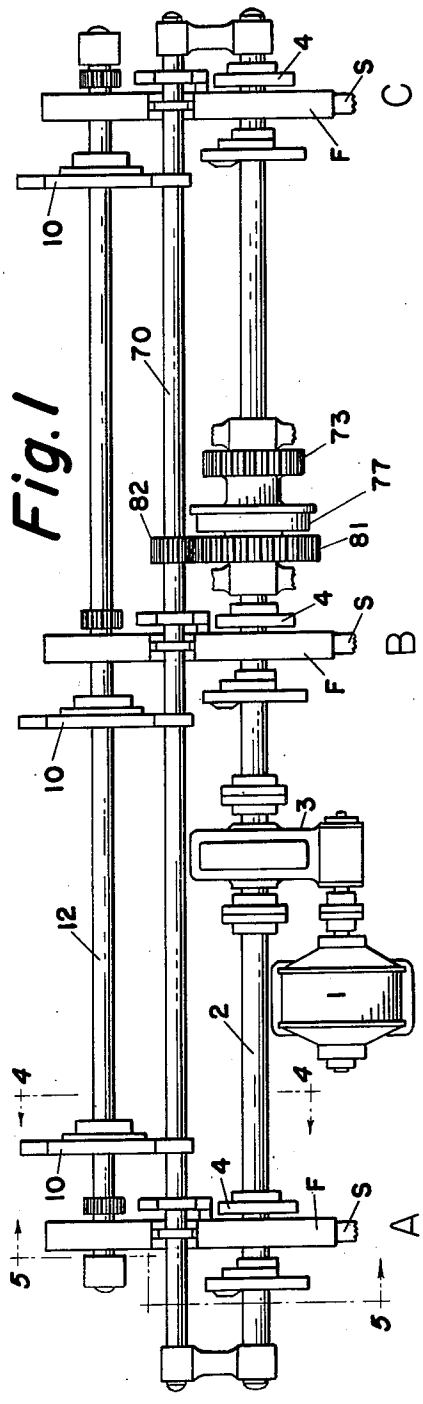
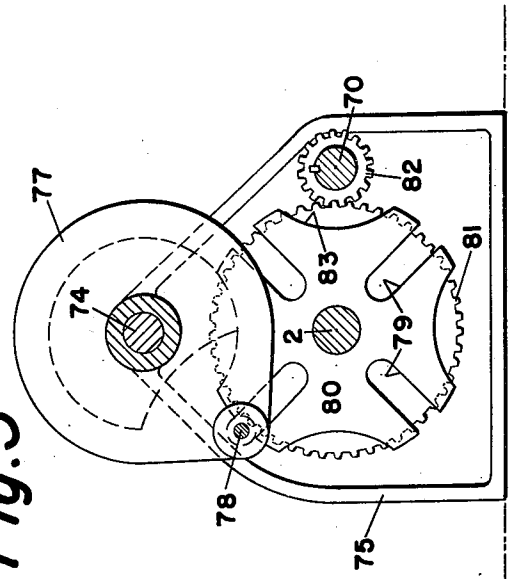
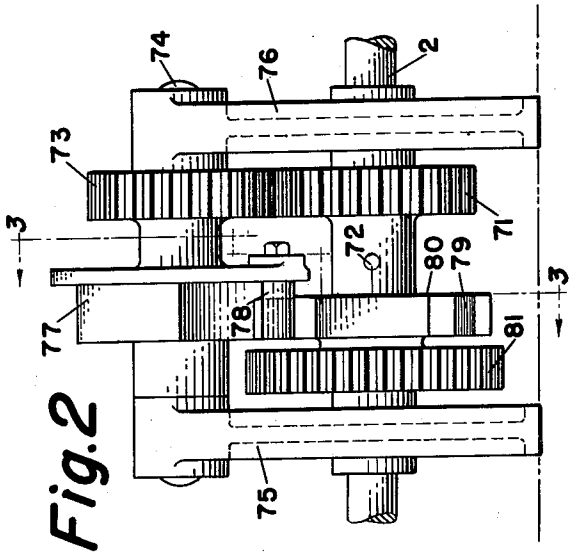
May 13, 1952 G. E. MIRFIELD 2,596,862

APPARATUS FOR BUNDLING PIPES, BARS AND THE LIKE

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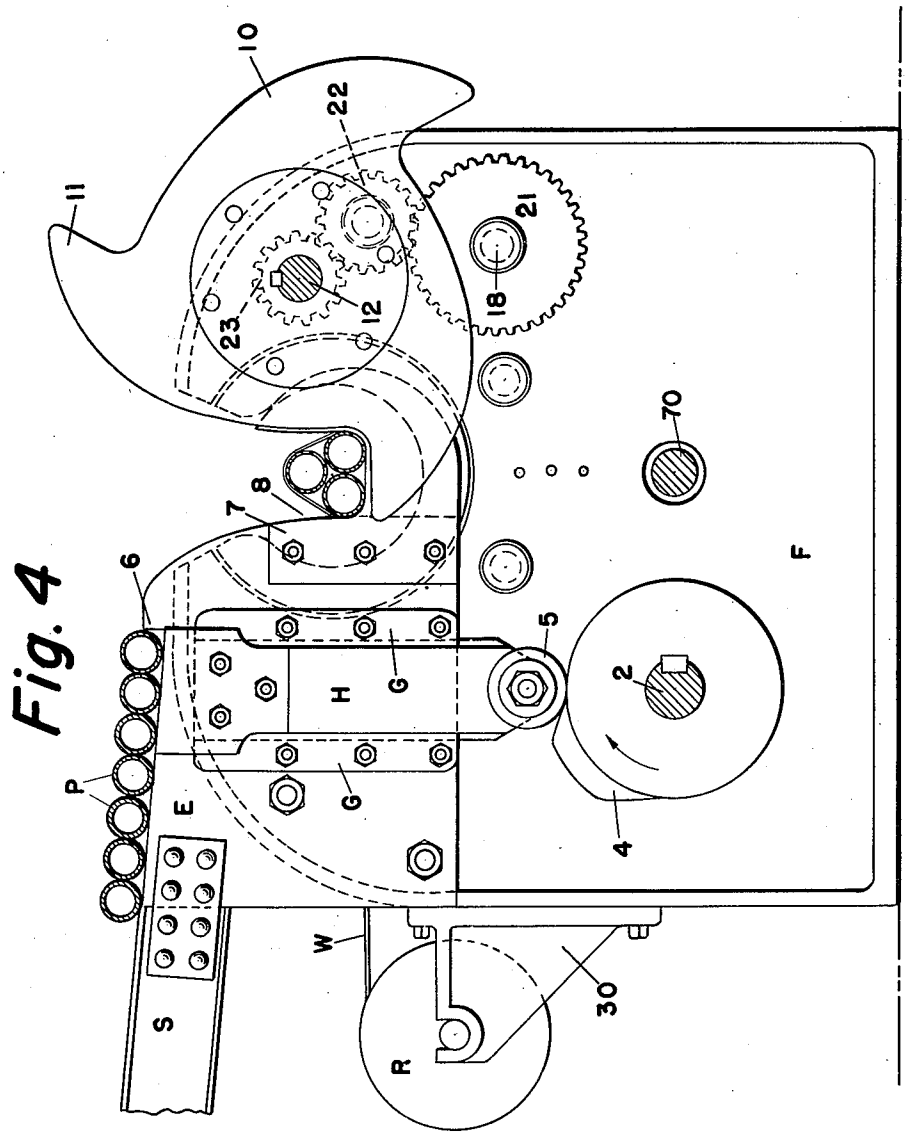
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APPARATUS FOR BUNDLING PIPES, BARS AND THE LIKE

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Fig. 4



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Fig. 9

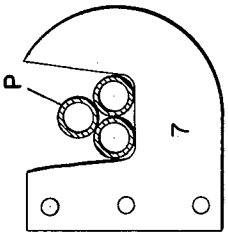
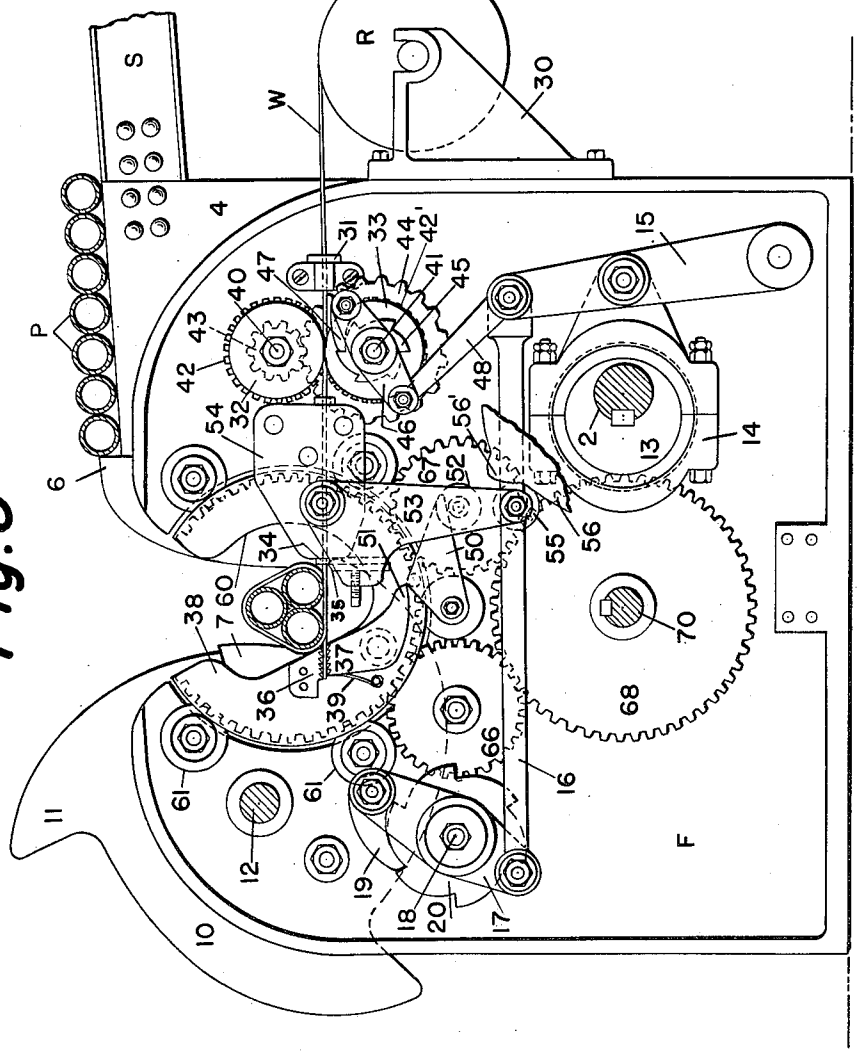


Fig. 5



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APPARATUS FOR BUNDLING PIPES, BARS AND THE LIKE

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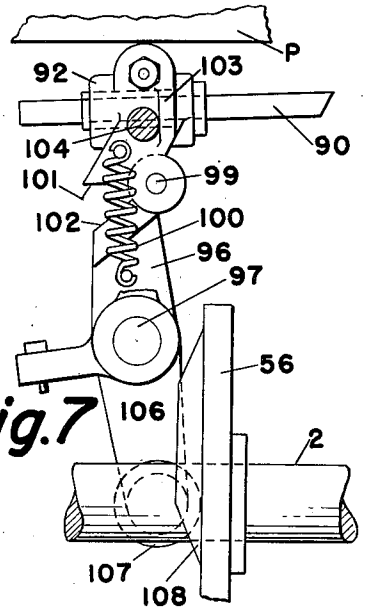
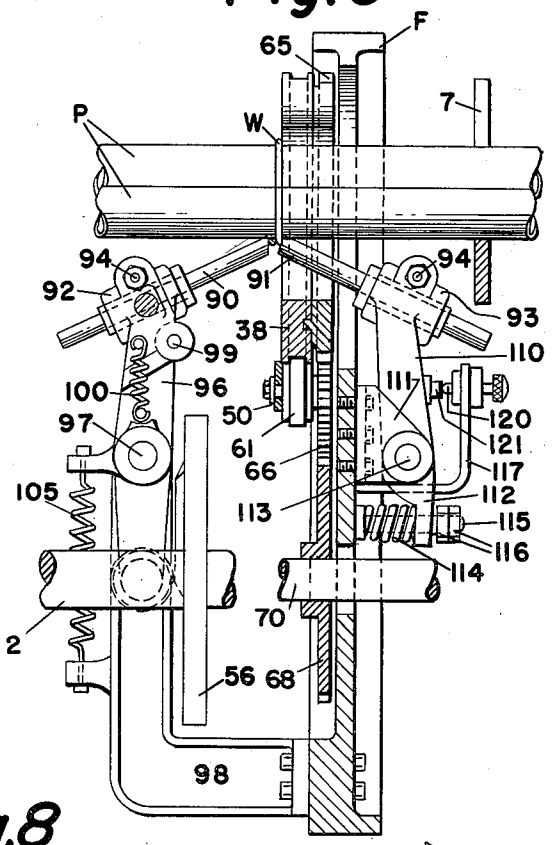


Fig.7

Fig.6



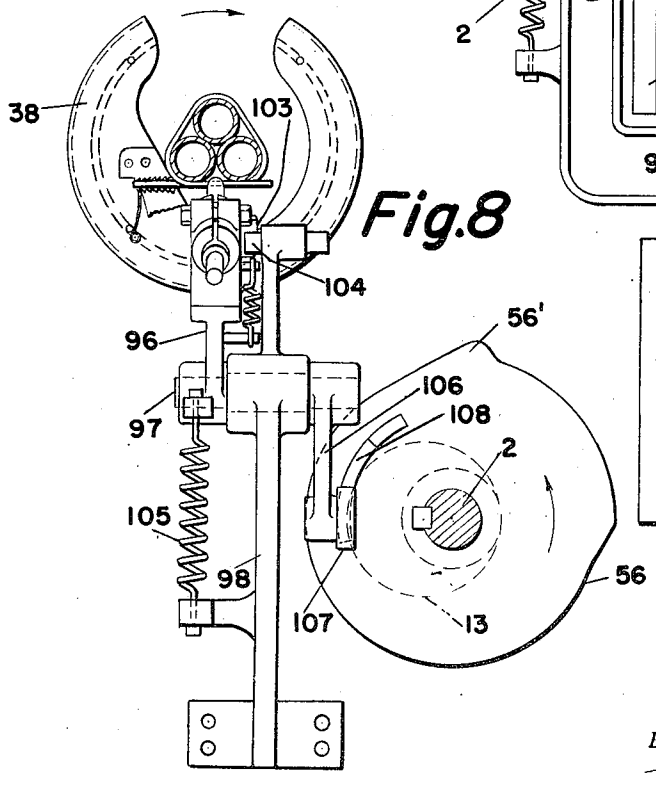


Fig.8

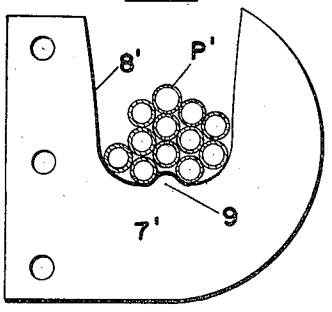


Fig. 10

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APPARATUS FOR BUNDLING PIPES, BARS AND THE LIKE

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Fig. 11

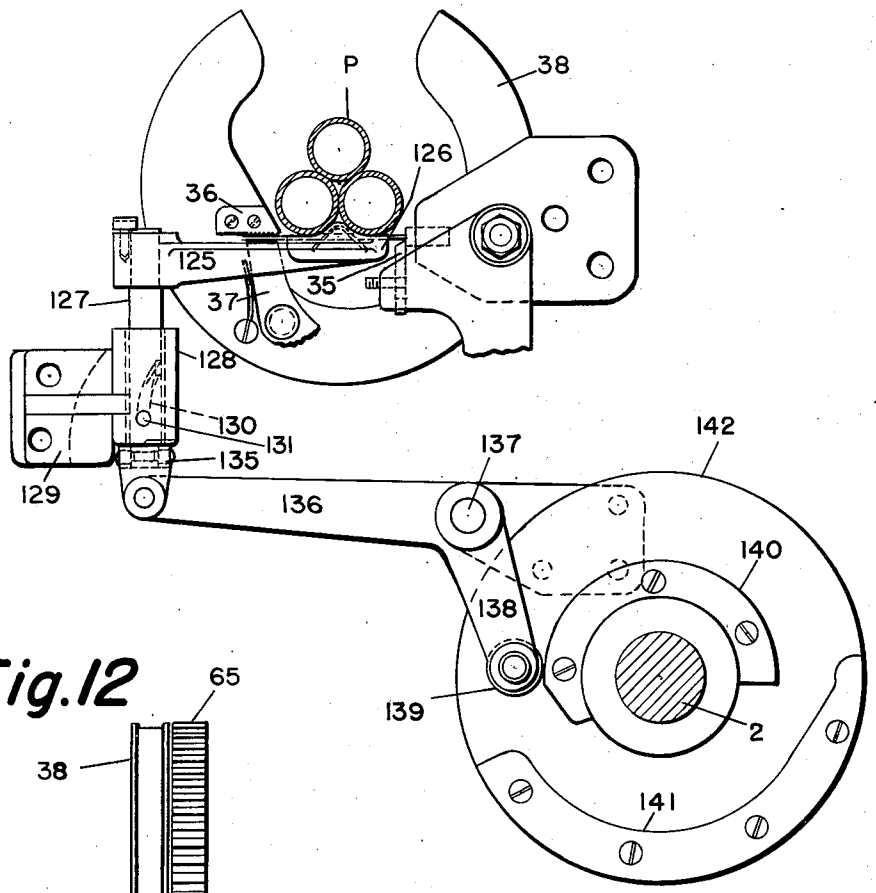


Fig. 12

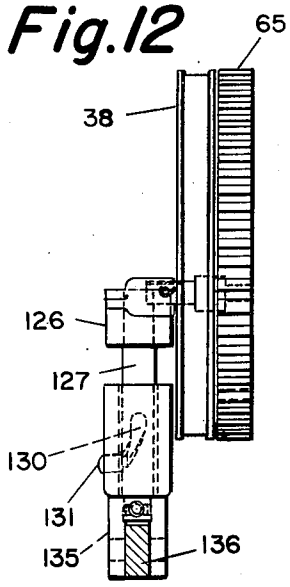


Fig. 13

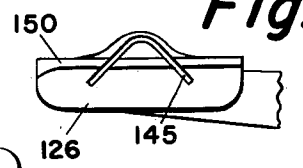
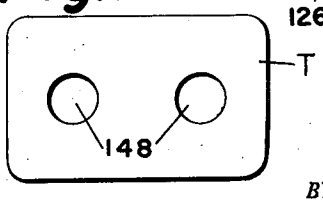


Fig. 14



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UNITED STATES PATENT OFFICE

2,596,862

APPARATUS FOR BUNDLING PIPES, BARS, AND THE LIKE

George E. Mirfield, Youngstown, Ohio; Thomas W. Craver executor of said George E. Mirfield, deceased

Application July 1, 1949, Serial No. 102,490

8 Claims. (Cl. 100—31)

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This invention relates to forming pipes, tubes, bars, rods and the like, hereinafter generically designated pipe, into bundles for convenient handling, shipment and storage and is especially directed to the provision of a machine for automatically forming into bundles and firmly securing together a predetermined number of individual pipes after they have been automatically segregated by the machine from an indefinite number supplied to it, the machine being adapted for forming into similar bundles in the same manner a substantially continuous succession of pipes for as long as it is being operated.

In pipe mills it has heretofore been the practice for a crew of men to perform with the aid of suitable mechanical apparatus the various operations incident to bundling pipes which following segregation of a predetermined number of them in a trough include manually passing a loop or bight of wire around the bundle and twisting its ends together at each of a number of stations, usually one adjacent each end and one at approximately the longitudinal center of the bundle. To enable the wire to be readily manipulated in this fashion it must be of a gauge permitting it to be manually twisted in a tight tie and the ties are frequently broken or become loose on the bundle after they have been formed and the bundle must then be tied again.

A machine for performing certain of the operations incident to bundling pipes is disclosed in U. S. Letters Patent 2,387,658, granted October 23, 1945, to Irving B. Gruber et al., and includes mechanism for automatically wrapping a wire around a bundle of pipe and then twisting its ends together to form a tie and while this machine may permit the use of somewhat stronger wire than can be satisfactorily secured manually about a bundle of pipe the severe twisting of the wire incident to making the tie may so weaken it that it is readily broken during subsequent handling of the bundle.

In accordance with the present invention, however, the wire used in tying a bundle of pipe is not twisted to hold its ends together, but after being wrapped about the pipe is permanently welded to firmly secure its ends thereby minimizing the likelihood of the bundle being accidentally broken open.

It is therefore a principal object of the invention to provide an automatic machine for wrapping and securing about a predetermined number of pipes formed into a bundle a tightly drawn wire having end portions welded together for permanently holding the pipes in the bundle until the wire is severed.

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A further object is to provide in a machine of this character a plurality of mechanisms the operation of which is so synchronized as to enable the rapid bundling of pipe by progressive automatic operations which include welding together overlapped portions of a piece or a plurality of spaced pieces of wire wrapped around the pipe to form a tie devoid of sharp twists or other weakening strains in the wire whereby the frequency of accidental breakage of bundle ties is substantially reduced.

A still further object is to provide a machine embodying mechanism for automatically applying to a wire tie on a bundle of pipe a distinguishing tag which may bear suitable indicia indicating the origin, grade, size or the like of the pipes in the bundle.

Other objects, purposes and advantages of the invention will hereafter more fully appear or be understood from the following description of a preferred embodiment of it shown in the accompanying drawings in which:

Fig. 1 is a fragmentary diagrammatic top plan view showing the general organization of the machine and the relative positions of its principal elements but omitting certain of the parts illustrated in subsequent figures.

Fig. 2 is a fragmentary front elevation on a larger scale of a portion of the driving and shuttle synchronizing and actuating mechanism embodied in the machine.

Fig. 3 is a staggered vertical section on the line 3—3 in Fig. 2 on the same scale as said figure.

Fig. 4 is a fragmentary vertical section of the machine on substantially the same scale as Figs. 2 and 3 taken on the line 4—4 in Fig. 1.

Fig. 5 is a staggered fragmentary vertical section on the line 5—5 in Fig. 1.

Fig. 6 is a fragmentary detail partly in vertical section and partly in front elevation illustrating certain of the apparatus embodied in the machine but omitted from the preceding figures to facilitate representation of the mechanism shown therein.

Fig. 7 is a fragmentary front view on a somewhat larger scale corresponding to a portion of Fig. 6 but showing certain of the parts in different positions.

Fig. 8 is a fragmentary end elevation of certain of the parts shown in Fig. 6.

Fig. 9 is a view in elevation showing apart

from the machine the pipe holding chuck also illustrated in some of the preceding figures.

Fig. 10 is a generally similar view of a chuck of modified form especially designed for holding pipes of smaller diameter.

Fig. 11 is a fragmentary end elevation on a larger scale than the preceding figures particularly illustrating mechanism for applying identifying tags to the pipe bundles.

Fig. 12 is a fragmentary front elevation of the mechanism illustrated in Fig. 11.

Fig. 13 is a fragmentary detail of the tag holding head employed in the mechanism shown in the two preceding figures and on a somewhat larger scale, and

Fig. 14 is a face view of a typical tag such as may be applied to a pipe bundle with the aid of the mechanism illustrated in Figs. 11 to 13 inclusive.

It will be appreciated that to facilitate ready comprehension of the machine and to avoid undue complication of the drawings as a whole, in the several figures many of the parts are shown separately from others with which they are in reality associated but with sufficient of the latter included to make clear their organized relationship therewith. Thus for example the welding mechanism illustrated in Figs. 6–8 is not shown in the other figures which would be unduly complicated thereby; likewise the tag applying mechanism illustrated in Figs. 11–13 is omitted for the same reason from the remaining figures and such omissions are therefore to be construed as merely for convenience in illustration and not as indicating that when the machine is in operative condition any of said parts must be removed from it to enable the remaining parts to perform their normal functions.

General operation

It will facilitate a ready understanding of the invention to consider first the several steps performed by the machine in their normal sequence with but limited refreence to the structure of the various parts embodied in it or to their specific individual functions and operation. Thus in general the machine comprises a plurality of wrapping or tying stands of which three may be employed when it is desired to apply ties to a bundle of pipe adjacent each of its ends and adjacent its longitudinal center line and these stands, which are substantially identical and designated A, B and C in Fig. 1 are supplied with operating energy desirably from a single motor 1 driving a main shaft 2 through a speed reducer 3, the shaft 2 extending the entire length of the machine and carrying suitable cams, gears and the like for actuating the parts in their normal operative sequence, the machine completing the cycle of operations resulting in formation of a single bundle of pipe during each revolution of the shaft 2. This cycle may begin after a plurality of pipes have been deposited by any suitable means on inclined skids disposed adjacent the front of the machine at an angle to induce pipes to roll by gravity inwardly toward its center in orderly succession in a single layer until the leading pipe encounters a stop, each succeeding pipe following until its further travel is interrupted by contact with the then stationary preceding one.

At the initiation of the bundling cycle a predetermined number of the pipes, beginning with the one engaging the stop, are lifted from the plane of the skids to free them from the stop

and allow them to roll by gravity into suitable chucks, of which one is disposed at each tying station, where they automatically fall into an appropriate relation to each other for application of tying wires. After the pipes have settled in the chucks the end of a tie wire is passed around them at each tying station from a roll of wire positioned adjacent thereto and brought into juxtaposition with the standing part of the wire after being wrapped completely around the bundle. Welding electrodes are then brought into engagement with the wires from opposite directions and welding current passed between them to form a weld firmly securing the end portion of the wire to the standing part. The latter is then severed from the wire supply and the bundle, now firmly tied together, is ejected from the machine as the pipes selected for the succeeding bundle are introduced into it.

While not essential to the bundling operation the machine also includes mechanism for applying to the wire as it is fed to position for being passed around the pipe bundle a perforated metal or other suitable tag through the holes in which the wire is automatically passed as it is fed to the mechanism which carries its leading end around the bundle so that after the wrapping and welding of the wire the tag remains strung on the tie wire and serves to identify the bundle in accordance with the indicia impressed upon it.

More particularly the machine may be considered as embodying a plurality of mechanisms respectively adapted for the performance of distinct but interrelated and coordinated functions and these mechanisms first will be described with reference to their several progressive operations as those (*a*) for handling the pipe, (*b*) for feeding and (*c*) for wrapping the tying wire, (*d*) for welding the latter and (*e*) for applying a tag thereto, and it will be understood that the timing of the operations is so coordinated throughout the cycle as to result in the bundling of pipe automatically at a relatively high rate of speed with practically no participation by attendants.

Pipe handling mechanism

As has been mentioned, the pipes are first deposited on the skids S of the machine by a crane or the like, the skids being inclined downwardly toward the center of the machine with their pipe receiving top surfaces respectively aligned with adjacent inclined upper edges of plates E of which one projects upwardly from a frame F at each stand. Each frame F also supports in guides G bolted to it elevator mechanism comprising a pipe selector H operated by a cam 4 keyed on the main drive shaft 2 and engaging a roller 5 rotatable on the lower end of the selector H the upper end of which is normally aligned with the skids S and the upper edge of plate E. When the cam 4 lifts the selector however, the latter carries a predetermined number of the pipes upwardly with it until they have been raised above the adjacent edge of a stop 6, over which they then roll downwardly into a chuck 7 removably bolted to the frame F and providing a pocket 8 for the reception of the pipes. The machine is shown in the drawings equipped with chucks 7 adapted to receive for bundling relatively large pipes P of which only three are formed into each bundle but for pipes of materially smaller diameter chucks of slightly different form may be substituted therefor and in Fig. 10 there is illustrated

a chuck 7' designed for the reception of much smaller pipes P' and provided with a projecting boss 9 in the bottom of its pocket 8' which holds the center pipe at the bottom of the bundle slightly above the plane of the adjacent bottom pipes for a purpose which will hereinafter appear. It is of course apparent the pocket 8 in the chuck 7 can be of any desired shape other than as illustrated so as to make bundles of various forms, for example, four pipes in a square bundle.

After the pipes have been positioned in the chucks and the wire wrapped around them, welded and cut off, the finished bundle is ejected from the chucks while the pipes which are to form a succeeding bundle are being delivered toward them. This ejection is effected by operation of ejector disks 10 of which one is disposed adjacent each stand and provided with projecting fingers 11 preferably three in number whereby through ⅓ of a revolution of the disk the bundle is lifted out of the chucks and deposited at the rear of the machine. The disks 10 are supported on a shaft 12 which extends the full length of the machine and is driven from the main driving shaft 2 through an eccentric 13 keyed to the latter and operating a strap 14 pivoted to lever arm 15 which actuates a horizontal connecting rod 16 the projecting end of which is pivoted to a ratchet lever 17 supported from the frame F on a stub shaft 18. The ratchet lever 17 carries a pawl 19 adapted to engage a ratchet wheel 20 keyed on the shaft 18 to drive therethrough a spur gear 21 on the other side of the frame meshing with an idler gear 22 which in turn drives a pinion 23 on shaft 12. The eccentric 13 and strap 14 cause the connecting rod 16 to reciprocate once during each revolution of the shaft 2 and the pawl 19 and ratchet wheel 20 are desirably proportioned to turn the shaft 18 through sixty degrees of arc in one direction only during each reciprocation of the rod. The ratio between the gear 21 and idler 22 is 2:1 however, and the idler is in 1:1 relation to pinion 23 whereby during each rotation of the main shaft 2 the disks are rotated ⅓ revolution or 120°, this ⅓ revolution occurring entirely during 180° of revolution of the main shaft 2, shaft 12 and the ejector disks remaining idle during the succeeding 180° revolution of the main shaft while the pawl 19 is being retracted to engage a succeeding tooth of the ratchet wheel 20. When the disks 10 are rotated 120° to eject a bundle of pipe supported by one finger 11 of each disk the succeeding finger thereon is being rotated to position substantially aligned with the bottoms of the chuck pockets 8 preparatory to ejecting a succeeding bundle after it has been completed during the 180° of revolution made by shaft 2 following this rotation of the ejecting disks.

Wire feeding mechanism

Adjacent each stand a reel R of tying wire W is supported in any convenient way as on a suitable bracket 30 secured to the frame F and when the machine is first set up or a new reel of wire supplied to it the leading end of the wire is fed manually through a tensioning guide 31 and between a pair of feeding rolls 32, 33 from which it passes through a shearing guide 34 adjacent the exit end of which is positioned a mechanically operated shear blade 35. Beyond the guides but aligned therewith when the wire is being fed forward by the feeding rolls is a pair of serrated wire grip jaws 36, 37 mounted on a revoluble shuttle 38 hereafter more fully described; one gripper jaw 36 is relatively stationary with respect to the shuttle while the other jaw 37 is pivoted to it and under the bias of a spring 39 is urged toward wire gripping relation with the stationary one, their opposed serrated faces being accordingly so formed and related to the pivot of the movable jaw 37 as to hold the wire securely and to bite into it with increasing pressure as tension on the wire is increased. Thus as the shuttle 38 carrying the jaws with a wire end gripped between them is actuated to pass the wire end about the pipe bundle additional wire is drawn through tensioning guide 31 which is therefore adjusted to control the tightness with which the wire is wrapped about the bundle.

The wire feeding rolls 32, 33, are supported from the frame F on parallel shafts 40, 41 and to these rolls are secured companion spur gears 42, 42' whereby the rolls are constrained to rotate in unison and at the same speed when either one of them is driven or the wire is being drawn between them as it is wrapped around the bundle. For actuating the feed rolls 32, 33 at the proper time during the machine cycle the upper roll 32 and its attached spur gear 42 are rotatable with shaft 40 which also carries a pinion 43 meshing with a gear 44 on shaft 41 and containing a roller ratchet (not shown) which may be of any suitable type adapted for driving the gear 44 from the shaft when the latter is driven counterclockwise in Fig. 5 but allowing the gear to be rotated in the same direction without moving the shaft when the latter is stationary. The shafts 40, 41 are journaled in suitable bearings carried by the frame F, the shaft 41 being provided with a ratchet wheel 45 and a lever 46 to one end of which is pivoted a pawl 47 for turning the ratchet wheel and shaft 41 when the lever is actuated. The other end of the lever 46 is pivoted to a connecting rod 48 which is in turn pivoted to the lever arm 15 so that when the latter is reciprocated, as heretofore described, the ratchet wheel 45 is turned in synchronism with the actuation of the pipe bundle ejecting disks and thereby rotates the wire feeding rolls to feed a predetermined length of wire forward into the machine while the disks are ejecting a bundle carrying a preceding length of the wire. Preferably the parts are so proportioned that the ratchet wheel 45 is rotated one tooth space during each reciprocation of the lever arm 15 and the resulting rotation of the feed rolls is adequate to feed the wire end forward from the shearing guide 34, after severing by the blade 35, to the gripping jaws 36, 37 or even perhaps a little beyond them to insure their obtaining a firm grip upon it. During this operation the jaws are held open by means of a pivoted lever 50 carried by the frame and engaging a toe 51 on the movable jaw 37, this lever projecting into engagement with a roller 52 rotatable on a shear arm 53 which is pivotally supported from the wire guide housing 54 and also carries the shear blade 35. A cam follower 55 on the shear arm 53 and a cam 56 rotatable with the main drive shaft 2 actuate this arm in timed relation to the machine cycle and the cam is so formed that when its highest part 56' first encounters the cam follower the arm is rotated on its pivot sufficiently to cause the shear blade 35 to sever the wire projecting through the shearing guide 34 and simultaneously to release the wire end from the gripper jaws. Thereafter, on further rotation of the cam 56, the shear blade is retracted from the path of the new wire end to permit the latter to be fed through guide 34 into the wire gripping jaws which for this purpose

are held partially open through the action of cam 56 for a suitable period after retraction of the shear. Thereafter the cam allows the shear arm to further retract and permits the spring 39 to move the movable gripping jaw 37 into snug engagement with the wire end where it is retained during the ensuing bundling operations and until on completion of the cycle the gripping jaws are again opened to release it.

Wire wrapping mechanism

The shuttle 38 to which reference has been made as supporting the wire gripping jaws 36, 37 is designed and suitably mounted in the machine to carry the wire end around a bundle of pipe P positioned in the chucks 7 as it makes one complete revolution about the bundle axis. It is therefore shaped to provide a trough 60 extending inward from its otherwise generally circular periphery and subtending preferably not more than 60° of arc to afford clearance adjacent its axis permitting its rotation about the pipes in the chuck. The outer edge of the shuttle is grooved to receive a plurality of supporting rollers 61 carried by the frame F which are circumferentially spaced about the shuttle axis at 60° of arc to provide adequate support for the shuttle as it rotates and its trough successively passes the several rollers.

Secured to one face of the shuttle and interrupted congruently with it is a substantially annular spur gear 65 by which the shuttle is driven to rotate it one complete revolution during each cycle. To effect its drive a pair of idler gears 66, 67 rotatable on studs carried by the frame F are spaced circumferentially not more than 60° of arc with respect to the shuttle axis so at least one is always in mesh with the interrupted gear 65 and both idler gears are driven from a gear 68 of the same pitch diameter as the interrupted gear 65, gear 68 being keyed on a shaft 70 which extends the entire length of the machine and thus drives a similar gear at each stand. While this shaft 70 is actuated in such manner as to cause it to make a complete revolution and hence to turn the shuttle once about the bundle axis during every revolution of the main drive shaft 2, the rotation of shaft 70 nevertheless is intermittent and at a substantially higher rotational rate than that of shaft 2 so that a complete revolution of the shuttle is accomplished during 90° of revolution of the latter while during the remaining 270° thereof the shuttle is at rest.

This intermittent drive of the shuttle actuating shaft 70 is effected through mechanism particularly illustrated in Figs. 2 and 3 and includes a spur gear 71 secured to the main drive shaft 2 as by a pin 72 and meshing with a second gear 73 of the same pitch diameter rotatable on a short shaft 74 extening parallel to the main drive shaft 2 and supported on pedestals 75, 76 which may also provide journals for the main shaft. The second gear 73 is fixed to a plate 77 carrying a pin 78 and forming one element of a Geneva movement, the pin 78 being adapted to engage successively in the slots 79 of a star wheel 80 mounted on but rotatable about shaft 2, the star wheel driving a gear 81 also rotatable on said shaft and meshing with a pinion 82 on the shuttle driving shaft 70. As the star wheel 80 is provided with four slots 79 and intermediate concave arcuate lands 83 complementary to the convex peripheral edge of the plate 77 aligned with pin 78 the star wheel rotates through 90° each time the pin enters a slot 79 therein and pursuing its normal arcuate course thereafter is disengaged therefrom while drive shaft 2 is making a quarter turn during each of its revolutions, the lands 83 engaging the plate 77 to hold the star wheel stationary until the pin again engages it in the succeeding slot. Accordingly, as the shuttle 38 must make a complete revolution about its axis while the main drive shaft 2 is rotating through the 90° of arc corresponding to engagement of the pin 78 in a slot 79, the gear 81 and pinion 82 are proportioned in a 4 to 1 ratio so that during each quarter turn of the star wheel and hence of the gear 81, the pinion 82 and shuttle driving shaft 70 rotate through a complete revolution and correspondingly turn the shuttle one revolution about the pipe bundle thus carrying the wire end, held by the gripping jaws, entirely around the bundle and overlapping it with respect to the standing part of the wire, the wire tensioning guide meanwhile controlling the tension of the wire as the shuttle travel draws additional wire from the reel.

During this operation the roller ratchet in the wire feed roll driving gear 44 allows the rolls 32, 33 to rotate freely in the direction the wire is drawn between them and the positions of the wire feed ratchet wheel 45 and its actuating pawl 47 which remain stationary during the rotation of the shuttle 38 are unaffected by the amount of wire drawn out. Thus the wire feeding mechanism always operates to feed a predetermined length of wire, no matter what length thereof was required to tie the preceding bundle and hence drawn out by the shuttle in passing its end around the bundle.

Welding mechanism

As illustration of the welding mechanism in Figs. 4 and 5 would obscure certain other parts of the machine and render more difficult comprehension of their structure and operative association, the said mechanism is shown in Figs. 6, 7 and 8 only but in proper relation to certain other parts heretofore described from which its relation to the machine as a whole will be apparent.

Essentially the welding mechanism comprises a pair of electrodes disposed at opposite sides of each frame F and adapted at the appropriate point in the cycle to engage thet ie wire after its end has been wrapped around a bundle of pipes by the shuttle and overlapped with its standing part and to press these adjacent portions of the wire tightly together at the bottom of the bundle and a current is then passed between the electrodes transversely through the wire parts to weld the latter securely together.

The electrodes 90, 91 are supported respectively in split electrode holders 92, 93 on opposite sides of the frame F and are adjustable longitudinally therein on loosening clamping bolts 94 to allow compensation for wear. The electrode holder 92 to the left in Fig. 6 and shown on a larger scale in Fig. 7 in different position is mounted on an arm 96 secured to a shaft 97 carried by a bracket 98 bolted to the frame F. This arm is articulated at a pivot 99 which allows the holder 92 and the upper part of the arm to swing relatively to its lower part and to the shaft 97 in one direction against the bias of a spring 100, complementary plane bearing surfaces 101, 102 on the arm parts limiting their relative movement in the opposite direction. A dog 103 projects from the upper arm part for engagement with a stop 104 fixed to the bracket 98 to limit relative movement of said part

counter-clockwise in Figs. 6 and 7 when the lower arm part moves in said direction about the axis of shaft 97 under the bias of a suitably disposed spring 105, the dog and stop thereby swinging the holder and upper arm part to the position indicated in Fig. 7 for a purpose which will hereafter appear. On the opposite side of the bracket the shaft 97 also carries a cam arm 106 supporting a cam follower 107 engageable with a face cam 108 conveniently a part of cam 56 driven by shaft 2 and in the proper relation to the edge cam surface thereof which operates the wire shear and gripping jaws, to cause the electrode arm to move clockwise in Figs. 6 and 7 and thus bring the electrode 90 into engagement with the tie wire at the proper point in the machine cycle to press the overlapped wires together and effect a weld just prior to the severing of the standing part of the wire and release of its free end by the gripping jaws preparatory to ejection of a finished bundle from the machine.

The other electrode holder 93 is carried by an arm 110 pivoted to a bracket 111 on the opposite face of the frame F and an extension 112 of the arm below its pivot 113 is engaged by a compression spring 114 which surrounds a stud 115 projecting from the frame through the spring and arm extension 112, the stud receiving lock nuts 116 which afford an adjustable stop to limit movement of the arm under the bias of the spring. On an extension 117 of the bracket 111 is an electrical contact 120 adapted to be engaged by a second contact 121 on the arm when the latter is moved clockwise in Fig. 6 against the bias of the spring, contact 120 being connected to one pole of a welding current source by a suitable conductor (not shown). Lock nuts 116 and contact 120 are preferably so adjusted that the end of electrode 91 lies closely adjacent the wires when the electrode supporting arm extension 112 is in engagement with the inner lock nut 116 and limited motion of the arm from this position causes the movable contact 121 on the arm to engage the fixed contact 120 on the bracket to complete the welding circuit, electrode holder 92 of course being suitably connected to the opposite pole of the current source. The wires yield slightly in directions longitudinally of the pipe before they are welded together when the electrode 90 is projected by operation of face cam 108 toward the position shown in Fig. 6 and it pushes them against the end of electrode 91 to move it sufficiently to complete the circuit through contacts 120, 121 whereupon the current passes from one electrode to the other through the overlapped wires to complete a weld as they are thus pressed tightly together between the electrodes.

The current of course may be controlled as by suitable relays or other instrumentalities to time its passage, although if no such means are employed the cam 108 controls the timing, since after it has passed cam follower 107 the spring 114 can act on the electrode arm 110 to break the circuit between contacts 120 and 121.

As shown in Fig. 8 when a bundle comprising three large diameter pipes P is positioned in the machine they in section define substantially an isosceles triangle having a void at the center of its base where the wire parts overlap into which ends of the electrodes partially project to make good contact with the wire, but without touching the pipes. When a plurality of considerably smaller pipes P' are being bundled however, I prefer to employ chuck 7' substantially of the form illustrated in Fig. 10 in which boss 9 at the bottom of its pocket 8' is aligned with the spaces occupied by the ends of the electrodes to keep the pipes P' clear of the latter during the bundling operation.

Tag applying mechanism

Reference has been made to means which preferably are incorporated in the machine for applying a tag to the tie wire as a bundle of pipe is being wrapped, the mechanism I have devised for this purpose being particularly illustrated in Figs. 11–13. Essentially it comprises an arm 125 carrying a tag positioning head 126 and supported from a shaft 127 mounted in a sleeve 128 secured by a bracket 129 to the frame F. The shaft is provided with a sinuous slot 130 in which a pin 131 carried by the sleeve engages whereby when the shaft is raised or lowered axially in the sleeve it is simultaneously rotated through a partial revolution to carry the head 126 along a spiral path into or from the vicinity of the wrapping mechanism.

For shifting the shaft axially to effect this action its lower end is grooved to receive a swivel collar 135 pivoted to one arm 136 of a crank supported on a pivot 137 projecting from the frame F, the other arm 138 of the crank carrying a cam follower 139 engageable with cam surfaces 140, 141 on a cam 142 carried by shaft 2, cam surfaces 140 and 141 being designed to move the crank in opposite directions respectively to raise and lower shaft 127 and thereby swing head 126 upwardly and inwardly or outwardly and downwardly with respect to the shuttle 38 in timed relation to the other operations in the cycle. The head 126 is provided with an arched slot 145 into which a tag such as the tag T (Fig. 14) made of thin metal and provided with holes 148 may be inserted after the tag has been bent to conform substantially to the shape of the slot. Extending transversely across one face of the head 126 and aligned with the holes 148 in the tag when the latter is positioned in slot 145 is a wire receiving groove 150 the sides of which extend at an angle to the horizontal substantially corresponding to the pitch of slot 130 in shaft 127.

Thus when a tag has been positioned in slot 145 in the head 126 and the latter raised and swung inward through operation of cam 142 groove 150 is aligned with the shearing guide 34 of the wire feeding mechanism and the gripping jaws 36, 37 of the shuttle, and with the head in this position as the wire feed rolls 32, 33 project the wire end from the shearing guide it follows groove 150, passing through holes 148 in the tag and enters the gripping jaws on the shuttle, the head being moved out of the way by cam 141 after the tag has thus been strung on the wire which retains it as the head retires.

It will be apparent from the drawings that in positioning a tag the head 126 moves into space sometimes occupied by welding electrode 90 and it is primarily to permit the head to do so that the arm supporting this electrode is articulated as heretofore described. Thus when the head is projected into said space it can depress the electrode against the bias of the electrode spring 100 which restores the arm parts to normal relation after the tag positioning head has retired preparatory to the electrode being projected inwardly against the wire after the end of the latter has been wrapped around the bundle.

Operation

While the functions and operation of the several parts of the machine individually have been explained, their coordination is essential to effective accomplishment of the tying of the bundle of pipe and a brief reference to the interrelationships of the several instrumentalities employed will perhaps clarify their operation.

Thus it will be assumed the machine is fully assembled and ready to begin operations, with a plurality of pipes P disposed on the skids at the front of the machine, a reel of wire W on its bracket **30** at each stand, its end threaded through tension guide **31**, between its feed rolls **32**, **33** and shearing guide **34** and positioned at or perhaps a little beyond the inner end of the latter, the welding electrodes in their non-operative positions and the tag holding head retracted but having positioned in its slot **145** a tag to be applied to the bundle of pipes which are to be wrapped.

The motor **1** is now energized, initiating rotation of shaft **2** clockwise in Fig. 4 and counterclockwise in Fig. 5; with the beginning of this motion the pipe lifts H start to rise, lifting the leading pipes P above the level of the stop **6** the lifts of course being proportioned to select from those on the skids the number of pipes, for example three, to be bundled together. While the pipe lifts are rising the ejector disks are also being rotated through 120° but devoid of any load at this time since no preceding bundle is present. However, the ejector fingers **11** which would otherwise be ejecting such bundle are moved far enough by the time the incoming pipes have passed over the stops **6** to clear the way for them to roll inwardly and downwardly into the chucks **7**.

During these operations the tag holder has been raised to align the tag with one of the wires and as the latter are fed toward their respective gripping jaws one of them is projected along the groove in the tag holder head, through the holes in the tag and all enter substantially simultaneously between the gripping jaws which are held open by their operating cams; if any wire at the start was projecting beyond the shearing guide the shear trimmed off its end just prior to initiation of its feed.

After the wire ends have been entered between the now open gripping jaws **36**, **37** the cams **56** release the movable jaw restraining levers **50** and jaw springs **39** press the movable jaws into clamping engagement with the wire ends, the pipe lifts meanwhile descending to enable the pipes for the next bundle to roll down the skids over them after they have passed below the skid level.

After the wires have been gripped by the grippers the tag holding arm is retracted, the wire strung through the tag holes retaining the tag as the head retires, and the shuttles carrying the grippers with the wires securely held between them now rotate through one complete revolution clockwise in Fig. 5 to pass the wires entirely around the bundle of pipe in the chucks and overlap their end and standing parts at the base of the bundle, the one carrying tag T usually somewhat flattening the tag as the leading end portion of the wire is brought under it. During this operation the tensioning guides control the tightness of the wrap of the wires, while the roller ratchets in the wire feed mechanisms allow the required amounts of wire to be drawn out at each stand. Each electrode actuating cam **108** now moves corresponding electrode **90** into engagement with the leading end portion of the wire, presses it against the standing part and in turn forces the latter to move electrode **91** to position to complete the welding circuit through contacts **120**, **121**. The welding current then passes through the overlapped wires for a time sufficient to weld them securely together, after which cams **108** release the electrodes and the circuit is broken by separation of the contacts. Thereafter the shear **35** at each stand operates to sever the wire adjacent its tensioning guide, the wire gripper jaws are opened to release the wire ends and as the bundle ejector disks **10** operate to lift the bundle out of the chucks **7** and discharge it at the rear of the machine the pipe lifts, wire feeds and tag positioning mechanism are again actuated to initiate a succeeding cycle.

No reference has been made to means for consecutively introducing the tags into the tag positioning head as the invention is not concerned therewith but it will be evident this may easily be accomplished manually by an operative stationed adjacent the machine within easy reach of the head when it is retracted, and as it remains retracted during one half of each cycle ample time is afforded for manual insertion of the tag. Preferably to avoid risk of injury to the operative from contact with pipe bundles ejected from the machine, tags are applied only at stand A where ample room beyond the ends of the bundles but still within reach of the head is afforded.

While I have herein particularly described and specifically illustrated the construction of one embodiment of the machine which is well adapted for accomplishing the objects of the invention, it will be understood I do not desire or intend thereby to confine myself in any way as changes and modifications in the form, construction, arrangement and relationship of the various instrumentalities comprised therein will readily occur to those skilled in the art and may be made if desired without departing from the spirit and scope of the invention as defined in the appended claims.

I claim and desire to protect by Letters Patent of the United States:

1. A machine for securing a wire about a predetermined number of pipes or the like comprising means for passing the leading end of the wire about the pipes, means for then welding together the end portion of the wire and a standing part thereof extending to a source of wire supply, means for severing the wire between the weld and said source after completion of the weld, means for projecting the wire end into the vicinity of the pipes prior to its passage thereabout, a movable arm for positioning a perforated tag adjacent the pipes with a perforation in the tag aligned with the path of projection of the wire end to thereby string the tag on the wire during its projection along said path before said end is passed about the pipes and actuating means for said wire projecting means and said arm operative to move the arm to so position the tag in predetermined timed relation to the projection of the wire along said path.

2. A machine for bundling pipes or the like, including pipe supporting means, means for selecting from a plurality of pipes supported thereby a predetermined number of pipes and delivering them to a bundling station, a cam for actuating said pipe selecting means, means at said sta-

tion for supporting the pipes in parallel interengaging relation, means for simultaneously passing a plurality of wire ends about the pipes at points spaced longitudinally thereof including a plurality of shuttles rotatable about the pipes each comprising means for gripping a wire end, coaxial gears respectively operative to rotate the shuttles and a shaft for supporting and simultaneously driving said gears, means for maintaining tension on the wires during passage of their ends about the pipes, means for welding overlapping portions of each wire together adjacent the pipes after passage of said ends thereabout, means for simultaneously severing the wires between the welds and the respective sources of wire supply comprising a shear disposed adjacent each shuttle and a plurality of cams respectively operative to actuate said shears, longitudinally spaced means for thereafter ejecting the wired bundle of pipes from the station, a second shaft supporting said ejecting means for simultaneous rotation about a common axis, a main shaft adapted for continuous rotation about an axis parallel to said first and second shafts, means interposed between the main shaft and the first shaft to impart intermittent motion to the latter, said main shaft supporting said shear operating cams, and means interposed between said main shaft and the second mentioned shaft for imparting intermittent motion thereto in predetermined timed relation to the motion of the first shaft.

3. A machine as defined in claim 2 including an arm movable toward and away from the path of one of the wire ends for positioning a perforated tag adjacent said path and wire engaging means for projecting said wire end through a perforation in the so positioned tag prior to its passage about the pipes.

4. A machine for bundling pipes or the like comprising a plurality of spaced chucks adapted to receive and support a predetermined number of pipes in parallel interengaging relation, means for introducing the pipes into the chucks, a plurality of rotatable shuttles disposed at intervals longitudinally of the pipes when seated in the chucks and each having a trough partially surrounding the pipes, wire gripping means carried by each shuttle, a source of wire supply proximate each chuck, means directing wire therefrom towards the shuttle and its gripping means, tag carrying means disposed adjacent one of the shuttles including a movable head adapted to receive and support a perforated tag and means for moving the head relatively to the path of the leading end of the wire extending towards said shuttle from the corresponding source operative to so position a tag carried by the head that its perforation aligns with said path, means for rotating the shuttles simultaneously to thereby carry about the pipes the leading ends of the wires after passage through said perforation of said leading end and reception of all said ends in the gripping means and thence into overlapping relation with the standing parts of the wires leading to the respective sources, and means for then securing together the overlapped parts of the wires.

5. A machine for bundling pipes or the like comprising a plurality of spaced chucks adapted to receive and support a predetermined number of pipes in parallel interengaging relation, means for introducing the pipes into the chucks, a plurality of rotatable shuttles each having a trough partially surrounding the pipes when disposed in the chucks, wire gripping means carried by each shuttle, means for rotating the shuttles about the pipes to thereby carry wire ends engaged in the wire gripping means around the pipes and overlap each end with a standing part of the wire, said means comprising an interrupted gear fixed to each shuttle, a pair of idler gears circumferentially spaced with respect to each interrupted gear and meshing therewith, a rotatable shaft and gears carried thereby respectively engaging the idler gears of each pair, a main shaft rotatable continuously about an axis parallel to that of said first shaft, cams carried by the main shaft respectively operative to actuate the pipe introducing means, and means for intermittently actuating the first shaft from the main shaft in timed relation to the actuation of said pipe introducing means.

6. A machine for bundling pipes or the like including a plurality of spaced pipe receiving chucks, means for introducing a predetermined number of pipes into the chucks, means for passing a wire end about the pipes while in the chucks and overlapping its end portion with respect to a standing part of the wire, means for welding together the overlapped portions of the wire, means for severing the standing part thereof, means for ejecting the bundled pipes from the chucks, and means for actuating each of said means including a rotatable shaft, a cam carried thereby for actuating the pipe introducing means, a gear train including a Geneva movement driven by the shaft for actuating the wire end passing means, a second cam carried by the shaft for actuating the welding means, an eccentric cam on the shaft, and a lever actuated thereby for actuating the wire severing means and the bundle ejecting means.

7. In a machine for bundling pipes and the like comprising supporting means for the pipes, a rotatable shuttle adapted to carry a wire end about the pipes and into overlapping relation to the standing part of the wire, wire end gripping means carried by the shuttle and means for feeding the end of the wire along a substantially rectilinear path to said gripping means, a tag carrying head having a slot for reception of a perforated tag, an arm supporting the head for movement toward and away from said path and means for actuating the arm in predetermined timed relation to the operation of said feeding means operable to move the head toward said path to so position a tag carried by the head that its perforation aligns with said path preparatory to passage of the wire end therethrough and to move the head away from said path and the tag after passage of the wire through the perforations and into engagement with the gripping means.

8. In a machine for securing a wire around a bundle of pipe comprising means for supporting the bundle, means for feeding the end of the wire forwardly proximate the bundle and means for then gripping said end and drawing the wire about the bundle, means for stringing a perforated tag on the wire during its said movement including a tag holder adapted to receive an edge of a tag having spaced holes so disposed that when the tag is arched transversely to said edge and inserted in the holder the holes are aligned to form a passage for the wire, and holder actuating means including a movable member supporting the holder and means coordinated with the wire feeding and gripping means to actuate the member to move the holder to a position such that the holes in the tag lie in the path of the leading end of the wire as it is thereafter fed to

the gripping means and to withdraw the holder from that position and from the tag after the wire has been passed through the holes and received in the gripping means.

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