July 12, 1932. T. C. SHEEHAN ET AL 1,867,331

FORGING MACHINE

Original Filed April 4, 1928 5 Sheets-Sheet 1

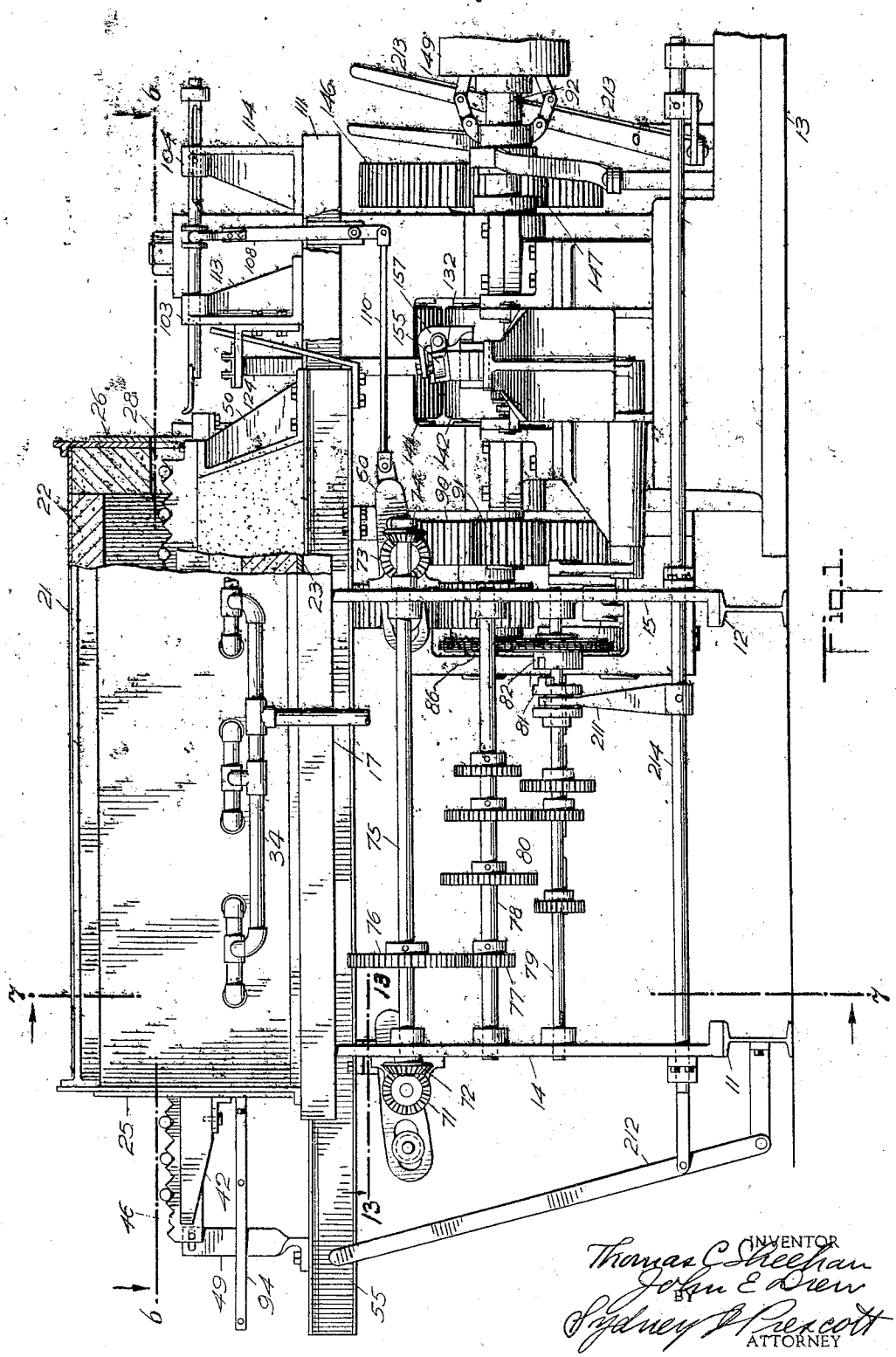


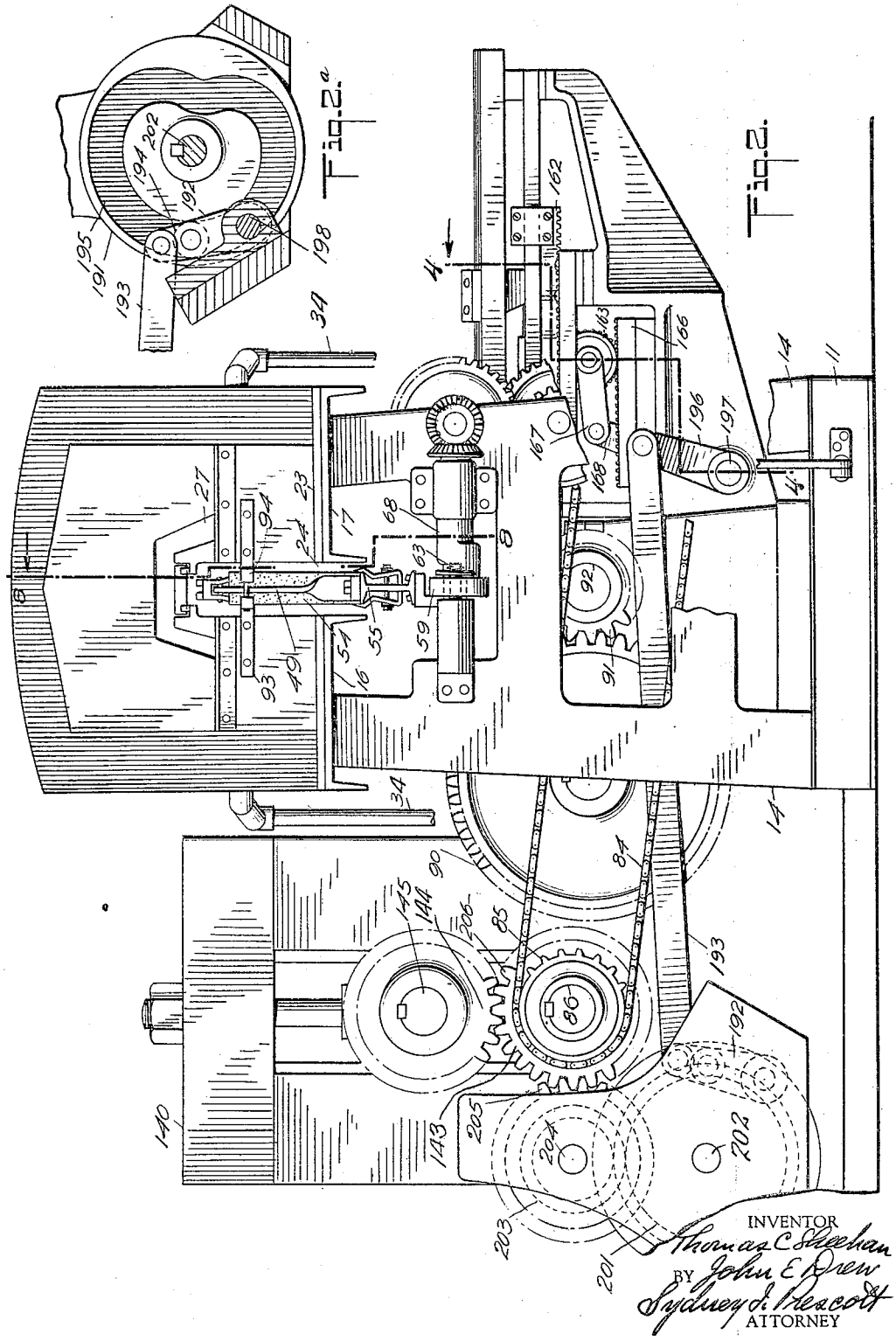
Fig. 1.

INVENTOR
Thomas C. Sheehan
John E. Drew
BY
Sydney P. Prescott
ATTORNEY

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Original Filed April 4, 1928 5 Sheets-Sheet 2



INVENTOR
Thomas C. Sheehan
BY John E. Drew
Sydney A. Prescott
ATTORNEY

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FORGING MACHINE

Original Filed April 4, 1928 5 Sheets-Sheet 3

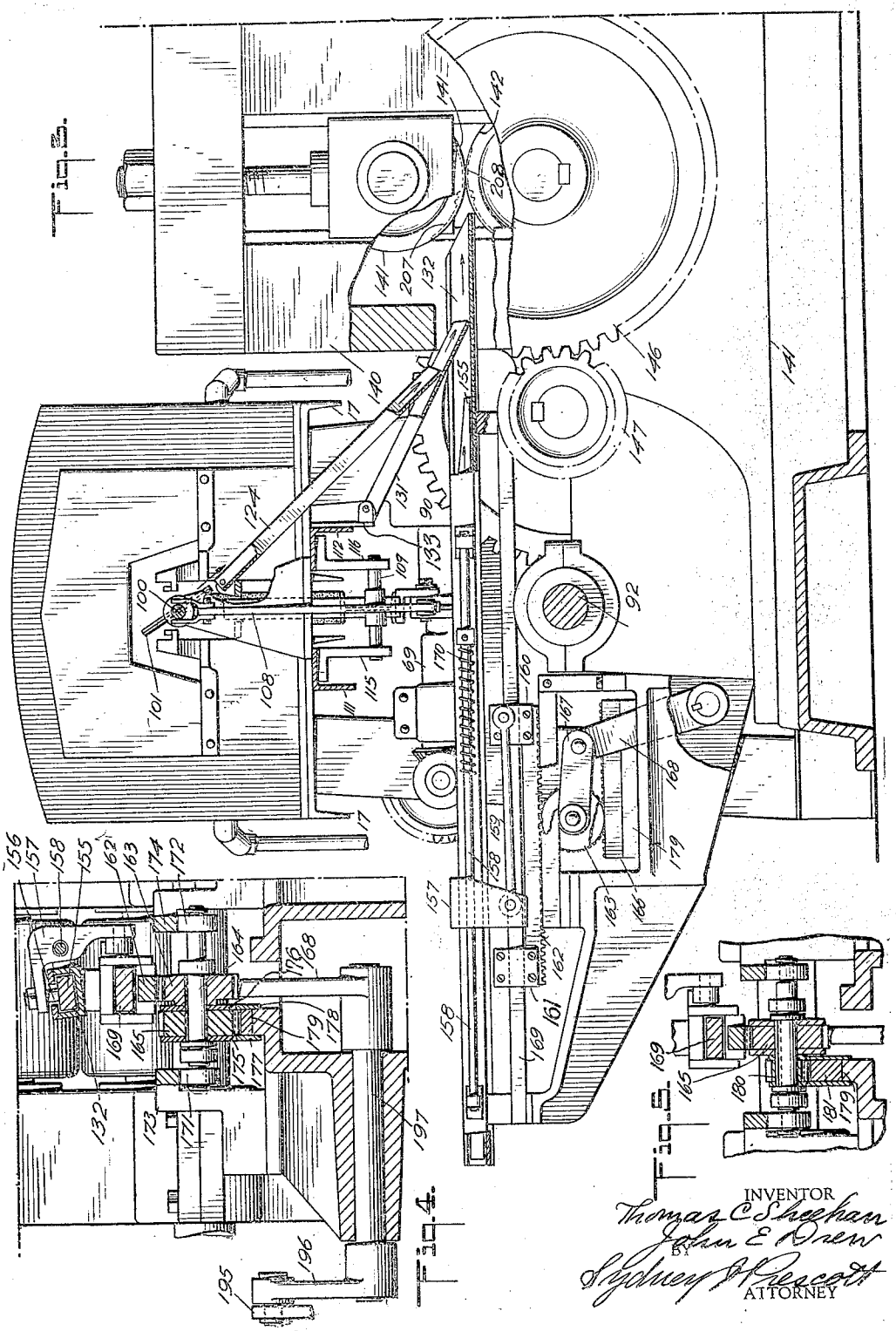


Fig. 5.

Fig. 4.

INVENTOR
Thomas C. Sheehan
John E. Drew
BY
Sydney P. Prescott
ATTORNEY

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Original Filed April 4, 1928 5 Sheets-Sheet 4

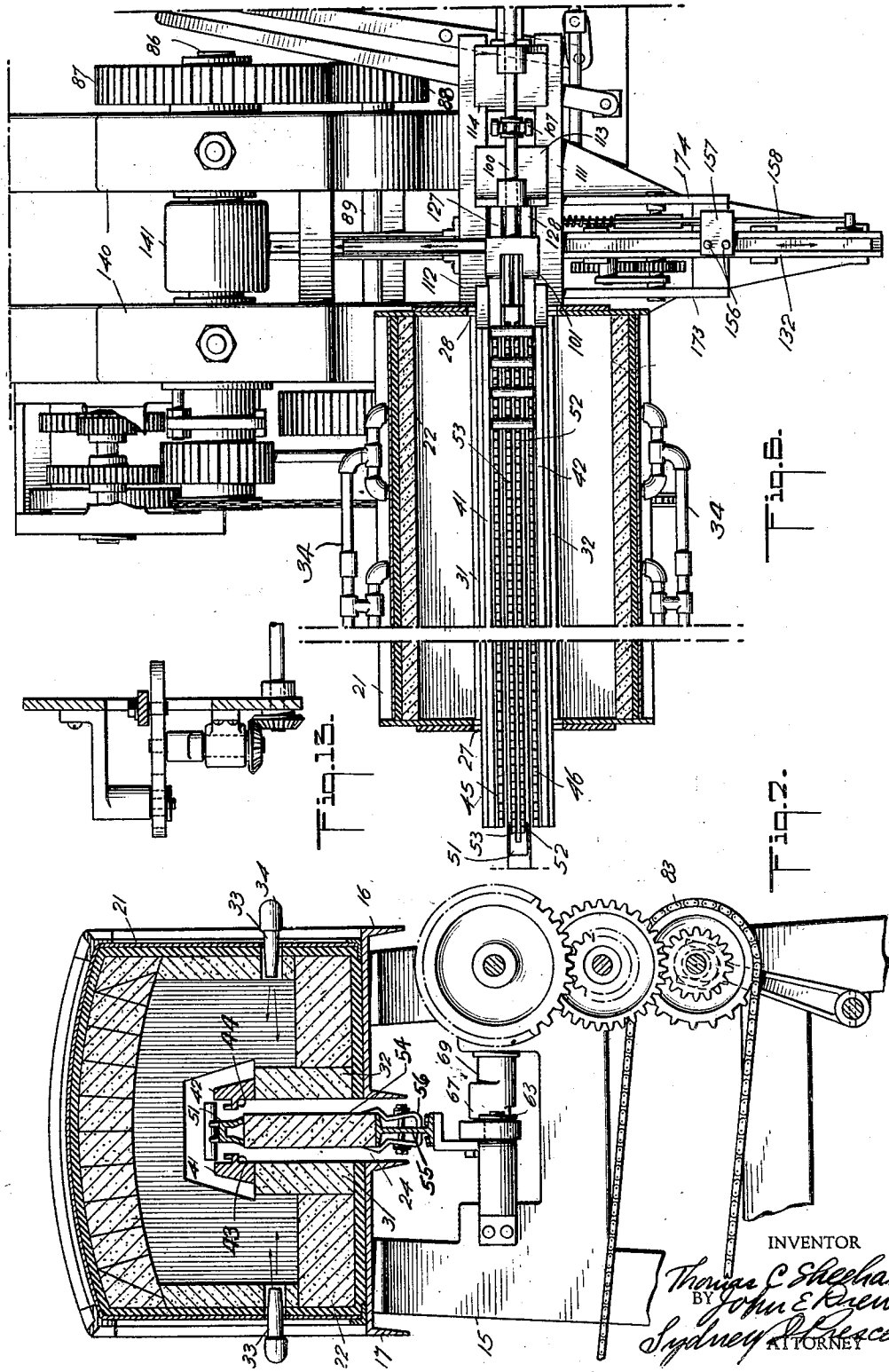


Fig. 2.

INVENTOR

Thomas C. Sheehan

BY John E. Drew

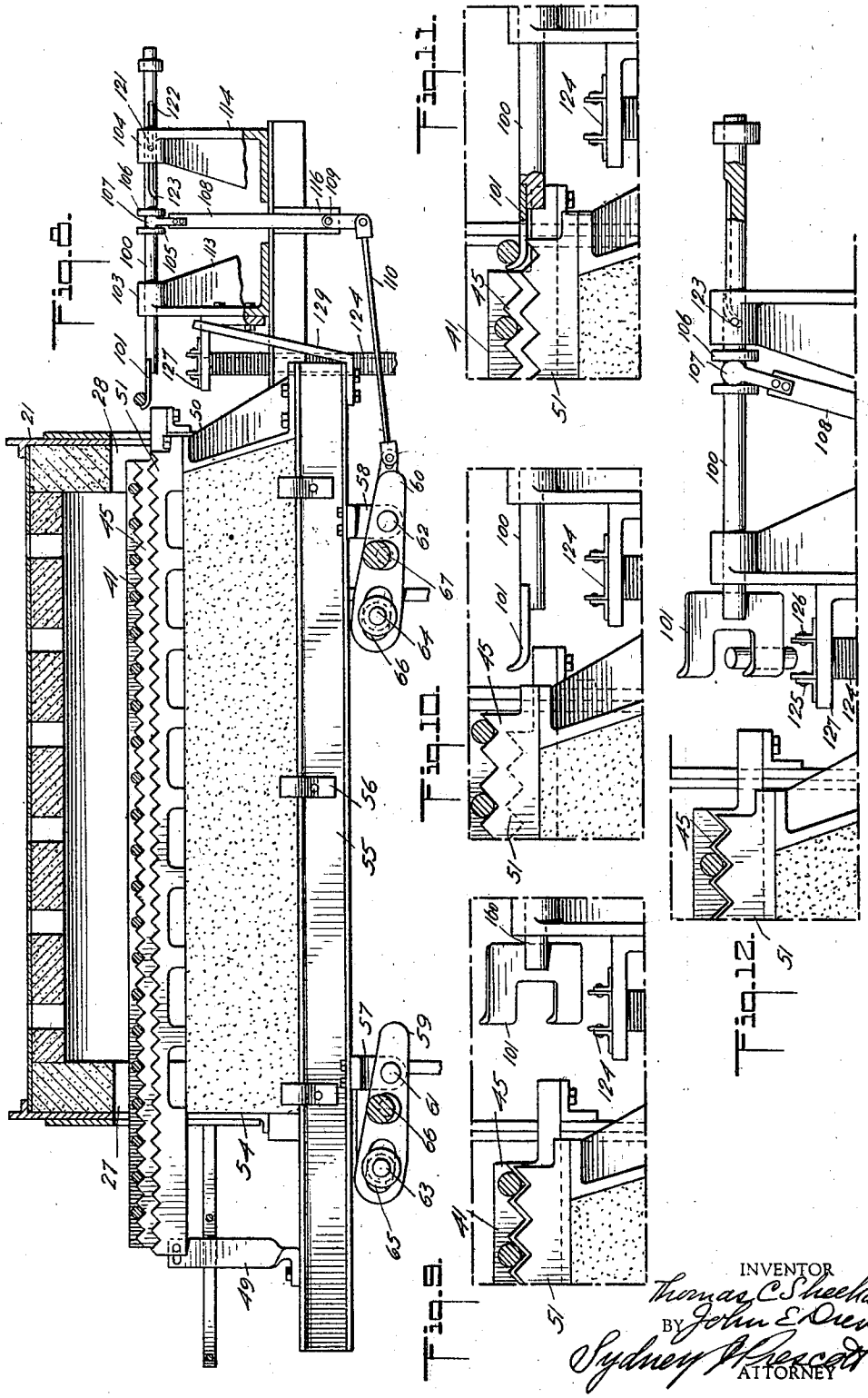
Sydney R. Prescott

ATTORNEY

July 12, 1932. T. C. SHEEHAN ET AL 1,867,331

FORGING MACHINE

Original Filed April 4, 1928 5 Sheets-Sheet 5



INVENTOR
Thomas C. Sheehan
BY John E. Drew
Sydney P. Prescott
ATTORNEY

Patented July 12, 1932

1,867,331

UNITED STATES PATENT OFFICE

THOMAS C. SHEEHAN, OF UPPER MONTCLAIR, AND JOHN E. DREW, OF JERSEY CITY, NEW JERSEY, ASSIGNORS TO WADE & BUTCHER CORPORATION, A CORPORATION OF NEW JERSEY

FORGING MACHINE

Application filed April 4, 1928, Serial No. 267,442. Renewed May 27, 1932.

This invention relates to a forging machine operative to automatically heat and shape metal blanks. The main object of the present invention is the production of an improved furnace for such a machine, of simplified construction to evenly and uniformly heat the blanks to be forged and to produce improved supporting and conveying means for passing the blanks through the furnace in a definite period of time. Another object is to eliminate the use of expensive heat resisting alloy supports for holding the blanks and to expose the blanks to the open heat of the furnace and at the same time avoid warping or uneven heating of the blanks. Another object of the invention is to provide a means which will remove the blanks from the furnace and deliver the same in proper position for passing into the shaper, without jamming or dropping of the blanks. It is also an object of the invention to produce improved means whereby the heated blanks transferred from the furnace will be forced into the shaper in correct position in respect to the shaper, despite some variation in size or shape of the blanks. With these and other objects not specifically mentioned in view, the invention consists in certain constructions and combinations which will be hereinafter fully described and then specifically set forth in the appended claims.

In the accompanying drawings, which form a part of this specification, and in which like characters of reference indicate the same or like parts, Fig. 1 is a right side elevation of the machine in accordance with the invention; Fig. 2 is a front elevation of the machine shown in Fig. 1; Fig. 2A is a side elevation of a detail shown in Fig. 2; Fig. 3 is a rear elevation of the machine shown in Fig. 1; Fig. 4 is a detailed sectional view of a portion of the machine shown in Fig. 3; Fig. 5 is a similar section of a modified form of the parts shown in Fig. 4; Fig. 6 is a plan view partly in section along the line 6—6 of the machine shown in Fig. 1; Fig. 7 is a vertical section taken on the line 7—7 of Fig. 1; Fig. 8 is a longitudinal vertical section of the machine taken on the line 8—8 of Fig. 2; Figs. 9 to 12 are detailed views of a part of the machine shown in Fig. 8 illustrating different positions of the parts shown in said figure during one complete cycle of operation of the machine; Fig. 13 is a sectional plan view on the line 12—12 of Fig. 1.

In carrying the invention into effect, there is provided means for heating the blanks, said means including a furnace having an opening in each end and blank advancing means within the furnace for receiving the blanks in one opening and advancing the blanks in one direction, and in a definite period of time to the other opening. In the best constructions also, the furnace includes means providing uniform heating along its central portion, and the blank advancing means operates to advance the blanks through this central portion. In the best constructions the blank advancing means will include open blank engaging elements for exposing the blanks to the direct heat of the furnace. The best constructions of the machine will also include means for transferring the blanks from within the furnace to the shaper in proper position for the shaping operation. The best constructions will also include means for forcing the blanks into the shaper in correct position, and such constructions will include interconnected means for operating the advancing means, the transfer means and the means for forcing the blanks into the shaper, in timed relation. The means above referred to can be widely varied within the scope of the claims, the particular machine selected to illustrate the invention, being only one of many possible embodiments of same.

Referring to the drawings, there is a foundation for the machine formed of sills 11 and 12 and a base 13. Supported on the sills is a pair of upright frames 14 and 15, supporting a pair of parallel spaced flat channel members 16 and 17, which form the base on which the means for heating the blanks are supported. While the heating means may take other forms, as shown, it consists of an elongated rectangular furnace 21 having a heat resisting lining 22 of well known character, the floor 23 of which furnace is slotted at 24 the entire length of the furnace

in register with the space between the channel members 16 and 17. The end walls are provided with centrally located openings 27 and 28, connected by vertical slots with the slot 24 in the floor.

As shown in Fig. 7, the slot in the floor is bordered by vertical walls 31 and 32, of the same material as the lining, extending above the general floor level. The interior of the furnace is heated by gas, passing through nozzles 33.

To provide uniform heat along the central portion of the furnace where the blanks are subject to the heat of the furnace and to avoid uneven heating of different parts of the blank, the nozzles 33 are arranged at regular intervals along the sides of the furnace and, as shown in Fig. 7, enter near the floor of the furnace and are directed horizontally against the upstanding walls 31 and 32, which serve as baffles to protect the central portion of the furnace through which the blanks pass from the direct blast of the nozzles without interfering with the passage of heat thereto. The nozzles are supplied with gas through conventional piping 34.

To support the blanks in the heat of the furnace, at the central portion thereof there is provided a pair of rails 41 and 42 extending in a straight line from a position exterior to the entrance opening 27 of the furnace, through the central portion of the furnace and into the exit opening 28 of the furnace. Extending into the space between the rails, there are provided on the rails longitudinal ribs 43 and 44 with upstanding portions having each a row of angular serrations 45 and 46, the serrations in one row registering with the serrations in the other, which serrations serve to support the blanks transversely between the rails, as shown in Fig. 6.

It will be apparent from an inspection of Figs. 6 and 7, that the inner side of the rails will prevent lateral displacement of the blanks. Conveyor means are provided to lift the blanks from one position on the serrated portions of the rails, advance the same and lower them to another position on said serrations and thus give the blanks a galloping movement along the rails, consisting of a third movable rail 51 between the first two. The upper surface of this rail is provided with a pair of spaced longitudinal ribs 52 and 53, serrated in the same manner as the ribs 41 and 42, to support the blanks transversely thereof. This third rail is supported at its ends by brackets 49 and 50 on the I beam 55 and is further supported along its length by a refractory wall 54 held by suitable clamps 56 on the I beam 55. This I beam is pivotally supported at each end on horizontal rock levers 59 and 60, by brackets 57 and 58 secured to the I beam and pivoted by pins 61 and 62 at one end of each rock lever.

To give the blank conveyor 51 successively an upward, an advancing and a downward motion, the other end of each of the rock levers is secured on fixed pivots 63 and 64, acting in slots 65 and 66 to permit pivotal and horizontal but not vertical movement of that end of the rock lever. Intermediate their ends, the rock levers are journalled on cranks 66 and 67, on crank shafts 68 and 69. It will be seen from Fig. 8 that rotation of the crank shafts 68 and 69 will give the blank conveyor 51 successively an upward, an advancing and a downward motion to lift the blanks, advance them and lower them in an advanced position.

The crank shafts 68 and 69 are driven through bevel gear drives 71, 72 and 73, 74, from a common shaft 75, driven in turn by gear 76, meshing with gear 77 secured to the counter shaft 78, which shafts is driven by a selective sliding gear transmission 80 of well known construction from shaft 79, driven through a clutch 81, 82 of well known construction, by sprocket and chain drives 83, 84 and 85 from shaft 86. Shaft 86 is driven through gears 87 and 88, counter shaft 89 and gears 90 and 91 from the main drive shaft 92 of the machine.

A pair of spaced brackets 93 and 94, between which the bracket 49 is guided, serves to maintain the conveyor rail 51 in upright position on its supporting structure. To permit expansion of the conveyor rail, a pin and slot connection permitting longitudinal play between the bracket 49 and the rail, is employed.

To transfer the heated blanks from the conveyor at the end of the furnace to the shaper, there is provided in the construction illustrated, a shovel shaped member 101 having a cutaway portion to admit the conveyor rail and supported below the serrations of the same when in highest position, which is secured to shaft 100 slidably mounted in bearings 103 and 104 for horizontal movement to a position underneath the end blank on the conveyor rail when near its high position. To cause this sliding movement, a pair of spaced collars 105 and 106 are secured thereon, between which a fork 107 embraces the shaft, the fork being secured to the longer arm of a lever 108 on a fixed pivot pin 109. The opposite end of the lever is connected by a link 110 to the free end of the rock lever 60 whereby the forward movement of the rock lever, after reaching high position, slides the shaft 100 and shovel 101 goes under the end blank on the rail 51. A pair of angle irons 111 and 112 secured to and projecting from the base of the furnace, serves to support the bearings 103 and 104 respectively secured thereon by brackets 113

and 114, and also supports the pivot pin 109 in brackets 115 and 116.

To discharge the blank from the shovel, the bearing 104 is provided with a projecting pin 121 engaging in a groove in the surface of shaft 100, the inner end of the groove having a transversely curved cam surface, engagement of which against the pin 121 tilts the shaft and discharges the blank, when the shaft is slid to its remote position with respect to the furnace. Below discharge position of the shovel, in a position to catch the blanks discharged therefrom, is a chute having two sections, the upper section 124 being pivoted at its upper end on pivot pins 125 and 126 to a bracket 127 on the bearing bracket 113. This bracket also serves as a mate to similar bracket 128 spaced therefrom to guide between them an upright 129 rigidly secured to the I beam 55, to secure accurate registration between the end of the conveyor and the discharge mechanism. The lower end of the section 124 rests in a second or lower section 131, similarly pivoted on a bracket 133 secured to angle iron 112, the lower end of which rests in the guideway 132 having its bottom surface inclined to one side as shown in Figs. 1 and 4 for directing blanks into the shaping means.

While other shaping means may be employed, as shown, a rolling mill of well known construction generally designated by 140, is employed for shaping the heated blanks. The rolls 141 and 142 are driven in synchronization by a pair of superposed gears 143 and 144 on the roll shafts 86 and 145, the latter of which is driven by reduction gears 146, 147, 90 and 91 from the main drive shaft 92, connected through a conventional clutch 149 to a source of power not shown.

The guideway 132 is positioned to receive the blanks from chute 131 and direct them into the bight of the rolls. When, as in the device illustrated, the rolls are in the form of circular dies to give the blank the desired shape, it is necessary that the heated blank enter the bight of the rolls at the proper moment. To insure this there is a plunger 155 in the guideway 132 passing under the pivoted chute 131 to push a blank which has gravitated down the same to the guideway into the rolls. The plunger 155 is provided with pins 156 projecting from its upper side out of the slideway and, as shown in Fig. 4, is connected to one arm of an angle shaped slide 157 slidable on a rod 158 secured in parallel relation on the side of the guideway. A spring 170 secured to the rod in the actuating range of the slide 157 serves to prevent shock and to retard the plunger against additional throw due to back lash. To the other arm of the slide is pivoted one end of a link 159, the other end of which is pivoted to one slide 160 of a pair of slides 160 and 161, slidably mounting a rack bar 162 on a slide bar 169, parallel with the rod 158. In mesh with the rack of the rack bar is pinion wheel 163 keyed to a short shaft 164 on which is also keyed another pinion 165 in mesh with a stationary rack 166 removably secured in any conventional way as by side plates 177 and 178 on the rack bed 179. Rollers 171 and 172 on shaft 164, engage guides 173 and 174 to maintain the shaft in horizontal position. Flanges 175 and 176 prevent lateral displacement of the pinions with respect to the racks.

Fig. 5 illustrates how the structure just described may be quickly modified to give the plunger a greater throw when changing to the forging of longer blanks. This is done by removing the rack 177 and substituting a smaller pinion 180 and proportionately thicker rack 181, as shown in Fig. 5.

It will be evident from Figs. 4 and 5 that rocking of rocker arm 168 through a relatively small arc will, through the medium of the pinions, cause a multiplied motion of rack bar 162 and consequently the plunger 132 connected thereto. It is apparent therefore that a cam wheel 191 of moderate proportions, will suffice to give the necessary range of movement to the plunger 132. A cam follower 192 pivoted at one end at 198 to the main frame and at the other end to a link 193, has secured to it intermediate its ends a roller 194 which rides in a cam groove 195 in the side of the cam wheel. Link 193 is pivoted to the arm 196 secured to rock shaft 197, on which the rocker arm 168 is secured. The cam wheel 191 is driven through a gear whose pitch line is indicated by dotted line 201 secured to the same shaft 202 as the cam wheel, and meshing with a gear, the pitch line of which is indicated by dotted line 203, secured to shaft 204 driven by gear 205, in mesh with a gear 206 on the roll shaft 87. The plunger operating means is, therefore, intergeared with the gears driving the rolls, whereby the plunger is synchronized to force the end of the blank into the bight of the rolls in proper relation to the circular dies indicated by dotted lines 207 and 208 of the shaper.

For convenience in operation, clutch 81—82 is provided with clutch operating fork 211 of well known construction, operated from either end of the machine by levers 212 and 213 arranged to shift the longitudinal shaft 214, to which the clutch operating fork is secured.

In view of the description of the operation incorporated in the foregoing, further detailed description of the operation of the machine is thought unnecessary and is omitted for the sake of brevity.

What is claimed is:

1. In a device for heating blanks, in combination, a furnace, a chute to receive the blanks from the furnace, means for advancing a row of elongated heated blanks in side

by side relation straight through the furnace, from one end to the other end thereof, and transfer means for successively removing one of the blanks from the row in the furnace and delivering it endwise into the chute.

2. In a device for heating blanks, in combination, a furnace, a chute to receive the blanks from the furnace, means for advancing a row of elongated heated blanks in side by side relation straight through the furnace, from one end to the other end thereof, and transfer means for successively removing one of the blanks from the row in the furnace and delivering it endwise into the chute, said transfer means being connected to the blank advancing means for synchronous operation therewith.

3. In a device for heating blanks, in combination, a furnace, a chute to receive the blanks from the furnace, means for advancing a row of elongated heated blanks in side by side relation straight through the furnace, and transfer means for successively removing one of the blanks from the row in the furnace and delivering it endwise into the chute, said transfer means including a blank supporting member movable to a position adjacent the chute, and means to tilt the member to deliver the blank to the chute.

4. In a machine for supplying heated blanks to a shaper, the combination with a furnace, of means for advancing blanks through the furnace, mechanism for transporting the blanks from the furnace into the range of action of the shaper, means cooperating with said mechanism for successively forcing said blanks into the shaper, and means for varying the relative operating speeds of said blank advancing means and said blank forcing means.

5. In a machine for supplying heated elongated blanks to a shaper, the combination with a furnace having an opening at each end, of means extending between said openings for supporting a row of the blanks in side by side spaced relation and advancing them from one end of said furnace to the other end thereof, means for forcing the blanks into the shaper, transfer mechanism for successively removing heated blanks from said advancing means and delivering them endwise into said forcing means, and interconnected means for operating the blank advancing mechanism, the transfer device and blank forcing means in timed relation.

6. In a machine for supplying heated elongated blanks to a shaper, the combination with a furnace having an opening at each end, of means extending between said openings for supporting a row of the blanks in side by side spaced relation and advancing them from one opening to the other, means for forcing the blanks into the shaper, transfer mechanism for successively removing heated blanks from said advancing means and delivering them endwise into said forcing means, and interconnected means for operating the blank advancing mechanism, the transfer device and blank forcing means in timed relation, said advancing means including stationary blank supporting rails extending between said openings and a moving rail extending lengthwise between the first mentioned rails.

7. In a machine for supplying heated elongated blanks into a shaper, the combination with a furnace having an opening at each end, of means extending between said openings for supporting a row of the blanks in side by side spaced relation and advancing them from one opening to the other, means for forcing the blanks into the shaper, transfer mechanism for successively removing heated blanks from said advancing means and delivering them endwise into said forcing means, and interconnected means for operating the blank advancing mechanism, the transfer device and blank forcing means in timed relation, said forcing means including a guideway positioned to receive the blanks from said transfer mechanism, and a plunger slidable along said guideway to force the blanks into the shaper, and said guideway having its bottom surface permanently inclined to one side whereby the blanks will be guided on the bottom and one side surface only as they pass into the shaper.

8. In a machine for supplying heated elongated blanks to a shaper, the combination with a furnace having an opening at each end, of means extending between said openings for supporting a row of the blanks in side by side spaced relation and advancing them from one opening to the other, means for forcing the blanks into the shaper, transfer mechanism for successively removing heated blanks from said advancing means and delivering them endwise into said forcing means, and interconnected means for operating the blank advancing mechanism, the transfer device and blank forcing means in timed relation, said forcing means including a guideway positioned to receive the blanks from said transfer mechanism, and a plunger slidable along said guideway to force the blanks into the shaper, said transfer mechanism including a chute having a section supported for movement away from the guideway with its lower end resting in said guideway.

9. In a machine for supplying heated blanks to a shaper, the combination with a furnace having an opening at each end, of stationary blank supporting rails extending between said openings, and means for advancing the blanks in spaced relation along said rails, said means including a moving central rail extending lengthwise between said first mentioned rails and having lat-

erally spaced blank engaging ribs for supporting elongated blanks.

10. In a machine for supplying heated blanks to a shaper, the combination with a furnace having an opening at each end, of stationary blank supporting rails extending between said openings, and means for advancing the blanks in spaced relation along said rails, said rails including opposed vertical walls having laterally projecting ribs for supporting elongated blanks with their ends adjacent and maintained in alignment by said walls.

11. In a machine for supplying heated blanks to a shaper, the combination with a furnace having an opening at each end, of stationary blank supporting rails extending between said openings, means for advancing the blanks in spaced relation along said rails, and means for successively imparting upward, forward and downward movements to said blank advancing element, said means comprising a floating lever pivotally connected to said advancing element and an eccentric operating element engaging said lever.

12. In a machine for supplying heated blanks to a shaper, the combination with a furnace having an opening at each end, of stationary blank supporting rails extending between said openings, means for advancing the blanks in spaced relation along said rails, and means for successively imparting upward, forward and downward movements to said blank advancing element, said means comprising a floating lever pivoted at one end of said advancing means and connected to a stationary pivot by means of a slot at the other end and an eccentric operating element engaging the central portion of said lever.

13. In a machine for supplying heated blanks to a shaper, the combination with a furnace having an opening at each end, of stationary blank supporting rails extending between said openings, means for advancing the blanks in spaced relation along said rails, said blank advancing means including a blank engaging rail extending between said supporting rails and a moving refractory support on which said advancing rail is mounted to prevent warping of the latter.

14. In a machine for supplying heated blanks to a shaper, the combination with a furnace having an opening at each end, of stationary blank supporting rails extending between said openings, and means for advancing the blanks in spaced relation along said rails, said furnace including upstanding refractory walls supporting said stationary rails.

15. In a machine for supplying heated blanks to a shaper, the combination with a furnace having an opening at each end, of stationary blank supporting rails extending between said openings, and means for advancing the blanks in spaced relation along said rails, said furnace including upstanding refractory walls supporting said stationary rails and means for directing hot gases against the outer sides of said walls whereby the latter serve as baffle walls to protect the blanks.

16. Means for forcing heated elongated blanks endwise into a shaper, comprising a guideway in which the heated blanks are received, a plunger slidable along said guideway to force the blanks into the shaper, a reciprocating element and reciprocation multiplying means connecting said element and said plunger.

17. Means for forcing heated elongated blanks endwise into a shaper, comprising a guideway in which the heated blanks are received, a plunger slidable along said guideway to force the blanks into the shaper, a reciprocating element and reciprocation multiplying means connecting said element and said plunger, said multiplying means including opposed racks and an intermediate pinion.

18. Means for forcing heated elongated blanks endwise into a shaper, comprising a guideway in which the heated blanks are received, a plunger slidable along the guideway to force the blanks into the shaper, said guideway having its bottom surface permanently tilted to one side whereby the blanks will be guided on the bottom and one side only as they pass into the shaper.

19. In a device for supplying heated blanks from a furnace to a shaper, the combination with a guideway for directing the blanks to the shaper, of means for successively transferring blanks from the furnace to the guideway, said means including a chute for delivering the blanks to the guideway comprising a section supported for movement away from the guideway, and a second section at a lesser incline to the guideway for delivering blanks from the first mentioned section to said guideway.

20. In a device for supplying heated blanks from a furnace to a shaper, the combination with a guideway for directing the blanks to the shaper, of means for successively transferring blanks from the furnace to the guideway, said means including a chute having a section supported for movement away from the guideway with its lower end resting on the guideway, and means operating in the guideway and under the lower end of said section to force the blanks into the shaper.

In testimony whereof, we have signed our names to this specification.

THOMAS C. SHEEHAN.
JOHN E. DREW.