(No Model.) 5 Sheets—Sheet 1.

C. PARTINGTON & E. W. HARDEN.

MACHINE FOR MAKING RAIL BRACES.

No. 458,480. Patented Aug. 25, 1891.

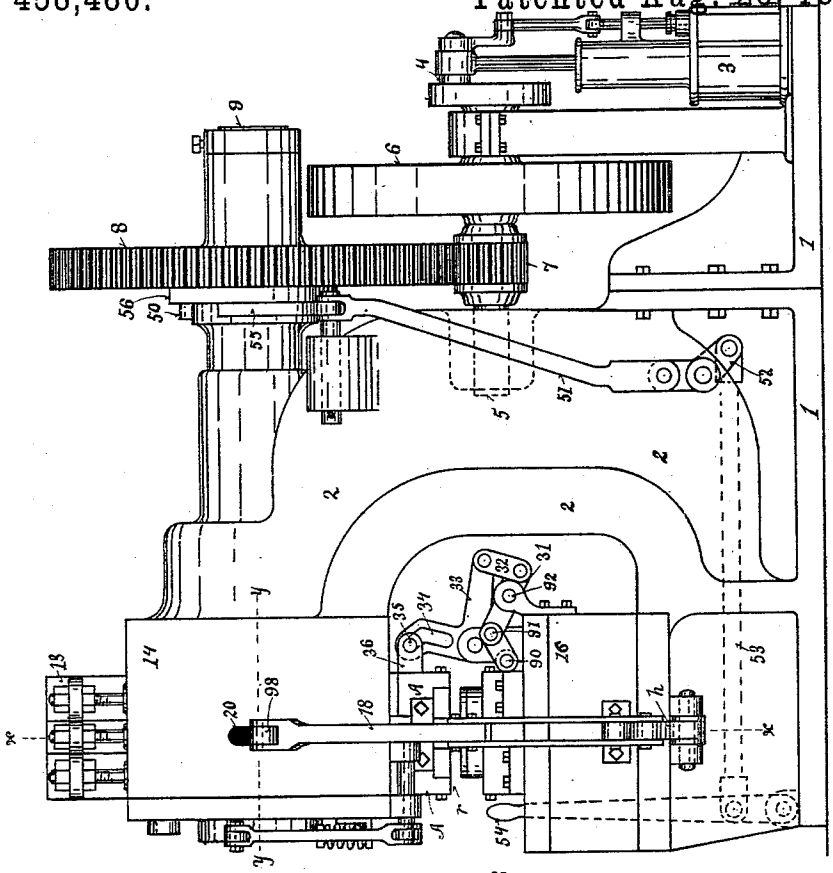


Fig. 1.

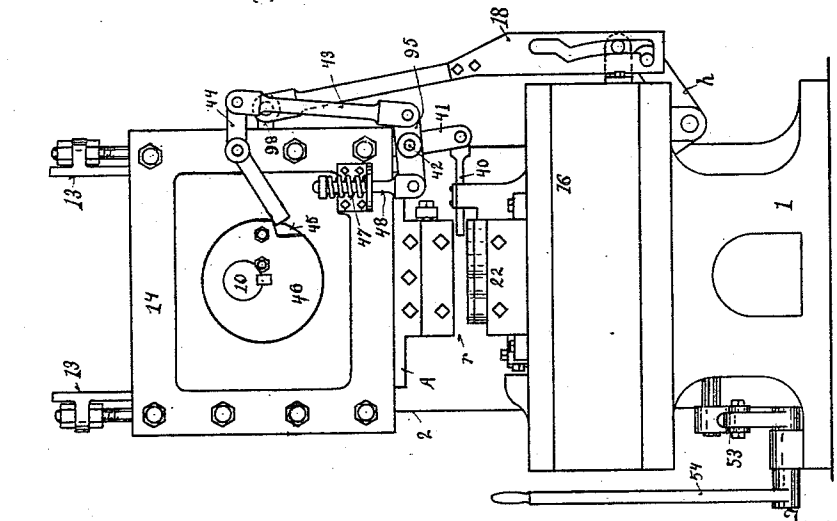


Fig. 2.

Witnesses
C. W. Miles
T. Simmons

Inventors,
Charles Partington and Edward W. Harden
By their Attorney Wood & Boyd

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(No Model.) 5 Sheets—Sheet 2.

C. PARTINGTON & E. W. HARDEN.

MACHINE FOR MAKING RAIL BRACES.

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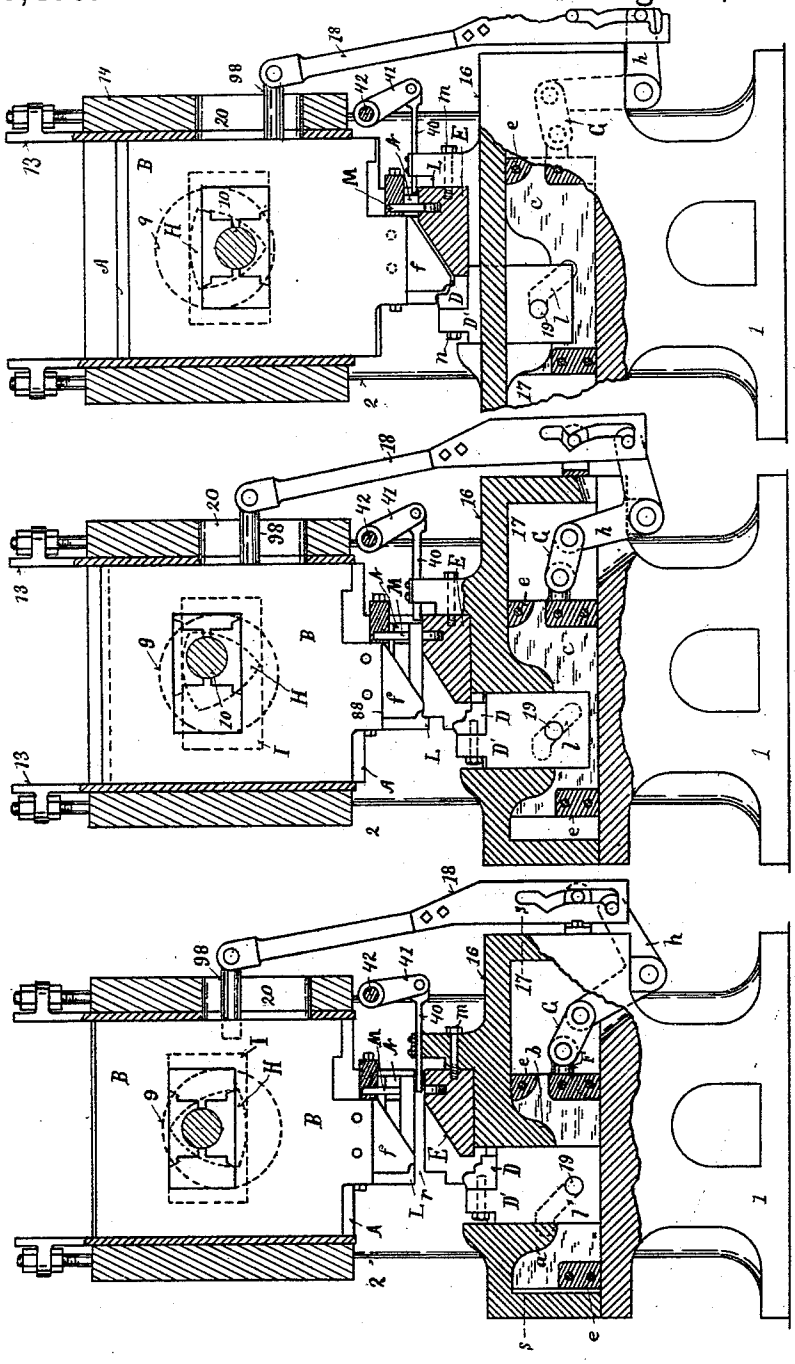


Fig. 5.

Fig. 4.

Fig. 3.

Witnesses
C. W. Miles
T. Simmons

Inventors,
Charles Partington and Edward W. Harden
By their Attorneys Wood & Boyd

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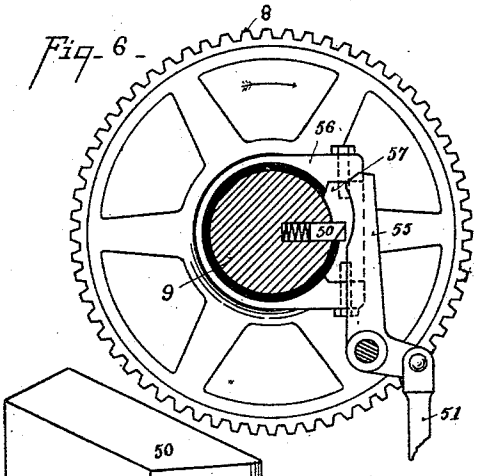
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C. PARTINGTON & E. W. HARDEN.

MACHINE FOR MAKING RAIL BRACES.

No. 458,480. Patented Aug. 25, 1891.

Fig. 6.



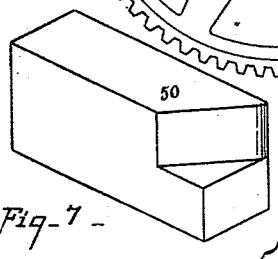


Fig. 7.

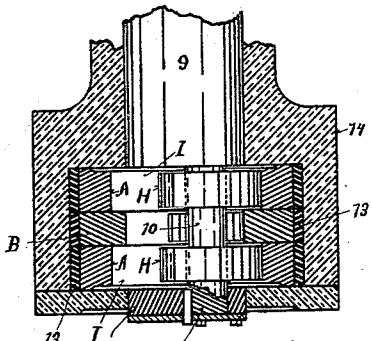


Fig. 8.

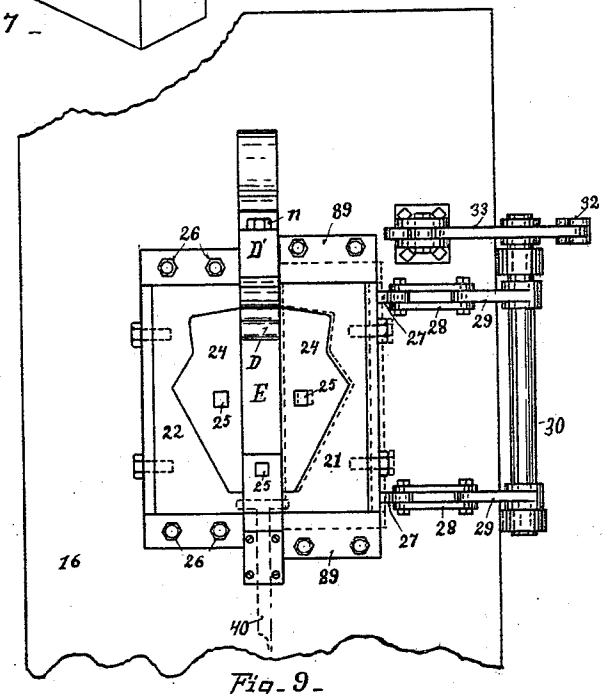


Fig. 9.

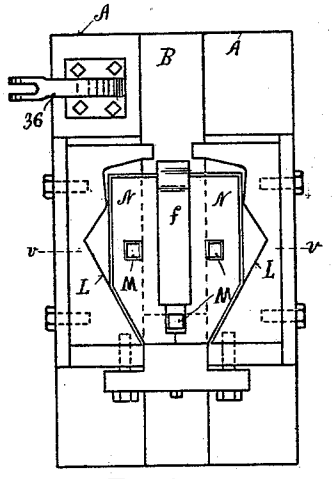


Fig. 10.

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C. PARTINGTON & E. W. HARDEN.

MACHINE FOR MAKING RAIL BRACES.

No. 458,480. Patented Aug. 25, 1891.

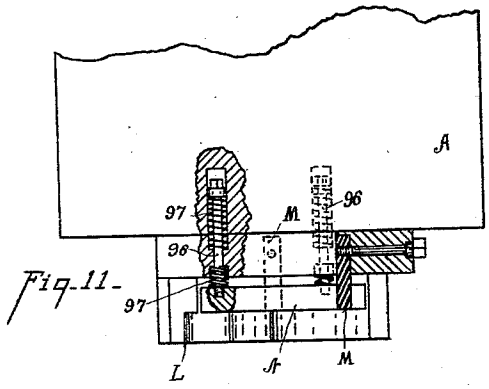


Fig. 11.

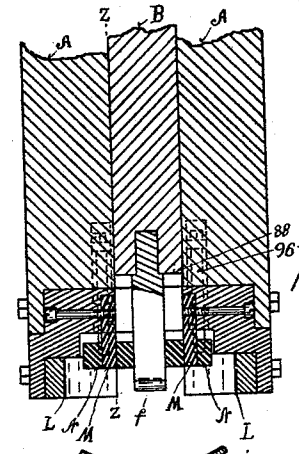


Fig. 12.

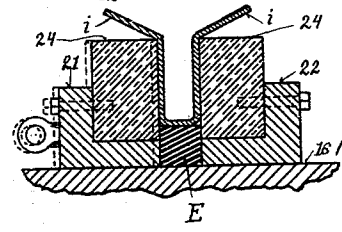


Fig. 17.

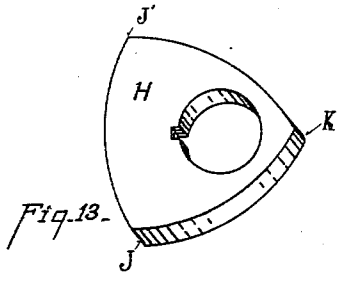


Fig. 13.

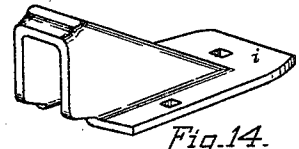


Fig. 14.

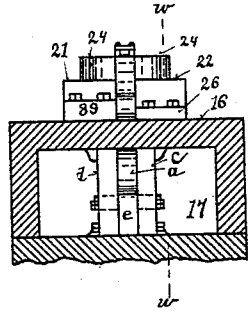


Fig. 15.

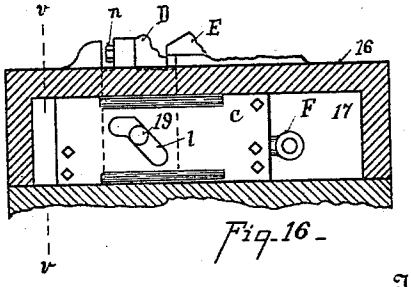


Fig. 16.

Witnesses
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(No Model.) 5 Sheets—Sheet 5.

C. PARTINGTON & E. W. HARDEN.

MACHINE FOR MAKING RAIL BRACES.

No. 458,480. Patented Aug. 25, 1891.

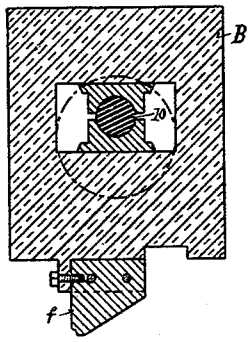


Fig. 18.

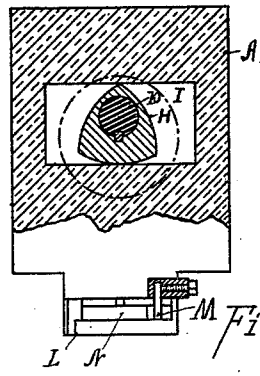


Fig. 19.

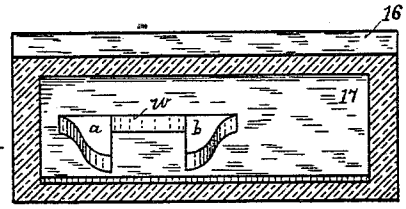


Fig. 20.

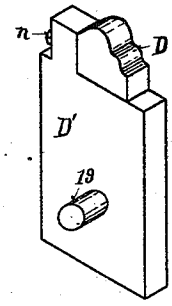


Fig. 22.

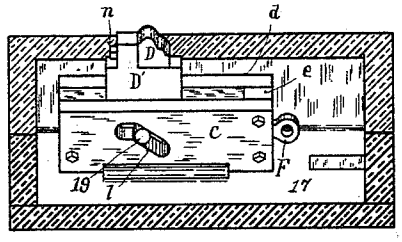


Fig. 21.

Witnesses
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T. Simmons

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By their Attorneys Wood & Boyd

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

UNITED STATES PATENT OFFICE.

CHARLES PARTINGTON AND EDWARD W. HARDEN, OF CINCINNATI, OHIO, ASSIGNORS TO THE WEIR FROG COMPANY, OF SAME PLACE.

MACHINE FOR MAKING RAIL-BRACES.

SPECIFICATION forming part of Letters Patent No. 458,480, dated August 25, 1891.

Application filed November 20, 1890. Serial No. 372,042. (No model.)

To all whom it may concern:

Be it known that we, CHARLES PARTINGTON and EDWARD W. HARDEN, citizens of the United States, and residents of Cincinnati, in the county of Hamilton and State of Ohio, have invented certain new and useful Improvements in Machines for Making Rail-Braces, of which the following is a specification.

The object of our invention is to provide a shaping-machine which when set in motion will automatically operate upon a blank piece of metal, first, to cut it in proper configuration; second, to shape it, and, third, to punch holes, or put in additional shapes, as occasion may require.

The various features of our invention will be fully set forth in the description of the accompanying drawings, making a part of this specification, in which—

Figure 1 is a side elevation of our improvement in position for use. Fig. 2 is a front elevation of the same. Figs. 3, 4, and 5 are each sections on line *x x*, Fig. 1, showing the working parts of the machine in different positions. Fig. 6 is a side elevation of the clutch for stopping and starting the machine. Fig. 7 is a detail view of the clutch-pin. Fig. 8 is a section on line *y y*, Fig. 1. Fig. 9 is a top plan view of the lower shearing, forming, and punching dies in position for use. Fig. 10 is a bottom plan view of the upper shearing, forming, and punching dies. Fig. 11 is a section on line *z z*, Fig. 12. Fig. 12 is a section on line *v v*, Fig. 10, of the plungers and upper dies. Fig. 13 is a detail view of one of the cams. Fig. 14 is a perspective view of an article made by the machine. Fig. 15 is a section on line *v v*, Fig. 16. Fig. 16 is a transverse section on line *w w*, Fig. 15. Fig. 17 is a section of the lower die and the holding-block operated in conjunction with the upper die shown in Fig. 12. Fig. 18 is a central vertical section of the inside plunger B and die. Fig. 19 is a similar view, partly in elevation, of one of the outside plungers A with its shearing and punching dies. Fig. 20 is a section on line *s s*, Fig. 3, showing the under side of the table 16 in perspective. Fig. 21 is a perspective view, partly in section, of the mechanism for operating the moving section of the lower die. Fig. 22 is a perspective view of said sectional die.

1 represents the bed-plate of the machine. It is shown constructed of two sections bolted together merely for convenience.

2 represents the supporting-column on which the driving parts are mounted.

3 represents an engine for driving the machine, which is preferably supported on the bed-plate and connected to the crank 4 of the main shaft 5.

6 represents a fly-wheel mounted on the main shaft 5.

7 represents a pinion on said shaft meshing with the driving-gear 8, which is mounted loose upon the working-shaft 9. This shaft is suitably journaled in the column 2, and it projects through the machine. It has a crank 10 on its forward end, which is formed by turning off eccentrically a portion of the main shaft. The crank 10 projects through and is keyed to the circular plate 11, (shown in Figs. 2 and 8,) so as to furnish a bearing for the shaft 9 and the crank 10 at the forward end.

13 represents guides secured to the overhanging portion of the frame 14. Between these guides are operated three plungers, A A representing two outside plungers, which work in conjunction, and B representing the central plunger. (See Fig. 8.) The plungers A A carry the shearing and punching mechanism and the plunger B carries the upper die for shaping the parts. They are operated by mechanism which will be hereinafter explained.

16, Figs. 3 and 16, represents the bed or table of the machine, upon which the lower dies are mounted.

In order to avoid lifting out the shaped article when an abutment like the rail-brace shown in Fig. 14 is made and to allow it to be moved out horizontally, we bisect the lower die and make one section of it stationary and the other movable, so that it may be dropped down sufficiently low to allow the finished article to be removed horizontally. To accomplish this result, we provide a space or opening 17 within the table of sufficient area and depth to allow the dropping down of said movable section of die and to maintain the

mechanism for raising and lowering said die, as illustrated in Figs. 15, 16, 17, 18, 20, and 21. Said table is pierced with the orifice *w*, of sufficient area to admit the moving section D of the lower die and the plunger D′, which carries the same.

a b represent downwardly-projecting lugs on each end of said orifice *w*, which serve as guides for the plunger D′. This plunger is raised and lowered by means of horizontal slides *c d*, which are bolted together and provided with ears *e* for holding said slides a sufficient distance asunder to allow them to move freely against the plunger D′. F represents a pivot journaled in said ears and serves as a hinge for the link G, which is hinged in turn to the bell crank lever *h*, which is operated by the pitman 18. The said slides *c d*, Fig. 21, are provided with an incline and horizontal slot *l*, in which travel studs 19 for operating the plunger D′. The die-section D is secured in place by bolt *n*, so as to be readily removed to change its shape or size.

E represents the stationary section of the lower forming-die. It is likewise shown as removable, so that the shape and size of the article to be formed may be accomplished by changing this portion of the die without taking the machine apart. It is held in place by means of screw-bolt *m*.

f represents the upper die, which is likewise made readily removable for the purpose of changing the size and shape. We have shown the die-sections D, D′, and E and die *f* and the corresponding shears, which will be hereinafter described, of the proper shape to make a hollow rail-brace; but any similar article—such as conveyer-buckets, boxes, and other hollow articles—can be readily made by making appropriate-shaped forming-dies.

It is desirable in some cases to provide flanges such as are shown at *i*, Fig. 14, and to accomplish this purpose it is necessary, in order to produce accurately-fitting and duplicate parts, to punch holes through the flanges after they have been turned, and we have shown this as accomplished by the operation of the same shaft as that which operates the forming-dies, which we accomplish by means of a cam mounted on the crank 10, driving the shears and punches.

When it is desired to make the articles from the blank to be cut automatically by the operation of the machine, it is necessary to have the shears or cutting-knives advance first and cut the blank any desired shape. This cutting mechanism is mounted upon the same plungers which afterward do the punching, and both of these motions are obtained by means of the peculiarly-shaped cam H, placed on the crank-pin 10 and engaging with the upper and lower surfaces of the recess I, formed through the plungers A. (Shown in dotted lines in Figs. 3, 4, and 5; also in Figs. 8 and 19.) The cam H has two working points or parts J K. This cam is mounted on the crank 10 and is constantly revolved with it. The point J′ is the complement of the point J and prevents lost motion. The point K gives the farthest downward motion and operates the plungers to punch the holes. The point J gives the first stroke to shear the blank.

L L represent shear-knives (see Figs. 10 and 12) to cut the blank, and the machine is so adjusted that one of the points J advances the plungers A A, consequently carrying the knives at the first movement of the machine. Then the cam travels as an idler, during which operation the knives remain still, and the central plunger B does its work of shaping the blank by the advancing of the upper die pressing the article into shape between it and the lower dies. When this movement is accomplished, then the point K advances the plungers A still farther downward to punch the holes.

Figs. 3, 4, and 5 illustrate the consecutive movements of the shearing, forming, and punching mechanism.

M M represent the punches, which reciprocate through strippers N, which are suspended on spring-rods 96. 97 represents springs on said rods, which yield under the pressure applied. This stripper also serves as a plunger for turning over the flange *i* of the blank, as shown in Fig. 14. Said strippers are caught and moved downward by the projecting faces 88 on the central plunger B in unison with the upper die, and when the plungers A A move downward by the action of the point K the punches M are put through said strippers and punch the blank, said strippers serving to prevent the blank from rising as the plungers A recede and withdraw the punches M. The movable portion D of the lower die is operated by means of the link G, crank *h*, and pitman 18, which is journaled upon the stud-shaft 98, rigidly secured in plunger B.

20 represents a slot pierced in the frame to allow of the reciprocation of the stud-shaft 19.

In Fig. 3 we have shown the parts in position ready for operation. The plate of metal to be sheared and wrought is inserted in the space *r* and the machine is started. First the cam H moves the plungers A A downward and shears the blank at the position shown in Fig. 4, when the plungers stop or rest, the shears still resting upon the margin around the blank to hold it in position. During this period of non-movement of the plungers A A the crank 10 moves the central plunger B downward to press the blank into shape. By the time the upper die *f* on plunger B has reached the blank the pitman 18, operating through the bell-cranks G *h*, has raised the lower die D up into the position shown in Fig 4. The pitman 18, moving downward with its shaft 19 and with the plunger B, operates the bell-crank *h* and link G to move the slides *c d* laterally, as shown in Fig. 4. These slides are provided with the inclined slot *l*, which engages studs 19, projecting out from the plunger D, which

is consequently raised in position. As the plunger B and the pitman 18 are carried still farther down, the studs 19 are in the horizontal portion of the slots *l*, which holds the bottom die D up in position so as to receive the impression of the upper die, and is there held until the pitman 18 is retracted by the upward movement of the plunger B, when it drops down into position shown in Fig. 3 and allows the blank which has been formed between the dies *f*, D, and E to be removed laterally over the dropped portion D. The peculiar shape of the slot in the lower end of the lever 18 is such as to stop the die D in the desired position by disengaging bell-crank *h* from pitman 18 and allow the pitman to still travel with the plunger B to the end of its stroke and again engaging with the bell-crank on its return stroke. The slot *l* in the slides *c d* has a horizontal portion into which the stud 19 moves, as shown in Fig. 5, so as to receive the direct strain of the dies without having any tendency to move.

In order to permit the ready removal of the blank from the lower die, we make the sides of the lower die of two sections, 21 22 representing (see Figs. 9 and 17) the base of the said lower die.

24 represents the faces on which the blank rests for being cut by the shears.

25 represents recesses in which the plungers or punches enter for piercing the blank. The said lower die-block is made of two sections 21 22, the die E being formed between said sections. One of said sections is held by the bolts 26 rigidly to the bed-plate or table, so as to be removable therefrom when it is desired to change the shape. The other section is held between guides 89, which are bolted to the bed-plate, the section 21 being thus allowed to slide to and from the die E between said guides 89.

27 represents ears, to which are pivoted links 28, which are in turn pivoted to the crank-arms 29, which are mounted on shaft 30. On one end of said shaft is a crank-arm 31. (See also Fig. 1.)

32 represents a link hinged thereto and to the slotted bell-crank 33. 34 represents said slot, which engages with the crank-pin 35 upon the stud 36, which is bolted onto one end of one of the plungers A. By means of these studs, cranks, shaft, and connecting-rods, as the plunger A makes its first movement the pin 35 descending the slot 34, rotates the crank 33 and shaft 30, and through the parts 29, 28, and 27 the section 21 is closed up against the die E. The centers 90, 91, and 92, being all brought into line, lock the section firmly in this position during the operation of the former. As the plungers A ascend the section 21 is released and withdrawn to the position shown in dotted lines, Fig. 9, thus releasing the finished article and allowing it to be removed from the die.

For removing the finished article from the die we have shown an automatic trip 40, which is operated by crank-arm 41, shaft 42, crank-arm 95, pitman 43, hinged to the crank 44, the forward end of which engages with the notch 45 in the plate 46, which is outside of and concentric with the plate 11 by the engagement of said lever with the notch therein.

47 represents a retractile spring attached to the spring-arm 48, secured to the opposite end of crank-arm 95, for retracting the trip 40. This trip motion is made at the last end of the motion of the machine by the lever 44 moving into the notch 45 of the plate 46. The recoil of the spring throws the tripping-rod 40 forward against the finished article, and the revolution of the plate brings the tripping-rod back into position just as the machine is stopped.

The machine is organized so as to make one complete operation by a single revolution of the main shaft 9. We have provided a lever-setting mechanism, so that this operation will be made continuous, and by means of which lever the machine can be thrown out of gear, so as to be stopped at the appropriate point, and the machine again started by the movement of the same lever.

The clutch mechanism is constructed as follows: 56 represents a clutch, between the ends of which is inserted a lock-plate 57. The shaft is bored to receive a sliding pin 50. It rests upon a coil-spring, which holds it normally out in the position shown in Fig. 6, when it seats in the recess in said lock-plate 57, in which position the shaft is driven by the main driving-gear. When it is desired to throw the machine out of gear, the crank-lever 55 is forced forward against the main shaft by means of the connecting-rod 51, link 52, connecting-rod 53, and hand-lever 54. This keeps the lock-pin 50 from entering the recess in the lock-plate 57 and allows the driving-gear 8 to revolve loosely on the shaft. The shaft 9 will thus always stop in the position in which it was released, which is the proper position from which to begin a second operation. When the hand-lever is moved so as to release the lock-pin 50, allowing it to spring out in position shown in Fig. 6, then the lock will enter the recess in the lock-plate 57, and the machine will keep in motion so long as said pin is engaged with the lock-plate.

Having described our invention, what we claim is—

1. A shaping-machine having a main driving-shaft driving and operating the following mechanism in consecutive time movements to each revolution: shearing-plungers A A and die-forming plunger B, connected to and taking their action directly from the main shaft, and lowering shaping-die receiving the action from the shear and upper plunger, one section of said lower die being connected to the main shaft by connecting and driving mechanism to be moved downward for the ejecting of the shaped article, substantially as specified.

2. A shaping-machine having a main driving-shaft driving and operating the following

mechanism in consecutive time movements at each revolution: shear and punching plungers A A and die-forming plunger B, connected to and taking their action directly from the main shaft, lower shaping-die receiving the action from the shear and upper plunger, one section of said lower die being connected to the main shaft by the connecting and driving mechanism to be moved downward for the ejecting of the shaped article, and an automatic tripping mechanism operated by mechanism from said main shaft to eject the article after the lower die-section has been moved downward, substantially as specified.

3. In a die-shaping machine, a lower die made of three sectional pieces D, D′, and E, with driving mechanism connecting the same to the main shaft, whereby one section of the die is moved downward and another section of the die moved outward for the release of the finished article, substantially as described.

4. In a die-shaping machine, a lower die made of three sectional pieces, with driving mechanism connecting the same to the main shaft, whereby one section of the die is moved downward and another section of the die is moved outward for the release of the finished article, and tripping mechanism for ejecting, substantially as described.

5. In a shaping-machine, the combination of plungers A A and the die-forming plunger D, operated intermittently by the crank 10 and cam H, mounted thereon, substantially as specified.

6. In a shaping-machine, the combination of the plungers A A and D, operated intermittently by the crank 10 and cam H, the die *f*, attached to the plunger B, and the shears L, attached to the plungers A, said parts being intermittently driven, and the shears in advance of the plunger for cutting the blank preparatory to shaping the same, substantially as specified.

7. In a die-shaping machine, in combination with the plungers A A and B, carrying the die *f* and shears L, and mechanism for operating the same intermitently, punches M, attached to the plungers A A, and the strippers N, suspended on said plungers A A by yielding mechanism, substantially as herein specified.

8. In a shaping-machine, the outside shaping-die formed of the stationary sections E and moving section D and the mechanism for moving the latter section downward below the opening in the stationary die, whereby the shaped article may be removed horizontally therefrom, substantially as described.

9. In a shaping-machine, the combination of the plungers A A and B, carrying, respectively, the die *f* and shears L, with the lower or outside forming-die, and the flanging-strippers inside of said shears for turning down the edges of the blank to form a flange thereon, substantially as specified.

10. In a shaping-machine, the combination of the stationary die E with the sectional moving die D, the slides *c d*, provided with slots *l*, the stud-shaft 19, projecting from the plunger D′, and the mechanism for reciprocating said slides for raising and lowering the die-section D, substantially as specified.

11. In a die-shaping machine, the lower die composed of sections, one of said sections E being stationary and the other movable, the mechanism consisting of the slides *c d*, stud 19, and link-and-crank connections attached to and operated by the shaft which drives the upper or inside shaping-plunger *f*, substantially as specified.

12. In combination with the sectional die D, operated by the slides *c d*, slot *l*, and studs 19, the crank-and-link mechanism engaging with the slot in the driving-pitman 18, by means of which the die D is held in its upper or shaping position during one interval and moved to its lower position and held during another interval and then returned to its former position automatically by a single revolution of the main driving-shaft, substantially as described.

13. In a shaping-machine having a stationary die E and a sectional moving counterpart D, the mechanism for moving said section downward, and the ejecting tripping-rod 40, operated intermittently and when said die D is held in its lowest position, substantially as specified.

14. In a shaping-machine having one section of the outside shaping-die D intermittently moved by driving mechanism from the main shaft, the tripping-lever 40, operated intermittently by the main driving-shaft by crank-and-link connections, substantially as specified.

15. In a shaping-machine, the combination of the plungers A A, carrying appropriate shears, the plunger D, carrying the shaping-die and driven by a single main shaft 9, carrying crank 10, cam H, operated intermittently and in conjunction with the outside or lower shaping-die, and the stopping mechanism operated by the main shaft in time movements when all the plungers are in their upper position, said clutch mechanism consisting, essentially, of the slide-pin, the clutch connected to the main driving-wheel 8 and operated by the lock-lever and connecting-rod, and a clutch-arm 54, substantially as specified.

In testimony whereof we have hereunto set our hands.

CHARLES PARTINGTON.
EDWARD W. HARDEN.

Witnesses:
T. SIMMONS,
C. W. MILLS.