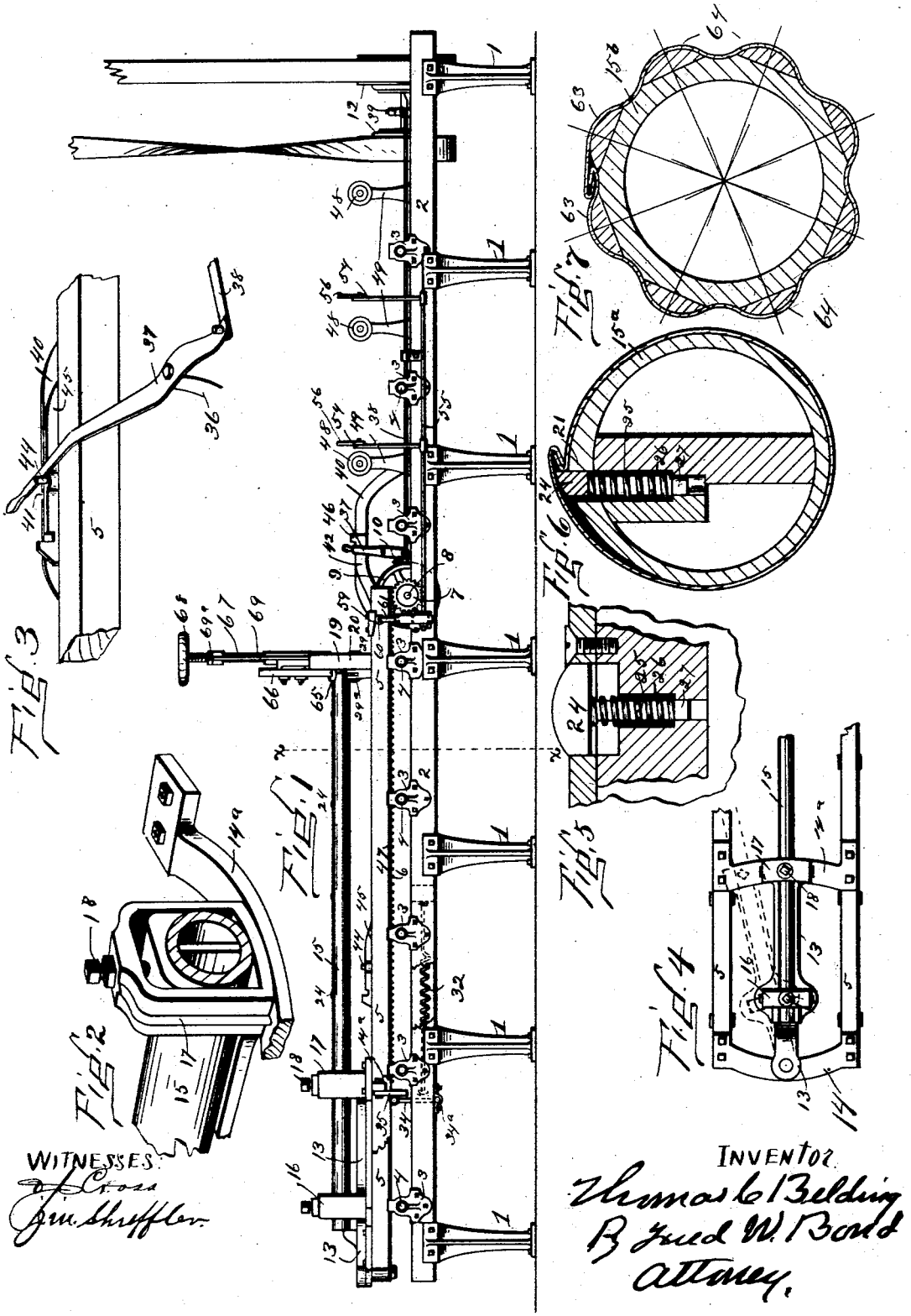
(No Model.) 4 Sheets—Sheet 1.

# T. C. BELDING.

## SHEET METAL PIPE CORRUGATING AND SEAM GROOVING MACHINE.

No. 525,438. Patented Sept. 4, 1894.



WITNESSES:
J. L. Cross
Jno. Shriffler.

INVENTOR.
Thomas C. Belding
By Fred W. Bond
Attorney.

(No Model.) 4 Sheets—Sheet 2.

# T. C. BELDING.

## SHEET METAL PIPE CORRUGATING AND SEAM GROOVING MACHINE.

No. 525,438. Patented Sept. 4, 1894.

Fig. 8

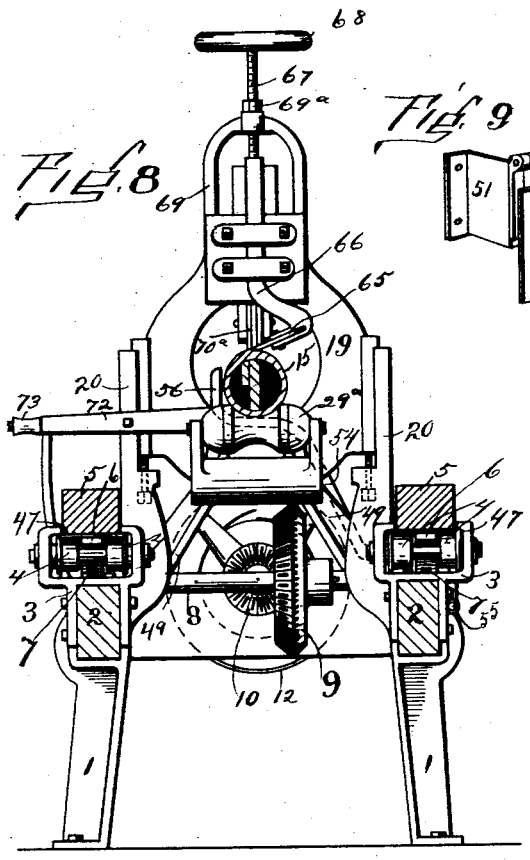



Fig. 9

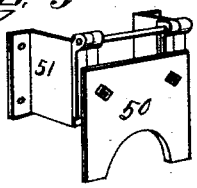



Fig. 10

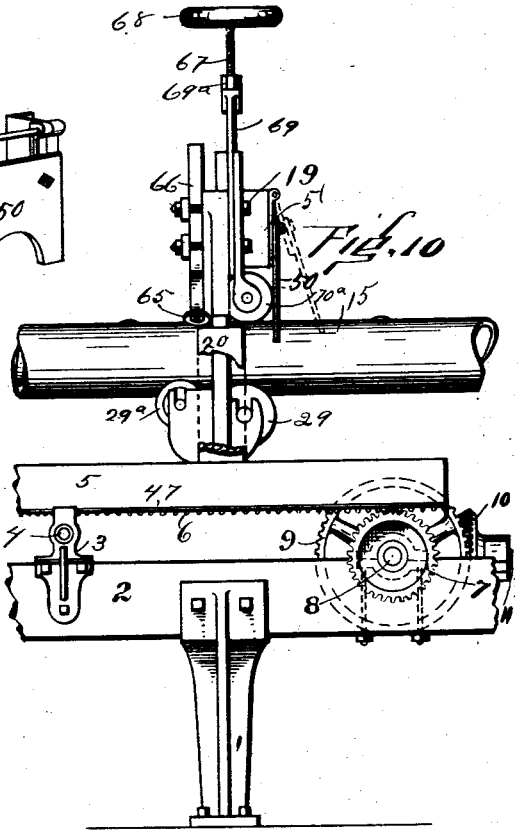



Fig. 11

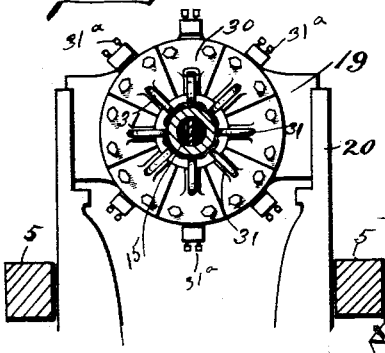



Fig. 12

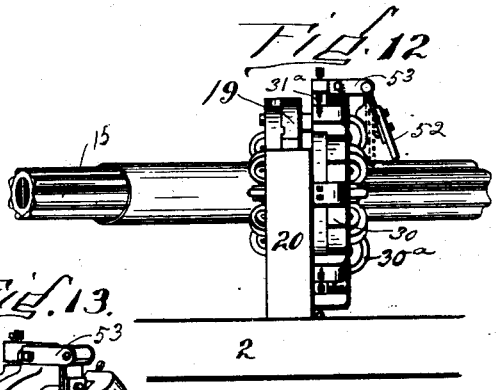
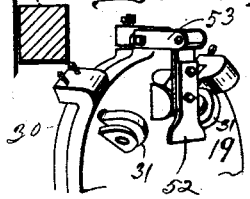



Fig. 13.




Witnesses:
E. Gould,
J. M. Shrefflin.

Inventor.
Thomas C. Belding
By Fred W. Bond
Attorney.

(No Model.) 4 Sheets—Sheet 3.

# T. C. BELDING.

## SHEET METAL PIPE CORRUGATING AND SEAM GROOVING MACHINE.

No. 525,438 Patented Sept. 4, 1894.

Fig. 14

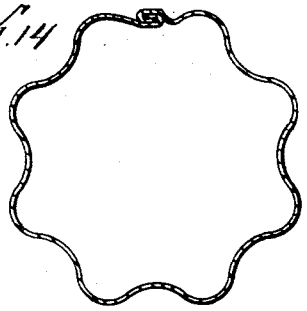


Fig. 18.

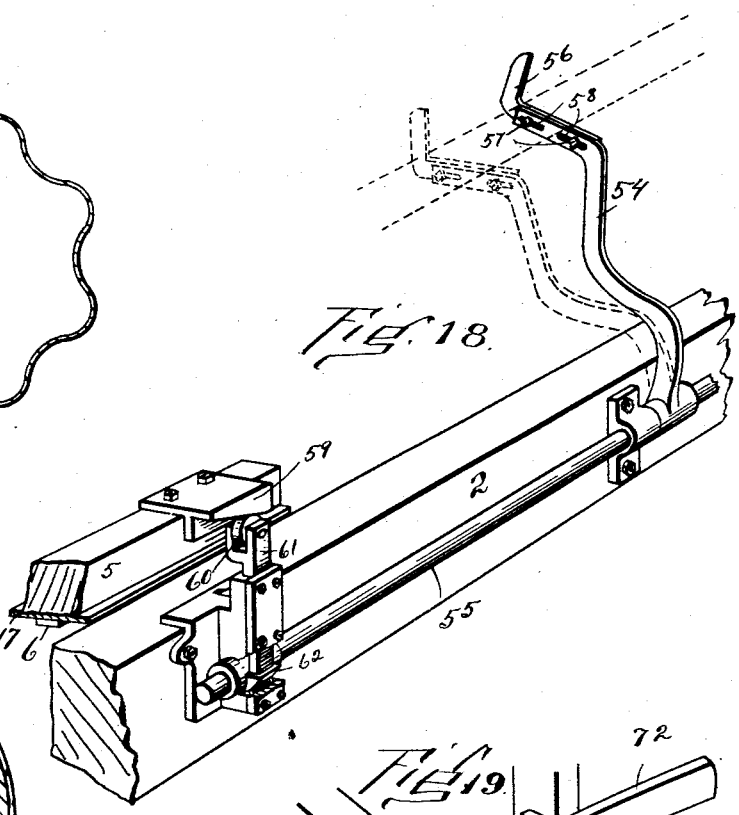



Fig. 15

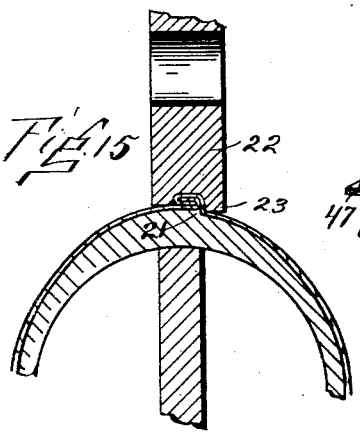



Fig. 19

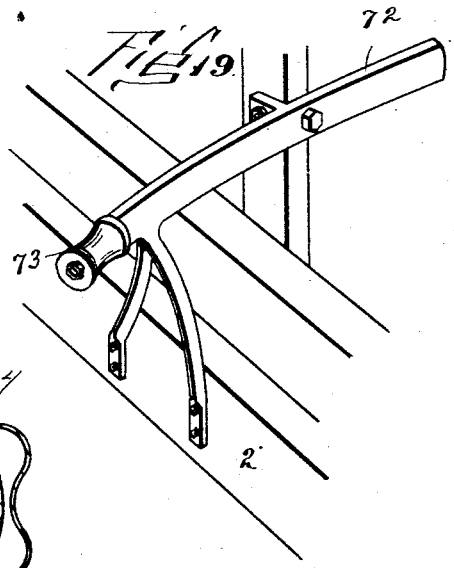



Fig. 16

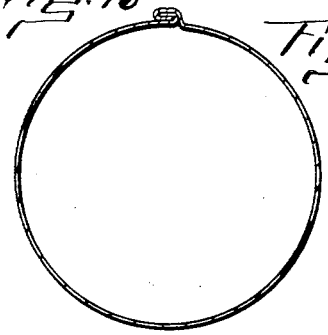
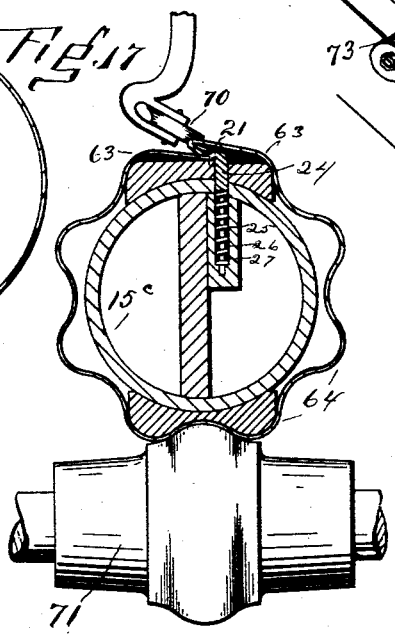


Fig. 17




WITNESSES:
J. Goss.
Jm. Shuffler.

INVENTOR.
Thomas C. Belding
By Ford W. Boyd
Attorney.

(No Model.) 4 Sheets—Sheet 4.

# T. C. BELDING.

## SHEET METAL PIPE CORRUGATING AND SEAM GROOVING MACHINE.

No. 525,438. Patented Sept. 4, 1894.

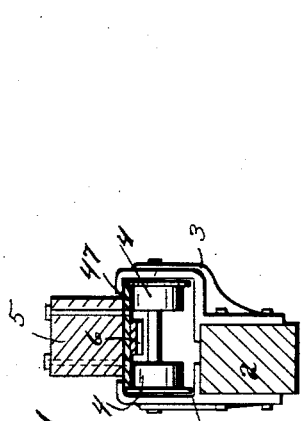


Fig. 21

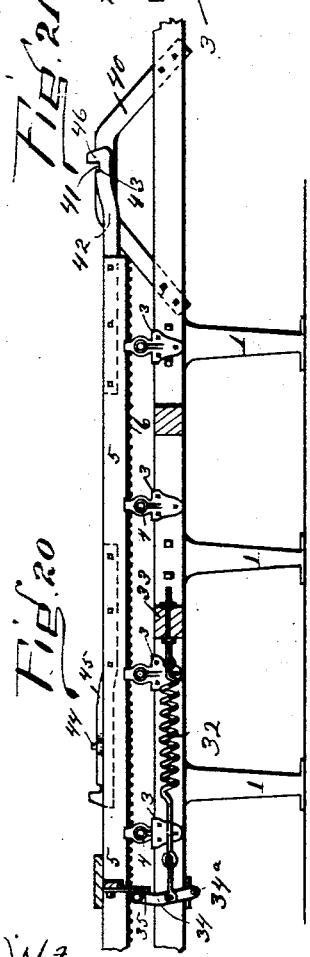


Fig. 20

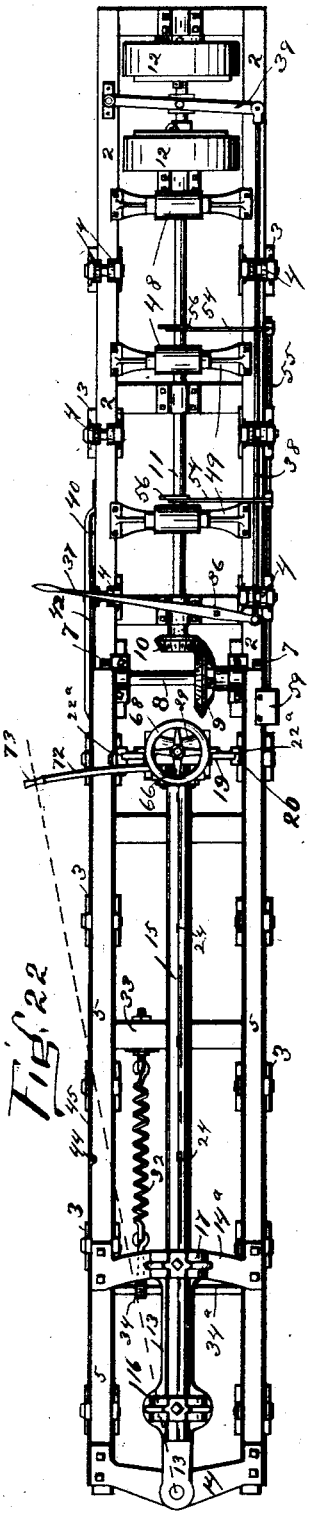


Fig. 22

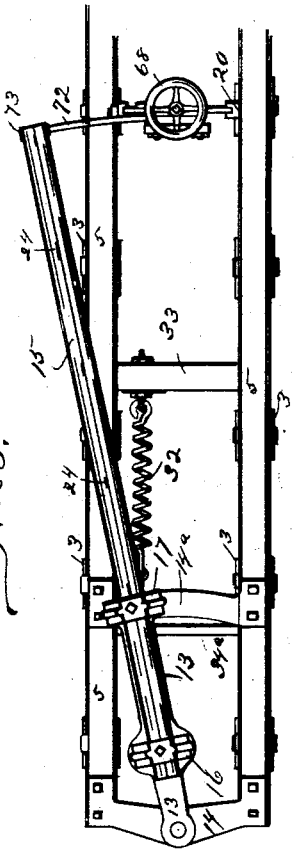


Fig. 23.

Witnesses:
C. J. Crowe.
J. M. Sheffler.

Inventor.
Thomas C. Belding
By Fred W. Bond
Attorney.

# UNITED STATES PATENT OFFICE.

THOMAS C. BELDING, OF CANTON, OHIO, ASSIGNOR TO THE CANTON STEEL ROOFING COMPANY, OF OHIO.

## SHEET-METAL-PIPE CORRUGATING AND SEAM-GROOVING MACHINE.

SPECIFICATION forming part of Letters Patent No. 525,438, dated September 4, 1894.

Application filed January 6, 1894. Serial No. 496,960. (No model.)

*To all whom it may concern:*

Be it known that I, THOMAS C. BELDING, a citizen of the United States, residing at Canton, in the county of Stark and State of Ohio, have invented certain new and useful Improvements in Sheet-Metal-Pipe Corrugating and Seam-Grooving Machines; and I do hereby declare that the following is a full, clear, and exact description of the same, reference being had to the annexed drawings, making a part of this specification, and to the figures of reference marked thereon, in which—

Figure 1, is a side elevation of the machine. Fig. 2, is a view, showing a portion of the mandrel and its sliding clamp, together with a portion of the supporting bar. Fig. 3, is a detached view of the belt shifting lever, and the devices for automatically shifting the lever. Fig. 4, is a top view of the mandrel clamps, and the pivoted mandrel head, showing the tie-bars placed in proper position. Fig. 5, is a longitudinal section, showing a small portion of a mandrel, and illustrating one of the yielding retaining pins. Fig. 6, is a transverse section of a mandrel, designed and calculated for seaming, and illustrating an edge view of one of the yielding pins. Fig. 7, is a transverse section of a corrugating mandrel, showing a pipe located thereon. Fig. 8, is a transverse section, through line $x$ $x$, Fig. 1, looking toward the power end of the machine. Fig. 9, is a detached view of a stripper, designed to be used to remove the pipe from its mandrel, after the pipe has been properly seamed, also showing its bracket. Fig. 10, is a side view of the seaming die, showing the mandrel properly located, with reference to said die, and illustrating a portion of the carriage, and the machine frame together with the stripper and its bracket. Fig. 11, is a front view of the corrugating die. Fig. 12, is an edge view of the corrugating die, showing a portion of the corrugating mandrel, and illustrating a pipe properly located upon the mandrel, and partially corrugated. Fig. 13, is a detached view of the stripper, showing the same properly located, the stripper illustrated being designed to remove a finished corrugated pipe from the mandrel. Fig. 14, is a transverse section of a finished corrugated pipe. Fig. 15, is a transverse section, showing a portion of the seaming mandrel, and illustrating the position of the seaming wheel, showing said parts somewhat enlarged. Fig. 16, is a transverse section of a finished plain or common round pipe. Fig. 17, is a transverse section of a mandrel, showing the position of the corrugated pipe, and illustrating the guide wheel properly located with reference to the backing wheel. Fig. 18, is a view showing one of the pipe removing arms properly located upon its shaft, and illustrating the position of the trip-bar, and mechanism for tripping the bar, and elevating the pipe removing arms. Fig. 19, is a detached view of the mandrel supporting bracket or arm, showing said mandrel supporting arm properly located and attached. Fig. 20, is a longitudinal section of a portion of the frame illustrating the lever bracket properly attached thereto, and illustrating the position of the belt shifting lever devices. Fig. 21, is a transverse section of one of the sills and rack-bar, showing the position of one of the carriage roller brackets, and the roller properly located with reference to the bracket shown. Fig. 22, is a top view of the machine, showing the different parts in proper position, with reference to the mandrel, after the mandrel has been moved backward through the dies. Fig. 23, is a top view, showing a portion of the carriage and illustrating the mandrel turned out of alignment to receive a pipe.

The present invention has relation to sheet metal pipe corrugating and seaming machines, and it consists in the different parts and combination of parts hereinafter described, and particularly pointed out in the claims.

Similar numerals of reference indicate corresponding parts in all of the figures of the drawings.

In the accompanying drawings 1, represents the legs or standards upon which the machine proper rests, and is supported at the required height. To the top or upper end of the legs or standards 1, are securely attached in any convenient and well known manner, the bars 2, which bars are formed of a length to correspond with the length of the machine designed to be constructed. The bars 2, are

held in proper parallel position by means of suitable cross-bars and tie-rods or bolts, which parallel cross-bars and tie-rods constitute the frame of the machine proper.

To the parallel bars 2, are attached by means of suitable clamping bolts or their equivalents, the brackets 3, which brackets are located at intervals along the bars 2, and are provided with the rollers 4, said brackets and rollers being located and arranged substantially as illustrated in Figs. 1, 8, 20, and 21.

Upon the rollers 4, are located the carriage sills 5, which carriage sills are provided with the rack-bars 6, which rack-bars are formed of a length to correspond with the length of travel calculated and designed to be given to the backward and forward reciprocating carriage.

For the purpose of imparting a reciprocating movement to the carriage proper, the pinions 7 are provided, which pinions are securely attached in any convenient and well known manner to the shaft 8, said shaft and pinions so located and adjusted, that the pinions 7, will mesh with the rack-bars 6. For the purpose of communicating rotary motion to the shaft 8, said shaft is provided with the beveled gear wheel 9, which beveled gear wheel meshes with the pinion 10, which pinion 10 is securely attached to the shaft 11, which shaft is connected with the belt pulleys 12, which belt pulleys are provided with any common reverse clutch mechanism, which mechanism may be of any desired style or kind, inasmuch as the reverse mechanism forms no particular part of the present invention, except that a reverse motion must be given to the shaft 11, to carry out the operations of the machine proper, which operations are to be hereinafter described.

To the rear end of the machine is located the pivoted arm 13, which pivoted arm is attached to the bar 14, or its equivalent, which bar 14 is attached to the rear end of the carriage sills or bars 5. For the purpose of assisting in holding the parallel bars 5, in proper position, the bracket $14^a$, is provided, said bracket being also for the purpose hereinafter described. For the purpose of securely holding the various mandrels, such as 15, and the other mandrels hereinafter described in proper position, and at the same time preventing the mandrels from moving end wise, the clamps 16 and 17 are provided, which clamps may be of the form shown in Figs. 1, 2, 4, 22, and 23.

For the purpose of supporting the different mandrels, the bar $14^a$, is located directly below the clamp 17, and the set-screw 18, and upon which bar or bracket, the clamp 17 moves or slides at the time the mandrel secured by said clamp is moved out of alignment with the carriage proper, as illustrated in Fig. 23, said movement being given to the mandrel for the purpose hereinafter described.

At or about the transverse center of the machine proper is removably attached the die frame or head 19, which die frame or head is held in proper position, by means of the brackets 20, which brackets are securely attached in any convenient and well known manner to the sills 2 or their equivalents.

For the purpose of removing any particular die head, such as 19, and the different dies attached to the head the brackets 20 are provided with the grooves $22^a$, which grooves are located substantially as illustrated in Fig. 22.

It will be understood that different dies are to be employed for the formation of different sized and shaped pipes; and it will also be understood that various styles of mandrels, such as $15^a$, $15^b$, and $15^c$ are to be used for seaming and corrugating pipes, and that the mandrels and dies are to correspond with each other, with reference to the corrugating of the pipe; that is to say a particular set of dies, and mandrel are to be used to produce a particular sized or shaped pipe.

In the drawings I have illustrated various kinds of mandrels, which are to be used both for seaming and corrugating; but it will be understood that various changes, both as to size and form can be made in the mandrels and dies, without departing from the nature of my invention, inasmuch as a reciprocating carriage, and means for reversing the carriage to produce a reciprocating movement must be provided for in all instances.

In Figs. 6, 15, and 17, I have illustrated in cross section mandrels designed and calculated for compressing and finishing the longitudinal seam of a pipe; these mandrels are each provided with the ledge or flange 21, which ledge or flange extends the entire length of the mandrel, or that much of the mandrel over which the pipe is to be placed.

In Fig. 15, a portion of the seaming wheel 22 is illustrated, which seaming wheel is provided with the flange 23, which flange is so arranged that it will come opposite the ledge or flange, as illustrated in Fig. 15.

For the purpose of holding the pipe, calculated to be seamed or corrugated in proper position upon the mandrel over which the pipe is placed, the yielding pins 24, are provided, and are so located and arranged that their curved faces will extend a short distance above, or beyond the periphery of the mandrel, substantially as illustrated in Figs. 1, 5, 6, and 17. For the purpose of preventing the yielding pins 24, from interfering with the seaming wheels or corrugating dies, said pins are held in their normal position by means of the springs 25, which springs are located within the chambers 26, and around the portions or extensions 27 of the pins 24.

It will be understood that as the various mandrels are moved longitudinally through the die heads or under the different seaming wheels that the pins 24 will be pressed inward toward the center of the mandrel, thereby preventing said pins from interfering in any manner with the operation of the various dies or seaming wheels.

For the purpose of preventing the ends of the pipe from striking the pins as said pipe is slipped on and off the mandrel, the outer faces or heads of the pins 24 are curved, so as to bring ends of said pins below or on a level with the periphery of the mandrel. For the purpose of supporting the mandrel and its pipe directly below the seaming wheel, and dies, the roller 29 is provided, and located substantially as illustrated in Fig. 10.

To the die head 19 are attached in any convenient and well known manner the blocks 30, which blocks are provided with the compressing or corrugating wheels 31, which compressing or corrugating wheels are properly journaled to the blocks 30, which blocks are located and arranged substantially as illustrated in Fig. 11.

It will be understood that the periphery of the different corrugating and compressing wheels 31, should be located at an equal distance from a common center, which common center is also the center of the mandrel. In Fig. 12, the finishing wheels or dies are illustrated, said finishing wheels and dies $30^a$ being located and arranged substantially as illustrated in Fig. 12, and are for the purpose of completing the corrugating of the pipe; the front corrugating wheels or dies act only to crush or start the bending of the metal. It will be understood that the number of compressing wheels in each set are to correspond with the number of corrugations to be given the pipe.

For the purpose of providing an adjustment for the different thicknesses of sheet metal from which the pipe is made the set-screws $31^a$ are provided. It will be understood that the material for the pipes is edged for their seams and formed round in the usual manner, which process or operation has no particular reference to the present invention, except to properly formulate the material from which the pipes are seamed and corrugated.

For the purpose of providing a means for placing the pipe of skelp upon the mandrels, the various mandrels are attached to the pivoted arm 13, so that the mandrels can be swung or turned to the position illustrated in Fig. 23, after the pipe has been properly placed upon the mandrel, the mandrel and pipe or skelp are placed in the position illustrated in Figs. 1 and 22, which position brings the pipe or skelp, and its mandrel directly opposite and in line with the corrugating dies or wheels, or seaming wheel, as the case may be, which position places the pipe and its mandrel in proper position to be moved forward through the corrugating die head or under the seaming wheel.

For the purpose of properly locating and guiding the mandrel and its pipe through the corrugating die head, or under the seaming wheel, the roller $29^a$, is provided, which roller is grooved, as illustrated in Fig. 8, it being understood that the grooved roller $29^a$, is especially for the purpose of providing a guide to properly start or enter the mandrel and its pipe into the corrugating die head or under the seaming wheel.

For the purpose of starting or entering the forward end of the mandrel, and its pipe into the corrugating die or under the seaming wheel the spring 32 is provided; one end of said spring is attached to the cross-bar 33 or its equivalent, and the opposite end of said spring is attached to the rock-bar 34, which rock-bar is located substantially as illustrated in Fig. 20, and as shown in said Fig. 20, the bottom or lower end of the rock-bar is pivotally attached to the cross-bar $34^a$, or if desired said rock-bar may be rigidly attached to the cross-bar $34^a$, and the cross-bar journaled as the object of said spring can be accomplished equally as well with either construction.

To the traveling carriage is attached the downwardly extending arm 35, which arm is located substantially as illustrated in Fig. 20, and is for the purpose hereinafter described.

To the arm 36 or its equivalent is pivotally attached the operating lever 37, which lever is located substantially as illustrated in Fig. 22. To one end of the operating lever 37 is pivotally attached the rod 38, which rod extends forward to a point about midway between the belt pulleys 12, and has pivotally attached thereto the shift-bar 39, which shift-bar is for the purpose of reversing the motion of the shaft 11, it being understood that the belt pulleys 12, are rotated in opposite directions by means of one of the belts upon said pulleys, being open and the other crossed.

The downwardly projecting arm 35, is so adjusted upon the carriage, that when said carriage nears its stop as it moves backward, the arm 35 will come in contact with the rock-bar 34, and move the upper end of the rock-bar a short distance, thereby converting the spring 32, into a live spring After a pipe or skelp has been properly placed upon a mandrel, and the mandrel and pipe swung into proper position to move longitudinally, the free end of the operating lever 37, is moved directly upward and out of the notches, which notches will hereinafter be described.

To one of the sills 2, is securely attached the bracket 40, which bracket is provided with the notch 41, said notch being for the purpose of holding the operating lever 37. When the carriage is moved backward as far as it is designed to travel, the arm 42 which is attached to one of the carriage sills, and moves back and forth with the carriage will be brought into the position illustrated in Fig. 20, which position brings the notch 43, in line with the notch 41, thereby locking the carriage by reason of the operating lever dropping into the notches inasmuch as the lever 37, when brought directly over the notch 41, disengages both belt pulleys, by means of the shift bar 39, and clutch mechanism. When the operating lever 37 is elevated so as to disengage it from the notches 41 and 43, the car-

riage together with its mandrel will be moved forward toward the front or power end of the machine, by reason of the spring 32 pulling on the rock-bar 34, which moves the carriage forward sufficiently to enter the mandrel and its pipe or skelp into the die head, or under the seaming wheel, as the case may be.

After the mandrel and its pipe or skelp has been properly started or entered, the operating lever 37 is moved toward the rear end of the machine, which in turn applies power and the carriage moves forward until the pin 44, comes in contact with the free end of the operating lever 37, and moves the free end of said lever toward the front or power end of the machine, which action reverses the rotation of the shaft 11, by means of the shift-bar 39, thereby reversing the movement of the carriage and its mandrel.

For the purpose of carrying the lever 37 over the notch 41, the plate 45 is inclined upon its top or upper edge as illustrated in Fig. 20, thereby elevating the operating lever, as the plate 45 passes under said lever. It will be understood, that by means of the pin 44 and the plate 45, that one complete forward and backward movement of the carriage will be made, and said carriage come to a stop upon its backward or return movement by reason of the shoulder 46, moving the operating lever toward the notch 41, until the notch 43 comes in line with the notch 41, at which time, the operating lever 37, drops into the notches.

For the purpose of preventing the carriage sills or bars 5, from vibrating or springing as they are moved longitudinally, and at the same time forming a guide for the movements of the carriage, the bottom or under side of the sills 5, are provided, with the plates 47, which plates are formed somewhat wider than the carriage sills, and are so formed for the purpose of causing the top or upper ends of the brackets 3 to engage said plates, as illustrated in Fig. 21. If desired the rack-bars 6, may be formed separate from the plates 47, and attached to said plates in any convenient and well known manner, or the rack-bars may be formed integral with the plates 47 if desired.

For the purpose of supporting the pipe, after the mandrel has been removed as hereinafter described, and at the same time assisting in supporting the mandrel, the rollers 48 are provided, which rollers are located and arranged substantially as illustrated in Figs. 1, and 22, and are held in the desired position by means of the brackets or arms 49, which brackets or arms are attached in any convenient and well known manner to the bars 2.

For the purpose of stripping the pipe from the mandrel as the carriage moves backward, the stripper 50 is provided, which stripper is so adjusted that its front edge or face will come against the rear end of the pipe, and thereby prevent the pipe from moving with the mandrel. The stripper 50, is attached to the brackets or arms 51.

In Fig. 13, the stripper 52 is somewhat modified from that shown in Fig. 9, but it is for the same purpose, and is pivotally attached at its top or upper end to the arms 53. The strippers are so adjusted that as the mandrel and its pipe moves under the strippers or stripper, the thickness of the pipe will cause the stripper to be moved as indicated in the dotted lines, Fig. 10, when the rear end of the pipe has passed the stripper, it will assume the position illustrated in Fig. 10, which position brings it into operative place.

For the purpose of providing a means for removing the pipe from the machine proper, after the mandrel has been withdrawn from said pipe, the arms 54 are provided, which arms are securely attached at their bottom or lower ends to the shaft 55, which shaft is properly journaled to one of the bars 2, and for the purpose of adjusting the length of the arms 54, the extensions 56 are provided, which extensions are adjustably attached by means of the clamping bolts 57 and the slots 58. The normal positions of the arms 54, is that indicated by the dotted lines Fig. 18, which brings the arms below the pipe.

To one of the carriage sills 5 is attached the inclined block 59, which inclined block is adjusted upon the carriage sill, that when the carriage has moved backward, and withdrawn the mandrel from the pipe, said inclined block will engage the roller 60, which roller is attached to the top or upper end of the trip-bar 61, thereby depressing said trip-bar and causing the bottom or lower end of said trip-bar to act upon the arm 62, which arm is attached to the shaft 55, and slightly rotate said shaft, which in turn elevates the arms 54, thereby elevating the pipe and causing it to roll or fall to the side of the machine. After the inclined block 59 has been released from the roller 60, the arms 54 will assume their normal positions by gravity. The arms 54 are bent so as not to interfere with the movements of the carriage.

For the purpose of properly gathering the corrugations of the pipe, and at the same time provide a means for easily placing the pipe upon the mandrel, and removing it from the mandrel, the corrugating flanges or ridges 63 (see Fig. 7) are located somewhat closer together than the corrugating flanges 64. It will be understood that by locating the flanges or ridges 63 and 64 as above described, that all of the corrugations of the pipe will be equal and alike; the flanges 63 being located closer together than the flanges 64, so as to compensate for the gather of the metal, and prevent a greater amount of metal from being gathered in the seam groove corrugations, than is gathered in the corrugations having no seams, and thereby prevent the seam corrugations from expanding beyond the width of the seamless corrugations thereby leaving all the corrugations equal.

For the purpose of adjusting the guide wheels 65 and 70, the arm 66 is provided, and is adjusted by means of the screw-threaded shaft 67, and the wheel 68, which screw-threaded shaft is held in proper position by means of the yoke 69, and is held at the desired point of adjustment by means of the jam nut $69^a$.

For the purpose of supporting the pipe during the time the seam is grooved by means of the seaming wheel $70^a$, the roller 71 is provided, and may take the place of the roller $29^a$. It will be understood that by providing the spring 32, said spring will act as a cushion, as the carriage is brought to a stop upon its return movement.

For the purpose of supporting a mandrel, when it is swung as illustrated in Fig. 23, the arm 72 is provided, which arm is provided with the roller 73, said roller being for the purpose of reducing the friction, as the pipe or skelp is placed on the mandrel. It will be understood that the clamp 16, should be securely bolted or otherwise attached to the arm 13 or its equivalent, to prevent said clamp from moving longitudinally.

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

1. In a sheet metal pipe corrugating and seam grooving machine, a frame or bed, having located thereon a reciprocating carriage provided with a swinging mandrel, substantially as and for the purpose specified.

2. In a sheet metal pipe corrugating and seam grooving machine, a bed or frame, having removably attached thereto a die head, provided with suitable dies, said frame having mounted thereon, a reciprocating carriage provided with a swinging mandrel, substantially as and for the purpose specified.

3. In a sheet metal pipe and seam grooving machine, a reciprocating and laterally swinging mandrel provided with yielding retaining pins, and dies, substantially as set forth.

In testimony that I claim the above I have hereunto subscribed my name in the presence of two witnesses.

THOMAS C. BELDING.

Witnesses:
J. M. SHIEFFLER,
F. W. BOND.