To all whom it may concern:

Be it known that I, HARRY M. PIERCE, a citizen of the United States, residing at Wilmington, county of New Castle, and State of Delaware, have invented a new and useful Improvement in Cartridge-Loading Machines, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, which form a part of this specification.

The invention relates to a dynamite cartridge filling machines of the type disclosed in the Patent No. 601,138, issued March 22, 1898, and the Donaldson Patent No. 865,592 issued Sept. 29, 1900. The present invention, however, relates only to the anti-friction driving mechanism for operating the tamp, the object being to provide means for uniformly and accurately packing the dynamite into shells of any required number or size. I do not, therefore, illustrate or describe the entire machine, but only that part thereof to which the invention relates.

In the drawings: Figure 1 is a sectional elevation of mechanism for operating a single row of tamps. Fig. 2 is a sectional plan on the line 2—2 of Fig. 1. Fig. 3 is a sectional elevation of part of the mechanism for operating a double row of tamps; Fig. 4 is a side elevation of modified form of mechanism for operating the cams for resetting the dogging mechanism.

The machine frame is bolted to the frame. Caps \(k\) are secured to supports \(k\) and hold the blocks \(j\) in place. In each support \(k\), to the rear of block \(j\), is placed a spring \(k\) serving to force out the corresponding block. An adjusting screw \(k\) carries a disk \(k\) abutting against the rear of the spring \(k\). By means of this screw, the tension of the spring against its corresponding block may be regulated. Toggle levers \(l\) are fulcrumed to brackets \(y\) adjustable to adjacent blocks \(j\). The toggle of each pair are joined together at their inner ends. Vertically extending dogging rods \(m\) (one for each tamping rod \(f\)) are jointed to the several pairs of toggle levers \(l\). The rods \(m\) slide in guides \(f\). A rigid bar or stop \(n\), secured to the frame, is arranged beneath the toggle levers \(l\). On each tamping rod \(f\) is a loose block \(o\) provided with a tongue having a sliding fit in a slot \(o\) in the tamping rod. The upper ends of the dogging rods \(m\) rest against a rigid bar \(q\). Turning in bearings \(p\) in the frame is a shaft \(p\), to which is secured a double cam \(r\), one member \(r\) of which bears against dogging levers \(s\), while the other member \(r\) is adapted to engage arms \(m\) projecting laterally from the upper ends of dogging rods \(m\). The dogging levers \(s\) are pivoted between their ends to the dogging rods \(m\). The lower ends of the dogging levers \(s\) are normally pressed against cam member \(r\) by means of springs \(s\), which also act to press the dogging rods \(m\) against rigid bar \(q\). The upper ends of dogging levers \(s\) rest against the tamping rods \(f\). On the shaft \(p\) is a spur gear \(p\) engaging a spur gear \(t\) on a shaft \(t\), to which is secured a hand operating lever \(t\).

The operation of the above mechanism is as follows: The drawings show the mechanism during the operation of filling the shells. The shafts \(b\), through eccentrics \(c\), connecting rods \(e\), cross-head \(d\), shafts \(g\) and blocks \(h\), impart rocking motion to toggle rolling cams \(i\) on their adjustable blocks \(j\). At each downward stroke of the cross-head \(d\) the tamping rods \(f\) are carried down by the cams \(i\) and the extensions of the rods touch the powder in the shells and pack it until a given resistance is encountered, after which the tamp rods remain stationary, slipping between opposing curved faces of the cams. During the upward stroke of the cross-head \(d\), the tamp rods are lifted by the cams. It will thus be understood that at each com...
plete oscillation down and up of the cams $i$, each tamp is lifted a net distance equal to the amount of powder packed in the corresponding shell. The loose sliding blocks $o$ are consequently lifted slightly higher at each upward stroke of the cross-head. When any given shell is packed to its full extent, the block $o$ of the corresponding tamp rod $f$ will have been lifted sufficiently high to engage and override the corresponding dogging lever $s$. During the upward strokes of the tamp rods $f$ the blocks $o$ rest upon the bottoms of the slots $o'$; but after any block has been lifted, as described, it will be carried, during the following downward movement of its tamp rod $f$, into position at the upper end of the slot $o'$; after which, before the completion of the downward movement of such tamp rod, the said block $o$ will be carried down therewith and apply sufficient pressure upon the dogging lever $r$ and dogging rod $m$ to force the corresponding pair of toggle levers $l$ down against the stop-bar $n$ and into a straight line position, thereby forcing back the corresponding adjustable blocks $j$, which retracted the corresponding toggle rolling cams $i$ from the corresponding tamp rod $f$. Therefore, the said tamp rod is at rest, the corresponding toggle roller cams vibrating as before but not touching the tamp rod. When any particular pair of toggle rolling cams $i$ has thus been rendered inoperative, the corresponding tamp $f$ has not been carried down to the extent that it would have been had the arms $i$ not been rendered inoperative and had the block $o$ not been stopped by the dogging mechanism; but the lower end of the extension (not shown) of said tamp is about (say) four and one half inches above the top of the powder in the corresponding shell and is therefore in position for operation as soon as the filled shells are removed and empty shells placed in position ready for the next operation. After all the shells are filled and hence the cams $i$ rendered inoperative and a set of empty shells placed in position, the operation is started as follows: By means of the operating lever $t'$ and the spur gear connection between shafts $t$ and $r$, the cam $r'$, is turned, causing member $r''$ to move all the dogging levers $s$ into position to release all the loose sliding blocks $o$ and allow them to slide down into resting position as shown, and allowing all the tamp rods $f$ to descend until they rest against the bottoms of the empty shells. At the same time, the cam member $r$ engages arms $m'$ and lifts dogging rods $m$ and toggle levers $l$, allowing springs $k^2$ to press blocks $j$ and cams $i$ against the tamping rods $f$. The arrangement is such that, in the movement of the lever $t'$, the undogging of the tamping rods $f$ occurs at the same time that the cams $i$ engage the tamping rods, whereby the latter are carried down by the tamps to the bottoms of the empty shells at the end of the downward stroke, thus preventing the tamping rods from falling. The machine continues to operate and each tamping rod continues to tamp its respective shell until it is dogged as described previously.

The mechanism of Fig. 3 differs from that of Figs. 1 and 2 only in that it is adapted to actuate a double row, instead of a single row, of tamps. The various parts of similar construction are similarly lettered in the two sets of figures. The only substantial differences are the following: In the double-row mechanism, the dogging levers $l$ of a pair are not joined together, but each is joined to one of the pair of dogging rods $m$ and their inner ends bear against the rigid bar $v$. A rectangular bar $w$ is secured to the cross-head $d$ and extends between the two rows of tamp rods $f$, the latter sliding between this bar and the cams $i$. There are, of course, provided two cams, one for each set of dogging levers and dogging rods. These cams are mounted respectively on the shafts $a$ and $a'$. The shaft $a$ is driven from the shaft $a^2$, through the medium of spur gears $a^2$ and $a^3$. Spur gear $a^3$ drives gear $a^1$ and also gear $a^5$ on shaft $a'$. On the shaft of gear $a^5$ is the hand operating lever $a^5$.

In Fig. 4 is shown a modified and simplified means for turning the cams that actuate the dogging levers and rods. The cams are secured respectively to the shafts $y$ and $y'$, which are geared together directly by the spur gears $y^2$ and $y^3$. The hand operating lever may be applied to either shaft $y$ or shaft $y'$. The degree of hardness of packing in the shells is regulated by screwing or unscrewing the adjusting screws $k^3$, thereby, through blocks $j$ and cams $i$, increasing or diminishing the pressure against the tamping rods $f$ and thus varying the resistance of the rods to slippage.

While all the tamps start tamping empty shells at the same time, any variations and irregularities are controlled because the tamping rods and their actuating and undogging mechanisms are independent of each other.

Having now fully described my invention, what I claim and desire to protect by Letters Patent is:

1. In a machine for loading shells, the combination with a series of independent tamping rods, of a series of cams fulcrumed to rock in the direction of extension of the tamping rods, said cams having curved faces adapted to engage and reciprocate the tamping rods but permitting the latter to slip upward under predetermined resistance to
downward movement, means to rock said 5
cams, and independent mechanism con- 10
trrolled by each rod for disengaging the 15
corresponding cam from said rod when the 20
latter has moved up to a determinate extent.

2. In a machine for loading shells, the 25
combination with a series of independent 30	
tamping rods, of a series of cams fulcrumed 35
to rock in the direction of extension of the 40
tamping rods, said cams having curved faces 45
adapted to engage and reciprocate the tamp-

ing rods but permitting the latter to slip 50
upward under predetermined resistance to 55
downward movement, means to rock said 60
cams, adjustable spring-pressed blocks on 65
which said cams are fulcrumed, and inde-

pendent mechanism controlled by each rod 70
for moving the corresponding cam and block 75
outward when such rod has moved up to a 80
determinate extent.

3. In a machine for loading shells, the 85
combination with a series of independent 90
tamping rods, of driving means for recipro-
cating each rod, each of said means being 95
independently movable out of engagement 100
with its corresponding rod, toggle levers for 105
each driving means adapted when moved 110
toward a straight line position to disengage 115
the corresponding driving means from its 120
corresponding rod, independent ‘dogging’ 125
mechanism for so operating the correspond-

ing toggle levers and means carried by each 130
rod adapted to be lifted above the corre-
sponding dogging mechanism after said rod 135
has been retracted to a determinate extent 140
and operate said dogging mechanism in the 145
downward movement of said rod.

4. In a machine for loading shells, the 150
combination with a series of independent 155
tamping rods and a series of independent 160
normally stationary dogging rods, of inde-

pendent driving means for reciprocating 165
each tamping rod, independent means car-

ried by each tamping rod adapted to be lifted 170
above the corresponding dogging mechanism 175
after said tamping rod has been retracted to 180
a determinate extent and operate said dog-

ging rod in the downward movement of said 185
tamping rod, independent mechanism ac-


tuated by each dogging rod for disengaging 190
the corresponding driving means from the 195
corresponding tamping rod, and means ac-
tuated from a common control to operate all 200
dooging rods to simultaneously permit all 205
dooging means to reengage their respective 210
tamping rods.

5. In a machine for loading shells, the 215
combination with a series of independent 220
tamping rods, of independent driving means 225
frictionally engaging and adapted to oper-

ate each rod, independent releasing means 230	
doing each driving means from its corre-

sponding rod, a block having a limited sliding 235	
movement on each rod and dogging mecha-

nism, connected with and operating each 240	
releasing means, adapted to be overridden 245	
by its corresponding block in the receding 250	
movement of its corresponding rod and actuated by said block, in the 255	
next forward movement of said rod, to 260	
operate the releasing means.

6. In a machine for loading shells, the 265	
combination with a series of independent 270	
tamping rods, of independent driving means 275	
frictionally engaging and adapted to oper-

ate each rod, independent releasing means 280	
doing each driving means from its corre-

sponding rod, a block having a limited sliding 285	
movement on each rod, dogging mechanism, 290	
connected with and operating each releasing 295	
means, adapted to be overridden by its corre-

sponding block in the receding movement of its' 300	
corresponding rod and actuated by said block, in the 305	
next forward movement of said rod, to 310	
operate the releasing means.

7. In a machine for loading shells, the 315	
combination with a series of independent 320	
tamping rods, of independent driving means 325	
engaging and adapted to operate each rod, 330	
independent normally inoperative releasing 335	
means for disengaging each driving means 340	
from its corresponding rod, a normally sta-

tionary dogging rod connected with and 345	
adapted when actuated to operate each rele-

sing means; a dogging lever pivoted on each 350	
dogging rod, a block carried by each rod 355	
adapted after the rod has receded to a predeter-

mind extent to abut against the corre-

sponding lever and thereby actuate the 360	
corresponding dogging rod and releasing 365	
means, and means, operable from a common 370	
control, to operate all the levers to release 375	
all the blocks and to operate all the dog-

ging rods to render the releasing means in-

operative.

8. In a machine for loading shells, the 380	
combination with a series of independent 385	
tamping rods adapted to be reciprocated in 390	
the direction of their length, of a series of 395	
cams fulcrumed to rock in the direction in 400	
which the tamping rods are reciprocable, 405	
said cams having curved frictional faces 410	
adapted to reciprocate the tamping rods but 415	
permitting them to slip under predetermined 420	
resistance to movement, and means to rock 425	
the cams.

9. In a machine for loading shells, the 430	
combination with a series of independent 435	
tamping rods adapted to be reciprocated in 440	
the direction of their length, of a series of 445	
cams fulcrumed to rock in the direction in 450	
which the tamping rods are reciprocable and 455	
also movable laterally toward and from the 460	
tamping rods, said cams having curved faces 465	
adapted to engage and reciprocate the tamp-
ing rods but permitting the latter to slip under predetermined resistance to downward movement, means to rock said cams in unison and independent mechanism controlled by each rod for moving the corresponding cam laterally away from the rods.

10. In a machine for loading shells, the combination with a series of independent tamping rods, of a series of cams fulcrumed to rock in the direction of extension of the tamping rods, said cams having curved faces adapted to engage and reciprocate the tamping rods but permitting the latter to slip upward under predetermined resistance to downward movement, means to rock said cams, laterally slidably blocks on which said cams are respectively fulcrumed, springs normally holding said slidable blocks in position to cause the cams to operatively engage the respective rods, and independent mechanism controlled by each rod adapted in the downward movement of each rod after such rod has moved to a determinate extent, to move the corresponding block against the action of its spring, thereby retracting the corresponding cam.

11. In a machine for loading shells, the combination with a series of independent tamping rods and a series of independent dogging rods, of independent driving means for reciprocating each tamping rod, independent means controlled by each tamping rod adapted, after such tamping rod has been retracted to a determinate extent, to depress the corresponding dogging rod, independent mechanism, actuated by each dogging rod in its downward movement, for disengaging the corresponding driving means from its respective tamping rod, and a cam for simultaneously lifting all the dogging rods to permit all the driving means to reengage their respective tamping rods.

12. In a machine for loading shells, the combination with a series of independent tamping rods and a series of independent dogging rods and a dogging lever for each dogging rod, of independent driving means for reciprocating each tamping rod, independent means controlled by each tamping rod adapted, after such tamping rod has been retracted to a determinate extent, to engage the corresponding dogging lever and depress it and the corresponding dogging rod, independent mechanism, actuated by each dogging rod in its downward movement, for disengaging the corresponding driving means from its respective tamping rod, and a cam adapted to engage and lift all the dogging rods to permit all the driving means to reengage their respective tamping rods and also adapted to disengage all the dogging levers from their respective tamping rods to permit the latter to descend.

13. In a machine for loading shells, the combination with a series of independent tamping rods, of independent driving means for reciprocating said rod, a block for each rod having a limited sliding movement thereon, independent mechanism for disengaging each driving means from its corresponding rod, said block being adapted when its corresponding rod has moved upward a determinate extent to override the corresponding disengaging mechanism and actuate it in the subsequent downward movement of said rod.

14. In a machine for loading shells, the combination with a series of independent tamping rods, of independent driving means for reciprocating said rod, a block for each rod having a limited sliding movement thereon, independent mechanism for disengaging each driving means from its corresponding rod, said block being adapted when its corresponding rod has moved upward a determinate extent to override the corresponding disengaging mechanism and actuate it in the subsequent downward movement of said rod, and means actuated from a common control for moving said disengaging mechanisms into position to permit said blocks to drop and permit all said driving means to reengage their respective rods.

15. In a machine for loading shells, the combination with a series of independent tamping rods and a series of independent dogging rods and dogging levers, of independent driving means for reciprocating each tamping rod, a block for each rod having a limited sliding movement thereon and adapted, after its tamping rod has been lifted to a determinate extent, to override the corresponding dogging lever and, in the subsequent downward movement of said rod, depress said dogging lever and the corresponding dogging rod, and independent mechanism, actuated by each dogging rod in its downward movement, for disengaging the corresponding driving means from its respective tamping rod.

16. In a machine for loading shells, the combination with a series of independent tamping rods and a series of independent dogging rods and dogging levers, of independent driving means for reciprocating each tamping rod, a block for each rod having a limited sliding movement thereon and adapted, after its tamping rod has been lifted to a determinate extent, to override the corresponding dogging lever and, in the subsequent downward movement of said rod, depress said dogging lever and the corresponding dogging rod, and independent mechanism, actuated by each dogging rod in its downward movement, for disengaging the corresponding driving means from its respective tamping rod, and a cam adapted to engage and lift all the dogging rods to permit all the driving means to reengage.
their respective tamping rods and adapted also to move all the tamping levers from under their respective blocks to permit said blocks to drop and the tamping rods to be again actuated by their respective driving means.

17. In a machine for loading shells, the combination with a series of independent tamping rods, of a series of cams fulcrumed to rock in the direction of extension of the tamping rods, said cams having curved faces adapted to engage and reciprocate the tamping rods but permitting the latter to slip upward under predetermined resistance to downward movement, a cross-head, guides in which said cross-head reciprocates, a shaft carried by said cross-head, blocks on said shaft slidable in the respective cams, means to reciprocate the cross-head, and independent mechanism controlled by each rod for disengaging the corresponding cam from said rod after the latter has moved up to a determinate extent.

18. In a machine for loading shells, the combination with a series of independent tamping rods, of a series of cams fulcrumed to rock in the direction of extension of the tamping rods, said cams having curved faces adapted to engage and reciprocate the tamping rods but permitting the latter to slip upward under predetermined resistance to downward movement, a cross-head, guides in which said cross-head reciprocates vertically, a shaft carried by said cross-head, blocks on said shaft slidable laterally in the respective cams, movable blocks on which said cams are respectively fulcrumed, a driving shaft, an eccentric thereon, a connecting rod between said eccentric and said cross-head, and independent mechanism controlled by each rod for moving the corresponding last-named block away from its corresponding rod after the latter has moved up to a determinate extent.

19. In a machine for loading shells, the combination with a series of independent tamping rods, of a series of cams fulcrumed to rock in the direction of extension of the tamping rods, said cams having curved faces adapted to engage and reciprocate the tamping rods but permitting the latter to slip upward under predetermined resistance to downward movement, means to rock said cams, slidable blocks on which said cams are respectively fulcrumed, a pair of toggle levers jointed to each pair of blocks, and independent mechanism controlled by each rod adapted after said rod has moved up to a determinate extent, to move the corresponding pair of toggle levers toward a straight line position, thereby retracting the corresponding blocks and moving the corresponding cams out of operative position.

20. In a machine for loading shells, the combination with a series of independent tamping rods, of a series of cams fulcrumed to rock in the direction of extension of the tamping rods, said cams having curved faces adapted to engage and reciprocate the tamping rods but permitting the latter to slip upward under predetermined resistance to downward movement, means to rock said cams, slidable blocks on which said cams are respectively fulcrumed, means to rock said cams, springs tending to move said blocks and cams into operative relation with the tamping rods, a pair of toggle levers jointed to each pair of blocks, independent mechanism controlled by each rod adapted, after said rod has moved up to a determinate extent, to move the corresponding pair of toggle levers toward a straight line position, thereby retracting the corresponding blocks and cams, and means operated from a common control to simultaneously move all the toggle levers away from a straight line position, thereby causing all the blocks and cams to be restored to operative position.

In testimony of which invention, I have hereunto set my hand, at Wilmington, Del., on this 25th day of August, 1911.

HARRY M. PIERCE.

Witnesses:
C. R. MUDGE,
A. M. GORMAN.