

Nov. 2, 1937.

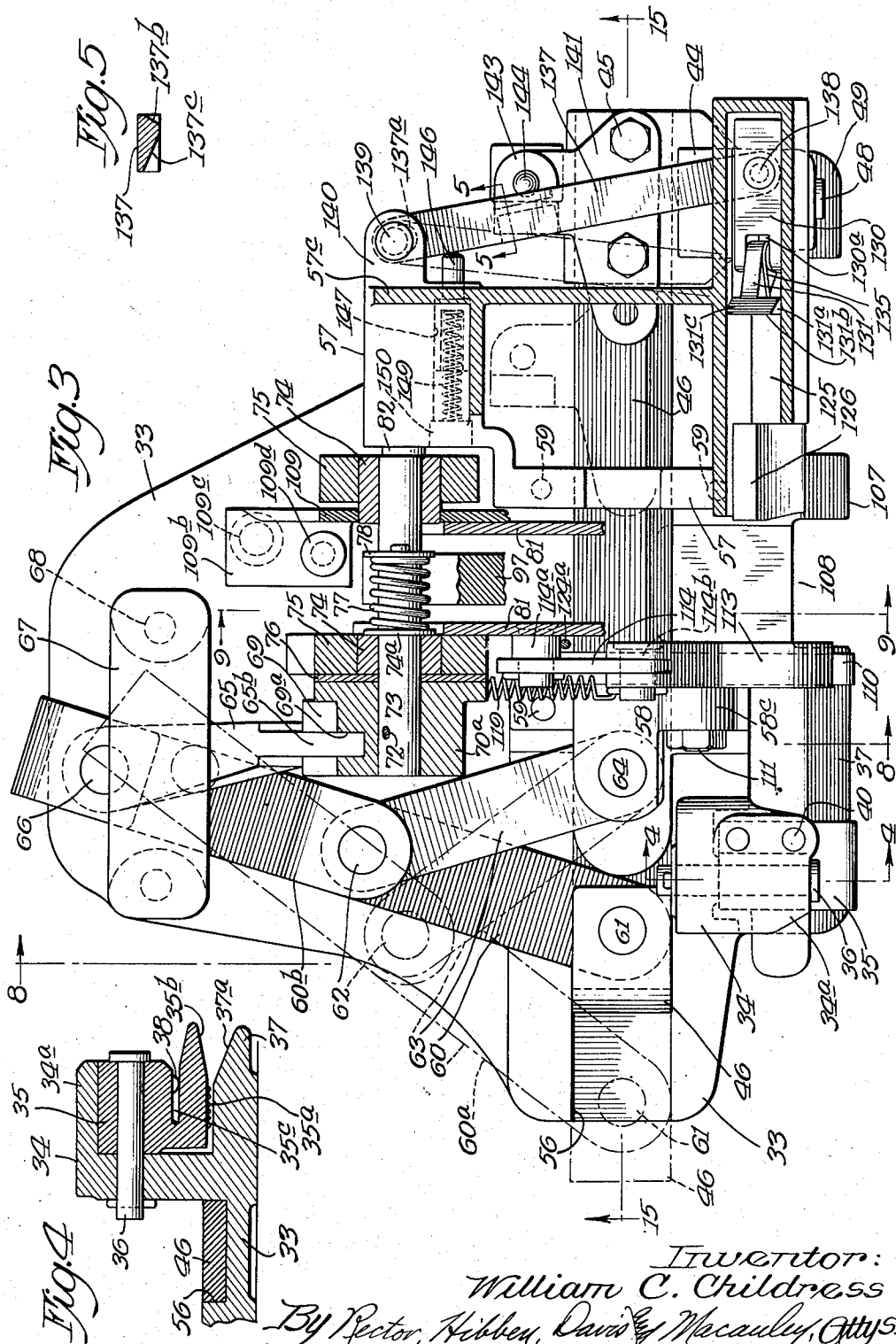
W. C. CHILDRESS

2,097,946

STRAP SEALING APPARATUS

Filed June 13, 1934

5 Sheets-Sheet 2



Nov. 2, 1937.

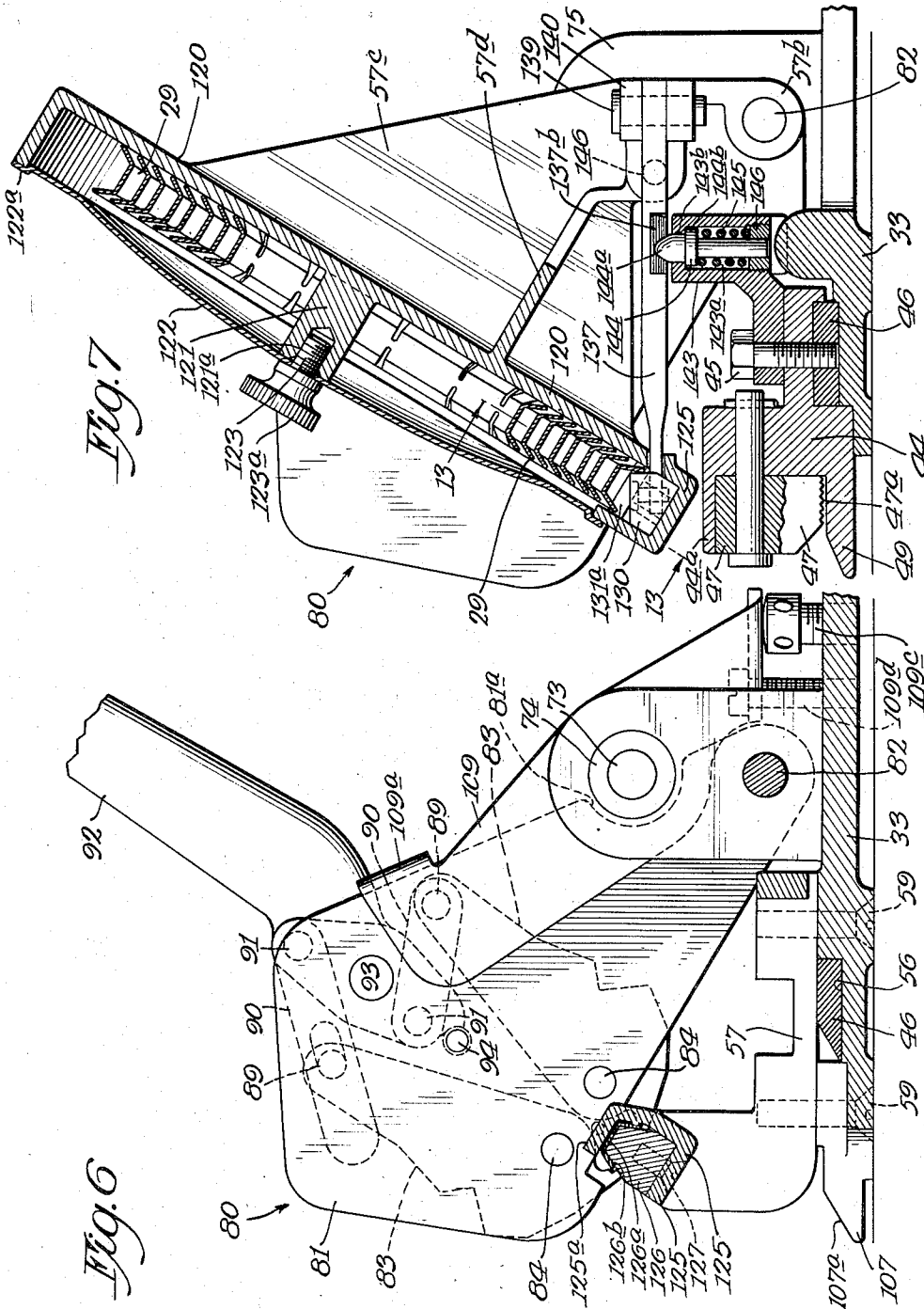
W. C. CHILDRESS

2,097,946

STRAP SEALING APPARATUS

Filed June 13, 1934

5 Sheets-Sheet 3



Inventor:
William C. Childress
By Rector, Hibben, Davis & Macauley, Attys

Nov. 2, 1937.

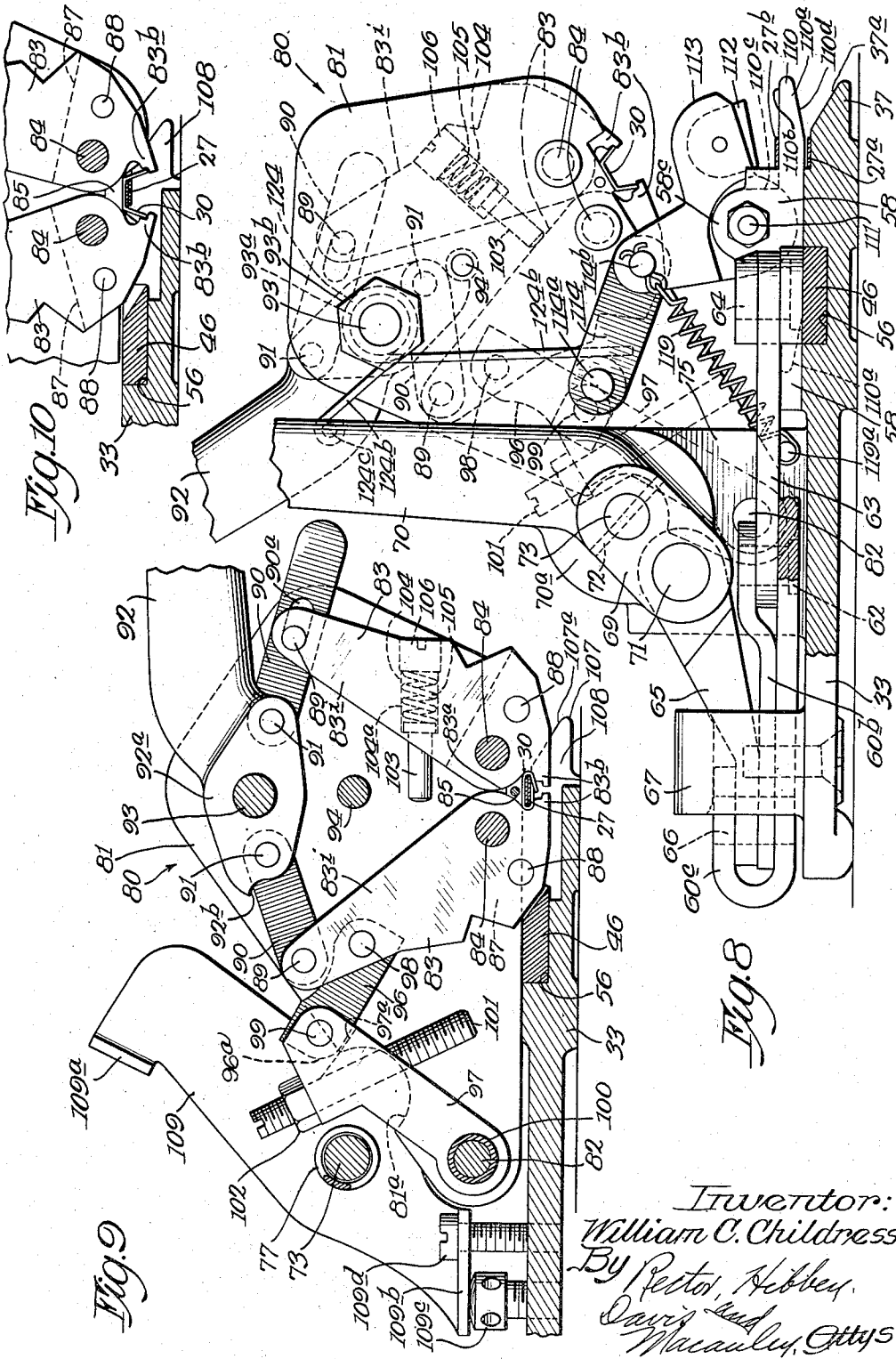
W. C. CHILDRESS

2,097,946

STRAP SEALING APPARATUS

Filed June 13, 1934

5 Sheets-Sheet 4



Nov. 2, 1937.

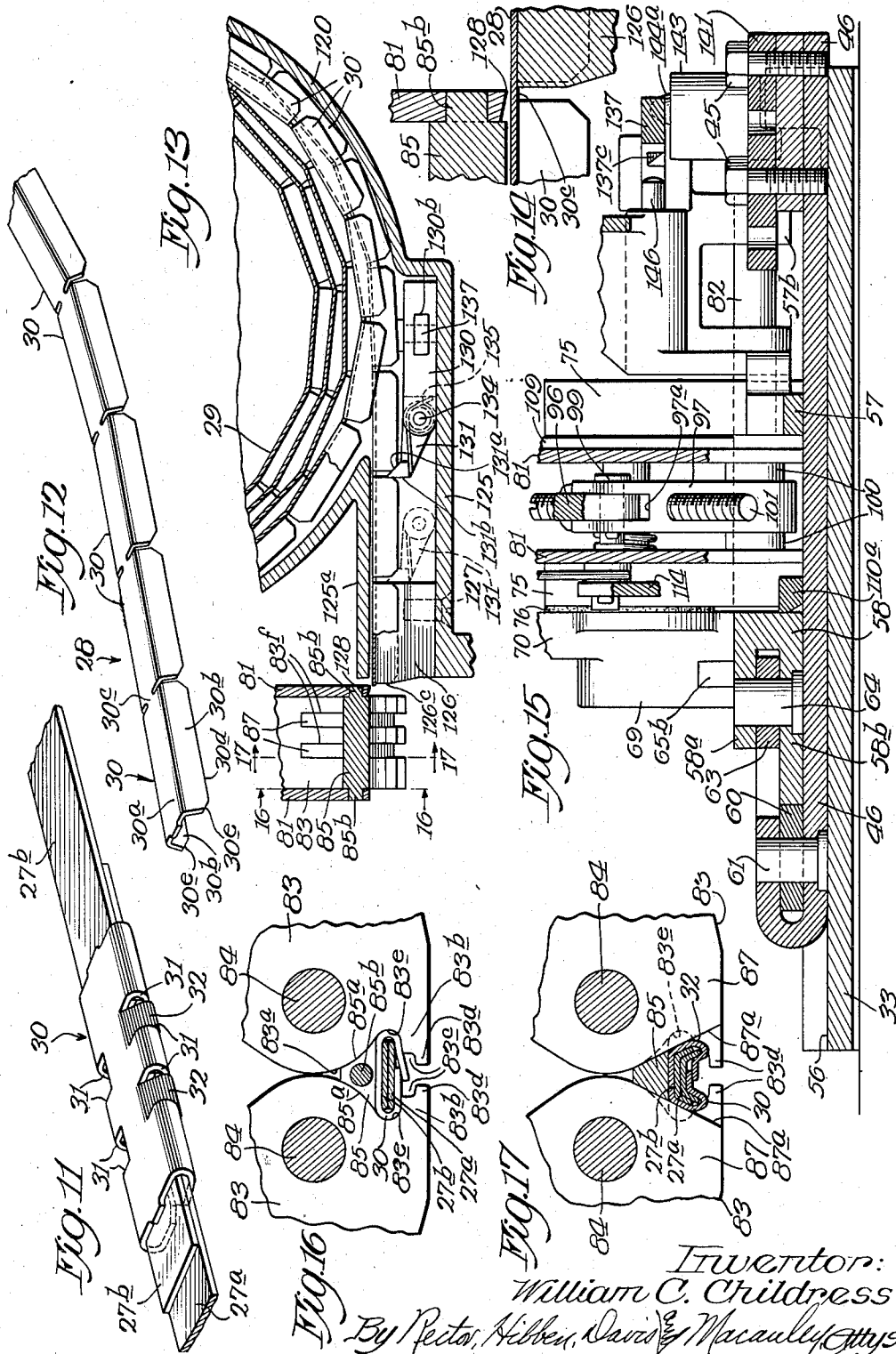
W. C. CHILDRESS

2,097,946

STRAP SEALING APPARATUS

Filed June 13, 1934

5 Sheets-Sheet 5



UNITED STATES PATENT OFFICE

2,097,946

STRAP SEALING APPARATUS

William C. Childress, Oak Park, Ill., assignor to
Acme Steel Company, Chicago, Ill., a corporation
of Illinois

Application June 13, 1934, Serial No. 730,471

21 Claims. (Cl. 81—9.1)

This invention relates to improvements in strap sealing apparatus and its purpose is to provide improved means for applying a seal to the overlapping ends of a metal strap or other binder and then deforming the strap and seal to provide an interlocking joint. Metal straps are commonly employed for binding and reenforcing boxes and packages and for binding together a plurality of boxes or packages to form larger load units for shipment and it has been the practice heretofore to apply channel-shaped metal seals to the overlapping ends of a strap after it has been drawn taut around the box or package, or group of packages, and then to bend the seal about the strap ends and deform the strap and seal, thus forming a joint adapted to prevent relative endwise movement of the overlapping portions of the strap. In the co-pending application of Ralph H. Norton Serial No. 727,455, filed May 25, 1934, there is described and claimed a form of sealing apparatus in which means are provided for drawing a strap taut around a box or package in combination with means actuated by the strap stretching mechanism for feeding channel-shaped seals from a magazine to a sealing device comprising relatively movable jaws between which a channel-shaped seal is positioned preliminary to being applied to the overlapping strap ends, after which the relatively movable jaws are operated to deform the strap and seal with the resulting formation of an interlocking joint.

The principal object of the present invention is to provide an improvement upon the said sealing apparatus of Ralph H. Norton, wherein the seals to be applied to the overlapping strap ends are supplied in the form of a continuous strip, portions of which are adapted to be fed progressively to a position between the jaws of a sealing device, whereupon the portion positioned between the jaws is severed from the remainder of the strip and the jaws are then operated to apply the severed seal to the overlapping strap ends. A further object of the invention is to provide an improved form of sealing apparatus in which the sealing blanks are supplied in the form of a coil adapted to be gradually unwound to position successive portions of the coil in a sealing device. Still another object of the invention is to provide an improved sealing blank comprising a series of channel-shaped seals joined together endwise and capable of being wound in the form of a spiral coil. Another object of the invention is to provide sealing apparatus having a seal storage magazine adapted to contain a spiral coil of seals

united with each other and adapted to be fed progressively to a position between the jaws of a sealing device capable of relative movement with respect to the magazine for positioning a seal over overlapping strap ends and adapted by such movement to sever a seal from the coil. Still another object of the invention is to provide sealing apparatus comprising means for drawing a strap taut around a box or package in combination with means actuated by the strap drawing means for feeding seals successively from a magazine in which they are stored in spiral fashion. Other objects relate to various features of construction and arrangement which will appear more fully hereinafter.

The nature of the invention will be understood from the following specification taken with the accompanying drawings, in which one embodiment is illustrated. In the drawings,

Fig. 1 shows a side elevation of a box or package with the improved sealing apparatus of the present invention in position thereon for applying a seal to the overlapping ends of a strap;

Fig. 2 shows an enlarged front elevation of the sealing apparatus illustrated in Fig. 1;

Fig. 3 shows a horizontal section taken on the line 3—3 of Fig. 2;

Fig. 4 shows a detail vertical section on the line 4—4 of Fig. 3;

Fig. 5 shows a detail section on the line 5—5 of Fig. 3;

Fig. 6 shows a vertical section on the line 6—6 of Fig. 2;

Fig. 7 shows a vertical section on the line 7—7 of Fig. 2;

Fig. 8 shows a vertical section on the line 8—8 of Fig. 3, illustrating the movable head of the sealing apparatus in the elevated position which it occupies when a seal is positioned between the jaws which form the sealing device;

Fig. 9 shows a vertical section taken on the line 9—9 of Fig. 3, illustrating the relative positions of the parts when the movable head of the sealing apparatus has been lowered and the relatively movable jaws have been actuated to bend the side walls of a channel-shaped seal about the overlapping ends of a strap;

Fig. 10 is a partial sectional view similar to that of Fig. 9, showing the relative positions of the parts before the jaws have been actuated to bend the side walls of the seal about the strap ends;

Fig. 11 is a perspective view of the completed joint which is formed by shearing and bending

the lateral edges of a seal and the strap ends enclosed therein;

Fig. 12 is a perspective view of a portion of a sealing strap comprising a plurality of channel-shaped seals having their back walls joined together at their ends to permit the coiling of the strip;

Fig. 13 shows a sectional view taken on the line 13—13 of Fig. 7, illustrating the means for feeding the seals from the magazine;

Fig. 14 shows an enlargement of a portion of the section illustrated in Fig. 13, illustrating the means for cutting off a seal from the supply strip after the seal has been positioned between the jaws of the movable head;

Fig. 15 shows a sectional view taken on the line 15—15 of Fig. 3;

Fig. 16 shows an enlarged vertical section through the movable head taken on the line 16—16 of Fig. 13, illustrating the relative positions of the parts when the side walls of the seal have been bent about the overlapping strap ends; and

Fig. 17 is an enlarged section taken on the line 17—17 of Fig. 13, showing the transversely deflected portions which are formed by the action of the jaws in shearing the lateral edges of the strap and seal and deflecting intermediate parts of the metal.

As illustrated in Fig. 1, the improved strap sealing apparatus 25, embodying the features of the present invention, is illustrated in position on the top of a box 26 which has applied thereto a pair of steel binding straps 27 arranged to surround the box and having their overlapping ends united by the use of the apparatus 25, shown in operative position with respect to one of the straps. The ends of each strap 27 are adapted to be engaged by gripping devices embodied in the tool 25 which is operated to draw the strap taut around the box. When the strap has been drawn taut, the apparatus is operated to cut off the strap from the source of supply and to place over the overlapping strap ends the channel-shaped metal seal which is fed to the sealing devices from a magazine in which a number of seals are stored in the form of a spiral coil. The sealing devices are carried by a movable head and when a seal has been inserted between these devices, the head is moved downwardly with the result that the seal is cut off from the supply coil in the magazine, after which the continued movement of the head positions the cut-off seal over the overlapping strap ends. The sealing devices are then operated to bend the walls of the seal about the strap and then to shear the edges of the strap and seal to form an interlocking joint of the type described and claimed in the United States Patent No. 1,260,016, dated March 19, 1918, one form of which is shown in Fig. 11 of the drawings.

The sealing apparatus disclosed in the drawings is adapted to be employed with a sealing strip 28, shown in Fig. 12, which may be bent into the form of a spiral coil 29, as shown in Fig. 13. The strip 28 is made up of a series of channel-shaped seals 30 each having a back wall 30^a and side walls 30^b. The ends of the back wall of each channel-shaped seal are integrally united by tongues 30^c with the back walls of the next adjacent seals of the strip. The tongues 30^c are preferably narrow as compared with the width of the back walls and the side walls 30^b are preferably flared downwardly and outwardly from the back walls. The lower edges 30^d of the side

walls 30^b of each seal occupy a plane which is parallel to the plane of the back wall and these edges are preferably inclined at their ends, as shown at 30^e. The steel strip 28 is formed of metal which is hard and stiff but which has a slight resiliency and sufficient ductility to cause it to retain a permanent set after the walls 30 have been bent around the overlapping ends of the strap.

After the ends 27^a and 27^b of the strap have been overlapped and while the strap is held taut by the stretching device which forms a part of the apparatus, the upper end portion 27^b of the strap is cut off from the source of supply and the movable head of the apparatus, carrying relatively movable sealing jaws, is operated to position a seal 30 over the overlapping ends of a strap. The apparatus which draws the strap taut is adapted to feed a seal 30 from the spiral coil 29 which is contained in a storage magazine so that this seal is positioned between the jaws of a head while the head is in its upper position. The initial downward movement of the head is adapted to effect the cutting off of the seal which is positioned between the jaws from the remaining seals in the magazine and the continued movement of the head operates first to cut off the strap end 27^b from the source of supply and then to position the channel-shaped seal over the overlapping strap ends. A relative movement of the jaws of the head then bends the side walls 30^b of the seal about the strap ends and shears the lateral edges of the strap and seal to form transverse cuts 31, shown in Fig. 11, while at the same time deflecting the metal of the strap and seal at one side of the line of shear in order to form an interlocking joint. At least one pair of cuts 31 is preferably formed along each edge of the seal and the metal between each pair of cuts is deflected downwardly by the shearing dies to form angularly disposed tongues or projections 32. The edges of these tongues or projections cross the body portions of the strap and seal, thus forming interlocking joints at a plurality of points. In the form of joint shown in Fig. 11, there are two pairs of cuts 31 on each side of the seal.

The sealing apparatus 25 comprises a base plate 33 which is adapted to rest upon the surface of the box or package about which a strap 27 is to be drawn taut and sealed. This plate 33 preferably has the irregular contour shown in Fig. 3 and the forward portion thereof is provided with two pairs of relatively movable gripping devices which are adapted to grip the opposite end portions of the strap and to hold them while the strap is being drawn taut. One pair of gripping devices is carried directly by the base plate and for this purpose the forward portion of the plate 33 is provided with an upwardly extending integral block or boss 34 having an overhanging flange 34^a adapted to conform to and contact with the curved upper end of a movable gripping dog 35 which is pivotally mounted upon a pin 36 engaging the back wall of this boss, as shown particularly in Fig. 2. This gripping dog is provided on its under side with a serrated gripping surface 35^a which is adapted to coact with the upper side of the end portion 27^a of the strap 27 when this strap is seated upon the stationary gripping plate or flange 37 which projects forwardly as an integral part of the base plate 33. This gripping plate or flange has its outer edges beveled downwardly as shown at 37^a to facilitate the insertion of the strap be-

neath the movable gripping dog 35 which is similarly provided with a tapered portion 35^b adapted to cooperate with the beveled surface 37^a to form a tapered passage to receive the strap, as shown in Fig. 4. The serrated surface 35^a of the gripping dog 35 is offset toward the right, as viewed in Fig. 2, with respect to a vertical plane passing through the axis of the pivot pin 36, so that when the end 27^a of the strap is inserted beneath it, a pull on the strap toward the left, as viewed in Fig. 2, will tend automatically to increase the grip of the dog 35 upon the strap. When a pull is exerted upon the strap in the opposite direction, the dog 35 tends to release its grip so that the strap will be readily removed from its position over the plate or flange 37. The gripping dog 35 is provided between its gripping surface and the pin 36 with an inwardly extending slot 35^c adapted to receive the body portion of the strap 27 after the strap has been passed around the box or package. This supply portion of the strap is adapted to be held in this slot 35^c by frictional engagement with a ball 38 which is pressed downwardly by a coil spring 39 engaging a recess in the gripping dog 35 and an aligning recess in the overhanging passage of the boss 34. A threaded plug 40 adjustably engages the upper end of this spring, and this plug may be adjusted to vary the compression of the spring which, in addition to maintaining the ball 38 in contact with the supply portion of the strap 27, forces the dog 35 downwardly into engagement with the upper end portion of the strap 27 which is seated upon the plate or flange 37.

After the strap 27 has been inserted beneath the dog 35 and passed around the box or package, the other end portion 27^b thereof is placed in position to be gripped by a movable pair of gripping devices comprising a block 44 which is slidably mounted on the front portion of the base plate 33 at the end thereof opposite the block 34. This block 44 is secured by cap screws 45 to the end of a bar 46 which is slidably mounted on the base plate for movement parallel to the front edge thereof and parallel to the direction in which the strap is passed around the package. As shown in Figs. 2 and 7, the block 44 comprises an overhanging portion 44^a which is curved to conform to the curvature of the upper end of the contacting gripping dog 47, pivotally mounted upon a pin 48 secured in the rear wall of the block. The gripping dog 47 is provided on its under side with a serrated gripping surface 47^a which is adapted to coat with the upper side of the end portion 27^b of the strap when the strap is seated upon the gripping plate or flange 49 formed integrally with and projecting forwardly from the lower part of the block 44. The gripping dog 47 is inclined so that the gripping surface 47^a is offset toward the left, as viewed in Fig. 2, with respect to a vertical plane through the axis of the pin 48, so that a pull upon the strap 27 toward the right, as viewed in Fig. 2, tends to increase the grip of the dog 47 upon the strap, while a pull upon the strap in the opposite direction serves to effect the automatic release of the strap from the gripping dog. This gripping dog 47 is moved into engagement with the strap by a coil spring 50 which engages a passage 51 formed in the overhanging portion of the block 44, with one end thereof engaging the inclined upper surface of the gripping dog and with the other end thereof engaging a plug 52 which threadably engages the passage 51 to permit adjustment of the compression of the spring.

The bar 46, to which the block 44 is attached by the studs 45, is mounted to slide in a groove 56 which is formed in the upper side of the base plate 33, as shown particularly in Figs. 3, 6, 7, 9, 10, and 15, and it is held against upward movement by a bracket or frame 57 and a block 58, both of which are secured to the base plate 33 by screws 59 passing upwardly therethrough, so that they bridge the groove 56 in spaced relation to each other. The bracket 57 extends upwardly from the base plate and supports the seal storage magazine and the seal feeding mechanism hereinafter described. The extremity of the bar 46, opposite the block 44, is reversely bent, as shown in Fig. 15, to overlie the end of a lever 60 which is pivotally secured to the end of the bar by a pin 61. The lever 60 extends rearwardly over the base plate 33, as shown in Fig. 3, and has an intermediate part thereof pivotally connected by a pin 62 with a link 63, the forward end of which is pivotally secured to the stationary block 58 by means of a pin 64 passing through the upper and lower flanges 58^a and 58^b, respectively, of this block, as shown in Fig. 15. The lever 60 is adapted to be oscillated about the pin 62 to cause it to assume the position shown by dotted lines at 60^a in Fig. 3, thereby causing movement of the block 44 toward the block 34 for the purpose of drawing the strap 27 taut around the box or package. The lever 60 is reinforced on its upper side by a bar 60^b which has the forward portion thereof bent upwardly to overlie the rear end of the link 63 and engage the pin 62, as shown in Fig. 8, and the rear end of the lever 60 is reversely bent to form a part 60^c which extends parallel to the body portion thereof and which is adapted to receive beneath it the rear flattened end of a link 65. This link is pivotally connected to the lever 60 by a pin 66 which passes vertically through the body portion of the lever, through the reinforcing bar 60^b and through the reversely bent portion 60^c. These parts are embraced and held against upward movement by a yoke 67 which is secured to the base plate 33 by screws 68 extending upwardly through the plate, as shown in Figs. 3 and 8. The forward end of the link 65 has a flange 65^b lying in a vertical plane, which engages the slot 69^a formed in a crank arm 69 which is constructed integrally with the hub 70^a of an operating lever 70 adapted to be manually manipulated to effect the stretching of the strap by causing the block 44 to move toward the block 34. The flange 65^b of the link 65 is pivotally connected to the crank arm 69 by a pin 71, and the hub 70^a of the operating lever is secured by a transverse pin 72 upon a shaft 73 which is journaled in bushings 74 mounted in apertures formed in upwardly extending arms or posts 75 secured to or formed integrally with the base plate 33, as shown particularly in Fig. 3. A washer 76 of leather or other friction material is secured to the side of one of the posts 75 to bear against the hub 70^a of the lever or handle 70, and a coil spring 77 is mounted on the shaft 73 to bear at one end against a collar 78 fixed on the shaft and at the other end against the washer 74 which seats against the bushing 74 adjacent to the hub 70^a, and thus hold the shaft 73 in its bearings while maintaining the hub 70^a in frictional contact with the leather washer 76. This construction is adapted to hold the lever 70 in any desired adjusted position, thus maintaining a corresponding fixed spaced relation of the blocks 34 and 44 while the strap is being applied to the grip-

ping devices. Upon movement of the lever 70 to the rear, that is, toward the left as viewed in Fig. 8, the rear end of the lever 60 is moved in a forward direction and the forward portion of this lever swings outwardly about the pin 62 until the lever occupies the position shown by the dotted lines 60^a in Fig. 3. This movement of the lever causes the bar 46 to slide on the base plate with a corresponding movement of the block 44 with respect to the block 34. An important advantage of this construction is that the operation of the lever 70 produces a rapid relative movement of the blocks 34 and 44 during the early part of the stretching operation when the strap is comparatively slack, while the rapidity of motion decreases and the force exerted upon the strap increases as the final stages of the stretching operation are approached, thus making it possible to draw a strap taut in a single operation of the lever 70.

The sealing of the overlapping ends of the strap, by the application thereto of a seal 30, is effected by a movable head 80 comprising a pair of side plates 81 which are pivotally mounted on a shaft 82 fixed in the lower part of the posts 75, as shown in Figs. 3, 6, 9, and 10. The plates 81 are notched on their upper sides, as shown at 81^a, to receive the shaft 73 when the head 80 is in its uppermost position, and these plates are adapted to receive between them a pair of jaw members 83 which are pivotally mounted upon pins 84 secured in the plates. Each jaw member 83 is provided on its inner side with a curved surface 83^a concentric with its pivotal axis, as shown in Figs. 10 and 16, and adapted to move in proximity to the curved surface on the other jaw member. Between these curved surfaces, below the line of their nearest proximity, there is mounted a seal supporting member or saddle 85 which is substantially triangular in cross-section, having curved surfaces 85^a which are adapted to coact with the curved surfaces 83^a of the jaw members. This saddle 85 is provided at each end with an integral projecting trunnion 85^b, shown in Figs. 8 and 13, and these trunnions engage apertures in the side plates 81 to support the saddle in position between the jaw members which are thus capable of relative movement without disturbing the position of the saddle. The lower portions of the jaw members 83 are provided with inwardly projecting hooks or jaws 83^b having notches 83^c therein to receive the lower portions of the side walls 30^b of the seal 30 when this seal is in position between them, as shown in Fig. 8. The lower walls or shoulders 30^d of these notches engage the extreme edges 30^d of the seal and thus hold the seal in place in position to straddle the overlapping ends of the strap 27 when the head 80 is lowered from its normal upper position, shown in Fig. 8, to its lower position, shown in Fig. 10. The jaw members 83 are undercut above the jaws 83^b as shown at 83^e and they are further provided with slots 83^f, located in vertical planes, which extend inwardly from the lower edges through the jaws 83^b and through the curved surfaces 85^a. These slots 83^f are engaged by cutting dies 87 which are in the form of flat plates fitting in the slots and having cutting edges 87^a which project beyond the margins of the recesses 83^e in the jaws and which are flush with the curved surfaces 83^a of the jaws at their inner ends, as shown in Figs. 16 and 17. These die plates 87 are engaged by the pivot pins 84 about which the jaws move and also by pins or

rivets 88 which pass transversely through the jaws and the die plates, thus holding the die plates rigidly in position in the slots of the jaws. When a seal 30 is initially placed between the jaws, it occupies the position shown in Fig. 8, with the edges 30^d of the side walls of the seal engaging the notches 83^c in the opposite faces of the jaws. The head 80 is then lowered until the seal 30 straddles the overlapping ends of the strap 27, as shown in Fig. 10. The next operation is to effect a relative movement of the jaws 83 about their pivot pins 84 with the result that the side walls of the seal are bent inwardly, as shown in Fig. 16, to underlie the overlapping strap ends and, preferably, to overlap each other. During this relative movement of the jaws 83, the edges of the strap and seal are sheared transversely by the action of the dies 87 and portions of the metal are deflected, as shown in Fig. 17, with the result that a joint is formed having the interlocking shoulders shown in Fig. 11, where the parts 32 are the projections which have been deflected laterally by the edges of the cutting dies.

The jaw members have arms 83ⁱ which extend upwardly from the pivot pins 84 and which are pivotally connected at their upper ends by pins 89 with links 90 mounted to engage slots formed in the upper ends of these arms. The links 90 are pivotally connected by pins 91 with opposite sides of the hub portion 92^a of an operating lever 92 which is pivotally mounted on a pin 93 carried by the side plates 81 of the head. The turning of the lever 92 about the pin 93 is adapted to spread the links 90 and the arms 83ⁱ of the jaw members so that the jaws 83^b of these members are moved inwardly toward each other to effect the operations upon the seal 30 which have previously been described. When the head 80 is in its uppermost position, as shown in Figs. 6 and 8, the elongated hub 92^a of the operating lever is positioned endwise between the arms 83ⁱ of the jaw members and a projection 92^b on the hub engages a spacer bar 94 which extends between the side plates 81, thus limiting further movement of the lever 92 toward the left, as viewed in Fig. 10. The jaw member 83 which is nearest the pivotal axis 82 of the head 80 is connected to the pin 82 by a pair of links 96 and 97. The link 96 is pivotally connected to the jaw member by a pin 98 and is pivotally connected at its other end to the link 97 by means of a pin 99. The lower end of the link 97 is pivoted on the pin 82 which has sleeves 100 mounted thereon for spacing the link midway between the side plates 81. The link 96 projects into a slot 97^a formed in the link 97 and this end of the link 96 is rounded on the lower corner thereof, as shown at 96^a, to permit relative angular movement of the two links in an upward direction, as shown in Fig. 9, while preventing relative angular movement in the opposite direction beyond a point where the two links are in substantial alignment with each other, as shown in Fig. 8, due to the engagement of the angular upper corner of the link 96 with the end wall of the slot 97^a. When the two links 96 and 97 are thus in alignment, the axis of the pin 99 is located below or to the right of a plane containing the axes of the pins 82 and 98 so that the two links thus act as a toggle connection between the jaw members 83 and the pivotal axis of the head 80, thereby preventing relative movement of the jaw members while the links occupy this position. This toggle connection permits the head 80 to be moved

downwardly by the operating lever 92 without relative movement of the jaw members 83 and with this lever in the position shown in Fig. 8, until the seal 30 held between the jaws 83^b has been passed over the overlapping strap ends. At this point in the operation, a stop member 101, threadedly engaging the link 97, abuts against the base plate 33 with the result that the link 97 is held against further movement and the toggle connection is then broken upon continued downward movement of the head 80. This allows the lever 92 to move in a forward direction about its pivot 93, thereby separating the arms 83ⁱ of the jaw members 83 and causing the lower parts of the jaw members to close upon the strap and seal to effect the bending of the arms of the seal about the overlapping strap ends and then the shearing of the edges of the strap and seal. The stop member 101 has a slot at its upper end for engagement by a screw driver and it may be adjusted to cause the jaws to close at the desired point during the movement of the head 80. A nut 102 serves to secure the stop member 101 in adjusted position.

In order to permit the lower portions 83^b of the jaw members to engage the side walls of the seal 30 with resilient pressure when the seal 30 is inserted between the jaw members with the head 80 in the elevated position shown in Figs. 6 and 8, one of the links 90 is provided with an elongated slot 90^a for engagement by the pin 89 which connects that link with the adjacent jaw member, as shown in Fig. 9, thus allowing a limited pivotal movement of this jaw member with respect to the connected link 90. The jaw member 83, which is connected to the slotted link 90, is provided with a tubular passage 104 in which is slidably mounted a pin 103 having an enlarged head located in the larger portion 104^a of the passage and having a stem which projects from the jaw member to engage the inner face of the other jaw member. The head of the pin 103 is engaged by a coil spring 105 located in the enlarged portion 104^a of the passage and held in position therein by a threaded plug 106 which is removably mounted in the upper end of the passage, as shown in Fig. 9. The compression of the spring 105 may be adjusted by the movement of the plug 106 in order to cause the pin 103 to engage the other jaw member with the desired pressure. It will be seen that this construction causes relative movement toward each other of the lower portions 83^b of the jaw members by the action of the spring 105 within the limits permitted by the elongated slot 90^a, so that when a seal 30 is inserted between the jaw members, the flaring side walls 30^b thereof are engaged with resilient pressure by the walls of the recesses 83^c of the jaw members. The seal is thus firmly held while the head 80 is being lowered to bring the seal into engagement with the overlapping strap ends.

The flange 37 of the base plate 33 extends transversely of the base plate for a considerable distance, as shown in Figs. 2 and 3, and it underlies the forward portion of the block 58 which is secured upon the base plate as previously described. The base plate has another forwardly projecting flange 107 which extends outwardly parallel to the flange 37 and spaced therefrom so that an inwardly projecting notch or opening 108 is formed between these flanges in registry with the path of movement of the jaws 83 as the head 80 is lowered, thus permitting the jaw members to be closed about the seal and strap

in this opening 108 while the strap is supported on the adjacent flanges 37 and 107. The flange 107 is beveled on its upper side at its forward end as shown at 107^a to correspond with the bevel on the forward edge of the flange 37, to permit the convenient insertion of the strap. At the commencement of the operation of applying a strap 27 around a box or package, the free end 27^a of the strap is first inserted between the gripping dog 35 and the flange 37 with the extremity of the strap projecting across the opening 108 and resting upon the flange 107, as shown in Fig. 2. The strap is then passed around the box or package and the portion 27^b thereof, which is connected to the source of supply, is passed beneath the gripping dog 47 so that it is held against the flange 49 carried by the movable block 44. After being passed beneath the gripping dog 47, the supply portion 27^b of the strap is placed in position over the extremity of the free end 27^a of the strap on the flange 107, as shown in Fig. 2, and beneath the forward end of the overlying portion of the bracket 57 by which the seal storage and feeding mechanism is carried. The strap is then inclined upwardly toward the left, as viewed in Fig. 2, and passed over a stationary cutting die 110, from which point the supply portion of the strap is carried over the flange 37 of the base plate and caused to occupy the slot 35^c in the gripping dog 35. The stationary cutting die 110 has the form shown particularly in Fig. 8, being provided with two oppositely extending blades 110^a, each of which has a cutting edge 110^b. At its middle point, the die has an upwardly extending lug 110^c which is apertured for engagement by a bolt 111 by which it is secured to the flange 58^c formed on the block 58. When thus secured in place by the bolt 111, the lower edge of the die 110 rests upon the upper surface of the base plate so that angular movement thereof is prevented. The under portions of the blades of the cutting die 110 are inclined upwardly as shown at 110^d in Fig. 8 to facilitate the insertion beneath the cutting blade of the free end portion 27^a of the strap.

The stationary cutting die 110 is adapted to cooperate with a cutting blade 112 detachably mounted upon a shearing lever 113 which is pivotally supported on the bolt 111 and which is pivotally connected with one end of a link 114 having its other end pivotally connected to a pin 114^a stationarily mounted upon the adjacent side plate 81 of the head. The pin 114^b which connects the lever 113 with the link 114 has a coil spring 119 connected thereto and this spring is attached at its other end to a stationary pin 119^a carried by the base plate. This spring 119 tends normally to rock the shearing lever 113 about its pivot 111 in a direction to elevate the cutting blade 112. The action of this spring 119 tends also to elevate the head 80 about the pin 82 since it tends to move the pin 114^b toward the pin 119^a, as viewed in Fig. 8, and the extent of this movement is limited by the engagement of one of the side plates 81 of the head with a flange 109^a formed on an adjustable stop arm 109 which is pivoted on one of the bushings 74 carried by the shaft 73, as shown in Figs. 3, 6, and 9. This stop arm is provided at its lower end with a horizontal flange 109^b which rests upon the head of a screw 109^c adjustably engaging the base, being held in engagement with that screw by another screw 109^d which passes through the flange and enters a threaded aperture in the base. As the head 80 is lowered by a forward pressure on the lever 92, the first effect of

the downward movement of the head is to lower the shearing lever 113 against the action of the spring 119 until the shearing blade finally engages the upper supply portion of the strap 27 and shears it off by cooperating with the underlying cutting die 110. Immediately after the strap is cut off from the source of supply by the action of the blades 110 and 112, the seal 30 carried between the jaws 83 engages the upper end portion of the strap which has just been cut off from the source of supply and forces it downwardly against the underlying end portion 27^a. As soon as this has occurred, the previously adjusted stop member 101 engages the base plate 33 to break the toggle connection formed by the links 96 and 97 so that these links then move upwardly, as viewed in Figs. 9 and 10, and the lever 92 is then permitted to move forwardly about its pivot 93 with the result that the upper arms 83¹ of the jaws are separated and the lower parts 83^b of these jaws bend the walls 30^b of the seal inwardly beneath the overlapping strap ends, causing them to assume the relationship shown in Figs. 9 and 16. Then, upon further movement of the lever 92, and a consequent further movement of the jaws, the edges of the strap and seal are sheared to form an interlocking joint, as shown in Figs. 11 and 17. When this operation of forming the joint is completed, the lever 92 is moved toward the left, as viewed in Fig. 9, thereby releasing the lower parts of the jaws from engagement with the strap and seal and then effecting the elevation of the head 80 and of the shearing lever 113 until these parts assume their normal upper position shown in Fig. 8, in which positions the parts are held by the spring 119. The operator then reverses the motion of the stretching lever 70 with the result that the block 44 is moved toward the right, as viewed in Fig. 2, thereby releasing the sealed strap from the grip of the dog 47. The tool may then be moved toward the left, as viewed in Fig. 2, and away from the strap to release the strap from the dog 35. As this is done, the flanges 37 and 107 are withdrawn from their positions beneath the strap and the strap is then permitted to snap downwardly in contact with the top surface of the box or package.

When the lever 92 is elevated with the head 80, it should be turned angularly until it is restored to the position shown in Fig. 8, thus separating the portions 83^b of the jaws to the maximum extent for the reception of a new channel-shaped seal, and to insure this result, a coil spring 124 is mounted on the enlarged portion 93^a of the pivot pin 93, between the head 93^b of the pin and the adjacent side plate 81, as shown in Figs. 2 and 8, and the ends of this spring are fixed to cause the turning of the pin 93 and the lever 92 by the spring when the lever is released by the hand of the operator. For this purpose, one end 124^a of the spring bears against the pin 114^a which connects the link 114 with the adjacent side plate 81, and the other end 124^b of the spring is secured to a pin 124^c fixed on the lever 92, so that the spring is coiled and put under greater tension by the turning of the lever 92 from the position shown in Fig. 8.

The seal storing and feeding mechanism which introduces the seals 30 into the space between the portions 83^b of the jaw members is carried by the previously described bracket 57 which is attached to the base 33 by screws 59, as shown in Fig. 6, and which has ears 57^b engaged by the projecting end of the shaft 82. This bracket extends upwardly at one side of the mov-

able head 80 and carries an upwardly extending web or plate 57^c, reenforced by a laterally extending flange 57^d, which is attached to or formed integrally with the seal storage magazine 120 which is in the form of a circular cup-shaped member mounted in an inclined position and open on its upper inclined face to receive the coil 29 of seals which is placed thereon around the central lug or hub 121. The coil of seals is adapted to unwind around this hub as they are fed from the magazine and after being put in place in the magazine, the front opening thereof is closed by means of a sheet metal cover plate 122 which fits within the opening and has an annular flange 122^a seating on the magazine around the opening. The hub or lug 121 is of greater depth than the magazine and is provided at its outer end with an internally threaded bore 121^a adapted to be engaged by a screw 123 which clamps the cover plate 122 in position and which has a knurled head 123^a adapted to be engaged by the fingers of the operator. The bracket 57 has formed integrally therewith, at the bottom of the magazine 120, a channel-shaped guide member 125 which communicates with the interior of the magazine and which has a flange 125^a overlying the forward portion thereof and terminating adjacent to the movable head 80, as shown in Figs. 6 and 13. The extremity of the strip 28 of connected seals which form the coil 29 in the magazine, extends through the guide channel 125 and the endmost seal 30 is normally positioned upon a die block 126 which is secured in the end of the channel by a screw 127. The block 126 has an upper surface 126^a adapted to engage the inner surface of the back wall of the seal, and lateral downwardly diverging surfaces 126^b which have the same inclination as the diverging side walls 30^b of the seal. The top flange 125^a of the guideway extends over the top wall of the seal, as shown in Fig. 6, and the arrangement of the parts is such that the seal seated on the die block is in proper position to be moved into engagement with the portions 83^b of the jaws 83, when the head is in its uppermost position, as shown in Fig. 8, the seal being then held between the jaws by the inwardly extending shoulders 83^d which engage the edges 30^d of the side walls of the seal. When a seal 30 has been thus positioned between the jaws 83 of the movable head 80, the initial downward movement of the head for placing the seal over the overlapping strap ends, is adapted to cut off the seal from the remaining seals of the strip and this is brought about by a cutting edge 128 which is formed on or carried by one of the side plates 81 of the head, as shown in Figs. 13 and 14. The edge 126^c of the die block 126 projects outwardly in proximity to the path of movement of the cutting edge 128 so that when the head 80 moves downwardly, these parts cooperate with each other to shear off the tongue 30^c by which the seal between the jaws is connected to the next adjacent seal of the strip. The downward movement of the head 80 then continues with the result that the strap is cut off from the source of supply and the seal is then positioned over the overlapping strap ends and an interlocking joint formed in the manner heretofore described.

The movement of the seals from the magazine to the jaws 83 of the movable head is effected by means of a plunger 130 which slides in the guide channel 125 and which carries a pawl 131 extending into a slot 130^a in the plunger, as shown in Fig. 3, and pivotally mounted upon a pin 134, as

shown in Fig. 13. A coil spring 135 is mounted around the pin 134 with one end thereof engaging the end of the slot 130^a and with the other end thereof extending beneath the tooth 131^a which is formed on the end of the pawl and which is adapted to extend upwardly between the ends of the side walls of adjacent seals with its forward vertical face 131^b engaging the edges of the side walls of the forward seal and with its rear inclined face 131^c engaging the inclined end surfaces 30^c formed on the next adjacent seal. Each time that the plunger 130 moves in a forward direction, it is adapted to unwind the coil 29 and to move a seal forwardly through the guide channel a distance equal to its length, thus projecting the endmost seal of the strip from the channel to a position between the jaws of the sealing device. The plunger 130 is adapted to be actuated by the mechanism which draws the strap 27 taut around the package and this operation is effected through a lever 137 which extends through a slot in the wall of the channel 125 and enters a recess 130^b formed in the plunger, where a pivotal connection is established with the plunger by means of a pin 138. The lever 137 is provided at its other end with an elongated slot 137^a which is pivotally engaged by a pin 139 secured in the ears 140 formed on the bracket 57. The elongated slot 137^a allows for some longitudinal adjustment of the lever 137 as it moves the plunger 130 along the straight guide channel 125.

In order to cause the movement of the sliding bar 46 of the strap stretching mechanism to actuate the lever 137 and thereby project the seal 30 to a position between the jaws 83, the bar 46 has a bracket 141 secured thereon by studs 45, as shown in Fig. 3, and this bracket carries an upwardly extending boss 143 provided with a tubular bore 143^a, shown in Fig. 7, in which is mounted a pin 144. This pin is provided with a tapered head 144^a which projects through the aperture in the end of the boss and adjacent this head there is formed an annular collar 144^b which is adapted to seat against the intumed annular flange 143^b of the boss to limit the upward movement of the pin under the influence of a coil spring 145 which is mounted in the tubular bore 143^a with its lower end engaging a nut 146 which closes the end of the bore and which is centrally apertured to be slidably engaged by the lower end of the pin. When the sliding bar 46 moves toward the left, as viewed in Figs. 2 and 3, the upper tapered head 144^a of the pin is adapted to coast with an inclined surface 137^b formed on the lever 137. The inclination of this surface 137^b is sufficiently abrupt to cause the pressure of the pin 144 to actuate the lever 137 and to move the plunger 130 along the guide channel 125 until the tooth 131^a of the detent engages the end of the die block 126, as shown by dotted lines in Fig. 13, whereupon the resistance which is thus provided to further movement of the plunger 130, causes the pin 144 to wedge downwardly on the surface 137^b of the lever 137, against the compression of the spring 145, until the pin 144 snaps beneath the lever to allow continued motion of the sliding bar 46, without further movement of the lever 137. In this way, the strap stretching mechanism is permitted to operate until the strap is taut without effecting further movement of the lever 137. As soon as the lever 137 is thus released by the pin 144, this lever and the plunger 130 are returned to their initial positions, shown in Fig. 3, by the action of a pin 146 which is

slidably mounted in a bore 147 formed in the bracket 57. The enlarged head of this pin is engaged by a coil spring 149 having its other end seated against the nut 150 which closes the end of the bore. When the lever 137 moves toward the left, as shown in Fig. 3, during the operation of feeding a seal to the jaws 83, the spring 149 is compressed, and when the lever 137 is released by the pin 144, the pin 146 and the spring 149 return the lever 137 to a position wherein the plunger 130 is at the right-hand end of the guide channel, as viewed in Fig. 3. When the sliding bar 46 of the strap stretching mechanism is subsequently returned to its initial position, after the strap has been drawn taut, the head 144^a of the pin 144 is adapted to engage the inclined surface 137^c on the under side of the lever 137, shown in Fig. 5. This surface has a gradual inclination adapted to wedge the pin 144 downwardly without providing substantial resistance to the movement of the bar 46 and this allows the pin 144 to snap beneath the lever 137 so that it again occupies the position shown in Fig. 3 at the right-hand side of the lever in readiness for the operation of feeding another seal from the magazine to the jaws of the sealing device.

By means of the mechanism described above, the channel-shaped seals 30 are fed in succession from the magazine 120 to positions between the jaws 83 of the movable head 80. Each feeding movement of the plunger 130 moves the end seal of the strip from the guide channel to a position between the jaws, as shown in Fig. 8, and then, as the plunger 130 is retracted by the action of the spring 149, the tooth 131^a of the detent moves downwardly, due to the coaction of the inclined toothed surface 131^c and the inclined surfaces 30^c formed on the ends of the side wall of the adjacent seal. The pawl 131 then moves rearwardly with the plunger 130 until it engages the recesses between the side walls of the two other seals, as shown in Fig. 13. The parts then remain in this position until the strap stretching mechanism is again actuated by the operation of the lever 70. After a seal 30 has been positioned between the portions 83^b of the jaws, in the manner just described, the lever 92 is operated to move the head 80 downwardly about its pivot. The initial movement of the head causes the cutting edge 128 to co-operate with the die block 126 to cut off from the remainder of the strip 28, the seal 30 which has been positioned between the jaws. The continued downward movement of the head 80 then actuates the shearing lever 113 to cause the cutting blade 112 to cut off the overlying portion 27^b of the strap from the source of supply. The movement of the head 80 then causes the seal 30 carried between the jaws to engage the upper end, portion of the strap which has just been cut off and to force it downwardly against the underlying portion 27^a. When this has been effected, the previously adjusted stop member 101 engages the base plate 33 to break the toggle connection formed by the links 96 and 97, thus allowing the lever 92 to move about its pivot 93 with the result that the parts 83^b of the jaws are closed upon the seal and the side walls of the seal are bent inwardly about the strap ends until they assume the position shown in Fig. 16. The closing of the jaws causes the cutting dies 87 to shear the edges of the strap and seal with the resulting formation of the cuts 31 shown in Fig. 11 and the intervening deflected portions 32, 75

shown in Figs. 11 and 17. When the joint has been formed, the head 80 is returned to its upper position shown in Fig. 8, in which position it is held by the action of the coil spring 119. In order to insure the location of the jaw members 83^b in a position in which they will register properly with the end seal 30 of the strip of seals in the magazine when the head 80 is in its uppermost position, the stop arm 109 may be adjusted by manipulating the screws 109^c and 109^d. In this way, repeated operations of the mechanism will gradually unwind the coil 29 of seals which is located in the magazine and when the supply of seals is exhausted, it may be readily replaced by taking off the cover plate and placing a new coil 29 about the hub 121 of the magazine.

Although one form of the invention has been shown and described by way of illustration, it will be understood that it may be constructed in various other embodiments coming within the scope of the appended claims.

I claim:

1. The combination in strap sealing apparatus, of means for holding a strap with its ends overlapping, a sealing device, means for storing a series of connected seals in the form of a coil, means for feeding the end seal of the coil from said storage means and positioning said seal in a position wherein it engages and is supported by said sealing device, and means for thereafter cutting off said seal from the remainder of the coil.

2. The combination in strap sealing apparatus, of means for holding a strap with its ends overlapping, a sealing device normally in a position removed from said strap ends, means for storing a series of connected seals in the form of a coil, means for feeding the end seal of the coil from said storage means and positioning said seal in said sealing device, means for moving said sealing device to position said seal over the overlapping strap ends, and means operated by the movement of said sealing device for cutting off said seal from the remainder of the coil.

3. The combination in strap sealing apparatus, of means for holding a strap with its ends overlapping, a sealing device, means for storing a series of connected channel-shaped seals in the form of a coil, means for unwinding said coil and feeding the end seal of the coil to a position in said sealing device when said sealing device is removed from said strap ends, means for moving said sealing device bodily to place said seal over said overlapping strap ends, and means actuated by the initial movement of said sealing device for cutting off said seal from the remaining seals of the coil.

4. The combination in strap sealing apparatus, of means for holding a strap with its ends overlapping, a sealing device, means for storing a series of connected channel-shaped seals in the form of a coil, means for unwinding said coil and feeding the end seal of the coil to a position in said sealing device, means for actuating said sealing device to place said seal over said overlapping strap ends, means actuated by the initial movement of said sealing device for cutting off said seal from the remaining seals of the coil, and means actuated by further movement of said sealing device for cutting off the strap from the source of supply.

5. The combination in strap sealing apparatus,

of means for holding a strap with its ends overlapping, a sealing device movable transversely to said strap ends, means for storing a series of connected seals in the form of a coil, means operating by engagement with the ends of said seals for feeding the end seal of the coil and positioning it in said sealing device while thereby unwinding said coil, and means for actuating said sealing device to place said seal over said strap ends and to form an interlocking joint.

6. The combination in strap sealing apparatus, of means for holding a strap with its ends overlapping, a sealing device movable bodily transversely to said strap ends, means for storing a series of connected seals in the form of a coil, means for feeding the end seal of the coil and positioning it in a position wherein it is supported by said sealing device while unwinding said coil, said sealing device being movable to place said seal over said overlapping strap ends, and means operated during said movement for cutting off said seal from the remaining seals of the coil.

7. The combination in strap sealing apparatus, of means for holding a strap with its ends overlapping, a head movable transversely to said strap ends and comprising a pair of relatively movable jaws, means for storing a strip of connected channel-shaped seals, means for moving the end seal of said strip and positioning it between said jaws, and means actuated by the movement of said head for cutting off said end seal from the remainder of the strip.

8. The combination in strap sealing apparatus, of means for holding a strap with its ends overlapping, a head movable transversely to said strap ends, said head comprising relatively movable jaws mounted between side plates, means for storing a strip of connected seals, means for actuating said seals to move the end seal of the strip to a position between said jaws, one of said side plates having a sharpened edge, and means for moving said head to cut off said end seal from the remainder of said strip and to position said seal over said overlapping strap ends.

9. The combination in strap sealing apparatus, of means for holding a strap with its ends overlapping, a head movable transversely to said strap ends, said head comprising relatively movable jaws mounted between side plates, means for storing a strip of connected seals, means for actuating said seals to move the end seal of the strip to a position between said jaws, one of said side plates having a sharpened edge, means for moving said head to cut off said end seal from the remainder of said strip and to position said seal over said overlapping strap ends, and means for effecting relative movement of said jaws to deform said seal and said strap ends to provide an interlocking joint.

10. The combination in strap sealing apparatus, of a sealing device, a seal magazine having a circular chamber adapted to receive a coil of connected seals, a guide channel communicating with said magazine and opening adjacent said sealing device, a plunger movable in said channel, a pawl mounted on said plunger and adapted to engage one of said seals, and means for actuating said plunger to feed one of said seals from said channel to said sealing device.

11. The combination in strap sealing apparatus, of a sealing device, a seal storage magazine adapted to receive a coil of connected channel-shaped seals connected end to end with their side walls spaced apart, a guide channel com-

communicating with said magazine and adapted to receive the end of said coil of seals, a plunger mounted to reciprocate in said guide channel, and a pawl carried by said plunger and having a tooth adapted to enter the space between the side walls of adjacent connected seals.

12. The combination in strap sealing apparatus, of a sealing device, a seal storage magazine adapted to receive a coil of connected channel-shaped seals connected end to end with their side walls spaced apart, a guide channel communicating with said magazine and adapted to receive the end of said coil of seals, a plunger mounted to reciprocate in said guide channel, a pawl carried by said plunger and having a tooth adapted to enter the space between the side walls of adjacent connected seals, and a spring for normally pressing said pawl into engagement with said seals, said tooth having an inclined surface adapted to cause said tooth to move out of the space between adjacent seals when said plunger is retracted.

13. The combination in strap sealing apparatus, of a sealing device, a seal storage magazine having an annular chamber adapted to receive a coil of connected channel-shaped seals, a guide channel communicating with said magazine and opening adjacent said sealing device, a die block mounted in said channel adjacent said sealing device, means for engaging said seals and moving them in succession over said die block to said sealing device, and means operated by the movement of said sealing device for cooperating with said die block to cut off the end seal from the remainder of the coil.

14. The combination in strap sealing apparatus, of means for drawing a strap taut around a package with its ends overlapping, a sealing device, a magazine adapted to store a coil of connected channel-shaped seals, and means actuated by said strap drawing means for moving the end seal of said coil and positioning it in said sealing device and simultaneously unwinding said coil.

15. The combination in strap sealing apparatus, of means for drawing a strap taut around a package with its ends overlapping, a sealing device, a magazine adapted to store a coil of connected channel-shaped seals, means actuated by said strap drawing means for moving the end seal of said coil and positioning it in said sealing device, and means for actuating said sealing device to cut off said seal from the remainder of the coil and then to apply said seal to said overlapping strap ends to form an interlocking joint.

16. The combination in strap sealing apparatus, of means for drawing a strap taut around a package with its ends overlapping, a sealing device, a magazine adapted to store a coil of connected channel-shaped seals, a reciprocating plunger adapted to be actuated by said strap drawing means, means carried by said plunger for engaging said seals to move the end seal of the coil to a position within said sealing device, and means for permitting continued operation of said strap drawing means after said seal has been positioned in said sealing device.

17. The combination in strap sealing apparatus of means for drawing a strap taut around a package with its ends overlapping, a magazine for storing a series of connected channel-shaped seals in the form of a coil, a sealing device, a guide channel communicating with said magazine

and opening adjacent said sealing device, a plunger mounted to reciprocate in said guide channel, a pawl mounted on said plunger and adapted to engage one of said seals, a lever for operating said plunger, and means for causing said lever to be actuated by the operation of said strap drawing means for moving a seal through said guide channel to said sealing device.

18. The combination in strap sealing apparatus, of means for drawing a strap taut around a package with its ends overlapping, a magazine for storing a series of connected channel-shaped seals in the form of a coil, a sealing device, a guide channel communicating with said magazine and opening adjacent said sealing device, a plunger mounted to reciprocate in said guide channel, a pawl mounted on said plunger and adapted to engage one of said seals, a lever for operating said plunger, means for causing said lever to be actuated by the operation of said strap drawing means for moving a seal through said guide channel to said sealing device, and means comprising a resiliently mounted member for permitting said lever to be released by said strap drawing means after a predetermined movement of said plunger.

19. The combination in strap sealing apparatus, of means for drawing a strap taut around a package with its ends overlapping, a magazine for storing a series of connected channel-shaped seals in the form of a coil, a sealing device, a guide channel communicating with said magazine and opening adjacent said sealing device, a plunger mounted to reciprocate in said guide channel, a pawl mounted on said plunger and adapted to engage one of said seals, a lever for operating said plunger, means for causing said lever to be actuated by the operation of said strap drawing means for moving a seal through said guide channel to said sealing device, means comprising a resiliently mounted member for permitting said lever to be released by said strap drawing means after a predetermined movement of said plunger, and means for restoring said lever and said plunger to their initial positions.

20. The combination in strap sealing apparatus, of means for holding a strap with its ends overlapping, a head movable transversely to said strap ends and comprising a pair of relatively movable jaws adapted to receive and support a seal between them, said head occupying a normally retracted position and being movable downwardly to position over said strap ends, a seal held between said jaws, means for storing a strip of connected channel-shaped seals, means for moving said seals and positioning the end seal of the strip between said jaws, and means operated by the initial downward movement of said head for cutting off said end seal from the remainder of the strip.

21. The combination in strap sealing apparatus, of means for holding a flat strap with its ends overlapping, means for storing a coil of channel-shaped seals which are connected end-to-end, means for unwinding said coil by engagement with the end seal of the coil and simultaneously feeding said end seal to a position where it is supported by and within said sealing device, and means for moving said sealing device bodily transversely to the plane of said strap ends for placing the seal therein over said overlapping strap ends.

WILLIAM C. CHILDRESS.