Oct. 16, 1934. C. E. GALVIN 1,977,053

MACHINE FOR MAKING METAL WOOL

Original Filed June 29, 1925 7 Sheets-Sheet 1

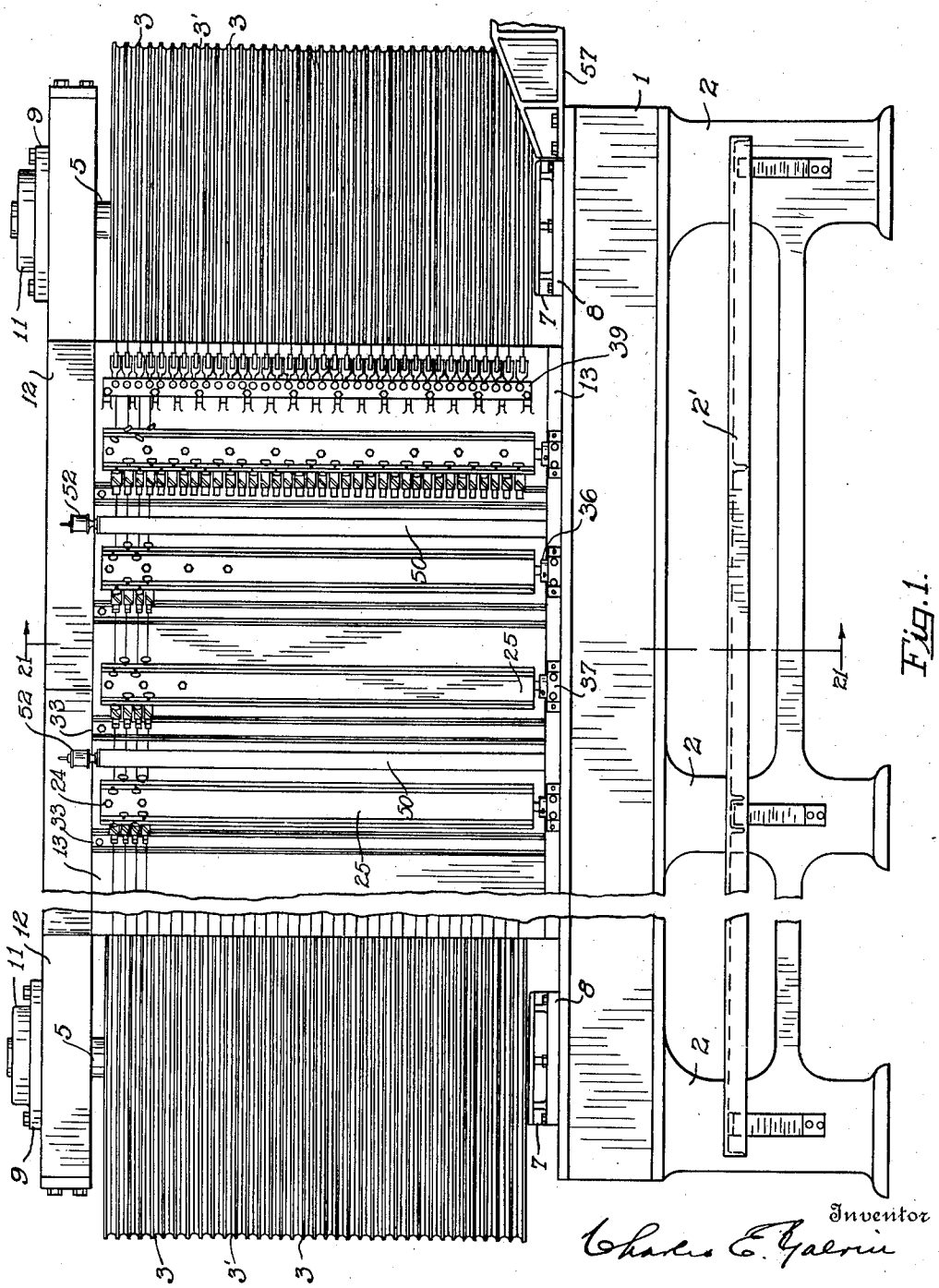


Fig. 1.

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MACHINE FOR MAKING METAL WOOL

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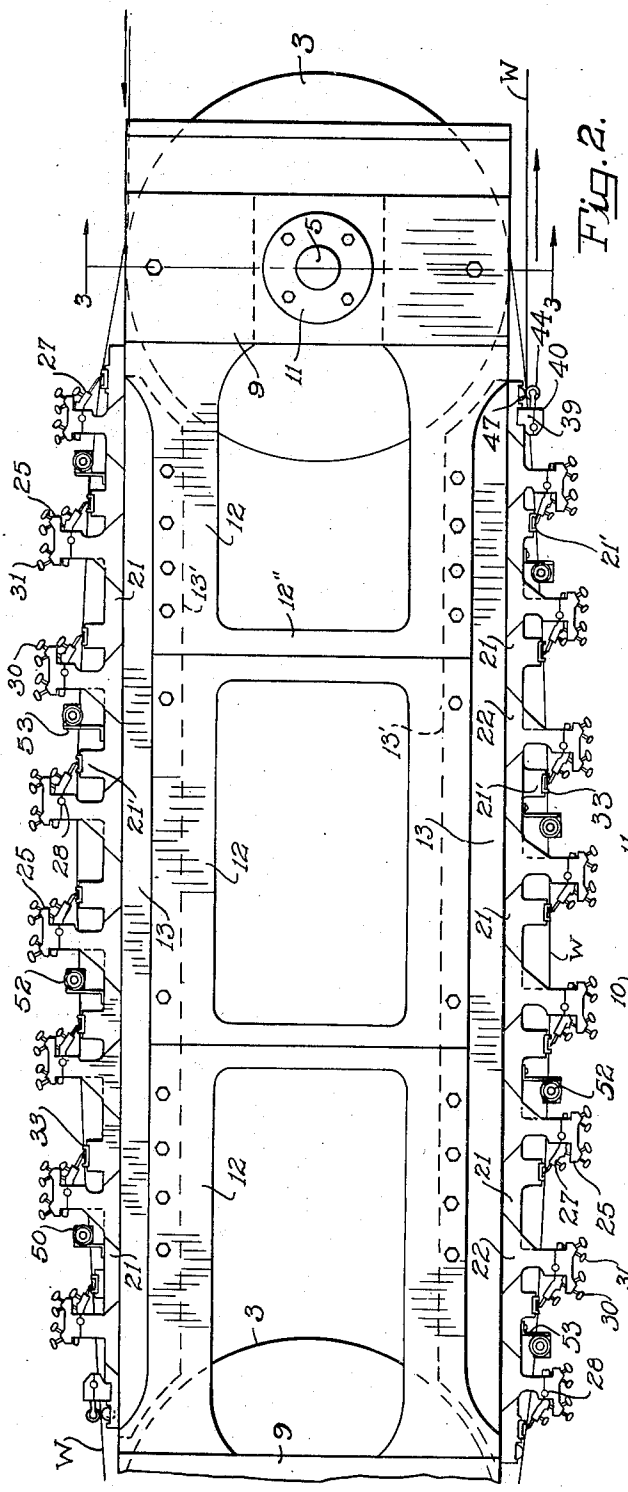


Fig. 2.

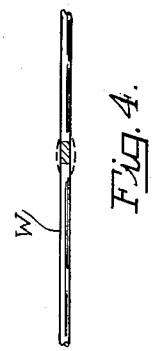


Fig. 4.

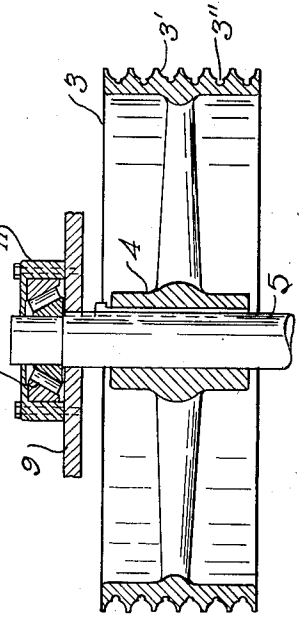


Fig. 3.

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MACHINE FOR MAKING METAL WOOL

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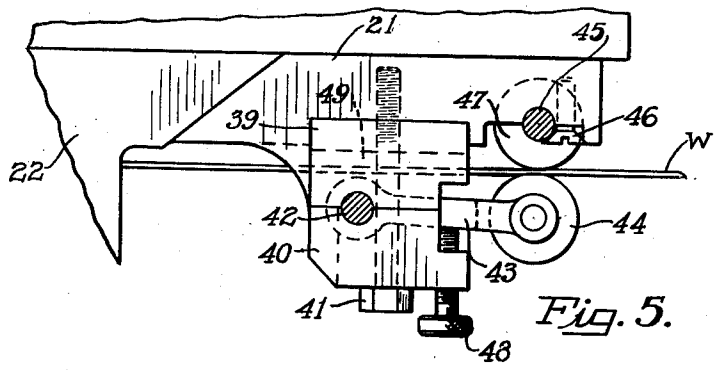


Fig. 5.

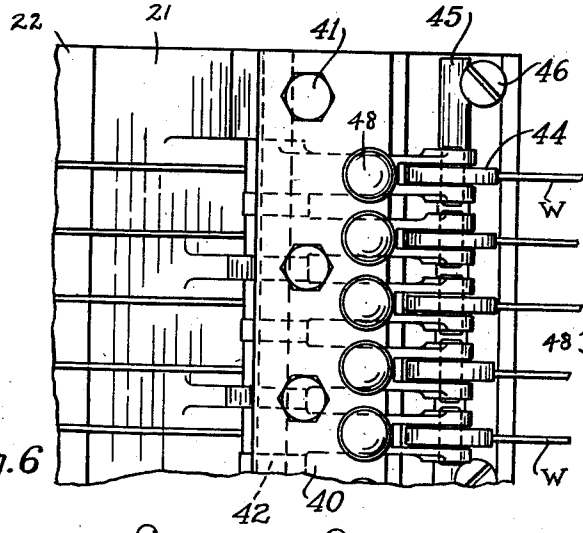


Fig. 6.

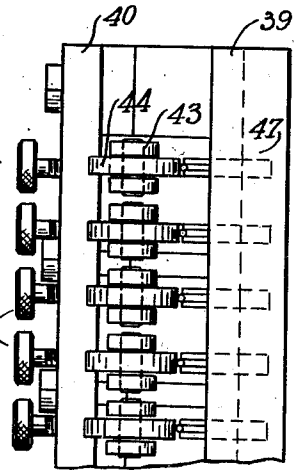


Fig. 7.

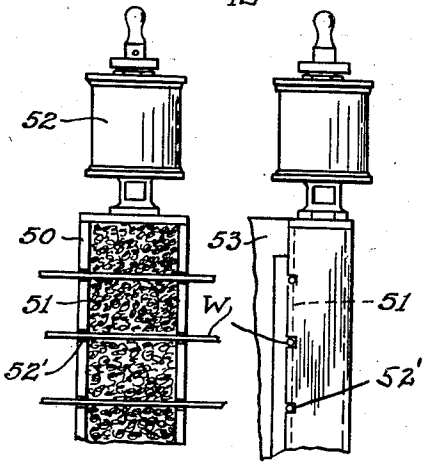


Fig. 8.

Fig. 9.



Fig. 10.



Fig. 11.

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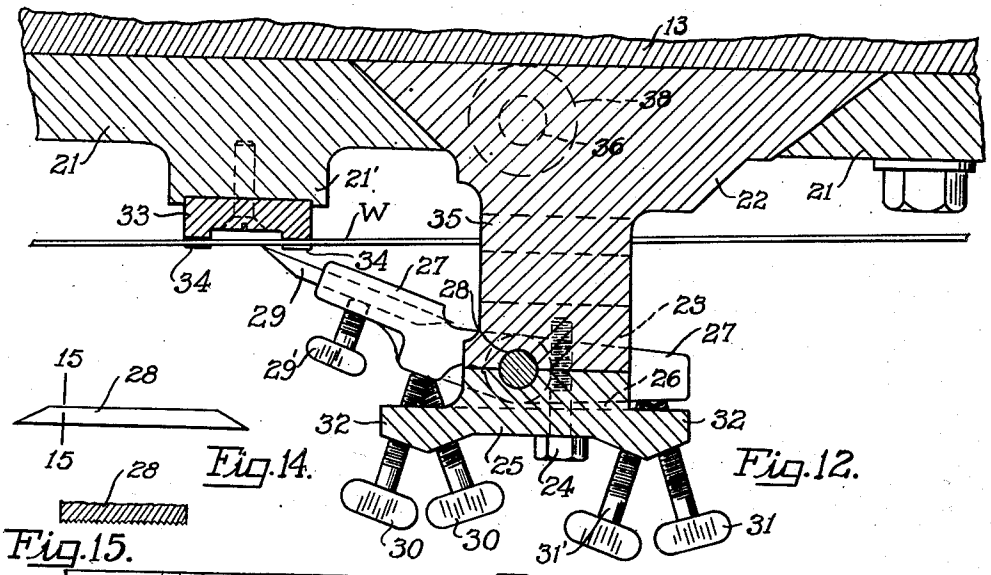


Fig. 12.

Fig. 14.

Fig. 15.

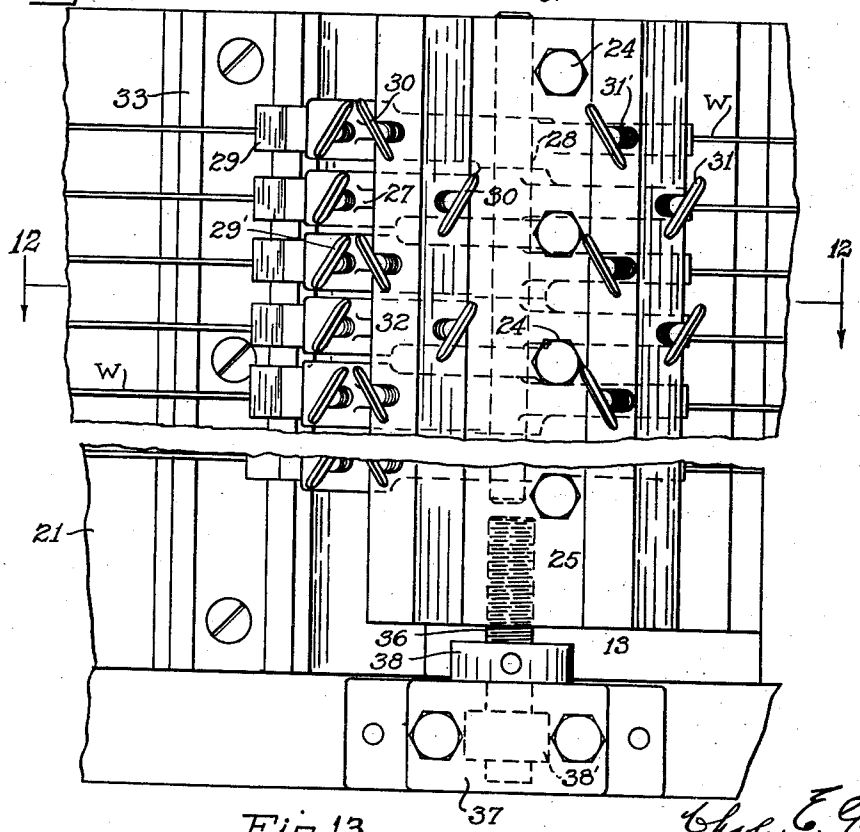


Fig. 13

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MACHINE FOR MAKING METAL WOOL

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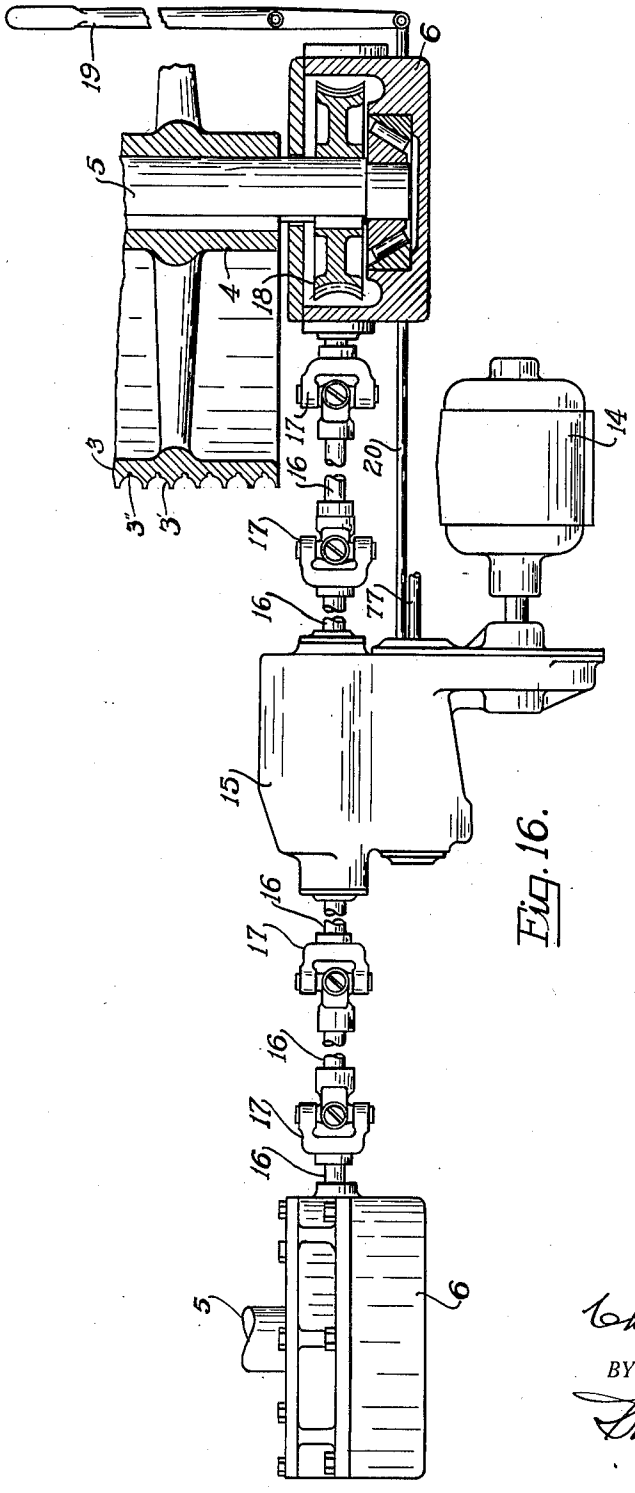


Fig. 16.

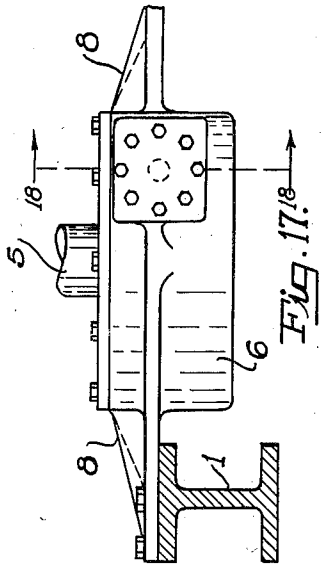


Fig. 17.

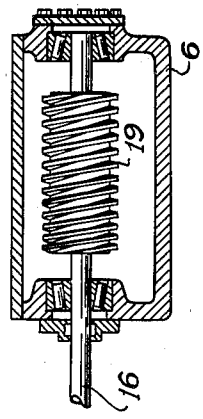


Fig. 18.

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MACHINE FOR MAKING METAL WOOL

Original Filed June 29, 1925 7 Sheets-Sheet 6

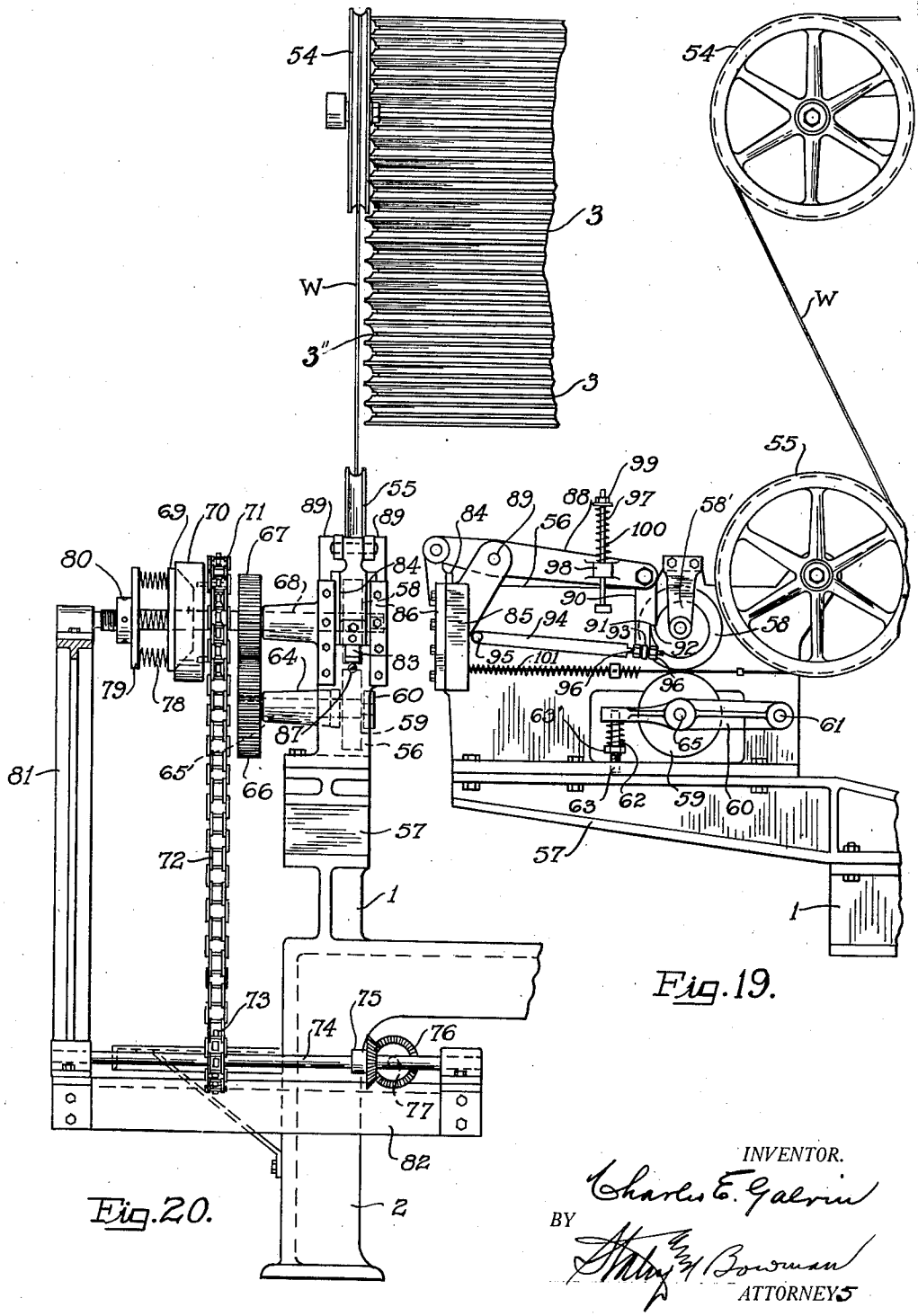


Fig. 19.

Fig. 20.

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MACHINE FOR MAKING METAL WOOL

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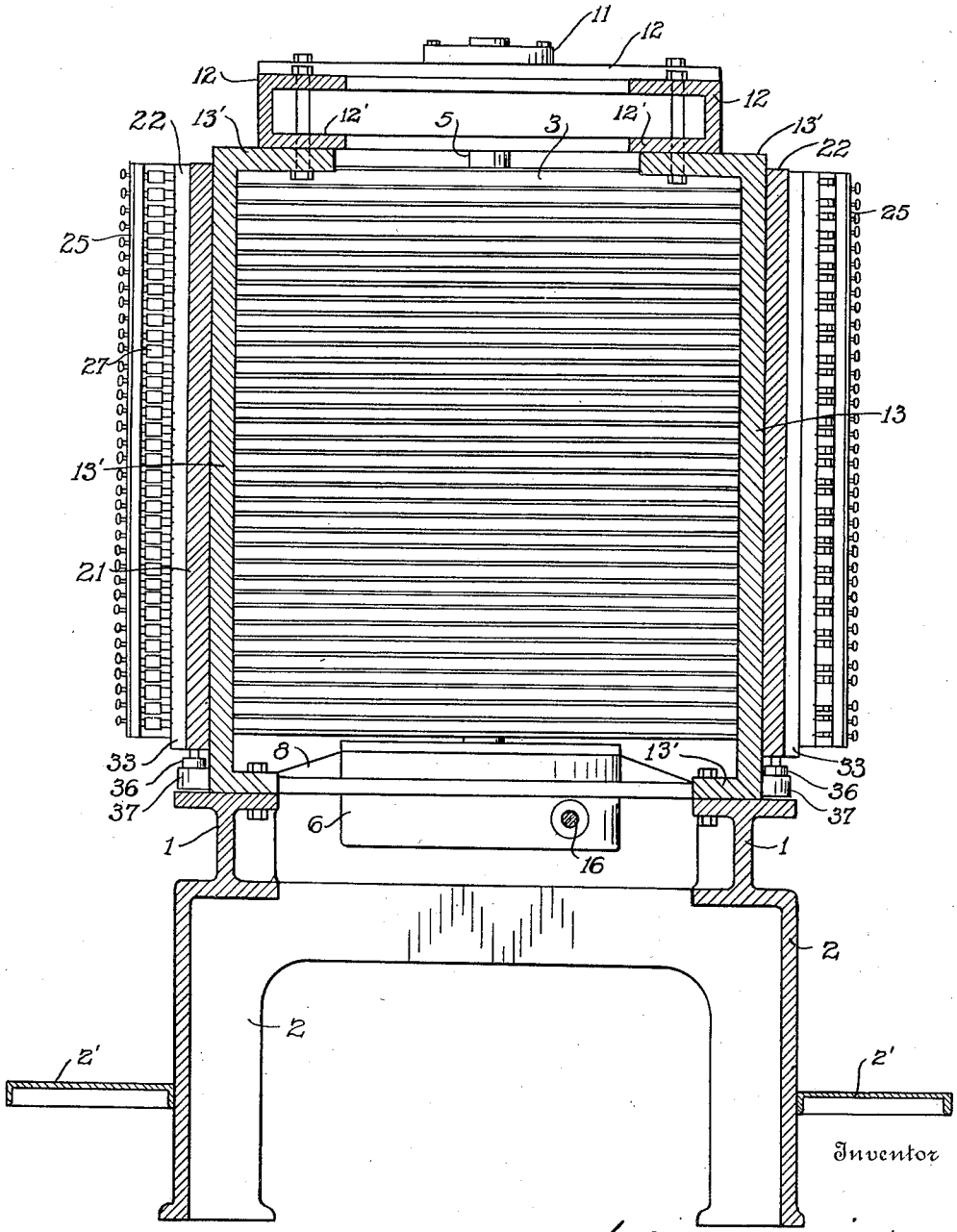


Fig. 21.

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Patented Oct. 16, 1934 1,977,053

UNITED STATES PATENT OFFICE

1,977,053

MACHINE FOR MAKING METAL WOOL

Charles E. Galvin, Springfield, Ohio, assignor, by mesne assignments, to International Steel Wool Corporation, Springfield, Ohio, a corporation of Ohio

Application June 29, 1925, Serial No. 40,143
Renewed March 16, 1932

11 Claims. (Cl. 29—4.5)

This invention relates to an improved machine for making metal wool, it particularly relating to improvements upon the machine described in the application of William A. Steinbart, filed Nov. 27, 1923, Ser. No. 677,352.

An object of the present invention is to simplify the construction of the machine of the application referred to and make more effective the operation of that machine.

Another and more specific object of the invention is to eliminate the mechanism for swinging the cutters out of contact with the travelling wire whenever a joint in the wire passes the cutters, and also to eliminate the necessity of adjusting the grooved drums relatively to each other to secure the proper tautness of the wire.

A further specific object of the invention is to provide improved means for adjusting the cutters for the purpose of presenting a new cutting surface to the travelling wire.

A further specific object of the invention is to provide simple and effective means for preventing the wire from turning about its axis during its travel through the cutting devices.

Referring to the drawings:

Fig. 1 is a side elevation partly broken away of a machine embodying the improvements with some of the cutters removed.

Fig. 2 is a top plan view partly broken away.

Fig. 3 is a vertical sectiton of one of the grooved drum segments and bearings for the drum shaft.

Fig. 4 is a view of adjacent ends of two lengths of wire showing in section the welded joint between the same.

Fig. 5 is a top plan view of a portion of the frame of the machine showing one of the devices for preventing the wire from turning.

Fig. 6 is a side elevation showing a series of the devices for preventing the turning of the wire.

Fig. 7 is an end view of the same.

Fig. 8 is an elevation of the inner side of a pair of one of the wire lubricating devices.

Fig. 9 is an end view of the same.

Fig. 10 is a section of the steel wire before it has been operated upon by the cutting devices.

Fig. 11 is another section of the wire in the form it leaves the machine after being operated upon by the cutting devices.

Fig. 12 is a transverse section through a portion of the frame of the machine and one of the supports for the cutting tools and one of the supports for the wire at the point where it is operated upon by a cutting tool.

Fig. 13 is a side elevation partly broken away of the parts shown in Fig. 12 showing in addition the adjusting device for the cutter support.

Fig. 14 is an end view of one of the cutting knives.

Fig. 15 is an enlarged sectional view of a portion of one of the cutting knives the section being on the line 15—15 of Fig. 14.

Fig. 16 is a plan view partly in section of the driving mechanism for the drums.

Fig. 17 is an end elevation of a portion of the driving devices.

Fig. 18 is a section on the line 18—18 of Fig. 17.

Fig. 19 is a side elevation of the wire cut off mechanism.

Fig. 20 is a top plan view of the cut off mechanism having in addition thereto a portion of one of the grooved drums.

Fig. 21 is a vertical section on the line 21—21 of Fig. 1.

The machine is supported upon a suitable base consisting of a pair of I-beams 1 formed with integral legs 2, the legs also supporting a suitable operator's platform 2'. As in the former application referred to the steel wire to be comminuted is passed in a series of convolutions about a pair of grooved rolls. Each roll is preferably formed of a series of grooved sections 3 (Figs. 3 and 16 for detail). Each section is cast with a series of grooves 3', and auxiliary grooves 3'' thereafter cut in the bottom walls of the main groove, and after the sections have been assembled on drums, the drums are rotated and auxiliary grooves 3'' finished with a suitable tool; these auxiliary grooves being large enough to receive the wire and being accurate as to concentricity with relation to the drums. The hub 4 of each section is keyed to a vertical shaft 5. The lower end of each shaft is supported in a box or housing 6 through the instrumentality of interposed roller bearings 7, this housing 6 having extensions 8 which are bolted to the I-beams 1 (Fig. 17). The upper end of each shaft is supported by a cross bridge piece 9 through the instrumentality of roller bearings 10 located in a housing 11 bolted to the cross piece 9; these cross pieces being in turn bolted to top frame pieces 12 secured to side frame plates 13'.

Each of the side plates 13 has an inturned flange 13' at its upper and lower edges. The bottom flanges 13' are secured to the I-beams 1

while the upper flanges 13' are secured to the lower legs 12' of the sides of the frame pieces 12 which are of channel form with the channelled sides connected by transverse webs 12''.

Both drums are simultaneously rotated at the same speed by an electric motor 14 (Figs. 16, 17 and 18) which drives change of speed gearing (not shown) located in the gear box 15. A series of shafts 16 connected by universal joints 17 extend in each direction to the housings 6. Each drum shaft 5 has secured thereto a worm gear 18 meshing with a worm 19 connected with one of the shaft sections 16 which is mounted in suitable roller bearings in the end walls of the housing. A suitable operating lever 19 having a link 20 extending into the gear box is provided for shifting the gears.

Secured to each of the side plates 13 is a series of vertical guide members 21 the adjacent edges of which are bevelled inwardly so as to form with the side plate 13 dove-tailed channels. Slidably mounted in each dove-tailed channel is a cutter supporting member 22 (Figs. 2, 12 and 13). Each one of these cutter supporting members extends across the entire series of wire convolutions and carries a series of cutting tools, one tool for each convolution of the wire. The outer face of each tool carrying member is provided with a series of recesses 23 and secured to the outer face by cap screws 24 is a cap 25. The inner face of the cap 25 is recessed as indicated at 26 to conform to the recesses 23 and provide a chamber for the reception of the shank 27 of a tool holder. A rod 28 extends throughout the entire length of the cutter supporting member and this cap and the shank 27 of each tool holder is pivoted upon this rod. The head 27' of the tool holder carries a cutting tool 29, the tool being held therein by the set screw 29'. This cutting tool 29 is double edged, as shown in Figs. 12 and 14, and the outer surface thereof is provided with a series of fine corrugations as indicated in Fig. 15 so that the cutting edges will be of a fine saw tooth character. A pair of adjusting screws 30 and 31 are provided for each tool holder, these screws being threaded in projecting ribs 32 formed on the cap 25, one screw being adapted to bear upon the head of the tool holder and the other screw upon the tail of the shank thereof so that the cutter may be adjusted relatively to the wire and held against chattering. Preferably these screws 30 and 31 are arranged in alternate staggered relation as shown in Fig. 12 to permit ready access. Adjacent each of the tool holding members 22 there is provided a wire guide and support 33. This guide and support consist of a metallic strip which is secured to a projecting rib 21' on the forward face of the guides 21. The forward face of this guide and supporting strip 33 is channelled and the walls of the channel are provided with a series of pairs of grooves 34, one pair for each convolution of the wire with the grooves of each pair in longitudinal alignment. Each supporting member 22 is also provided with a series of channels 35 in line with the grooves 34 to permit the passage of the wire.

Means are provided for adjusting each cutter supporting member 22 vertically for the purpose of presenting new cutting surfaces to the convolutions of wire as the cutters become dull. To that end each member 22 has its lower end provided with a threaded bore to receive a screw 36 (Figs. 13 and 21), the lower end of which projects into a bracket 37 secured to the lower part of the side plate 13 and has formed integrally thereon a collar 38 formed to receive a spanner wrench which rests upon the top of the bracket, and also a collar 38' fitted in a recess in the bracket. By turning the collar 38 the member 22 may be raised or lowered to the required extent.

Referring to Fig. 2 it will be noticed that the ribs 21' on the guides 21 gradually increase in thickness transversely away from the center of the machine so that the wire guiding or supporting surfaces of the guides are arranged substantially upon the arc of a circle which is tangent to both drums, the radius of the arc being about four times as great as the distance between the axes of the drums. As a result of this arrangement convolutions of wire have imparted thereto a bowed character which has the effect of maintaining the convolutions of wire in a taut condition as they pass by the cutters.

The wire as it is fed into the machine is round in cross section, but is gradually reduced by the cutters, one side thereof becomes flattened until as it leaves the machine it has the form shown in Fig. 11. It is essential that the wire as it passes through the machine be prevented from rolling or turning so that the flat surface thereof caused by the cutting action will at all times be presented to the action of the cutters. To that end there is located at each end of each side of the machine, a series of devices for preventing the turning of the wire, one device at the place indicated for each convolution. Referring particularly to Figs. 1, 2, 5, 6 and 7 there is attached to each of the end guides 21 a support 39 having a cap piece 40 connected therewith by the bolts 41 which act to secure the support 39 to the guide 21. The support 39 and its cap 40 carry a vertical rod 42 and are recessed to receive a series of arms 43 which are pivoted upon the rod 42. The free bifurcated end of each arm 43 carries a roller 44 having a plain periphery. Journaled upon a vertical rod 45 which is secured to the support 21 by screws 46 is a series of rollers 47 which cooperate with the rollers 44; the guide 21 being recessed to accommodate these rolls 47. Each of the rollers 47 is provided with a grooved periphery to receive the rounded portion of the wire, while the rolls 44 cooperate with the flattened side of the wire. An adjusting screw 48 having a threaded engagement with the cap 40 cooperates with the arm 43 to adjust the roll 44 relatively to the roller 47. The support 39 is also provided with a channel 49 to permit the passage of the wire through the support 39.

Means are provided for lubricating the wire as it passes by the cutters and for that purpose there is secured to some of the guide strips 21 a vertically extending channelled member 50 filled with felt packing 51 or other suitable material and having an oil cup 52 at its upper end to keep the packing saturated with lubricant (Figs. 1, 2, 8 and 9). The webs or flanges of the member 50 are provided with a series of grooves 52, a pair of grooves for each convolution of wire so that the convolutions of wire are in contact with the packing and become lubricated thereby. Each channelled member 50 is supported by a bracket 53.

The wire as it leaves the machine in the attenuated condition shown in Fig. 11 is fit only for scrap. Heretofore in machines of this character it has been common to wind the attenuated wire upon a reel, but in this condition it is practically worthless as scrap because before remelting it must be unwound and cut into short

lengths. In order to reduce the attenuated wire to short lengths so that it can be conveniently bundled and thereby at once have considerable value as scrap material, there is provided a cut off mechanism such as shown in Figs. 19 and 20. The final convolution of wire leaves the machine from a grooved roller 54 and from there passes about a grooved roller 55 mounted at the forward end of a head 56 which constitutes a support for the mechanism, this head being secured to a bracket 57 which is in turn secured to one of the I-beams 1 of the main frame of the machine. From the grooved roller 55 the wire passes through a pair of feed rollers 58 and 59 which are driven in opposite directions in the manner presently to be described. The feed roller 58 is stationarily supported in the depending arms 58' while the feed roller 59 is yieldably supported in an arm 60 which is pivoted to the head 57 as at 61 and has its free end supported by a spring 62 coiled about a stud 63 supported by the head 56 and being interposed between the free end of the arm 60 and the adjustable nut 63' on the stud 63. The arm 60 has a bearing 64 for the shaft 65 of the roller 59, this bearing 64 being extended as shown in Fig. 20. Connected with the inner end of the shaft 65 is a gear 66 meshing with the gear 67 on the shaft 68 of the roller 58. The shaft 68 is extended and has keyed thereto one member 69 of a cone clutch, the other member 70 of which is loosely mounted upon the shaft 68 and has secured thereto a sprocket wheel 71 driven by the chain 72 which passes about the sprocket 73 on the shaft 74. This shaft 74 is driven through the bevelled gears 75 and 76 from a shaft 77 which is in turn driven by the gears in the gear box 15 (Fig. 16). The clutch members 69 and 70 are held in spring-pressed engagement by a series of coil springs 78 interposed between the clutch member 69 and a disk 79 which is loosely mounted upon the shaft 68, a spanner nut 80 threaded upon a threaded portion of the shaft furnishing the means for adjusting the tension of the springs. The inner end of the shaft 68 is supported in bearings at the upper end of a standard 81 the lower end of which is secured to a supporting member 82 which also supports the shaft 74.

The feed rolls impart a continuous feeding movement to the wire to cause it to travel beneath a reciprocal cutter 83 fastened to a cutter head 84 slidably mounted in a guide formed in a vertically extending sub-head 85 and cheek piece 86. The wire passes through the aperture 87 formed in the sub-head and after being severed drops into a suitable receptacle (not shown). The upper end of the cutter head is pivotally connected with the rocker arm 88 pivoted between the bracket arms 89. The forward end of the arm 88 has a pivotal connection with a stem 90 formed with a shoulder 91 which cooperates with the shoulder 92 formed on the side of the feed wheel 58. The lower end of the rod 90 has a lateral apertured projection 93 through which passes the reduced threaded end of a link 94 pivoted at 95 to the head 56. Nuts 96 on the threaded reduced portion of the link furnish the means for adjusting the position of the rod 90 to bring its shoulder 91 in proper relation with the shoulder 92. Upon each revolution of the feed wheel 58, the rod 90 will be raised to rock the arm 88 and thereby reciprocate the cutter head downwardly to sever the wire. A spring 97, interposed between a lug 98 on the side of the rocker arm and a collar 99 on the upper end of a stem 100, the lower end of which is connected to the head 56, serves to swing the rocker arm in the opposite direction and thereby raise the cutter head. Preferably there is placed between the feed wheels and the sub-head 85 a guide 101 for the wire in the nature of a coiled wire.

The wire is fed to the machine from a reel (not shown in the present case) the reel being large enough to contain a great length of wire usually sufficient for a run of at least one day. To that end the coils of wire as they are shipped from the wire factory are joined together preferably by electric welding in the manner shown in Fig. 4, the welded joint being dressed down to a size no greater than the cross sectional area of the wire. By so joining the coils of the wire, I am enabled to dispense with the more or less complicated mechanism described in the Steinbart application referred to for raising the cutting tools over the wire joint, as they pass through the machine.

By having each series of cutting tools arranged upon a common support which is manually adjustable I am enabled to readily adjust the tools to present new cutting surfaces to the wire whenever necessary and this arrangement also enables me to dispense with the automatic mechanism described in the said Steinbart application for adjusting the tools relatively to the wire to present new cutting surfaces to the wire. The adjustment of each series of cutters independently of the other series of cutters eliminates the tendency of the wire to roll or turn over, as is the case where all of the cutters on the machine are adjusted simultaneously as in the machine of the Steinbart application.

By having the support for the wire located on the side frame members in the manner described so as to cause a slight bowing of the long side of the wire convolutions, the convolutions of wire are maintained in a taut condition, and by the use of the guide rolls on each side of the respective ends of the machine which cooperate with the wire, the wire is prevented from turning or rolling upon its axis during its passage through the machine, thus keeping the reduced flattened side of the wire presented to the cutting surfaces of the cutters.

The mechanism described for cutting the attenuated wire into short lengths allow the waste wire to be readily bundled in a manner which enables it to be disposed of as scrap. As heretofore explained the waste wire when wound upon a reel is worthless as scrap for the reason that before remelting it must be unwound and cut into lengths.

By grooving the drums in the manner described, an accurate concentricity of the grooves in which the wire runs is insured.

Having thus described my invention, I claim:

1. In a machine for making metal wool, means for causing a length of wire to travel in a series of oblong convolutions, a plurality of series of cutters for said wire, a holder for each cutter, each series of cutters arranged to operate upon a plurality of convolutions, each series of holders being mounted upon a common support, and manually operated means for adjusting said support to adjust the cutting edges of the cutters across the wire.

2. In a machine for making metal wool, means for causing a length of wire to travel in a series of oblong convolutions, supporting frame

parts adjacent the long sides of the wire convolutions, a plurality of series of cutters for said wire, a holder for each cutter, a common support for each series of holders arranged at right angles to the direction of travel of the wire convolutions, and manually operated means for adjusting each support to cause each cutter to present a new cutting surface to the wire convolution with which it is associated.

3. In a machine for making metal wool, a pair of spaced apart drums, each provided with a series of peripheral grooves, means for rotating said drums simultaneously at the same speed, said drums carrying a continuous length of wire in a series of oblong convolutions, a plurality of series of cutters for said wire, a holder for each cutter, a common support for each series of holders extending across the series of convolutions, and manually-operated means for adjusting the position of each support.

4. In a machine for making metal wool, a pair of spaced apart drums arranged in parallel relation and each provided with a series of peripheral grooves, means for simultaneously driving said drums at the same speed, said drums carrying a wire in a series of oblong convolutions, frame members arranged adjacent the sides of the wire convolutions, a plurality of series of holders, a cutter held in each holder, a common support for each series of holders, said supports being slidably mounted on said frame members, and manually operated means for adjusting each support to cause new cutting surfaces to be presented to said wire.

5. In a machine for making metal wool, means for causing a length of wire to travel in a series of oblong convolutions, a frame member arranged adjacent said convolutions, a series of cutters, a holder for each cutter, a common support for said holders extending across a series of convolutions, each cutter being supported to operate upon a different convolution from the other cutters, said support being slidably mounted upon said frame member, and a manually operated adjusting screw between said frame member and cutter support to adjust said support to cause new cutting surfaces to be presented to said wire.

6. In a machine for making metal wool, means for causing a length of wire to travel in a series of oblong convolutions, a frame member arranged adjacent said convolutions, guides on said frame member and forming therewith a dove-tailed channel, a series of holders, a cutter held in each holder, a support for said series of holders slidably mounted in said dove-tailed channel, the holders being arranged so that each cutter operates upon a different convolution from the other cutters, and manually operated means for sliding said support in said channel to cause different cutting surfaces to be presented to said wire.

7. In a machine for making metal wool, means for causing a length of wire to travel in a series of oblong convolutions, a series of cutters for said wire, a holder for each cutter, a common support for said holders extending across a series of convolutions, with each cutter arranged thereon to operate upon a different convolution from the other cutters, manually-operated means for adjusting said support, and a support for each wire convolution arranged adjacent the cutting edge of each cutter.

8. In a machine for making metal wool, means for causing a length of wire to travel in a series of oblong convolutions, a frame member arranged adjacent said convolutions, a pair of guide members secured to said frame member, a support slidably mounted in said guides, together with manually operated means for adjusting said support, a series of holders carried by said support, a cutter held in each holder each cutter arranged to operate upon a different convolution from the other cutters, and wire supports on one of said guides to support the convolutions of wire adjacent the cutting edges of said cutters.

9. In a machine for making metal wool, a pair of drums for carrying a length of wire in the form of convolutions, a series of cutters for acting upon the wire convolutions for gradually reducing one side of said wire to a flattened condition, and a series of devices for preventing the turning of the wire about its axis, said devices being located on each side of the machine in proximity to said drums, each device consisting of a pair of rolls between which the wire passes, one of said rolls having a grooved periphery to cooperate with the round side of the wire and the other roll a plain periphery to cooperate with the flat side of the wire.

10. In a machine of the character described, a pair of vertically arranged spaced apart parallel walls, means for causing a length of wire to travel unidirectionally in a constant manner in form of a series of oblong convolutions about the outer sides of said walls, one side of each convolution passing about one wall in a direction opposite to that in which the other side passes about the opposite wall and a series of supports located on the outer side of each wall for each wire convolution, said supports being of different widths and gradually decreasing toward the ends of said walls, and a series of knives on the outside of said walls cooperating with said supports.

11. In a machine of the character described, a pair of vertically arranged spaced apart parallel walls, a pair of revoluble drums arranged respectively at the ends of said walls to cause the length of wire to travel unidirectionally in a constant manner in the form of a series of oblong convolutions about said drums and over the outer sides of said walls and a series of supports located on the outside of said walls for each convolution of wire arranged on the arc of a circle tangential to both drums, said wires travelling over the outer sides of said supports, one side of each convolution passing between drums over its supports in a direction opposite to the travel between drums of the other side of said convolutions over the opposite supports, a series of cutters for the wire arranged on the outer sides of said supports.

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