

July 31, 1945.

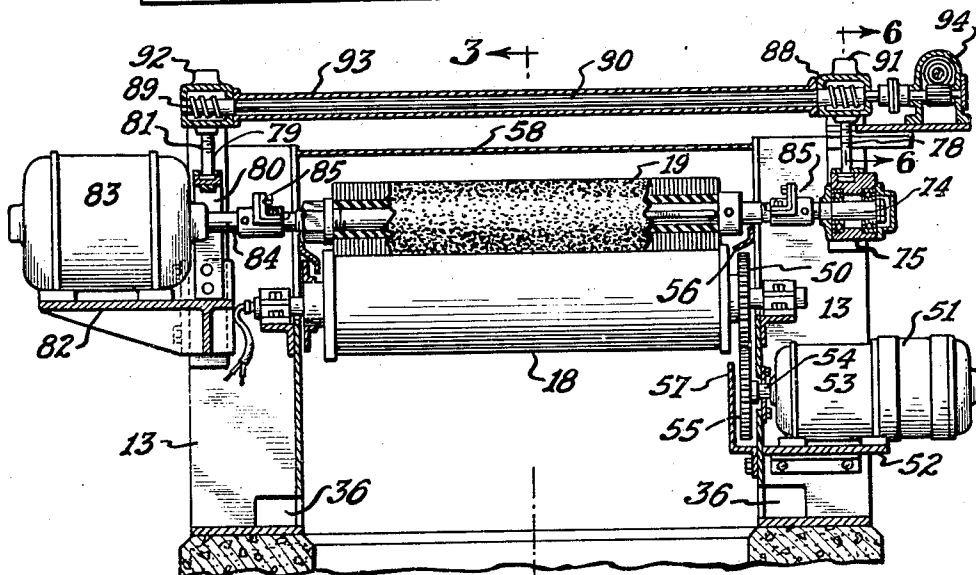
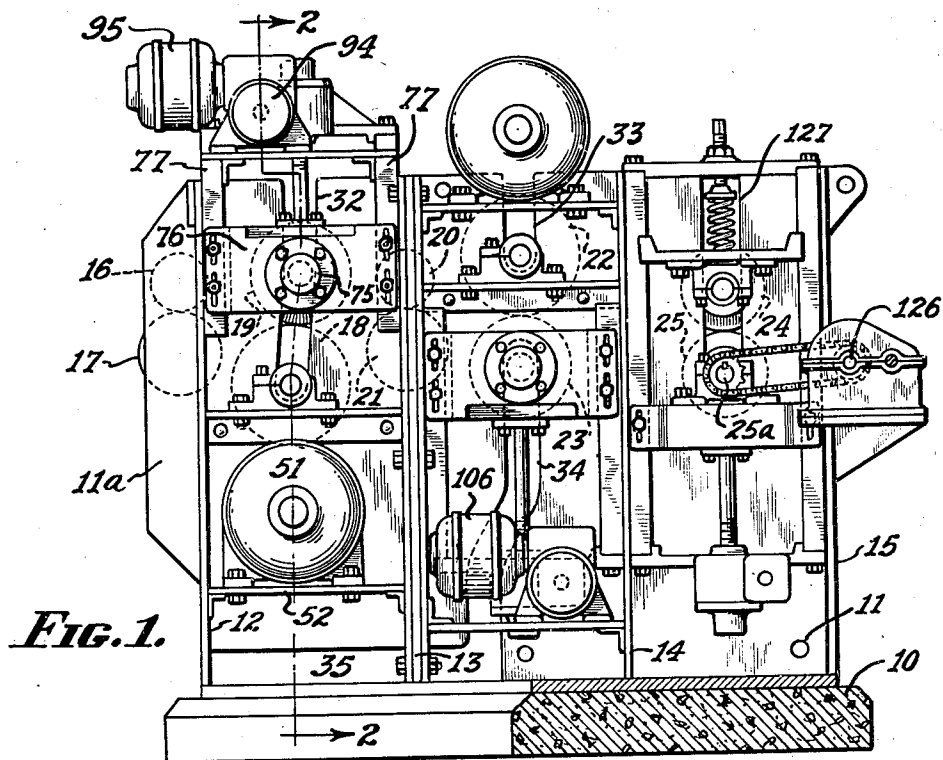
E. REED

2,380,550

MEANS FOR CLEANING METAL SHEETS

Filed Nov. 7, 1941

4 Sheets-Sheet 1



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4 Sheets-Sheet 2

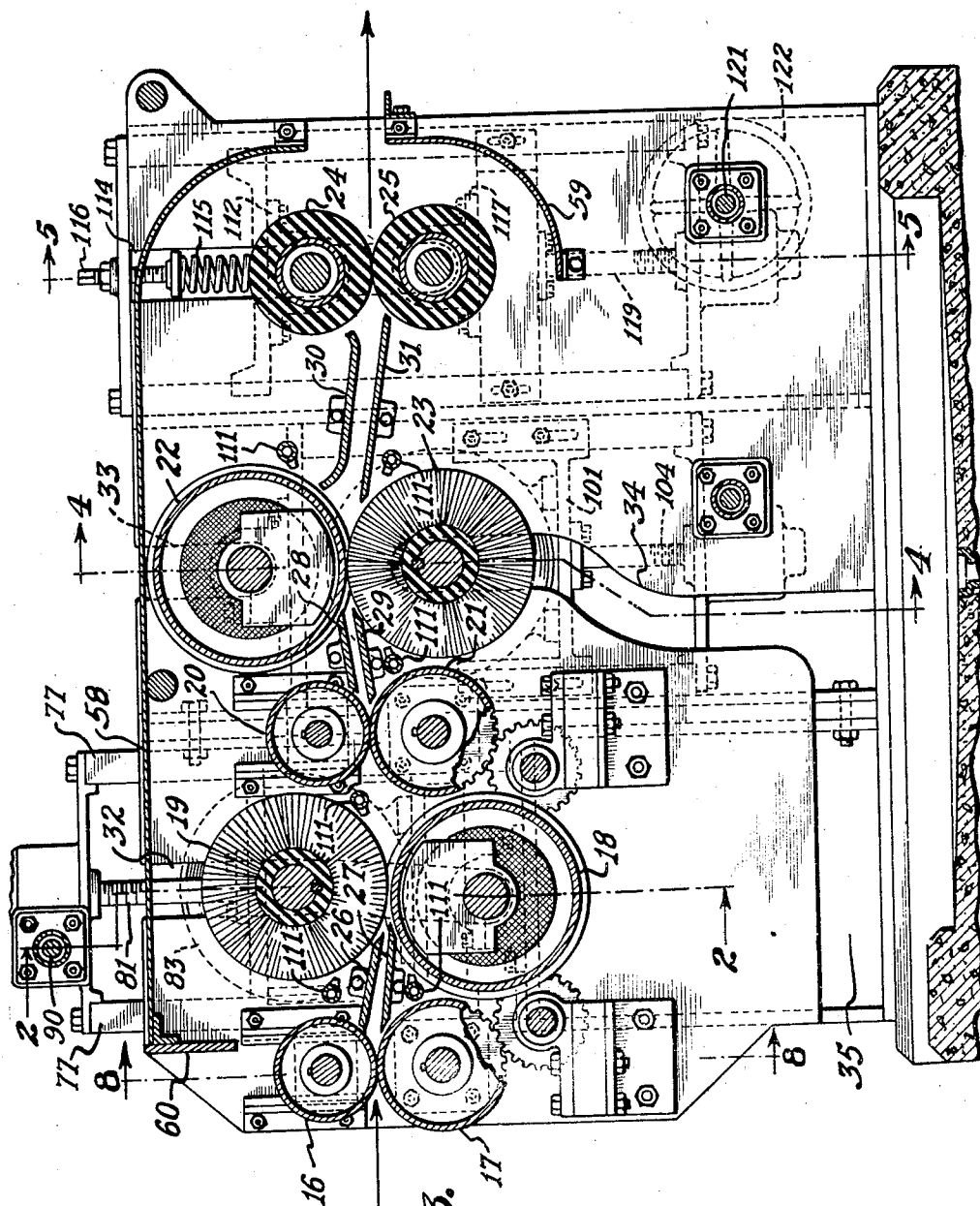


FIG. 3.

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4 Sheets-Sheet 3

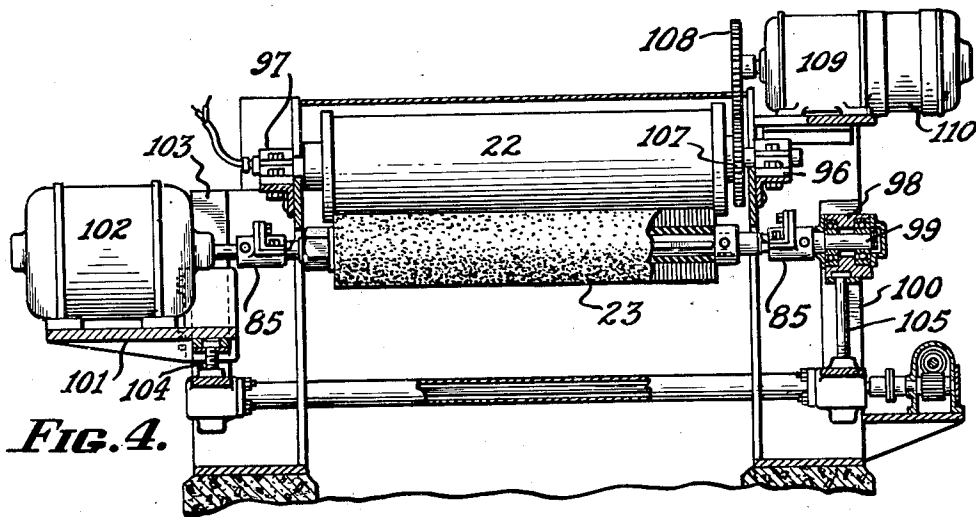


FIG. 4.

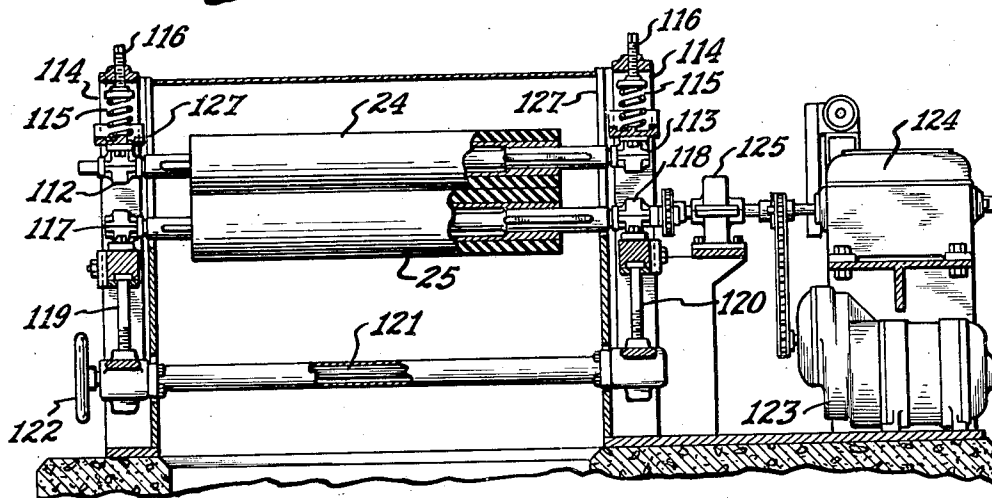


FIG. 5.

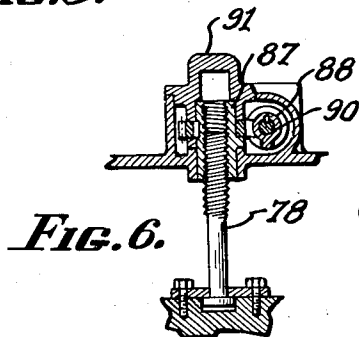


FIG. 6.

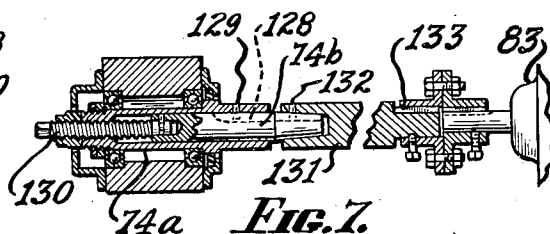


FIG. 7.

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4 Sheets-Sheet 4

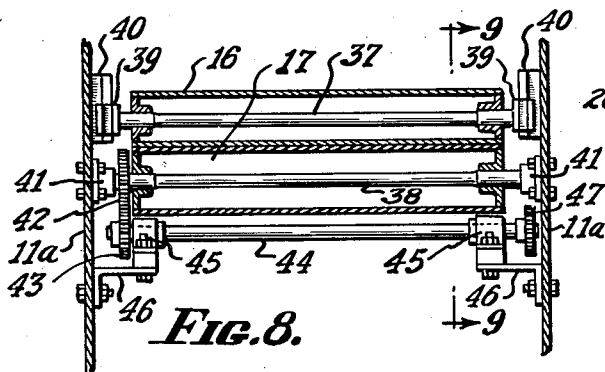


Fig. 8.

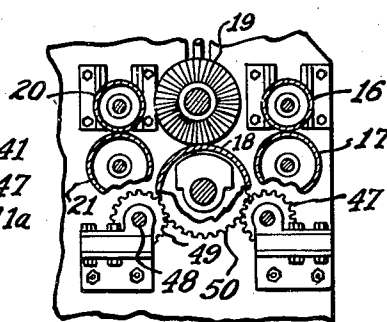


Fig. 9.

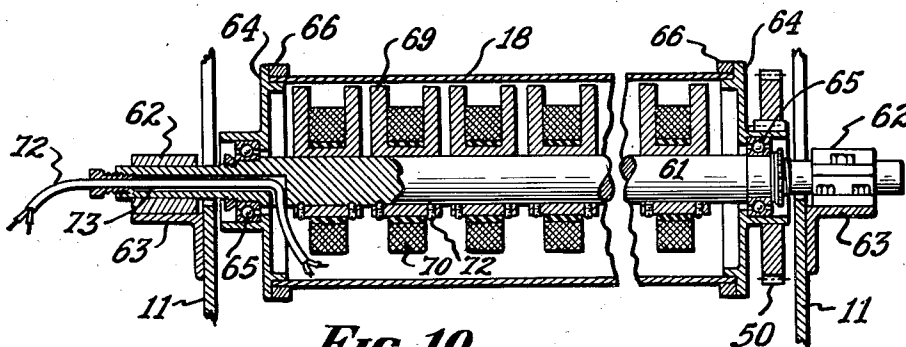


Fig. 10.

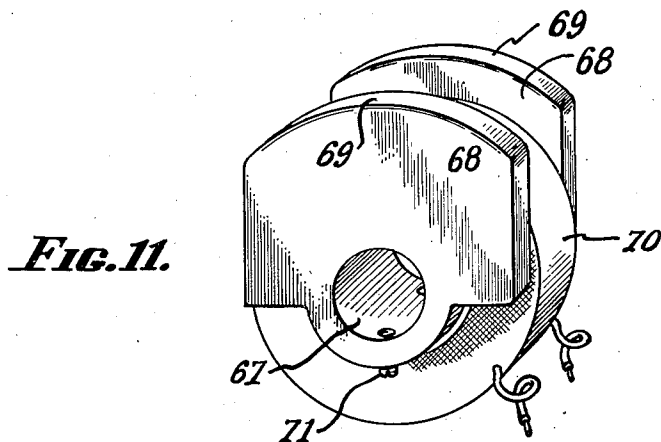


Fig. 11.

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UNITED STATES PATENT OFFICE

2,380,550

MEANS FOR CLEANING METAL SHEETS

Ed Reed, Zanesville, Ohio, assignor to The American Rolling Mill Company, Middletown, Ohio, a corporation of Ohio

Application November 7, 1941, Serial No. 418,227

6 Claims. (Cl. 15—4)

My invention has to do with cleaning metal sheets, and a particular field of utility lies in freeing the surfaces of sheet metal from substances used as separators during annealing.

It is a common practice in the box annealing of sheet metal, or strip of sheet width, to coat the surfaces of the metal with a material which will prevent sticking during annealing. Such substances are usually and most conveniently applied to the surfaces of the sheet metal in the form of a slurry or suspension in a suitable vehicle, such as water. Some substances, like lime, after they have gone through the annealing cycle are comparatively easy to remove. Other substances such as hydrated magnesium oxide form a paste or slurry of very considerable binding power, and even after that dehydration of the magnesium hydroxide which occurs in the furnace, are exceedingly difficult to remove. By way of example, in the co-pending application of Messrs. Carpenter, Bell and Heck, Serial No. 389,962, filed April 23, 1941, there is described a process of producing silicon steel sheet material bearing on its surfaces a thin insulating film of glassy character. Incident to this process, silicon steel sheet material at one stage of the process of manufacture has its surfaces coated with a slurry of hydrated magnesium oxide and is then dried. The coated strip is wound into coils or the coated sheets are stacked and are given an annealing treatment under particular conditions, not germane to the present invention, whereby magnetic qualities in the sheets are brought to their optimum development, and whereby some of the magnesia combines with silica at the surfaces of the sheet metal to form the aforesaid glassy coating. After the sheet metal has cooled, there remains the problem of removing from its surfaces the excess magnesia, which will be found quite strongly adherent and quite tenacious.

One of the problems inherent in such removal is that of cleaning the surfaces of large quantities of sheet metal rapidly, efficiently, economically, and above all dependably. The nature of the coating is such as to require for its removal vigorous brushing in the presence of water. A very serious problem has been the design of a machine providing vigorous brushing through which the materials could be led or fed without damage. It has been found that side guides or other type guiding means could not be relied upon for this because revolving brushes tend to displace the sheet materials as they are fed. In many instances, guide means served to crumple edge portions of the sheet materials, and in other

instances to fold, break or tear end portions of the sheets. I have found the best brushing action is obtained by revolving brushes against the surfaces of the sheets in a direction counter to the direction of feeding of the sheets. When this is attempted however, the brushes themselves tend to mar, break, or turn back the ends of the sheets. Another problem involved is the provision of a machine in which the feeding of the sheets is properly synchronized so as to expose all parts of successive sheets to a thorough cleansing action. Still another problem is the provision of a machine which is effective both for strip materials and for individual sheets. Still another problem is the provision of a machine which, within the limits of its ultimate width capacity, is useful for cleaning all widths of sheet or strip without special adjustment or the loss of time in effecting change-over manipulations.

Fundamental objects of my invention are the solution of the problems mentioned above and others which will be pointed out hereinafter or will be apparent to one skilled in the art upon reading these specifications. I accomplish the objects of my invention by that certain construction and arrangement of parts of which I shall now describe an exemplary embodiment. Reference is first made to the drawings, wherein:

Figure 1 is a side elevation of my apparatus exclusive of feed and delivery tables.

Fig. 2 is a transverse section taken along the line 2—2 of Fig. 1.

Fig. 3 is a longitudinal sectional view of the machine taken along the line 3—3 of Fig. 2.

Fig. 4 is a transverse sectional view, a line upon which it is taken being the line 4—4 of Fig. 3.

Fig. 5 is another transverse sectional view taken along the line 5—5 of Fig. 3.

Fig. 6 is a partial sectional view of a means for moving brush roll supports to compensate for wear.

Fig. 7 is a fragmentary perspective view of a coupling whereby I provide quick removability for my brush rolls.

Fig. 8 is a sectional view taken along the line 8—8 of Fig. 3.

Fig. 9 is a fragmentary sectional view taken along the line 9—9 of Fig. 3.

Fig. 10 is a longitudinal sectional view of one of my magnetic pullers.

Fig. 11 is a partial perspective view showing a magnetic unit employed in connection with the roll of Fig. 10.

Briefly in the practice of my invention, I provide

a machine in which sheets or strip material are fed along between sets of pinch roll combinations interspaced from each other. Intermediate the pinch roll combinations I provide brush rolls, or revolving brushes, different ones of these being so positioned as to act on the upper and lower sides of the sheet material being treated. In connection with each such brush roll, I provide a special form of support for the sheet material as the brush operates upon it. These supports, in the preferred form of my invention, are relatively large diameter rolls which are magnetized, or to the surfaces of which the sheets are bound by magnetic means, as will hereinafter be described. The effect of such supporting means, however, is not only to support the sheet metal as it is being treated by the revolving brush, but to prevent the brush from marring, breaking, or laying over the ends of the sheet material even though the brushes be driven at high speeds in a direction counter to the direction of the movement of the sheet material. This is accomplished by causing the sheet material to cling to the surface of the roller over an area substantially as large or larger than the area of the surface of the sheet material upon which the brush is operating. While the sheet material follows a substantially straight line path between sets of rolls, it follows an arcuate path while in contact with the supporting rolls just referred to. This arcuate path is enforced against the resilience of the sheet material; and the resilience is such that the sheet material will eventually release itself from the surface of the supporting rolls, but not until it has passed beyond the area of action of the brush. Or the magnetic attraction may be confined to that area in which it is desired that the sheet material conform to the surface of the support. In any event, as the end of a sheet or strip approaches the zone of action of a brush, it first contacts and is bound to the surface of a supporting roll in such a way that it cannot be bent, dislodged or broken by the action of a revolving brush; and it is not released from the revolving support until it has passed beyond the zone of operation of the brush. When so released, however, it is free to follow a substantially rectilinear path to the next pair of rolls, and it is only necessary to provide guide means to insure its passage into the bite of the next pair of rolls, which guide means have no supporting function against the operation of the brushes, and need contact the sheet surfaces only upon the occurrence of substantial mis-alignment. Moreover, where a brush is operating on the under side of the sheet material, the supporting roll holds the sheet material up. The supporting rolls revolve with the sheet surfaces and exert thereon no frictional drag which would tend to mar or scratch the surfaces, or substances thereon such as the glassy coatings referred to above. For a similar reason I prefer to drive all rolls (excepting the brushes) in synchronism as to their peripheral speeds.

Referring to Figs. 1 and 3, upon a base or foundation 10, I mount suitable side frames 11 for my machine. Each frame is conveniently made of sections as shown; but if desired may be made all in one piece. Each frame is preferably formed with vertical ribs 12, 13, 14 and 15 for strength, and to which solid supporting means, or ways for movable supporting means, may be attached as will hereinafter be explained. The side frames are solid in construction excepting where slotted for the removal of rolls, as will also be hereinafter described. This solid construction tends to

confine the wash water to the interior of the machine. A suitable drain may be provided between the foundation members 10.

The sheet or strip material is fed into the machine from a conveyor or feed table, not shown, and in Figs. 1 and 3 passes through the machine from left to right, being caught upon a receiving table or receiving conveyor, also not shown. As it passes through the machine, in the exemplary embodiment, it is first fed forward by a pair of pinch rolls 16 and 17. Next it passes between a supporting roll 18 and a revolving brush 19. Next it passes between a pair of pinch rolls 20 and 21, next beneath a supporting roll 22 and over a brush roll 23, and finally through rubber squeegee or wiping rolls 24 and 25. The construction, mounting, driving and adjustment of these elements will hereinafter be described. It will be noted in Fig. 3 that between the first pinch roll and the first brush and support combination, I provide simple guide means 26 and 27. Similar guide means 28 and 29 may be located between the second pinch roll combination and the second support and brush roll combination. Guide means 30 and 31 may be located between the second support and brush roll combination and the wiping rolls. It may be noted that the shafts of all of the supporting and brush rolls thus far described extend through the side frames and have mountings or bearings outside them. To facilitate the removal or replacement of the first support and brush roll combination, I provide slots 32 in the side frames through which both rolls may be removed upwardly. The supporting roll for the second such combination may be removed upwardly through a slot 33. The brush roll of this combination may be removed downwardly through a slot 34 in the central side frame member, which connects with a horizontal slot 35, the ribs on the side frame members being cut away to clear the ends of the brush roll shaft, as indicated at 36 in Fig. 2.

The first set of pinch rolls, 16, 17, is detailed in Fig. 8. The rolls themselves are of any suitable construction, being shown as hollow sleeves mounted upon end members attached to shafts 37 and 38. The shaft 37 may be made movable up and down in ways 40 on extensions 11a of the side frame members. The shaft 38 has stationary bearings 41 on these extensions. It is not necessary to drive both rolls of the pinch combinations, though both may be driven if desired. I have shown a pinion 42 on the shaft 38 meshing with a pinion 43 on the shaft 44 extending across the machine below the pinch rolls. This shaft is mounted in bearings 45 on brackets 46 attached to the side frame extensions 11a. At its opposite end the drive shaft 44 for the first set of pinch rolls bears a gear 47, the purpose of which will hereinafter be set forth.

The second pinch roll combination 20, 21 may be the same in detail as that shown in Fig. 8, and may have an exactly similar drive comprising a drive shaft geared to the lower pinch roll 21 and bearing a gear 49. Both gears 47 and 49 mesh with a gear 50 on the supporting roll 18, so that the lower pinch roll of both combinations and the lower supporting roll of the first brush and supporting roll combination are geared together to turn at the same peripheral speed, and to be driven by a single prime mover. This is the motor 51, which is shown in Figs. 1 and 2. It is mounted upon a shelf or support 52, fastened between the side frame ribs 12 and 13. It may if desired be provided with a gear box 53, the shaft 54 of which

is provided with a gear 55 meshing with the gear 50 on the supporting roll 18. It may be noted in Fig. 2 that such gearing as is located inside the side frame members may be provided with shields 56, 57 to protect it to a sufficient extent at least from the splash of the water within the housing formed by the side frames of the machine and the general splash guards 58, 59 and 60, shown most clearly in Fig. 3.

The supporting roll 18 is shown in section in Fig. 3 and is detailed in Figs. 10 and 11. It comprises a stationary shaft 61, which is mounted in supports 62 on brackets 63 on the side frame members 11. The roll proper is the cylindrical member 18, fastened to side flanges 64. These flanges are mounted by means of roller bearings 65 or their equivalent on the shaft 61. The gear 50 is non-rotatively fastened to a sleeve on one of the flanges, so that it may drive the flanges and the cylindrical member 18. Guide rings 66 may be provided at the ends of the cylindrical member, and the relationship of the parts is such as to keep water out of the interior of the roll, where the magnetic mechanism is located.

The construction of the magnetic means may be varied of course. I prefer to provide it in the form of a plurality of individual units, one of which is illustrated in Fig. 11. Each unit has a core comprising a sleeve-like member 67 to each end of which is attached a pole piece 68. The outer edges 69 of these pole pieces are shaped to conform to the interior circumference of the cylindrical member 18, and to lie closely adjacent thereto without touching it. The longitudinal extent of the curved ends of the pole pieces is made substantially equal to the width of that area of the roll 18 over which the sheet material being cleaned is expected to be bound. Over the sleeve portion 67 of the core, and between the pole pieces, I provide a coil 70. As determined by the length of the supporting roll proper, a number of these units are slipped over the shaft 61, aligned thereon so that their pole pieces point in the same direction, and non-rotatably fastened thereto by the set screws 71, by splines, or by equivalent means.

Power leads 72 may be passed into the hollow interior of the cylindrical member 18 through a perforation 73 in the stationary shaft 61. The power leads will be connected to the coils 70 in any suitable way. In actual practice, each of my supporting rollers contains ten coils connected in series across 225 volts direct current, consuming approximately 1200 watts. The sector shaped pole pieces of my magnetic units embody an arc of about 90°. Needless to say these figures are exemplary and not limiting. The pole pieces, of course, point toward the brush roll used with the supporting roll.

The cylinder 18 is made of some non-magnetic, metallic or non-metallic substance. In practice, my cylindrical members are made of non-magnetic stainless steel, about three-eighths inch in thickness.

The construction of the other supporting roll 22 is the same as that just described.

The brush rolls 19 and 23 may be any type of rotary brush structure capable of exerting the necessary scrubbing action. In practice, my brushes are made of Tampico bristles, nickel silver wire, plain steel wire, bronze or brass wire or combinations of any of these wires or bristles, set in suitable holding means and mounted on a shaft which projects from each end of the brush portion proper. Since, with the great quantity

of metal passing through my machines daily, the wear on brushes is relatively rapid, I provide means which not only permit a rapid and convenient replacement of brushes, but also permit variation of the position of the brush rolls to compensate for wear so long as the brushes are still usable. Reference to Fig. 2 will indicate that at one side of my machine I mount a short stub shaft 74 in suitable bearing means 75 which is slidable up and down. This is accomplished by mounting the bearing on a support 76 (Fig. 1) vertically slidable on ways 77. The bearing and its support are suspended by means of a threaded rod 78. At the other side of the frame I similarly mount on ways 79 a box shaped support 80, suspended by a threaded rod 81. To the support 80, I attach a shelf or bracket 82 upon which I mount a motor 83 for the brush roll. The shaft 84 of this motor and the stub shaft 74 each bear a readily separable coupling 85. One form of this coupling comprises a part fixed respectively to one of the shafts aforementioned, and a removable segment which may be held in place by means of bolts or their equivalent. The coupling provides a socket to accept the end of the shaft of the brush rolls. The end of the shaft and the socket are squared or otherwise configured so that the brush shaft may be driven.

Another form of coupling is detailed in Fig. 7. Here the stub shaft 74a is made in the form of a hollow sleeve, and carries within it another shaft 74b. This shaft is provided with a spline groove 128, and a pin 129 in the shaft 79a provides for the sliding of the shaft 74b within the shaft 74a but prevents its rotation therein. A threaded rod 130 with a squared outer end, rotatably but non-slidably engages the shaft 74b, and, operating in a nut at the end of shaft 74a, serves as a means of advancing and retracting shaft 74b. The end of this shaft may be tapered as shown to fit into a socket on one end of the brush roll shaft 131, and this socket may have a pin 132 engaging in the spline groove 128.

At the other end, the brush roll shaft may engage in a splined socket formed as part of a flanged coupling on the shaft of the motor 83.

The manner in which the bearings for the brush roll and its coupled shaft are raised and lowered will be appreciated from a consideration of Figs. 2 and 6. Each of the threaded rods 78 or 81 engages an internally threaded worm gear 87 which meshes with the worm 88 or 89 on a common shaft 90. A housing 91 or 92 is provided for the worm and worm gear; and the shaft 90 may also be housed by a sleeve 93 if desired. The shaft 90 is coupled to a worm gear and worm combination 94 which is connected to a small electric motor 95 (Fig. 1). It will be understood that the motor is provided with suitable power connections and controls so that the brush 19 may be raised or lowered as may be required. These are not shown. The motor 83 is provided with power connections and controls (not shown). It is the motor which drives the brush roll 19. In normal operation I cause my brushes to travel counter to the direction of sheet travel at a speed of 600 to 1200 revolutions per minute but other speeds may also be used.

The second brush roll and supporting roll combination is detailed in Fig. 4. Here the supporting roll 22, of the same construction as has been described above, is mounted on the frame in shaft holders 96 and 97. A bearing 98 for the stub shaft 99 of the brush roll 23 is mounted on ways 100. At the other side of the frame a bracket

101 for the motor 102 is slidably mounted in ways 103. The threaded rods 104 and 105 in this instance extend downwardly (since the brush roll is located below the supporting roll). The threaded rods are provided with the same sort of threaded worm and worm gear arrangement as has been described above and will not here be redescribed. The controlling motor for raising and lowering the brush roll 23 is shown at 106 in Fig. 1.

The supporting roll 22 is provided with a gear 107 meshing with a gear 108 on the shaft of a gear box 109 connected with a motor 110. This motor drives the supporting roll 22. Motors 102, 106, and 110 are provided with connection to power and appropriate controllers; and I prefer to interconnect motor 110 with motor 51 for the first brush roll and supporting roll combination in such a way that the motors are synchronized and so that several sets of pinch rolls and the supporting rolls are driven at the same peripheral speeds. The brush roll 23 is like brush roll 19 and is driven by its motor 102, preferably counter to the direction of movement of the sheet material, and at the speeds set forth above. The brush roll is mounted in couplings 85 similar to the ones described above. I have already indicated that the removal of brush roll 23 from the machine may be accomplished downwardly through slots 34 and 35 when the couplings 85 have been disassembled.

The Fig. 3 will show various means for the delivery of water to the surfaces of the sheet metal being operated upon. These means are preferably in the form of pipes or conduits extending transversely of the sheet material and provided with perforations at intervals or with jet forming spouts. Water delivery means are indicated at 111, and an exemplary placement of them will be clear from Fig. 3.

The mounting and drive for the rubber wiping or squeegeeing rolls 24, 25 is detailed in Fig. 5. The upper roll has bearings 112 and 113 slidable on ways 114 on the frame of the machine. Downward pressure on the bearings is maintained by compression springs 115. Adjustment for these springs may be had through threaded rods 116, engaged in members attached to the frame.

The lower roll 25 also has slidable bearings 117, 118, which may be mounted upon the same ways. These slidable bearings are supported from beneath by threaded rods 119, 120. These rods are provided with a threaded worm gear and worm arrangement similar to that which has already been described. The worms are mounted on a common shaft 121; but since the wear on the wiping rolls will be much less than the wear on the brush rolls, and since the upper wiping roll has a resilient mounting, I have found it sufficient to fasten a hand wheel 122 to the end of the shaft 121, instead of providing a motor drive.

A drive for the lower wiping roll is, however, provided. A motor 123 is connected through a change speed mechanism 124 to a gear box 125. The driven shaft 126 of this gear box is located to one side of the shaft 25a of the lower wiping roll (see Fig. 1) and is coupled thereto by a chain and sprocket or other suitable drive, in such a way that the drive is effective irrespective of the position of the shaft 25a.

The frame of the machine may be slotted as at 127 to permit removal and replacement of the wiping rolls.

The operation of the machine will be clear from the foregoing description. It will be noted

that the sheet material is fed through the machine and is scrubbed while completely supported over the scrubbing areas. It is then wiped. In my practice I have found this machine capable of handling and cleaning 40,000 pounds of silicon steel sheet material of transformer gauge every eight hours.

Modifications may be made in my invention without departing from the spirit of it.

Having thus described my invention in an exemplary embodiment, what I claim as new and desire to secure by Letters Patent is:

1. In a device of the class described, a rotary supporting roll adapted to contact one surface of sheet material to be operated upon, operating means to contact the other surface of said sheet material, said supporting roll having magnetic means to bind the sheet material to its surface over a limited area which is at least as great as the operating area of said operating means, but not substantially larger, said supporting roll comprising a hollow non-magnetic cylindrical member journaled for rotation at the same peripheral speed as the speed of travel of said sheet material, a stationary shaft mounted interiorly of said cylindrical member, and magnetic elements extending transversely to the axis of said shaft mounted on said shaft and having pole pieces located adjacent the interior surface of said cylindrical member, said pole pieces having an extent transverse the axis of said cylindrical member at least as great as the width of the area of operation of said operating means and in which said operating means is a rotary brush mounted on a shaft having bearings, said bearings being slidable toward and away from the axis of said supporting roll, means for moving each of said bearings, and a common operating connection between said moving means.

2. In a machine of the character described, a housing, a pair of pinch rolls, a rotary brush and an opposed supporting roll, a pair of pinch rolls, a rotary brush and an opposed supporting roll, and a pair of wiping rolls, said elements being arranged in the order named, said brushes being arranged respectively to contact upper and lower surfaces of sheet material passing through said machine, said supporting rolls being provided with magnetic means to bind the sheet material to their surfaces over areas at least as great as the areas of operation of said brushes, and means engaging the material between the pairs of rolls hereinabove set forth, said magnetic means being limited in area to release said material to said engaging means, and means for driving a roll of each of said pinch roll pairs, said supporting rolls and a roll of said wiping roll pair at the same peripheral speeds, said driving means comprising a motor and a gear drive from said motor to a roll of each of said pinch roll pairs and to one of said supporting rolls, and a second motor drive for the second of said supporting rolls, said motor drives being synchronized.

3. In a machine of the character described, a housing, a pair of pinch rolls, a rotary brush and an opposed supporting roll, a pair of pinch rolls, a rotary brush and an opposed supporting roll, and a pair of wiping rolls, said elements being arranged in the order named, said brushes being arranged respectively to contact upper and lower surfaces of sheet material passing through said machine, said supporting rolls being provided with magnetic means to bind the sheet material to their surfaces over areas at least as great as the areas of operation of said brushes, and means

engaging the material between the pairs of rolls hereinabove set forth, said magnetic means being limited in area to release said material to said engaging means, and means for driving a roll of each of said pinch roll pairs, said supporting rolls and a roll of said wiping roll pair at the same peripheral speeds, said driving means comprising a motor and a gear drive from said motor to a roll of each of said pinch roll pairs and to one of said supporting rolls, and a second motor drive for the second of said supporting rolls, said motor drives being synchronized, and a motor drive for one of said wiping rolls, said motor drive having change speed mechanism.

4. In a machine of the character described, a housing, a pair of pinch rolls, a rotary brush and an opposed supporting roll, a pair of pinch rolls, a rotary brush and an opposed supporting roll, and a pair of wiping rolls, said elements being arranged in the order named, said brushes being arranged respectively to contact upper and lower surfaces of sheet material passing through said machine, said supporting rolls being provided with magnetic means to bind the sheet material to their surfaces over areas at least as great as the areas of operation of said brushes, and means engaging the material between the pairs of rolls hereinabove set forth, said magnetic means being limited in area to release said material to said engaging means, and means for driving a roll of each of said pinch roll pairs, said supporting rolls and a roll of said wiping roll pair at the same peripheral speeds, said driving means comprising a motor and a gear drive from said motor to a roll of each of said pinch roll pairs and to one of said supporting rolls, and a second motor drive for the second of said supporting rolls, said motor drives being synchronized, and means for raising and lowering said brushing means to compensate for wear, and means for driving said brushing means in a direction counter to the direction of movement of said sheet material through said machine.

5. In a machine of the character described, a housing, a pair of pinch rolls, a rotary brush and an opposed supporting roll, a pair of pinch rolls, a rotary brush and an opposed supporting roll, and a pair of wiping rolls, said elements being arranged in the order named, said brushes being

arranged respectively to contact upper and lower surfaces of sheet material passing through said machine, said supporting rolls being provided with magnetic means to bind the sheet material to their surfaces over areas at least as great as the areas of operation of said brushes, and means engaging the material between the pairs of rolls hereinabove set forth, said magnetic means being limited in area to release said material to said engaging means, and means for driving a roll of each of said pinch roll pairs, said supporting rolls and a roll of said wiping roll pair at the same peripheral speeds, said driving means comprising a motor and a gear drive from said motor to a roll of each of said pinch roll pairs and to one of said supporting rolls, and a second motor drive for the second of said supporting rolls, said motor drives being synchronized, and means for raising and lowering said brushing means to compensate for wear, means for driving said brushing means in a direction counter to the direction of movement of said sheet material through said machine, means for raising and lowering one of said wiping rolls, and means for delivering a fluid to the surfaces of said sheet material in said housing.

6. In a machine of the class described, a housing, means for moving sheet material through said housing in a path having substantially rectilinear components, rotary brushing means in said housing for operating upon the surfaces of said sheet material, supporting rolls opposite said rotary brushing means for supporting said sheet material while its surfaces are being brushed, said supporting rolls having magnetic means for binding said sheet material to their surfaces over areas at least as great as the areas of operation of said brushing means, whereby said sheet material is forced to follow an arcuate path while in contact with said supporting rolls, and is magnetically released beyond the area of said operation, said means for moving said sheet material comprising pinch roll pairs, said housing also containing wiping rolls, means in said housing for delivering a fluid to the surfaces of said sheet material, and guide means in said housing for enforcing movement of said sheet material from element to element.

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