The present invention relates to a die press, and particularly to ejector means for positively engaging an article from a die cavity of the press, and wherein the article of the die is adapted to have its side wall laterally compacted within the die. An object of the invention is to provide ejector means, automatically actuated through the operation of the press, to the end that, irrespective of variation in the tightness with which the articles are engaged within the die after they are formed thereby, they are positively ejected in exact timed relation with the operating cycle of the press.

While the invention may find application in various types of presses, and in the formation of various articles, the present disclosure is illustrated by way of example in connection with a multiple station press of the type disclosed more fully in Patent No. 493,519, Richards, March 14, 1883. A press of this kind has an article transfer die providing an article supporting aperture adapted to receive and transfer the articles from one operative station to another. During the forming operations upon the article, it may be moved out of an aperture of the die by a suitable punch into a forming die which, in the particular machine shown in the drawings, is above the die, and is thereafter moved back into an aperture of the die for transfer to the next station. The invention is further illustrated by way of example in connection with the formation of bullets of armour piercing type, which comprise a bullet jacket having a steel core inserted therein, this core having a closure cap engaged over its heel end and retained in the jacket by crimping over and flattening the open end thereof. Following the crimping and flattening of the open end of the jacket, the bullet is subjected to a so-called healing operation, for the purpose of tapering slightly the heel end of the bullet, this tapering operation consisting in laterally compressing the wall of the jacket adjacent its crimped end against the steel core, the jacket thus being tightly compacted between the tapered wall of the die and the steel core within the jacket.

The ejector means employed in connection with this operation usually consists of a spring loaded plunger, requiring an extremely heavy spring in order to effectually disengage and eject the bullet from the die. This has the disadvantage that the disengagement of a very tightly compacted bullet is uncertain, and is apt to be out of exact timed relation with the operating cycle of the machine. Also upon sudden dis-
scale, showing the bullet engaged with the healing die.

Similar reference characters indicate corresponding parts throughout the several figures of the drawings.

Referring to the drawings, the press, illustrated by way of example, comprises a table 10 mounting an intermittently rotatable transfer die 11 disposed at its marginal portion in spaced parallel relation above the table, a die block 12 being mounted in the space beneath the dial for cooperation therewith, as will presently more fully appear. The press includes a vertically reciprocating gate 13 disposed above the dial and a vertically reciprocating under carriage 14 disposed below the table, this under carriage being adapted to have up and down movement in timed relation with the reciprocating gate during the raising movement of the gate. The dial is provided with a series of equally spaced circumferentially arranged article receiving pockets 15 having yeldable split sleeve article gripping members 16 therein, these gripping members being open at both ends and extending entirely through the dial. The dial is adapted to be moved intermittently to carry the articles inserted in pockets from one to another of a series of stations during the latter part of the upstroke of the gate, and following the up and down movement of the under carriage, which occurs during the first part of the upstroke. The particular press illustrated is of the type where certain operations which require down pressure of a punch upon the article are performed in dies carried in the die block 12 below the dial, while other operations which require upward pressure of a punch upon the article are performed in dies mounted above the dial, the articles being moved from the dial into the respective dies, and then back into the dial during the stationary periods of the dial.

The bullet illustrated by way of example is one of the so-called armour piercing type, and comprises a bullet jacket 17 in which is engaged a steel core 18, the point of the core being pressed into a compacted point filling insert of lead 19 in the point of the jacket. The heel end of the steel core is tapered inwardly, as at 20, to provide a space for the insertion of the rim of a closure cap member 21, this closure cap member being retained by crimping over and flattening the open end of the jacket, as at 22.

The illustrated machine is adapted to assemble the closure cap 22 and to perform a series of finishing operations upon the bullet, the open ended jacket with the assembled steel core therein being inserted in the pockets of the dial at one point and then fed into successive relation with the several operative stations. The first operative station is the cap feeding station where a cap 21 is inserted into the open end of each jacket. At the next station the cap is seated, being forcibly pressed downwardly into the jacket into covering engagement with the end of the steel core with its rim engaging in the space provided by the tapered end 20 of the core. This cap seating operation is performed in a die at the under side of the dial. At the next station the end of the jacket is crimped inwardly, this operation being performed in a die at the upper side of the dial. At the next station the crimped end of the jacket is flattened, so that the bullet is in the state as shown in Fig. 5.

The crimp flattening operation is performed in a die 23 provided in the die block 12 at the under side of the dial in vertical line with the dial pocket by a punch 24 carried by the gate 13 in vertical line with the die 23. In the base of the die 23 there is provided an engaging punch 25 carried by the under carriage 14. During the down stroke of the gate the punch 24 enters the pocket 15 of the dial and pushes the bullet thereon downwardly through the pocket into the die 23 where it flattens the crimped end of the bullet jacket. During the raising movement of the gate the under carriage 14 moves upwardly, causing the punch 25 to carry the bullet out of the die 23 back into the die pocket 15, the under carriage thereupon moving downwardly to disengage the punch 25 from the dial, this up and down movement of the under carriage occurring during the first part of the upstroke of the gate. During the latter part of the upstroke of the gate, and after disengagement of the ejector punch 25 and the flattening punch 24 from the dial, the dial is moved to transfer the bullet carried engaged in it on the crimp flattening station to the next station. At this next station the heel tapering operation is performed upon the bullet, this being the operation with which the die and ejector means of the present invention are particularly concerned.

The bullet jacket 23 there is mounted a bracket 26 having an angularly extending arm projected over the dial and provided with a tubular cylindrical die holding head 27 in vertical alignment with the heating station of the dial next following the crimp flattening station in line with the punch 24 and die 23. Within the tubular head 27 there is engaged a sleeve member 28, having an annular flange 29 at its lower end engaging the lower end of the head. In its upper portion the sleeve member is provided with a cylindrical piston chamber 30, and in its lower portion is provided with a cylindrical die receiving pocket 31, the chamber 30 and the pocket 31 being connect ed by a reduced diameter passage 32. The upper end of the sleeve is interiorly threaded and is engaged by the threaded plug end 33 of a plug cap 34, bearing upon the upper end of the tubular head 27, tightening of the plug cap drawing the flange 30 upwardly against the lower end of the head 27 and thus securing the sleeve in place. The sleeve is held against rotation by a set screw 35 screwed into the lower end of the head 27 and having its head engaged in a pocket 36 provided in the periphery of the flange 29. The plug cap is secured against rotation by means of a set screw 37 bearing upon the upper end of the head 27.

Within the chamber 30 there is provided a piston 38 having a lower stem portion 39 engaged in the passage 32, a vertical stem rod 40 being secured to its upper side and slidably engaged in its upper end portion within a central passage 41 in the plug cap. An ejector pin 42 is engaged in a pocket 43 in the lower stem portion of the piston and is secured therein by means of a set screw 44 engaged in a recess 45 cut in the side of the pin. Within the piston chamber there is provided a helical compression spring 46 disposed between the plug cap and the piston and exerting downward pressure upon the piston. A die block 47 is engaged in the die pocket 31 and is secured in seating relation therein by a retaining cap 48 screw 49 bearing upon a threaded end of the sleeve 50. The die block 47 is provided with a cavity 51 for receiving the bullet to be formed, and provided in axial line above this pocket with a cylindrical passage 52 engaged by the ejector pin 42, the lower end of this pin being projected into the die cavity in line with the lower end of the die in
the, normal, depressed, position of the piston, and
being raised to the upper end of the die cavity;
through, the upward pressure of the bullet in-
serted therein, as will presently more fully appear.
The bullet is adapted to be inserted within the
cavity by means of an under carriage 34 and
provided in its upper end with a pocket 52 for engaging the point end of the
bullet. This punch moves upwardly during the initial upward movement of the gate 13, push-
ing the bullet from the retaining sleeve 16 of the pocket 15 of the dial upwardly into the cavity 56 of
the die 47, the tapered form of the die cavity imparting a slightly tapered form to the heel of
the bullet. Thereupon, and still during the up-
ward movement of the gate 13, the punch 51
moves downwardly out of engagement with the
dial, and it is during this movement that the
ejector means of the present invention is adapted
to be actuated.
The plug 34 is provided with a pair of spaced
bearing ears 53, the bottom 54 of the space be-
tween these ears being inclined downwardly and
rearwardly and having the upper end of the pun-
ch 42 located therein. A lever arm 55 is piv-
ately mounted at one end between the arms 53
upon a pin 56, rotatably supported at its ends in
bearing bushings 57 in the arms and secured to
the lever arm by means of a set screw 58 in
the end of the arm engaged in a groove 59 in the
pin. Upon the end of the arm there is pro-
vided a projecting lug 60 carrying a pressure
screw 61 arranged to engage the upper end of
the rod 40, when the latter is projected above the
inclined surface 54 in the raised position of the
piston, as shown in Fig. 4, and to depress the
plunger rod through swinging movement of the
arm imparted thereto through a lazy- tong
connection with the gate 13. For this purpose
the outer end of the lever arm 55 is connected
by a pair of link members 62—62 to a fixture 63
secured by screws 64 to the under side of the gate,
the link member being pivotally connected to
the lever arm and to the fixture by cross pins 65 and
66, preferably fixed to one of the links and in-
serted through the lever arm and fixture and
through the other link, which is retained thereon
by means of washers 67 and cotter pins 68.
Sleeve washers 69 are preferably provided upon
the pin 65 between the lever arm and the links.
In operation, the bullet is brought by the dial
to the heeling station, the transfer movement of
the dial taking place during the latter part of
the raising movement of the gate 13, as indicated
in Fig. 4. Thereupon the gate moves downwardly
to its maximum down position and during this
down movement the punches carried by the gate
are brought into relation with the dies below the
dial. As shown in Fig. 5, the punch 24 moves
downwardly through the dial at the station pre-
dedicated for the punching station, moving the bullet into the
die 23 and flattening the cramped end. Dur-
ing the first part of the upward movement of
the gate the under carriage moves upwardly and
downwardly, its upward movement moving the
ejecting punch 25 upwardly through the die 23
reached by the forward motion of the punch at
the heeling station punch 51, also carried by the
under carriage, moves upwardly and down-
wardly, its upward movement forcing the bullet
at the heeling station into the die cavity 49 of
the die 47, the engagement of the bullet in the cavity
for the ejector pin 42, the piston 36 and the
stem rod 40 upwardly, so that the upper end of
the stem rod is projected above the inclined bot-
tom, surface 54 of the plug cap. As the under
carriage completes its upward movement the lever
arm 55, which swings in clockwise direction dur-
ing the upward movement of the gate, is brought
into contact with the projected upper end of the
stem rod, so that as the under carriage moves
downwardly withdrawing the punch 51 from the
die cavity the ejector pin is pressed downwardly
by the combined action of the lever 55 and the
spring 46, thus positively exercising disengaging
force upon the upper end of the bullet within the
die cavity. Irrespective of the tightness of the
bullet in the cavity its disengagement and
ejection takes place simultaneously with the with-
drawing action of the punch 51, the action of the
spring 46 projecting the ejector pin to the point
where the bullet is forced back into the dial pocket.
As soon as the bullet is fully engaged in the
dial pocket, and the punch 51 descends below
the dial, the dial is rotated to transfer the bullet
to the next station, the completed bullet being
finally ejected by a suitable ejector punch.
The form of the invention illustrated in the
drawing and described herein is typical and ille-
trative only, and it is evident that the invention
is capable of embodiments in other forms, all
falling within the scope of the appended claims,
which are to be broadly construed.

What is claimed is:
1. In a die press, the combination with a table;
article supporting means movably mounted on
said table; a gate reciprocably mounted above
said supporting means; an under-Carriage recip-
rocably mounted beneath said supporting means;
a die having a die cavity fixedly mounted on said
table above said supporting means; an article
ejector mounted in said die and movable into and
out of said die cavity; resilient means arranged
normally to project said ejector into said die
cavity, said ejector being adapted to be engaged
and displaced therefrom by an article thrust into
said die cavity from said supporting means; and
means carried by said under-carriage constructed
and arranged to engage an article in said support-
ing means to move said article therefrom up into
said die cavity and to subsequently retire down-
wardly therefrom; of means to positively return
the displaced ejector into position; and
means whereby said article is ejected from said
die cavity through said die cavity and onto the
next lower station thereupon, the combination
comprising a stem upon said ejector arranged to be
moved from a normal position corresponding to
the normal position of said ejector to a displaced
position by displacement of said ejector from said
die cavity, a lever arm pivotally supported on said
table, one end of said lever arm being arranged to
engage said stem in its displaced position and to
positively move said stem to its normal position in
response to predetermined movement of said lever
arm; and means associated with said gate con-
structed and arranged to impart said article
pre-determined movement to said lever substantially
simultaneously with the retirement of said article
moving means carried by the under-carriage.
2. In a die press, the combination with a table;
article supporting means movably mounted on
said table; a gate reciprocably mounted above
said supporting means; an under-carriage recip-
rocably mounted beneath said supporting means;
afixed bracket fixed to said table having a cylinder; a
die having a die cavity fixedly mounted in the
lower end of said cylinder above said supporting
means; an article ejector slidably mounted in said
cylinder having an ejector pin movable into and
out of said die cavity; resilient means in said
cylinder arranged normally to project said ejector
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pin into said cavity, said pin being adapted to be engaged and displaced therefrom by an article thrust into said die cavity from said supporting means; and means carried by said under-carriage to engage an article in said supporting means to move said article therefrom up into said die cavity; of means to positively return the displaced ejector pin into said die cavity and thereby to eject the article therefrom comprising a stem on said ejector arranged to project upwardly in said cylinder and movable from a normal position therein corresponding to the normal position of said ejector pin to a displaced position by displacement of said ejector pin from said die cavity wherein the upper end of said stem projects above the upper end of said cylinder, a toggle joint connected between said reciprocable gate and said fixed bracket, and a lug portion on one of the levers of the toggle joint arranged to engage the top of said stem in its displaced position to positively move said stem to its normal position in said cylinder in response to movement of said gate.

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