L. CAMPBELL & J. F. RICHARDS.
Flanging-Machine.

No. 201,325. **Patented March 19, 1878.**

Fig. 1.

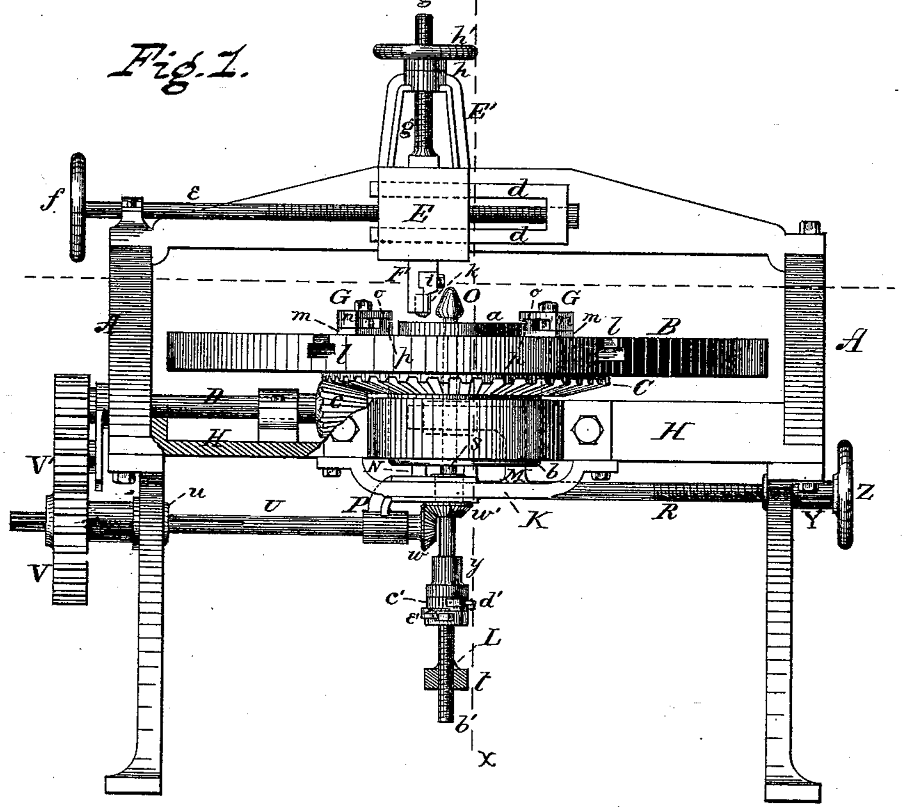
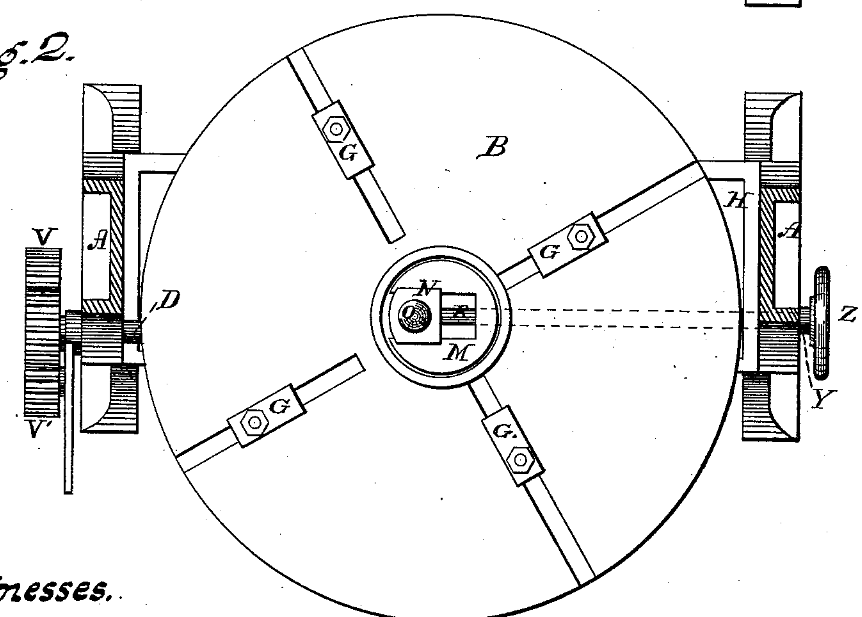


Fig. 2.



Witnesses.

F. A. Pollock,
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Loudon Campbell
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2 Sheets—Sheet 2.

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Fig. 3.

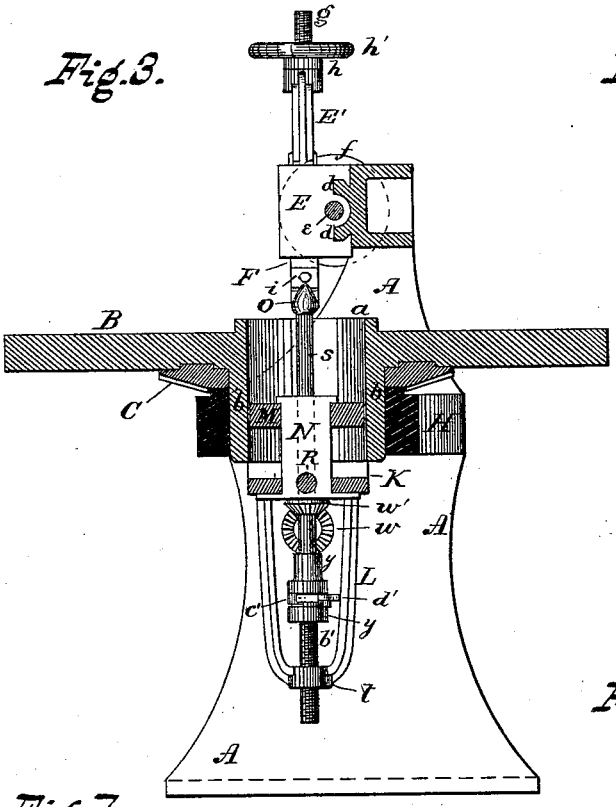


Fig. 4.

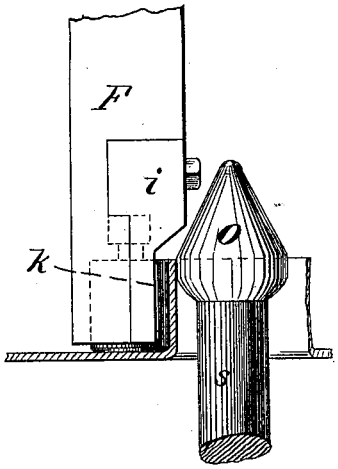


Fig. 5.

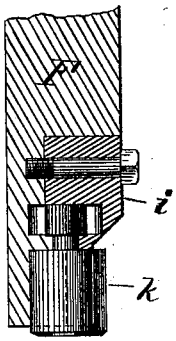


Fig. 6.

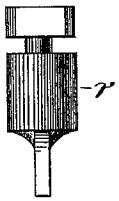


Fig. 7.

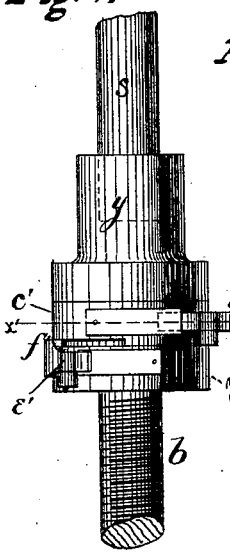


Fig. 8.

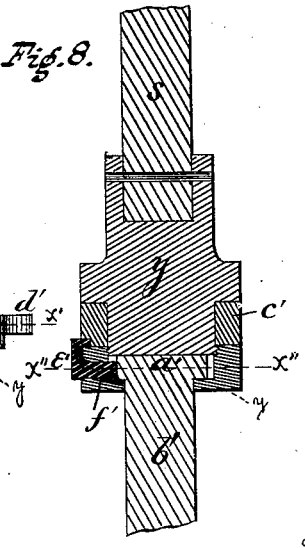


Fig. 9

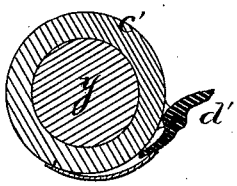
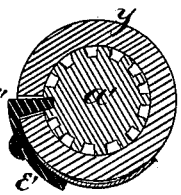


Fig. 10.



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UNITED STATES PATENT OFFICE.

LOUDON CAMPBELL AND JAMES F. RICHARDS, OF PITTSBURG, PENNSYLVANIA, ASSIGNORS OF ONE-THIRD THEIR RIGHT TO WILLIAM M. REES, OF SAME PLACE.

IMPROVEMENT IN FLANGING-MACHINES.

Specification forming part of Letters Patent No. **201,325**, dated March 19, 1878; application filed July 13, 1877.

To all whom it may concern:

Be it known that we, LOUDON CAMPBELL and JAMES F. RICHARDS, of Pittsburg, in the county of Allegheny and State of Pennsylvania, have invented certain new and useful Improvements in Flanging-Machines; and we do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it pertains to make and use it, reference being had to the accompanying drawings, which form part of this specification, in which—

Figure 1 is a front elevation, partly broken to show interior. Fig. 2 is a plan section; Fig. 3, a vertical transverse section on line *x x* of Fig. 1. Fig. 4 is a detail, showing relation of former and tool to the boiler-head. Fig. 5 is a section of tool-carrier; Fig. 6, the cutter; Fig. 7, a detail of the feed; Fig. 8, a section of same; Fig. 9, a section on line *x' x'* of Fig. 7; Fig. 10, a section on line *x'' x''* of Fig. 8.

This invention relates to machines for forming inside flanges on boiler-heads and similar articles; and consists in the construction, combination, and arrangement of parts, substantially as hereinafter fully described and claimed.

The machine has two functions, being intended to first cut the flue-openings in the head, and then to bend up the flange after a simple change of one part of the machine, and has adjustments provided whereby on the one machine every variety of size of head, size of flue-opening, relative position, number, and depth of flange may be readily and quickly accommodated.

Mounted in a massive frame, A, and rotating horizontally, is a heavy circular table, B, having a hollow hub, projecting above, as a reenforcement, *a*, and underneath as a sleeve, *b*, which serves as a journal for the table. On its under face the table is fitted with a ring bevel-wheel, C, into which meshes a small bevel-pinion, *c*, fixed on a horizontal shaft, D, which projects laterally through frame A, and receives motion from the engine, thus slowly revolving the table B. The two sides of frame A are connected above by a cross-bar, on which is constructed a horizontal slideway, *d*, on which reciprocates a head-block, E, operated back and forth, at will, by means of a screw, *e*, taking into a threaded lug on the head-block, between the slides. The screw *e* is turned by a hand-wheel, *f*, at one side of the frame. Turning the hand-wheel *f* causes the movement of the head-block. A vertical tool-carrier, F, works up and down in this head-block by means of its threaded shank *g*, which passes through a sleeve-nut, *h*, operated by a hand-wheel, *h'*, in the arch E' of the head-block as a bearing. At the lower end of carrier F is a detachable block, *i*, and in the opposing faces of the carrier and block is constructed a seat for a small vertical roller, *k*, which has a collar at its upper end, playing in a groove in the carrier and block, to prevent longitudinal play. The block *i* has its outer face cut away, to permit the protrusion of the periphery of roller *k*, which also projects below the carrier and block, and has its lower end convex or rounded off slightly. Recesses are cut in the groove of carrier and block, to receive the elongated head of a cutting-tool, *r*, so as to prevent it from turning when in use.

By this construction, we may use either the cutter or roller, according to whether the head is to be cut or flanged. The change is readily effected, as will be seen.

The upper face of table B has a number of radial grooves, *l*, (we prefer four,) and in these grooves slide the adjustable dogs G, which are constructed as follows: Each is in two parts—the slide *m* and the clamp *n*. The slide is fitted to the groove of the table, and is provided with a shoulder, *o*, and a groove, *p*, cut down into the upper face of slide *m*. If a plain head is to be operated upon, it is clamped with its edges against the shoulders *o;* and if the head has been already flanged on its periphery, it is set with its flange resting in the grooves *p*, in both cases being held firmly by the clamps *n*.

The bed H supports the remaining devices. Bolted to it underneath is a slideway, K, having an upward extension entering the hub,

and forming the upper slideway M, both horizontal. A vertical head, N, long enough to embrace both slides, is fitted to them so as to slide horizontally, and is bored out in the middle for the passage of a vertical shaft, *s*, carrying at its upper end a former, O, of conical outline, or pear-shaped. Forming a part of the sliding head N is a bracket, L, or inverted arch, at whose lowest point is a threaded bearing, *t*. A lateral bracket, P, also forming a part of the sliding head N, extends out as a bearing for a horizontal shaft, U, which passes through a rotating sleeve, *u*, set in frame A, and having on its outer end a gear, V, which is given motion by an idler, V′, in gear with a pinion on the main shaft D. As shaft U must be capable of longitudinal movement, it is grooved, and a pin in the sleeve and gear permits its longitudinal movement without interfering with its rotation. On the inner end of this shaft is a miter-gear, *w*, which meshes with a miter-gear, *w′*, which is journaled in the sliding head N, and the shaft *s* is rotated by it by means of a pin and groove, so that the former O shall be rotated while capable of free up-and-down motion. This up-and-down feed is accomplished in a novel way. The lower end of shaft *s* is firmly fixed in a sleeve, *y*, which is in two parts, and has a circumferential groove. (See Figs. 7, 8, 9, and 10.) The two parts of sleeve *y* are screwed together, and the lower one is recessed for the reception of the toothed head *a′* of a screw, *b′*, which passes downwardly through the sleeve, and takes into the threaded bearing *t* on the suspended arch L.

Previous to joining the two sections of the sleeve, and after inserting the head of the screw, a loose collar, *c′*, is placed in the groove of the sleeve, having a portion of the lower edge of its periphery cut to a smaller diameter. Pivoted to a lug on the collar *c′* is a spring-dog, *d′*, so arranged that, going one way, the dog yields to pressure, and the sleeve carries the collar with it by friction; but in the opposite direction, the dog catches against the arch L, and the collar becomes stationary, the sleeve *y* revolving. On the lower part of the sleeve *y* is pivoted another spring-dog, *e′*, having its end *f′* projecting above into the groove formed by cutting away the edge of the collar *c′*, and also projecting through an opening into the sleeve *y*, (lower section,) and so pressed by the spring that when opposite a notch in the screw-head *a′*, it at once flies in and engages it, so that, when thus engaged, the screw must revolve with the sleeve. It is disengaged by the action of the upward projection of the dog *e′* on the periphery of collar *c′*.

So long as the uncut portion is facing the dog, its end *f′* is held out of contact with the notched head; but when the cut-away portion is opposite, it allows the end *f′* to fly into the notches and engage the screw. The dog *d′* is so arranged as to slip past the arch when the screw is descending, causing a rapid and uninterrupted withdrawal of the former from its work; but when the screw is turning to ascend, the collar is held stationary by the contact of the dog *d′* and the arch, and its peripheral formation causes the dog *e′* to alternately engage and disengage the notched head *a′* of the screw *b′*, thus effecting an alternate motion and rest of the screw *b′*, which gives a gradual or rather intermittent feed to the former O.

The former and all its connections are adjusted horizontally by means of a screw, R, which is attached to the sliding head N, and passes out laterally through a threaded sleeve, Y, set in the frame A, and attached to a hand-wheel, Z; or the hand-wheel shaft may be arranged on the cross-head to pass vertically to a beveled gear, thus placing the adjustment nearer the work.

From the foregoing, it will be seen that the machine is so constructed that while the table is revolving the tool-carrier and the former can be fed up and down and from side to side, and also while the former itself is revolving.

The mere shape of the former may be altered as found best suited to the character of the work to be done; but it must be smallest at its upper end, or pear-shaped, so as to give the flanging tendency to the plate under operation.

The machine may be used exclusively for flanging, or for cutting and flanging.

The operations are as follows: In a boiler-head of the usual form two flue-openings must be cut and flanged. As these flue-openings have the same eccentricity relatively to the center of the boiler-head, having once adjusted the head properly in the dogs after completing one opening, no readjustment is required except that of the head, as we have only to slacken the clamps *n* and rotate the head till it is in position for the second opening to be made, then tighten the clamps. Having the size and position of the openings, the head is laid on the re-enforcement *a*, with the center of the desired opening in line with the center of the table, after which the dogs are pushed up till the shoulders *o* tightly press its edge; then the clamps are screwed down on it; then the cutting-tool, Fig. 6, is fitted into carrier F, and motion given the main shaft D, first disconnecting the idler V′. This causes table B to revolve (the former O not moving) and carry with it the boiler-head. The hand-wheel *f* is then turned till the tool is above the line of the desired cut, when it is lowered to its work by hand-wheel *h′*, and fed down gradually till the cut is finished. The piece cut out is removed, the cutter replaced by the vertical roller *k*, the carrier withdrawn horizontally till the proper depth for the flange is left free, then lowered till its end presses firmly upon the face of the boiler-head. In this position the head cannot "buckle" or bag, being supported above and below. Then the former O is adjusted to such position that, rising therefrom in a vertical line, when at its highest reach the space between its periphery at the longest diameter and that of roller *k* will be equal to the thickness

of the boiler-head. Then the idler V′ is shipped into gear with main pinion and gear V, and the operation of flanging begins. The table B revolves slowly, and the former revolves at such a rate that the edge of the opening in the head and the former shall travel at about the same speed and in the same direction, so as to prevent all "riding" or grinding of surfaces. As the former rotates, it is fed gradually upward automatically, bending the edge of the flue-opening gradually, till the former has reached its limit of travel, having brought the edge to a vertical line, producing a perfect flange at right angles to the surface of the boiler-head. Motion is now reversed till the former is withdrawn, the tool-carrier and clamps slightly relieved. Then the boiler-head is rotated till center of the desired second flue-opening coincides with that of the revolving table, the clamps tightened, the cutter inserted, and the foregoing operations are repeated; or the two holes may first be cut, and afterward flanged, requiring but one change of tool, but at the same time four changes of the boiler-head.

The adjustments provided permit any size of boiler-head, any size or eccentricity of flue-hole, or any depth or angle of flange to be accurately and easily worked, without any possibility of error. The changes required are easily and readily made.

Any of the ordinary expedients for engaging or disengaging the idler V′ may be employed. In the drawings, we have an arm, to which it is journaled, rotating upon the shaft D, and which may be locked in position by any suitable device.

Having thus fully described our invention, we claim as new—

1. In a flanging-machine, the combination, with table B, of a vertical roller, *k*, in a carrier, F, capable of vertical and lateral adjustment, and a revolving former, O, having positive independent motion and capable of vertical feed, substantially as described.

2. In a flanging-machine, the combination, with table B, of a vertical roller, *k*, in a carrier, F, capable of vertical and lateral adjustment, and a revolving former, O, capable of both vertical and lateral adjustment, substantially as described.

3. The combination of carrier F and block *i*, having its outer face cut away to permit the protrusion of the periphery of the roller *k*, and both grooved and recessed substantially as described, and adapted to receive either the vertical friction-roller *k* or the fixed cutter *r*.

4. The combination, in the dogs G, of the slide *m*, having shoulder *o* and groove *p*, or either, with the clamp *n* and tightening-screw, said groove having a retaining-face or back wall for the plate to abut against, substantially as shown and described.

5. In combination with the arch L, or an equivalent stop, and the shaft *s*, or its fixed sleeve *y*, the loose collar *c′* and its spring-catch *d′*, substantially as described, whereby revolution of the collar is permitted in one direction and prevented in the other.

6. The combination of the loose collar *c′*, having a cam face or groove, and a pivoted spring-catch, *d′*, with the sleeve *y* or shaft *s*, having the spring-dog *e′*, with its end *f′*, and the notched-headed screw *b′*, let into the recessed sleeve or shaft, and operating in bearing *t*, substantially as shown.

In testimony that we claim the foregoing we have hereunto set our hands this 2d day of July, 1877.

LOUDON CAMPBELL.
JAMES F. RICHARDS.

Witnesses:
THOS. J. MCTIGHE,
DAVID R. STEWART.