March 13, 1928. 1,662,657

M. ALPERN

SAFETY DEVICE FOR STOKERS

Filed Dec. 2, 1922 3 Sheets-Sheet 1

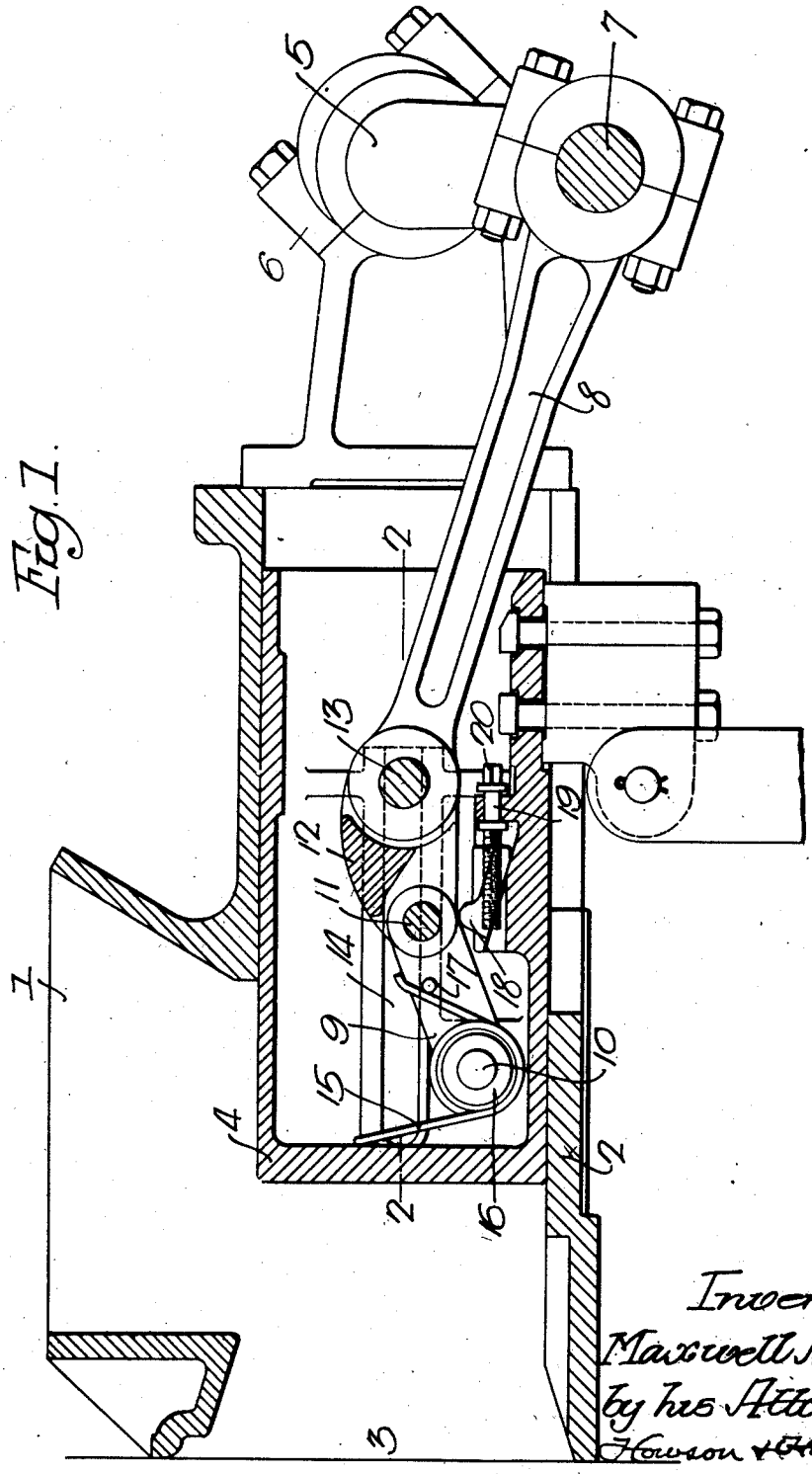


Fig. 1.

Inventor-
Maxwell Alpern.
by his Attorneys.
Howson & Howson

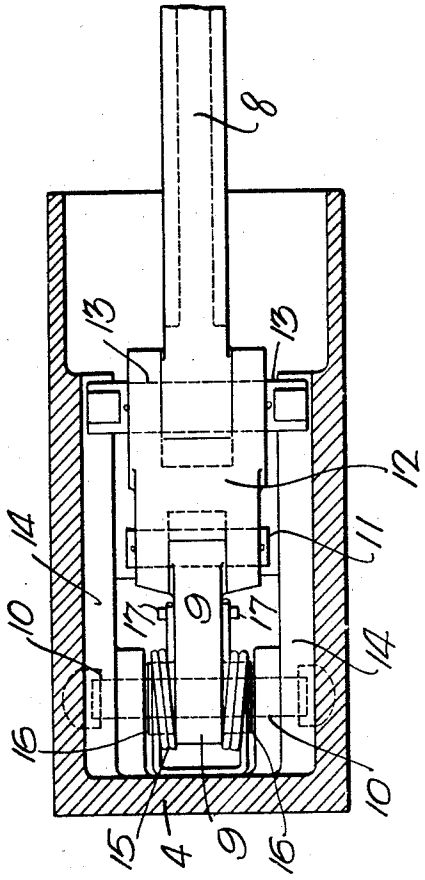
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Fig. 2.



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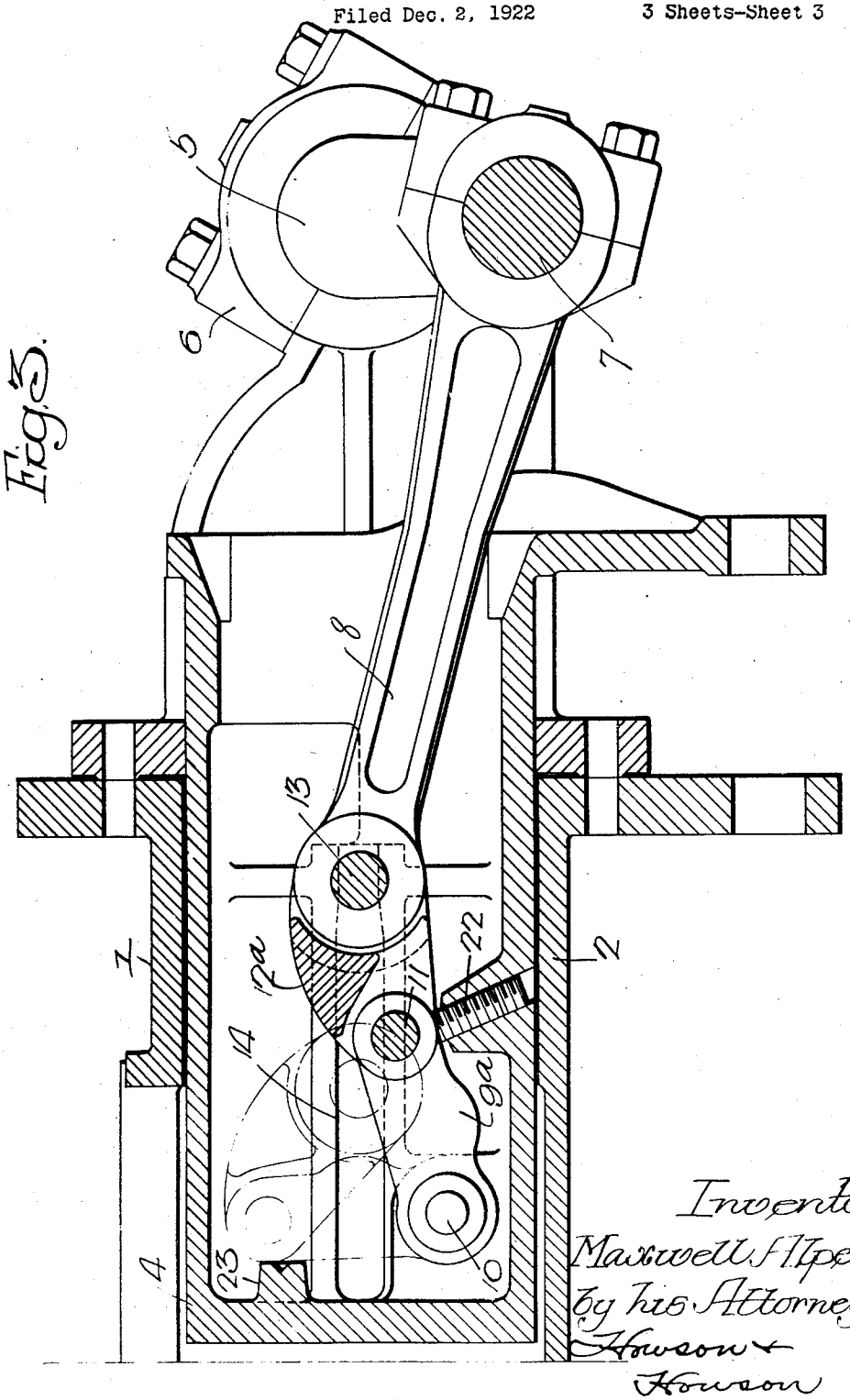
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SAFETY DEVICE FOR STOKERS

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Fig. 5.



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UNITED STATES PATENT OFFICE.

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SAFETY DEVICE FOR STOKERS.

Application filed December 2, 1922. Serial No. 604,493.

One object of this invention is to provide a train of mechanism of novel construction, particularly designed for use between a driving and a driven element, which shall not only yield when the driven element opposes more than a predetermined resistance to the driving element, but shall also automatically resume its power-transmitting position and function upon the removal of such abnormal force or load, the construction being such that the mechanism shall be capable of yielding and thereafter becoming operative as often as the load on the driven element is increased and thereafter sufficiently diminished.

A further object of the invention is to provide novel adjusting means for regulating or determining the load at which a train of mechanism having the above characteristics, will yield.

Another object of my invention is to provide a novel connection particularly designed for use between the fuel feeding ram or plunger of an automatic stoker and the member for reciprocating the same, which shall be capable of yielding in case the ram offers more than a predetermined resistance to the actuating force applied by said member, with a view to preventing injury in case the ram is blocked or prevented from moving by tramp iron or other foreign bodies in the fuel;—the arrangement being such that upon the removal of the object obstructing or preventing movement of the ram, my connecting mechanism will automatically resume its power-transmitting position so that the driving member will again reciprocate said ram without further attention.

Another object of the invention is to provide a safety device having the above characteristics which shall be capable of automatically changing the stroke of the ram or other actuated element in case the movement of the latter is obstructed or when the load on it exceeds a predetermined amount; the arrangement and construction being such as to reduce the stroke of the ram to a fraction of its normal length when its full movement is prevented by a foreign body, in order that the continued slow feed of fuel shall tend to force said body into the throat of the stoker.

I also desire to provide a conveniently operative, relatively simple device for regulating the load at which my device will function.

These objects and other advantageous ends I attain as hereinafter set forth, reference being had to the accompanying drawings, in which,

Fig. 1 is a longitudinal vertical section of a portion of the fuel-feeding mechanism of an automatic stoker, illustrating my invention as applied thereto;

Fig. 2 is a horizontal section of the ram shown in Fig. 1 and taken on the line 2—2 of said figure; and

Fig. 3 is a longitudinal vertical section similar to Fig. 1, showing a second form of my invention.

In the above drawings, 1 represents a portion of the fuel hopper of an automatic stoker, which in the case illustrated, is shown as integral with the cylindrical ram chamber 2, having a flaring outlet or throat 3 designed for connection to one of the retorts of the stoker. A hollow cylindrical plunger or ram 4 is reciprocable in the chamber 2, and for the purpose of actuating it a shaft 5 is provided which is usually mounted in suitable bearings 6 so as to extend horizontally at the front end of said chamber. Said shaft includes a crank 7 engaged by one end of a connecting rod 8, whose second end is operatively connected to the ram 4.

In accordance with my invention I mount within the hollow of the ram, or otherwise suitably dispose adjacent thereto, a suitable form of yieldable connection or device, consisting in the present instance of a link 9 having one end pivoted to the rear end of the ram by a pin 10. The opposite end of this link is connected by a second pin 11 with a second link 12, also pivotally connected to the rear end of the connecting rod 8 by a pin 13. The ends of this latter pin are preferably extended beyond the sides of the link 12 so as to be slidable in guideways 14 extending longitudinally of and formed in the sides of the ram 4.

The two links 9 and 12 constitute in the present instance a toggle interposed between the end of the connecting rod 8 and the ram. Obviously the weight of these two links or their friction on their connecting pins, or

both of these characteristics, may be so varied that under ordinary conditions of operation the three pins 10, 11 and 13 will lie so close to the same plane that the rotation of the shaft 5 will cause the ram 4 to be reciprocated in the chamber 2, thus feeding fuel from the hopper 1 into the outlet opening 3 and the retort connected thereto. The stroke of said ram in such case is equal to twice the throw of the crank. The adjustment is such however, that in the event of a body of wood, tramp iron or other foreign material becoming jammed between the rear end of the ram and the rear wall of the hopper, said toggle will "break" or yield, allowing the two links to turn on their pivot pins and permitting the connecting rod to move longitudinally of the ram.

The links are so designed that they thus provide a lost motion connection between the crank and the ram, the amount of this lost motion in a typical case being ten inches with a normal stroke of twelve inches for the ram. Consequently the stroke of the ram is automatically reduced to two inches; the pin guiding the rear end of the connecting rod. Upon outward or forward movement of the latter by reason of the continued rotation of the shaft 5, the links will automatically return to their power transmitting or substantially aligned positions shown, so that if the obstructing body has been removed from the hopper or no longer opposes movement of the ram, the latter will be reciprocated as usual upon the next succeeding stroke of the connecting rod. If however the obstruction is not removed, the toggle continues to automatically yield and straighten as long as the shaft is rotated and reciprocates the ram with a reduced stroke, so that the continued slow feeding of fuel tends to likewise move the obstruction into the throat 3, thus avoiding the necessity of manually removing the obstruction.

If desired or found necessary, one or more springs 15 may be employed to assist in maintaining the toggle in and returning it to its straight and normally operative position between the ram and the connecting rod. Such spring is shown in the present case as coiled upon hubs 16 on the opposite sides of the link 9, with its ends bearing upon pins 17 projecting from the sides of said link and its middle portion acting against the rear wall of the ram. With such an arrangement the spring acts with the weight of the links and the frictional resistance to their movement, to retain the toggle in its straight condition and also to return it to this condition after it has yielded. It is to be noted that said spring may be omitted, without departing from my invention, by suitably designing and mounting the links and their associated parts.

In order to adjust or determine the load at which the toggle will yield, I provide a device such as a slidable block 18 having a portion formed to normally support the toggle at or adjacent the point of pivotal connection of its two links. This block is preferably mounted on a portion of the ram structure which is inclined to its center line and it is movable longitudinally by a threaded member 19 having a squared head or end 20, whereby it may be turned. Obviously when said block is moved toward the front of the ram, the links of the toggle are permitted to swing on their pivots so as to bring the center line of the pin 11 more nearly into the plane including the center lines of the pins 10 and 13, with the result that the load at which the device yields is increased. On the other hand if the block 18 is moved toward the rear end of the ram, the links of the toggle are moved further from their aligned positions so that said toggle will yield at a reduced load.

In Fig. 3 I have shown a form of my invention in which the parts are so constructed and arranged as to operate without the springs and to employ a set screw 22 mounted in the ram so as to serve as a means, in place of the block 18 and bolt 19, for adjusting the load at which the links will buckle. In this case said screw is positioned to engage one end of the link 9^a just under the pin 11 connecting it to the link 12^a; there being also a lug 23 on the inner surface of the rear end of the ram, positioned to be engaged by the link 9^a when the links yield.

From the above description it will be appreciated that my device may be adjusted to yield and shorten the stroke of the ram whenever the opposition to the movement of said ram or other driven element exceeds a predetermined amount, thus preventing injury to the stoker structure or mechanism, in case of jamming of the ram. Moreover, as soon as the obstruction or abnormal load is removed, the device automatically resumes its full stroke and operative condition so that there is no further interference with the continued operation of the stoker.

While I have shown my safety device as particularly designed for use in connection with the fuel feeding mechanism of a stoker, it will be obvious to those skilled in the art that it may without essential change, be utilized between any driving and driven members where it is essential or desirable that yielding shall occur and the stroke of the driven member be reduced in case said member opposes more than a predetermined load to operation by the driving member. It is to be understood that by properly proportioning the length of the crank and the lengths of the links, the stroke of the driven member may be reduced to any desired extent or in an extreme case may be made

zero when the links yield so that said driven member may be allowed to remain stationary while the crank continues to turn.

I claim:

1. In a stoker mechanism, the combination of a fuel hopper, a ram chamber communicating therewith, a hollow ram adapted to reciprocate within said ram chamber, a track member positioned within said hollow ram, a driving member having a pivot pin adapted to engage said track member, and a toggle positioned within the hollow ram adapted under normal operating conditions to prevent movement of the driving member relative to the ram and to transmit the movement of the driving member to the ram and to yield under predetermined pressure conditions to permit the driving member to move relative to the ram to automatically reduce the length of the stroke of the ram when the ram contacts with an obstruction in the ram chamber.

2. In a stoker mechanism, the combination of a fuel hopper; a ram chamber communicating therewith; a hollow ram having a closed inner end adapted to reciprocate within said ram chamber; track members positioned within said hollow ram; a driving member having a pivot pin adapted to engage said track members; a link pivoted within said ram at a point adjacent the closed end thereof; a second link pivotally connecting the free end of said link and said driving member, said links and their respective pivot pins being so positioned that they constitute a toggle connection adapted to transmit the full stroke of the driving member to the ram under normal operating conditions, and to yield under a predetermined pressure to automatically reduce the length of the stroke of said ram by permitting the driving member to reciprocate within the track members.

3. In a stoker mechanism, the combination of a fuel hopper; a ram chamber communicating therewith; a hollow ram having a closed inner end adapted to reciprocate within said ram chamber; track members positioned within said hollow ram; a driving member having a pivot pin adapted to engage said track members; a link pivoted within said ram at a point adjacent the closed end thereof; a second link pivotally connecting the free end of said link and said driving member, said links and their respective pivot pins being so positioned that they constitute a toggle connection adapted to drive the ram under normal operating conditions but to yield under a predetermined pressure to permit the driving member to move relative to the ram to reduce the stroke of the ram; and an adjustable abutment accessible through the open end of the hollow ram for supporting the adjacent ends of said toggle elements whereby the pressure at which said toggle yields may be varied.

4. In a stoker mechanism, the combination of a fuel hopper; a ram chamber communicating therewith; a hollow ram having a closed inner end adapted to reciprocate within said ram chamber; track members positioned within said hollow ram; a driving member having a pivot pin adapted to engage said track members; a link pivoted within said ram at a point adjacent the closed end thereof; a second link pivotally connecting the free end of said link and said driving member, said links and their respective pivot pins being so positioned that they constitute a toggle connection adapted to drive the ram under normal operating conditions but to yield under predetermined pressure conditions to permit the driving member to move relative to the ram to reduce the stroke of the ram; a wedge abutment slidably mounted within the hollow ram for supporting the adjacent ends of the toggle element and an adjusting screw accessible through the open end of the hollow ram adapted to move the wedge abutment whereby the pressure at which said toggle yields may be varied.

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