No. 827,441. PATENTED JULY 31, 1906.

S. B. HARDING.

MACHINE FOR SPREADING SLITTED METAL.

APPLICATION FILED OCT. 30, 1905.

3 SHEETS—SHEET 1.

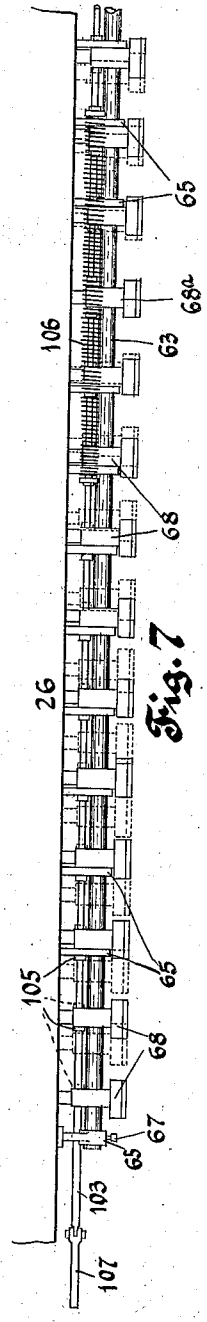


Fig. 7

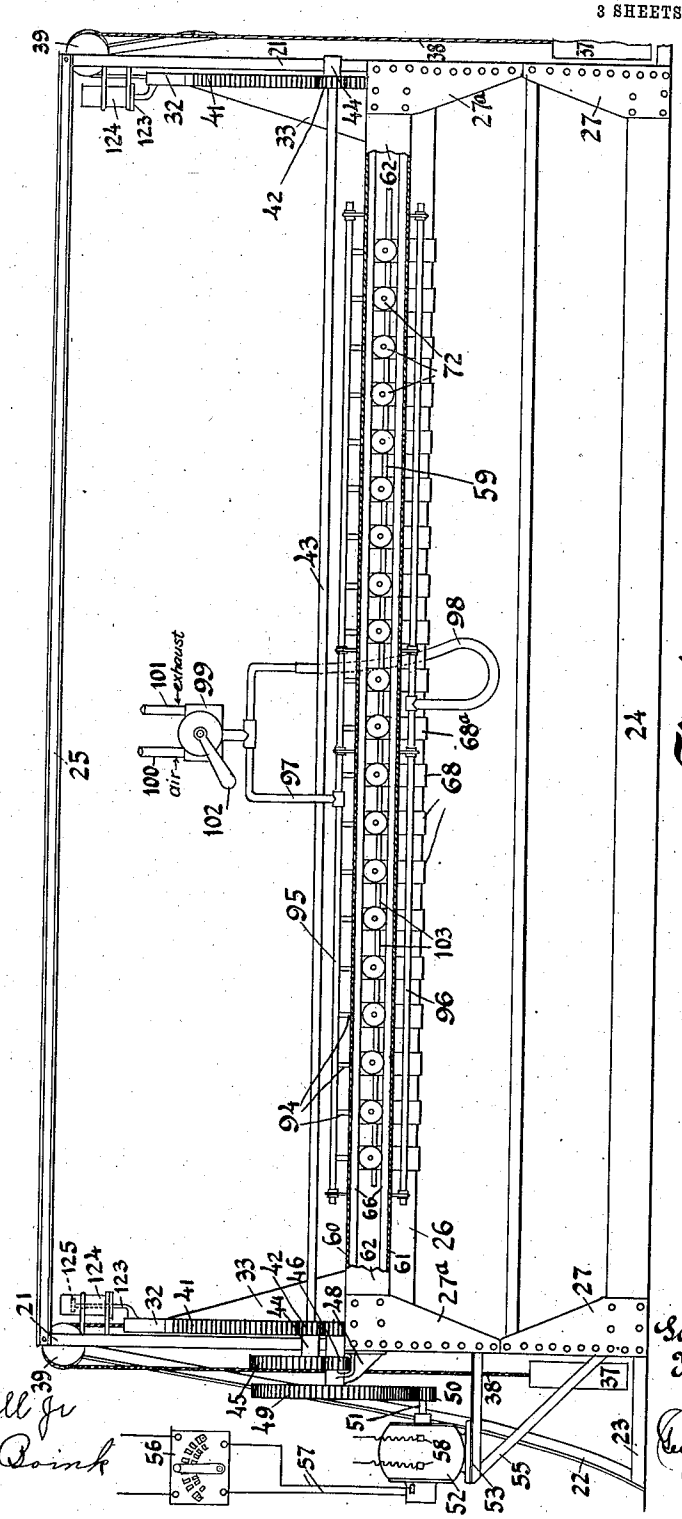


Fig. 1

Witnesses

J. A. Mitchell Jr

Gertrude H. Boink

Inventor

Samuel B. Harding

By Fenger & Colles

Attorney

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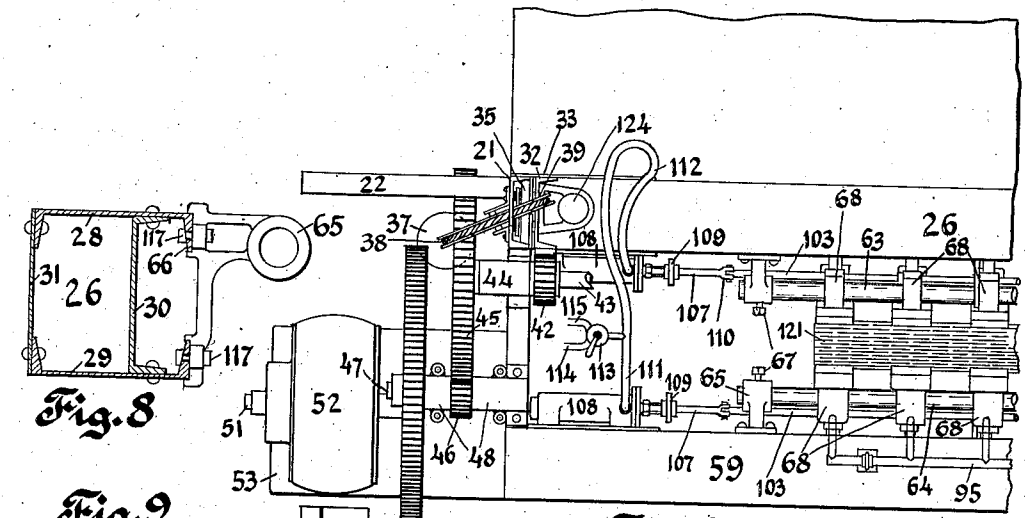


Fig. 8

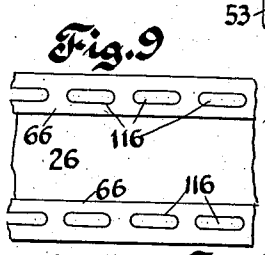


Fig. 9

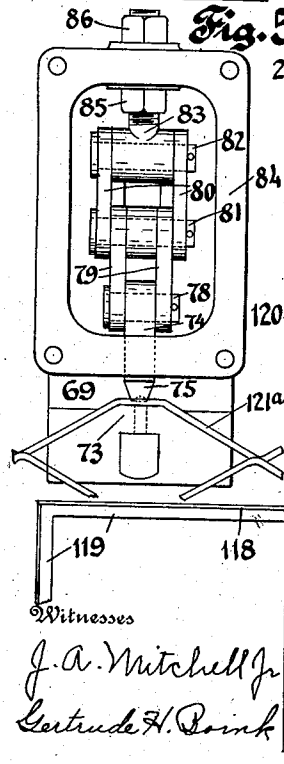


Fig. 5

Fig. 3

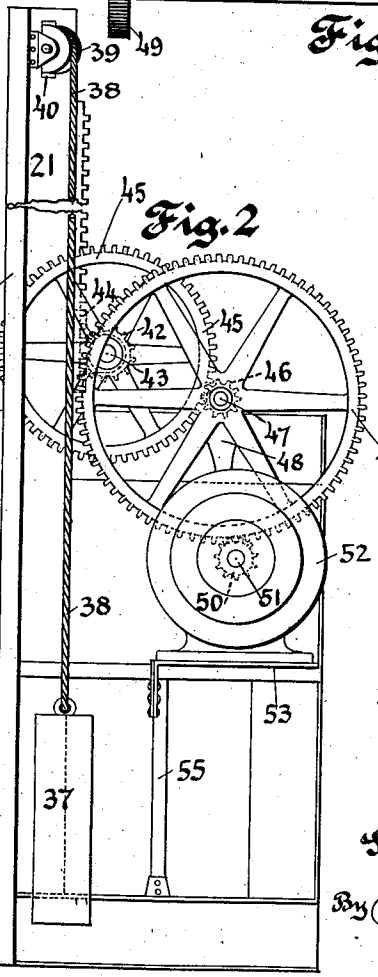


Fig. 2

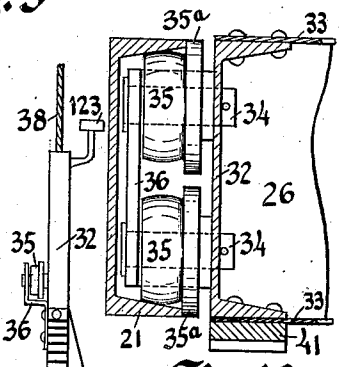


Fig. 10

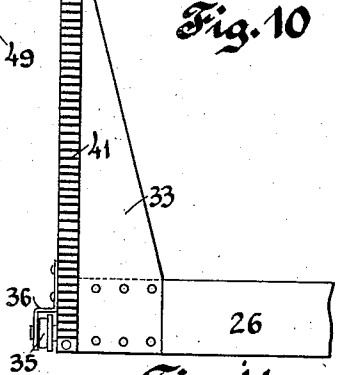


Fig. 11

Witnesses

J. A. Mitchell Jr.

Gertrude H. Boink

Samuel B. Harding,

Inventor,

By George Wetmore Colles

Attorney

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3 SHEETS—SHEET 3.

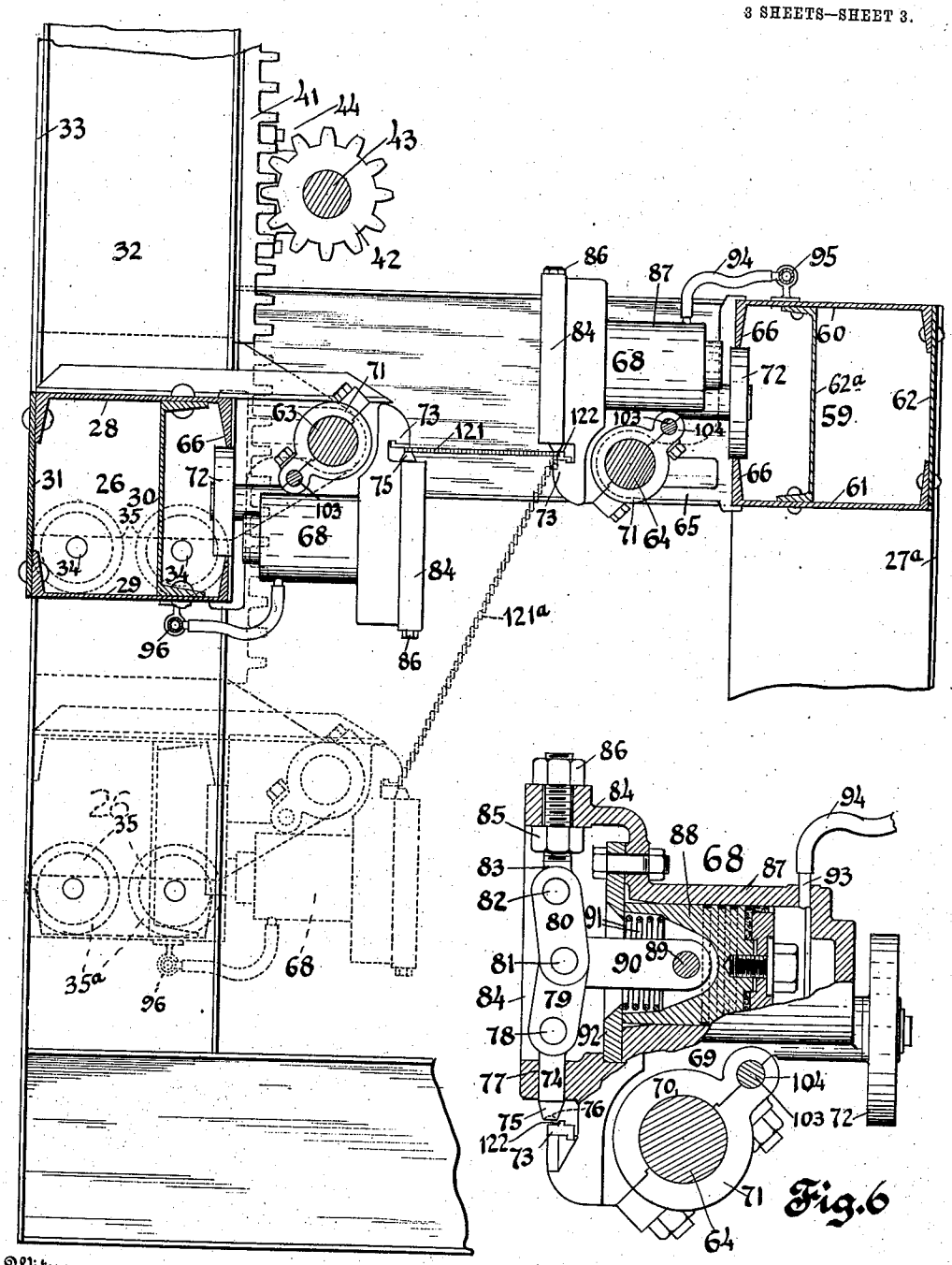


Fig. 4

Fig. 6

Witnesses

J. A. Mitchell Jr.

Gertrude H. Boink

Samuel B. Harding, Inventor,

By George Setmore Coller

Attorney

UNITED STATES PATENT OFFICE.

SAMUEL B. HARDING, OF WAUKESHA, WISCONSIN.

MACHINE FOR SPREADING SLITTED METAL.

No. 827,441. Specification of Letters Patent. Patented July 31, 1906.

Application filed October 30, 1905. Serial No. 284,959.

To all whom it may concern:

Be it known that I, SAMUEL B. HARDING, of Waukesha, Wisconsin, have invented a Machine for Spreading Slitted Metal, of which the following is a specification.

This invention is a machine for spreading metal which has been previously slitted after the manner of that shown, for example, in the patent to Curtis for a cutting-roll, No. 671,915, issued April 9, 1901, the adjacent rows of slits being arranged in quincunx, so that when the edges of the metal are pulled apart to spread it it will take the form of a network having diamond-shaped meshes, this product being known to the trade as "expanded metal."

My apparatus is intended more particularly to accomplish in a rapid and perfect manner the spreading of the larger sizes of mesh of expanded metal or metal lathing, such as are intended for use with reinforced concrete, these larger sizes being at the present time spread or expanded by hand for lack of the perfection of machinery to perform this operation. It will be understood, however, that my machine can also be used to advantage for spreading the smaller sizes.

In a general way my apparatus consists in stationary means for gripping one edge of the slitted metal sheet and movable means for gripping the opposite edge, which latter means is then caused to move away from the former, so as to draw out the metal into expanded form. Each of the gripping means consists of a plurality of grippers which grip the edge of the sheet at the center of each mesh, and the grippers of each set are arranged to move toward each other in proportion as the metal is expanded, so as to allow for the actual shortening in length which takes place during this operation.

My invention may best be understood from a consideration of the following detailed description in conjunction with the accompanying drawings, wherein—

Figure 1 is a rear elevation of the machine, a part of the fixed gripper-beam being removed. Fig. 2 is a side elevation thereof. Fig. 3 is a plan view of the right-hand end thereof. Fig. 4 is a transverse section through the machine, showing a side elevation of a pair of grippers on an enlarged scale. Fig. 5 is a front elevation of one of these grippers, showing expanded metal gripped and partially spread. Fig. 6 is partly a longitudinal section and partly an elevation of one of the grippers on a larger scale. Fig. 7 is a plan view of part of the movable set of grippers to show the returning mechanism. Fig. 8 is a transverse section through the movable gripper-beam and an elevation of one of the shaft-brackets mounted thereon. Fig. 9 is a front elevation of a portion of said beam, showing the means for mounting the shaft-brackets thereon. Fig. 10 is a horizontal section through one of the vertical frame-posts and one end of the movable gripper-beam, showing the guiding-rollers; and Fig. 11 is a rear elevation of the end of the movable gripper-beam.

The apparatus comprises a frame having two upright guide-posts 21, which have oblique braces 22 and are fixed at the bottom to a roughly triangular base 23, and the two sides of the frame are joined together by a channel-beam 24 at the bottom and a channel-beam 25 at the top. Each upright 21 consists, as seen from Fig. 10, of a channel having its flanges turned inwardly to serve as guides for the moving gripper-beam 26. Gussets 27 are preferably provided between the uprights 21 and the base-beams 24 as additional knee-bracing.

The movable gripper-beam 26 is made up of two horizontal channels 28 and 29, having their flanges turned inwardly, an intermediate vertical channel 30 connecting them near the rear side and a plate 31 connecting their flanges at the front side, (see Fig. 8,) and to each end of the beam is fixed an upright guide-bar 32, which is braced by a gusset 33. The guide-bar 32, as seen from Fig. 10, is likewise, preferably, a channel and has secured thereto at its upper and lower ends two pairs of stub-shafts 34, on which are mounted rollers 35, which run on the inner sides of the flanges of the posts 21, as shown, and preferably, also, have flanges 35^a running on the edges of these flanges, so as to prevent an endwise movement of the gripper-beam. For additional strength the free ends of the stub-shafts 34 are supported by brackets 36. The gripper-beam is counterweighted by a pair of weights 37 on the ends of cords 38, running over pulleys 39, supported at the upper ends of the respective frame-posts 21 and turning in slots 40 therein, the opposite ends of the cords 38 being secured, as shown, to the upper ends of the guides 32. Thus mounted it will be seen that the movable gripper-beam

has a free vertical motion, and it is operated by the mechanism which will now be described.

To the rear sides of the guides 32 are fixed racks 41, with which engage the teeth of a pair of pinions 42, mounted on a shaft 43, which runs across the machine above the gripper-beam and is journaled at its ends in boxes 44, secured to the rear sides of the posts 21. One end of this shaft, the right-hand end as herein shown, projects beyond the bearing and has mounted thereon a gear-wheel 45, which meshes in turn with a pinion 46 on a jack-shaft 47, journaled in a bracket 48 on the framework, the shaft 47 carrying also a gear 49, which meshes with a pinion 50 on the armature-shaft 51 of an electric motor 52, which latter is mounted on a platform 53, supported by bracket-arms 55 on the side of the frame. Means are provided for starting the motor in either direction, as indicated diagrammatically in Fig. 1, by a reversing and starting box 56, to which the leads 57 of the motor-armature are carried. The field-terminals of the motor are shown at 58. Of course it will be understood that this particular combination of means for operating the gripper up and down is not essential to the invention. Although considered the most convenient method, other kinds of motors might be used, which would of course have corresponding means for starting them and operating them in either direction.

With the moving gripper-beam coöperates the fixed gripper-beam 59, which is mounted on the frame to the rear of the movable gripper-beam and is of similar composite structure, comprising horizontal channels 60 and 61, united by a plate 62 at the rear side and an intermediate channel 62^a. On each of the gripper-beams and on the sides facing each other are mounted a pair of parallel gripper-shafts. (Designated 63 and 64, respectively.) These gripper-shafts are supported in shaft-brackets 65, one of which is shown in Fig. 8, and which are secured on the free flanges 66 of the horizontal channels 28 and 29, 60 and 61, respectively. The shaft-brackets and other apparatus on the fixed gripper-beam are reversed in position with respect to those on the moving gripper-beam, as seen from Fig. 4. The gripper-shafts may be secured against endwise movement by one or more set-screws 67 in the end brackets, although whether the shafts rotate or not is immaterial. On the shafts are mounted the grippers 68, which correspond in number to the number of meshes longitudinally counted in the piece of slitted metal 121, which is to be spread, and the distance between the grippers should also be equal to the width of the slitted metal sheet before being spread.

The construction of the grippers is best seen from Fig. 6, which shows one of the grippers on the fixed gripper-beam in partial cross-section. It comprises a base 69, having a recess 70, which forms, in combination with a box-half 71, a journal-box to receive the gripper-shaft 64. The gripper does not rotate on the shaft, but moves longitudinally thereon and is provided with a roller 72, fitting between the edges of the free flanges 66 of the gripper-beam and rolling on one of them. The base 69 is provided with a fixed gripper-jaw 73, with which coöperates a moving jaw 74, which is herein shown as having a conical end 75, which is concavely recessed, as shown at 76, to enable it to bite and grip firmly the edge of the slitted metal. The jaw 74 slides in a bore 77, which is formed in a yoke 84 on the base 69, and the upper end of the jaw has an eye through which passes a pin 78, securing it to a pair of toggle-links 79, whose upper ends are secured to companion toggle-links 80 by a pin 81, while the upper ends of the links 80 are pivoted on a pin 82, which is mounted in the eye of a projecting piece 83. The piece 83 is adjustably secured in the upper side of the yoke 84 by means of lock-nuts 85 and 86 on the threaded stem of the piece 83, thus enabling the separation of the gripper-jaws to be adjusted to different thicknesses of sheet metal.

Above the gripper-shaft 64 there is formed on the base 69 an air-cylinder 87, in which reciprocates a piston 88, which has a transverse wrist-pin 89, serving to connect a link 90 with the pin 81, whereby the latter is drawn back or pushed forward, so as to raise and lower the gripper-jaw 74. Normally the piston 88 is held retracted, so as to raise the gripper-jaw by means of a coiled compression-spring 91 within the piston, which abuts against the latter and against an abutment-plate 92 at the open end of the air-cylinder. Into the rear of the cylinder is introduced a short pipe 93, to which is fixed a flexible pipe 94, through which is introduced a supply of compressed air at proper times to cause the cylinder 88 to advance and so operate the gripper to grip the metal. The flexible pipes 94 on the fixed grippers are connected with an air-main 95, mounted on the beam, and similarly those of the movable grippers are connected with an air-main 96, mounted on the movable gripper-beam. Both of these air-mains, the former by a pipe 97 and the latter by a flexible hose 98, are connected with a three-way cock 99, one branch 100 of which is connected with a source of compressed air and the other, 101, with the atmosphere for the exhaust, whereby when the handle 102 of the three-way cock is thrown to one side all the gripper-cylinders will be connected with the compressed-air supply and will be actuated to grip the slitted metal and when the handle 102 is thrown to the opposite side the cylinders will be connected with the exhaust 101, so as to discharge them and permit the pis-

tons to be returned by the springs 91, thereby releasing the metal.

It will be understood that, as previously mentioned, when the slitted metal is spread the meshes thereof shorten in length, so that the grippers are drawn together, and to permit this to take place they are longitudinally movable on the gripper-shaft. When the spreading operation is completed, it is necessary to return the grippers to their former positions to be ready to grip a new sheet of slitted metal, and to accomplish this I provide on each gripper-beam a pair of return-rods 103, which pass through bearing-boxes 104, which are formed at one side of the bearings for the gripper-shafts on the base-pieces 69 and box-halves 71. Each of these return-rods has a set of collars 105, spaced so as to abut against the inner sides of the respective grippers when these latter are in their initial or extended position, and the rods are also extended. The central gripper 68^a (there being an uneven number) is anchored to the gripper-shaft by a set-screw or in any other manner, so that the others all move toward it in the spreading operation. The two rods 103 may, as shown, be connected near their inner ends by a coiled tension-spring 106, which passes over the shaft-brackets 65 on the movable gripper-beam and under those of the fixed gripper-beam and serves to keep the two return-rods drawn together, so that the collars 105 are normally away from the inner sides of the grippers and do not interfere with the inward movement of the latter. This, however, is found unnecessary in practice and may be omitted. To each outer end of the return-rods is connected a piston-rod 107, which is fixed to the piston of an air-cylinder 108, mounted at each end of each gripper-beam, and there is provided, preferably, a stop-plate 109 to strike against the cross-head 110 of the piston-rod when the latter is fully drawn in, so as to limit its motion at the point where the return-rods have drawn the grippers all back into their initial positions. The inner ends of the air-cylinders are connected by air-ducts comprising a stationary pipe 111 in the case of the fixed gripper-beam and a flexible pipe 112 in the case of the movable gripper-beam, and these are connected with a three-way valve 113, arranged similarly to the valve 99 in connection with an air-pipe 114 and an exhaust-pipe 115, so that compressed air may be introduced into and released from the cylinder 108 by operating the handle of the valve 113.

Owing to the longitudinal motion of the grippers on the gripper-shafts, it is necessary to have the shaft-brackets 65 properly adjusted thereon, so as not to interfere with this motion, and to facilitate proper adjustment and enable the grippers to be adjusted for different sizes of mesh these shaft-brackets near the ends of the beams are arranged to have considerable longitudinal adjustment. To this end the free flanges 66 of the beams have longitudinal slots 116, Fig. 9, spaced so that the intervals between the slots are slightly shorter than the slots themselves. The shaft-bracket 65 is secured in these slots by four bolts 117, two at each side of the bracket, spaced so that each enters a separate slot 116. The bracket can now be shifted on the beam within the limits of the slots, and to shift it farther it is only necessary to take out the bolts and move the bracket along the space of one pair of slots, and it will be found that in this way the brackets can be placed at any desired point on the beams.

To facilitate operating the machine, I provide a platform 118, supported at the front side of the machine on a framework 119, on which the operator stands, and to prevent the operator from getting caught in the machinery a guard plate or shield 120 is placed across the front of the machine and secured to the posts 21.

At the upper ends of the guides 32 are fixed brackets 123, and at the upper ends of the frame-posts 21 are secured dash-pots 124, having plungers 125, whose ends project slightly below the dash-pots, and when the movable gripper-beam reaches the upper limit of its motion the brackets 123 strike the projecting plungers of the dash-pots, and the beam is thus cushioned as it is brought to a stop. Similar cushioning-beams may be provided, if preferred, at the lower end of the beam's motion.

The operation of my machine is as follows: The machine being in its initial position, in which the movable gripper-beam is raised so that the grippers are opposite each other, as shown by the full lines in Fig. 4, a sheet of slitted metal 121 is introduced between the grippers, so that one edge is between each set thereof, and the edge bonds of the slitted metal come midway between the successive pairs of grippers. A stop-lug 122 may be cast on the fixed jaw of each rear gripper, so as to facilitate adjustment of the metal sheet. When the sheet is in proper position, the operator turns the handle 102 of the air-valve 99, so as to admit air into the gripper-cylinders and cause the movable jaws thereof to seize the metal, and he thereupon turns the handle of the starting-box 56, so as to operate the motor 52 to lower the movable gripper-beam to the bottom of its travel, thus drawing out the slitted metal, as indicated at 121^a in Fig. 4. When the slitted metal is drawn out, the grippers are drawn together toward the centers of the gripper-shafts, as previously explained. When the movable gripper-beam has reached the lower limit of its movement, the starting-box 56 is operated to shut off the motor, or it may be shut off

automatically by a suitable arrangement. The handle 102 of the air-valve 99 is thereupon reversed, so as to release the air from the gripper-cylinders and cause the grippers to release the metal, when the expanded sheet may be taken out. The starting-box 56 is now operated to return the movable gripper-beam to its raised position, and the valve 113 is operated to throw air into the return-cylinders 108 momentarily, which causes the return-rods to be drawn back, so as to return the grippers to their initial positions, after which the valve 113 is again thrown back, so as to free the rods 103 and permit them to be drawn forward by the grippers themselves on their advance movement or by the springs 106 if the latter are used.

My invention resides rather in the general principles than in the details of the machine, and I do not limit myself, therefore, to the specific details, as other ways of carrying out my invention can be readily devised by machine-builders and others skilled in the art.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. A machine for spreading slitted metal comprising means for gripping each edge of a sheet of slitted metal at independent points corresponding to the length of the meshes, and means for subsequently moving the gripping means on one side away from the gripping means on the other side so as to draw out the metal.

2. A machine for spreading slitted metal comprising means for gripping each edge of a sheet of slitted metal at independent points corresponding to the length of the meshes, means for subsequently moving the gripping means on one side away from the gripping means on the other side, and means whereby the independent gripping-points may move together during the operation of spreading by distances equal to the contraction of length of the meshes.

3. In a machine for spreading slitted metal, the combination of a plurality of stationary grippers movable longitudinally toward and from each other, a plurality of movable grippers likewise movable toward and from each other, and means for moving the movable grippers bodily toward and from the stationary grippers.

4. A machine for spreading slitted metal comprising a fixed gripper-beam, a plurality of grippers mounted and movable longitudinally thereon, a movable gripper-beam, a plurality of grippers mounted and movable longitudinally thereon, and means for moving the movable gripper-beam parallel to itself toward and from the fixed gripper-beam.

5. In a machine for spreading slitted metal, the combination of a set of grippers mounted to move longitudinally toward and from each other, a second set of grippers similarly mounted and also mounted to move bodily toward and from said first set, and means for simultaneously operating all of said grippers to grip the edges of a piece of slitted metal.

6. In a machine for spreading slitted metal, the combination of a fixed gripper-beam, a plurality of grippers mounted and having longitudinal movement thereon, a movable gripper-beam mounted opposite said fixed gripper-beam and having a travel toward and from the latter, a plurality of grippers mounted and longitudinally movable on said movable gripper-beam, means for operating said grippers simultaneously to grip the edges of a sheet of slitted metal, and means for returning the grippers of each set to the proper spacing corresponding to the length of mesh of the slitted metal after each spreading operation.

7. In a machine for spreading slitted metal, the combination of a fixed gripper-beam, a gripper-shaft, a plurality of grippers mounted and longitudinally movable on said shaft, a movable gripper-beam mounted to run in guides toward and from said fixed gripper-beam, a gripper-shaft carried on said movable gripper-beam, a plurality of grippers mounted and longitudinally movable on said last-named shaft, means for operating all of said grippers simultaneously to grip or release the edges of a slitted sheet, means for moving the movable gripper-beam toward and from said fixed gripper-beam, and means for returning all of said grippers to the proper spacing for the initial gripping operation on their respective shafts.

8. In a machine for spreading slitted metal, the combination of a gripper-beam, a plurality of grippers mounted and longitudinally movable thereon, and means for simultaneously placing all of said grippers at a definite spacing on said beam corresponding to the length of mesh of the slitted metal.

9. In a machine for spreading slitted metal, the combination of a gripper-beam, a plurality of grippers mounted and longitudinally movable thereon, a return-rod having collars thereon adapted to abut against the side of said grippers, and means for moving said return-rod longitudinally so that said collars engage and move the grippers to a certain spacing.

10. In a machine for spreading slitted metal, the combination of a horizontal gripper-beam carrying grippers mounted and longitudinally movable thereon, a pair of upright posts, a movable gripper-beam guided between said posts, a second set of grippers mounted and longitudinally movable on said movable gripper-beam, means for raising and lowering said movable gripper-beam bodily, means for simultaneously operating all the grippers to grip or release the edges of a slitted sheet, and means for returning all of said grippers to the initial spacing.

11. In a machine for spreading slitted

metal, the combination of a horizontal gripper-beam, a set of grippers mounted and longitudinally movable thereon, a pair of upright posts, a movable horizontal gripper-beam guided and vertically moving between said posts, said gripper-beam having racks mounted at the ends thereof, a driving-shaft carrying pinions engaging said racks, and means for rotating said driving-shaft in either direction whereby to raise or lower said movable gripper-beam.

12. In a machine for spreading slitted metal, the combination of a gripper-beam, a set of grippers mounted and longitudinally movable thereon, a pair of return-rods extending along the line of the grippers and bearing collars adapted to abut against the inner sides of said grippers and return them to their extended positions, and means for causing the return-rods to move outwardly to a fixed limit whereby the grippers are returned to their initial operating positions.

13. In a machine for spreading slitted metal, the combination of a gripper-beam, a set of grippers mounted and longitudinally movable thereon, a pair of return-rods extending along the line of the grippers and bearing collars adapted to abut against the inner sides of said grippers and return them to their extended positions, a pair of fluid-cylinders connected to the outer ends of said rods and mounted on said beam, and means for connecting said fluid-cylinders with a source of compressed fluid whereby the rods may be operated to return said grippers to their initial spacing.

14. In a machine for spreading slitted metal, a gripper for the edge of the metal comprising a fixed jaw, a movable jaw, a cylinder connected with said movable jaw to reciprocate the same, and means for supplying said cylinder with compressed fluid.

15. In a machine for spreading slitted metal, a gripper comprising a fixed jaw, a movable jaw reciprocating toward and from it, a set of toggle-links connected at one end to said movable jaw, a cylinder connected to the central point of said toggle-links whereby to straighten and bend the latter, and means for supplying said cylinder with compressed fluid.

16. In a machine for spreading slitted metal, the combination of a gripper-shaft, a gripper mounted and longitudinally movable thereon, and means for preventing the rotating of said gripper about said shaft; said gripper comprising a fixed jaw, a movable reciprocating jaw coöperating therewith, a fluid-cylinder connected with said movable jaw to operate it, and means for connecting said cylinder with a source of compressed fluid whereby said gripper is operated to grip the metal.

17. In a machine for spreading slitted metal, the combination of a gripper-beam, a plurality of grippers mounted and longitudinally movable thereon, a return-rod having collars thereon adapted to abut against the side of said grippers, means for moving said return-rod longitudinally so that said collars engage and move the grippers to a certain spacing, and a spring counteracting said moving means.

18. In a machine for spreading slitted metal, the combination of a gripper-beam, a set of grippers mounted and longitudinally movable thereon, a pair of return-rods extending along the line of the grippers and bearing collars adapted to abut against the inner sides of said grippers and return them to their extended positions, a spring connecting the inner ends of said return-rods, and means for causing the return-rods to move outwardly to a fixed limit whereby the grippers are returned to their initial operating positions.

19. In a machine for spreading slitted metal, a gripper comprising a fixed jaw, a movable jaw reciprocating toward and from it, an adjustable pivot, a set of toggle-links connected at one end to said movable jaw and at the other end to said adjustable pivot, and means for bending and straightening said toggle-links.

20. In a machine for spreading slitted metal, a gripper comprising a base, a fixed jaw mounted thereon, a movable jaw reciprocating toward and from it, a pivot-piece having a screw-threaded engagement with said base whereby it is adjustable toward and from said fixed jaw, a set of toggle-links connecting said pivot-piece with said movable jaw, and means for bending and straightening the intermediate joint of said toggle-links.

21. In a machine for spreading slitted metal, a gripper comprising a base, a fixed jaw mounted thereon, a movable jaw reciprocating toward and from it, an eyebolt set in line with said movable jaw and having a longitudinally-adjustable engagement with said base, a set of toggle-links connected at one end with said eyebolt and at the other end with said movable jaw, a cylinder connected to the central joint of said toggle-links whereby to straighten and bend the latter, and means for supplying said cylinder with compressed fluid.

22. A slitted-metal-expanding machine comprising means for gripping the edges of a sheet of slitted metal at independent points midway between the bonds on said edges, and means for subsequently moving the two gripping means apart whereby to expand the slitted sheet.

In testimony whereof I have hereunto set my hand this 20th day of August, 1905.

S. B. HARDING.

In presence of—

D. N. HUGHES,

C. E. CAURIGHT.