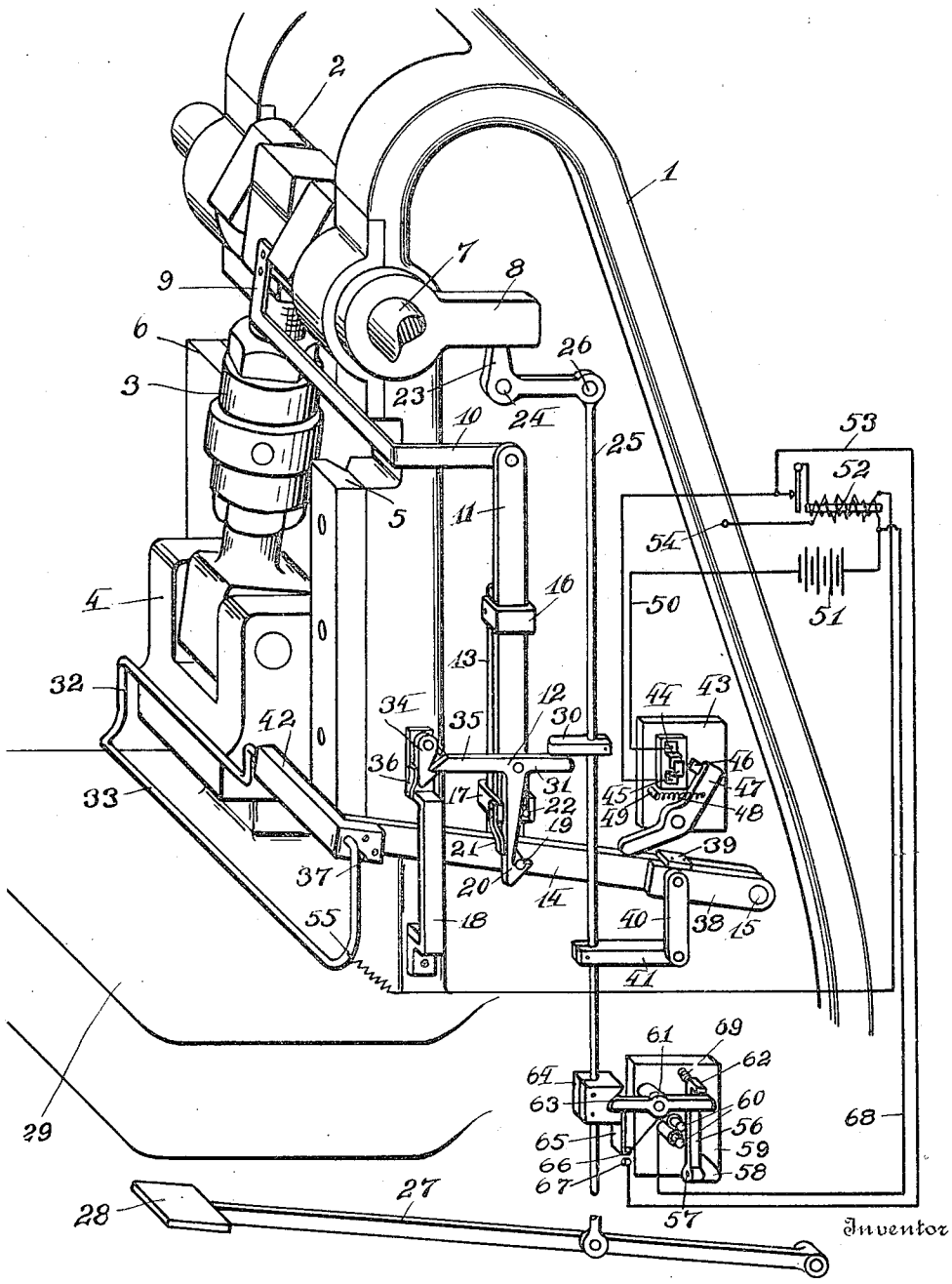
E. W. PINKERTON.

SAFETY GUARD.

APPLICATION FILED MAR. 28, 1917.

1,289,536. Patented Dec. 31, 1918.



Witness

Eric Dschinger

Ervin W. Pinkerton

Inventor

By Frank Keizer.

Attorney

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

UNITED STATES PATENT OFFICE.

ERVIN W. PINKERTON, OF ROCHESTER, NEW YORK.

SAFETY-GUARD.

1,289,536. Specification of Letters Patent. Patented Dec. 31, 1918.

Application filed March 28, 1917. Serial No. 158,127.

To all whom it may concern:

Be it known that I, ERVIN W. PINKERTON, citizen of the United States, residing at 6 Englert street, Rochester, in the county of Monroe and State of New York, have invented certain new and useful Improvements in Safety-Guards, of which the following is a specification.

The object of this invention is to provide a new and improved safety guard for punch presses which is adapted to prevent injury to the hand of an operator while feeding material to the press.

Another object of this invention is to warn the operator of the press by means of an electric shock when the ram of the press is accidentally released.

Another object of this invention is to automatically lock the releasing mechanism of the driving clutch of the press when the electric guard fails to operate.

These and other objects of this invention will be fully illustrated in the drawing described in the specification and pointed out in the claims at the end thereof.

In the accompanying drawing—

The figure is a perspective view of a portion of a punch press with the electric safety guard and locking mechanism attached thereto.

In the drawing like reference numerals indicate like parts.

The punch press shown in this figure may be any one of the well known types of presses which consists of a frame 1 having a crank 2 mounted to rotate near the top thereof. The connecting rod 3 connects the crank 2 with the ram 4 and reciprocates this ram between the guides 5 and 6 provided at the front of the frame 1. The crank shaft 7 of the crank 2 is connected to the driving pulley (not shown) by means of the usual clutch mechanism 8 by which the machine is thrown into operation.

The mechanism of the safety guard is attached to different parts of the punch press which operate to release the mechanism as hereinafter described.

The rigid arm 9 is fastened at a suitable point to the connecting rod 3 so as to reciprocate therewith. This arm extends to one side of the frame 1 and has an extension 10 at the end thereof which projects at right angles to the arm 9 and reaches around to the side of the frame 1 as shown in the figure. To the end of the extension arm 10 is pivotally mounted the link 11 which link has the dog 12 pivotally mounted near the lower end thereof. Mounted to slide parallel to the link 11 is the link 13. This link is pivotally mounted at the lower end thereof to the lever 14 which lever in turn is mounted to swing on the pivot pin 15 provided on the frame 1. The links 11 and 13 are mounted to slide on top of each other and are held together by means of the brackets 16 and 17. Each of these brackets is U-shaped and the ends of these brackets are fastened to the sides of each of the links. The ends of the bracket 16 are fastened to the sides of the link 13 near the upper end thereof and in such a manner that a rectangular sleeve is formed thereon in which the link 11 is adapted to slide. The bracket 17 has its ends fastened to sides of the link 11 near the lower end thereof so as to form a sleeve in which the link 13 is adapted to slide.

The lever 14 passes through a guide 18 provided on the frame 1 and carries on the outer end thereof the arm 42 which projects at right angles to the lever 14 and in front of the frame of the press. The guide 18 is adapted to hold the lever 14 in a straight up and down movement as will presently appear. This guide has also a rubber cushion provided at the bottom thereof which cushions the lever 14 when it strikes the lower end of the guide 18.

A pin 19 is provided on the lever 14 and projects out therefrom so that it can be engaged by the hook-shaped end 20 of the dog 12. This dog which is pivotally mounted to the lower end of the link 11 normally holds the lever 14 in its raised position. In this position the ram of the press is at its upper position and is ready to descend as soon as the clutch mechanism 8 releases it. The hook-shaped end 20 of the dog 12 is held in engagement with the pin 19 by means of the leaf spring 21 which forces the lower end of the dog toward the pin 19. A pin 22 is provided on the link 11 which forms a stop and prevents the leaf spring 21 from forcing the lower end of the dog 12 beyond a certain position when the pin 19 is not engaged thereby.

The clutch mechanism 8 is operated by

means of the bell crank 23 which is pivoted at 24 to the frame of the press. A rod 25 is pivotally mounted to this bell crank as shown at 26 and connects the bell crank with the treadle 27. This treadle is ordinarily mounted near the base of the punch press and is operated by the foot of the operator who steps on the outer end 28 to force the treadle down which in turn rocks the bell crank 23 and releases the clutch mechanism 8 so that the ram 4 of the press descends and operates on the material which has been previously laid on the table 29 formed by the frame of the press.

A lug 30 is clamped to the rod 25 so as to normally rest on top of the arm 31 which projects at right angles to the dog 12 and to the right thereof. When the treadle 27 is operated and the rod 25 descends, it carries with it the lug 30 which in turn engages the arm 31 of the dog 12 and swings this dog around its pivot. This in turn moves the hook-shaped end 20 of the dog 12 out of engagement with the pin 19 and allows the lever 14 to drop so that the gate 32 moves in front of the ram of the press and prevents the operator from moving his hands underneath the ram when the ram descends.

The gate 32 consists of a rod 33 which is L-shaped and has its ends pivotally mounted in the ends of the arm 42. The gate 32 is free to swing outwardly and the lower end thereof may be lifted so as to give the operator access to the dies mounted below the ram of the press. Stop pins 37 are provided on the ends of the arm 42 and in back of the gate 32 so as to prevent the gate from swinging back toward the frame of the press.

After the lever 14 has been disengaged from the dog 12 as previously described and has dropped into its lowest position the link 11 descends on the downward movement of the connecting rod 3 until the inclined surface of the hook-shaped end of the dog 12 rides over the pin 19 and forces the dog 12 to the left against the pressure of the spring 21 until the hook 20 of the dog 12 engages the pin 19. In this manner the link 11 is again connected to the lever 14 and on the upward movement of the connecting rod 3, the link 11, which moves with it, lifts the lever 14 and carries it back into the position shown in the figure in which position the gate 32 is lifted up from the table of the press which permits the operator to take out the material operated upon by the ram and insert new material instead. The cycle of operation may then be repeated by stepping down upon the treadle 27.

It sometimes happens that the clutch mechanism 8 fails to disconnect the driving wheel from the crank shaft at the end of each turn in which case the crank revolves indefinitely so that the ram 3 descends repeatedly without operating the treadle 27. For this reason a dog 34 having a hook-shaped end is pivotally mounted on top of the guide 18. The hook-shaped end of this dog 34 is normally forced by the spring 36 into engagement with the end of the arm 35 which forms an elongation of the arm 31 and projects to the left of the dog 12. Should the ram of the press descend without depressing the treadle 27 for reasons above pointed out the dog 34 will hold the arm 35 and rock the dog 12 so as to disengage the lower end thereof from the pin 19 and permit the lever 14 to drop and move the gate 32 in front of the ram as previously described. On the return movement of the link 11 the outer end of the arm 35 rides up the inclined surface of the dog 34 until it snaps in place in the hook formed thereon so that the mechanism is again ready to be released.

In case the lever 14 with the gate 32 carried at the front thereof should not drop, due to its own weight after the dog 12 has released the pin 19 a crank 38 is pivoted on the pivot pin 15 which crank has an over-hanging lug 39 fastened to the top thereof which overlaps the top of the lever 14. A link 40 is connected to the crank 38 which link connects the arm 41 clamped to the rod 25 with the crank 38. The arm 41 normally holds the crank 38 in a position in which the lug 39 is held about one 16th of an inch above the top of the lever 14. The lug 30 is held about a 32nd of an inch above the arm 31 and the downward movement of the rod 25 which is about $\frac{3}{8}$ of an inch, first operates to release the lever 14 by means of the lug 30 and if the lever should not drop immediately thereafter, the downward movement of the rod 25 forces the lug 39 provided on the crank 38 on top of the lever 14 by means of the arm 41 and link 40 so that the gate 32 is positively moved in place in front of the press in case the lever 14 does not drop due to the force of gravity acting thereon.

So far only the mechanical construction and operation of the guard has been described and the electric device which operates in combination with the mechanical guard to warn the operator when the ram of the press is about to descend will now be described.

Fastened to the frame of the press is the switch 43 which comprises the electrodes 44 and 45 and between which the lug 46 carried on the end of the bell crank 47 is adapted to engage. The bell crank 47 normally rests with one arm on top of the lever 14 which in turn holds the lug 46 on the opposite end of the bell crank 47 out of engagement between the electrodes 44 and 45. When the lever 14 drops as previously described it moves away from the

end of the bell crank and permits the tension spring 48 stretched between the pin 49 and the bell crank 47 to pull the lug 46 between the electrodes. This in turn completes the electric circuit 50 which derives its current from the battery 51 and supplies it to the primary winding of the induction coil 52. The electric current induced in the secondary winding on the completion of the circuit 50 by means of the switch 43 passes through the circuit 53, one end of which is grounded to the frame of the press as shown at 54 and the other end of which connects to the gate 32 as shown at 55.

The arm 42 in which the ends of the gate 32 are pivoted is made out of an insulating material such as fiber so that the electric current cannot pass directly from the gate 32 into the frame 1 and back to the induction coil, and the suspension of the gate 32 is such that it does not at any time come in contact with the frame 1 and close the secondary circuit.

The operation of this electric guard is as follows:

When the operator has placed the material to be operated upon below the ram of the press he forces down the treadle 27 and releases the clutch mechanism 8 so that the ram of the press quickly descends. As previously described the lever 14 with its gate 32 is released on the downward movement of the connecting rod 3 and drops in front of the press before the ram 4 has reached the end of its stroke. If for any reason the operator neglects to withdraw his hands from underneath the ram, the gate 32 will drop on his hands so that the secondary current passes from the gate into the portion of his body which comes in contact with the gate 32 and passes out therefrom into the frame of the press from which it returns to the negative side of the secondary winding 53 of the spark coil 52. From this it will be seen that the operator who neglects to withdraw his hands or any part of his body from the danger zone will receive an electric shock which makes him instinctively withdraw his hands before the ram of the press has far enough advanced to hurt him.

It will be understood that a magneto may be used to furnish the current for the electric guard instead of the induction coil and its battery.

The punch press is also provided with an electric locking mechanism which prevents the clutch mechanism 8 from being operated when the electric guard fails to operate on account of the break in the primary circuit. The locking mechanism consists of a pawl 56 which is pivoted at 57 to a lug 58 provided on the base 59. Mounted on this base and in back of the pawl 56 is the magnet 60 which operates to draw the pawl 56 toward the rear and release the right-hand end of the lever 61 from the hook-shaped end 62 of the pawl 56. The lever 61 is pivotally mounted on the base 59 and the left-hand end thereof projects into a pocket 63 provided on the lug 64. The lug 64 is clamped to the rod 25 and moves therewith. Fastened to the right-hand side of the lug 64 is the sliding contact plate 65 which is adapted to slide over the ends of the contact buttons 66 and 67, which in turn close the auxilary circuit 68 and permit the electric current furnished by the battery 59 to pass through the magnet 60 so that it is energized thereby.

The operation of this lock is as follows:

The downward movement of the rod 25 carries with it the lug 64 which in turn moves the sliding contact plate 65 over the contact buttons 66 and 67 to close the circuit 68. The magnet 60 is energized by the current passing through the closed circuit 68 and draws the pawl 56 rearwardly so that the hook 62 on the upper end of the pawl 56 is moved out of the way of the right-hand end of the lever 61 which in turn permits the lug 64 to swing the lever 61 around its pivot on account of its engagement with the left-hand end of this lever. As previously described the downward movement of the rod 25 is about $\frac{3}{8}$ of an inch and enough free space is provided between the hook 62 and the top of the right-hand end of the lever 61 so as to permit the lug 64 to travel a distance long enough to permit the sliding plate 65 to connect the buttons 66 and 67 before the right-hand end of the lever 61 comes in contact with the hook 62 of the dog 56.

If the primary circuit of the electric guard is broken no current is furnished to the magnet 60 which then remains demagnetized and fails to move the hook 62 away from the right-hand end of the lever 61 which is held in engagement therewith by means of the spring 69. This in turn arrests any further movement of the lug 64 and prevents the rod 25 from moving the distance required to operate the locking mechanism 8. This failure of releasing the driving mechanism of the press indicates to the operator that the electric circuit is out of order and prevents him from operating the machine when the electric guard cannot warn him to withdraw his hands when the ram of the press descends.

In the foregoing the electric guard has been described in connection with a punch press, but it is understood that the same mechanism may be used to guard other machines which are dangerous to operate, such as paper cutters, corner cutters, stapling machines, etc.

When the ram of the press repeats without operating the clutch mechanism 8, the lever 14 is forced down by the end of the

link 11 and is driven positively into its lower position before the ram 4 has reached its lower position.

I claim

1. In a safety guard for machines having a movable member, the combination of a gate operated by said movable member, said gate being adapted to be moved in front of said movable member to prevent access to said movable member, an electric circuit adapted to include the operator and including said gate, a current source and means actuated by said movable member for closing said circuit.

2. In a safety guard for machines having a movable member, the combination of a gate operated by said movable member, said gate being adapted to be moved in front of said movable member to guard the danger zone of the machine, an electric circuit adapted to include the operator and including said gate, a current source, means actuated by said movable member for closing said circuit and means for preventing the movement of said movable member when said source of current gives out.

3. In a safety guard for machines having an operating member and means for releasing said operating member, the combination of a gate operated by said means for releasing said operating member, said gate being adapted to be moved in front of said operating member on the release thereof to prevent acess to said operating member, an electric circuit adapted to include the operator and said gate, a current source and means actuated by said gate for closing said circuit.

4. In a safety guard for machines having an operating member, the combination of a lever, a gate carried by said lever, a link connected to said operating member, means for connecting said link with said lever and means for disconnecting said link from said lever at a predetermined position, an electric circuit adapted to include the operator and said gate, a current source and means actuated by said lever for closing said circuit.

5. In a safety guard for machines having an operating member and means for releasing said operating member, the combination of a lever, a gate carried on said lever and adapted to move in front of said operating member, a link connected to said operating member, said releasing means for said operating member being adapted to disconnect said link from said lever and allow said gate to drop, an electric circuit adapted to include the operator and said gate, a current source and means actuated by said lever for closing said circuit.

6. In a safety guard for machines having an operating member and means for releasing said operating member, the combination of a gate operated by said member to move in front of said operating member on the release thereof, an electric circuit adapted to include the operator, a current source, and means actuated by said releasing means for closing said circuit, and means for automatically locking said releasing means on the failure of said source of current.

7. In a safety guard for machines having an operating member and means for releasing said operating member the combination of a gate, operated by said releasing means for said operating member, an auxiliary releasing mechanism for said gate to move said gate in front of said operating member without being operated by said releasing mechanism for said operating member, an electric circuit adapted to include the operator, a current source, and means actuated by said gate for closing said circuit.

8. In a safety guard for machines having an operating member and means for releasing said operating member the combination of a lever, a link connecting said operating member with said lever, a gate carried on said lever, means operated by said releasing means for said operating member to positively move said gate in front of said operating member an electric circuit including the operator, a source of current and means actuated by said lever to close said electric circuit.

9. In a safety guard for machines having an operating member and means for releasing said operating member, the combination of an arm carried by said operating member, a link attached to said arm, a lever temporarily connected to said link, a gate carried on said lever, said gate being adapted to be moved in front of said operating member, said releasing means operating to disconnect said link from said lever when releasing said operating member, means on said link to automatically connect said link with said lever on the return-movement of said operating member, an electric circuit adapted to include the operator and said gate, means operated by said lever from closing said circuit.

10. In a safety guard for machines having a reciprocating member, the combination of an arm fastened to said reciprocating member, a lever, a link connecting said lever to said arm, a gate carried on said lever, said lever operating to swing said gate on the movement of said reciprocating member, means on said link to automatically connect or disconnect said link from said lever.

11. In a safety guard for machines having a reciprocating member and means for releasing said reciprocating member the combination of a gate, a lever connected to said connecting rod, said lever operating to swing said gate approximately parallel to and in front of the end of said reciprocating member, means for connecting and discon-

necting said lever from said reciprocating member, and means for positively operating said gate when disconnected from said reciprocating member.

12. In a safety guard for machines having a reciprocating member, the combination of an arm attached to said reciprocating member, a dog carried by said arm, stationary means engaging said dog, said means being adapted to rock said dog on the descent of said reciprocating member, a lever temporarily engaged by said dog, said lever being released by said dog on the rocking movement thereof, said dog being also adapted to reëngage said lever on the end of the downward movement of said reciprocating member and said arm, a gate carried on the outer end of said lever.

13. In a safety guard for machines having a reciprocating member, the combination of an arm attached to said reciprocating member, a dog carried by said arm, stationary means engaging said dog, said means being adapted to rock said dog on the descent of said reciprocating member, a lever temporarily engaged by said dog, said lever being released by said dog on the rocking movement thereof, said dog being also adapted to reëngage said lever on the end of the downward movement of said reciprocating member and said arm, an auxiliary reciprocating member being also adapted to engage said dog and release said lever in case said reciprocating member fails to descend and move said arm carrying said dog, said auxiliary reciprocating member operating to release said main reciprocating member.

14. In a safety guard for machines having a reciprocating member, the combination of an arm fastened to said reciprocating member, a lever, a link connecting said lever to said arm, a gate carried on said lever, said lever operating to swing said gate on the movement of said reciprocating member, means on said link to automatically connect or disconnect said link from said lever, said gate comprising a horizontal member and a loosely swinging frame pivotally mounted on said horizontal member.

In testimony whereof I affix my signature.

ERVIN W. PINKERTON.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."