Oct. 9, 1934. L. H. MORIN ET AL 1,975,966

CASTING MACHINE

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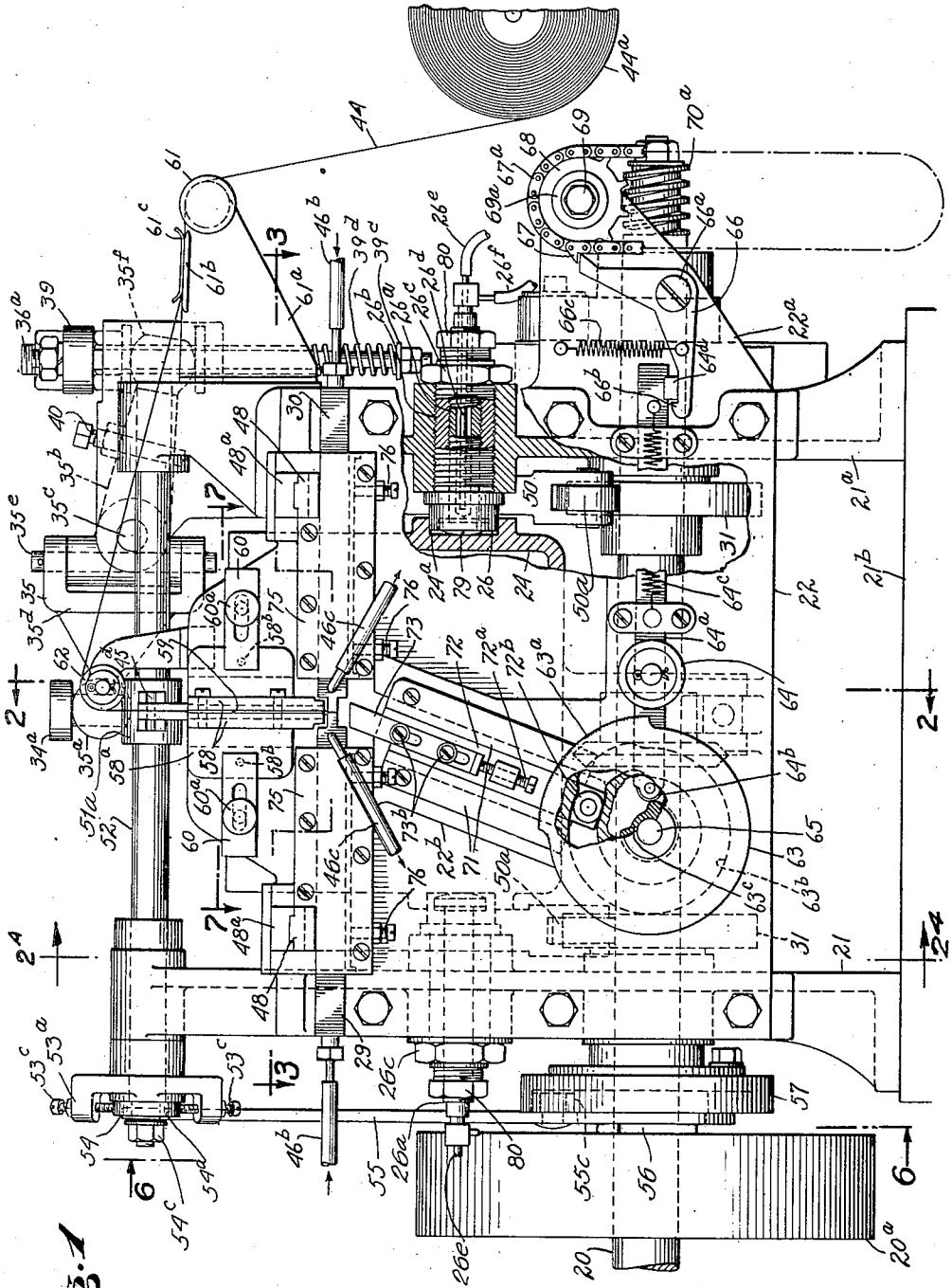


Fig. 1

INVENTORS
DAVIS MARINSKY
LOUIS H. MORIN
BY
Howard E. Thompson
ATTORNEY

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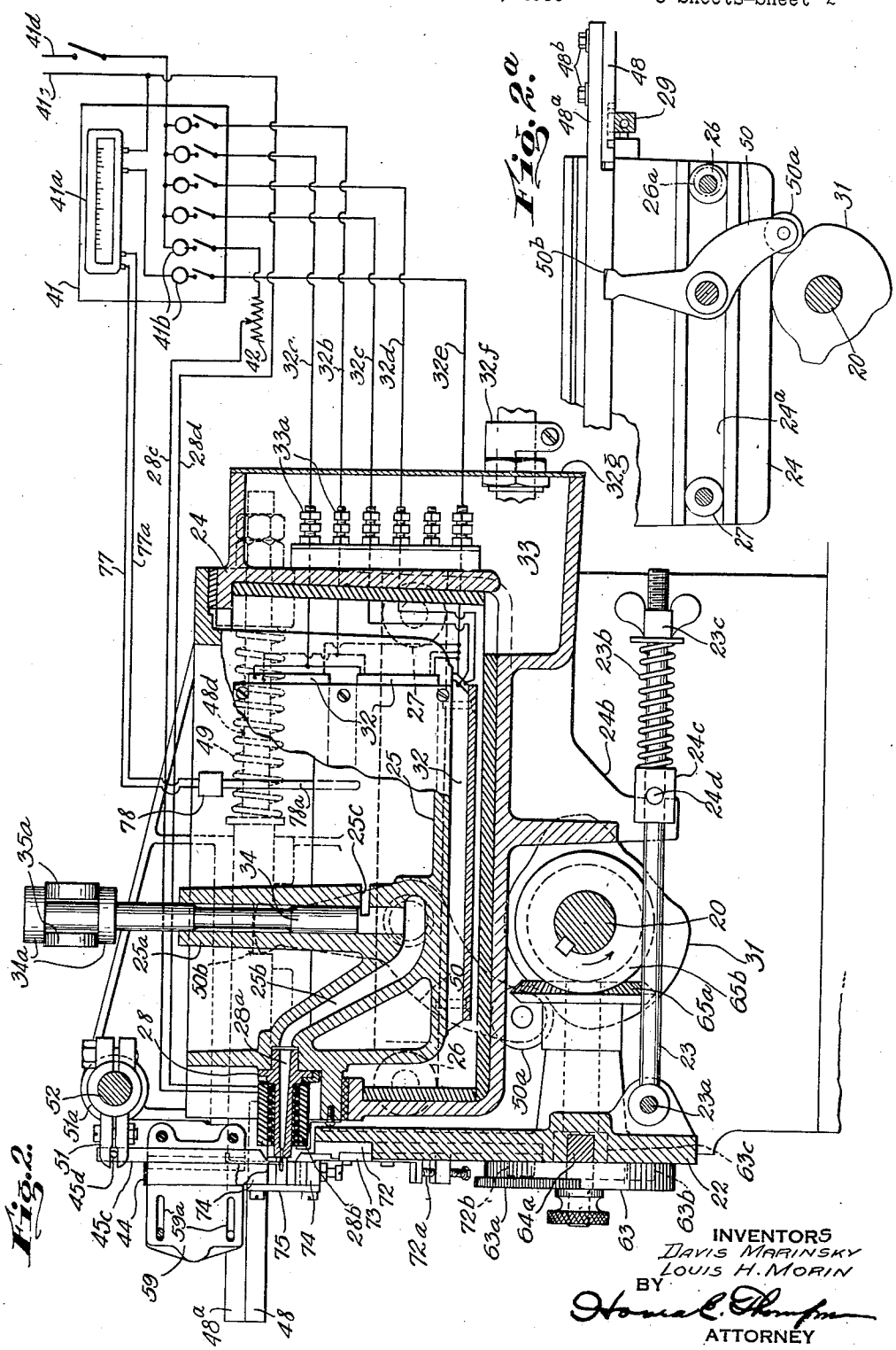


Fig. 2.

Fig. 2a.

INVENTORS
DAVIS MARINSKY
LOUIS H. MORIN
BY
Howard C. Thompson
ATTORNEY

Oct. 9, 1934. L. H. MORIN ET AL 1,975,966

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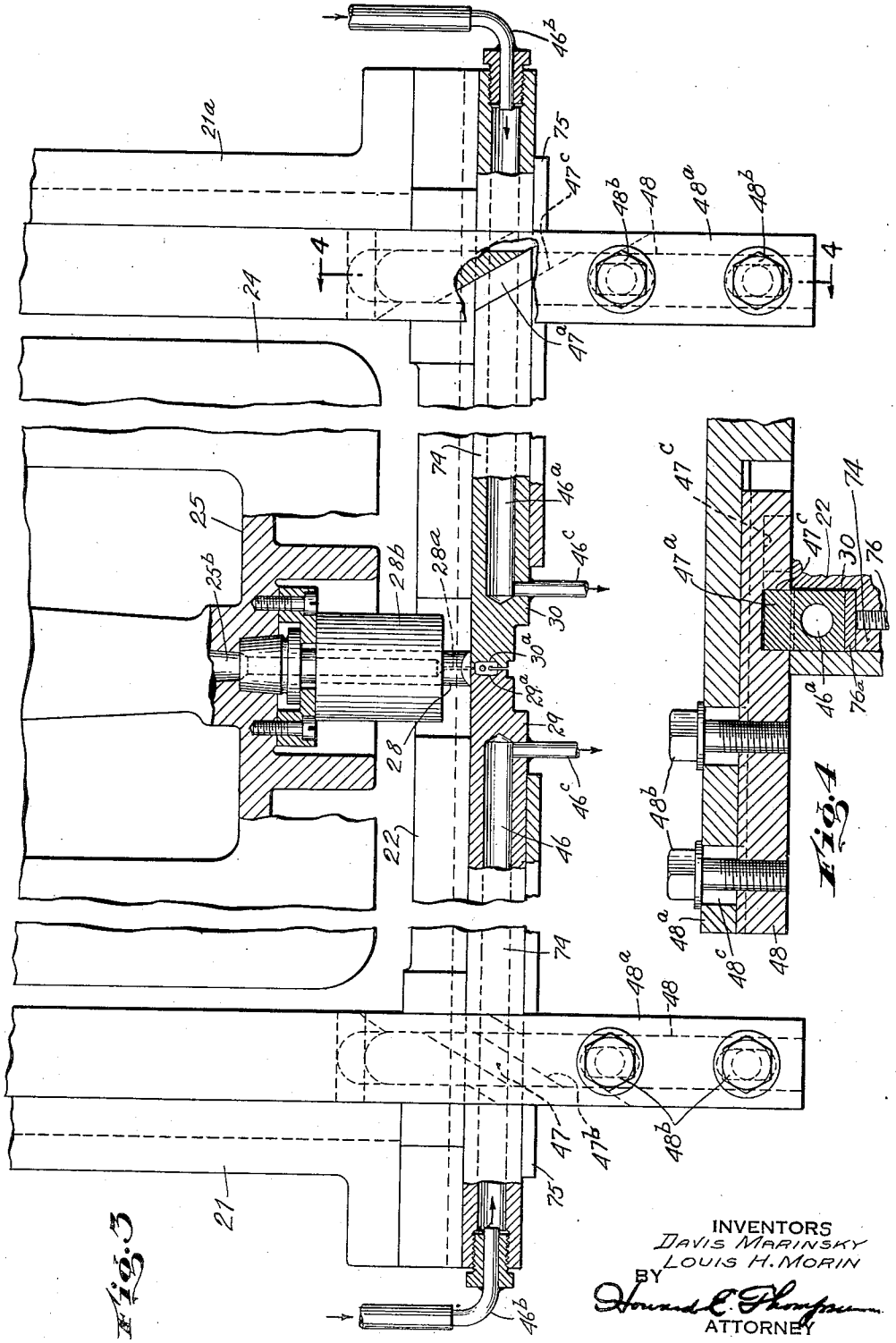


Fig. 3

Fig. 4

INVENTORS
DAVIS MARINSKY
LOUIS H. MORIN
BY
Howard E. Thompson
ATTORNEY

Oct. 9, 1934. L. H. MORIN ET AL 1,975,966

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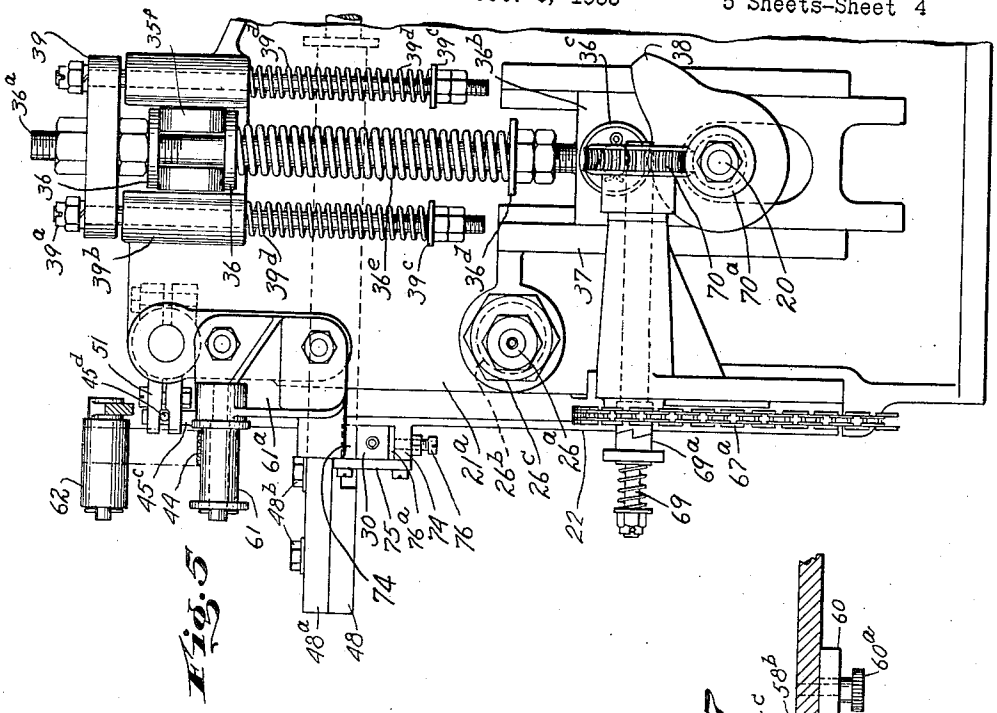


Fig. 5

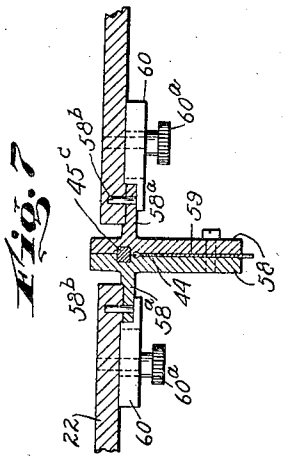


Fig. 7

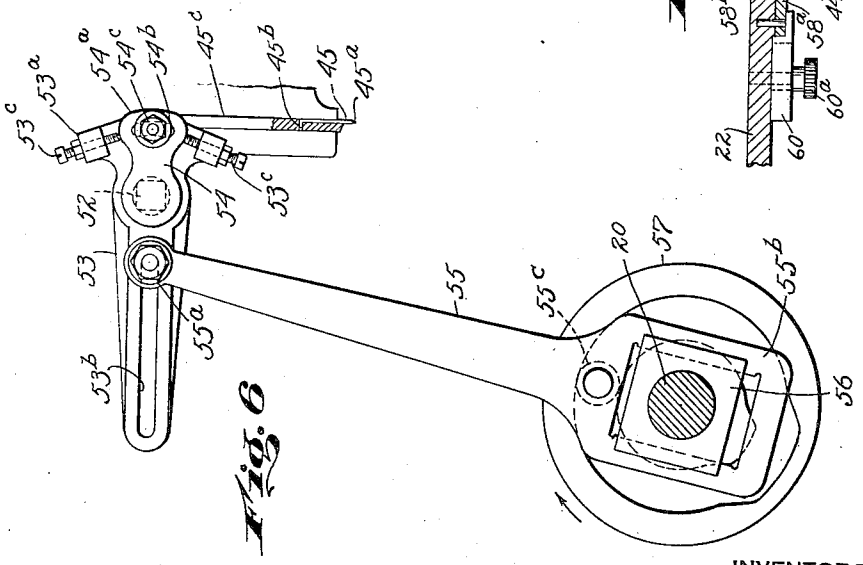


Fig. 6

INVENTORS
DAVIS MARINSKY
LOUIS H. MORIN
BY
Howard C. Thompson
ATTORNEY

Oct. 9, 1934. L. H. MORIN ET AL 1,975,966

CASTING MACHINE

Filed Oct. 3, 1933 5 Sheets-Sheet 5

Fig. 15.

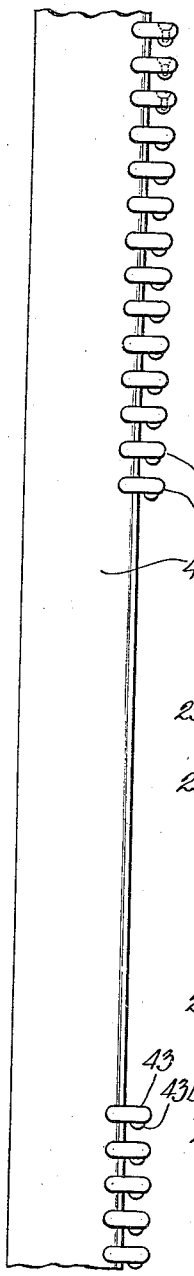


Fig. 8.

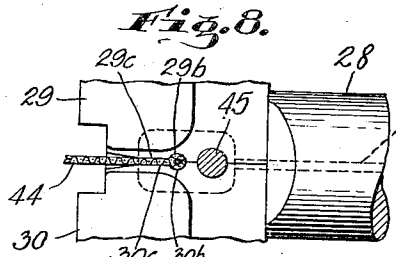


Fig. 10.

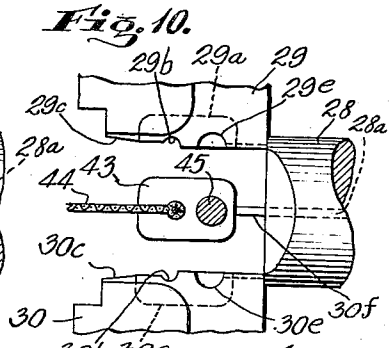


Fig. 9.

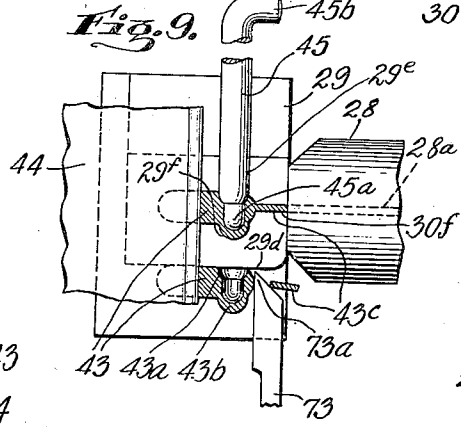


Fig. 11.

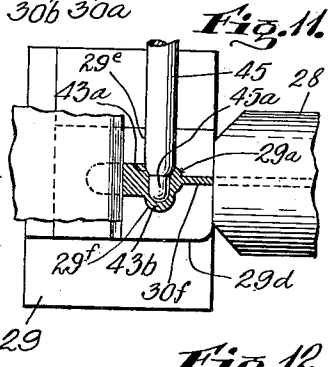


Fig. 12.

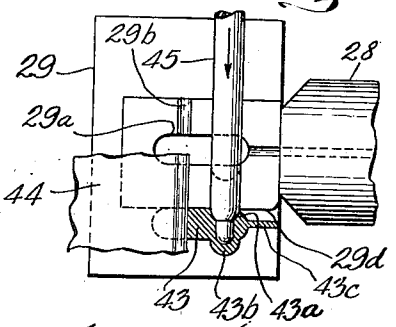


Fig. 13.

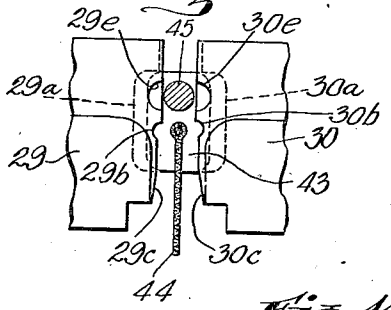


Fig. 14.

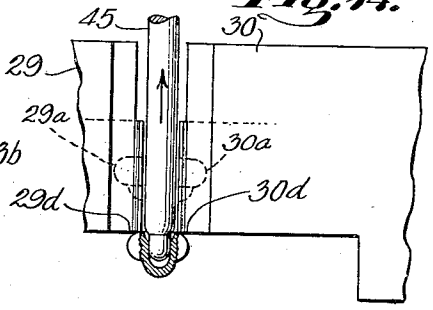
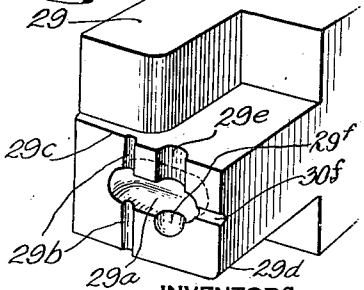


Fig. 16.



INVENTORS
DAVIS MARINSKY.
LOUIS H. MORIN.

BY
Howard C. Thompson
ATTORNEY

Patented Oct. 9, 1934 1,975,966

UNITED STATES PATENT OFFICE

1,975,966

CASTING MACHINE

Louis H. Morin and Davis Marinsky, Bronx, N. Y., assignors, by direct and mesne assignments, to Whitehall Patents Corporation, New York, N. Y., a corporation of New York

Application October 3, 1933, Serial No. 691,934

31 Claims. (Cl. 22—57)

This invention relates to casting machines and particularly machines of this class designed to cast a series of members on an elongated strand or strip and to space multiple series of said members on said strand or strip; and the object of the invention is to provide a machine of the class described which is entirely automatic in operation and wherein dies are intermittently moved toward and from a mounting member and wherein the casting or molding material is introduced into the dies when in closed position through a nozzle preferably arranged between the dies, and further, wherein the castings are formed about a core member disposed between the dies whereby when the casting is formed and the dies separated, the core acts as a supporting and feeding member to feed the formed casting out of the path of the core of the mold chamber of the dies to position the mounting member to receive the next adjacent casting to be formed thereon; a further object being to include a trimming tool for trimming the castings to form finished links or parts on the mounting member when discharged from the machine; a further object being to provide means for heating the container for the casting material, as well as means for heating the discharge nozzle for such material so as to insure the transmission of the casting material to the die and prevent clogging or congestion of the parts or passages; a further object being to provide means for cooling the dies to prevent overheating thereof, thus enabling the machine to produce numerous casting per minute, resulting in an economical production of devices of the class under consideration; a further object being to provide means for insulating and/or cooling certain parts of the machine or apparatus to prevent heat flow to the machine as a whole from the molten metal pot or container; a still further object being to provide a machine or apparatus of the class described which is entirely automatic and wherein the operation of the machine in the production of a successive series of castings upon a mounting member or tape as well as the spacing of such series in groups on said tape will be performed without requiring the care or attention of an operator except to check on the replacement of casting material in the pot and the supply of the mounting tape or strand to the machine, thus enabling one operator to care for many machines while in operation; and with these and other objects in view, the invention consists in a machine or apparatus of the class and for the purpose specified, which is simple in construction, efficient in use and which is constructed as hereinafter described and claimed.

The invention is fully disclosed in the following specification, of which the accompanying drawings form a part, in which the separate parts of the improvement are designated by suitable reference characters in each of the views, and in which:

Fig. 1 is a front view of a machine with parts of the construction broken away and in section.

Fig. 2 is a partial section on the line 2—2 of Fig. 1 and diagrammatically illustrating the electric heating circuit.

Fig. 2*a* is a partial section on the line 2*a*—2*a* of Fig. 1.

Fig. 3 is a partial section on the line 3—3 of Fig. 1 on an enlarged scale and with parts broken away.

Fig. 4 is a partial section on the line 4—4 of Fig. 3.

Fig. 5 is an end view of the machine showing part of the construction and with parts omitted.

Fig. 6 is a detail view looking in the direction of the arrow 6 of Fig. 1 and showing only part of the construction.

Fig. 7 is a partial section on the line 7—7 of Fig. 1.

Fig. 8 is a sectional detail view showing the die or molded parts in closed position.

Fig. 9 is a view at right angles to Fig. 8 showing the casting formed between the dies and also indicating the manner of trimming the previously formed casting.

Fig. 10 is a view similar to Fig. 8 showing the dies in open position.

Fig. 11 is a view at right angles to the structure shown in Fig. 10 indicating the manner of supporting a casting on a core prior to feeding the casting and supporting tape into a spaced position.

Fig. 12 is a view similar to Fig. 11 showing the result of the feeding operation by said core.

Fig. 13 is a view similar to Figs. 8 and 10 indicating a partial inward movement of the dies preparatory to removing the core from the formed casting.

Fig. 14 is a face view of the parts as seen in Fig. 13 with parts removed and in section.

Fig. 15 is a side view of a mounting strip showing part of two groups of coupling elements arranged thereon.

Fig. 16 is a perspective view of the end portion of one of the dies detached.

The apparatus or machine forming the sub-

ject matter of this application is a continuation in part of application bearing Serial Number 661,099 filed March 16, 1933 and is designed for the production of the links or coupling members of separable fasteners and the machine elements diagrammatically illustrated and the method described and claimed in the above identified application.

It will be understood that while dies are fashioned to produce links or coupling elements of the class under consideration, the contour of the dies employed may be varied to produce other types or kinds of elements, and in like manner, the parts of the machine revised or modified to adapt the same to such other uses or adjustments made in the machine to compensate for other uses or different sizes of elements to be formed by the dies.

To illustrate one use of the invention, the accompanying drawings disclose a machine and parts thereof consisting of a main drive or power shaft 20 having at one end a pulley 20*a* by means of which the shaft is driven from a suitable source of power, not shown as it does not form any distinct part of the invention. The shaft 20 is mounted in bearings of two side frame members 21, 21*a*, arranged upon a suitable base or support 21*b*, note Fig. 1, and these frames are joined by a front frame plate 22. Arranged within the frame is a substantially box-shaped casing 24 forming a support for the container or pot 25 for the molten metal or other casting material.

The casing 24 has grooves 24*a* on the side walls thereof and rollers 26 and 27 are supported in connection with each side frame and operate in the grooves 24*a* to guide the casing 24 in its forward and backward movement in the frame. The rollers 26 at the front of the frame and casing are rotatably supported on hollow pins 26*a* eccentrically disposed within bushings 26*b* so as to adjust the casing 24 vertically in the frame to properly position the nozzle 28 of the pot 25 with respect to dies 29 and 30 to insure proper alinement therewith. Lock nuts 26*c* are employed to retain the rollers in their desired position of adjustment, and it will be seen that cool water may be circulated into the tubular pins through pipes 26*d* from the supply tube 26*e* and discharged from the bore of the pins 26*a* from the tubes 26*f*, note the left side of Fig. 1 of the drawings.

The purpose of cooling the rollers is to prevent the flow of heat into the frame members, especially at the forward part of the machine, and it will be understood that the rollers 27 may be cooled in a similar manner if desired. However, it is not essential that the rollers 27 be adjustably supported, the adjustment of the front rollers being sufficient to provide the proper alinement referred to. The casing 24 includes a donwardly directed, fork-shaped extension 24*b* on which is supported a block 24*c* having trunnions 24*d* extending laterally therefrom to engage the recesses in the separate members of the extension 24*b*.

Slidably mounted in the block 24*c* is a rod 23 pivoted to the front plate as indicated at 23*a* and arranged on this rod upwardly of the block is a spring 23*b*, the tension of which is controlled by a winged nut 23*c* in threaded engagement with the rod. The purpose of this construction is to normally support the casing 24 in a forward position so as to maintain the nozzle 28 in proper engagement with the dies during the casting operation. Cams 31 are employed for operating the dies 29 and 30 as later described.

The pot 25 is mounted in and insulated from the casing 24 and includes therewithin a vertical cylinder 25*a* opening through the top of the pot and downwardly into a goose-neck passage 25*b*, the upper and outer end of which opens into the port 28*a* of the nozzle 28, the latter being detachable with respect to the pot 25. It will appear that the nozzle opens into a large recess formed in the top forward end of the casing, and mounted on the protruding end of the nozzle is an electric heating unit 28*b*, by means of which the nozzle may be kept at the required temperature to maintain the casting material in a flowing state to facilitate the formation of proper castings. The circuit wires to the heating unit 28*b* are diagrammatically illustrated at 28*c* and 28*d* in Fig. 2 of the drawings.

A plurality of heating plates 32 are disposed on the outer surface of the pot 25 within the casing 24, preferably on the bottom and sides of said pot, in order to maintain the casting or molding material within the pot at the proper temperature at all times, and the circuit wires to these heating plates are diagrammatically illustrated at 32*a*, 32*b*, 32*c*, 32*d* and 32*e*. The electric circuit in itself forms no direct part of the invention and for this reason is only diagrammatically illustrated. In practice, the circuit wires will enter the casing 24 through a suitable fitting or coupling 32*f* mounted on a cover plate 32*g* controlling admission to a large chamber 33 at the back of the casing, in which is arranged a series of terminals or binding posts 33*a*, with which the circuit wires 32*a* to 32*e* are coupled. At the lower end of the cylinder 25*a* is an admission port 25*c* whereby the casing or molding material from the pot 25 may enter the lower end of the cylinder as well as the gooseneck passage 25*b*.

Mounted in the cylinder 25*a* is a piston or plunger 34 at the upper end of which are two collars 34*a* between which are disposed the forked ends 35*a* of a rocker arm 35. The arm 35 includes a part 35*b* pivoted to an extension on the frame 21*a* as seen at 35*c*, the arm 35 having a yoke-shaped portion 35*d* pivoted to the part 35*b* by a pin 35*e*, note Fig. 1 of the drawings, the purpose of which is to permit swinging movement of the arm 35 consistent with and during the forward and backward movement of the casing 24 and the nozzle 28 movable therewith.

The free end of the part 35*b* of the arm is yoke-shaped in form and rounded as seen at 35*f* and seats between collars 36 on a rod or plunger 36*a*. The plunger 36*a* has at its lower end a follower 36*b* slidably mounted in guideways 37 on the frame 21*a*, and on the follower is a roller 36*c* operating upon a cam 38 on the shaft 20. Disposed on the plunger is a collar 36*d* upon which a spring 36*e* seats, said spring also seating on the lower and free collar 36 at the upper end of the plunger, so that as the plunger is moved upwardly by the cam 38, the rocker arm 35 is actuated through the spring 36*e* to depress the plunger 34, it being understood that the spring will be of sufficient tension to give the required pressure to perform the function desired and yet will prevent any breakage to the machine should the plunger stick or be jammed or rendered inoperative by reason of any improper condition of the casting material. It will be understood that the lower end of the plunger 34 is normally

disposed above the port 25c as is indicated in Fig. 2.

In the upward movement imparted to the rod 36a, a crosshead 39 at the upper end thereof is raised and this crosshead has at its ends rods 39a extending down through guides 39b on the frame 21a. The lower ends of the rods have adjustably supported collars 39c operating upon springs 39d so that said springs are placed under compression in the upward movement of the rods 39a. The springs 39d serve to return the plunger rod 36a as well as the piston or plunger 34 to raised position and also to maintain the roller 36c in constant engagement with the cam 38.

On the part 35b of the rocker arm is an adjustable stop screw 40 engaging a part of the frame 21a to limit the downward movement of the plunger rod 36a as well as the upward movement of the piston 34. The circuit wires to the heating elements employed are connected with a switch or control board 41 diagrammatically illustrated in Fig. 2 of the drawings, and the ground side of the circuit from the wire 32e extends to a pyrometer indicated at 41a. A series of automatic switches 41b are employed in the circuit wires to control the temperature of the material in the pot 25, a suitable resistance 42 being employed in the circuit wires 28c, 28d controlling the nozzle heating unit 28b. At 41c and 41d are shown the circuit wires from a source of supply entering the board which is diagrammatically illustrated.

The dies 29 and 30 are slidably mounted in the front plate 22 of the frame and the inner adjacent surfaces of these dies have registering mold chambers 29a, 30a of such contour as to form the links 43 of a separable fastener as is illustrated in Figs. 8 to 15 inclusive. The outer end of the nozzle 28 at all times seats on the surface of the dies 29 and 30, note Figs. 8 and 10 and is held in engagement therewith by the spring 23b. The dies are provided at their outer sides with grooves 29b, 30b to receive the corded edge of the tape 44 and also with recesses 29c and 30c to receive the mounting tape, strand or member 44 beyond said corded edge.

Below the mold chambers 29a, 30a, the dies have surfaces 29b, 30d against which a previously formed link or element 43 is adapted to rest in the operation of spacing the links 43 on the mounting member 44 and also in removing the core 45 from the formed link, the core fitting between the dies 29 and 30 with its inner reduced end 45a disposed within the mold chambers of the dies so as to form a recess or aperture 43a at one side face of a coupling link 43 to receive the body or projecting member 43b on the opposite side face of an opposed link, the latter being formed by the contour of the mold chambers of the dies. The dies also include recesses 29e, 30e for receiving the core die part later described and between adjacent surfaces thereof is formed a port 30f by means of which casting material may be introduced into the mold chambers 29a and 30a. The mold chambers of both dies are also recessed as indicated at 29f to form the projecting member 43b on the ring.

The dies 29 and 30 in the construction shown, are in the form of relatively long strips of metal having water circulating chambers 46, 46a respectively so that the dies may be maintained in a cool state or at the proper temperature in the casting operations and water is introduced into the chambers 46, 46a through intake tubes or pipes 46b at the outer ends of said dies and is discharged through exhaust tubes 46c at the adjacent ends of said dies, note Fig. 3 of the drawings. Each die 29 and 30 has on its upper surface an upwardly projecting lug 47, 47a disposed angularly to a plane transversing the longitudinal plane or path of movement of the dies, note the right end of Fig. 3 of the drawings, where the lug 47 is shown in section.

These lugs operate in corresponding annular channels 47b, 47c respectively in short bars 48 adjustably supported with respect to the forward ends of long bars 48a by bolts or screws 48b secured to the bars 48 and passing through elongated apertures 48c in the long bars 48a, note Fig. 4. This adjustment is to compensate for accurate abutment as between the dies, and it will be understood that the long arms 48a will have wider grooves to compensate for this adjustment as clearly seen at the right of Fig. 3. The bars 48a are disposed at opposite sides of the machine adjacent the frames 21 and 21a and movable forwardly and backwardly in suitable guides in said frames. The inner ends of the bars 48a extend in rods 48d upon which are mounted coil springs 49 seating upon the frame. Pivotally mounted in connection with the frames are rocker arms 50 having rollers 50a at their lower ends operating upon the cam members 31a. The upper ends of said rocker arms operate in recesses 50b in the lower surfaces of the slide bars 48a. It will thus be seen that the springs 49 serve to maintain the rollers 50a in constant engagement with the cams 31, the cams operating to separate the dies 29 and 30, whereas the springs 49 serve to hold the dies firmly in engagement with each other, sufficient clearance being allowed between the rocker arms 50 and slide bars 48 to permit this operation.

The core 45 is in the form of a pin or rod, the upper end of which is offset as at 45b to engage an aperture in a core supporting plunger 45c, the latter having at its upper end a cross pin 45d entering a notch or slot in the protruding arm 51 of a block 51a clamped to a rocker shaft 52 mounted in the upper end of the frames 21, 21a. The shaft 52 projects outwardly beyond the frame 21 and rotatably mounted thereon is a rocker arm 53 having a yoke-shaped crosshead 53a at its outer end and a long arm provided with an elongated aperture 53b, at its other end. Keyed to the shaft 52 is a block 54, the head 54a of which is disposed between the yoke-shaped crosshead 53a and has an arc-shaped aperture 54b through which is passed a lock bolt 54c, the latter being mounted in the crosshead 53a.

On the arms of the crosshead are adjustment screws 53c cooperating with the head 54a to control adjustment of the rocker arm 53 with respect to the shaft to regulate or adjust the vertical position of the core with respect to the dies, the bolt 54c locking the arm to the block 54 when predetermined adjustment is made. Whereas, the operating arm 55 has its end 55a adjustably clamped to the end of the rocker arm having the elongated aperture 53b. The arm 55 has a square end 55b operating upon a crosshead 56 on the shaft 20, permitting sliding movement of the squared end 55b with respect to the crosshead and shaft 20. Upon the end 55b of the arm 55 is a roller 55c which operates in the groove of a cam 57 secured to the shaft 20, and this cam serves to operate the

core to feed the formed link and to space said link and its mounting tape in the operation of the machine.

The core supporting plunger 45c is mounted between two similar guide plates 58 having laterally extending flanges 58a including key pins 58b entering the front plate 22 of the frame, note Fig. 7. The plates 58 are clamped together by screws or other devices, and between these plates is an adjustable spacing and backing plate 59, the inner end of which guides and spaces the outer edge of the mounting strip or tape 44 which is also guided by the plates 58. The plate 59 has elongated apertures 59a, note Fig. 2, through which the clamping screws or bolts pass, and these apertures permit inward and outward adjustment of the plate 59 to compensate for mounting strips or tapes of different widths. The plates 58, 59 form a guide unit which in its assemblage is detachable with respect to the frame; and when detached, the plunger 45c may be removed therefrom. This unit is held in place by two clips 60 adjustably clamped to the plate 22 by milled screws 60a, note Fig. 7. The strip or tape 44 from a spool or drum 44a diagrammatically illustrated in Fig. 1 passes over an idler 61 supported on a bracket 61a on the frame 21a of the machine, the tape passing over a plate 61b on said bracket, and a flat spring 61c engages the tape as it passes over said plate to apply the required spring tension or friction to the tape to permit proper feeding thereof as it is drawn into and through the machine by the feed heretofore mentioned. From the plate 61b, the tape passes over another idler 62 and from this idler down through the guide unit consisting of the plates 58, 59 and the tape with the links thereon after being fed from the dies 29 and 30 extends downwardly between a feed disk 63 having a projecting roughened surface 63a and a roller 64 movable toward and from the disk 63, the purpose of which feed is to intermittently cause a fairly long length of the strip to be fed through the machine in order to space the groups of coupling elements on the strip to form independent stringer sections. For example, in Fig. 15 of the drawings, it will be seen that the group of coupling elements 43 at the top of said figure is spaced apart from the group of elements indicated at the bottom of said figure by a long portion of the tape, upon which end coupling elements are secured. In the manufacture of the stringers, the said blank portion is severed centrally between the respective groups of coupling elements to provide ends facilitating attachment to various articles of manufacture in connection with which the stringers are used.

The disk 63 is mounted on a shaft 65 supported in a suitable bearing in the front plate 22, the shaft having at its inner end a beveled gear 65a meshing with a corresponding gear 65b on the shaft 20, and by this means, the disk 63 is rotated. The inner surface of the disk 63 has a surface cam groove 63b and inwardly thereof another small cam 63c. The roller 64 is mounted on a bar 64a slidably mounted in the frame 22, and at the inner end of the bar is a roller 64b engaging the cam 63c to permit inward movement of the roller 64 into engagement with the surface 63a to cause the sudden feed of the tape. The roller 64b is held in engagement with the cam 63c by a spring 64c and at the outer end of the bar 64a is a stop 64d adapted to be engaged by a pawl 66 pivoted as seen at 66a to control the inward movement of the bar 64a. The pawl 66 is moved into inoperative position by an offset or trip member 67 on one or more of the links of a chain 67a passing around a sprocket 68 on a shaft 69 mounted in a projecting bracket portion 22a on the shaft plate 22. To the inner end of this shaft is secured a worm gear 70 engaging a worm 70a at the end of the shaft 20 in Figs. 1 and 5. The sprocket is driven through a spring clutch 69a at the outer end of the shaft 69 as indicated in Fig. 5 of the drawings, so as to obviate any possible breakage should obstructions occur or improper timing be occasioned, especially in the initial setting up of the machine after changes in the size of dies or other elements have been made. It will be understood that the timing arrangement of the quick feed of the tape here referred to is controlled and regulated to be performed when the dies are in separated position immediately after the core 45 has been removed from a formed link and prior to the movement of the dies into closed position. It will appear that the hook end 66b of the pawl 66 is held in operative engagement with the stop 64a by a spring 66c as clearly indicated in Fig. 1 of the drawings.

On the face of the front plate 22 are angularly disposed guide members 22b formed into channels by retaining strips 71 which guide a trimming plunger 72 in the frame, the latter having a knife or blade 73 adjustably supported thereon by means of an adjustment screw 72a in order to provide very definite adjustment of the cutting edge 73a of the blade 73 with respect to each link and the die, note in this respect, Fig. 9 of the drawings. The knife or blade 73 is employed to trim off the gate 43c of the cast link as is represented in said figure. When adjustment is made, the blade is clamped to the plunger 72 by screws 73b passing through elongated apertures in said blade.

At the lower end of the plunger 72 is a roller 72b which operates in the surface cam 63b of the disk 63, and it will be understood that after each link is formed and moved into a position below the die or in engagement with the surface 29d thereof, the gate 43c is trimmed from said formed link in the operation of forming the next adjacent link as is indicated in Fig. 9 of the drawings. The dies 29 and 30 are slidably supported between outwardly extending parallel flanges 74 at opposite sides of the front plate 22 and are retained between said flanges by removable plates 75. In the bottom flanges are adjustment screws 76 adjacent the ends of said flanges, operating upon an alinement plate 76a in order to maintain the dies 29 and 30 in proper vertical alinement in the machine with respect to the nozzle 28, the plate 75 permitting quick attachment and detachment of the dies as will be apparent, this construction being seen in Figs. 1, 2, 4 and 5 of the drawings.

The operation of the machine will be readily understood from the foregoing description when taken in connection with the accompanying drawings and the following statement. Starting from a point in the cycle of operation where the dies are in closed position as indicated in Fig. 8 of the drawings with the mounting strip or tape 44 disposed therebetween and with the nozzle 28 abutting the dies and core 45 between said dies, the next step in the operation will consist in forcing or injecting under pressure the molten metal or other material into the mold

chamber formed between the die parts, which result is accomplished by the descending operation of the piston or plunger 34 in the cylinder 25*a* through the action of the rocker arm 35, spring 36*e* operated by roller 36*c* engaging cam 38. At the same time, the trimming knife or blade 73 is moved into position to trim off the gate 43*c* of a previously cast link 43, the knife being actuated by the cam groove 63*b* and the roller 72*b* operating therein.

The next function of the machine consists in separating the dies as is indicated in Fig. 10 of the drawings. This operation is performed by the inward movement of the slide bars 48, 48*a* against the tension of the springs 49, made possible by the rocker arms 50 actuated through the cams 31, it being noted in Figs. 8 to 12 inclusive that the nozzle 28 is held in engagement with the dies at all times by means of the spring 23*b* shown in Fig. 2 of the drawings.

When the dies 29 and 30 have been opened, the next step in the operation is to feed the last formed link 43 including the tape to which it is attached downwardly, it being understood that the cast link remains upon and is supported by the core 45. The operation is performed by the cam 57 which actuates the arm 55 through the roller 55*c*, the arm 55 operating the rocker arm 53 to rotate the shaft 52, which in turn operates the arm 51 of the block 51*a* and moves the core downwardly through the core plunger 45*c*. This downward feed of the plunger and the cast link thereon brings the parts into the position shown in Fig. 12 of the drawings, with the upper surface of the cast link in alinement with the lower surfaces 29*d*, 30*d* of the dies.

The cams 31 now function to permit a partial closing of the dies 29, 30 into the positions indicated in Figs. 13 and 14 of the drawings so that the surfaces 29*d* and 30*d* may be brought above the links to prevent upward movement thereof, after which the core is moved upwardly by means of the action of the cam 57 and the associated parts above referred to, thus leaving the said cast link supported temporarily between the partially closed dies. After the core has returned to its raised position similar to that indicated in Figs. 9 and 11, the dies are again opened and quickly closed, returning the parts to the position shown in Fig. 8. In the last above stated opening movement of the dies 29 and 30 from the position indicated in Figs. 13 and 14 to a position susbtantially similar to that indicated in Fig. 10, the quick feeding of the tape by means of the feed disk 63 and roller 64 may be performed, it being understood, however, that this operation is only after casting a predetermined number of links on the tape, which would designate the desired grouping of links or govern the length of the stringer desired. In this connection it will be understood that the length of these groups of coupling elements or stringers may be a matter of an inch or more to the conventional lengths of six and nine inches or to a length of many yards, depending entirely upon the requirements.

In the above operation it will be understood that after the metal has been injected into the dies, the metal in the end of the nozzle 28 is drawn back into the nozzle or goose-neck 25*b* thereof by the upward movement of the piston or plunger 34, it being also understood that the heating unit 28*b* on the nozzle serves to maintain the nozzle heated to prevent any possible chilling of the casting material in the nozzle during the operations of feeding a formed casting and repositioning the mounting tape and dies for the next casting to be formed.

The cycle of operation of the machine above referred to is completed upon a revolution of the shaft 20 and is repeated at each revolution of said shaft, as will be apparent.

The pyrometer includes circuit wires 77 and 77*a* which extend to a temperature control tube or device 78 which includes a portion 78*a* extending into the molten metal or other casting material to automatically control and regulate the temperature and permit the functioning of the automatic switches 41*b*. The pins 26*a* are provided at their inner ends with enlarged heads having rounded surfaces 79, note the right hand of Fig. 1 of the drawings, and these pins are adjustable in bushings 26*b* so as to aline the casing 24 laterally in the frame to properly position the nozzle 28 with respect to the dies, and this adjustment plus the eccentric mounting of the pins provides substantially a universal adjustment of the casing for the purpose stated and the nuts 80 retain the pins in different positions of adjustment.

As heretofore stated, different types of casting or molding materials may be used such as various kinds and classes of metal which are suitable for the purpose intended and which will depend to a large degree upon the particular type and character of the mounting strip employed as well as thermoplastics capable of being molded or cast in a machine of the class under consideration in accordance with the later teachings in this art.

As previously stated, it will be understood that the invention is not limited to the formation of coupling links or elements as other bodies or members of this kind may be formed in the production of various kinds and classes of merchandise, and still further, in dealing with the production of coupling elements forming the links of separable fasteners. It will also be apparent that the invention is not limited to the shape, contour or size of the coupling elements or links formed, it being possible to shape and form the dies in any desired manner within the working functions of this machine, the only requirements being that the core or mold chambers of the die parts be such as to pull away from the cast or molded product.

It will also be understood that the invention disclosed is not necessarily limited to the particular combination of machine elements herein disclosed for performing the several functions and operations of the machine, and various other changes in and modifications of the construction herein shown and described may be made within the scope of the appended claims without departing from the spirit of the invention or sacrificing its advantages.

Having fully described the invention, what is claimed as new and desired to be secured by patent protection, is:

1. A machine for casting a series of elements on a mounting member of flexible material comprising means for supporting the mounting member in the machine, die parts movable toward and from each other and opposed sides of said mounting member, the die parts forming a mold chamber therebetween and around a part of the member disposed therein, means for intermittently moving said die parts toward each other into closed position and away from each

other into open position, and means for intermittently forcing casting material into the mold chamber of the die parts when said die parts are in closed position to form a series of castings at spaced intervals on the mounting member during the successive cycles of operation of the machine.

2. A machine for casting a series of elements on a mounting member comprising means for supporting the mounting member in the machine, die parts movable toward and from each other and opposed sides of said mounting member, the die parts forming a mold chamber therebetween and around a part of the member disposed therein, means for intermittently moving said die parts toward each other into closed position and away from each other into open position, means for intermittently forcing casting material into the mold chamber of the die parts when said die parts are in closed position to form a series of castings at spaced intervals on the mounting member during the successive cycles of operation of the machine, said last named means including a container for the casting material, a discharge nozzle on said container, means for firmly supporting the nozzle in engagement with the die parts in the casting operation, and means providing vertical and lateral adjustment of said nozzle for alinement with the die parts.

3. A machine for casting a series of elements on a mounting member comprising means for supporting the mounting member in the machine, die parts movable toward and from each other and opposed sides of said mounting member, the die parts forming a mold chamber therebetween and around a part of the member disposed therein, means for intermittently moving said die parts toward each other into closed position and away from each other into open position, means for intermittently forcing casting material into the mold chamber of the die parts when said die parts are in closed position to form a series of castings at spaced intervals on the mounting member during the successive cycles of operation of the machine, said last named means including a container for the casting material, a discharge nozzle on said container, means for firmly supporting the nozzle in engagement with the die parts in the casting operation, a casing supporting said container, means for heating the material in said container, and means for insulating the container from said casing and the frame of the machine.

4. A machine for casting a series of elements on a mounting member comprising means for supporting the mounting member in the machine, die parts movable toward and from each other and opposed sides of said mounting member, the die parts forming a mold chamber therebetween and around a part of the member disposed therein, means for intermittently moving said die parts toward each other into closed position and away from each other into open position, means for intermittently forcing casting material into the mold chamber of the die parts when said die parts are in closed position to form a series of castings at spaced intervals on the mounting member during the successive cycles of operation of the machine, said last named means including a container for the casting material, a discharge nozzle on said container, means for firmly supporting the nozzle in engagement with the die parts in the casting operation, a casting supporting said container, means for heating the material in said container, said last named means including electric heating plates, means comprising an electric circuit and elements in said circuit for automatically controlling and maintaining the temperature of the casting material in said container, and a heating element on said nozzle adjacent the die parts.

5. A machine for casting an element on a mounting member of fibrous material comprising means for supporting the mounting member in the machine, die parts movable relatively to each other and to said member and forming therebetween a mold chamber in which part of said member is arranged, and a nozzle engaging the die parts and through which casting material is injected into the mold chamber of said die parts to form a casting therein on that part of said member disposed in said chamber.

6. A machine for casting an element on a mounting member comprising means for supporting the mounting member in the machine, die parts movable relatively to each other and to said member and forming therebetween a mold chamber in which said member is arranged, a nozzle engaging the die parts and through which casting material is injected into the mold chamber of said die parts to form a casting therein on said member, one of said die parts including a core extending into the mold chamber and upon which the casting is formed, and means for actuating the core to feed and space the cast element and mounting member when the other die parts and nozzle are separated.

7. A machine for casting an element on a mounting member comprising means for supporting the mounting member in the machine, die parts movable relatively to each other and to said member and forming therebetween a mold chamber in which said member is arranged, a nozzle engaging the die parts and through which casting material is injected into the mold chamber of said die parts to form a casting therein on said member, means for moving the die parts toward and from each other during each cycle of operation of the machine, one of said die parts serving to support the casting formed thereby in the separation of other die parts, means for operating the supporting die part to feed the casting and mounting member a predetermined distance to space the mounting member with respect to said die parts for spacing the successive elements on the mounting member during a successive series of casting operations of the machine, and means for moving the second named die parts into position to engage a cast element facilitating the removal of the first named die part from said element.

8. A machine for casting an element on a mounting member comprising means for supporting the mounting member in the machine, die parts movable relatively to each other and to said member and forming therebetween a mold chamber in which said member is arranged, a nozzle engaging the die parts and through which casting material is injected into the mold chamber of said die parts to form a casting therein on said member, means for moving the die parts toward and from each other during each cycle of operation of the machine, one of said die parts serving to support the casting formed thereby in the separation of other die parts, means for operating the supporting die part to

feed the casting and mounting member a predetermined distance to space the mounting member with respect to said die parts for spacing the successive elements on the mounting member during a successive series of casting operations of the machine, means for moving the second named die parts into position to engage a cast element facilitating the removal of the first named die part from said element, and means for trimming the cast elements disposed on said member.

9. A machine for casting an element on a mounting member comprising means for supporting the mounting member in the machine, die parts movable relatively to each other and to said member and forming therebetween a mold chamber in which said member is arranged, a nozzle engaging the die parts and through which casting material is injected into the mold chamber of said die parts to form a casting therein on said member, means for moving the die parts toward and from each other during each cycle of operation of the machine, one of said die parts serving to support the casting formed thereby in the separation of other die parts, means for operating the supporting die part to feed the casting and mounting member a predetermined distance to space the mounting member with respect to said die parts for spacing the successive elements on the mounting member during a successive series of casting operations of the machine, means for moving the second named die parts into position to engage a cast element facilitating the removal of the first named die part from said element, means for trimming the cast elements disposed on said member, and means periodically movable toward and from that part of the mounting member having the cast elements thereon for quickly feeding a relatively long length of the mounting member with respect to the die parts to arrange the cast elements on said mounting member in groups.

10. A machine for casting an element on a mounting member of fibrous material comprising means for supporting the mounting member in the machine, die parts movable relatively to each other and to said member and forming therebetween a mold chamber in which said member is arranged, a nozzle engaging the die parts and through which casting material is injected into the mold chamber of said die parts to form a casting therein on said member, a pot forming the container for the casting material, means for heating said pot, means for forcing the heated casting material from the pot and through said nozzle into the mold chamber of the die parts, and means for heating the nozzle adjacent the die parts.

11. A machine for casting an element on a mounting member of fibrous material comprising means for supporting the mounting member in the machine, die parts movable relatively to each other and to said member and forming therebetween a mold chamber in which said member is arranged, a nozzle engaging the die parts and through which casting material is injected into the mold chamber of said die parts to form a casting therein on said member, a pot forming the container for the casting material, means for heating said pot, means for forcing the heated casting material from the pot and through said nozzle into the mold chamber of the die parts, means for heating the nozzle adjacent the die parts, and means for circulating cooling water into and through the die parts adjacent the mold chamber formed thereby.

12. A machine for casting an element on a mounting member comprising means for supporting the mounting member in the machine, die parts movable relatively to each other and to said member and forming therebetween a mold chamber in which said member is arranged, a nozzle engaging the die parts and through which casting material is injected into the mold chamber of said die parts to form a casting therein on said member, a pot forming the container for the casting material, means for electrically heating said pot, and means for automatically controlling the temperature of the casting material in said pot.

13. In a machine for making die cast links of separable slide fasteners of the class described, said machine including relatively movable die parts forming a mold chamber therebetween, a nozzle adjacent and in constant engagement with the die parts by means of which die casting material is injected under pressure into said mold chamber, and means for intermittently actuating the die parts toward and from each other in each cycle of operation of the machine to form a successive series of die cast links.

14. In a machine for making die cast links of separable slide fasteners of the class described, said machine including relatively movable die parts forming a mold chamber therebetween, a nozzle adjacent and in constant engagement with the die parts by means of which die casting material is injected under pressure into said mold chamber, means for intermittently actuating the die parts toward and from each other in each cycle of operation of the machine to form a successive series of die cast links, a core cooperating with said die parts and upon which the die casting is formed, and means for operating the core independent of the said die parts to feed the casting through the machine.

15. In a machine for making die cast links of separable slide fasteners of the class described, said machine including relatively movable die parts forming a mold chamber therebetween, a nozzle adjacent the die parts by means of which die casting material is injected into said mold chamber, means for intermittently actuating the die parts toward and from each other in each cycle of operation of the machine to form a successive series of die cast links, one of said die parts including a core upon which the die cast link is formed, means for operating the core independent of the other die parts to feed the casting through the machine, said other die parts cooperating with the cast link facilitating removal of said link from the core, and means whereby a cooling fluid may be circulated through the die parts and discharged adjacent the impression therein to permit rapid formation of castings by said die parts.

16. In a die casting machine including relatively movable die parts within and between which is formed a mold chamber, a link mounting member comprising a fabric strip arranged in the path of movement of predetermined die parts to dispose a part of said strip in the mold chamber of said die parts, and means for injecting casting material into the mold chamber under pressure to form a die cast link on that part of said strip disposed within the mold chamber of said die.

17. In a die casting machine including relatively movable die parts within and between which is

formed a mold chamber, a link mounting member comprising a fabric strip arranged in the path of movement of predetermined die parts to dispose a part of said strip in the mold chamber of said die parts, means for injecting casting material into the mold chamber under pressure to form a die cast link on that part of said strip disposed within the mold chamber of said die, and one of said die parts including a core disposed in the plane of said strip and means for actuating said core to feed and space a cast link and said strip with respect to the other die parts when in open position to facilitate the formation of another link on the strip in predetermined spaced relation to the previously formed link.

18. In a die casting machine including relatively movable die parts within and between which is formed a mold chamber, a link mounting member comprising a fabric strip arranged in the path of movement of predetermined die parts to dispose a part of said strip in the mold chamber of said die parts, means for injecting casting material into the mold chamber under pressure to form a die cast link on that part of said strip disposed within the mold chamber of said die, one of said die parts including a core disposed in the plane of said strip, means for actuating said core to feed and space a cast link and said strip with respect to the other die parts when in open position to facilitate the formation of another link on the strip in predetermined spaced relation to the previously formed link, means for heating the casting material adjacent the die parts and means for cooling the die parts adjacent said strip.

19. In a machine for intermittently forming a plurality of die cast links on a mounting member of flexible material in predetermined spaced relation with respect to each other, means for feeding a mounting member with the links thereon to form grouped spacing of the links on said member.

20. In a machine for intermittently forming a plurality of die cast links directly upon a mounting member of flexible material in predetermined spaced relation with respect to each other, means for trimming the links formed on said member.

21. In a machine for intermittently forming a plurality of die cast links on a mounting member of flexible material in predetermined spaced relation with respect to each other, a core upon which said castings are formed, and means for actuating the core to feed and space the links with respect to each other on said mounting member.

22. The combination with means for automatically and intermittently casting members on a strip, of means comprising a core piece constituting part of said first named means for feeding the members and strip to space the members on the strip.

23. The combination with casting die parts movable toward and from each other with a mold chamber between adjacent surfaces of said parts when in closed position, of means for supporting a mounting strip to expose a portion thereof to the mold chamber of the die parts to facilitate formation of a casting on said strip by said die parts.

24. The combination with automatically actuated dies intermittently movable toward and from spaced portions of a mounting strip, the dies forming single impressions at said spaced portions, of means for automatically introducing casting material into the impression of the dies when in closed position to form in a successive series of operations, a successive series of castings on said spaced portions of the strip.

25. In a machine for making die cast links comprising relatively movable die parts forming a mold chamber therebetween, a nozzle adjacent the die parts by means of which die casting material is injected into said mold chamber, means for intermittently actuating said die parts toward and from each other, one of said die parts constituting a core upon which the die casting is formed and supported when the other die parts are separated from the casting, and said other die parts being utilized to remove the casting from said core.

26. In a machine for intermittently forming a successive series of die cast parts on a mounting member, dies intermittently movable toward and from longitudinally spaced sections of said member, means for moving said member to bring the spaced sections into alinement with the dies, and means for injecting casting material into said dies under pressure when in engagement with said sections and upon that part of the mounting member therein to form said successive series of die castings.

27. A machine of the class described comprising dies movable toward and from each other, the adjacent abutting faces of the dies forming a mold impression therebetween, a core member movable relatively to the dies and positioned therebetween and extending into the impression when the dies are in closed position, means for inserting casting material under pressure into the impression and around said core to form a casting supported by the core when said dies are separated, said core serving to move the casting out of alinement with the dies, and means comprising movement imparted to said core and dies for stripping the casting from the core to permit the return of the core into position between the dies for the next casting operation.

28. A machine of the class described comprising dies movable toward and from each other, the adjacent abutting faces of the dies forming a mold impression therebetween, a core member movable relatively to the dies and positioned therebetween and extending into the impression when the dies are in closed position, means for inserting casting material under pressure into the impression and around said core to form a casting supported by the core when said dies are separated, said core serving to move the casting out of alinement with the dies, means comprising movement imparted to said core and dies for stripping the casting from the core to permit the return of the core into position between the dies for the next casting operation, and means for trimming the casting formed by the dies to a finished size.

29. In a die casting machine, a pair of dies movable toward and from each other, a core member disposed between the dies and extending into the impression chamber thereof, said core member being movable relatively to and angularly with respect to said dies and forming means for ejecting the casting from the dies as well as a means for feeding the casting out of the path of movement of the dies, a nozzle through which casting material is injected under pressure into the impression chamber of the dies when said dies are in closed position, and the structure of the nozzle and dies being such as to maintain the nozzle in constant engagement

with the dies in the different positions assumed by the dies in the operation of the machine.

30. In a die casting machine, a pair of dies movable toward and from each other, a core member disposed between the dies and extending into the impression chamber thereof, said core member being movable relatively to and angularly with respect to said dies and forming means for ejecting the casting from the dies as well as a means for feeding the casting out of the path of movement of the dies, a nozzle through which casting material is injected under pressure into the impression chamber of the dies when said dies are in closed position, the structure of the nozzle and dies being such as to maintain the nozzle in constant engagement with the dies in the different positions assumed by the dies in the operation of the machine, and means for circulating cooling water through the dies.

31. The combination with automatically actuated dies intermittently movable toward and from spaced portions of a mounting strip, the dies forming single impressions at said spaced portions, of means for automatically introducing casting material into the impression of the dies when in closed position to form in a successive series of operations, a successive series of castings on said spaced portions of the strip, and means for automatically heating and controlling the temperature of the casting material employed for forming said castings.

LOUIS H. MORIN.
DAVIS MARINSKY.