(No Model.) 4 Sheets—Sheet 1.

E. NORTON & J. G. HODGSON.

TINNING MACHINE.

No. 500,718. Patented July 4, 1893.

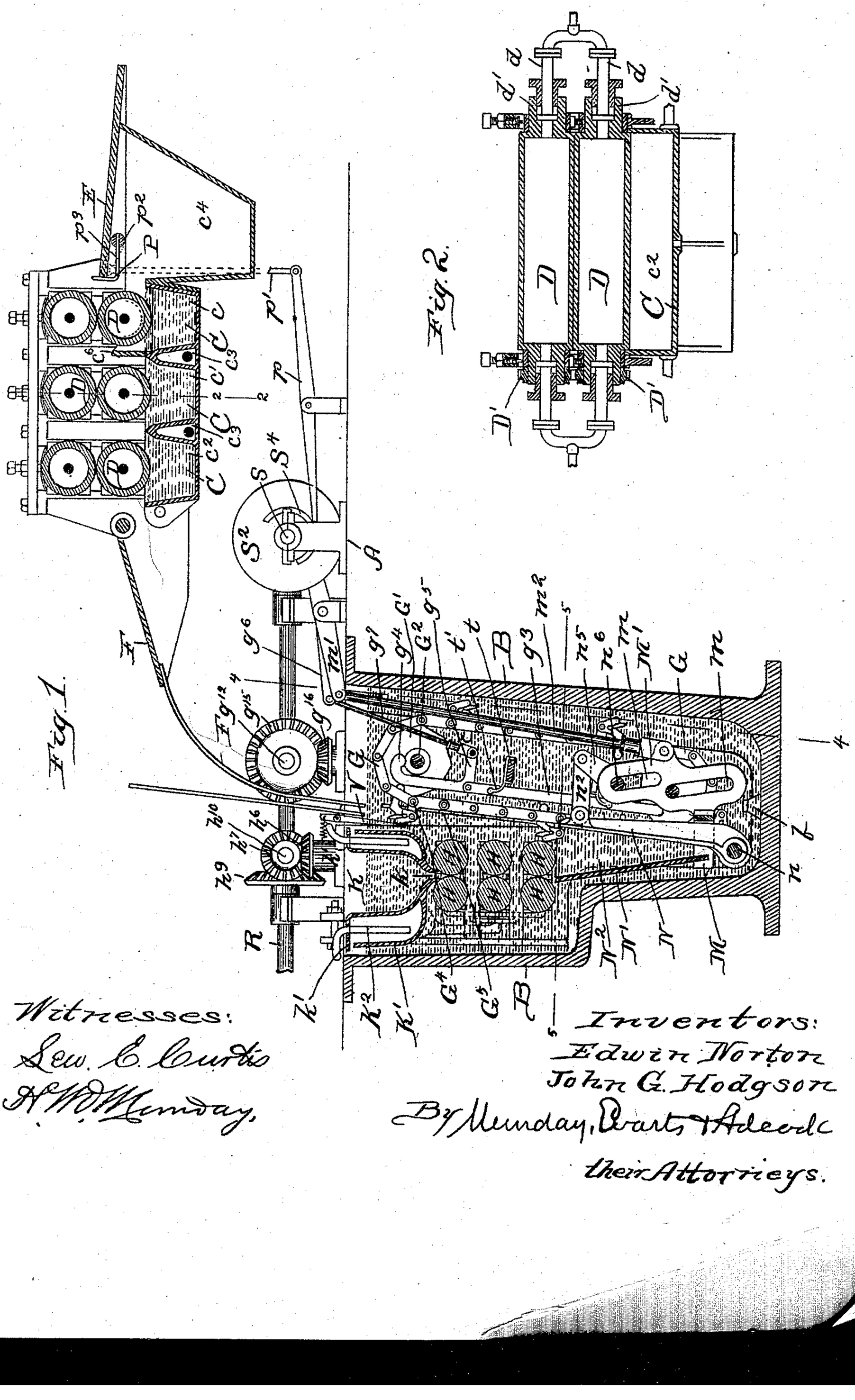

Fig. 1.

Fig. 2.

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their Attorneys.

(No Model.) 4 Sheets—Sheet 2.

E. NORTON & J. G. HODGSON.

TINNING MACHINE.

No. 500,718. Patented July 4, 1893.

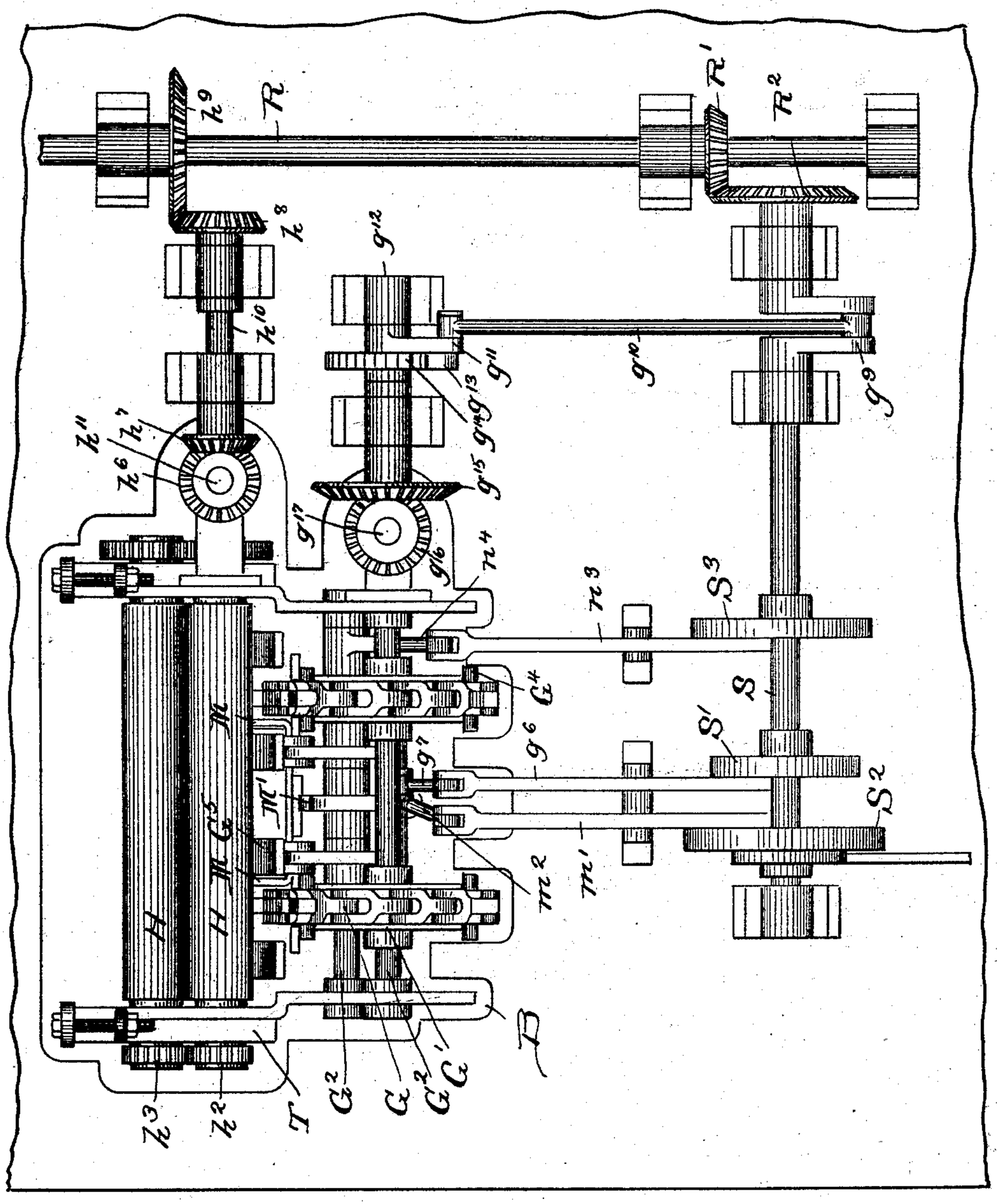

Fig. 5.

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(No Model.) 4 Sheets—Sheet 3.

E. NORTON & J. G. HODGSON.

TINNING MACHINE.

No. 500,718. Patented July 4, 1893.

Fig. 4.

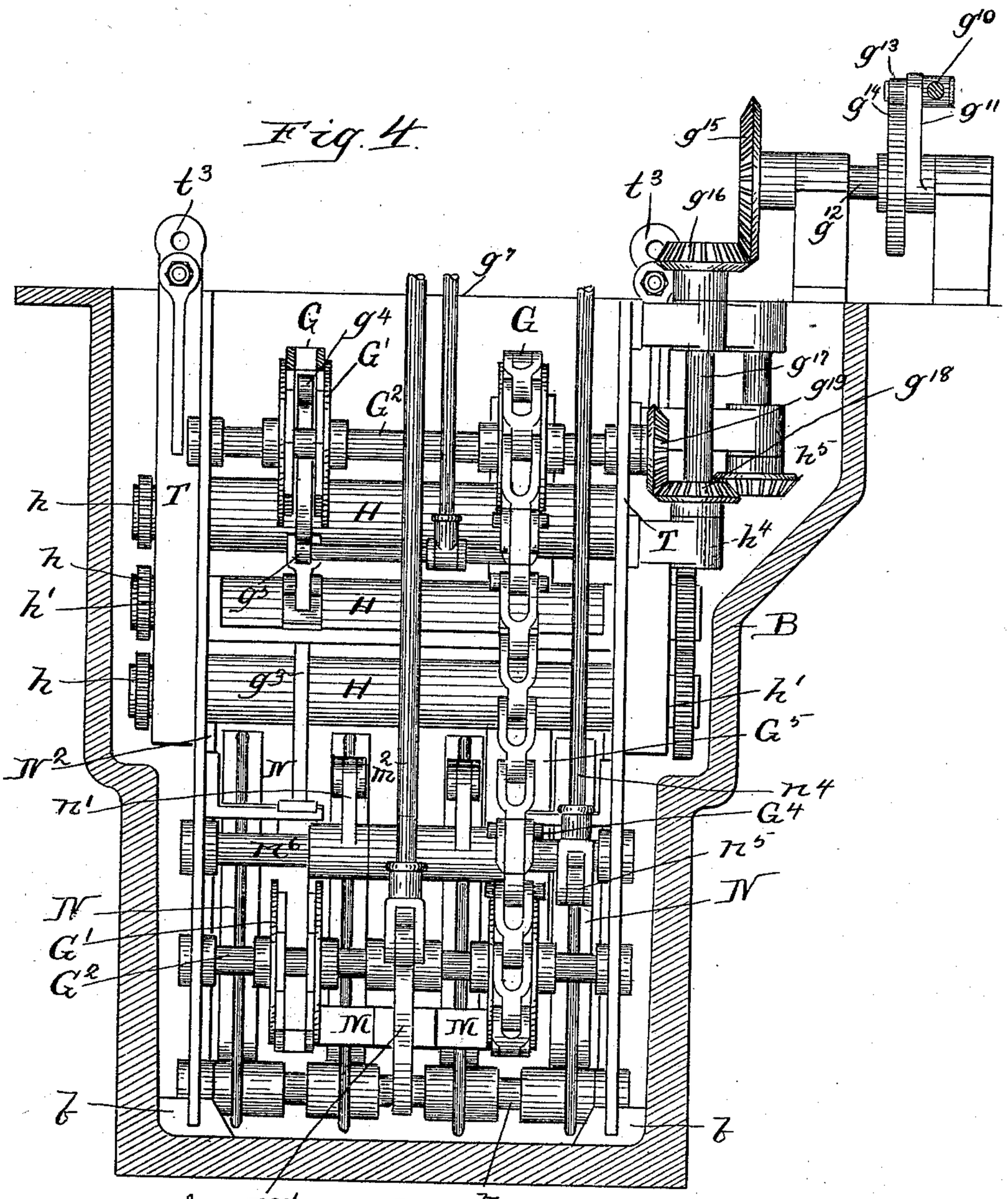
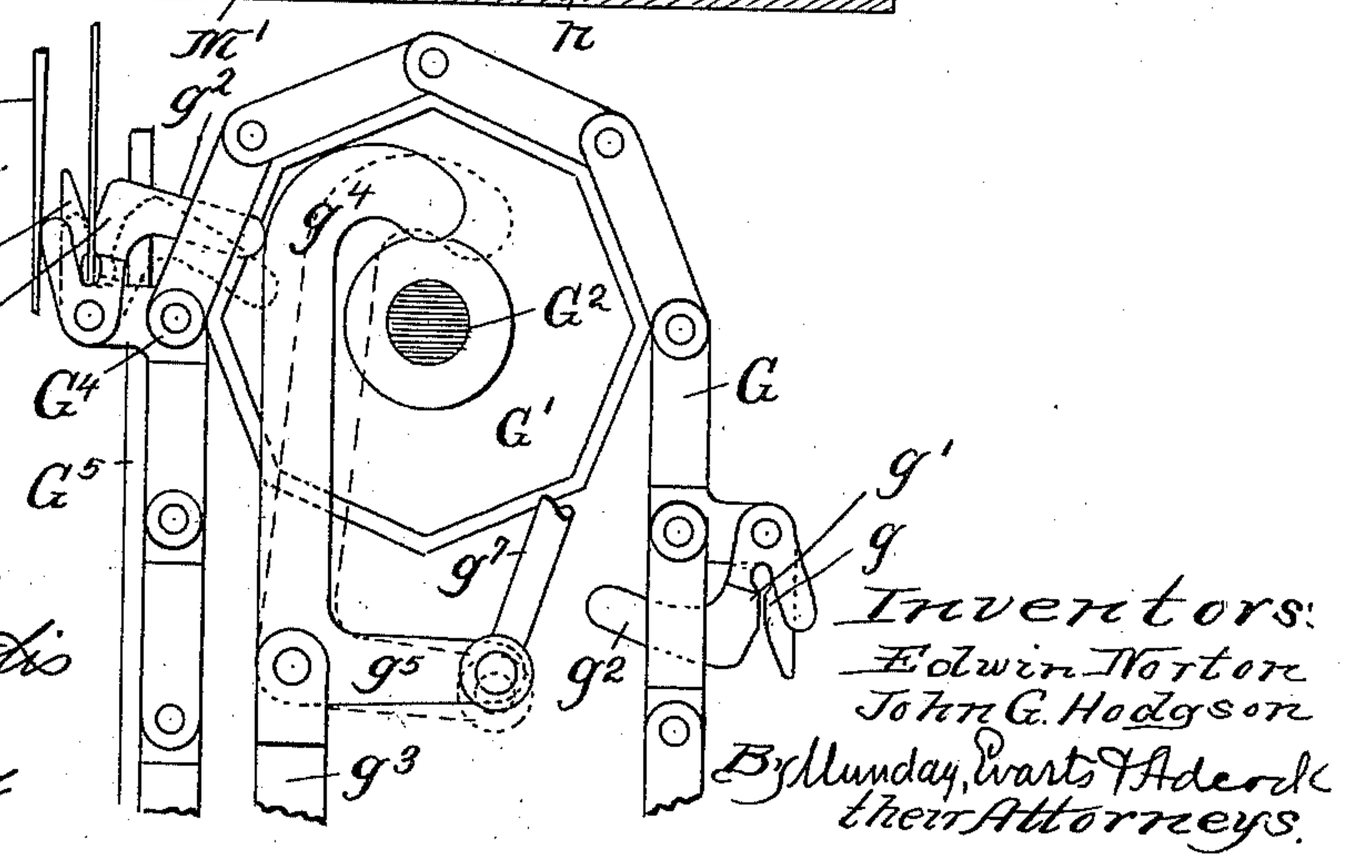


Fig. 6.



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(No Model.) 4 Sheets—Sheet 4.

E. NORTON & J. G. HODGSON.

TINNING MACHINE.

No. 500,718. Patented July 4, 1893.

Fig. 5.

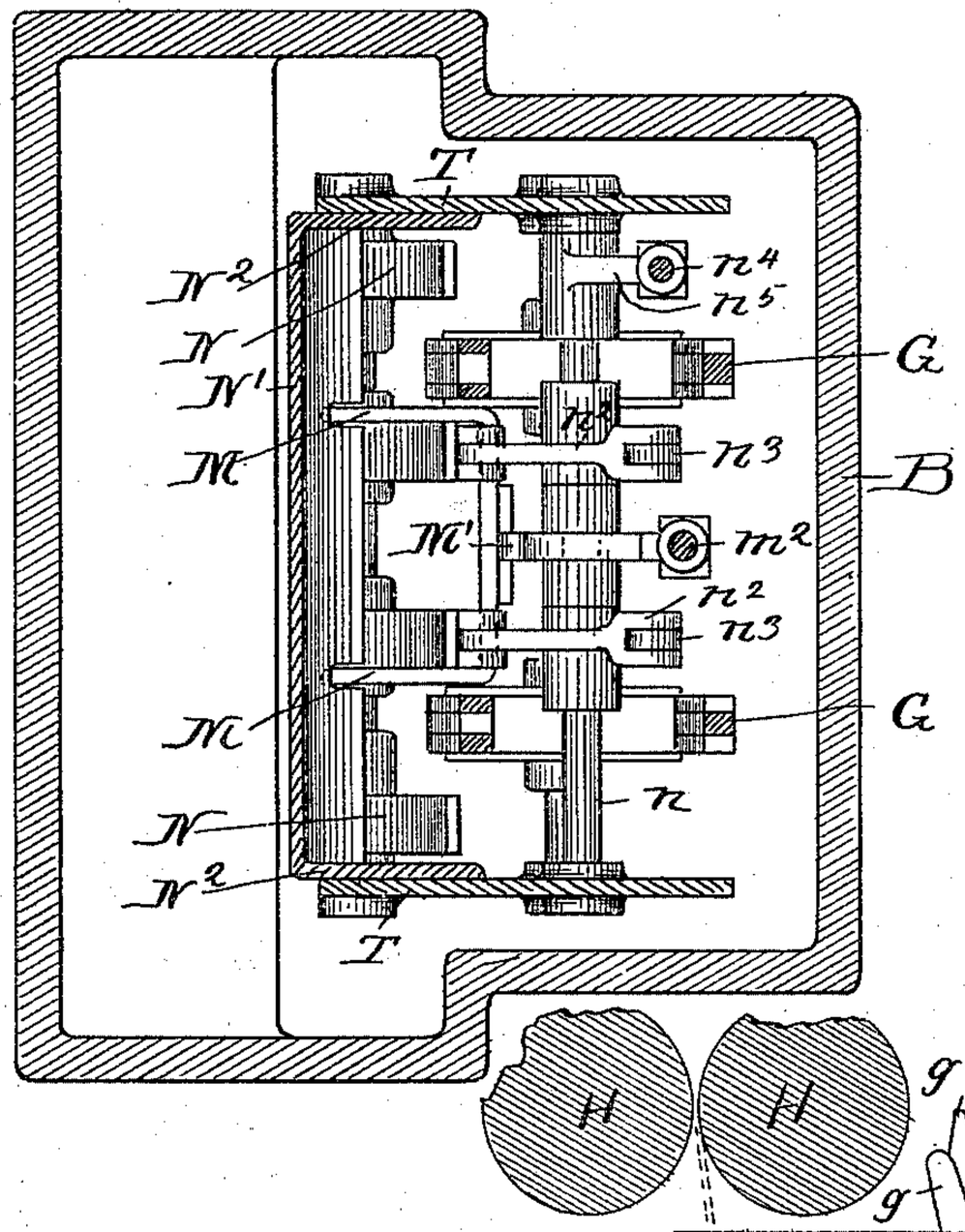
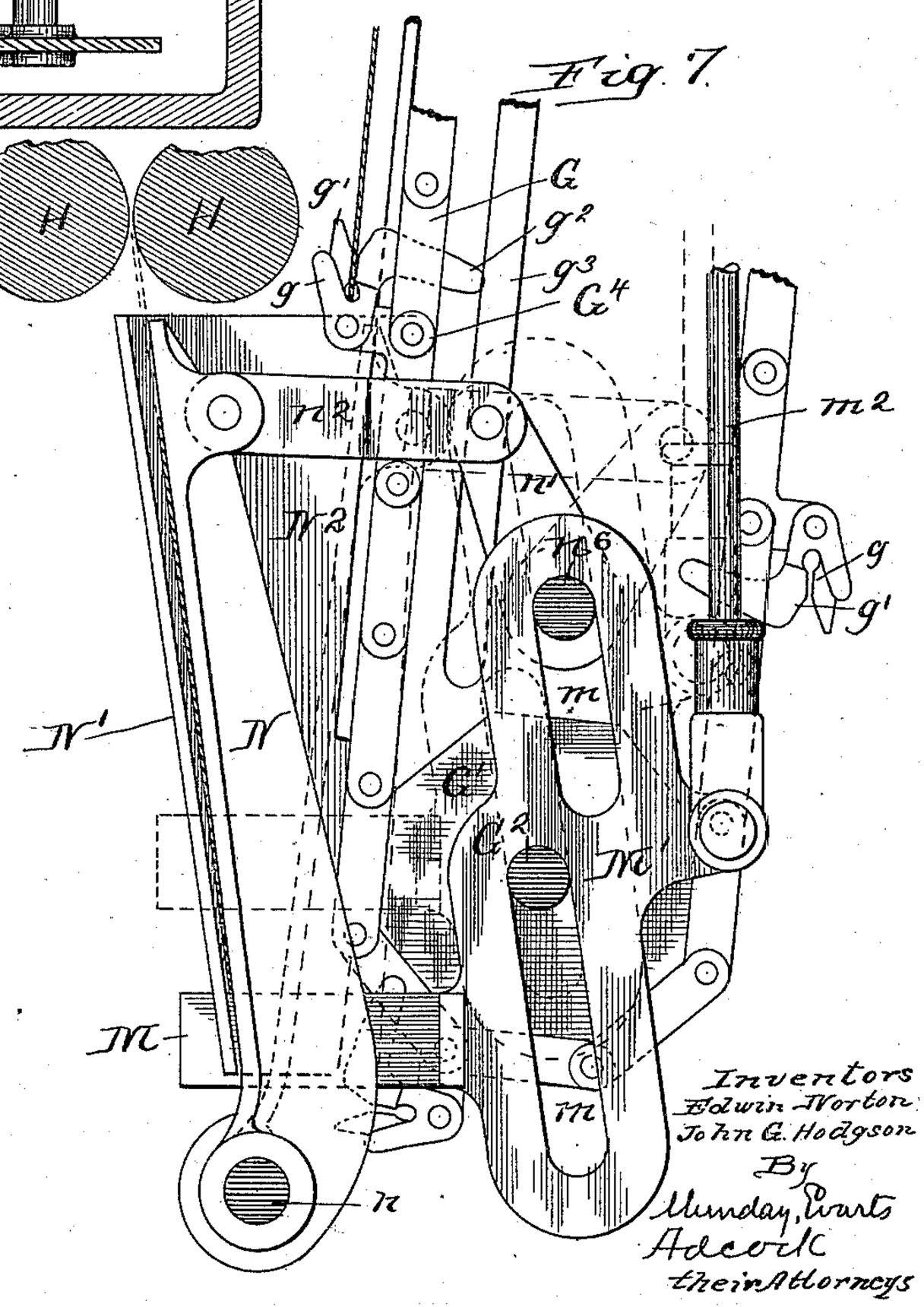


Fig. 7.



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UNITED STATES PATENT OFFICE.

EDWIN NORTON AND JOHN G. HODGSON, OF MAYWOOD, ASSIGNORS TO SAID EDWIN NORTON, AND OLIVER W. NORTON, OF CHICAGO, ILLINOIS.

TINNING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 500,718, dated July 4, 1893.

Application filed June 22, 1892. Serial No. 437,648. (No model.)

To all whom it may concern:

Be it known that we, EDWIN NORTON and JOHN G. HODGSON, citizens of the United States, residing at Maywood, in the county of Cook and State of Illinois, have invented a new and useful Improvement in Tinning-Machines, of which the following is a specification.

Our invention relates to improvements in tinning machines, and more particularly to tinning machines for use in practicing what is commonly known as the palm oil process of manufacturing tin plate and wherein an oil flux is employed as contradistinguished from what is known as the acid process wherein an acid is employed as the flux.

The object of our invention is to provide an apparatus of a simple, durable and efficient construction adapted for use in the palm oil process and by means of which sheets of iron or steel may be automatically, rapidly and cheaply tinned, thus saving the skilled labor heretofore commonly required in the practice of this process.

To this end our invention consists in the combination with a device for drying, heating and fluxing the sheets automatically, of a device for automatically tinning the dried, heated and fluxed sheets and means for delivering the sheets automatically and regularly from the drying, heating and fluxing device to the sheet carrier or conveyer of the tinning device.

It also consists in connection with a tinning pot of an endless conveyer or carrier furnished with grippers or devices for grasping the sheets, and operated automatically to grasp and release the sheets, whereby the sheets are automatically conveyed down into and through the molten tin in the pot.

It also consists in connection with the tinning pot and sheet carrier in providing the carrier with a series of sheet gripping or holding devices so that a number of sheets may be operated upon simultaneously or immersed in the pot at once.

It also consists in connection with the pot of the tinning rolls mounted therein and the sheet conveyer or carrier for immersing the sheets in the pot, of a device for automatically lifting the sheet into the bite of the lower pair of rolls, and a device for tilting or moving the sheet from the conveyer in position under the rolls, and a guide box or case to prevent the sheet from buckling or bending as it is lifted.

It also consists in connection with the pot and the tinning rolls of a supplemental pot of cooler metal above the rolls through which the sheet is discharged, the molten metal in the two pots communicating together through the opening in the supplemental pot through which the sheets issue.

It also consists in providing the supplemental pot with an air jacket surrounding the same for the purpose of conveniently maintaining the metal in the supplemental pot at a lower temperature than the metal in the main pot.

It further consists in means for supplying a blast of air to the air jacket space surrounding the supplemental pot.

It further consists in connection with the drying, heating and fluxing device, the tinning pot and its automatic mechanism of a sheet feed regulating device operated automatically from or in connection with the sheet carrier of the tinning device and whereby feed of the sheets to the sheet drying, heating and fluxing device is made to correspond to the delivery of the sheets from the tinning device, thus preventing any possibility of two sheets entering the tinning device together or at improper intervals.

Our invention also consists in the novel devices and novel combinations of parts and devices herein shown and described and more particularly pointed out in the claims.

In the accompanying drawings which form a part of this specification and in which similar letters of reference indicate like parts, Figure 1 is a vertical longitudinal sectional view of the machine embodying our invention. Fig. 2 is a vertical cross section on line 2—2 of Fig. 1. Fig. 3 is a detail plan view showing the mechanism in the tinning pot. Fig. 4 is a vertical cross section on line 4—4 of Fig. 1 and showing the sheet conveyer or carrier in elevation. Fig. 5 is a horizontal section on line 5—5 of Fig. 1. Fig. 6 is an enlarged detail view of the sheet carrier or conveyer and its sheet gripping or holding de-

vices. Fig. 7 is an enlarged detail view of the device for lifting the sheets into the bite of the rolls and of the device for tilting the sheet from the path or line of the sheet conveyer into position under the tinning rolls.

In the drawings A represents the frame of the machine, B the tinning pot, C the palm oil or flux containing vessel, D the drying, heating and fluxing rolls, E the feed table or chute, F the intermediate sheet delivery device or chute by which the sheets after being dried, heated and fluxed are delivered to the sheet conveyer or carrier G in the tinning pot, H the tinning rolls, K the supplemental pot of cooler metal above the tinning rolls, M the sheet lifting device by which the sheets are lifted into the bite of the tinning rolls, N the device for tilting or moving the sheets from the conveyer G into position under the tinning rolls, and P is the device for regulating the feed of the sheets to the machine. These parts are all combined to co-operate together. They may be combined to coact by any suitable intermediate connecting or operating mechanism. In the drawings we have shown however what we believe to be the best way now known to us of operating, connecting and arranging the several devices or parts constituting the combined machine and the various subcombinations.

The palm oil or flux containing vessel, pot or trough C is preferably divided into three compartments c c' c^2 and with intermediate steam compartments c^3 for heating the oil and an overflow compartment c^4. The drying, heating and fluxing rolls D are preferably three pairs in number and are hollowed and heated by steam admitted through the steam pipes d which connect through their hollow journals d'. The rolls are furnished with gears D′ for driving the same. The white or pickled sheets are taken directly from the water or washing bath and placed upon the feed table E which should preferably be somewhat inclined to permit the surplus water to flow off. And the wet sheets are then passed immediately through or between the pairs of drying, heating and fluxing rolls D. Each successive pair of rolls should be heated to a higher degree than the preceding rolls, so that the water and moisture on the sheets as they enter the first pair of rolls will not, owing to the low temperature of these rolls cause the oil to foam or boil over too violently. The partition c^6 between the first two pairs of rolls D is also extended up to a considerable distance to prevent the palm oil boiling over too much into the contiguous compartments of the oil pot C.

The sheet conveyer or carrier G in the tinning pot B consists preferably of an endless link chain and mounted upon or driven by sprocket wheels G′ on the shafts G^2. The shafts G^2 are journaled on a movable frame T which fits inside the pot B and is adapted to be lifted bodily out of the same together with rolls H, lifting device M, sheet tilting device N and the supplemental pot K which are also all mounted upon this movable frame T. The sheet carrier or conveyer chain G is furnished at intervals with sheet holding devices g which co-operate with movable grippers g' to grasp the sheet by its lower edge and thus convey it down through the molten tin in the pot B. The grippers g' each have an operating arm or lever g^2 which engages a stationary track or cam g^3 mounted on the frame T and which operates to close the grippers and hold the same closed. This track or cam g^3 is provided with a movable section g^4 at its upper end which by its movement serves to close the grippers after the edge of the sheet is entered between the same. By furnishing the cam track with a movable section g^4 which closes the grippers by its movement, we are enabled to close the grippers while the carrier remains stationary, thus insuring against displacement of the sheet before the grippers close upon its edge. The track or cam g^3 terminates near the lower end of the conveyer G or its lower sprocket wheel G′ so that the movable gripper g' may open when the conveyer G carries it beyond the end of the track g^3, and thus release the sheet and permit it to be swung or moved over by the device N into position under the tinning rolls H. The sheet tilting or moving device N consists preferably of a series of fingers or arms secured to a rock shaft n mounted on the movable frame T. The sheet moving or tilting arms N co-operate with a guide box N′ which is fixed immovably on the frame T in position under the rolls H. The arms N operate to swing or move the sheet over against the guide N′. The guide N′ is, or should be provided with guide flanges or wings N^2 at each end, so that the sheet cannot get out of position. The arms N swing back and forth between the guide flanges N^2 of the box or guide N′. After the sheet having been first released from the grippers has been swung over into position under the guide rolls H it is next lifted into the bite of the lower pair of rolls H by the sheet lifter M, the same consisting of two or more horizontal fingers projecting between the arms N and into slots formed in the guide N′ so as to lift the sheet between the guide N′ and the arms N, the sheet being thus held in a true plane and prevented from buckling or binding by these co-operating devices N and N′. The lifter M is secured to or carried by a reciprocating slide M′ which is furnished with guide slots m and is mounted upon the shaft G^2 of the lower sprocket wheel and on the rock shaft n by which the sheet tilting or moving device N is actuated. The tracks or cams g^3 are attached to lugs t on the frame T by brackets t'. The movable section g^4 of the cam or track g^3 is provided with an operating arm or lever g^5 and is actuated by a cam S′ on the cam shaft S through a lever g^6 and connecting link g^7. The lifting device M is operated at intervals from the cam S^2 on the cam shaft S through

the lever m' and connecting link m^2. The sheet tilting or moving device N is operated from the rock shaft n^6 through an arm n' secured to said rock shaft and the pivoted connecting link n^2. The rock shaft n^6 is rocked at intervals by means of a cam S^3 on the cam shaft S, lever n^3 connecting link n^4 which is pivoted at its lower end to an arm n^5 on the rock shaft n^6.

The tinning rolls H are mounted in suitable bearings h' on the frame T and are driven by connecting gears h^2 h^3 on the shafts of said rolls, and the bevel gears h^4 h^5 h^6 h^7 h^8 h^9, the latter gear being on the driving shaft R, the gears h^7 h^8 on the intermediate horizontal shaft h^{10} and the gears h^5 h^4 on the intermediate vertical shaft h^{11}. This latter shaft extends down to the molten tin in the pot B to connect with the beveled gear h^4 on the shaft of the roll H.

The supplemental pot K is mounted on or secured to the removable frame T in the upper part of the pot B and just above the tinning rolls H. It is provided with a slot or opening k which registers with the rolls H and through which the sheets pass upward into and through the supplemental pot and are thus discharged from the machine.

The supplemental pot K is provided with an air jacket K′ or other suitable means for keeping the molten tin or metal in this supplemental pot at a somewhat lower temperature than that in the main tinning pot B.

K^2 is an air blast pipe for supplying a blast or current of fresh or cool air to the air jacket space and thus aid in keeping the temperature of the supplemental pot at the required degree. The supplemental pot K is also preferably furnished with a lip or flange k' overlapping the air space K′ to guard against the molten metal dripping or dropping into this air space as the tinned sheets are removed or lifted away.

The cam shaft S is furnished with a cam S^4 which operates at suitable intervals the feeder P through the lever p connecting link p' and rock shaft p^2 furnished with arm p^3.

The sheet conveyer or carrier G or its upper sprocket wheel shaft G′ is intermittently driven from the main shaft S by means of a crank g^9, connecting link or pitman g^{10}, pawl arm g^{11} on shaft g^{12}, pawl g^{13}, ratchet g^{14} on said shaft g^{12}, bevel gears g^{15} g^{16}, the latter being on the vertical shaft g^{17}, and bevel gears g^{18} g^{19}, the latter being on the shaft G^2.

It will be observed that the sheet carrier or conveyer G has a series of sheet holders g and grippers g', so that a number of sheets may be operated upon at the same time, in continued succession of steps, one sheet being at one step or stage of the operation while another sheet is at another step or stage of the complete operation. By this means two or more sheets are immersed in the molten metal at the same time, or all the time, and still no part of the machine separately considered contains or handles but one sheet at a time, that is to say one sheet may be received by the grippers while another is held by the grippers immersed in the molten metal in the middle of the pot, while another sheet is being released from the grippers and moved into position under the tinning rolls at the bottom portion of the pot, and still another sheet is being discharged by the rolls through the supplemental pot and delivered from the machine, and at the same time still another sheet is being operated upon by the drying, heating and fluxing device. By this means as the sheets pass along through the tinning pot in a continued succession, one by one, there is no danger of the sheet handling mechanism which is immersed in the molten metal becoming clogged with the sheets.

By providing the tinning pot B with a supplemental pot K of cooler metal through which the sheets pass after leaving the tinning rolls H the sheets may be completely tinned on their way out of the pot B and by the same operation, thus saving the labor of delivering the sheets into a separate pot of cooler metal.

The brackets or arms t' which connect the gripper operating tracks or cams g^3 with the frame T are preferably spring or yielding arms so as to slightly cushion the action of the grippers and thus insure the smooth and easy running of the machine and the proper holding action of the grippers at all times.

The links G^3 of the chain carrier G, upon which the grippers are mounted, are preferably provided with guide rolls G^4 which engage or co-operate with a stationary guide track G^5 secured to the frame T so as to hold the chain or the grippers carried thereby in proper coactive relation with the cam track g^3.

The grippers g' are so pivoted or mounted on the carrier G that they will normally open by their own gravity when not engaged by the cam or track g^3; but to insure the positive opening of the gripper at the point or station where the sheets are received between the two opposing jaws of the gripper, we provide the machine with a gripper opening device V, the same consisting preferably of a spring in contact with which the gripper is brought by the movement of the carrier G.

By providing the machine with a guide or box N′ and the coacting guide arms N, which when swung over in position beneath the tinning rolls H leaves simply a narrow space for the sheet or plate to fit and be lifted in, the machine is adapted to operate practically and with success upon very thin plates, such for example as those used in the manufacture of taggers tin, as these thin plates are supported and guided on both sides while being lifted into the bite of the rolls on one side by the guide box N′ and on the other side by the sheet moving and guide arms N. The guide box N′ by its end flanges N^2 also guides the sheets at its ends and prevents any possibility of displacement.

By means of this machine each and every sheet or plate is treated exactly alike, being subjected to the same amount of heat for the

same length of time in the heating, drying and fluxing device of the machine, and each and every sheet being also subjected to the tinning bath for a like period of time, so that all the sheets are uniformly and perfectly tinned, while at the same time no skilled labor is required, the machine itself determining by its operation when the sheet is properly heated, properly dried, properly fluxed, and when it has been subjected to the bath of molten tin a sufficient length of time to be properly tinned. By the movable feed sheet stop or regulating device P the rapidity or rate at which the sheets may be fed to the machine is also automatically regulated and determined so that a boy may be employed for operating the machine. As the sheets are discharged or delivered from the machine through the supplemental pot K of cooler metal, they are grasped by the attendant with suitable tongs and placed upon the cooling racks or in a subsequent finishing machine, if it is desired to give the sheets a further finish. The cam shaft S is driven from the main driving shaft R by beveled gears R′ R^2 connecting the same.

By mounting the mechanism for conveying and handling the sheet in and through the molten metal in the tinning pot on a separate removable frame T adapted to be lifted bodily out of the tinning pot, we are enabled to very easily and quickly examine the mechanism and repair or adjust it when desired. This feature is a matter of great practical convenience and results in a great saving of time and labor as by this improvement it is unnecessary to draw the molten metal out of the pot in order to examine, repair or adjust the mechanism.

The frame T is furnished with eyes or hooks t^3 to enable it to be conveniently lifted out of the pot. The pot B is provided with lugs *b* for the frame T to fit upon.

We claim—

1. In a machine for tinning plates by the palm oil process the combination with a device for simultaneously drying, heating and fluxing the wet pickled sheets, of a tinning pot, an endless sheet conveyer for the sheets mounted therein and provided with a series of grippers, mechanism for closing the grippers at intervals, tinning rolls mounted in the pot, a device for moving or tilting the sheet into position under the tinning rolls, and a device for lifting the sheet into the bite of the rolls, substantially as specified.

2. In a machine for tinning plates by the palm oil process the combination with a device for simultaneously drying, heating and fluxing the wet pickled sheets, of a tinning pot, an endless sheet conveyer for the sheets mounted therein and provided with a series of grippers, mechanism for closing the grippers at intervals, tinning rolls mounted in the pot, a device for moving or tilting the sheet into position under the tinning rolls, a device for lifting the sheet into the bite of the rolls, and a guide box or plate N′ to guide the sheet as it is lifted, substantially as specified.

3. In a machine for tinning plates by the palm oil process the combination with a device for drying, heating and fluxing the wet pickled sheets, of a device for tinning the sheets, and mechanism for automatically delivering the sheets one by one and separately from the fluxing device to said tinning device, substantially as specified.

4. The combination with a tinning pot of an endless conveyer mounted therein and provided with a series of grippers, and mechanism for opening and closing the grippers at intervals automatically, substantially as specified.

5. The combination of a tinning pot, an intermittently-moving endless carrier provided with a series of grippers and mounted in said pot for conveying the sheets into the pot, mechanism for operating said carrier, means for closing said grippers, and a sheet tilting device N mounted in the pot near the lower end of the carrier and in front of which the sheet is conveyed by the carrier and by which the sheet is tilted or moved laterally out of the path of the succeeding sheet, substantially as specified.

6. The combination with a tinning pot of an intermittently moving sheet carrier furnished with grippers or devices for holding and grasping the sheet, and a cam or track for closing the grippers, substantially as specified.

7. The combination with a tinning pot of an intermittently moving sheet carrier furnished with grippers or devices for holding and grasping the sheet, and a cam or track for closing the grippers, said cam or track having a movable part or section to close the gripper after the sheet has been received therein, substantially as specified.

8. The combination of a tinning pot with a sheet carrier for conveying the sheets into the molten metal, tinning rolls mounted in the pot, a device for moving or tilting the sheet into position under the tinning rolls, and a device for lifting the sheet into the bite of the rolls, said carrier extending down to said sheet tilting and sheet lifting devices, and operating to deliver the sheet onto the lifting device and in front of the tilting device substantially as specified.

9. The combination of a tinning pot with a sheet carrier furnished with a series of grippers for grasping the sheets tinning rolls mounted in the pot, a device for moving or tilting the sheet into position under the tinning rolls, and a device for lifting the sheet into the bite of the rolls, means for closing the grippers to grasp the sheets substantially as specified.

10. The combination of a tinning pot with a sheet carrier furnished with a series of grippers for grasping the sheets tinning rolls mounted in the pot, a device for moving or tilting the sheet into position under the tin-

ning rolls, a device for lifting the sheet into the bite of the rolls, and means for automatically delivering the sheets one by one to said carrier, means for closing the grippers to grasp the sheets substantially as specified.

11. The combination of a tinning pot with a sheet carrier furnished with a series of grippers for grasping the sheets tinning rolls mounted in the pot, a device for moving or tilting the sheet into position under the tinning rolls, a device for lifting the sheet into the bite of the rolls, and a supplemental pot above the tinning rolls furnished with means for maintaining the metal therein at a lower temperature than that of the main tinning pot before mentioned means for closing the grippers to grasp the sheets substantially as specified.

12. The combination of a tinning pot with a sheet carrier furnished with a series of grippers for grasping the sheets a cam or track for closing the grippers and holding them closed, tinning rolls mounted in the pot, a device for moving or tilting the sheet into position under the tinning rolls, and a device for lifting the sheet into the bite of the rolls, substantially as specified.

13. The combination of a tinning pot, of an endless conveyer mounted thereon and provided with a series of grippers, means for closing the grippers at intervals, mechanism for communicating an intermittent motion to said conveyer, and a sheet delivery device F for delivering the sheets to said conveyer, substantially as specified.

14. The combination of a tinning pot, of an endless conveyer mounted thereon and provided with a series of grippers, means for closing the grippers at intervals, mechanism for communicating an intermittent motion to said conveyer, a sheet delivery device F for delivering the sheet to said conveyer, and a movable stop or gate P adapted to close the sheet feed passage and prevent the feed of the sheets, except at intervals, substantially as specified.

15. The combination with a drying, heating and fluxing device, of a tinning device, means for delivering the sheets automatically from said fluxing device to said tinning device, and a stop device for closing the sheet feed passage at intervals and automatically regulating the feed of the sheets to said fluxing device, substantially as specified.

16. The combination with a drying, heating and fluxing device, of a tinning device, means for delivering the sheets automatically from said fluxing device to said tinning device, and a stop device for closing the sheet feed passage at intervals and automatically regulating the feed of the sheets to said fluxing device, said fluxing device comprising an oil or flux trough C, and a series of heated fluxing rolls D, substantially as specified.

17. The combination with a drying, heating and fluxing device, of a tinning device, means for delivering the sheets automatically from said fluxing device to said tinning device, and a stop device for closing the sheet feed passage at intervals and automatically regulating the feed of the sheets to said fluxing device, said tinning device having an automatic sheet conveyer for conveying the sheets into the bath of tin, and to which the sheets are automatically delivered, substantially as specified.

18. The combination with a drying, heating and fluxing device, of a tinning device, means for delivering the sheets automatically from said fluxing device to said tinning device, and a stop device for closing the sheet feed passage at intervals and automatically regulating the feed of the sheets to said fluxing device, said fluxing device comprising an oil or flux trough C, and a series of heated fluxing rolls D, tinning rolls and devices for automatically delivering the sheets to the rolls from said conveyer, substantially as specified.

19. The combination with a tinning pot, of an endless conveyer mounted therein and provided with a series of grippers for grasping the sheet, means for closing the grippers at intervals, tinning rolls mounted in the pot, a sheet lifting device M upon which the sheet is delivered by said conveyer, and a sheet tilting or moving device N in front of which the sheet is delivered by said conveyer, substantially as specified.

20. The combination with a tinning pot, of tinning rolls mounted therein, a sheet lifter M mounted below the rolls, a sheet tilting or moving device N, an intermittently-moving endless conveyer provided with a series of grippers and extending vertically down to said lifter M so as to deliver the sheets positively thereto, and means for closing and holding closed the grippers, substantially as specified.

21. The combination with a tinning pot, of tinning rolls mounted therein, a sheet lifter M mounted below the rolls, a sheet tilting or moving device N, an intermittently moving endless conveyer provided with a series of grippers and extending vertically down to said lifter M so as to deliver the sheets positively thereto, means for closing and holding closed the grippers, wheels or pulleys G′ G′ upon which said endless conveyer travels, the lower one of said pulleys G′ extending below the lifter M, and the sheet tilter or mover N arranged to oscillate back and forth across the path of the grippers or the sheets carried thereby, substantially as specified.

22. The combination with a tinning pot, of tinning rolls mounted therein, a sheet lifter M mounted below the rolls, a sheet tilting or moving device N, an intermittently-moving endless conveyer provided with a series of grippers and extending vertically down to said lifter M so as to deliver the sheets positively thereto, means for closing and holding closed the grippers, and a guide box or plate N′ co-

operating with said device N to guide the sheets as they are lifted by said device M, substantially as specified.

23. The combination with a tinning pot, of tinning rolls mounted therein, a sheet lifter M mounted below the rolls, a sheet tilting or moving device N, an intermittently-moving endless conveyer provided with a series of grippers and extending vertically down to said lifter M so as to deliver the sheets positively thereto, means for closing and holding closed the grippers, and a guide box or plate N′ co-operating with said device N to guide the sheets as they are lifted by said device M, said guide box or plate N′ having end plates or flanges N^2, substantially as specified.

24. The combination with a tinning pot, of tinning rolls mounted therein, a sheet lifter M mounted below said rolls, a sheet tilting or moving device N, an intermittently-moving endless conveyer provided with a series of grippers and extending vertically down to said lifter M so as to deliver the sheets positively thereto, means for closing and holding closed the grippers, and a guide box or plate N′ co-operating with said device N to guide the sheets as they are lifted by said device M, said guide box or plate N′ having slots to receive the fingers of the lifter, and said lifter consisting of or being provided with a series of parallel fingers, substantially as specified.

25. The combination with a tinning pot, of tinning rolls mounted therein, a sheet lifter M mounted below the rolls, a sheet tilting or moving device N, an intermittently-moving endless conveyer provided with a series of grippers and extending vertically down to said lifter M so as to deliver the sheets positively thereto, means for closing and holding closed the grippers, and a supplemental pot K above said tinning rolls, furnished with an air jacket to maintain the same at a lower temperature than the main pot, substantially as specified.

26. The combination of a tinning pot B, sheet carrier G furnished with a series of holding devices *g* and grippers *g′* and a cam or track for operating the grippers, mounted upon yielding or spring supports, substantially as specified.

27. The combination of a tinning pot B, sheet carrier G furnished with a series of holding devices *g* and grippers *g′* and a cam or track for operating the grippers, mounted upon yielding or spring supports, said cam or track having a movable section g^4 to operate the grippers in the sheet receiving position, substantially as specified.

28. The combination with a tinning pot of an endless flexible or link chain sheet carrier G furnished with sheet holding devices *g g′*, a cam or track for operating said sheet holding devices, and a guide track for the flexible carrier G, substantially as specified.

29. The combination of a tinning pot, a sheet carrier furnished with grippers, and a device for automatically opening the grippers at the sheet receiving station, substantially as specified.

30. The combination of a fluxing pot C, drying, heating and fluxing rolls D, a sheet feed table E and a movable sheet feed regulating device P adapted to close the feed passage to prevent the sheets from being fed except at intervals, substantially as specified.

31. The combination of a fluxing pot C, drying, heating and fluxing rolls D, a sheet feed table E, a movable sheet feed regulating device, P adapted to close the feed passage to prevent the sheets from being fed except at intervals, and a cam and lever for operating said device P, substantially as specified.

32. The combination of a fluxing pot C, drying, heating and fluxing rolls D, sheet delivery device F, tinning pot B and sheet conveyer G furnished with grippers and a cam or track for operating the grippers, said sheet delivery device F being between the fluxing rolls and the tinning pot, and the conveyer G extending vertically in the tinning pot substantially as specified.

33. The combination of a fluxing pot C, drying, heating and fluxing rolls D, a sheet delivery device F, tinning pot B, sheet conveyer G furnished with grippers, and a cam or track for operating the grippers and a sheet moving or tilting device N and guide N′ said sheet delivery device F being between the fluxing rolls and the tinning pot, and the conveyer G extending vertically in the tinning pot, substantially as specified.

34. The combination of a fluxing pot C, drying, heating and fluxing rolls D, a sheet delivery device F, tinning pot B, sheet conveyer G furnished with grippers and a cam or track for operating the grippers, a sheet moving or tilting device N and guide N′, and a sheet lifting device said sheet delivery device F being between the fluxing rolls D and the tinning pot, and the conveyer G and tilting device N and guide N′ being in the tinning pot at the lower end of said conveyer, substantially as specified.

35. The combination of a fluxing pot C, drying, heating and fluxing rolls D, a sheet delivery device F, tinning pot B, sheet conveyer G furnished with grippers and a cam or track for operating the grippers, a sheet moving or tilting device N and guide N′, a sheet lifting device, M, and tinning rolls H said sheet delivery device F being between the fluxing rolls D and tinning pot and the sheet conveyer G, tilting device N, guide N′, lifting device M and tinning rolls H being in the pot, and the devices M, N and N′ being below the tinning rolls H, substantially as specified.

36. The combination of a fluxing pot C, drying, heating and fluxing rolls D, a sheet delivery device F, tinning pot B, sheet conveyer G furnished with grippers and a cam or track for operating the grippers, a sheet moving or tilting device N and guide N′, a sheet lifting device M, tinning rolls H and supplemental

tinning pot K of cooler metal, said sheet delivery device F being between the fluxing rolls D and tinning pot and the sheet conveyer G, tilting device N, guide N′, lifting device M and tinning rolls H being in the pot, and the devices M, N and N′ being below the tinning rolls H, and said supplemental pot K being above said tinning rolls and furnished with means for maintaining the metal therein at a lower temperature substantially as specified.

37. The combination of a fluxing pot C, drying, heating and fluxing rolls D, a sheet delivery device F, tinning pot B and sheet conveyer G furnished with grippers, a sheet moving or tilting device N and guide N′, a sheet lifting device M, tinning rolls H, supplemental tinning pot K of cooler metal, and an automatic feed regulating device consisting of a stop adapted to close the sheet feed passage, said sheet delivery device F being between the fluxing rolls D and tinning pot and the sheet conveyer G, tilting device N, guide N′, lifting device M and tinning rolls H being in the pot, and the devices M, N and N′, being below the tinning rolls H, and said supplemental pot K being above said tinning rolls and furnished with means for maintaining the metal therein at a lower temperature substantially as specified.

38. The combination of a fluxing pot C, drying, heating and fluxing rolls D, a sheet delivery device F, tinning pot B and sheet conveyer G furnished with grippers, a sheet moving or tilting device N and guide N′, a sheet lifting device M tinning rolls H, supplemental tinning pot K of cooler metal, an automatic feed regulating device consisting of a stop adapted to close the sheet feed passage, and mechanisms substantially as shown and described for automatically operating said devices, said mechanism comprising means for communicating a revolving motion to said rolls D, means for communicating an intermittent movement to said conveyer D, means for closing said grippers, means for oscillating said tilting device N, means for reciprocating said lifting device M, means for revolving said tinning rolls H and means for vibrating said sheet feed regulating device, said sheet delivery device F being between the fluxing rolls D and tinning pot, and the sheet conveyer G, tilting device N, guide N′, lifting device M and tinning rolls H being in the pot, and the devices M, N and N′ being below the tinning rolls H, and said supplemental pot K being above said tinning rolls and furnished with means for maintaining the metal therein at a lower temperature substantially as specified.

39. The combination with a tinning pot B, of tinning rolls H, endless conveyer G, provided with a series of grippers and means for operating the grippers, upper and lower wheels or pulleys G G for said conveyer, a device N for moving or tilting the sheet, a sheet lifting device M, and a common removable frame T adapted to fit in said pot and to be bodily removed therefrom, and upon which all said devices are mounted so that the entire mechanism may be bodily lifted out of the pot without taking it apart, substantially as specified.

40. The combination with a tinning pot B, of tinning rolls H, endless conveyer G, provided with a series of grippers and means for operating the grippers, upper and lower wheels or pulleys G′ G′ for said conveyer, a device N for moving or tilting the sheet, a sheet lifting device M, a common removable frame T adapted to fit in said pot and to be bodily removed therefrom, and upon which all said devices are mounted so that the entire mechanism may be bodily lifted out of the pot without taking it apart, and a supplemental pot K also mounted upon said movable frame T, substantially as specified.

EDWIN NORTON.
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Witnesses:
H. M. MUNDAY,
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