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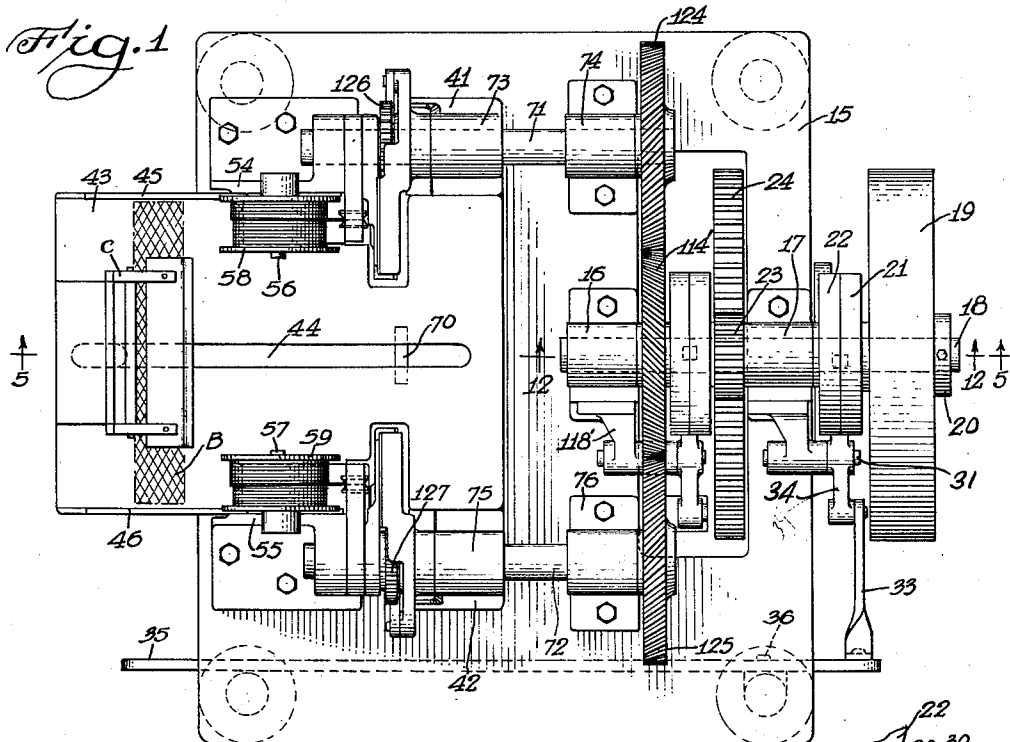
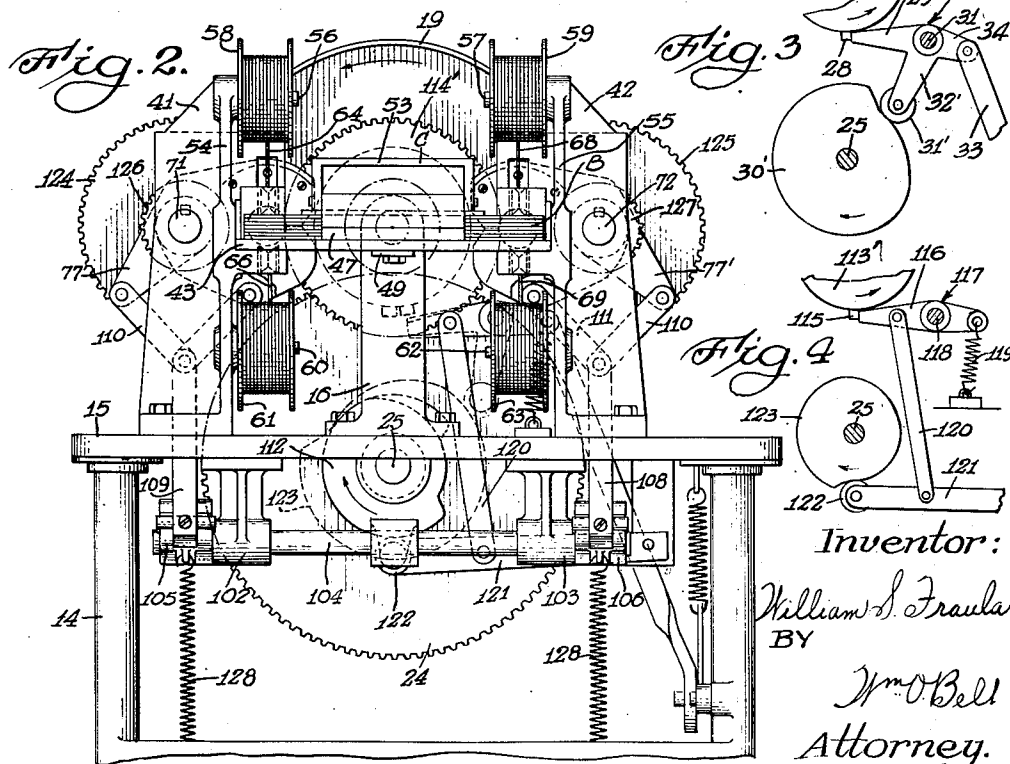
W. S. FRAULA

2,173,393

BUNDLING MACHINE

Filed July 16, 1934

3 Sheets-Sheet 1



Sept. 19, 1939.

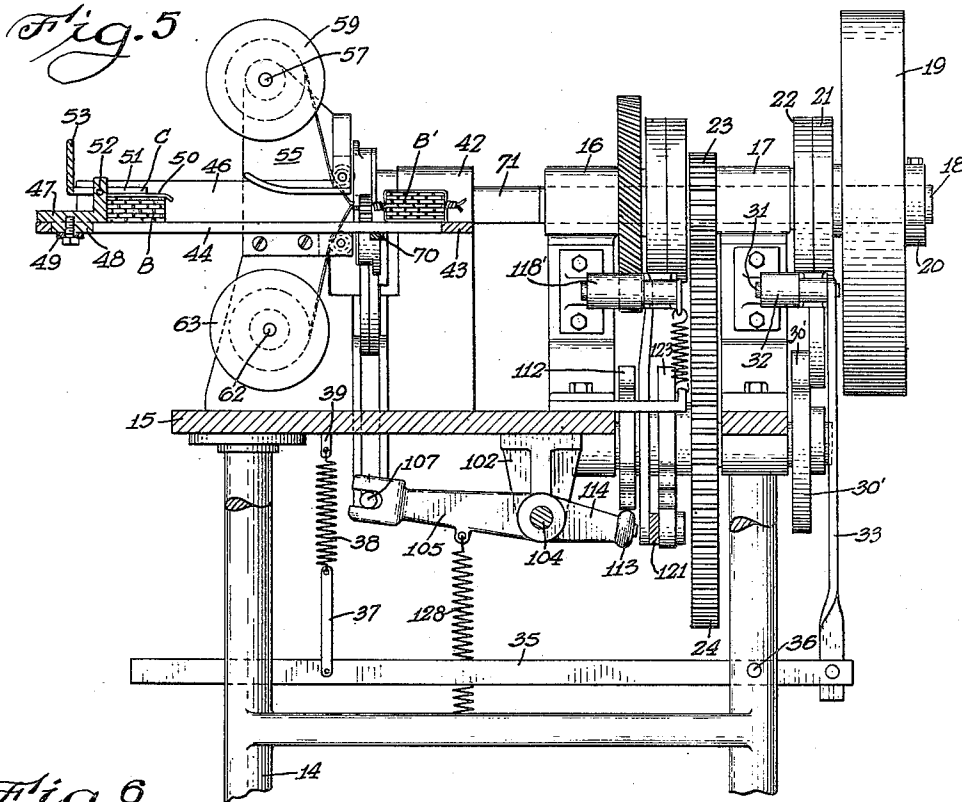
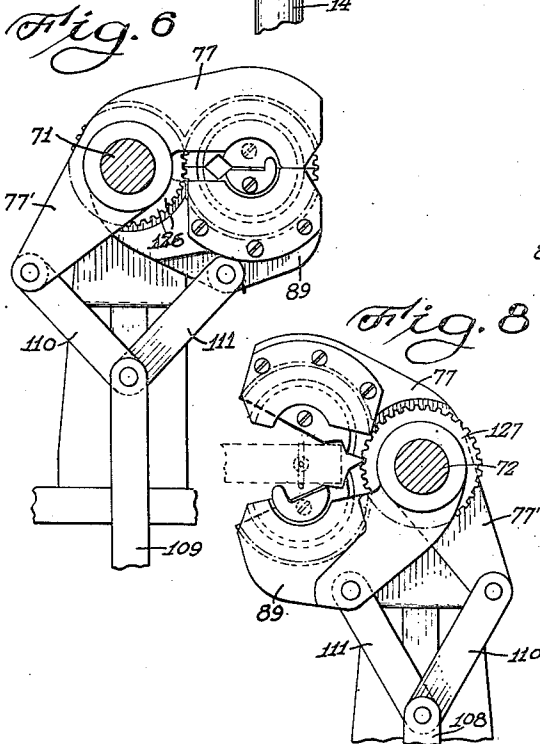
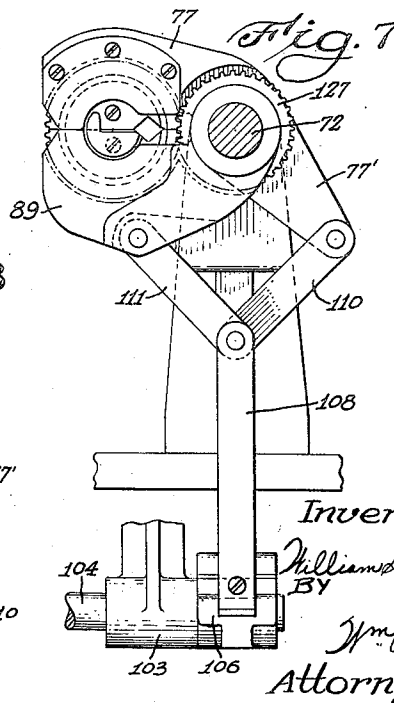
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BUNDLING MACHINE

Filed July 16, 1934

3. Sheets-Sheet 2



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UNITED STATES PATENT OFFICE

2,173,393

BUNDLING MACHINE

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24 Claims. (Cl. 100—31)

This invention relates to bundling machines and is particularly adaptable for binding together stacked substantially flat strips.

The primary objects of my invention are to pass 5 binding means, which may be in the form of wires or the like, about a bundle of stacked substantially flat strips near the ends of the bundle, and to secure the binding means on the bundle.

Another object is to so position binding means 10 in the machine that a bundle of stacked substantially flat strips may be engaged therewith and moved relative thereto to withdraw the binding means from supplies thereof in the machine and thereby pass the binding means about the bundle 15 near the ends of the bundle.

Further objects are to sever the binding means after passage thereof about a bundle; to interconnect the severed ends and secure the binding means on the bundle; and to arrange the binding 20 means for engagement with another bundle subsequently positioned in the machine.

Still further objects are to provide separable jaws for severing, securing and positioning the binding means; to close and open the jaws auto- 25 matically in the operation of the machine; to intertwist the ends of the binding means, when in the form of wires, by devices in the separable jaws; to so time the operation of the various devices in the machine that efficient operation is 30 assured; and to provide a novel machine of simple and positive operation and economical construction.

A preferred form of my invention is illustrated in the accompanying drawings wherein

35 Fig. 1 is a plan view;

Fig. 2 is a front view looking in at the left hand end of Fig. 1;

Figs. 3 and 4 are detail views of cams and de- 40 vices operated thereby;

Fig. 5 is a longitudinal sectional view taken substantially on the line 5—5 on Fig. 1;

Figs. 6, 7 and 8 are detail views of the binding means severing, securing and positioning jaws;

Fig. 9 is a vertical sectional view through one 45 pair of the jaws, showing the same in open position;

Fig. 10 is a view similar to Fig. 9 showing the jaws in closed position;

Fig. 11 is a perspective detail view of a gear 50 part employed in the jaws;

Fig. 12 is a fragmentary vertical sectional detail view taken substantially on the line 12—12 on Fig. 1; and

Fig. 13 is a detail view of the main clutch and 55 the operating parts therefor.

In the selected embodiment of my invention illustrated in the accompanying drawings 14 indicates a suitable frame for the machine and supporting a plate 15 at the top thereof. Aligned 5 bearings 16 and 17 are mounted on the plate 15 adjacent the rear edge thereof and the main drive shaft 18 is journaled in these bearings. A flywheel 19, about which a belt or the like may be directed to transmit power from a suitable 10 source, such as an electric motor, to the flywheel, is rotatably mounted on the shaft 18 adjacent one end thereof, a collar 20 being fast on the shaft to prevent movement of the flywheel toward said end of the shaft. A main clutch is 15 mounted on the shaft 18 intermediate the adjacent bearing 17 and the flywheel 19 and includes a driving part 21 rotatable on the shaft 18 and connected to the flywheel 19 and a driven part 22 fast on the shaft 18.

A pinion 23 is fast on the drive shaft 18 at 20 the side of the bearing opposite the main clutch and this pinion meshes with a gear 24 fast on the cam shaft 25 journaled in bearings 26 and 27 carried by the plate 15. The control and timing devices for the machine are mounted on the cam 25 shaft 25 as will be described hereinafter.

The main clutch includes a control dog 28 (Figs. 3 and 13) regulated by the arm 29 of the rocker 30 mounted on the shaft 31 journaled in a bracket 32 (Fig. 5) fast to the side of the bearing 17. A 30 link 33 is connected to the free end of the arm 34 of the rocker 30 and to a foot treadle 35 pivotally mounted in the frame 14, as indicated at 36. The foot treadle extends to the forward end of the machine from the pivotal mounting 36 35 thereof and the link 33 is connected to the foot treadle 35 rearwardly of the pivotal mounting 36. A link 37 is connected to the foot treadle 35, near the forward end thereof, and to one end of a spring 38, the opposite end of said spring being 40 secured to a spring anchor 39 depending from the plate 15. The spring 38 normally urges the forward end of the foot treadle 35 upwardly and the rear end thereof downwardly and therefore the link 33 normally holds the arm 29 of the 45 rocker 30 in the position illustrated in Fig. 13 whereat the dog 28 is engageable with the arm 29 to effect disengagement of the main clutch.

A cycle of operation of the machine, as illustrated, entails four revolutions of the shaft 18 50 and to this end means are provided for retaining the arm 29 out of dog engaging position until a cycle of operation is finished and this means includes a peripheral cam 30' fast on the cam shaft 25 in substantially vertical alignment with the 55

main clutch. A roller 31' on the depending arm 32' of the rocker 30 is urged into engagement with the peripheral cam 30' by the action of the spring 38. Thus when the forward end of the foot treadle 35 is depressed and the arm 29 is retracted from engagement with the dog 28 a spring 40 in the main clutch acts on the dog to effect engagement of the driving and driven parts 21 and 22 of the main clutch whereupon the shafts 18 and 25 are set in operation. The forward end of the foot treadle 35 is manually held in depressed position until a rise on the cam 30' engages the roller 31' which occurs immediately after the start of rotation of the shaft 25, and after the rise on the cam 30' has engaged the roller 31' the forward end of the foot treadle 35 is held in depressed position. The engagement of the rise on the cam 30' with the roller 31' holds the arm 29 out of dog engaging position and the roller 31' remains in engagement with the rise on the cam 30' until immediately prior to the time the shaft 18 has completed its fourth revolution whereupon the roller 31' moves onto a drop in the cam 30' and the spring 38 repositions the arm 29 in dog engaging position so that the main clutch is disengaged at the end of the fourth revolution of the shaft 18. The ratio between the shafts 18 and 25 is four to one so that the cam shaft 25 makes but a single revolution while the drive shaft is making four revolutions.

Brackets 41 and 42 are mounted on the plate 15 in side by side relation near the front edge thereof. A horizontal work table 43 is supported by the brackets 41 and 42 above the plate 15 and at the front of the machine. The work table 43 has a medially located slot 44 extending longitudinally thereacross and this table is equipped with side flanges 45 and 46. A transfer carriage C is mounted on the table 43 between the side flanges 45 and 46 and includes an angle plate 47 having a medially located depending lug 48 thereon which is disposed in the slot 44. A strip 49 is secured to the lug 48 and engages the bottom of the table 43 and retains the lug in the slot 44 so that the carriage is supported for sliding movement over the horizontal table 43. A clamp plate 50 is carried by the arms 51 pivotally mounted as indicated at 52 in the upstanding part of the angle plate 47 and a hand plate 53 is fast on the arm 51. The hand plate 53 may be manually grasped so that the clamp plate 50 may be pivoted upwardly to permit a bundle B of stacked substantially flat strips to be positioned therebelow, said bundle being rested on the table 43 and engaged with the front face of the upstanding part of the angle strip 47.

When the hand plate 53 is grasped and pressure is applied thereon the clamp plate 50 is urged into engagement with the top of the bundle B and then by applying further pressure on the hand plate 53 the transfer carriage C may be moved across the horizontal table 43, the side flanges 45 and 46 of said table guiding the ends of the strips in the bundle. When the transfer carriage C is so moved across the table 43 the bundle of strips is moved from the forward end of the table into bundling position near the rear edge of the table and indicated by B'.

The illustrated embodiment of the invention is particularly adaptable for bundling strips of expanded metal such as are often incorporated in railway brake shoes. These strips of expanded metal are in the form of substantially flat strips and are stacked one upon the other and wires are passed about the stacked strips near the ends

thereof to bind the strips together and prevent displacement thereof during casting of the brake shoe. The wires so passed about the bundle also serve to support the bundle in the mold cavity to permit the molten metal to flow thereabout and to insure proper positioning of the expanded metal in the cast shoe.

The brackets 41 and 42 support the table 43 along the side edges thereof and therefore devices for binding the bundle near the ends thereof may be mounted on these brackets. When the machine is used for bundling strips of expanded metal, wires are used as the binding means and these wires are preferably withdrawn from supply spools supported in proper position on the brackets 41 and 42.

Four spools of wire are provided, two of which are supported above the horizontal work table 43 and the other two of which are supported below said table so that wire lengths withdrawn from the spools may be respectively passed across the top and bottom of the bundle near the ends thereof. Upstanding arms 54 and 55 are respectively provided on the brackets 41 and 42 and spindles 56 and 57 are respectively mounted in these arms. Spools of wire 58 and 59 are rotatably mounted on these spindles above the work table 43. A spindle 60 is mounted in the bracket 41 below the work table 43 and substantially in vertical alignment with the spindle 56 and a spool of wire 61 is rotatably mounted on this spindle below the table 43. Another spindle 62 is mounted in the bracket 42 in horizontal alignment with the spindle 60 and substantially in vertical alignment with the spindle 57 and a spool of wire 63 is mounted on this spindle 62 below the table 43.

A length of wire 64 is withdrawn from the spool 58 and is directed to a grooved guide pulley 65 (Fig. 9) rotatably mounted in the bracket 41 above the work table 43. A length of wire 66 is withdrawn from the spool 61 and is directed about a grooved guide pulley 67 mounted in the bracket 41 in vertical alignment with the guide pulley 65 and below the table 43. A length of wire 68 is withdrawn from the spool 59 and is directed about a grooved guide pulley arranged in horizontal alignment with the guide pulley 65 and a length of wire 69 is withdrawn from the spool 63 and is directed about a grooved guide pulley horizontally aligned with the guide pulley 67. At the start of the operation of the machine the ends of the wire lengths 64 and 66 are twisted together and the wire lengths are disposed in a position substantially like that illustrated in broken lines in Fig. 9 and the wire lengths 68 and 69 are similarly arranged.

The intertwined ends of the wire lengths and the positioning thereof as described so locates the wire lengths that when the bundle B is slid forwardly from its initial position with the transfer carriage C the leading edge of the bundle engages the wire lengths, which are disposed near the ends of the bundles and continued movement of the transfer carriage withdraws wire from the spools so that when the bundle attains the position B' lengths of wire extend across the top and bottom of the bundle near the ends thereof. A stop 70 is mounted on the underside of the work table 43 and is engaged by the lug 48 to interrupt movement of the transfer carriage over the work table to limit movement of the transfer carriage and insure positioning of the bundle in the position B'. After the bundle

is in the position B', the transfer carriage C is retracted to its initial position.

When the ends of the wire lengths are arranged as shown in broken lines in Fig. 9 they are disposed at one side of the severing, securing and positioning jaws of the machine but when the bundle attains the position B' the bundle will have passed through the separated severing, securing and positioning jaws and the wire lengths will be drawn past these separated jaws. Two severing, securing and positioning jaws are provided in the machine, each of which is adapted to cooperate with the binding means at an end of the bundle. These jaws are respectively supported on shafts 71 and 72. The shaft 71 is journaled in a bearing 73 on the bracket 41 and in a bearing 74 carried by the plate 15. The shaft 72 is journaled in a bearing 75 on the bracket 42 and in a bearing 76 carried by the plate 15. The bearings 74 and 76 are preferably arranged in transverse alignment with the bearing 16, as best illustrated in Fig. 1.

The jaws are identical in construction except that they face toward each other, that is, the separated parts thereof face each other when the jaws are in open position. The jaws separate along parting lines that are disposed substantially horizontally when the jaws are closed. In each of the jaws there is a gear divided into equal halves and when the jaws are separated one gear half is located in the upper part of each jaw and the other gear half is located in the lower part of each jaw. When, however, the jaws are closed the gear halves are united to provide a continuous gear and parts of the jaw unite to provide gibs on which the gears are supported for rotation.

The upper half of each jaw includes an arm 77 having a recess 78 in one face thereof. The upper half of the gear in each jaw is mounted in this recess and has a groove 80 in one face thereof in which a rib 81 in the recess 78 is fitted. A plate 82 is fast to each arm 77 and respectively closes the recesses 78 to enclose the gear half in the recess. Each plate has a rib 83 thereon that extends into a groove 84 in the face of each gear half and located opposite the groove 80 therein. A hardened member 85 is mounted on the inner periphery of each gear half 79 and includes a diametrically extending edge in which there are grooves 86 and 87. A severing jaw 88 is located between the grooves and clamping ribs 86' and 87' are provided at the outer edges of the grooves. As best illustrated in Fig. 6, the arm 77 of one of the jaws is pivotally mounted on the shaft 71 and, as best illustrated in Fig. 7, the arm 77 of the other of the jaws is pivotally mounted on the shaft 72. Each of the arms 77 includes a lug 77' formed as a continuation thereof which extends from the shaft opposite the extent of the respective arms.

The lower half of each of the jaws includes an arm 89. One arm 89 is pivotally mounted on the shaft 71 and the other arm 89 is pivotally mounted on the shaft 72, as illustrated in Figs. 6 and 7. Each arm 89 has a recess 90 in one face thereof in which a gear half 91 (Fig. 11) is mounted. Each gear half 91 has a groove 92 therein in which a rib 93 in the respective recesses 90 is mounted. A plate 94 is secured to one face of each arm to close the recess 90 therein and enclose the gear half 91. Each plate 94 has a rib 96 thereon which extends into a groove 97 in the gear half 91 opposite the groove 92. A hardened member 98 is mounted on the inner

periphery of each gear half 91 and has a diametrical edge in which grooves 99 and 100 are provided. A severing jaw 101, adapted for cooperation with the severing jaw 88, is located between the grooves 99 and 100 and clamping ribs 99' and 100' are provided at the outer edge of the grooves 99 and 100.

When the jaws are closed the ribs 81 and 96 unite to provide a gib as do the ribs 83 and 93. Further, the diametrical edges of the hardened members 85 and 98 interengage, the severing jaw 101 passing into the groove 87 and the severing jaw 88 passing into the groove 99. The clamping rib 99' passes into the groove 86 and the clamping rib 87' passes into the groove 100 when these edges engage. Thus the gears are united when the jaws are closed and are rotatably supported on continuous gibs.

The jaws are closed and opened automatically in each cycle of operation of the machine, the jaws normally being in open position, as illustrated in Fig. 8. The opening and closing of the jaws is controlled by a peripheral cam 112 fast on the cam shaft 25 adjacent the bearing 26. An arm 114 fast on the rock shaft 104 carries a roller 113 that rides on the peripheral cam 112. The rock shaft 104 is journaled in bearings 102 and 103 depending from the plate 15. Arms 105 and 106 are fast on the rock shaft 104 adjacent the bearings 102 and 103 and, as best illustrated in Fig. 5, these arms are bifurcated at their free ends to receive a pin 107. A link 108 is connected to the pin 107 in the bifurcation in the arm 106 and a link 109 is connected to the pin 107 in the bifurcation in the arm 105. A toggle is provided at the upper end of the links 108 and 109 and these toggles comprise links 110 and 111. The links 110 are pivotally connected to the free ends of the lugs 77' and the links 111 are respectively connected to the arms 89. Springs 128 act on the arms 105 and 106 to urge the bifurcated ends of these arms downwardly and to maintain the roller 113 in engagement with the cam 112 and the springs 128 therefore act through the links 108 and 109 and the respective links 110 and 111 to normally hold the jaws in the open position illustrated in Fig. 8. When, however, a rise on the cam 112 engages the roller 113 the bifurcated ends of the arms 105 and 106 are pivoted upwardly against the action of the springs 128 and the links 108 and 109 are moved upwardly and straighten the toggles provided by the links 110 and 111. Upward movement imparted to the links 111 urges the arms 89 of the lower halves of the jaws upwardly and upward movement of the links 110 acts through the lugs 77' to urge the arms 77 of the upper halves of the jaws downwardly and thus upward movement of the links 108 and 109 closes the jaws.

The driving part 112' of an auxiliary clutch (Fig. 12) is keyed to the shaft 18 adjacent the pinion 23 and the driven part 113' of this clutch is rotatably mounted on the shaft 18 intermediate the driving part 112' and the bearing 16. A gear 114' is keyed to a hub of the driven part 113'. The gear 114' meshes with gears 124 and 125 respectively fast to the shafts 71 and 72. A pinion 126 is fast to the shaft 71 adjacent the arm 77 thereon and this pinion 126 meshes with the gear formed by the gear halves when the jaw on the shaft 71 is closed. A pinion 127 fast on the shaft 72 adjacent the arm 77 on this shaft meshes with the gear provided by the gear halves on the jaw on the shaft 72 when the jaw on this shaft is closed.

When the auxiliary clutch is engaged the gear 114' rotates with the shaft 18 and this movement is imparted through the gears 124 and 125 to the shafts 71 and 72 and thence through the pinions 126 and 127 to the gears in the jaws.

The auxiliary clutch is controlled by a peripheral cam 123 fast on the cam shaft 25 intermediate the cam 112 and the gear 24. The auxiliary clutch includes a control dog 115 (Fig. 4) regulated by the arm 116 of a rocker 117 pivotally mounted on the shaft 118 carried by the bracket 118' (Fig. 1) fast to the bearing 16. A spring 119 acts on the rocker 117 to urge the arm 116 into dog engaging position illustrated in Fig. 4. An arm 121 is pivotally supported in the frame 14 and carries a roller 122 that travels on the cam 123. A link 120 interconnects the arms 116 and 121 and when the roller 122 engages a rise on the cam 123 the arm 121 is pivoted downwardly and the link 120 withdraws the arm 116 from dog engaging position whereupon the driving and driven parts 112' and 113' of the auxiliary clutch are engaged and the gear 114' is set in operation.

At the start of an operation of the machine the severing, securing and positioning jaws are in open position and the transfer carriage C is in initial position at the forward end of the work table 43 and the wire lengths leading from the supply spools are positioned as shown in broken lines in Fig. 9. The operator of the machine then arranges a bundle of expanded metal in the transfer carriage C and then moves the carriage over the work table and the leading edge of the bundle engages the wire lengths and continued movement of the bundle toward the position B' draws the wire lengths over the top and bottom of the bundle and through the separated jaws, and when the lug 48 engages the stop 70 the bundle is arranged in the position B', as shown in Fig. 9.

The operator then depresses the forward end of the treadle 35 engaging the main clutch whereupon the shaft 18 is set in operation. The cam 30' holds the arm 29 out of dog engaging position and the cam shaft 25 rotates with the shaft 18. Preferably the ratio between the shaft 18 and the cam shaft 25 is four to one so that the cam shaft 25 will make one revolution while the shaft 18 is making four revolutions. During the first one-eighth of a revolution of the cam shaft 25 the rise on the cam 112 engages the roller 113 whereupon the links 108 and 109 are moved upwardly and at the completion of one-eighth of a revolution of the cam shaft 25 the severing, securing and positioning jaws are closed. At the end of this one-eighth of a revolution of the cam shaft 25 the rise on the cam 123 will have engaged the roller 122 so that at this time the arm 116 will have been retracted from dog engaging position and the auxiliary clutch will at this time be engaged, setting the shafts 71 and 72 in operation. The shafts 71 and 72 continue to rotate until the cam shaft 25 has completed seven-eighths of its revolution whereupon the roller 122 will have engaged a drop in the cam 123, and the spring 119 will have positioned the arm 116 in dog engaging position to disengage the driven and driving parts of the auxiliary clutch to interrupt further rotation of the shafts 71 and 72 at this time. During the remaining one-eighth of a revolution of the cam shaft 25, the roller 113 will move onto a drop in the cam 112 and the springs 128 will therefore move the links 108 and 109 downwardly, which movement will be transmitted through the links 110 and 111 to

open the jaws. During this same period the roller 31' will move onto a drop in the cam 30' and a spring 38 will move the forward end of the foot treadle 35 upwardly to reposition the arm 29 in dog engaging position so that as the main drive shaft 18 completes its fourth revolution and the cam shaft 25 finishes its single revolution the main clutch will be disengaged and operation of the machine interrupted. Thus it will be seen that the main drive shaft 18 makes four revolutions, the cam shaft 25 makes one revolution, and since the auxiliary clutch remains closed for three-fourths of a revolution of the cam shaft 25 the shafts 71 and 72 will make three revolutions during each cycle of operation of the machine.

The free edges of the severing jaws 88 and 101 are the first parts to move into cooperating relation when the jaw halves are moved toward each other and these severing jaws cut the wire lengths. Immediately following the cutting of the wire lengths the clamping ribs 99' move into the grooves 86 and the clamping ribs 87' move into the grooves 100. Thus the marginal ends of the wire lengths on each side of the cut are clamped in the grooves by the clamping ribs when the jaws are completely closed, as illustrated in Fig. 10. Therefore, the ends of the wire lengths are held in the hardened members 85 and 98 and as these members are carried by the gear parts which at this time will be united into continuous gears and as these continuous gears mesh with the pinions 126 and 127 and as these pinions 126 and 127 will rotate with the shafts 71 and 72 and as the ratio between the gears provided by the united gear parts and the pinions 126 and 127 is one to one the united gear parts will rotate three times which will effectively twist the wire ends on each side of the jaws. The wire ends extending from the bundle in the position B' will be drawn tightly about the bundle by this twisting so that the strips in the bundle are firmly bound together. The wire lengths on the other sides of the jaws are intertwisted together and are positioned to be engageable by the next bundle moved with the transfer carriage from the forward end of the work table into the position B' and after the next or subsequent bundle has been moved into the position B' the forward end of the foot treadle 35 is again depressed and the foregoing operations are repeated.

It is manifest from the foregoing description that my novel machine may be employed for binding a bundle of substantially flat strips, such as strips of expanded metal, which are arranged in side by side relation as by being stacked one upon the other. The machine as constructed passes binding means about the bundle near the ends thereof and when wires are used as the binding means the machine intertwists the ends of the wires so as to tightly bind the strips in the bundle together. If binding means other than wire is used as, for example, when cord or the like should be employed, the divided gears described may be used to drive a motor or similar device for securing the ends of the binding means. In the machine the binding means is supported so that when the bundle is moved into engagement therewith and relative thereto the binding means is withdrawn from supplies thereof in the machine and passed about the bundle. Furthermore, the machine supports the binding means for engagement with the bundle and severs the binding means from supplies thereof and retains the severed means with bundles successively passed into the machine.

The machine possesses many other advantages and while I have described a preferred embodiment thereof it is to be understood that the machine is capable of variation and modification and I therefore do not wish to be limited to the precise details set forth but desire to avail myself of such changes and alterations as fall within the purview of the following claims.

I claim:

1. In a bundling machine which has means supporting binding means for engagement with one side of a bundle to be bound and means for moving a bundle into engagement with the supported binding means and relative thereto to pass the binding means over sides of the bundle extending angularly to the side first engaged with the supported binding means, the combination of means for securing the binding means in binding position on said bundle and including pivotally mounted severing and clamping means movable toward each other to draw the binding means over the side of the bundle opposite the side first engaged with the binding means, and means for operating said severing and clamping means to secure the binding means on the bundle after said severing and clamping means have drawn the binding means over said side of the bundle.

2. In a bundling machine which has means supporting binding means for engagement with one side of a bundle near opposite ends thereof and means for moving a bundle into engagement with the supported binding means and relative thereto to pass the binding means over sides of the bundle extending angularly to the side first engaged with the supported binding means, the combination of, independent pivotally mounted devices for securing the binding means in binding position at opposite ends of the bundle, each of said devices including severing and clamping means movable toward each other to draw the binding means over the side of the bundle opposite the side first engaged with the binding means, and common means for operating said devices to operate said severing and clamping means and thereby secure the binding means on the bundle after the severing and clamping means have drawn the binding means over said side of the bundle.

3. In a bundling machine which has means supporting binding means for engagement with a bundle to be bound and means for moving a bundle into engagement with and relative to the binding means to pass the binding means about the bundle, the combination of a single means including separable and pivotally mounted parts positioned in alignment and adapted for cooperation to sever the binding means from a supply thereof in the machine and for then clamping and then securing the severed binding means in binding position on a bundle, said separable parts being operable to sever the binding means prior to the clamping and securing thereof, and means for operating said severing, clamping and securing means to sever and clamp the binding means and secure it on the bundle after passage of the binding means about the bundle and at a point intermediate the sides of the bundle at the end of the bundle.

4. In a bundling machine which has means supporting binding means for engagement with a bundle to be bound and means for moving a bundle to be bound into engagement with and relative to the binding means to pass the binding means about the bundle, the combination of a

single pair of separable and pivotally mounted means for severing the binding means from a supply thereof in the machine and clamping and then securing the severed binding means in binding position on a bundle and closable to sever the binding means prior to the clamping and securing thereof, and means for closing and operating said severing, clamping and securing means to sever and clamp the binding means and secure it on the bundle after passage of the binding means about the bundle.

5. In a bundle machine which has means supporting binding means for engagement with a bundle near opposite ends thereof and means for moving a bundle into engagement with the binding means and relative thereto to pass the binding means about the bundle, the combination of a means consisting only of pivotally mounted and normally separated jaws adapted for cooperation with binding means at opposite ends of a bundle, said jaws including cooperating parts for first severing and then clamping the binding means, means for pivoting the separated jaws into engagement with each other to first sever and then to clamp the binding means, and means for operating said jaws after clamping of the binding means to secure the binding means on the bundle.

6. In a bundling machine which has means supporting binding means for engagement with a bundle and means for moving a bundle into engagement with the binding means and relative thereto to pass the binding means about the bundle, the combination of means consisting of pivotally mounted and normally separated jaws adapted for cooperation with the binding means to first sever and then clamp and then secure the binding means in binding position on a bundle, means for pivoting said jaws into engagement with each other to sever and then clamp the binding means, and means for operating said jaws after severing and clamping of the binding means to secure said binding means on the bundle.

7. In a bundling machine which has means supporting binding means for engagement with a bundle and means for moving a bundle into engagement with the binding means and relative thereto to pass the binding means about the bundle, the combination of pivotally mounted jaws normally arranged in open position and between which said binding means is drawn in the movement of said bundle, said jaws including means for severing said binding means, and means for closing and operating said jaws to first sever said binding means from the supply thereof in the machine and then to cause said jaws to secure said binding means on said bundle.

8. In a bundling machine which has means supporting binding means for engagement with a bundle and means for moving a bundle into engagement with the binding means and relative thereto to pass the binding means about the bundle, the combination of pivotally mounted jaws normally arranged in open position and between which said binding means is drawn in the movement of said bundle, means in said jaws for severing said binding means, means in said jaws for securing said binding means on said bundle, and means for closing and operating said jaws to sever said binding means and cause the said jaws to secure said binding means on said bundle after the severing thereof, said last named means positioning said binding means for engagement

with a bundle subsequently moved into engagement therewith and relative thereto.

9. In a bundling machine which has means supporting binding wires for engagement with a bundle, a work table, means for moving a bundle over said work table into engagement with and relative to the binding wires to pass said binding wires over opposite sides of the bundle, and means including pivotally mounted parts movable toward each other and having means thereon for first severing the binding wires from supplies thereof in the machine and other means thereon for then clamping the severed wires, and means for thereafter operating the severing and clamping means to intertwist the severed end portions of the binding wires to secure said wires on said bundle.

10. In a bundling machine which has means supporting binding wires for engagement with a bundle, a work table, and means for moving a bundle over said work table into engagement with and relative to the binding wires to pass the binding wires about the bundle, the combination of pivotally mounted means for severing, clamping and intertwisting the binding wires, and means for operating the severing, clamping and intertwisting means to sever, clamp and then intertwist the binding wires on opposite sides of the severance thereof and at a point intermediate the sides of the bundle at the end of the bundle to secure said wires on the bundle and to position said wires for engagement with another bundle subsequently moved across said work table.

11. In a bundling machine which has means supporting binding wires for engagement with a bundle, a work table and means for moving a bundle over said work table into engagement with and relative to the binding wires to pass said binding wires about the bundle, the combination of normally open pivotally mounted jaws through which the binding wires are passed when said bundle is moved into engagement with and relative to said binding wires, means in said jaws for severing said binding wires from supplies thereof in the machine, means in said jaws for intertwisting the ends of said wires on opposite sides of said jaws, means for closing said jaws to sever said wires, and means for operating the means in said jaws to intertwist the severed ends of said wires.

12. In a bundling machine which has means supporting binding wires for engagement with a bundle, a work table and means for moving a bundle over said work table into engagement with and relative to the binding wires to pass said binding wires about the bundle, the combination of normally separated jaws between which parts of the binding wires are passed when said bundle is moved into engagement with and relative to said binding wires, said jaws including separable and rotatable members, severing means on the separable members, clamping means on the separable members, means for joining the separable members to sever said wires and clamp said wires, and means for rotating said members to intertwist the parts of said wires adjacent the parts thereof clamped in the clamping means.

13. In a bundling machine, operating means, a driven member, a cam shaft, means connecting said cam shaft to said driven member, clutch means connecting said driven member to said operating means, a cam on said cam shaft for effecting disengagement of said clutch after a cycle of operation of said machine, means supporting binding wires for passage about a bundle

moved into engagement therewith and relative thereto, normally open jaws for severing and clamping said binding wires, means in said jaws for intertwisting the ends of said clamped wires, driving means for driving the intertwisting means from said driven member, a second clutch for connecting said driving means to said driven member, a second cam on said cam shaft for engaging and disengaging the second clutch, and a third cam on said cam shaft for closing and opening said jaws.

14. In a bundling machine, operating means, a driven shaft, a cam shaft, means connecting said cam shaft to said driven shaft, clutch means for connecting said driven shaft to said operating means, manually operable means for controlling said clutch, a cam on said cam shaft for effecting disengagement of said clutch after a cycle of operations of said machine, means supporting binding wires for passage about a bundle moved into engagement therewith and relative thereto, normally open jaws for severing and clamping said binding wires, means in said jaws for intertwisting the ends of said clamped wires, driving means for driving the intertwisting means from said driven shaft, a second clutch for connecting said driving means to said driven shaft, a second cam on said cam shaft, a third cam on said cam shaft, means operable by the third cam for closing and opening said jaws during a cycle of operation of the machine, and means operable by the second cam for engaging and disengaging the second clutch during the time said jaws are closed whereby said driving means are operated only when said jaws are closed.

15. In a bundling machine, operating means, a driven shaft, a cam shaft, means connecting the cam shaft to the driven shaft and adapted to impart a single revolution to the cam shaft during a plurality of revolutions of the driven shaft in each cycle of operation of the machine, clutch means for connecting the driven shaft to the operating means, manually operable means for controlling the clutch, a cam on said cam shaft for effecting disengagement of the clutch after a single rotation of the cam shaft, means for supporting binding wires for passage about a bundle moved into engagement therewith and relative thereto, normally open jaws for severing and clamping said binding wires, means in said jaws for intertwisting the ends of said clamped wires, driving means for driving the intertwisting means from said driven shaft, a second clutch for connecting said driving means to said driven shaft, a second cam on said cam shaft, a third cam on said cam shaft, means operable by the third cam for closing said jaws during the first part of the rotation of said cam shaft and for opening said jaws during the last part of the rotation of said cam shaft, and means operable by the second cam for engaging and disengaging the second clutch during the time said jaws are closed whereby said driving means are operated only during a part of the rotation of said cam shaft.

16. In a bundling machine, a rotatable shaft, an arm pivotally mounted on said rotatable shaft and having a recess therein having a gear half mounted therein, a second arm pivotally mounted on said shaft and having a recess therein having a gear half mounted therein, links respectively connected to said arms, means for moving said links to move said arms toward each other to unite said gear halves, and a gear on said shaft meshed with said gear halves when they are

united and adapted to transmit rotation of said rotatable shaft to said united gear halves.

17. In a bundling machine, a rotatable shaft, an arm pivotally mounted on said rotatable shaft and having a recess therein having a gear half mounted therein, a second arm pivotally mounted on said shaft and having a recess therein having a gear half mounted therein, severing and clamping means on the engageable edges of said gear halves, links connected to said arms, means for moving said links to move said arms toward each other to unite said gear halves and operate said severing and clamping means, and a gear on said shaft meshed with said gear halves when they are united and adapted to transmit rotation of said rotatable shaft to said united gear halves to intertwist the ends of members clamped in said clamping means.

18. In a bundling machine, a rotatable shaft, an arm pivotally mounted on said rotatable shaft and having a recess therein having a gear half mounted therein, a second arm pivotally mounted on said shaft and having a recess therein having a gear half mounted therein, clamping means on the engageable edges of said gear halves, links connected to said arms, and means for moving said links to move said arms toward each other to unite said gear halves and operate said clamping means, and a gear on said shaft meshed with said gear halves when they are united and adapted to transmit rotation of said rotatable shaft to said united gear halves to intertwist the ends of members clamped in said clamping means.

19. In a machine of the character described, the combination of, means for supporting a pair of flexible tying elements having free end portions, adapted to be tied together, in the path of travel of a bundle to be tied thereby so that the leading side of the said bundle will engage the said tied free end portions of the said flexible tying elements, means for cutting the flexible tying elements at the trailing side of said bundle, and means for twisting the cut end portions of said flexible tying elements together so as to complete the tying of said flexible tying elements about the bundle and leave the free end portions thereof tied together in the path of another bundle subsequently moved into engagement therewith, said twisting means including a pair of coaxing pivotally and rotatably mounted clamping jaws, means for pivotally moving said clamping jaws together so as to clamp the cut end portions of the flexible tying elements therebetween, and means for imparting a turning or rotative movement to said clamping jaws, after the same have been pivotally moved into clamping relationship with each other, so as to twist the cut end portions of the flexible tying elements clamped therebetween.

20. In a machine of the character described, and in which a pair of flexible tying elements having end portions tied together are supported in the path of travel of a bundle to be tied thereby so that the leading side of the bundle engages the tied end portions of said flexible tying elements, the combination of, means for cutting

the flexible tying elements at the trailing side of the bundle, and means for twisting the cut end portions of said flexible tying elements together so as to complete the tying of the flexible elements about the bundle and leave the free end portions thereof tied together in the path of another bundle subsequently moved into engagement therewith, said twisting means including a pair of pivotally and rotatably mounted clamping jaws, means for pivotally moving said clamping jaws together so as to clamp the cut end portions of the flexible tying elements therebetween, and means for imparting a turning or rotative movement to said clamping jaws, after the same have been pivoted into clamping relationship with each other, so as to twist the cut end portions of the said flexible tying elements clamped therebetween.

21. In a wire tying machine, the combination of a pair of normally spaced complementary gear segments each having a wire-severing element and a wire-clamping element mounted thereon, means for moving the gear segments together so as to move the wire-severing elements and the wire-clamping elements carried thereby into co-operable relationship with each other, in the order named, and means for imparting a rotary movement to the said gear segments when the wire-clamping elements are disposed in co-operable relationship with each other.

22. In a wire tying machine, the combination of a pair of normally spaced complementary gear segments each having a wire-severing element and a wire-clamping element mounted thereon, means for moving the gear segments together so as to move the said wire-severing elements and the said wire-clamping elements carried thereby into co-operable relationship with each other, and means for imparting a rotary movement to the gear segments when the wire-clamping elements are disposed in co-operable relationship with each other.

23. In a wire tying machine, the combination of a pair of normally spaced complementary jaws each having a wire-severing element and a wire-clamping element mounted thereon, means for moving the jaws together so as to move the wire-severing elements and the wire-clamping elements carried thereby into co-operable relationship with each other, in the order named, and means for imparting a rotary movement to the said jaws when the wire-clamping elements are disposed in co-operable relationship with each other.

24. In a wire tying machine, the combination of a pair of normally spaced complementary jaws each having a wire-severing element and a wire-clamping element mounted thereon, means for moving the jaws together so as to move the wire-severing elements and the wire-clamping elements carried thereby into co-operable relationship with each other, and means for imparting a rotary movement to the jaws when the wire-clamping elements are disposed in co-operable relationship with each other.

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