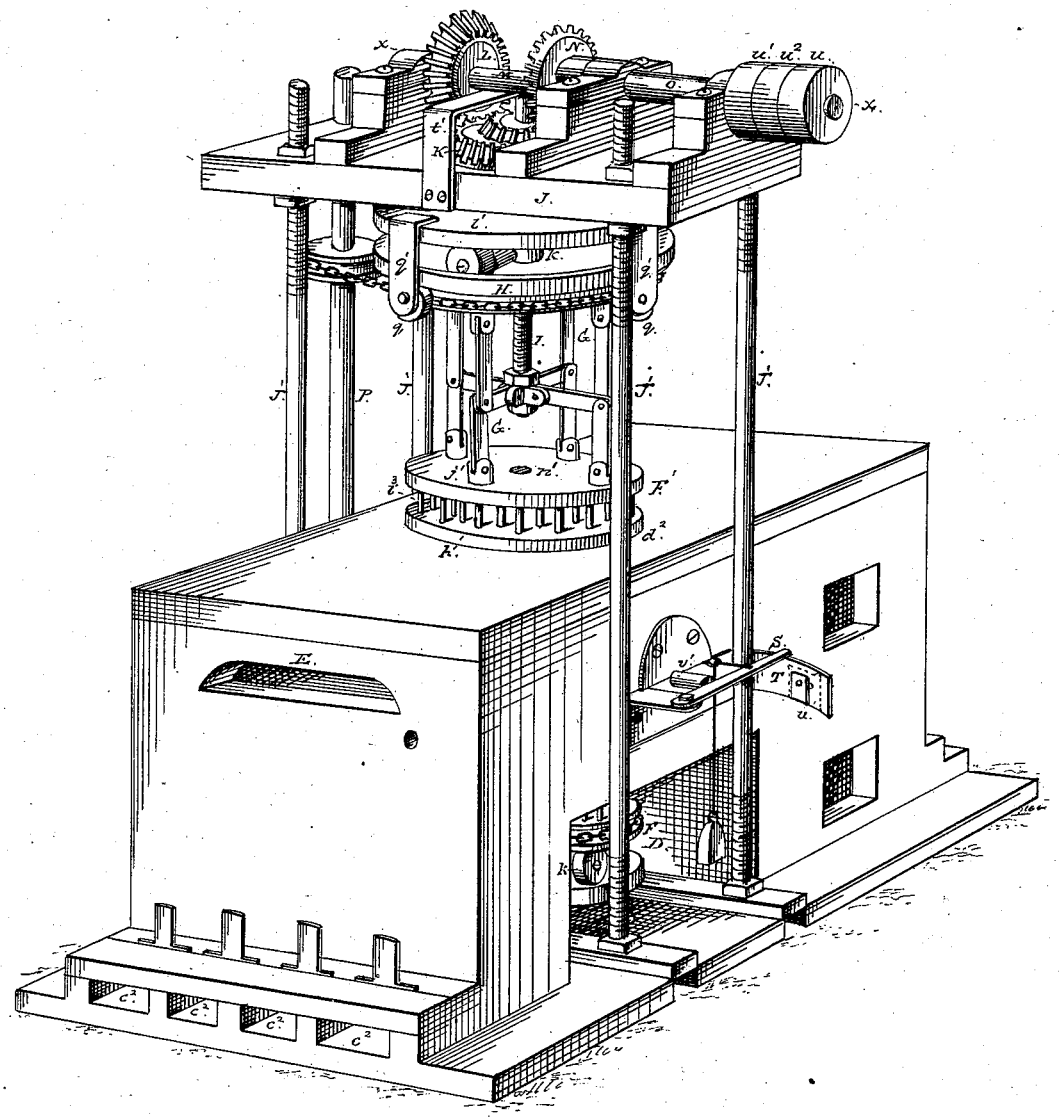
3 Sheets—Sheet 1.

E. ANDREWS.

APPARATUS FOR TEMPERING AND FLATTENING SHEET METAL PLATES.

No. 260,517. Patented July 4, 1882.

Fig. 1.



Attest:
F. W. Howard
Jas. A. Payne

Inventor:
Emanuel Andrews
by Geo. W. Ayer
atty.

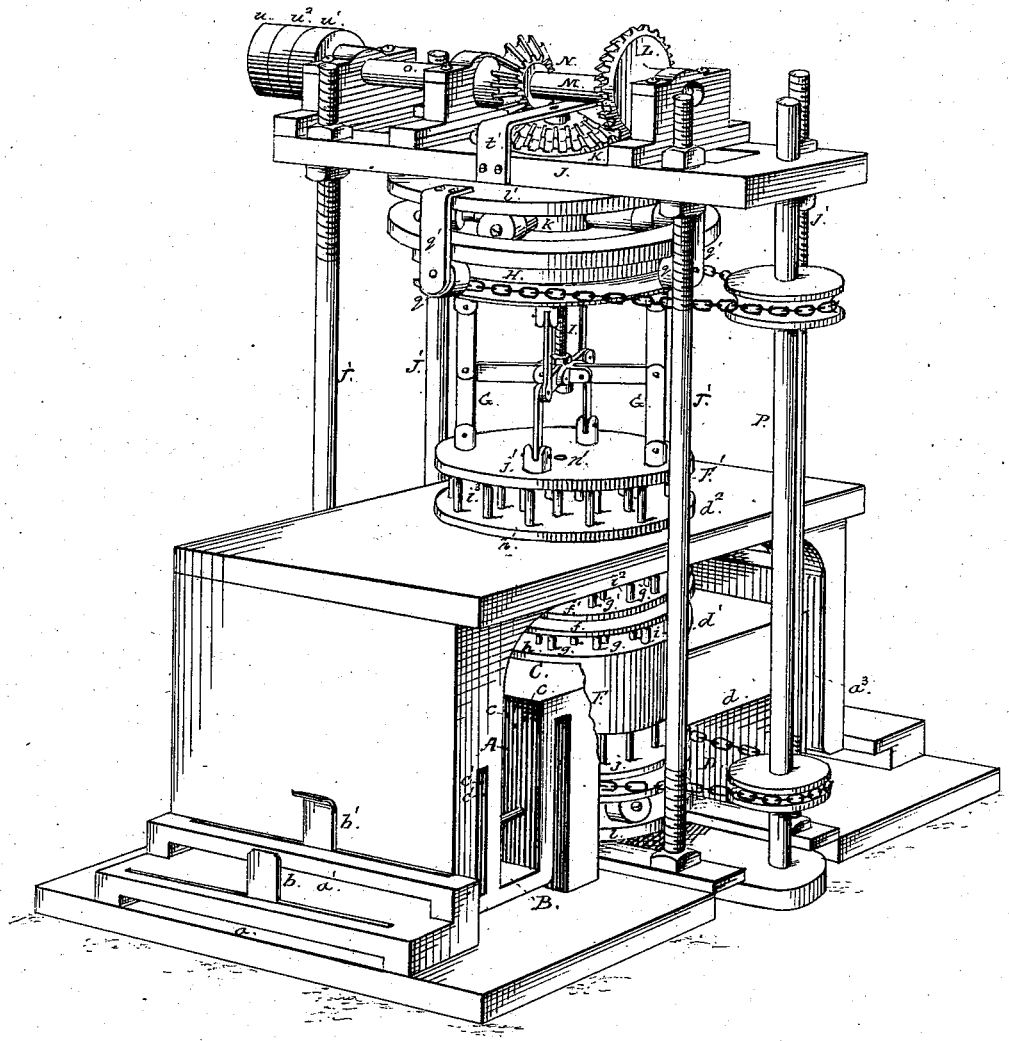
3 Sheets—Sheet 2.

E. ANDREWS.

APPARATUS FOR TEMPERING AND FLATTENING SHEET METAL PLATES.

No. 260,517. Patented July 4, 1882.

Fig. 2.



Attest:
H. W. Howard
James A. Payne.

Inventor:
Emanuel Andrews
by Geo. W. Dyer
Atty.

3 Sheets—Sheet 3.

E. ANDREWS.

APPARATUS FOR TEMPERING AND FLATTENING SHEET METAL PLATES.

No. 260,517. Patented July 4, 1882.

Fig. 3.

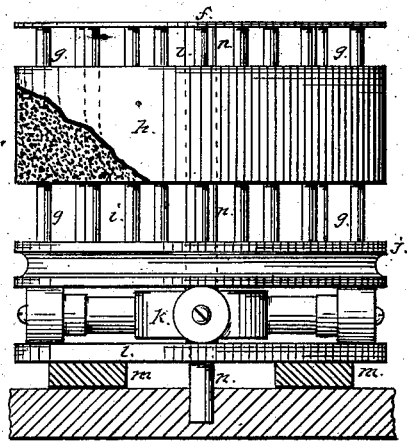


Fig. 5.

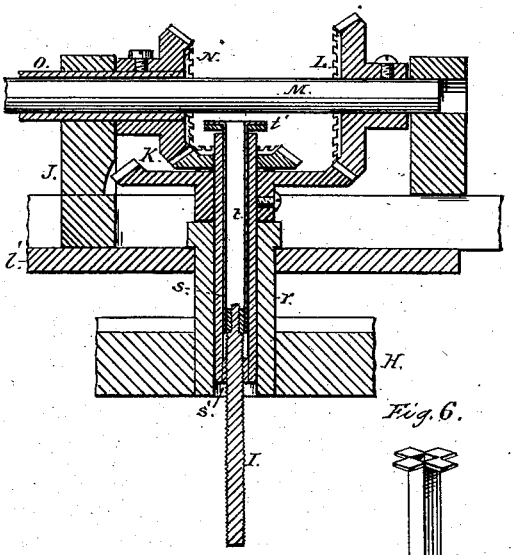
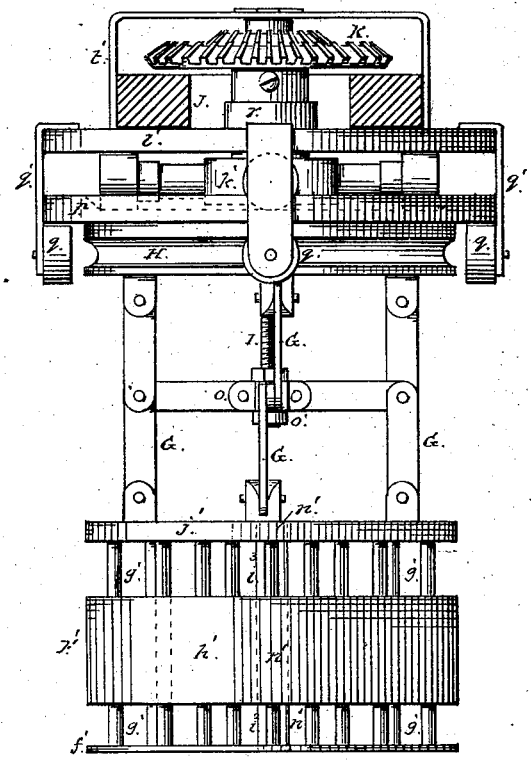


Fig. 6.

Fig. 4.



Attest:
H. W. Howard
James A. Payne

Inventor:
Emanuel Andrews
by Geo. W. Aber
atty

UNITED STATES PATENT OFFICE.

EMANUEL ANDREWS, OF WILLIAMSPORT, PENNSYLVANIA.

APPARATUS FOR TEMPERING AND FLATTENING SHEET-METAL PLATES.

SPECIFICATION forming part of Letters Patent No. 260,517, dated July 4, 1882.

Application filed December 19, 1879.

To all whom it may concern:

Be it known that I, EMANUEL ANDREWS, of Williamsport, in the county of Lycoming and State of Pennsylvania, have invented a new and useful Improvement in Apparatus for Tempering and Flattening Sheet-Metal Plates; and I do hereby declare that the following is a full and exact description of the same, reference being had to the accompanying drawings, and to the letters of reference marked thereon.

My invention relates to a new and improved apparatus for tempering and flattening saw-plates, but equally well adapted for tempering and flattening other metal plates; and my invention consists therein in a novel construction of the furnace and the arrangement of its principal operative parts, to the end that it may consume the gases of combustion and maintain a still soaking heat in the heating-chamber; in the devices connected with the holding of the saw-plates and tempering them, consisting of novel rotating formers, one of which is adapted to be depressed, and each of which is constructed and arranged so as to be very little distorted or warped by the heat; in the devices for depressing and raising one of the formers, whereby the same is depressed more and more slowly to the point of contact and raised more and more rapidly away from the point of contact, and both of the movements of depression or raising are effected by a single driving-belt running always in the same direction; and, finally, in the new method and processes employed by me in the manipulation of saw-plates in tempering them, which method and process may be employed in a variety of apparatuses, but are well adapted for my apparatus, which is now described, reference being had to the accompanying drawings, in which—

Figure 1 is an elevation in perspective, showing the principal working end and one side of the apparatus; Fig. 2, an elevation a little in perspective of the opposite side and apparatus, one of the side walls being removed; Fig. 3, a separate view of the lower former, its spider, and spider bed-plate; Fig. 4, a separate view of the upper former, its connecting press-levers, its driving-wheel, the spider above it, and the bearing above the spider; Fig. 5, a vertical section on the line *x x* of Fig. 1, showing the gear mechanism which exerts pressure upon the upper former. Fig. 6 is a detail of one of the parts.

Like letters denote corresponding parts in each figure.

In the drawings the furnace indicated is built of fire-brick, in which A denotes the fire-box, B the ash-pit, both with suitable doors, and placed preferably at one end of the furnace, the draft to supply combustion being admitted at the ash-pit door. Air in aid of combustion enters at the flue *a*, preferably long and narrow, controlled by a suitable damper, *b*, and passes under the ash-pit and up outside of the inner wall of the same, and then through many perforations, *c c*, into the combustion-chamber just above the burning fuel. Other air in aid of combustion enters at the long and narrow flue *a'*, situated above the entrance of the flue *a*, controlled by a suitable damper, *b'*, and passes above the level of the ash-pit bottom and up outside of the wall of the same, and enters the combustion-chamber through many perforations, *c' c'*, just above the burning fuel. By reason of the construction and arrangement of these flues *a* and *a'*, in connection with the ash-pit and combustion-chamber, the air passing through these flues becomes heated, and, entering the combustion-chamber in a heated condition, insures the combustion of the gases therein. The products of combustion, leaving the fire-box, pass into and through the heating-chamber C, situated in the upper part of the furnace, and having its bottom *d* raised by suitable supporting-walls, so as to leave under it a chamber, D, with entirely open ends, so that said chamber shall always be cool. After the products of combustion pass through the heating-chamber C, they enter the flue a^3, and, diving, pass out through the several flues c^2 c^2, controlled by suitable dampers on their way to the stack and place of exit.

The bottom *d* of the chamber C, preferably of fire-brick, which should be made thick in order that little heat should enter the chamber D, and may be supported conveniently by cross-bars on its under side, has in its center a large opening, *d'*, through which passes the lower former, presently to be described.

At the exit end of the furnace is placed the opening E, through which the saws to be treated are introduced, which opening has a suitable door.

The lower former, F, which is placed preferably centrally in the furnace, is composed of circular top plate, *f*, preferably of thin cast

metal, which is dressed down true on its upper and lower faces and edges. This plate rests upon numerous metal pins or supports, *g g*, which pins in turn pass entirely through a drum, *h*, preferably cast hollow, and intended to be filled with non-conducting material. There is thus left a clear open space, *i*, between the bottom of the plate *f* and the top of the drum *h*, where the hot air of the chamber C may be equally diffused. The top of this drum should also be placed upon a level with the bottom of the chamber C. The pins *g g*, passing through the drum *h*, terminate and are secured a little distance below in a cast-metal plate, *j*, adapted to be driven by a pulley in any convenient way, leaving a clear open space, *i*, between the bottom of the drum and the top of the plate *j*. This plate *j* rests upon a spider, *k*, with friction-rollers on the ends of its arms, and this spider turns upon a bed or bearing plate, *l*, which rests upon bed-pieces *m*. A bolt or post, *n*, passes centrally down through the plate *f*, the drum *h*, the plate *j*, and the spider, and through the spaces *i* and *i'*, and is stepped upon the bearing-plate *l*.

Directly above the opening *d'* in the bottom of the chamber C is a similar opening, d^2, in the top of the furnace, through which the upper former, F', is operated. This former, like the lower former described, but reversed, has a thin cast-metal lower plate, *f'*, resting against the ends of numerous pins or supports, *g' g'*, which pass up through a cast-iron drum, *h'*, intended to be filled with non-conducting material, with a clear open space, i^2, between the top of the plate *f'* and the bottom of the drum *h'*, where the hot air of the chamber C may be equally diffused. This drum *h'* preferably should be so thick that at any point of its movement it should not be below the outer surface of the top of the furnace or above the inner surface of the top of the furnace. The pins *g' g'* extend above the drum *h'* to the under side of the plate *j'*, which rests upon them, leaving a clear open space, i^3, between said plate and said drum. A bolt or post, *n'*, passing centrally down through the plate *j'*, the drum *h'*, and the plate *f'*, and the spaces i^2 and i^3, ties the plates and drums together.

In order to exert pressure upon the upper former and bring it in contact with the lower former, a system of compound levers, G, is employed, the lower ends of which are pivoted in lugs upon the top of the plate *j'*, and the upper ends of the outer levers to lugs upon the under side of the driving-plate H, and the upper ends of the inner levers are pivoted to lugs upon a collar, *o*, which revolves upon a collar-bearing, *o'*, which is secured to a screw-threaded bolt or post, I.

The driving-plate H has a flange, *p*, at its upper surface, extending outwardly and turning upon roller *q*, journaled in hangers *q'*, which are secured to the upper bearing-plate, *l'*. Between this last-named plate and the top of the plate H the spider *k* is placed, with rollers upon its arms which traverse upon the top of the plate H, or preferably in a recess in the same. By reason of this construction and arrangement of the parts just described, where a rotation is communicated in one direction to the bolt or post I, the compound levers G are operated, and the inner set of levers acting upon the outer levers, the upper former, F', is forced downward toward the lower former, F, so that their respective plates *f* and *f'* come in contact. It will be perceived that in this operation of the compound levers the downward movement of the former F' is constantly more and more slow, and also more powerful, to the very point of contact, by which is avoided the frequent cracking of plates resulting from the ordinary movements of the screws or levers directly applied, as heretofore, and that the upward movement is more and more quick, enabling the operator to withdraw the saw-plates directly after they are tempered and flattened.

The mechanism which operates the bolt or post I is placed upon a frame which consists of cross upper girths, J, resting upon standards J', provided with adjusting-nuts upon the screw ends of the standards, so that the height of the cross-girths may be varied and the level position of the same secured. The upper bearing-plate, *l'*, which is secured to the under side of the cross-girths J, has a hollow axle, *r*, depending below it, upon which the plate H rotates. Inside of this hollow axle is a hollow shaft, *s*, which extends down through the hollow axle and through the plate H, and has firmly secured in its lower portion a nut, *s'*. Within this hollow shaft *s* is a rectangular sleeve, *t*, secured in a yoke, *t'*, which in turn is secured to the girths J, which extends down to near the top of the nut *s'*, and covers closely the square upper end of the bolt I and prevents the same from turning.

A double-beveled gear-wheel, K, is secured upon the top of the hollow shaft *s*, so that when this wheel is turned it turns the hollow shaft, which, turning the nut *s'*, carries the screw-bolt I up or down, and consequently moves the upper former, F', in a vertical direction. A beveled-gear wheel, L, mounted upon the shaft M, engages with the outer gear of the wheel K, and this shaft extends beyond the end of the girths J, and has a pulley, *u*, secured upon its end, so that in the revolution of the pulley the wheel L turns the wheel K in one direction. A beveled-gear wheel, N, mounted upon a hollow shaft, O, which turns upon the shaft M, engages with the inner gear of the wheel K, and the shaft O having a pulley, *u'*, secured upon its outer end, the revolution of this pulley turns the wheel L in the opposite direction, when both of the pulleys *u* and *u'* are revolved in the same direction. A loose pulley, u^2, is placed upon the shaft M, between the pulleys *u* and *u'*. If, now, the pulley *u* is revolved by suitable belting, the wheel L is turned somewhat slowly and pressure is gradually exerted downward upon the former F'. If the belting is then slipped upon the

intermediate loose pulley, u^2, no motion is imparted to the pressure mechanism. If the belting is now slipped over the pulley u', the smaller wheels N and the smaller inner gear of the wheel L are revolved and the former F′ is raised quite rapidly, wherefore by means of a single belt running always in the same direction I am enabled to depress the former slowly with great power and raise it rapidly.

A shaft, P, journaled in a bed-piece of the furnace and in a cross-tie of the girths, and provided with pulleys, by means of proper connections is revolved and communicates a slow revolution to the former F and F′.

In the operation of this apparatus it is understood that a proper heat is obtained in the furnace in such a way that the products of combustion shall pass very slowly out of the furnace, and that there shall be maintained in the chamber C a soaking heat or heat in the nature of a bath. The saw-plate to be treated, having been hardened in the usual way, and cold, is introduced through the opening E and placed upon the plate *f* of the lower former, F, the door of the opening E being immediately closed and a revolution of both formers commenced. Power being applied to the pulley *u*, the former F′ is depressed, as described, until its plate *f′* rests upon the top of the saw-plate and this former F′ is revolved, as described, during this operation, and the revolution of both formers is kept up during the act of tempering and flattening the saw-plate. The saw-plate is kept thus revolving a length of time which varies with the temperature of the plates *f f′* and the thickness of the saw-plates. It is apparent that these former plates, being quite thin and of the same thickness and size and exposed upon all sides to the comparatively still heat of the chamber C, will be of the same temperature, and that temperature, although lowered at first by the contact of the cold saw-plate, will, after a certain length of time, return to the temperature of the chamber C and will communicate the same temperature to the saw-plate. The saw-plate, when first placed upon the plate *f*, has been warped in the act of hardening. I find by actual test that during the slow descent of the former F′ the saw-plate becomes sufficiently pliable, by the heat of the plate *f* and the chamber C, that when the plate *f′* comes in contact with it it will at once flatten it and hold it securely and absolutely flattened while it is being tempered. When the saw-plate is sufficiently tempered revolution is imparted to the pulley *u′*, and the former F′ is rapidly raised. The revolution of the former F and F′ is then stopped and the saw-plate is withdrawn through the opening E.

I have described an apparatus specially designed for tempering and flattening saw-plates; but it will be readily understood that it is equally well adapted for all sheet-metal plates, and either for tempering or flattening or both.

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

1. A furnace for tempering saw-plates wherein are combined a fire-box, an ash-pit adapted to admit air for combustion, and flues, one passing under inner side of ash-pit and fire-box, the other passing up outer side of the same, admitting air above the burning fuel in opposite directions to consume the gases, substantially as described and shown.

2. A furnace for tempering saw-plates wherein are combined a fire-box at one end, a central heating-chamber above the level of the fire-box, diving-flue, and a series of dampers at its lower end for the purpose of retarding the flow of the products of combustion and of maintaining a still heat in such heating-chamber, substantially as described.

3. A furnace for tempering saw-plates having the bottom of the heating-chamber raised and a clean open space underneath it and between its supporting-walls, the same serving as inside walls for flues, substantially as shown, and an opening leading from such bottom to such open space, substantially as described.

4. A former for holding saw-plates for tempering, composed of a plate held against numerous separate supports, substantially as described and shown.

5. A former for holding saw-plates for tempering, composed of a plate resting upon numerous supports and separated by a clear open space from a drum made non-conducting, substantially as described.

6. A former for holding saw-plates for tempering, composed of a plate resting on numerous supports, a drum made non-conducting, and a driving-plate, with a clear open space between the non-conducting drum and the other plates, substantially as described.

7. The former F, substantially as described, having the plates *f j*, drum *h*, post *n*, pins *g g*, and spider *k*, substantially as set forth and shown.

8. The vertically-moving former F′, composed of the plates *f′ j′*, drum *h′*, and pins *g′ g′*, substantially as described.

9. The former F′, in combination with the compound pressing-levers G, substantially as described.

10. The combination, with the driving-plate H and compound pressure-levers G, of the bolt I, substantially as described.

11. The combination of the double-beveled gear-wheel K, hollow shaft *s*, nut *s′*, and bolt I, whereby former F′ is depressed or raised when operated, substantially as described and shown.

This specification signed and witnessed this 28th day of November, 1879.

EMANUEL ANDREWS.

Witnesses:
FRED M. ANDREWS,
C. E. CLINE.