(No Model.) 5 Sheets—Sheet 1.

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APPARATUS FOR SEPARATING METAL PLATES OR SHEETS.

No. 602,969. Patented Apr. 26, 1898.

Fig. 1.

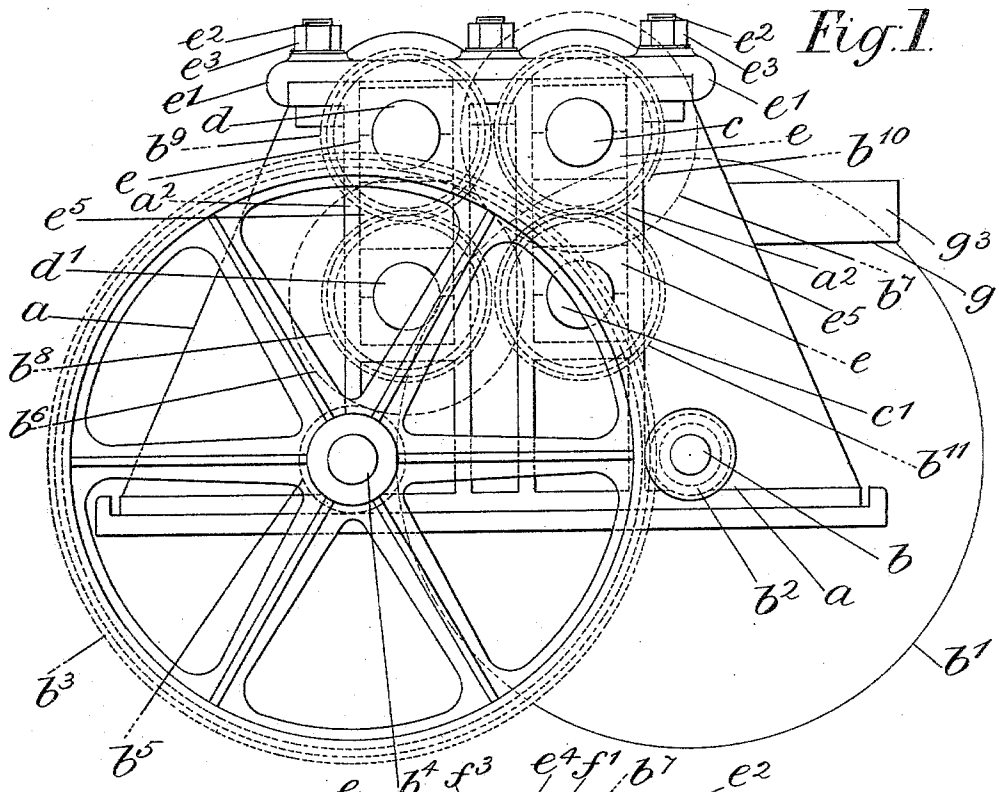
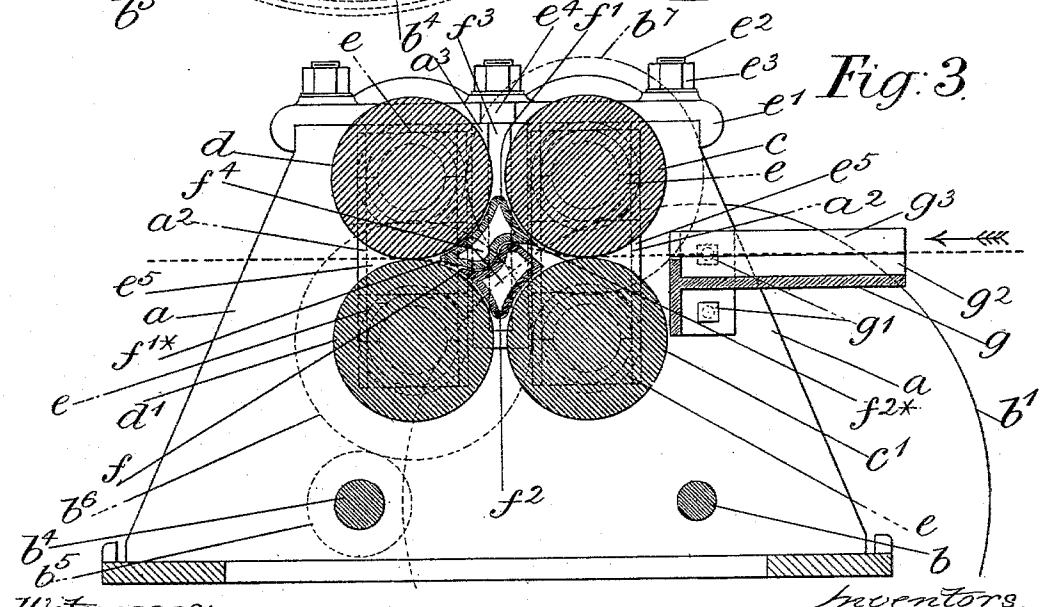


Fig. 3.



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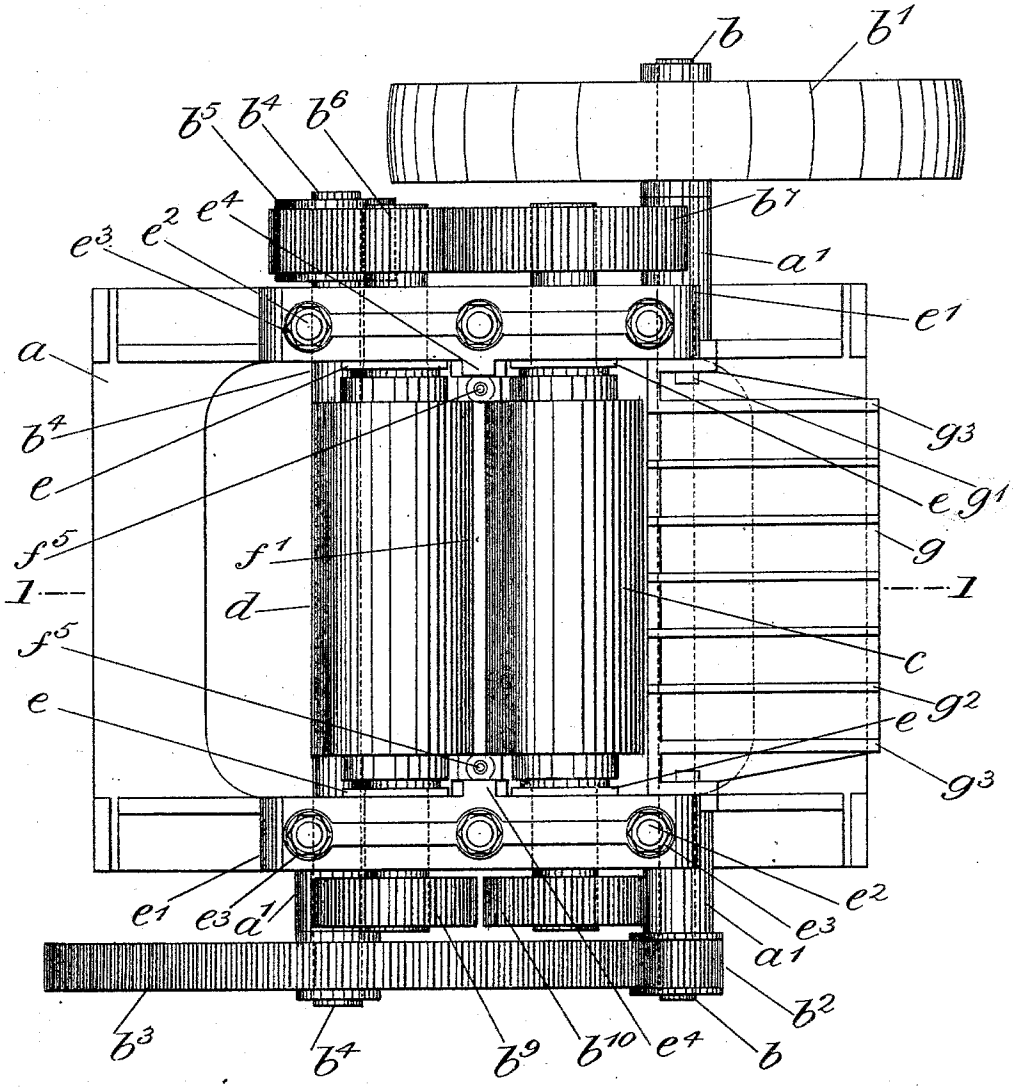
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Fig. 2.



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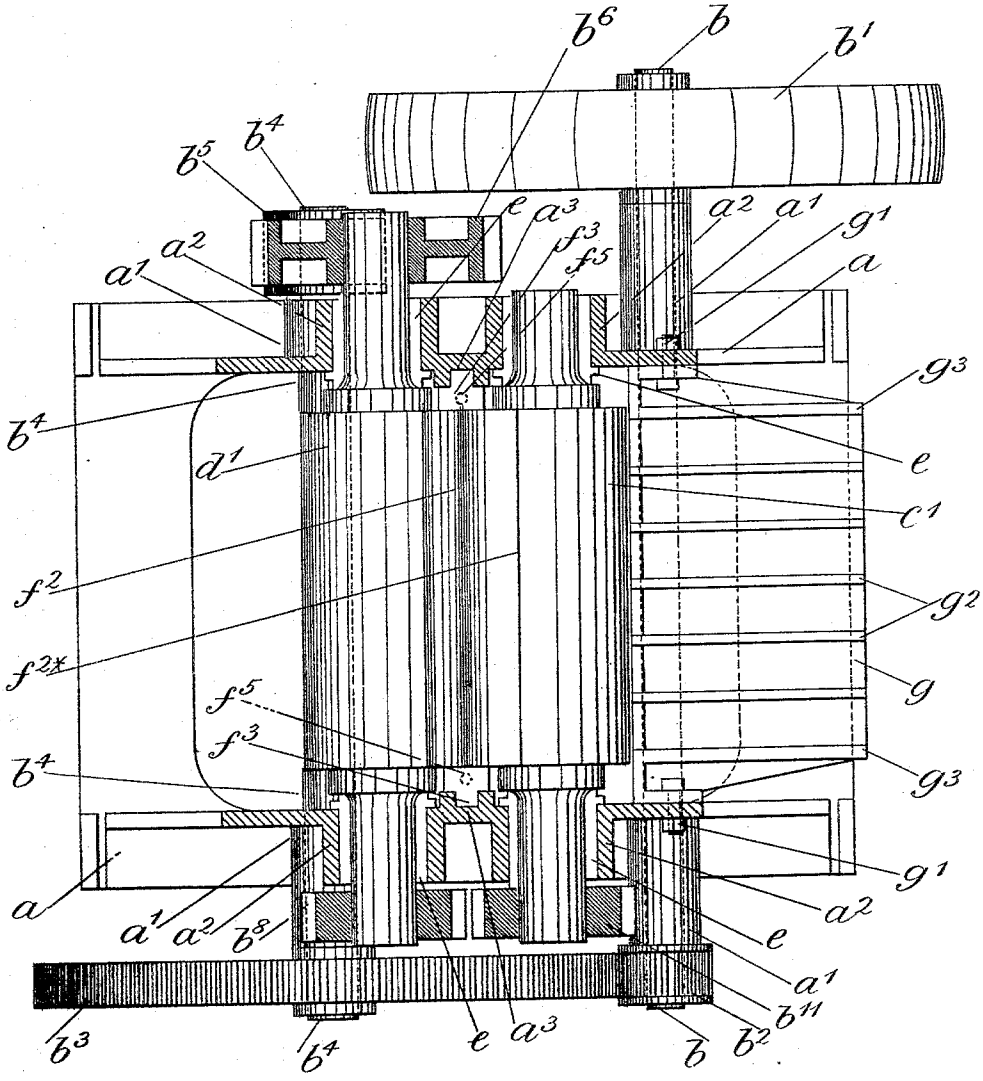
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Fig. 4.



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Fig. 5.

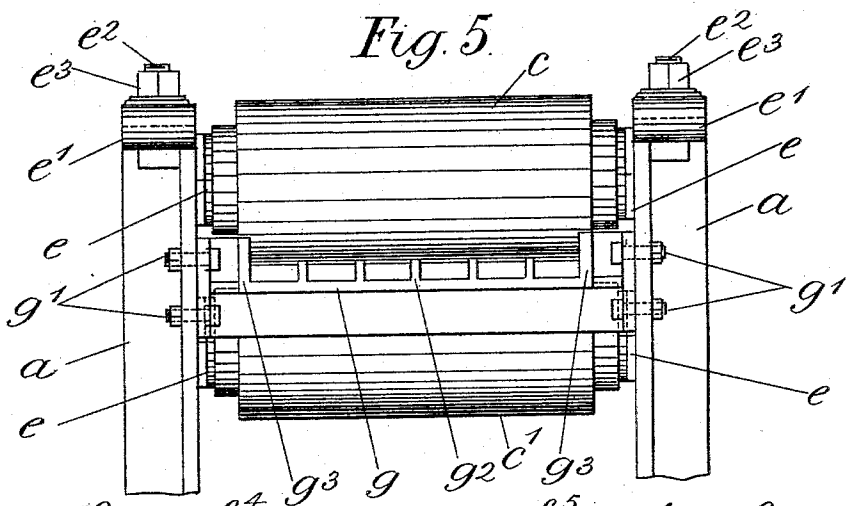


Fig. 6.

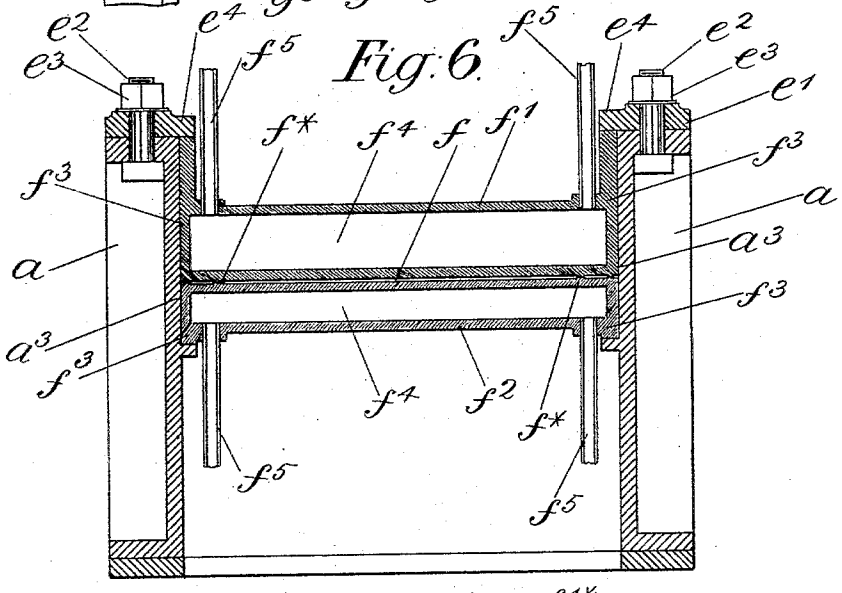


Fig. 7.



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Fig. 8.

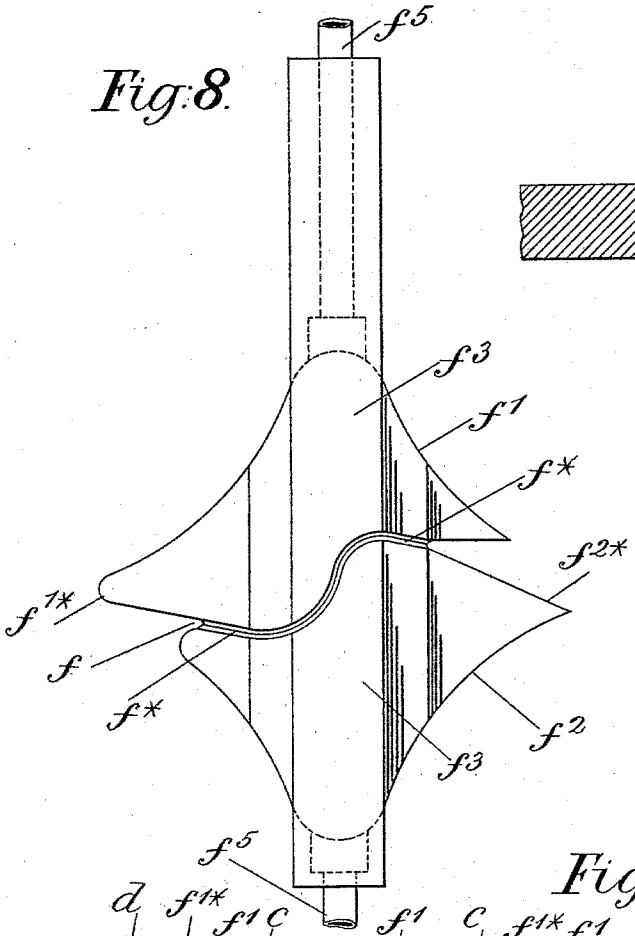


Fig. 9.

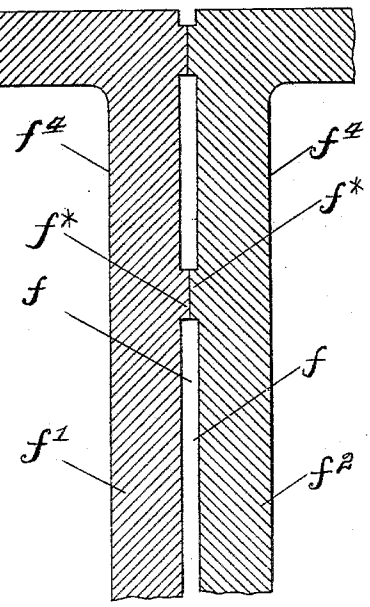
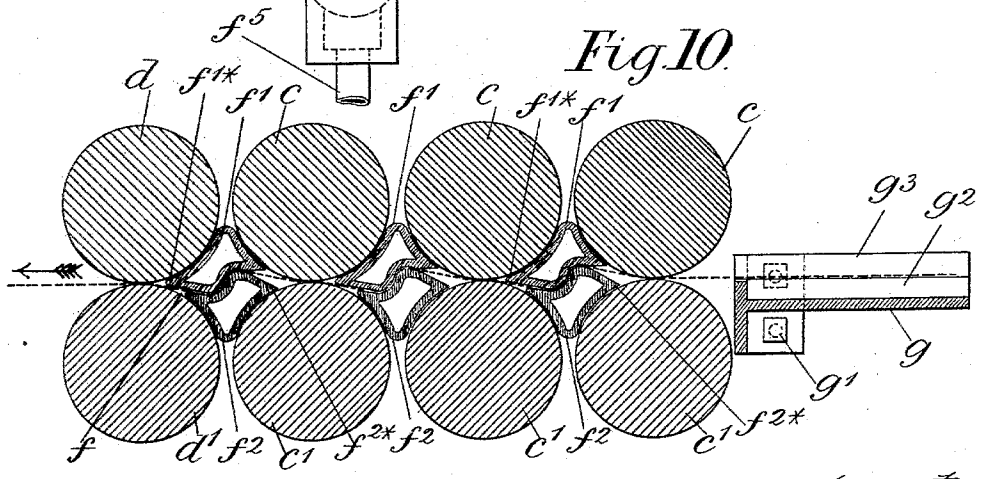


Fig. 10.



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UNITED STATES PATENT OFFICE.

JOSEPH WILLIAMS, OF GOWERTON, AND GEORGE HENRY WHITE, OF PONTARDULAIS, ENGLAND.

APPARATUS FOR SEPARATING METAL PLATES OR SHEETS.

SPECIFICATION forming part of Letters Patent No. 602,969, dated April 26, 1898.

Application filed February 1, 1897. Serial No. 621,518. (No model.)

To all whom it may concern:

Be it known that we, JOSEPH WILLIAMS, engineer, residing at Woodlands, Gowerton, and GEORGE HENRY WHITE, engineer, residing at Sliw Forge, Pontardulais, in the county of Glamorgan, England, subjects of the Queen of Great Britain, have invented certain new and useful improvements in machinery or apparatus for opening or separating sheets or plates, but more especially metal plates or sheets which have together been rolled or pressed in a folded or piled form, of which the following is a specification.

The invention relates to improvements in machinery or apparatus for opening or separating sheets or plates, but more especially metal plates or sheets which have together been rolled or pressed in a folded or piled form, and while the invention is designed more particularly to be employed in connection with black plates or sheets intended for the manufacture of tin, terne, and galvanized plates or sheets it may also be usefully employed in connection with plates for enameling or the like.

In the manufacture of black plates or sheets bars of steel or iron are hot-rolled until their thickness is more or less reduced, and they are then doubled or folded and after reheating are again rolled until a pile or block composed of several thicknesses of metal of the required substance or thickness is obtained, and this pile is then reheated and rolled until each thickness or layer thereof is reduced to the required substance. The pile thus formed is next cut or sheared to the size required for the finished plates or sheets, after which the pile is ready for opening or separating. According to the method formerly adopted the sheets or plates of a pile which had become adherent, although not actually welded together in the process of rolling, were split up or opened and torn apart or separated by hand; but latterly machinery has been devised by us for effecting this separation, and which consists, essentially, of a pair of corrugated rolls, between which the pile of plates is passed, which has the effect of bending them to and fro in a waved or corrugated form, and thereby more or less separating them, after which they are rolled out flat and the separation is thus completed.

Now the object of the present invention is to obtain a more simple and comparatively inexpensive machine, by the aid of which the plates will be efficiently separated, which is of such a character that it is unlikely to get out of order, while the surface of the plates will not be injured by the separating operation; and in order that the said invention may be more clearly understood and readily carried into effect we will proceed, aided by the accompanying drawings, more fully to describe the same.

In the drawings, Figure 1 is a side elevation of a machine constructed according to the present invention. Fig. 2 is a plan thereof. Fig. 3 is a vertical longitudinal section taken on the line 1 1 of Fig. 2, and Fig. 4 is a sectional plan of the machine with top rollers and the upper part of the waved guide removed. Fig. 5 is a feed end view of part of the machine, illustrating more particularly the feed-table. Fig. 6 is a vertical transverse section of part of the machine, taken through the waved guide and coacting parts. Fig. 7 is a plan of the waved guide separately. Fig. 8 is an end view thereof drawn to an enlarged scale. Fig. 9 is a sectional view of part of the waved guide drawn to a still further increased scale and illustrating more particularly the ribs or distance-pieces. Fig. 10 is a diagrammatic view representing the employment of several waved guides.

In the several figures like parts are indicated by similar letters of reference.

Referring to Figs. 1 to 9, *a* represents the frame of the machine, which must possess considerable strength. *b* represents the main shaft thereof, which is mounted in bearings *a'*, formed in the frame *a* and receives motion from any suitable source of power through a band wheel or pulley *b'*.

Within the frame *a* are arranged two pairs of pressure-rolls *c c'* and *d d'*, one pair being placed slightly in advance of the other but with their axes parallel, and these rolls are mounted in brasses or bearings *e*, slid into vertical ways a^2 in the frame *a*, while the upper rolls *c* and *d* are held to their work by

straps e' and bolts and nuts e^2 e^3, while between the bearings e are provided distance-pieces e^5, the thickness of which is so adjusted as to separate each pair of rolls a sufficient distance to allow of the passage therethrough of the pile or collection of plates with just sufficient grip to effect that purpose.

The rolls c c' d d' are driven from the main shaft b by means of a pinion b^2 upon the latter, which engages a toothed wheel b^3, fixed upon a shaft b^4, which latter is mounted in bearings a' and passes to the opposite side of the machine, where it has fixed thereon a pinion b^5, which engages a toothed wheel b^6, fixed with that end of the roll d' and engaging a similar wheel b^7, fixed with the roll c, while upon the other side of the machine the roll d' has fixed therewith a toothed wheel b^8, which engages a corresponding wheel b^9, fixed with the roll d, and the roll c has fixed therewith a toothed wheel b^{10}, which engages a corresponding wheel b^{11}, fixed with the roll c' and the rolls c c' and d d', which are all of the same diameter, thus receive rotary motion at the same circumferential speed and in the required direction from the main shaft b.

Between the two pairs of rolls c c' and d d' is arranged a waved or sinuous guide consisting of or formed by two plates or blocks f' f^2, placed horizontally one above the other, with a suitable space f between them and formed, preferably, of cast-iron chilled on the working faces, so as to give to the plates f' f^2 a hard, smooth, and glossy face and insure the durability of those parts.

The guide plates or blocks f' f^2 are at their ends f^3 shaped to fit into vertical guides a^3, formed in the frame a, and at their backs they are curved to the arc of the rolls, so as to clear the same, while they are kept to their work by means of the straps e' through the intervention of projections e^4 thereon, and the plates or blocks f' f^2 are separated a sufficient distance to admit of the passage of the pile of plates by means of distance-pieces, ribs, or projections f^*, formed thereon. The space f, between the guide plates or blocks f' f^2, which must be of very exact and equal gage throughout the curved parts, is of sufficient area to just permit the unopened pile of plates to be operated upon to pass therethrough from the first or forcing rolls c c' to the second or drawing or smoothing rolls d d'.

The guide-plates f' f^2 are bent or shaped into a waved or sinuous form, and they are so arranged that the pile of plates passing into the circuitous guide or passage f first strikes the inclined projecting part f^{2*} of the lower plate or block f^2, by which it is guided or directed into the passage f.

It may be desirable to form the guide blocks or plates f' f^2 so that the sinuous passage f will be more bell-mouthed than is shown in the drawings, for the reason that the plates of the pile are at the end sometimes slightly separated by the first or forcing rolls, and in that case a bell-mouth is necessary to gather the ends of the plates together.

The guide plates or blocks f' f^2 are so shaped that at a short distance from the forcing-rolls c c' the passage f between the same has an upward inclination. It then describes a double curve in a downward path and then again ascends at an inclination, and the collection of plates issuing from the circuitous passage f strikes against the inclined projecting part f'^* of the upper plate or block f', which guides or directs the collection of plates into the grip of the drawing-rolls d d'.

The shape hereinbefore shown and described for the circuitous or waved passage f has been found by experiment to answer well for certain thicknesses of plates; but it will be understood that the same may be more or less varied and the number of bends may be increased or diminished, and the radius of the individual bends may be varied according to requirements without departing from the spirit of the present invention.

The pile of plates is fed to the first or forcing rolls c c' from a feed-table g, fixed by means of bolts g' to the frame a, and the surface upon which the pile of plates rests is composed of a number of vertical bars or ribs g^2, while at the sides are provided walls g^3, which serve as guides, by pressing the pile against one or other of which the pile of plates may be introduced squarely into the grip of the rolls c c', and thereby into the waved or bending guide f. After leaving the feed-table g the pile of plates is carried forward by the forcing-rolls c c' and forced through the circuitous passage of the waved bending-guide f until it emerges from the guide and is nipped and carried forward by the second or drawing rolls d d', from which it issues with the collection of plates constituting the pile completely separated.

The buckling of the pile of plates between the forcing-rolls and the first curve or bend of the waved guide is prevented by placing the first bend in the waved guide or channel f or the mouth of the waved guide as close as possible to the first or forcing rolls.

The pile of plates in its passage through the waved guide or channel f is bent to and fro, thereby causing the plates to move relatively to each other, owing to the difference in speed between the individual plates of the pile at the bends of the waved or sinuous guide or channel f. This bending to and fro passes like a wave throughout the whole substance of the pile from end to end thereof and completely breaks the thin film of oxid of iron, binding the individual sheets together. The last bend of the waved or sinuous guide or channel f, which is in the opposite direction to the first, partly straightens the pile, and the drawing-rolls d d', in addition to assisting in passing the pile through the waved

guide or channel f, complete the restoration of the plates to their original form.

In order to prevent the undue heating of the plates or blocks f' f^2 constituting the waved or sinuous guide, they are formed with hollows f^4 therein or therethrough, as indicated at Figs. 3 and 6, and these hollows f^4 are by pipes f^5 connected with a supply of water, so that a circulation thereof through the hollows f^4 may be maintained.

In the example given at Fig. 10 several waved guides are shown arranged in continuation with pressure or carrying rolls between them, and the object of such arrangement is to provide a means of bending the pile of plates to and fro a number of times in cases where they are so firmly united by the oxid that the passage thereof through a single waved guide is insufficient to effect the separation of the plates.

It will be understood that the details of the apparatus may be considerably varied without departing from the spirit of the invention. For example, the number, position, and radius of the bends in the waved guide or channel f may be varied and the bends or curves may be of the same radius or of differential radii, as experience may dictate, while two or more of such waved guides may be arranged in continuation, but with carrying or drawing rolls between them, as hereinbefore described.

Although the invention is primarily intended for the separation of "black plates" preparatory to the process of tinning or galvanizing, it will be understood that it is also applicable to piles of other plates or sheets of metal or other material.

By the means hereinbefore described a machine is obtained which is simple in character, inexpensive to construct, unlikely to get out of order, and by the aid of which the sheets or plates may be separated efficiently, rapidly, and economically.

Having now particularly described and ascertained the nature of the said invention and in what manner the same is to be performed, we declare that what we claim is—

1. In machinery for separating the plates or sheets of a pile, a waved or sinuous guide or channel formed of undulating plates or blocks, substantially as herein shown and described.

2. In machinery for separating the plates or sheets of a pile, the combination of a waved or sinuous guide or channel formed of undulating plates or blocks and means for forcing the pile through the guide substantially as herein shown and described.

3. In machinery for separating the plates or sheets of a pile the combination of a waved or sinuous guide or channel, a pair of feed or forcing rolls located in front of the waved guide for carrying the pile into the waved guide, a feed-table provided with a guide or guides for conducting the pile squarely to the feed-rolls, and a pair of drawing-rolls located at the rear of the waved guide for drawing the pile through the waved guide and assisting to flatten the plates substantially as herein shown and described.

4. In machinery for separating the plates or sheets of a pile the combination of a waved or sinuous guide or channel composed of two hollow plates or blocks, means for supplying water to the hollow blocks and means for forcing the pile through the guide substantially as herein shown and described.

5. In machinery for separating the plates or sheets of a pile the combination of a waved or sinuous guide or channel composed of two plates or blocks superposed one upon the other, means for separating the plates or blocks a given distance and means for forcing the pile through the waved guide substantially as herein shown and described.

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