

(No Model.)

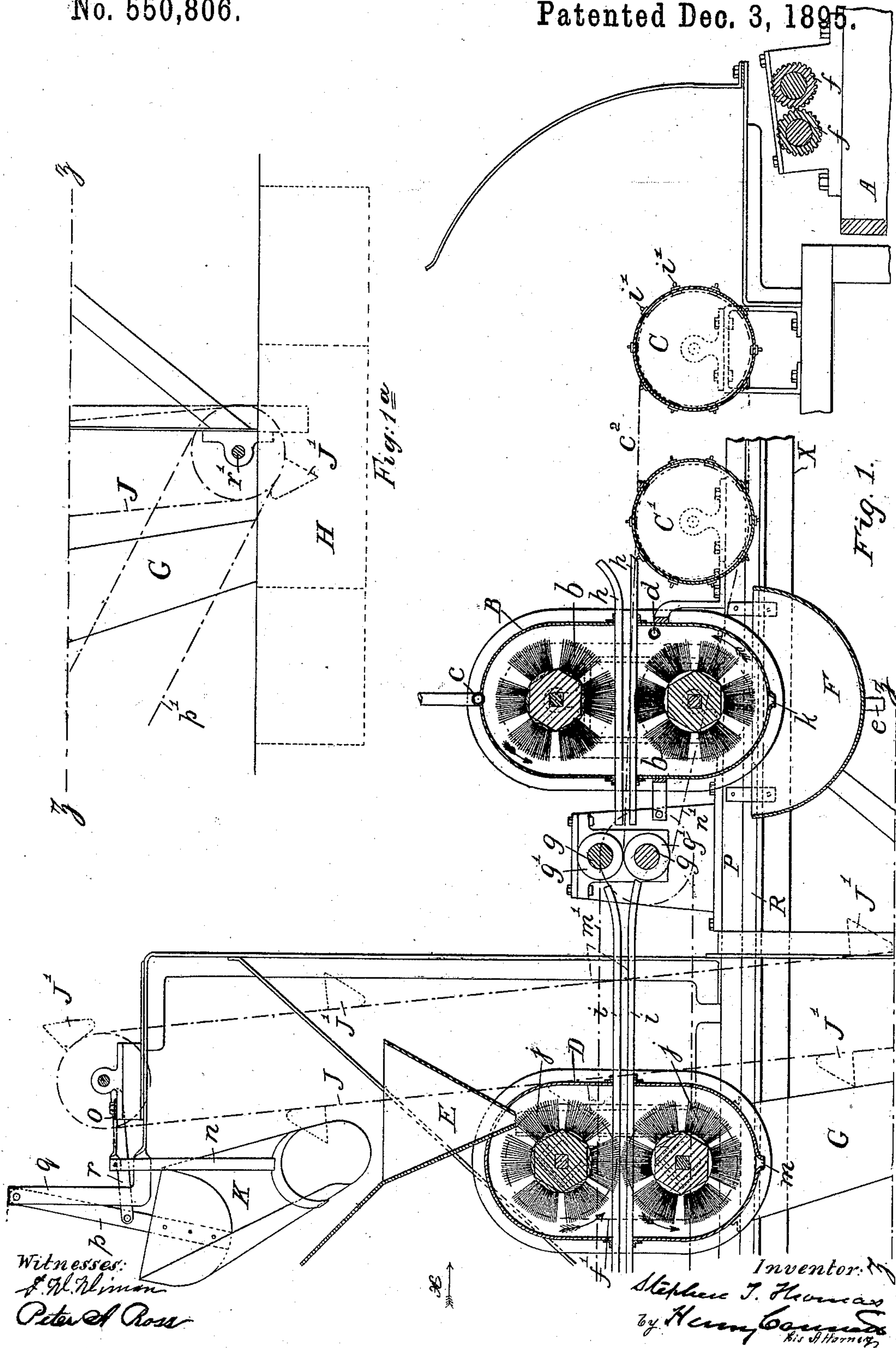
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S. T. THOMAS.

APPARATUS FOR CLEANSING OR WASHING AND DRYING GALVANIZED SHEETS.

No. 550,806.

Patented Dec. 3, 1895.



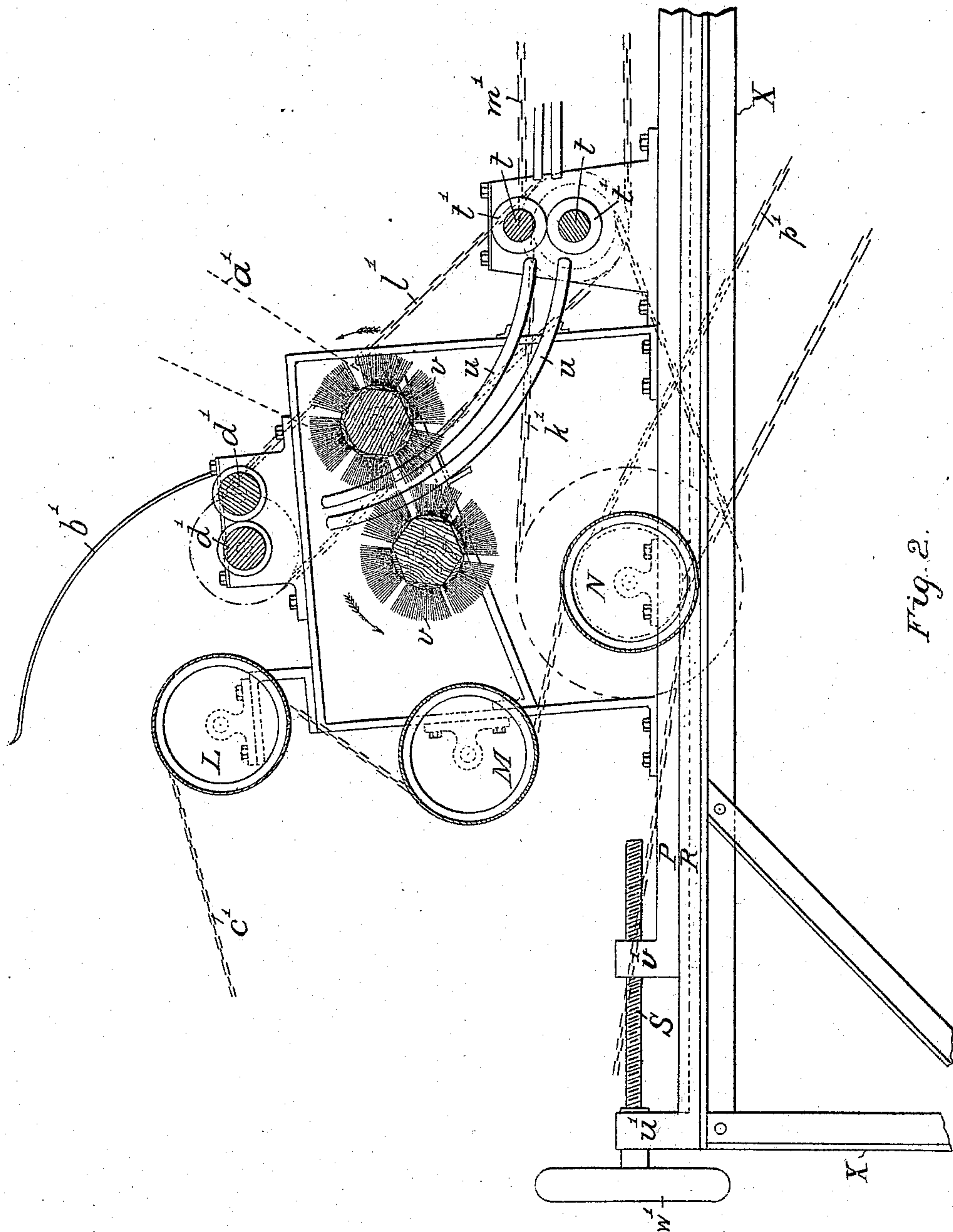
(No Model.)

5 Sheets—Sheet 2.

S. T. THOMAS.
APPARATUS FOR CLEANSING OR WASHING AND DRYING GALVANIZED
SHEETS.

No. 550,806.

Patented Dec. 3, 1895.



Witnesses:
J. W. Wiman
Peter A. Ross

Inventor:
Stephen J. Thomas
by *Henry Combs*
for Attorney

(No Model.)

5 Sheets—Sheet 3.

S. T. THOMAS.
APPARATUS FOR CLEANSING OR WASHING AND DRYING GALVANIZED
SHEETS.

No. 550,806.

Patented Dec. 3, 1895.

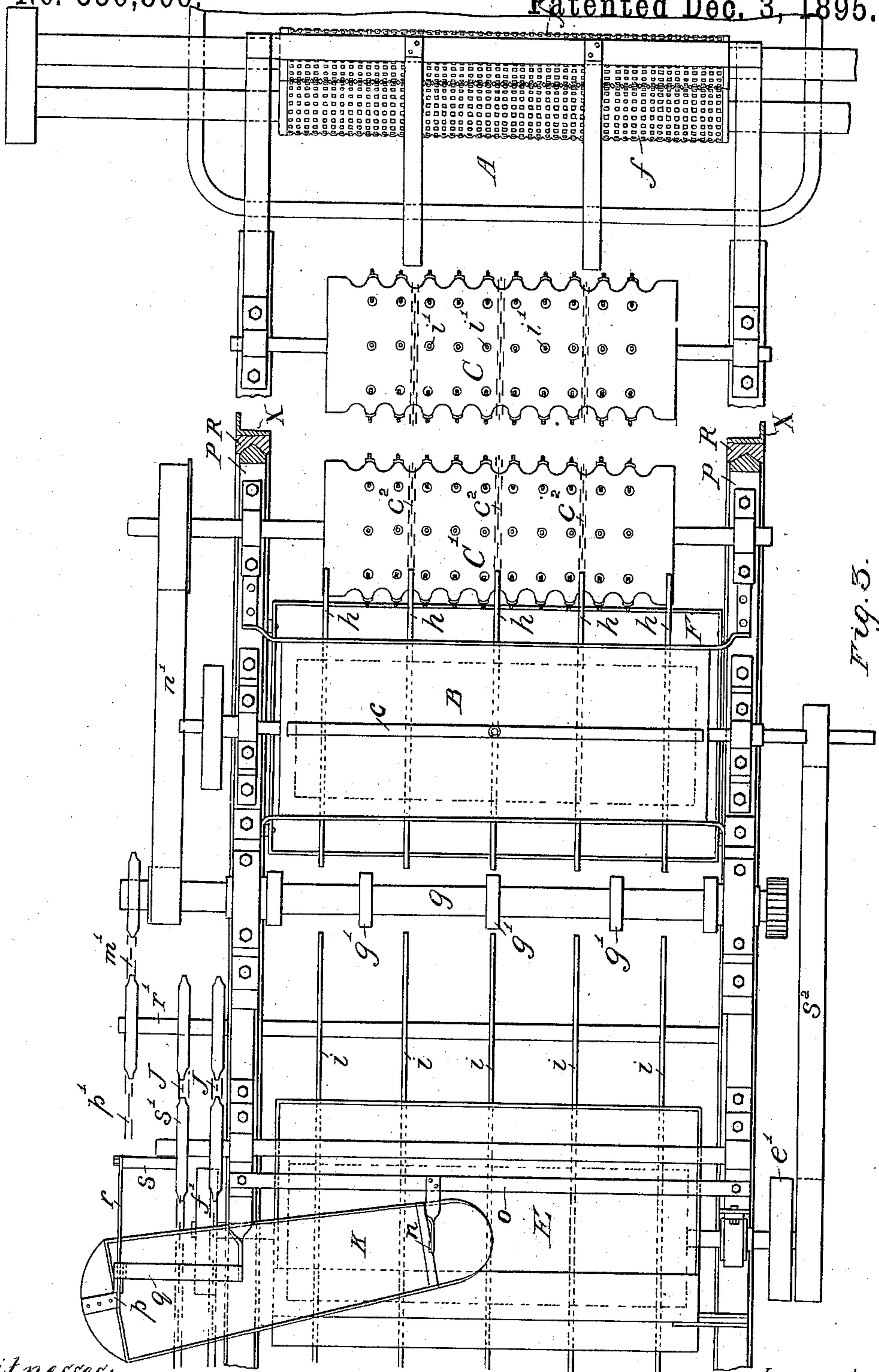


Fig. 5.

Witnesses:
S. H. Winman
Peter A. Ross

Inventor:
Stephen J. Thomas
by Henry Cornwell
His Attorney

(No Model.)

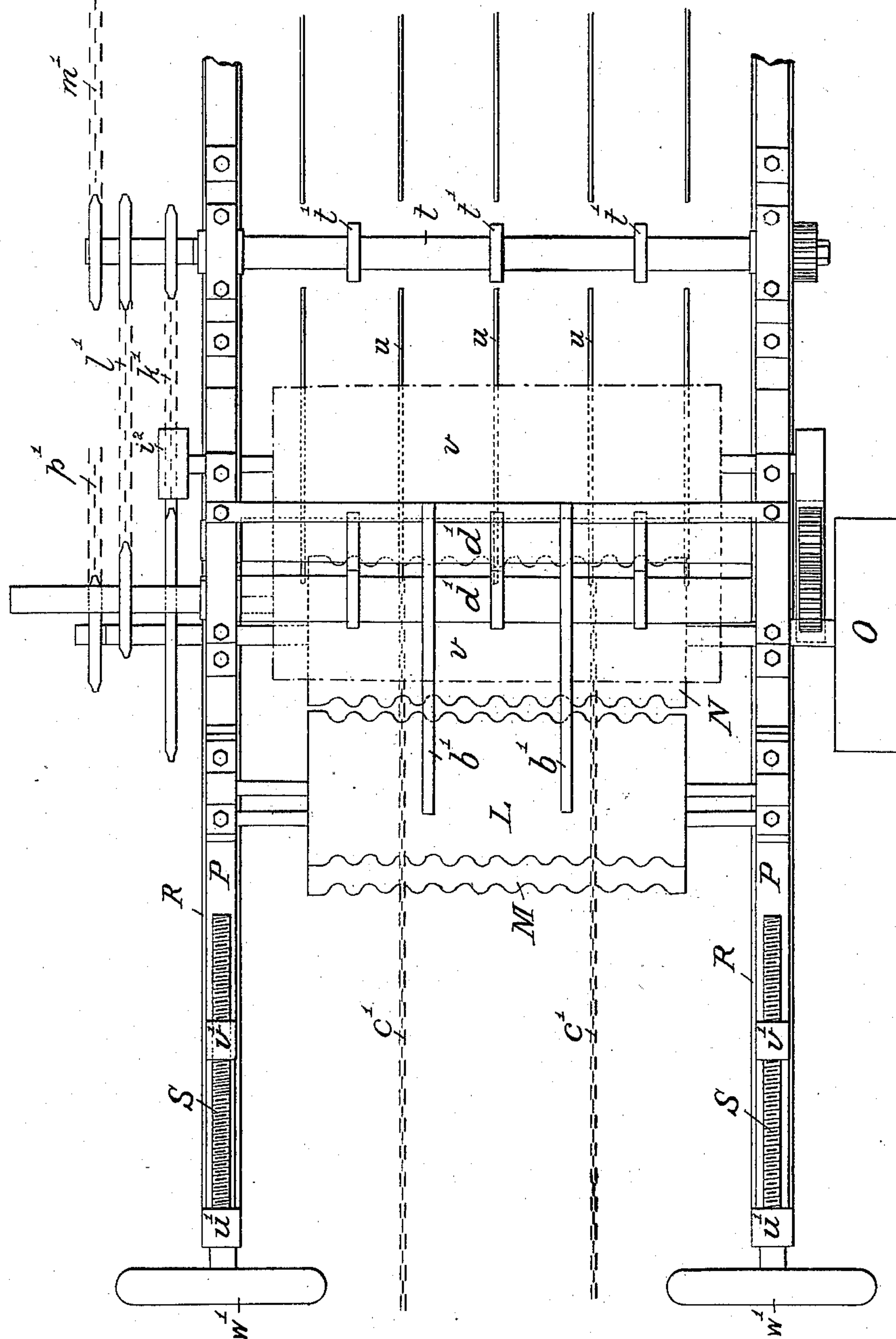
5 Sheets—Sheet 4.

S. T. THOMAS.

APPARATUS FOR CLEANSING OR WASHING AND DRYING GALVANIZED SHEETS.

No. 550,806.

Patented Dec. 3, 1895.



Witnesses:

F. M. Winon
Peter A Ross

Inventor:

Stephen J. Thomas

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his Attorney,

(No Model.)

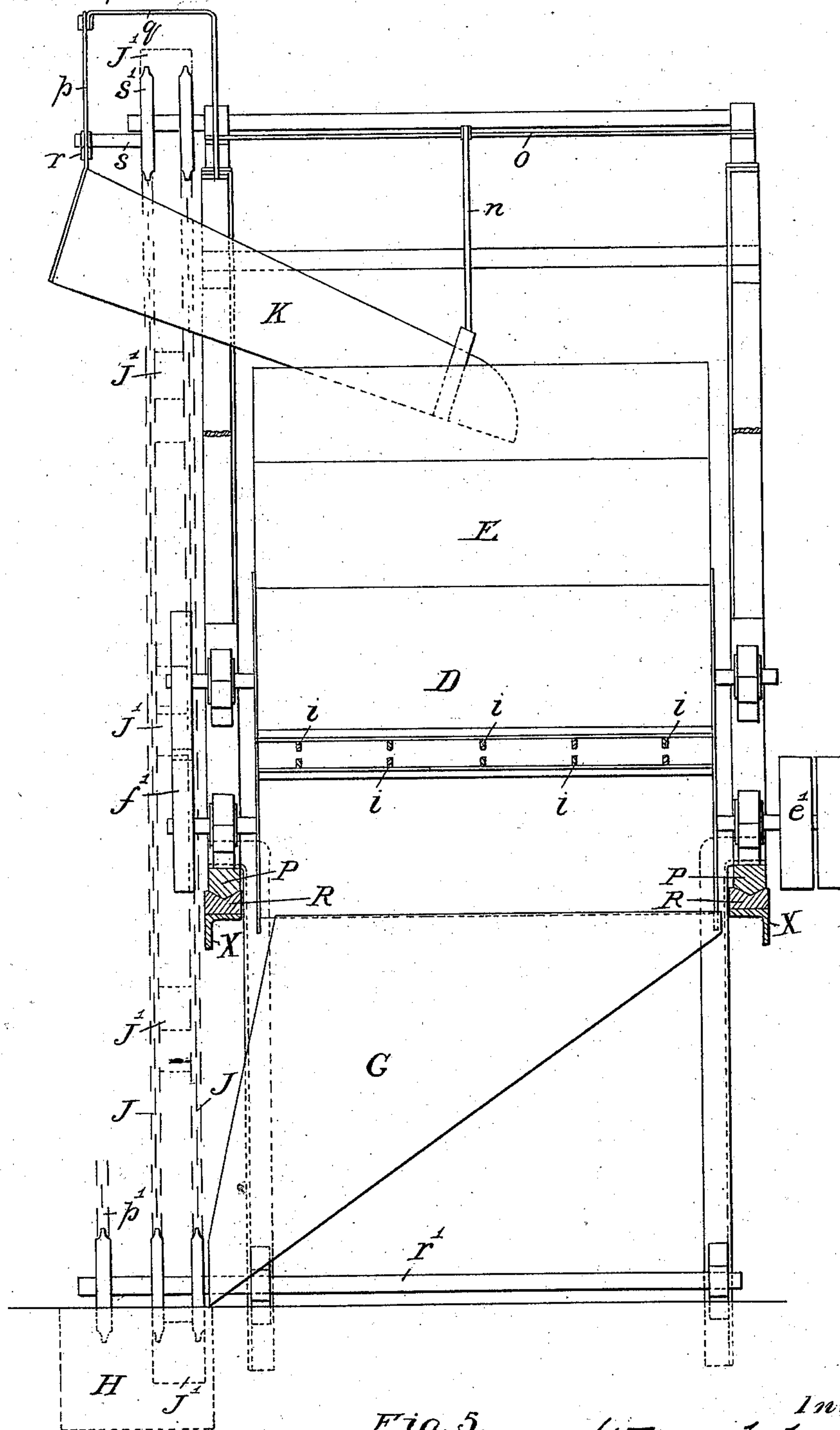
5 Sheets—Sheet 5.

S. T. THOMAS.

APPARATUS FOR CLEANSING OR WASHING AND DRYING GALVANIZED SHEETS.

No. 550,806.

Patented Dec. 3, 1895.



Witnesses:

J. M. Minan
Peter H. Ross

Fig. 5.

Inventor:

Stephen J. Thomas
by Henry Connell
his Attorney

UNITED STATES PATENT OFFICE.

STEPHEN THORPE THOMAS, OF WOLVERHAMPTON, ENGLAND, ASSIGNOR
TO DAVIES BROTHERS & CO., LIMITED, OF SAME PLACE.

APPARATUS FOR CLEANSING OR WASHING AND DRYING GALVANIZED SHEETS.

SPECIFICATION forming part of Letters Patent No. 550,806, dated December 3, 1895.

Application filed May 31, 1894. Serial No. 512,974. (No model.)

To all whom it may concern:

Be it known that I, STEPHEN THORPE THOMAS, a subject of the Queen of Great Britain, residing at Wolverhampton, in the county of Stafford, England, have invented new and useful Improvements in Apparatuses for Cleansing or Washing and Drying Galvanized Sheets; and I do hereby declare that the following is a full, clear, and exact description of the invention, which will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to an apparatus to be employed in the galvanizing of metal sheets, and particularly to that part of galvanizing apparatuses whereby the sheet is treated after it leaves the galvanizing-bath. After the hot sheet leaves the bath the flux thereon continues to boil and rapidly dries up and burns fast to the metal, forming a spot which it is difficult to remove. Therefore it is desirable to dissolve and wash away the flux before it shall have had time to dry and burn.

Now this invention has for its object to cause every portion of the surface of a sheet to be washed almost immediately (or as nearly so as may be conveniently practicable) after the coating metal has set or crystallized, so that the flux may be dissolved and washed off before it can be burned or dried hard; to cause also any other impurities to be washed away at the same time; to insure, without the use of a drying-stove, that the sheet shall be so rapidly and thoroughly dried as to avoid any liability of oxidation, and, finally, to effect a considerable saving in labor and insure a better and more uniform appearance of the surface of the sheet.

The above object is effected, according to this invention, by carrying the sheets on their passage from the galvanizing-bath first between washing brushes or appliances, which project the water at a high velocity and in the form of spray against the surfaces of the sheets, and then between drying-brushes to which drying absorbent material is supplied and which dry and clean the sheets, the sheets being entered between the washing brushes or appliances as soon as may be conveniently possible after the coating metal on their forward

ends has set or crystallized and passed between such brushes or appliances at the speed at which the setting of the metal takes place along their surfaces. The sheet may next be passed between brushes to remove any particles of sawdust or the like adhering thereto.

In order that the invention may be clearly understood, I will proceed to describe a practical application of it with reference to the accompanying drawings, of which—

Figure 1 is a longitudinal vertical mid-section through the part of the apparatus, constructed according to this invention, for use in washing and drying galvanized sheets in the manner of the invention. The portion of the apparatus which is below the broken line $z z$, Fig. 1, is shown detached on the same sheet as Fig. 1^a. Fig. 2 is a longitudinal vertical mid-section through the part of the apparatus used for finally cleaning the sheets after they have been washed and dried in the part of the apparatus illustrated in Figs. 1 and 1^a. Fig. 3 is a plan of the part of the apparatus seen in Fig. 1. Fig. 4 is a plan of the part of the apparatus seen in Fig. 2. Fig. 5 is an end elevation of the part of the apparatus used for drying the sheets, as seen from the direction of the arrow x , Fig. 1.

The portion of the apparatus illustrated in Figs. 2 and 4 is shown on separate sheets from the portion illustrated in Figs. 1 and 3 simply for convenience of illustration. The former is really connected with the latter, and the parts through which the connection is made are shown in the several figures as if broken off.

A is the delivery side or end of the galvanizing-bath.

$f f$ are a pair of rolls of which the operative surfaces consist of a number of projections terminating outward in ends of small area, so as not to injure the coating of the sheets. These rolls correspond to the rolls $f f$ described in the specification of Moses Bayliss' United States patent, dated March 15, 1892, No. 471,065, (except that the number of projections is greatly increased, and the projections are shaped as small pyramids with flattened tops for convenience in forming them in the same pieces of metal as the rolls,) and

are similarly placed in relation to the metal in the bath. The rolls are positively driven, as is the case with Bayliss' rolls. They draw the sheets out from the molten coating metal, and as they do so the sheets fall onto a drum C, having projections i' of small end area on its periphery. This drum corresponds to the drum C described in the aforesaid patent and is positively driven in a direction to convey the sheets away from the bath. A drum C', like the drum C, is mounted at a point some distance from the drum C, and endless chains c^2 form with the drums a short carrier system similar to the carrier system described in the said Bayliss patent. The sheets are carried forward in turn by this carrier and fed thereby between a pair of brushes $b b$, which rotate rapidly in the directions respectively indicated by the arrows adjacent thereto, the one above and the other below the sheet, the ends or tips of the fibers or bristles composing the brushes being about two inches from the surface of a sheet as it passes between the brushes, so that they do not come in contact with the sheet. These brushes are housed in a suitable casing or chamber B. Water at a boiling temperature or at as high a temperature as it can conveniently be obtained is supplied through a perforated tube c at the top of the casing B onto the upper brush and water is projected sidewise from a perforated tube d in the casing against the lower brush. The brushes as they rotate throw the water in a fine spray and with considerable force against the upper and lower surfaces of a sheet, and the dirty water, falling to the bottom of the casing B, runs away through an outlet-slit k into a trough F below, from which it passes off through a pipe e to the drain. The slit k runs the whole length, or approximately so, of the bottom of the case, and the dirt is thus readily washed out through the slit by the water as it flows out therethrough. The sheet is guided between upper and lower guides $h h$ through the casing B, within which the brushes $b b$ rotate, and as it passes forward from between the washing-brushes $b b$ it is led by the guides $h h$ to and enters between a pair of positively-driven feed-rolls $g g$, each formed with narrow collars g' , having plain cylindrical bearing-surfaces. The collars are formed narrow, so as to bear on a small width only of the surface of a sheet and thus minimize the risk of rolling onto the surface any impurities. The rolls $g g$ feed the sheet on between guides $i i$ similar to the guides $h h$, and said guides $i i$ lead it between a pair of brushes $j j$ in a casing D. These brushes rotate rapidly in the direction indicated by the arrows adjacent thereto and they are so mounted as to contact with and rub the passing plate, the one the upper and the other the lower surface thereof. The casing D is provided with a hopper E at the top, and sawdust (sharps or other material suitable for the purpose) is supplied to said hopper and passes

therefrom into the upper portion of the casing D. As the brushes $j j$ rotate, they throw the sawdust in all directions, some of it passing to the lower brush at the sides, the casing being long enough to permit this, and as a galvanized sheet passes through between the brushes the sawdust is projected in a continuous shower against its surfaces and is also rubbed thereagainst by the action of the brushes. The surfaces are thus thoroughly dried and are also cleaned. The surplus sawdust falls out through a narrow aperture m in the bottom of the casing and thence down a chute G into a well H, Fig. 1^a, from whence it is elevated by elevator chains or bands J, carrying elevator-buckets J', and is delivered into the upper end of an inclined chute K, which carries it to the hopper E. Thus the sawdust is used over and over again. The lower forward end of the chute K is suspended by a rod n from a bearer o , and the hinder upper end is fixed to the lower end of an arm p , which is pivoted at its upper end to a support q . A connecting-rod r is pivoted at one end to the arm p and is engaged at its other end with a crank-pin s in the upper wheel s' of the elevator. Thus once during each revolution of the wheel s' the upper end of the chute K is moved or swung outward and allows a bucket, which has already delivered its contents into such chute, to pass down clear of the latter.

The special form of elevator described and illustrated is not of course essential, as any convenient arrangement of elevator may be used, and if the elevator chains (or bands) are carried sufficiently inclined it is obvious that the chute K need not to be moved outward for a bucket to clear it, as ample clearance may be given for a bucket to clear the chute after delivering its contents thereinto.

The elevator device is mainly indicated in dotted lines in the drawings.

As the sheets are washed while still in a heated condition and retain their heat to a considerable extent as they pass out from the casing or washing-chamber B, they become considerably dried before entering the casing D, and thus a quantity of sawdust may be passed through the chamber D a considerable number of times before it is too damp to be efficient in drying the sheets, and when it is required to be changed it can be removed from the well H and fresh sawdust supplied thereto.

The sheets are carried forward from the drying-brushes $j j$ along the guides $i i$, which pass through the chamber D and extend beyond it and enter between a pair of feed-rolls $t t$, of which each roll is formed with narrow collars t' , (substantially similar to the rolls g ,) which press against narrow surfaces of the sheets only, and thus minimize the risk of rolling any sawdust adhering to the sheets onto the surfaces thereof. The sheets are fed forward by these rolls along guides $u u$, which curve in an upward direction, as seen in Fig. 2, and

between brushes $v v$, rotating rapidly in the directions indicated by the arrows adjacent thereto, which brush away any sawdust adhering to the surfaces of the sheets and thoroughly clean the surfaces. The sheets are drawn from between the brushes $v v$ by means of rolls $d' d'$, which are similar to the rolls g and t before described, and as the sheets emerge from the rolls d' they are deflected by curved guides b' onto a carrier having chains c' , such as the carrier described in the said Bayliss patent, by means of which they are conveyed away to any point desired.

The brushes $v v$ are shown in Fig. 2 as placed in position to operate on a sheet while the same is in a nearly vertical position, so that any particles of dirt may readily fall clear of the sheet when detached therefrom by the brushes.

The means for driving the various portions of the apparatus may, of course, be modified.

In the particular apparatus illustrated the lower of the pair of brushes j is driven by means of a belt passing around a pulley on an overhead shaft (not shown in the drawings) and around the pulley e' , fixed on one end of the brush-spindle. The upper brush j is driven by means of a belt f' from a pulley on the opposite end of the lower brush-spindle to that on which the pulley e' is fixed. The lower brush b is driven by means of a belt s^2 from the spindle of the lower brush j , and the upper brush b is driven by means of a belt from a pulley on the opposite end of the spindle of the lower brush b to that on which the pulley is fixed, which is operated by the belt s^2 . One of the brushes v is driven by a belt a' from a pulley on an overhead shaft, (not shown,) which passes around a pulley v^2 on the brush-spindle, and the other brush v is driven by a belt from the spindle of its fellow brush. The chains c' of the carrier beyond the rolls $d' d'$ pass, at the inner end of the carrier for convenience in the general arrangement, around drums L, M, and N, Fig. 2; but of course one drum only may be used at such end, if preferred. The drum N is driven by means of a belt from a pulley on an overhead shaft, (not shown,) which passes around the pulley O, Fig. 4, fixed on the spindle of such drum, and thus the carrier-chains are operated. The lower roll t is driven by means of a chain k' from a wheel on the spindle of the drum N. One of the rolls d' is driven by means of a chain l' from a wheel on the spindle of the lower roll t , and the lower roll g is operated, also, by means of a chain m' from a wheel on the spindle of the lower roll t . The drum O' of the carrier adjacent to the galvanizing-bath is operated by means of a belt n' , Fig. 1, from the spindle of the lower roll g . The drum C is of course operated by the carrier-chains c' . The rolls of each pair are geared together by a toothed wheel on one gearing with a toothed wheel on the other. The elevator is driven by means of a chain p' from the spindle of the drum N, which passes

around a wheel on the lower spindle r' of the elevator.

It is not of course essential that in some instances belts and in some instances chains should be used for driving one shaft or spindle from another. The drawings have been made from the machine as fitted up, and as in some cases belts are shown and in others chains are indicated the description has been made to correspond therewith.

In order to obtain the fullest advantage in washing the sheets, they should commence to enter between the spraying-brushes immediately the coating metal has set or crystallized on their forward ends, and regard to this should be had in fixing the distance between the drum C and the spraying-brushes. Thin sheets, such as No. 26 Birmingham wire-gage, require, in order that they may be properly coated, to pass out from the molten coating metal at the rate of about eighteen feet per minute, and the distance from the center of the brushes to the surface of the molten metal, measured along the surface of the sheet, should be about four feet. Thicker sheets should, as is well understood, leave the bath somewhat more slowly. They retain their heat longer than the thinner sheets, and the coating metal does not in consequence crystallize so quickly. It is found in practice that four to five feet is a suitable distance from the center of the spraying-brushes $b b$ to the center of the drying-brushes $j j$, whatever the thickness of the sheets which are being treated.

The cleaning-brushes $v v$ may be placed at any desired distance from the drying-brushes $j j$.

The washing, drying, and cleaning brushes may each be conveniently about twelve inches in diameter.

The spraying or washing brushes may be run at a velocity of about two hundred and sixty revolutions per minute and the drying and cleaning brushes at a velocity of about one hundred and thirty revolutions per minute.

The operative parts of the brushes may be of fiber, such as is used for brushes for other purposes, or they may be of bristles.

In order to enable the distance between the washing-brushes and the drum C to be adjusted to suit different conditions of working and thus insure in any case that each portion of the surface of a sheet shall be washed almost immediately after the coating metal thereon has set, and at the same time to maintain the relative positions of the other parts of the apparatus, the pairs of brushes, guide-rolls, drums C', L, M, and N and the elevator may be mounted on slides P, fitted so as to be capable of being shifted longitudinally along fixed V-guides R, through the medium of screws S, fitted to turn in lugs u' on the ends of the guides R and screwed through lugs v' on the ends of the slides P, and of being held by such screws S in any position into which they have been moved. A hand-wheel w' is fixed on each screw S, whereby the lat-

ter is operated. The slides P and V-guides R are shown in transverse section in Fig. 5. The mechanism described is mounted in and on a suitable frame X of any kind best suited to the occasion.

When it is desired to vary the distance between the rollers f at the bath and the washing-brushes b , the drums C and C' will, of course, be separated; and this will require that the chains c^2 be lengthened or shortened, as required, by removing links therefrom or adding links thereto.

The brushes v are indicated in Fig. 4 merely by a rectangle formed with broken lines.

By the employment of this apparatus every portion of the surface of a sheet may be washed almost immediately after the coating metal has set or crystallized, as the sheets pass through the brushes at the rate of speed at which they leave the bath, and consequently at the speed at which the setting of the metal takes place along their surfaces, and thus the flux is dissolved and washed off before it can become burned, and any other impurities are of course washed away also. A small amount of water only is required and the dirty water passes away at once from the bottom of the washing-chamber and is not used over again. The sheets retain their heat to a considerable degree while passing between the drying-brushes and pass out from the drying casing or chamber in a dry condition, so that there is no need to place them subsequently in a drying-stove. The rapidity of the whole operation, which is entirely automatic, does not allow time for oxidation. A considerable saving in labor is effected over the old methods and a better and more uniform appearance of the surface of the sheets insured.

It must be borne in mind that in the case of any but a short sheet the forward end of the sheet commences to be washed before the hinder end thereof is clear from the bath, so that all of the operations set forth as successive may be taking place simultaneously on the same sheet. In the case of a ten-foot sheet, for example, five feet of it will usually be in the bath when the forward end reaches the washing devices. However, the thickness of the sheet, the temperature of the bath, and that of the room will effect the setting of the coating metal on the sheet. In fixing the position of the washing-chamber with relation to the bath the attendant is guided by his experience.

The apparatus above described is intended more especially for use with apparatus which delivers the sheets automatically from the bath to the washing-brushes above described and is especially suitable for employment with delivery-rolls of the character of those by which the sheets are delivered from the gal-

vanizing-bath described in the said Bayliss patent—that is to say, with the delivery-rolls $f f$ above described.

It has not been deemed necessary to illustrate the bath and the delivery devices for the sheet connected therewith, as these devices are common and are not actually included in my invention. The devices for this purpose shown in the Bayliss patent before mentioned will serve.

I prefer to employ brushes for projecting the washing-water and the granular absorbent material for drying the sheets upon the latter; but some equivalent rotating or revolving appliance which would not be called a "brush" might, especially for the washer, answer as a substitute. Therefore I do not limit myself strictly to a fibrous brush.

Having thus described my invention, I claim—

1. In an apparatus for cleansing galvanized metal sheets, the combination with a moving carrier for carrying the hot sheet from the point where it leaves the galvanizing bath to and through the cleansing mechanism, of a washer for the sheet situated at that point in the travel of the sheet where the coating metal will have set but the flux thereon will be still unburned, said washer comprising means for projecting water against both faces of the sheet, substantially as and for the purpose set forth.

2. In an apparatus for cleansing galvanized metal sheets, the combination with a washing chamber or casing, having inlets for water and a passage or way through it for the sheet to be washed, of a pair of rotating brushes or the like within said casing, whereby the water entering the casing is projected by said brushes against the plate in the form of spray, substantially as set forth.

3. In an apparatus for carrying and cleansing a hot metal sheet, fresh from the coating bath, the combination with the drum C and delivery rolls f , fixed with relation to each other, the frame X, slides mounted on the frame X, and adapted to be moved along said frame toward and from the drum C, the drum C', mounted on the said slides, the chains about the drums C and C', mechanism for driving the drum C', the washing apparatus, mounted on the said slides, and guides adapted to receive the sheet from the drum C' and guide it through the washing apparatus, substantially as set forth.

In witness whereof I have hereunto signed my name in the presence of two subscribing witnesses.

STEPHEN THORPE THOMAS.

Witnesses:

ROBERT M. LISTER,
ROBERT G. GROVES.