^*, housing A', and means for moving the whole longitudinally, the pivot b'', shaft b', housing A^2, and means for moving the same longitudinally, said jigs being arranged with their axes in the same line, all combined with each other and with a head B, arranged with its axial line at right angles to the axial line of said jigs and carrying a radially-movable tool-carriage equipped with tools for facing, counterboring, drilling, and tapping, means for operating said tools successively, a shaft b, housing A^3, and means for moving the whole longitudinally, all arranged for joint operation and adapted to serve, as specified, to finish the side flanges of a steam-engine cylinder with a single setting of the latter.

2. The combination and arrangement of the step-cone jig B', shaft b^*, housing A', traversing screw A^4, bevel-gears, and vertical driving-shaft A^5, whereby automatic longitudinal movement of the jig and its connections is secured.

3. The combination and arrangement of the step-cone jig B', shaft b^*, housing A', traversing screw A^4, power-shaft A^5, with provisions for connecting and disconnecting it at will, and hand-wheel a for longitudinally moving the jig and its connections at will, all substantially as herein specified.

4. The pivot b'', shaft b', housing A^2, in combination with each other and with the

traversing screw A^4, and upright shaft A^5, connected thereto by bevel-gears, all arranged as shown, and adapted to serve, as specified, to move said jig and its connections, substantially as described, automatically, substantially as described.

5. The combination and arrangement of the pivot b'', shaft b', housing A^2, traversing screw A^4, hand-wheels a, all adapted to serve, as specified, to move the jig and its connections longitudinally at will, substantially as described.

6. The gear B″, provided with concentric series of holes in its arms or spokes, and the pivot b'' and shaft b', combined with each other, and means, as the pinion b^2, shaft b^3, and hand-wheel b^4, for rotating said gear and its connections to revolve the cylinder.

7. The gear-wheel B″, having a concentric series of holes and provided with means for engaging with a cylinder, and the dog *e*, and lever *d*, combined with each other and with provisions for treating the cylinder side flanges, as herein specified.

In testimony whereof I have hereunto subscribed my name in presence of two witnesses.

EMILY A. CORLISS,
Administratrix of the estate of George H. Corliss, deceased.

Witnesses:
HENRY MARSH, Jr.,
MARIA L. CORLISS.