P. E. DUTCHER.

SELF OPERATING LATCH.

APPLICATION FILED FEB. 16, 1917.

1,338,219. Patented Apr. 27, 1920.

3 SHEETS—SHEET 1.

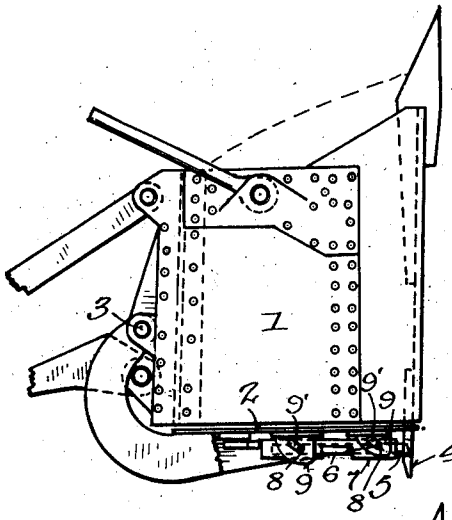


Fig. 1.

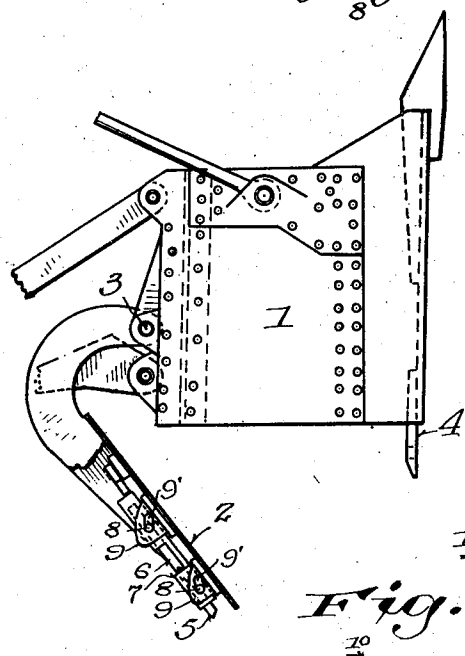


Fig. 2.

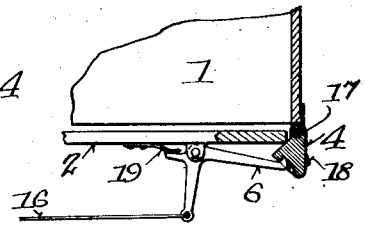


Fig. 10.

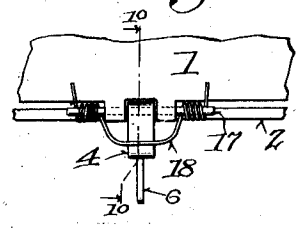


Fig. 11.

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3 SHEETS—SHEET 2.

Fig. 3.

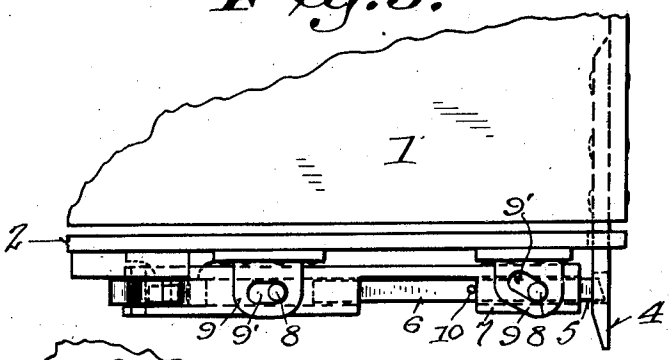


Fig. 4.

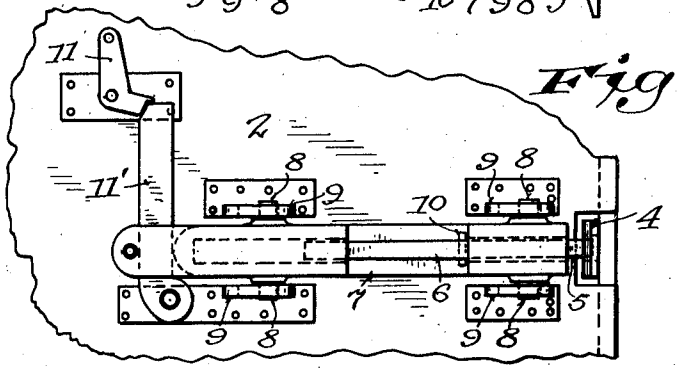


Fig. 5.

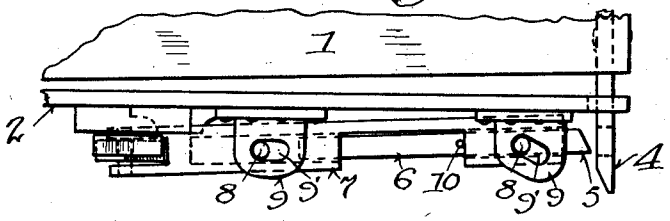
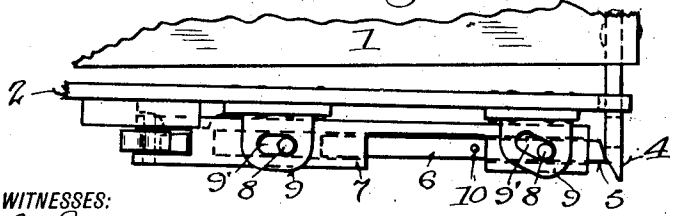


Fig. 6.



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3 SHEETS—SHEET 3.

Fig. 7.

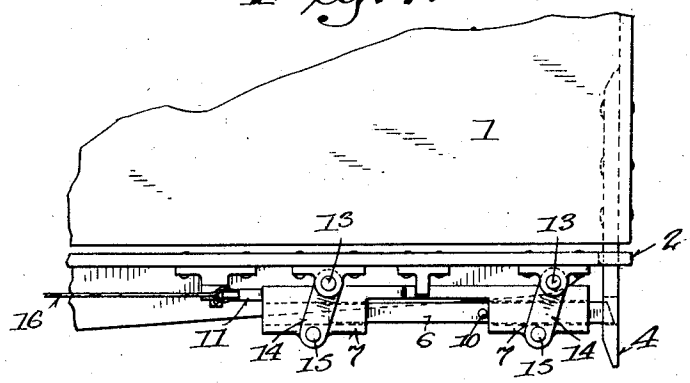


Fig. 8.

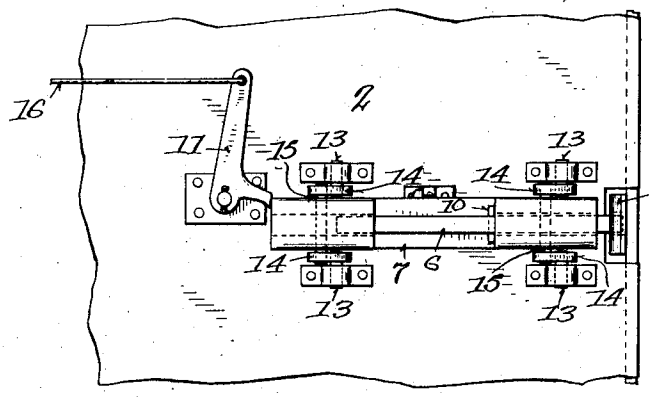
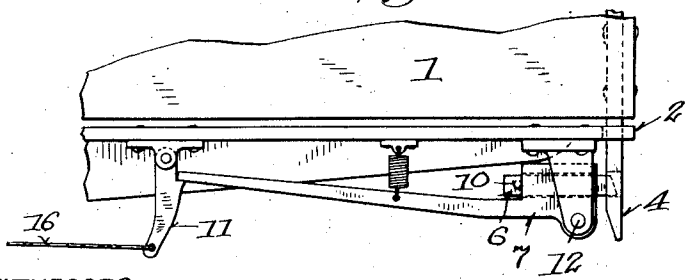


Fig. 9.



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SELF-OPERATING LATCH.

1,338,219. Specification of Letters Patent. Patented Apr. 27, 1920.

Application filed February 16, 1917. Serial No. 149,031.

To all whom it may concern:

Be it known that I, PIERPONT E. DUTCHER, a citizen of the United States, residing at Milwaukee, county of Milwaukee, and State of Wisconsin, have invented a new and useful Self-Operating Latch, of which the following is a specification.

In the operation of excavating machinery, transporting apparatus such as dump cars, dump buckets, and other machinery in which heavy loads are carried, it is often necessary that there be movable portions of the apparatus held closed by latches and which must be opened while the apparatus is filled with material and the latch is under heavy strain. A very clear example of this is seen in excavating machinery, particularly of the type known as dipper dredges and steam shovels wherein the dipper is filled with material to be excavated and the latch is tripped when the dipper is full. The same is, of course, true as to other types of excavators and to the other classes of machinery and devices to which I have alluded. It has been the practice in the past, so far as I am aware, of using latches of the ordinary bolt or slide type, or hook latches or other equivalents, all of which either require manual manipulation which as the machines are increased in size, puts an unusual and excessive burden upon the operator or necessitates the application of power devices for tripping the latch. The latter are expensive to produce and require care to keep in order, as there are necessitated a number of working parts which need oiling and attention and which are affected by the presence of dirt and grit, which are unavoidable in this class of machinery, as the latch is necessarily in an exposed position. In a good many cases it is impossible or not practicable to use power operated latches, and in such case resort has been had to manually operated latches of the bolt type, and the necessary power to operate them has been given by use of compounding levers.

The object of my present invention is to produce a latch which is self-operating in that it is self-closing and which when closed is also self-operating or semi-automatic in that the load thereon has a tendency to open the latch rather than to hold it closed as is true with the devices heretofore in use. It is a further object of my invention to produce a latch which comprises comparatively few moving parts, that is simple, can be applied to almost any type of machinery, is rugged in construction, requires little or no attention, and can be operated easily by any man, no expert engineer or mechanic being necessary.

The accompanying drawings illustrate four preferred embodiments of my invention, although I claim the right to any modifications of this invention within the scope of the appended claims. The latches are shown applied to an excavating machine of the dipper dredge type. In this type of machine the excavator has a scoop or dipper mounted on a handle and digs by being swung through a circular arc of approximately ninety degrees in a vertical plane. Figure 1 is a side view of the dipper with one type of my improved latch in the position assumed at the end of the travel on the digging arc, the dipper at this position being full of the excavated material. Fig. 2 shows the dipper with the latch after the latch has been tripped, showing the door forming the bottom of the dipper open as it is after discharging the load. Fig. 3 shows one preferred embodiment of my improved latch known as the sliding type, in a closed position. Fig. 4 is a bottom plan view thereof. Fig. 5 shows the same type of latch with the latch frame retracted. Fig. 6 shows the same type of latch with the latch frame locked and the latch engaging the latch keeper. Figs. 7, 8 and 9 show other preferred embodiments of my invention, the first two being side and bottom views respectively of what I call a lever latch, and the latter view being a side view of what I call a rotating latch. There is a further form which my improved latch may assume and which is shown in Figs. 10 and 11. The first of these is a side view of this type of latch known as a keeper latch, part thereof being shown in section, the section being along the line 10—10 in Fig. 11 looking in the direction of the arrows. Fig. 11 is an end view of the latch shown in Fig. 10 being viewed from the right hand or outside end of the dipper to which it is attached.

In the drawings 1 indicates the dipper of the excavating machine, and 2 the door plate which is attached thereto by the door hinge 3. 4 is the latch keeper which is in this

case mounted upon the outer edge of the dipper 1. 5 is my improved latch which is shown in Fig. 1 as being in the operative position and engaging the keeper, and shown in Fig. 2 as having been released and ready for reëngagement with the keeper when the dipper swings down into position to commence again the digging cycle.

Referring particularly to the sliding type of my improved latch as shown in Figs. 3, 4, 5, and 6, 5 represents the improved latch as an entirety. This it will be seen is composed of a latch proper 6, slidably mounted within a latch frame 7, and so placed that it is gravity actuated when the latch is in an inoperative position as shown in Fig. 6. It is understood of course that if necessary the latch can be made to operate in a reversed position by supplying a spring which has a tendency to hold the latch proper 6 in an operative position even against the force of gravity. The latch frame 7 is slidably attached to and mounted upon the bottom of the door plate 2 by four brackets 9 with biased slots 9′ which are fixedly attached to the door plate 2. Four pins 8 forming part of the latch frame 7 engage the slots in the brackets and the slots are so biased that the upward pressure on the latch proper 6 caused by the resistance of the latch keeper 4 to the downward pressure of the load resting on the door plate 2 tends to retract the latch frame 7 and draw with it the latch proper 6, and thus disengage it from the latch keeper 4. It will be noted that the latch proper 6 is prevented from projecting into the latch keeper beyond the position shown in Fig. 3 by a stop 10 which also retracts the latch proper 6 when the latch frame 7 is retracted. This retracting movement of the latch frame 7 and latch proper 6 would if not prevented cause the latch to automatically open and thus it would not remain in an operative position as shown in Fig. 3 were it not for the latch retainer or trip 11 which may abut against a projection on the side or against the end of the latch frame 7 and thus hold it in its operative position, although I have other means for preventing or counteracting that as hereinafter set forth. Instead of acting directly on the latch frame 7 this trip 11 may act on a lever 11′ which in turn abuts against the latch frame and in this way decreases the pressure on the trip allowing it to be made lighter. I prefer to have this trip 11 built as shown particularly in Fig. 4 so that it will automatically return to the operative position as shown in Fig. 4 by the force of gravity when the door plate 2 is opened. Of course this may be done by a spring where the placing of the latch is such that it is impractical to use gravity for this purpose.

In Fig. 9 the rotating type of latch is also provided with a latch proper 6, slidably mounted within a latch frame 7, and provided with a motion limiting stop 10. The latch frame in this case is pivotally mounted so that it may rotate about the pivot 12 which is attached to the bottom of the door plate 2 by any suitable means, and is held in operative position by the trip 11. The sliding type of latch shown in Fig. 7 is constructed in all respects similarly to the sliding type shown in Fig. 3, except that the pins 8 and biased slots 9′ are replaced with fixed pins 13, links 14, and pins 15 mounted in the latch frame 7. Links 14 are slanted or biased so that the movable end thereof is farther from the latch keeper than the fixed end, as a result of which bias the upward pressure of the latch keeper 4 on the latch proper 6 causes a retracting component to act upon the latch frame 7 precisely as is done in the sliding type latch shown in Fig. 3. This latch frame is also held in operative position by the trip 11 and the latch has the motion limiting stop 10.

In operation my improved self-operating latch when closed or in an operative position has a tendency to open which is retarded or held by the trip 11, and the greater the amount of pressure due to the material, etc., upon the bottom of the door plate 2, the greater will be the tendency of the latch 5 to open. Upon the trip 11 being moved out of operative position by the latch line 16 the pressure of the material in the dipper 1 or even of the weight of the door plate 2 will cause the entire latch 5 to retract, thus drawing the latch proper 6 out of engagement with the keeper 4 and permitting the door plate to open. The amount of pressure upon the trip 11 and friction thereby caused is very much less than the amount of pressure that is unavoidable with the slide or bolt type of latch as ordinarily used, and even when the dipper or other machinery on which the latch is applied is very large my improved form of latch can easily be manually operated and no trip machinery is necessary. If it is desired to have the latch operated with extreme ease it can be easily done by either increasing the length of the arm on the trip 11 to which the latch line 16 is attached, or it can be compounded by suitable levers or other equivalent devices.

There are three positions that are assumed by my improved latch 5 in operation. They are the operative or closed position shown particularly in Fig. 3, where the latch proper 6 engages the latch keeper 4, and the latch frame 7 is in locked position, being so held by the trip 11; the second position shown particularly in Fig. 5 shows the latch frame 7 retracted, carrying with it the latch proper 6 so as to bring it out of engagement with the latch keeper 4, thus opening the latch; and the third position is that

shown in Fig. 6 wherein the latch frame 7 has returned to its locked position and is held locked by the trip 11 and the latch proper 6 is in position to engage the end of the latch keeper 4. As the dipper 1 swings downward to resume digging operations it meets, or the latch keeper 4 comes into contact with the latch proper 6 as it hangs suspended from the door plate 2, retracts the latch proper 6, and causes it to engage in a hole provided therefor in the latch keeper 4, thus closing the latch and locking the door plate 2 to the dipper 1, and thus completes the cycle of the operations of the latch.

The operation of the embodiment of my invention that I call keeper latch as shown in Figs. 10 and 11 is similar excepting only that the latch keeper 4 is rotatably mounted upon a pivot 17 and brought into engagement with the latch 6 by a spring 18 or other equivalent means. The latch 6 is kept in engagement with the movable latch keeper 4 by the spring 19 or other equivalent means. It will be seen by an inspection of Fig. 10 that the weight of the door plate 2 upon the biased edge of the latch keeper 4 has a tendency to cause that to rotate or open but is prevented therefrom by the operation of the latch 6.

It will be noted that although I have shown the different embodiments of my invention, for example, Figs. 7 and 8, with a trip 11 to prevent the latch from automatically opening, yet I can, where the maximum load under which the latch must operate, so regulate it by varying the bias of the lever slots or other operating means shown in the different figures as to cause the force tending to open the latch to not quite equal the frictional resistance which it encounters and thus the latch while tending to open, will not of itself open automatically. In such case I attach the latch line 16 directly to the latch frame 7 and it can then be easily operated manually or otherwise as that which needs to be overcome is just the residuum due to the difference between the self-operating tendency of the latch and the frictional resistence thereof.

It will be noted that my improved self-operating latch is entirely automatic in that it need not be operated in order to become locked, but does so by the force of gravity or springs; and when in a locked or operative position has a tendency to disengage itself, thus permitting its unlocking to be accomplished by merely moving the trip or by a slight pull which can be done with very little exertion on the part of the operator.

Having thus completely described my device, I claim:

1. The combination with a receptacle having a movable closure, of a latch comprising a movable bolt guided on the closure and a keeper on the receptacle with which the bolt positively engages to lock the closure shut, and means actuated by opening pressure on the closure and adapted to withdraw the bolt from the keeper with the initial opening movement of the closure.

2. The combination with a receptacle having a movable closure, of a latch comprising a movable bolt guided on the closure and a keeper on the receptacle with which the bolt positively engages to lock the closure shut, means actuated by opening pressure on the closure and adapted to withdraw the bolt from the keeper with the initial opening movement of the closure, and means for retaining the bolt in engagement with the keeper and for releasing it therefrom.

3. A latch adapted for use on excavating machinery comprising a latch proper, a motion limiting latch stop, a latch frame, a latch trip or lock, and a mounting for said latch frame so biased as to tend to cause the latch to disengage when in the operative position.

4. A latch adapted for use on excavating machinery comprising a latch proper, a motion limiting latch stop, a latch frame, and a mounting for said latch frame so biased as to tend to cause the latch to disengage when in the operative position.

5. A latch adapted for use on excavating machinery comprising a latch proper, a motion limiting latch stop, a latch frame, a latch trip or lock, and a mounting for said latch frame, having biased slots therein, pins mounted on the latch frame and engaging the slots in the latch frame mounting, said slots being so biased as to tend to cause the latch to disengage when in the operative position.

6. A latch adapted for use on excavating machinery comprising a latch proper, a motion limiting latch stop, a latch frame, and a mounting for said latch frame, having biased slots therein, pins mounted on the latch frame and engaging the slots in the latch frame mounting, said slots being so biased as to tend to cause the latch to disengage when in the operative position.

7. A dredge bucket having a swinging door or bottom thereto, a latch securing said door to said bucket, said latch having a tendency to disengage under load, a tripping mechanism, said latch comprising a proportioning mechanism for said latch transferring to the tripping mechanism a portion of the load carried by said latch.

8. The combination with a dipper provided with a door, of a latch comprising two positively engaging members, one applied to the dipper and the other to the door and one movable relative to the other into and out of locking engagement therewith, and means tending when subjected to

pressure on the door in the direction of its opening movement to shift one member out of locking position.

9. The combination with a dipper provided with a door, or a latch comprising two positively engaging members, one applied to the dipper and the other to the door and one movable relative to the other into and out of locking engagement therewith, means tending when subjected to pressure on the door in the direction of its opening movement to shift one member out of locking position, and means for releasing one member from engagement with the other.

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