A. SUNDH.

APPARATUS FOR WINDING METAL STRIPS.

APPLICATION FILED DEC. 20, 1917.

1,371,769.

Patented Mar. 15, 1921.

6 SHEETS—SHEET 1.

FIG. 1

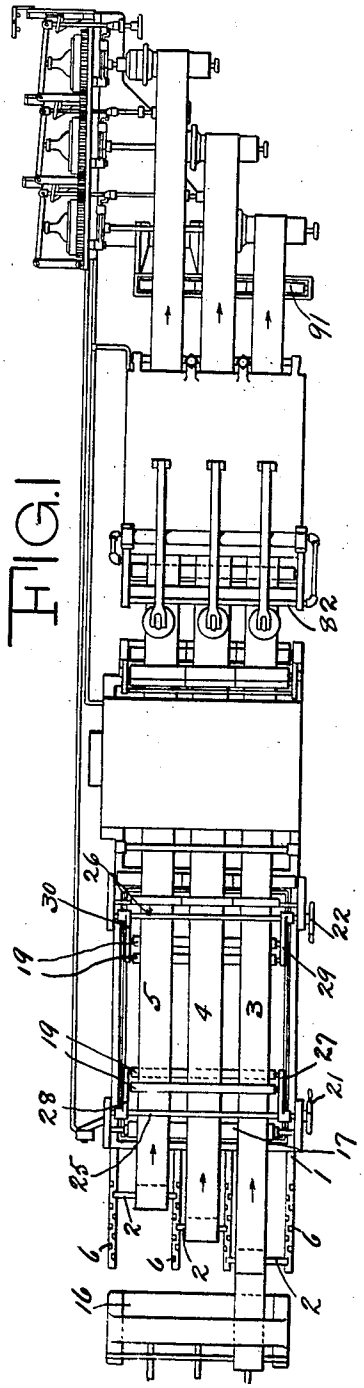
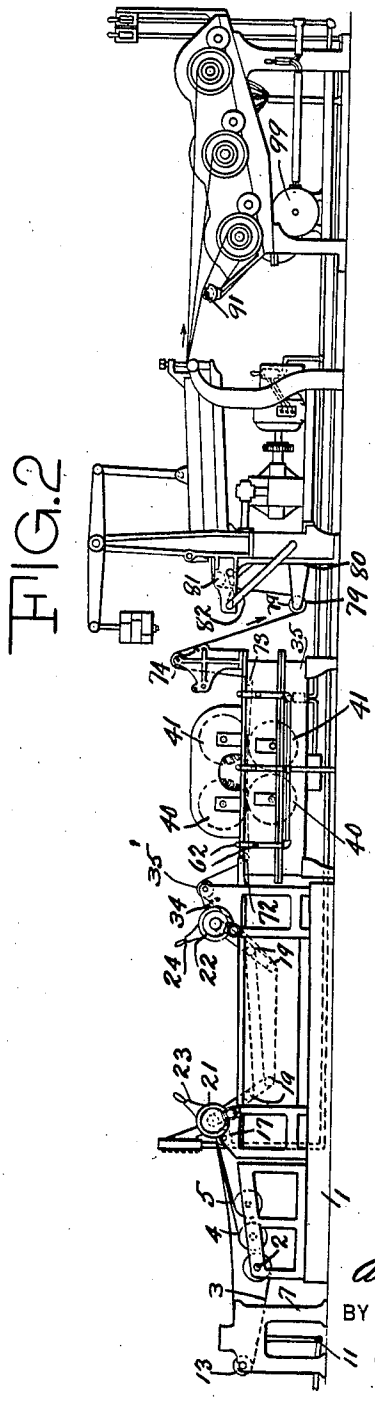


FIG. 2



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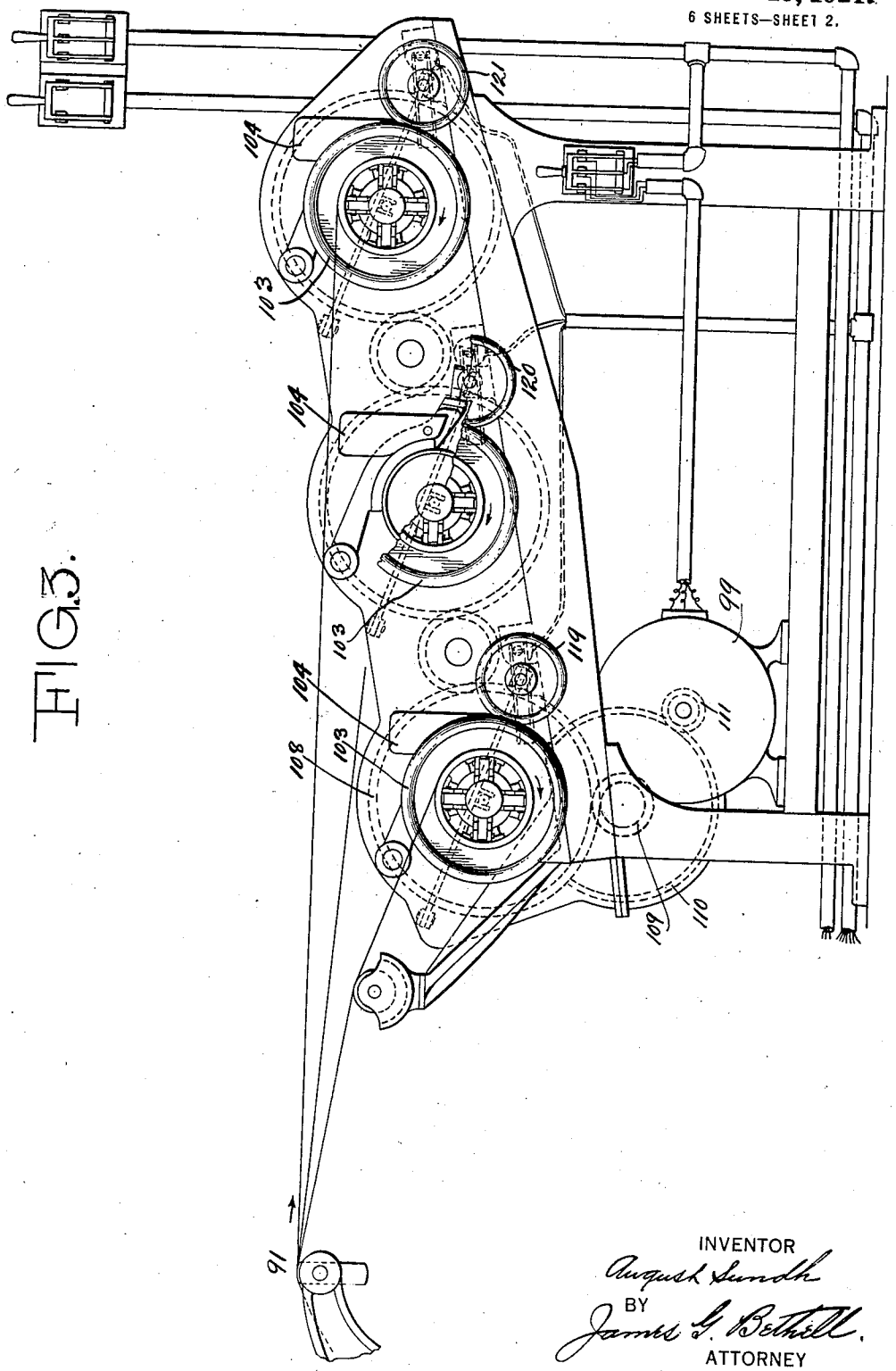
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6 SHEETS—SHEET 2.

FIG. 3.



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6 SHEETS—SHEET 3.

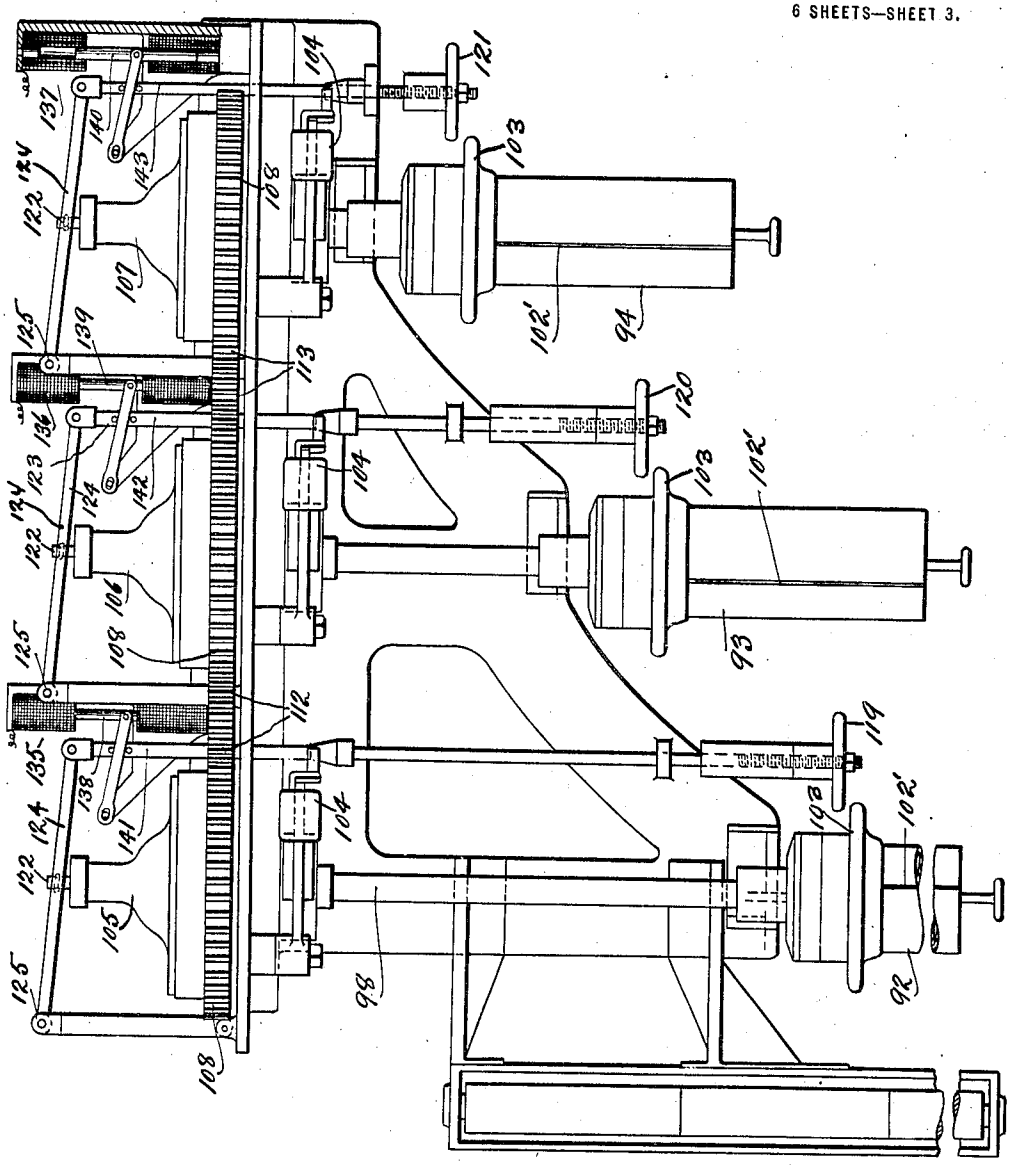


FIG. 4.

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6 SHEETS—SHEET 4.

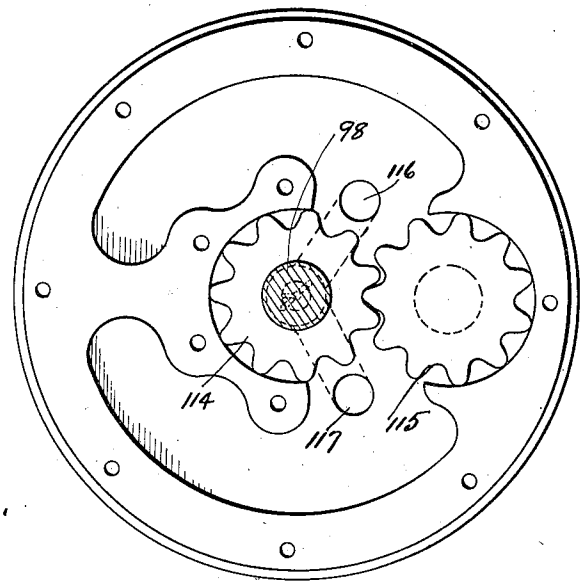


FIG. 5.

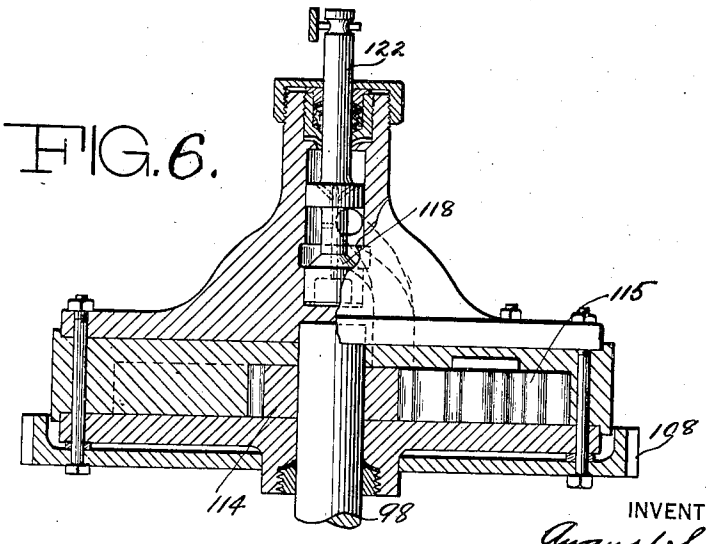


FIG. 6.

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6 SHEETS—SHEET 5.

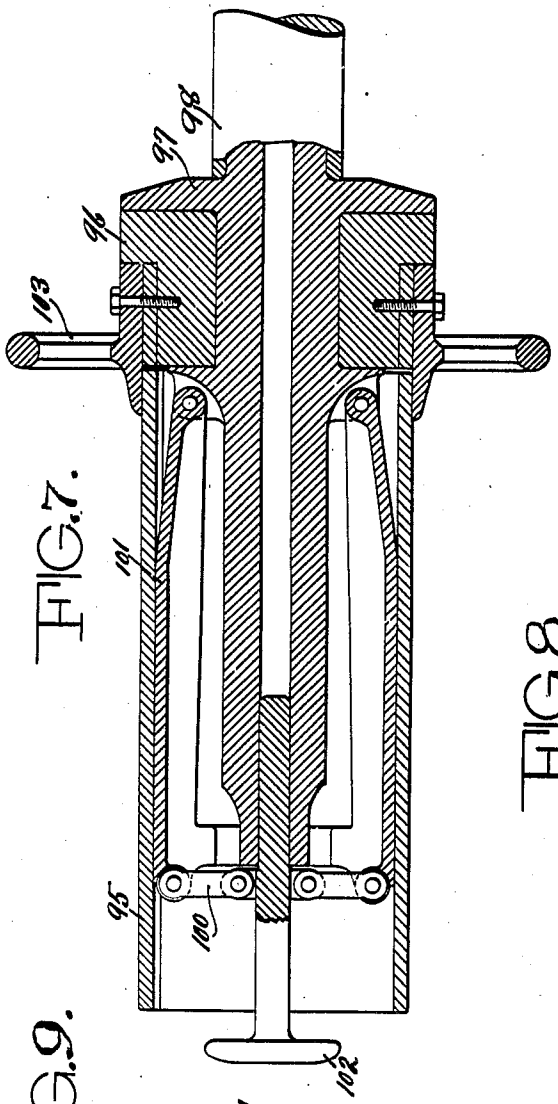


FIG. 7.

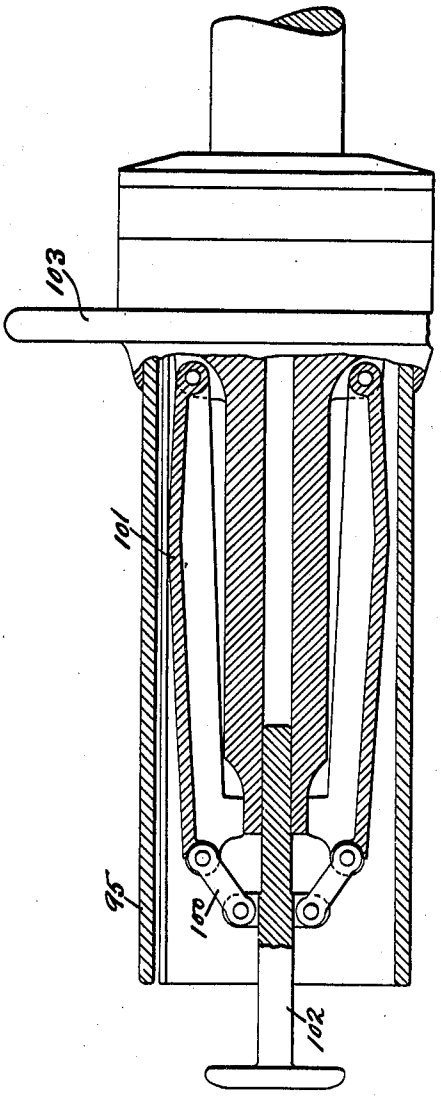


FIG. 8.

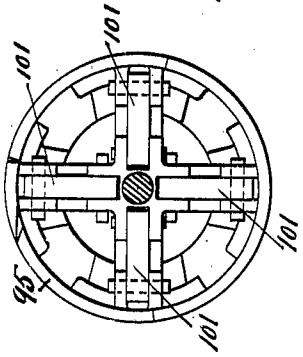


FIG. 9.

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6 SHEETS—SHEET 6.

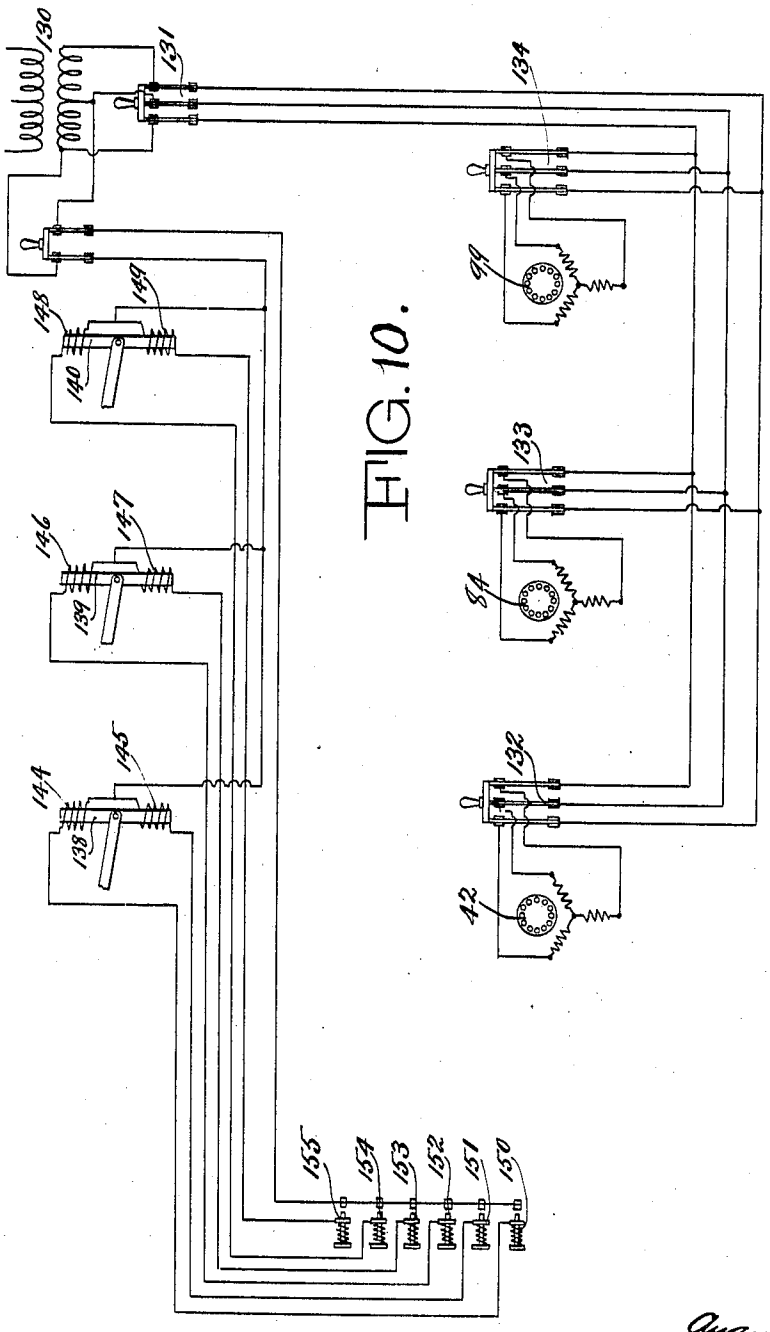


FIG. 10.

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By his Attorney
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UNITED STATES PATENT OFFICE.

AUGUST SUNDH, OF HASTINGS-UPON-HUDSON, NEW YORK, ASSIGNOR TO SUNDH ENGINEERING AND MACHINE COMPANY, OF PHILADELPHIA, PENNSYLVANIA, A CORPORATION OF PENNSYLVANIA.

APPARATUS FOR WINDING METAL STRIPS.

1,371,769. Specification of Letters Patent. Patented Mar. 15, 1921.

Application filed December 20, 1917. Serial No. 208,070.

To all whom it may concern:

Be it known that I, AUGUST SUNDH, a citizen of the United States, and a resident of Hastings-upon-Hudson, in the county of Westchester and State of New York, have invented certain new and useful Improvements in Apparatus for Winding Metal Strips, of which the following is a specification.

This invention relates to a method and apparatus for preparing metal strips for manufacture wherein a more perfect product and higher production at minimum expense may be obtained than has been possible with apparatus of this character, as heretofore constructed, and wherein the strips, after being treated, are coiled up bright, clean and dry, and free from buckles.

In apparatus of this character, as heretofore constructed, the strips are first of all passed through what is known as a pickling process consisting in immersing the strips in a bath of acid or similar fluid. After passing through the pickling process, the strips are washed by a bath of water and then drawn through sawdust for drying purposes from which they pass to coiling or winding blocks. In some cases as a variation of this drying process, the strips are run over steam rollers. Both processes are very unsatisfactory, however, being very slow, as a great deal of labor and time must be expended in treating the strips and they are frequently left imperfectly dried and improperly cleaned, particularly where the strips have buckled. It has been found with the sawdust process that the strips will not be thoroughly dried, and with the steam roller process the strips are frequently spotted where the acid has not been thoroughly washed off after the strips have passed through the pickling process due to the evaporation of the moisture from the strips. Another drawback to the systems now in use is that should the strips buckle in passing through the apparatus, moisture, dirt and scale lodge in the buckled portions and are wound up with the strip.

It is the purpose of this invention to eliminate the defects noted and provide an apparatus wherein the strips will be thoroughly cleaned and dried and coiled up bright and clean and free from buckled portions. A great deal of time is saved by the use of the present invention, as not only may the strips be fed through the machine at a higher speed than heretofore possible, but several strips may be run through at the same time, obviously greatly increasing the output of the apparatus over that of the art as now constituted.

In the present invention, the strips are first of all passed through a tub of acid or pickle, back and forth several times, for the purpose of loosening the scale located thereon. Several strips arranged side by side are passed through this bath at the same time, but are independently operated and controlled so that their relative speeds may be varied, if desired, and so that while one is being spliced to the preceding strip, the others may still be running. In order that, in case of a shutdown of the apparatus from any cause, the strips will not be left in the pickling bath too long with possible injury to the strips due to the chemical action of the acid, means have been provided whereby the strips may all be raised out of the bath and maintained in that position until such time as the apparatus is again put into operation. From the pickling bath the strips are passed through a washing unit, comprising several sets of brushes which engage the surfaces of the strips while jets of water are projected on both sides thereof to thoroughly wash and clean them, ridding the same of scale, dirt and acid. From the washing unit the strips are passed between wipers operating automatically and arranged so that should there be any obstruction on the strips, such as an imperfect splice, etc., they will yield and allow the same to pass through without injury, either to the strips or to the wipers. The strips next pass through blasts of hot air, under pressure, directed on them in a direction so as to drive the moisture therefrom in the direction of gravity, the strips traveling between the blasts in a vertical direction. The strips are next passed into and through a heated compartment and over and under a series of rollers in said compartment provided for the purpose of straightening and slightly heating the strips before reaching the winding blocks to which they next pass and upon which they are coiled. The advantage of this last arrangement is, of course, obvious, as not only will the strips be thoroughly

straightened, but will be wound on their respective blocks in a warm condition and free from moisture, so as to insure the strips being coiled up in a perfectly clean and dried condition and free from buckles.

The power for driving the winding blocks to draw the strips through the apparatus and wind them up is furnished by an electric motor located near and clutched to the winding blocks. The clutch mechanism is of such a nature that each block may be started and stopped and run at various speeds, independently of the others, and may be controlled at both ends of the apparatus. This arrangement has been provided so that the attendant who stands at the splicing end of the apparatus may stop any strip as its end is reached, while the others are running, enabling him to splice on the next strip without interfering in any way with the other strips passing through the machine. An attendant stands at the other end of the machine and by reason of controlling mechanism provided at his end of the machine, may also stop any block at will to remove the finished strip therefrom without disturbing the others.

The washing unit and the drying unit are each provided with independent motors.

An important feature of the washing unit is the manner in which the brushes are mounted and geared to the driving motor, means having been provided whereby the brushes may be adjusted vertically for wear or to insure the proper amount of friction on the strip surfaces, without throwing the trains of gearing, by which they are connected to the driving motor, out of mesh.

In the accompanying drawings—

Figures 1 and 2 are plan and elevational views, respectively, of the whole apparatus.

Fig. 3 is an elevation of the strip winding unit.

Fig. 4 is a plan view of the strip winding unit.

Figs. 5 and 6 are views of the clutch mechanism by means of which the driving motor is connected to the winding blocks; Fig. 6 being taken substantially on the line *a*—*a* of Fig. 5.

Figs. 7, 8 and 9 show one of the winding blocks in section and in end elevation; and

Fig. 10 is a wiring diagram showing the various electrical controlling circuits for the whole apparatus.

Referring now to the drawings in detail, 1 designates part of the frame of the apparatus adapted to receive the strips which are brought to the machine coiled up on mandrels 2, the strips, of which three are shown, being designated 3, 4 and 5, respectively. Open slots 6 are cut in the frame 1 of the machine and are adapted to receive the ends of the mandrels 2, a number of slots being provided, so that the coils of strips may be placed on the machine in any desired order, but generally arranged as shown in Fig. 1. It will be understood, of course, that the first three strips are pulled through the machine by hand until their forward ends engage the winding units and that the succeeding strips are spliced thereto through the medium of a pedal-operated splicing apparatus designated 7.

The splicing strips next enter a reservoir 8 of pickle, and after being pickled, are drawn through the machine into and through a washing and scrubbing compartment 9 where they are thoroughly scrubbed and washed. The strips are then drawn through a drying and straightening compartment 10 where they are dried and straightened, finally passing to the winding apparatus.

This apparatus comprises three winding blocks or drums, one for each strip and designated as a whole 92, 93 and 94, respectively, it being understood, of course, that the number of blocks may be varied depending upon whether the machine is a three-strip machine, as illustrated, or not. These blocks are identical in structure and a description of one will suffice for all. Referring particularly to Figs. 7, 8 and 9, each block comprises an outer sectional shell or casing 95 mounted on a ring 96 which in turn is mounted on a member 97 secured to a shaft 98 operatively connected to a driving motor 99. This motor furnishes the driving power for all three blocks. One section of the shell 95 is rigid with the ring 96, while the other sections are hinged thereto so as to permit of the casing collapsing when it is desired to remove a roll of strip therefrom. Within the shell 95 is toggle mechanism designated 100, connected to a set of four arms 101 within the block. A member 102 suitably guided within the block is operatively connected to the toggle mechanism 100 so that longitudinal movement thereof will cause the arms 101 to be moved outwardly or inwardly, as the case may be, to clamp or release the strips, the end of the strips being fed to the interior of the block through a slot 102′ which is left for that purpose between adjacent edges of two of the sections of the shell 95. From the description thus far given it will be obvious that if the member 102 be left in the position shown in Fig. 9, and the end of a strip be inserted in the slot 102′, the member 102 may then be moved to the position shown in Fig. 7, carrying the arms 101 outwardly to clamp the strip between the arms and the interior of the shell 95. In order that the slot 102′ may be in proper position to receive the advancing end of the strip, a hand wheel 103 is provided by which the shell may be rotated at will. After a strip is completely blocked, by moving the member

102 back to the position shown in Fig. 9, the shell 95 may be collapsed and the coil of strip removed therefrom. Each block is provided with a weighted brake shoe, designated 104, pivoted at 104', the brakes being controlled by valve operating means used in connection with fluid clutch mechanism by which the blocks are clutched to the driving motor 99 and which clutch mechanism will now be described.

Clutch mechanism.—The clutches are best illustrated in Figs. 4, 5 and 6, and comprise rotatable units designated 105, 106 and 107, a clutch being provided for each winding block. Each clutch unit is mounted on a shaft 98 and comprises a gear 108 secured to the housing of the clutch, one of these gears being in mesh with a gear 109 driven by the motor 99 through a train of gearing 110 and 111, the latter being carried on the armature shaft of the motor 99. The gear 108 of the other two units are operatively connected to the first unit through pinions 112 and 113. Fluid gears 114 and 115, the former being keyed to the shaft 98, are carried within the clutch housing. Ports 116 and 117 are provided for controlling the circulation of the fluid within the clutches, these ports being controlled by valves 118, a valve for each unit, whereby the torque between the driving motor 99 and shafts 98 may be controlled at will by means of hand-wheels 119, 120 and 121. These wheels are operatively connected to the stem 122 of the clutch valve 118 through rods 141, 142 and 143, respectively, to each of which is pivoted a lever 124 connected directly to the stem 122 of the valves and pivoted at 125. By merely moving the rods 141, 142 and 143 longitudinally, the setting of the valve 122 may be regulated to clutch the driving motor to the shafts 98 or disconnect it therefrom, as the case may be, it being obvious that any block may be connected to the driving motor or disconnected therefrom independently of the others. This arrangement is essential as in a machine of this character, it becomes necessary to stop a block at times independently of the others in order to splice the strips, as hereinbefore fully described. The hand wheels 119, 120 and 121 also control the brakes 104, already referred to, through the medium of cams 141', 142' and 143' carried on the shafts 141, 142 and 143, respectively. The movement of the wheel 119, for instance, as viewed in Fig. 4 to move the rod 140 upwardly in a direction to clutch the block 92 to the driving motor will carry the cam 141' beneath the brake-shoe 104 to lift the same to release the block. It will be apparent, therefore, that when any block is clutched in, its brake will be released and when disconnected from the driving motor by moving any of the rods 141, 142 or 143 in the opposite direction, the cam 141', 142' or 143', as the case may be, will be moved away from the corresponding brake-shoe to allow that particular brake to be applied.

The valve 118 on each clutch is preferably set so as always to permit of some slip of the clutch, so that while the strips will be pulled through the machine so long as everything is working properly, should a strip catch or anything else happen to bring a higher tension on the strips than that previously determined, the clutches will slip and allow that particular block to come to rest without danger of injury either to the strip or to the machine. Since each block has its own clutch, however, stopping one block or retardation of any one block from any source, has no effect upon the others. This arrangement is very important as the clutches will work automatically to regulate the tension on the strips, which obviously could not be done by the attendant with any satisfactory result as he would be unable to notice in time that the tension on the strips was approaching the danger point, and would, therefore, probably not stop the machine in time to prevent possible fracture of the strip or injury to the machine itself.

From the description of this clutch mechanism, it is obvious that the winding blocks are capable of being run at various speeds relative to each other, and may be started and stopped at the will of the attendant, and are operable automatically to prevent fracture of the strips or injury to the machine should the strips catch in passing through. In order that I may vary the amount of movement which may be imparted to the rods 141, 142 and 143, I have screw-threaded them at their outer end and mounted collars *a*, *b* and *c*, respectively, thereon, these collars being adapted to engage stops *d*, *e* and *f*, respectively. By merely screwing the wheels 119, 120 and 121 on or off their respective rods, the amount of movement which may be given to the rod before the collars *a*, *b* and *c* engage the stops *d*, *e* and *f* may be varied, as desired.

The manual control just described in connection with the clutch mechanism is for the use of the attendant in removing the cleaned strips from the machine, but it is obvious some means should be provided at the splicing end of the apparatus whereby the attendant, who feeds the strips into the machine, may control the winding blocks.

Referring now to Fig. 10, it will be seen that the circuits for the motor 42 for the washing compartment 9, the motor 84 for the drying and straightening compartment 10 and the motor 99 for driving the winding blocks, receive their current from any suitable source of supply, designated 130, the current being controlled by a main

switch 131. Each motor has an independent switch, 132 for the motor 42, 133 for the motor 84 and 134 for the motor 89. As all three motors are running constantly when the apparatus is in use, these switches are all that is necessary for their control, but it will be noted that each motor may be started and stopped independently of the others, should it be desired at any time to shut down one portion of the machine for any reason whatsoever. The winding blocks 92, 93 and 94, are arranged, as already described, to be started and stopped and their speeds varied independently of each other from the finishing end of the machine, but with a machine of this kind it is essential that some means for controlling these winding blocks other than that so far described, be provided so that the attendant at the splicing end of the machine may start and stop the blocks at will independently of the attendant who stands at the other end of the machine. This control is provided in the form of a series of push buttons, designated 150, 151, 152, 153, 154 and 155, these buttons being located near the splicing unit, as indicated in Fig. 1, and controlling the windings of a series of electromagnets operatively connected to the valve stems 122. These magnets are each doubly wound having windings 144, 145, 146, 147, 148 and 149, respectively, adapted to reciprocate cores 138, 139 and 140, each of which is connected to the rods 141, 142 and 143, carrying the hand wheels 119, 120 and 121, already referred to, for controlling the valve mechanisms of the clutches, by means of lever arms *g*, *h*, *j* connected to the rods by pins *k* and *i*. The push buttons 150 to 155, inclusive, control the windings 144, 145, 146, 147, 148 and 149, in the order named.

Assuming now that all the winding blocks are in operation, and say the attendant at the rear end of the machine sees the end of the strip on the block 92, for example, approaching, he at once presses the button 150 or 151, as the case may be, to energize one of the windings 141 or 145. Assuming, for example, that he presses the button 151 to energize the winding 145, the magnet will at once draw in its core 138 to allow the fluid in the clutch for that block to by-pass and at the same time moving the rod 141 in a direction to allow the brake 104 to be applied to the block. The block will come to rest, the other blocks, however, continue to rotate and the attendant proceeds to splice on another strip to the end of the strip on the block 92, which has now been stopped. As soon as this is done, the operator presses the button 150 which will energize the winding 144 of the magnet for this particular block, and the latter will pull in its core in the opposite direction to which it was moved formerly to partially shut off the circulation of fluid within the clutch, release the brake 104 and cause the block to be set in motion once more. The same procedure is followed with the other blocks, it being understood, of course, that a separate button is pressed each time, depending on which block it is desired to have started or stopped.

From this description, it will be seen that I have provided a method and apparatus for preparing metal strips for manufacture, whereby the strips will be coiled up in a perfectly cleaned, straightened and dried condition, and whereby several strips may be operated upon simultaneously. It will be apparent also that, owing to the particular method of operating on the strips the latter may be run through the machine at a comparatively high rate of speed, and as several strips are run through the machine simultaneously, the output of the finished product will be greatly increased over that heretofore possible by use of machines for the purpose of preparing metal strips for manufacture now known in the art. It will be seen that the relative speeds of the various strips passing through the machine may be varied at the will of the attendant, and also that in case of a strip catching in some part of the apparatus during the process of treating the strips, the machine will automatically adjust itself to prevent injury either to the strip or to the machine, owing to the particular form of clutch mechanism used in connecting the driving motor to the winding blocks. It will be seen also that the present invention involves an apparatus of the character described, wherein the starting and stopping of the blocks may be effected from both ends of the machine independently of each other, which, of course, is an obvious advantage in that each attendant may act on his own initiative in starting and stopping the machine, and independently of the other. It will be obvious also that all the parts are arranged so that the liability of break-down is reduced to a minimum.

While I have described the preferred embodiment of my invention, it is to be understood that I desire not to be limited to the precise details of construction and arrangement of parts herein shown, but what I claim as new and desire to secure by Letters Patent of the United States, is:

1. A machine of the character described, comprising a plurality of winding blocks having a common drive adapted to feed a plurality of strips through the machine simultaneously and to coil them up, and a plurality of means operable independently of each other for controlling the winding blocks.

2. A machine of the character described, comprising a plurality of winding blocks

having a common drive adapted to feed a plurality of strips through the machine simultaneously and to coil them up, and means operable from each end of the machine and operable independently of each other for controlling the winding blocks.

3. A machine of the character described, comprising a plurality of winding blocks having a common drive adapted to draw strips through the machine and coil them up, and means at each end of the machine independently operable to start and stop the winding blocks.

4. A machine of the character described, comprising a plurality of winding blocks having a common drive adapted to feed a plurality of strips through the machine simultaneously and coil them up, and means at each end of the machine operable independently of each other to start and stop the winding blocks independently of each other.

5. A machine of the character described, comprising a plurality of winding blocks having a common drive adapted to feed a plurality of strips through the machine simultaneously and to coil them up, manually operable means at one end of the machine to start and stop the winding units independently of each other, and electromagnetic means controlled from the other end of the machine for starting and stopping the blocks independently of each other.

6. A machine of the character described, comprising a plurality of winding blocks having a common drive to draw strips through the machine and coil them up, manually operable means at one end of the machine for controlling the winding blocks independently of each other, and electromagnetic means operable independently of the manually operable means for starting and stopping the winding blocks independently of each other from the other end of the machine.

7. A machine of the character described comprising means for winding a plurality of strips simultaneously and means controlling the winding means whereby the strips may be wound at any desired speed relatively to each other.

8. A machine of the character described, means for treating a plurality of strips simultaneously, a plurality of winding blocks adapted to draw the strips through the treating means and wind them up, power means for said blocks and clutch mechanism to connect the power means to the winding blocks and operable to allow the blocks to be driven at variable speeds relatively to each other or at the same speed as may be desired, and to be started and stopped at will independently of each other.

9. A machine of the character described, means for treating a plurality of strips simultaneously, a plurality of winding blocks to draw the strips through the treating means and wind them up, a brake for each winding block, a single motor for driving the blocks, clutch mechanism for connecting the motor to any one or all of the blocks, as may be desired, and clutch and brake controlling means operable to connect and disconnect the winding blocks to the motor and release or apply the brakes.

10. A machine of the character described, means for treating a plurality of strips simultaneously, a plurality of winding blocks to draw the strips through the treating means and wind them up, a brake for each block, a single motor for operating the blocks, clutch mechanism for connecting and disconnecting the blocks to the motor independently of each other, and means for controlling the clutch mechanism and brakes whereby the blocks may be started and stopped at will from either end of the machine.

11. A machine of the character described, means for treating a plurality of strips simultaneously, a plurality of winding blocks to draw the strips through the treating means and wind them up, a single motor for operating the winding blocks, fluid clutches for connecting the blocks independently of each other to the motor, manually operable means for varying the relative speed of the winding blocks at will, and electro-magnetically operable means controlled from the other end of the machine for starting and stopping the blocks independently of the clutch controlling means.

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