Sept. 20, 1927. 1,642,769

H. A. DAVIS

LAY ACTUATING MECHANISM FOR LOOMS

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Fig. 1

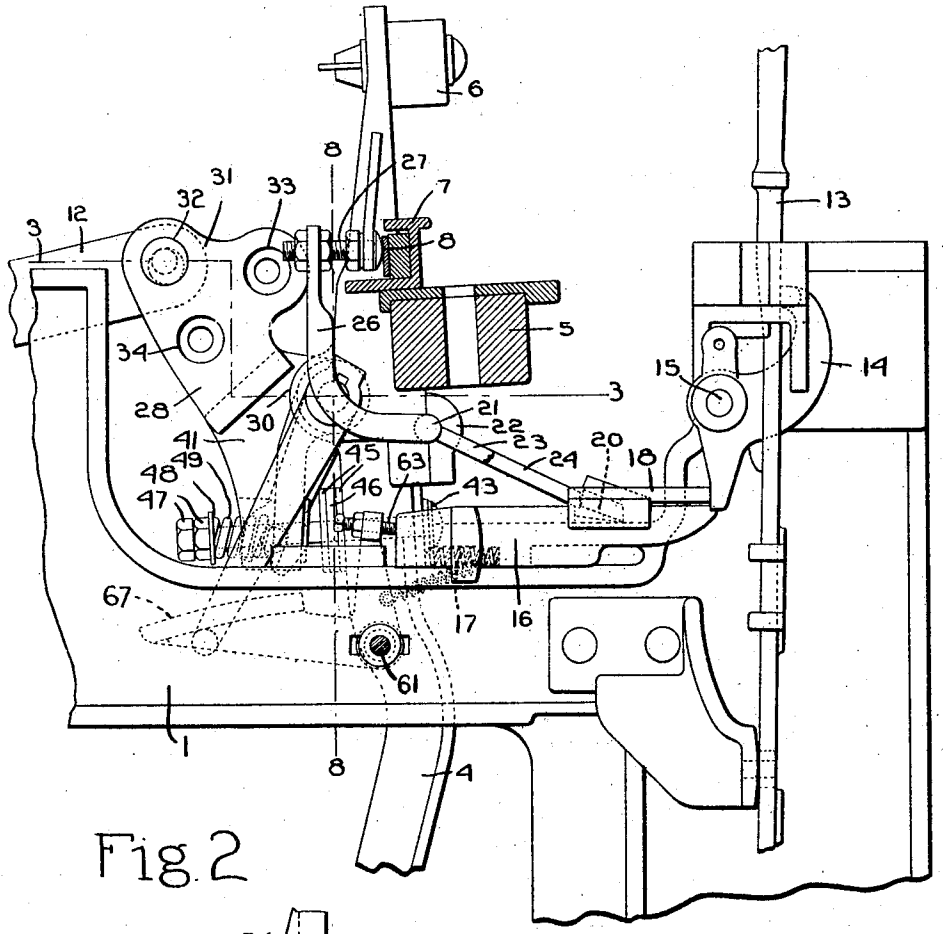
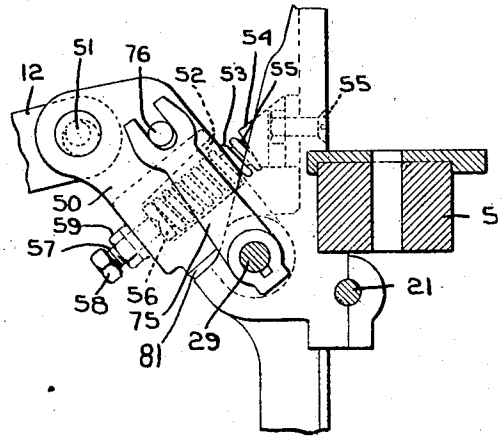


Fig. 2



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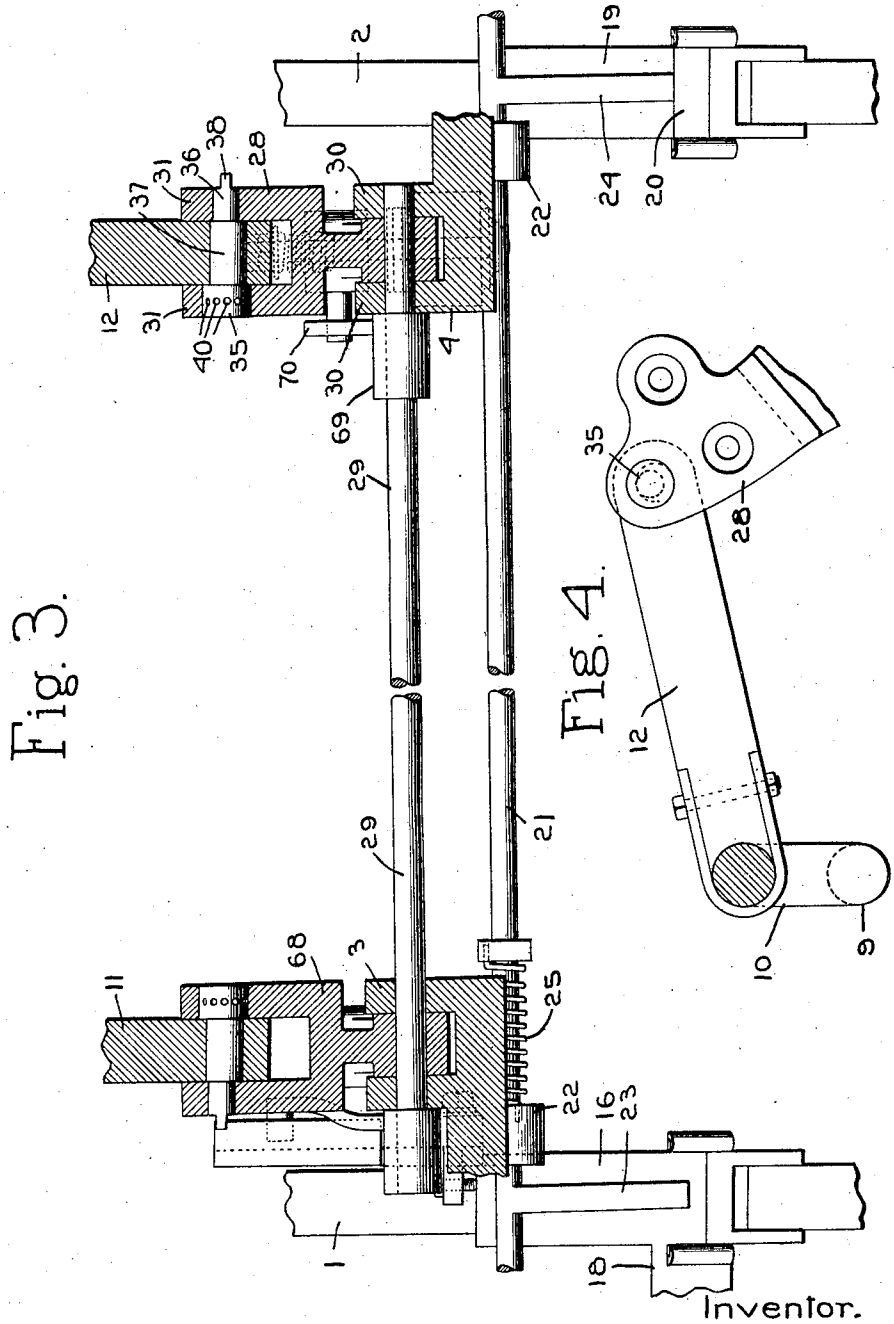


Fig. 3.

Fig. 4.

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LAY ACTUATING MECHANISM FOR LOOMS

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Fig. 5.

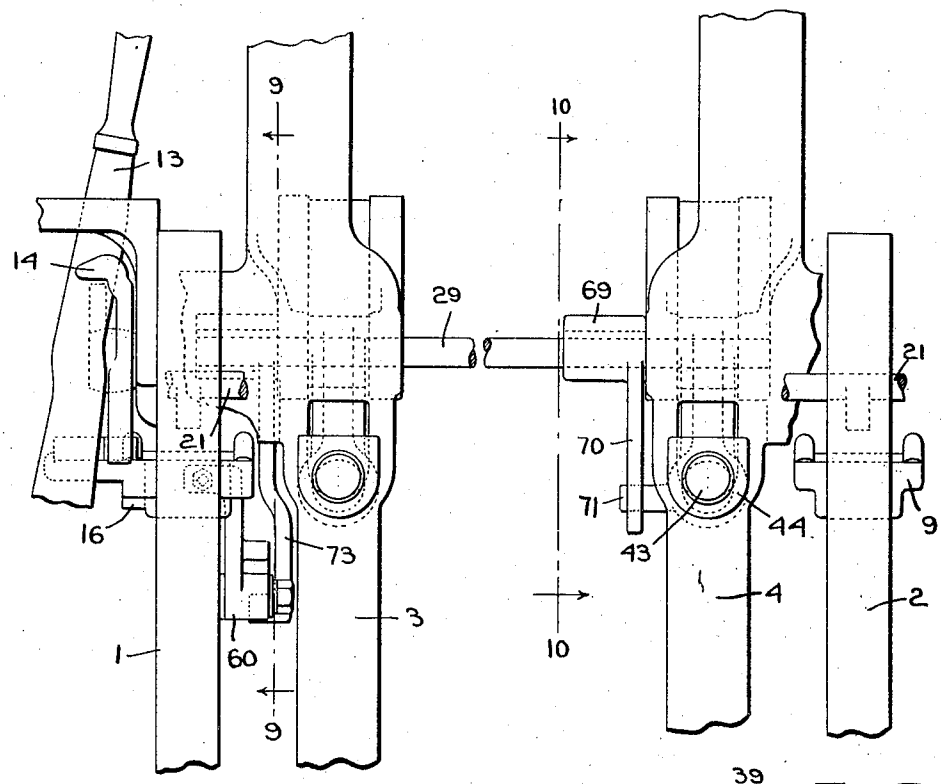


Fig. 6.

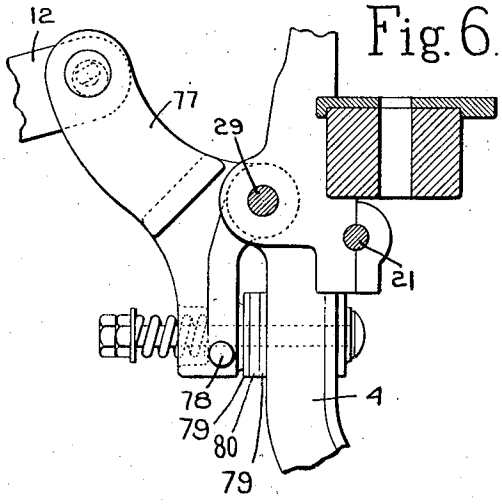
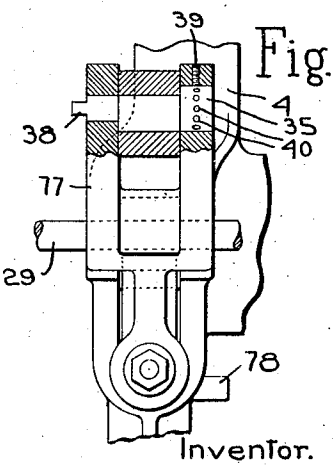


Fig. 7.



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LAY ACTUATING MECHANISM FOR LOOMS

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Fig. 8.

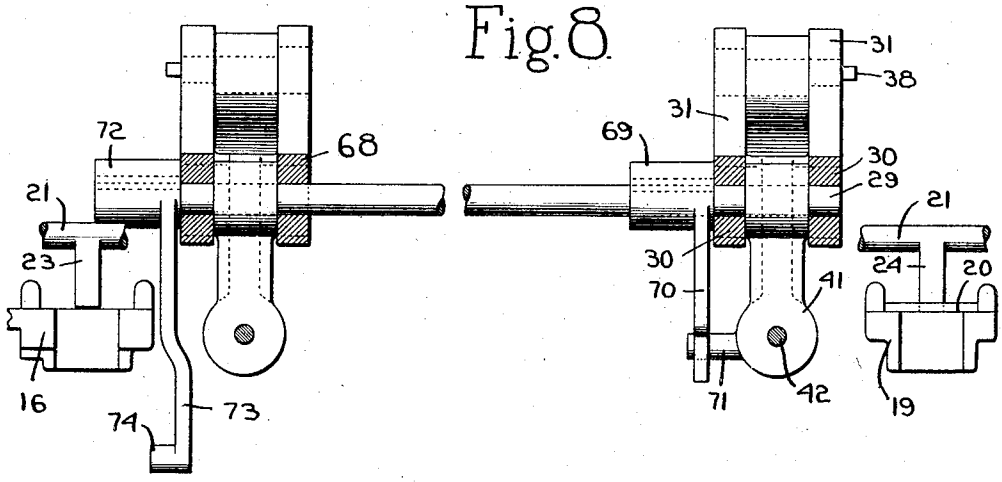


Fig. 9.

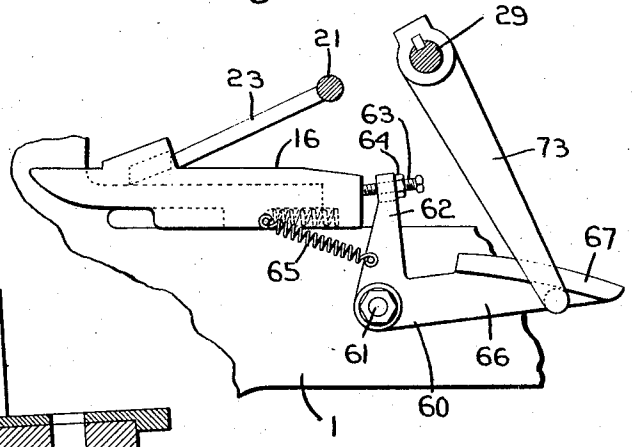
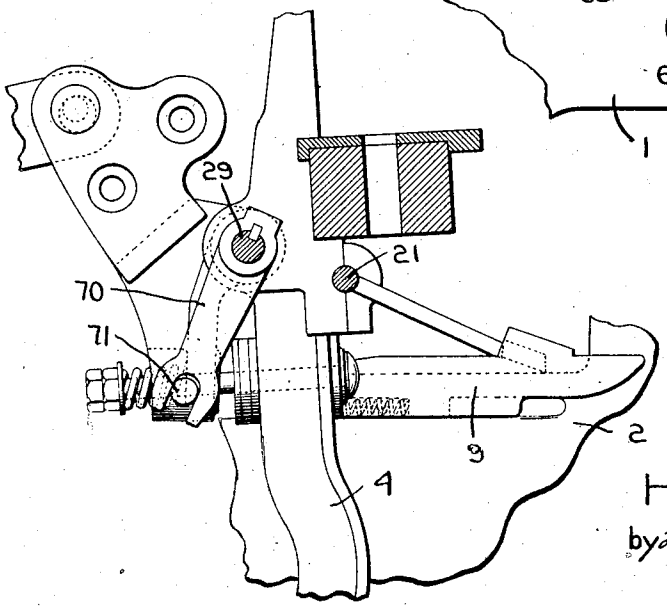


Fig. 10.



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LAY ACTUATING MECHANISM FOR LOOMS

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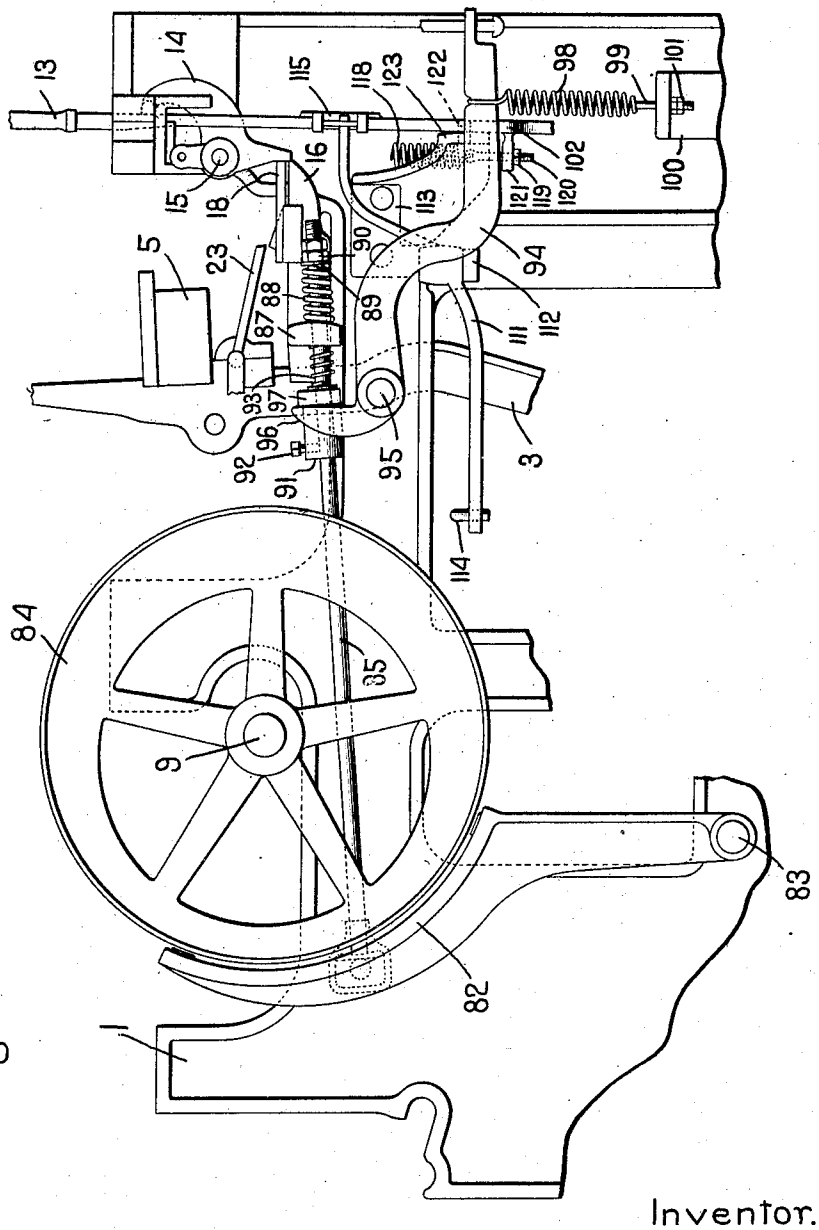


Fig. 11.

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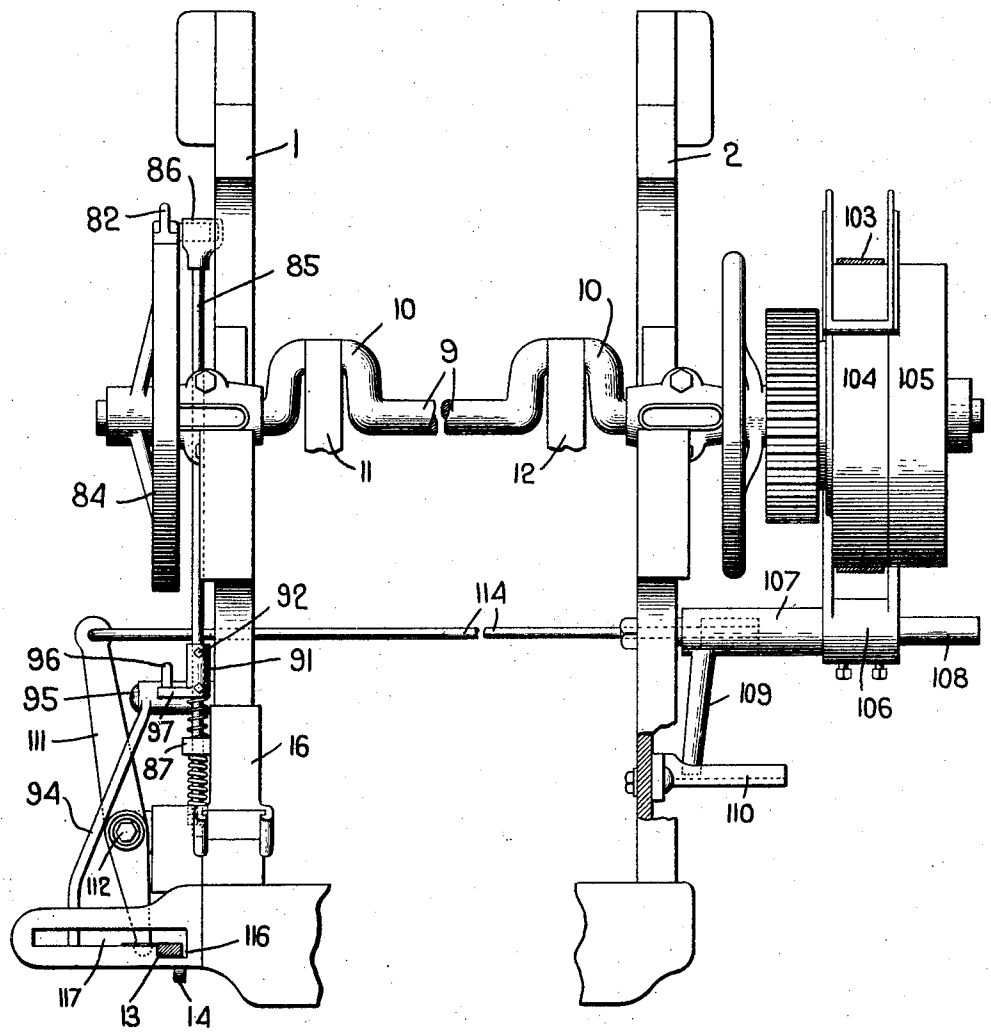
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LAY ACTUATING MECHANISM FOR LOOMS

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Fig. 12.



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UNITED STATES PATENT OFFICE.

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LAY-ACTUATING MECHANISM FOR LOOMS.

Application filed February 26, 1926. Serial No. 90,775.

This invention relates to the mechanism for actuating the lay of a loom and also involves the control of the usual protector mechanism.

In a loom the lay, the reed, the hand rail and associated parts which are of considerable weight are carried near the top of the lay swords which swing with a shaft at their lower ends. The lay swords and the parts supported thereby are swung forwardly and rearwardly by pitman connections extending to the crank shaft of the loom. A protector mechanism is provided which, in case the shuttle is not properly boxed at either end of a pick, acts both to bring the lay to a sudden stop and also to effect the immediate stopping of the loom itself. The operation of thus stopping the lay and the loom places a great strain upon the lay actuating mechanism and is complicated because of the length of the lay and the difficulty of insuring the action of the protector mechanism unless both ends of the lay are stopped simultaneously.

The timing of the lay movement with respect to the movements of the other elements of the loom is important to the proper weaving operation and varies according to particular desired conditions. It is desirable, for example, that the dwell of the lay in its movement be controlled as to its extent and the relative time of its occurrence to provide for the requisite shifting of the shed under the control of a dobby, a cam mechanism, or otherwise, to provide for the required picking movement of the shuttle, or to control the speed of the initial movement of the lay away from front center or from the fell.

The object of the present invention is to provide a simple and efficient mechanism for taking care of these things and particularly for providing an efficient cushioning connection between the lay and its actuating mechanism and also to provide an actuating mechanism which may be adjusted to vary the timing of the lay movement.

The object of the invention is further to provide a lay actuating mechanism in which the pitmen may be so connected at either of a plurality of points to the lay as to enable an accurate and wide variation in the movement of the lay to be effected.

The object of the invention is further to provide a lay actuating cushioning mechanism in connection with the usual protector mechanism so arranged that when protection is called for, the loom will be stopped even if the protector mechanism fails to operate at one side of the loom.

The object of the invention is further to provide means acting, when the lay is stopped by the protector mechanism, to cause the lay to move backward and thus prevent the lay being locked in the most forward position attained when it is stopped. Such a backward movement of the lay removes any dangerous strain upon the warps. The shuttle in being improperly boxed is wholly or partially within the shed when the lay is stopped and when the lay is locked in its forward stopping position, the shuttle not infrequently so strains the warps as to break or injure them. This danger is obviated by this feature of the invention.

The object of the invention is further to provide such a means acting to cause the lay to move backward when stopped by the protector mechanism in which the amount of backward movement may be controlled and adjusted, more particularly by adjusting the brake mechanism against which the lay acts upon such backward movement.

The object of the invention is further to provide a cushion connnection between the lay and its actuating mechanism in combination with the brake mechanism of the loom by means of which, when the protector mechanism acts, the lay, after stopping, will rebound to a controllable extent.

These and other objects and features of the invention will appear more fully in the accompanying description and drawings and will be particularly pointed out in the claims.

Since the present invention is concerned only with a portion of a loom and is quite independent of the particular construction or type of loom, and as its adaptability to various types of looms will be apparent to those skilled in the art, it is only necessary, in order to disclose the principles of the present invention and of a preferred form thereof, to illustrate a portion of an ordinary type of loom, together with a simple and preferred form of the present invention embodied therein.

In the drawings:

Fig. 1 is a left-hand side elevation partially in vertical cross section of the upper front

end of a loom and with the pitman and connections therefrom to the lay at the left-hand side omitted.

Fig. 2 is a detail similar to Fig. 1, but showing a modified form of construction.

Fig. 3 is a view partially in plan and partially in cross section on the line 3—3 of Fig. 1.

Fig. 4 is a side elevation and partially in vertical cross section of a detail to show the connection from the crank shaft of the loom.

Fig. 5 is a view in front elevation with the breast beam omitted of a portion of the construction shown in Fig. 1.

Fig. 6 is a view similar to Fig. 2 of another modified form of construction.

Fig. 7 is a view in rear elevation and partially in vertical cross section of the view shown in Fig. 6.

Fig. 8 is a front elevation partially in vertical cross section on the line 8—8 of Fig. 1.

Fig. 9 is a view looking from the inside toward the left hand side of the loom partially in cross section on the line 9—9 of Fig. 5.

Fig. 10 is a view looking from the inside toward the right hand side of the loom taken partially in vertical cross section on the line 10—10 of Fig. 5.

Fig. 11 is a side elevation of a portion of the loom with many of the parts removed to illustrate a suitable form of mechanism for stopping the loom.

Fig. 12 is a plan view of the loom partially broken away and with many of the parts removed illustrating the brake and means by which the loom is stopped.

A portion of the side frames 1 and 2 of an ordinary type of loom is shown. The two lay swords 3 and 4 which are mounted to swing in the usual manner carry the transversely extending lay 5 and hand rail 6. The portion of a shuttle box 7 is shown provided with the usual movable rear binder 8. The crank shaft 9 of the loom is provided with the usual cranks 10 on which are journalled the pitmen 11 and 12.

The mechanism illustrated is of a usual type. The shipper lever 13 has associated therewith a knock-off lever 14 fulcrumed at 15 on the loom frame. When this knock-off lever is rocked counterclockwise on its fulcrum, it knocks the shipper lever out of the slot in which it is held while the loom is running and thereby effects through clutch and brake mechanism, (hereinafter described), the immediate stoppage of the loom. The knock-off lever 14 is usually actuated from the knock-off frog 16 mounted to slide on the loom frame 1. This frog is held normally in its rearward position by a buffer or spring 17 and is provided with an arm 18 extended in line with the knock-off lever 14, so that when this frog is moved forwardly to the proper extent, it will operate the knock-off lever and effect the stopping of the loom. A similar frog herein termed the bunter frog 19 is mounted on the right hand side frame of the loom. These frogs are usually provided with "steels" 20 fitting in pockets in the frogs and which take the blow of the dagger mechanism.

The protector rod 21 is journalled in bearings 22 on the lay swords beneath the lay and extends entirely across the loom. This protector rod is provided at each end with the daggers 23 and 24 in line with the respective frogs 16 and 19 and is normally actuated by a spring 25 to depress the daggers into position to engage the frog steels as the lay beats up. Arms 26 extend upwardly from the protector rod 21 and are provided with adjustable set screw heads 27 engaging the rear binders 8 of the shuttle boxes. Consequently if a shuttle is boxed properly at either end of the pick, it forces the binder 8 rearwardly to such an extent as to rock the protector rod and raise the daggers so that they will not engage the frog steels as the lay beats up; while if the shuttle is not boxed properly at either end of the pick, the daggers will not be raised. Hence as the lay beats up, the daggers will catch against the frog steels. Consequently the lay is brought suddenly to a stop or "bangs off". The buffers or strings of the frogs permit a slight movement of the frogs forwardly thus to take up to some extent the shock of the sudden stoppage of the lay and the parts carried thereby and this movement is utilized, as already explained, to effect the movement of the knock-off lever 14 and the constant stopping of the entire loom, all in a well known and familiar manner.

When protection is called for, and the heavy mass of the lay swords, lay and other parts carried by the lay swords is brought to a sudden stop, it is impractical, if not imposible, to stop simultaneously and completely the rotation of the crank shaft. Consequently the rotation of the crank shaft continues to a slight degree, forcing the pitmen forward and thus placing a great strain upon the lay swords and not infrequently breaking the lay swords. Consequently cushioning devices have been provided to absorb, to some extent at least, the strain thus produced.

In the construction of this invention, there is provided between each pitman and the corresponding lay sword a movable device herein referred to as a "stand" or a "lever stand". In the preferred construction illustrated in Fig. 1 and similar figures, these lever stands are of a similar construction at each side of the loom. The lever stand 28 at the right hand side is fulcrumed

on a rod 29 mounted in the bearing ears 30 on the lay sword where the pitman is usually connected. This lever stand has its upper arm bifurcated to present the ears 31. The pitman 12 extends between these ears 31 and is connected thereto at either one of a plurality of points. Three such points are herein illustrated at 32, 33 and 34 and the connection is made by means of an eccentric pivot pin. This pivot pin is provided with concentric end sections 35 and 36 fitting aligned holes in the ears 31 and with a central eccentric section 37 fitting a bearing in the end of the pitman 12. A lug 38 on the pivot pin enables it to be rotarily adjusted by means of a wrench or similar device, while a set screw 39 extending through the ear engages one of the holes 40 in the periphery of the pin section 35 to lock it in adjusted position.

The lower arm 41 of the lever stand extends downwardly below the fulcrum shaft 29. A stud 42 extends through the lay sword and through an aperture in the lower end of this arm. This stud at the front is provided with a head 43 seated against a plate washer 44 resting on the face of the lay sword. Between the arm 41 and the rear of the lay sword, a cushioning device, shown as comprising metal washers 45 and an interposed washer 46 of leather or other suitable resilient material, is seated on the stud. The rear end of the stud is threaded and provided with the lock nuts 47 and the washer 48. A powerful helical metal spring 49 is seated on the stud between the washer 48 and the rear face of the arm 41. The construction is the same at the other side of the loom and needs no further description.

Under normal operating conditions, the springs 49 of lock nuts 47 are adjusted to maintain the lever stands with their lower arms forced by heavy pressure against the lay swords. Upon the beat-up the springs 49 have no material function and the operation is practically the same as if the pitmen were connected directly to the lay swords in the usual manner. When, however, protection is called for and the loom bangs off, the daggers engaging the frogs at the sides of the loom, the lay swords and lay are brought to a sudden stop and the pitmen under the momentum of the crank shaft and the train of mechanism connected therewith advance slightly, thus rocking the lever stands on the fulcrum rod 29 and compressing the springs 49. This, as already pointed out, absorbs much of the strain on the lay swords and prevents damage to the loom. The springs 49, immediately the lay is stopped, expand and thus swing the lay back, releasing the daggers from the frogs and withdrawing the improperly boxed shuttle from a position in the shed where it might injure the warps, as hereinafter described. When the springs finally close back after performing their functions, wear and jar is prevented by the cushioning devices comprising the washers 45 and 46.

The particular arrangement of the springs between the lever stands and the lay swords is not essential and a variation of this construction is illustrated in Fig. 2. In this case the stand 50 is fulcrumed on the rod 29 as before and has the pitman 12 connected thereto at 51. In this case the stand is formed with a socket 52 in its rear face and in this socket is seated and projects therefrom the powerful helical metal spring 53. The block 54 is secured at 55 to the lay sword opposite the stand and is provided with a stud entering the spring 53. The spring at its opposite end in the socket seats against a head 56 having a screw threaded shank 57 extending through the stand and provided with the polygonal head 58 and lock nut 59. Thus the tension of the spring is adjustable. The action of the spring is substantially the same as in the previous case.

The provision of a plurality of pivot pin holes in the lever stand, as shown at 32, 33 and 34 in Fig. 1, together with the rotary adjustment of the eccentric pivot pin by means of which the pitman is connected to either one of the holes affords a great flexibility of adjustment in the timing of the movement of the lay with respect to the other mechanisms of the loom, particularly, as already pointed out, in determining the position of the lay with respect to the shifting of the shed when controlled by a dobby, cam or otherwise, or with respect to the picking of the shuttle and also in controlling the speed of the initial movement of the lay away from front center.

It will be observed that the provision of the stands or lever stands of this invention enables the substitution of this cushioning mechanism between the pitmen and lay swords without alteration of existing looms because these stands may be fulcrumed at the same points where the pitmen have hitherto been connected. Furthermore, while the point at which the pitman is connected to the lever stand is now considerably above the point at which it is usually connected to the lay sword, there is no change in the moment of turning which tends to place strain upon the lay swords, because the force exerted from the crank shaft is still exerted on the lay sword at the same point as heretofore.

It will be observed that, with the protector mechanism usually employed and already described, while there are two frogs, one at each side of the loom, which act to check the movement of the lay, only one of these frogs, namely, that at the left-hand side, controls the stopping of the loom itself.

Consequently, if for any reason the dagger at one side of the loom should fail to engage its frog when protection is called for, the two ends of the lay would not be checked and would not stop simultaneously. While this of itself is not serious, although it places a considerable strain on the lay, it is a serious matter if it is the left-hand dagger which fails to operate because then the loom stopping mechanism would not be actuated and a very great strain would be placed upon the lay actuating mechanism.

An important feature of this invention, therefore, consists in the provision of means for stopping the loom in case, upon bang-off, the left-hand dagger fails to engage the knock-off frog. This result is secured by utilizing the twisting movement of the lay which takes place when the dagger fails to cooperate with its frog or, more specifically, by utilizing the relative movement between the lay and the lever stand adjacent the one dagger to effect the required protecting sliding movement of the other frog.

In the preferred form of construction provided for this purpose, a frog actuator in the form of a bell crank lever 60 is fulcrumed at 61 adjacent the knock-off frog and consequently upon the loom side 1, in the construction shown. The arm 62 of this bell crank lever is provided at its upper end with an adjustable set screw 63 threaded therethrough and held in place by a lock nut 64. This set screw forms an adjustable contact with the end of the knock-off frog 16. The bell crank lever is preferably held yieldingly in contact with the knock-off frog by a spring 65, connected at one end to the frog and at the other end to the arm 62 of the lever. The other arm 66 of the frog actuating lever extends rearwardly and is provided with a laterally extending flange 67.

The right-hand lever stand 28, as already noted, is fulcrumed on a rod 29. In the present case this rod is extended lengthwise of the lay and forms at its other end the fulcrum for the left-hand lever stand 68. This rod is employed as a shaft in the present case and carries adjacent the right-hand lever stand 28, rigidly secured to it by means of the hub 69, a depending arm 70. This arm is forked at its lower end and engages a stud 71 projecting laterally from the lever stand 28. At the other end this shaft 29 has rigidly secured thereto by means of the hub 72 a second depending arm 73 having at its end a laterally projecting stud 74 extending beneath the flange 67 on the frog actuating lever.

Assuming now that because of maladjustment, loss of the frog steel, or for other reasons, the dagger 23 which cooperates with the knock-off frog 16 fails to engage that frog when protection is called for or bang-off occurs. When protection is thus called for, the shaft 21 is positioned by the influence of its spring 25, due to failure of the binder 8 to press the arm 26 outwardly. As the lay moves forward the dagger 24 engages the bunter frog checking the movement of the lay at the right-hand end and bringing it to a stop with a compression of the frog buffer or spring 17. But the opposite end of the lay, or the knock-off end, under the momentum of the parts and the continued push from the drive shaft, moves forward slightly twisting the lay and drags with it to a slight extent the crank shaft. This forces the pitman at the left-hand side where the lay is locked a little forward. But this movement is taken up by the rocking of the lever stand 28 and the compression of the spring 49 to an abnormal extent. The relative movement which thus takes place between the lever stand and the lay at the locked side rocks the shaft 29 because the rocking of the lever stand carries with it the arm 70 on the shaft 29. But when this shaft is thus rocked, it also rocks the second arm 73 at the other side of the loom. The rocking of the arm 73 is in turn utilized to rock the frog actuating lever 60 and this movement is sufficient to slide the knock-off frog 16 to rock the knock-off lever 14 and stop the loom, just as it would have been stopped if the dagger 23 had functioned properly. In Figs. 1 and 3 more particularly the parts are shown with the dagger 24 engaging the frog steel 20 at the right-hand side of the loom and with the dagger 23 failing to engage the knock-off frog at the left-hand side, owing to the absence of the frog steel. It will be seen that the lay at the left-hand end has advanced more than at the right-hand end and that the right-hand lever stand 28 has been rocked to compress the spring 49 and is swinging the arm 70 to rock the shaft 29 and operate the frog actuating lever 60.

The lever stand or the stand which connects the pitman to the lay sword may, particularly so far as this last feature of the invention is concerned, take various forms, one of which has already been disclosed in Fig. 2. In the case of such a construction, the arm which actuates the shaft 29, and which is located at the bunter frog side of the loom, would extend upwardly. Such an arm 75 is shown in Fig. 2 extending upwardly alongside the stand 50 and with its bifurcated end engaging a stud 76 extending laterally from the stand. So far as this feature of the invention is concerned also, it is immaterial how many points of connection are provided between the pitman and the stand. In Fig. 2, but one such point is shown and in Figs. 6 and 7 another form of lever stand 77 is shown having a single point of pivotal connection with the pitman 12, and having at its lower end the laterally projecting stud 78 for cooperation with the arm 70.

A suitable cushioning device is provided between the stand 77 and the lay sword in the construction of Figs. 6 and 7 comprising the metal washers 79 and an interposed washer 80 of leather or other suitable resilient material and also between the stand 50 and the lay sword in the construction of Fig. 2 where a buffer 81 of leather or other suitable resilient material is shown.

There is thus presented a simple and preferred form of mechanism for securing the desired results, the principles of which are applicable to all forms of looms and in most cases without alteration of the existing loom structure, but only with the addition thereto of the required parts.

As has already been pointed out, when the protector mechanism acts, the lay is stopped by the engagement of the daggers with the frogs and at the same time the loom itself is stopped. Any suitable mechanism may be used for this purpose, but in order to embody certain features of the present invention, that portion of the mechanism which effects the braking action must be adjustable to vary the braking action. A suitable form of mechanism for this purpose is illustrated in Figs. 11 and 12.

A brake shoe 82 pivoted at 83 on the loom frame cooperates with a brake wheel 84 secured to the left-hand end of the crank shaft 9. A rod 84 has a pivotal connection at 86 with the brake shoe and extends forwardly through a lug 87 projecting laterally from the knock-off frog 16. A powerful helical spring 88 is mounted on the rod 85 between the lug 87 and a washer 89 and the force exerted by this spring is adjusted by means of a pair of lock nuts 90 threaded on the rod 85 and abutting the washer 89. A collar 91 is adjustably secured to the rod 85 by the set screws 92 at the rear of the lug 87 and a light helical spring 93 is mounted on the rod 85 between this collar and the lug 87. A lever 95 fulcrumed on the stud 61 held in place by a head 95 has an upwardly extending shorter arm 96 engaging a lug 97 projecting laterally from the collar 91. The longer arm of this lever extends forwardly and is engaged by a spring 98. This spring at its lower end has a stem 99 passing through a bracket 100 secured to the loom frame. A pair of lock nuts 101 on the threaded lower end of the stem enables the tension of the spring 98 and consequently the pressure produced by the lever 94 on the lug 97 to be adjusted.

The shipper lever 13, as usual, is provided with a lateral projection 102 which normally extends beneath the longer arm of the lever 94 and holds the spring 98 under tension with the lever in such position that the light spring 93 holds the brake shoe 82 away from the brake wheel.

The loom, of course, may be driven from any suitable source of power and the mechanism includes means for connecting and disconnecting the power of the loom. In the construction illustrated, the power is supplied through a belt 103 running over a pulley 104 fast on the right-hand end of the crank shaft 9. A loose pulley 105 is mounted on the same shaft. A belt shifter is illustrated in the form of a yoke 106 engaging the belt 103 and secured to a sleeve 107 slidable longitudinally on a stud 108 projecting laterally from the side frame 2 of the loom. A lug 109 projecting forwardly from the sleeve 107 is guided in a longitudinally curved bracket 110 secured to the side frame 2. A lever 111 is fulcrumed on a vertical stud 112 secured on a bracket 113 secured to the side frame 1. This lever at its rear end is connected by a rod 114 to the sleeve 107 of the belt shipper and at its forward end engages at 115 the shipper lever 13.

The shipper lever normally stands in the recess 116 of the slot 117. A spring 118 connected, as usual, and not here shown, at its upper end to the loom frame is adjustably secured, by means of the nut 119 on the threaded stem 120 to a projection 121 extending rearwardly and toward the loom frame from the shipper lever at a point below the pivotal connection 122 of the shipper lever to a flange 123 of the bracket 113. When, therefore, the knock-off lever 14 is actuated, the shipper lever is swung by the spring 118 to rock the lever 111 and withdraw the projection 102 from beneath the lever 94.

It will thus be seen that when the protector mechanism acts and bang-off occurs, the dagger 23, engaging the knock-off frog 16, moves the knock-off frog forwardly. The brake shoe 82 is immediately thrown against the brake wheel with a yielding pressure determined by the force to which the spring 88 is adjusted. Simultaneously the knock-off lever 14 is actuated and the upper end of the shipper lever 13 swings to the left unclutching or disconnecting the power, in this case by means of the connections extending to the belt shipper 106 and simultaneously the projection 102 is withdrawn from beneath the lever 94 and the full force of the spring 98, as determined by the adjustment of the nuts 101, is added to the pressure of the brake shoe 82 on the brake wheel 84.

The springs between the pitmen, as, for example, the springs 49 of the construction shown in Fig. 1, are now compressed and the lever stands swing away from the lay, thus storing up power in these springs. This stored up power at once reacts and the lever stands fulcrum on their connections with the pitmen and not only force the lay back until the lever stands close up against

the lay, but also force the pitmen back and reverse the rotation of the crank shaft against the action of the brake. This kick-back of the lay under the reaction of the pitman springs and the slight reverse rotation of the crank shaft is of great importance because it at once relieves the warps from any strain. The protector mechanism acts, it will be remembered, because the shuttle is improperly boxed and therefore is wholly or partially within the shed. When the lay is stopped, the shuttle is carried well up into the shed toward the fell and places an undue strain upon the warps and if the lay were locked in forward position reached by it when stopped, the shuttle would frequently strain, injure or break the warps. With the present invention the rebound or kick-back of the lay, due to the reaction of the springs and the lever stand connections with the pitmen, carries it back to a position where the warps are relieved of all strain. The extent to which the lay is thus thrown back is under control because of the means provided for varying the pressure of the brake shoe 82 on the brake wheel by the adjustment of the force imparted by the springs 88 and 98. The spring 88 is so set and adjusted that when the parts stand in their normal position, as shown in Fig. 11, substantially no pressure is exerted by the spring on the lug 87. If both daggers act on their respective frogs a very substantial backward movement of the lay under the control of the adjustments provided is readily secured. If only the right-hand dagger acts on its frog, the left-hand side of the lay moves back a further distance than the right hand side, which moves back about as usual, for the reasons already explained, and in both cases the required backward movement of the lay to protect the shed is readily and adjustably secured.

Having thus described the invention, what is claimed as new, and desired to be secured by Letters Patent, is:

1. A loom comprising a lay, a crank shaft, pitmen journalled on the cranks of the crank shaft and each provided with a pivot pin bearing, lever stands pivoted on the lay and each provided with a plurality of pivot pin holes, a spring between each lever stand and the lay yieldable only upon the occurrence of an abnormal strain to permit relative movement of the lever stand and lay, a pivot pin for each pitman having its section fitting the pitman pivot pin bearing eccentric to its section fitting the lever stand pivot pin hole, and means for locking each pivot pin in rotary adjusted position whereby the timing and movement of the lay is accurately and widely varied by the selection of the lever stand pivot pin hole and by the rotary position of the pivot pin when assembled and adjusted.

2. A loom comprising a frame, a lay, a protecting sliding frog at one side and a bunter sliding frog at the opposite side of the loom frame, a dagger mounted on the lay at each end to cooperate with the corresponding frog, means for retaining the daggers out of position to cooperate with the frogs when the shuttle is properly boxed and for permitting such cooperation at other times, and means acting, when protection is called for and the dagger cooperates with the bunter frog and the other dagger fails to cooperate with the knock off frog, to effect the required protecting sliding movement of the knock off frog.

3. A loom comprising a frame, a lay, a sliding bunter frog at one side of the loom frame, a knock-off sliding frog at the other side of the loom frame, a dagger mounted on the lay at each end to cooperate with the corresponding frog, means for retaining the daggers out of position to cooperate with the frogs when the shuttle is properly boxed and for permitting such cooperation at other times, a frog actuator mounted on the frame adjacent the knock-off frog, and means to move the frog actuator to move the knock-off frog actuated by the twisting of the lay when protection is called for and the dagger at the knock-off side fails to engage the knock-off frog, while the dagger at the opposite side engages the bunter frog.

4. A loom comprising a lay, a crank shaft, pitmen journalled on the cranks of the crank shaft, lever stands pivoted on the lay, pivotal connections between the respective pitmen and lever stands, a spring between each lever stand and the lay yieldable only upon the occurrence of an abnormal strain to permit relative movement of the lever stand and lay, a sliding bunter frog at one side of the loom frame, a knock-off sliding frog at the other side of the loom frame, a dagger mounted on the lay at each end to cooperate with the corresponding frog, means for retaining the daggers out of position to cooperate with the frogs when the shuttle is properly boxed and for permitting such cooperation at other times, a frog actuator mounted on the frame adjacent the knock-off frog, a shaft journalled on and lengthwise of the lay, an arm on the shaft connected to the lever stand adjacent the bunter frog, and a second arm on the shaft engaging the said frog actuator whereby, when the said lever stand connected to the shaft is rocked on its pivot owing to the dagger engaging the bunter frog, while the other dagger fails to engage the knock-off frog, the shaft will be rocked to move the frog actuator and thereby to effect the knock-off movement of the frog.

5. A loom comprising a frame, a lay, a sliding bunter frog at one side of the loom frame, a knock-off sliding frog at the other side of the loom frame, a dagger mounted on the lay at each end to cooperate with the corresponding frog, means for retaining the daggers out of position to cooperate with the frogs when the shuttle is properly boxed and for permitting such cooperation at other times, a frog actuating lever fulcrumed on the frame adjacent the knock-off frog, a contact device adjustably mounted in the one and engaging the other of said latter elements, and means to rock the frog actuating lever to move the knock-off frog actuated by the twisting of the lay when protection is called for and the dagger at the knock-off side fails to engage the knock-off frog, while the dagger at the opposite side engages the bunter frog.

6. A loom having the construction defined in claim 5, together with a spring acting normally to maintain contact between the knock-off frog and its actuating lever.

7. A loom comprising a lay, a crank shaft, pitmen journalled on the cranks of the crank shaft and each provided with a pivot pin bearing, stands secured to the lay and each provided with a plurality of pivot pin holes, a pivot pin for each pitman having its section fitting the pitman pivot pin bearing eccentric to its section fitting the stand pivot pin hole, and means for locking each pivot pin in rotary adjusted position whereby the timing and movement of the lay is accurately and widely varied by the selection of the stand pivot pin hole and by the rotary position of the pivot pin when assembled and adjusted.

8. A loom comprising a lay, a crank shaft, pitmen journalled on the cranks of the crank shaft and each provided with a pivot pin bearing, lever stands pivoted on the lay and each provided with a pivot pin hole, a spring between each lever stand and the lay yieldable only upon the occurrence of an abnormal strain to permit relative movement of the lever stand and lay, a pivot pin for each pitman having its section fitting the pitman pivot pin bearing eccentric to its section fitting the lever stand pivot pin hole, and means for locking such pivot pin in rotary adjusted position.

9. A loom comprising a lay, a crank shaft, pitmen journalled on the cranks of the crank shaft, lever stands pivoted on the lay, pivotal connections between the respective pitmen and lever stands, a spring between each lever stand and the lay yieldable only upon the occurrence of an abnormal strain to permit relative movement of the lever stand and lay, a protecting sliding frog at one side and a bunter sliding frog at the other side of the loom frame, a dagger mounted on the lay at each end to cooperate with the corresponding frog, means for retaining the daggers out of position to cooperate with the frogs when the shuttle is properly boxed and for permitting such cooperation at other times, and means acting, when protection is called for and one dagger cooperates with the bunter frog and the second dagger fails to cooperate with the protecting frog and actuated by the relative movement between the lay and the lever stand adjacent the first dagger to effect the required protecting sliding movement of the protecting frog.

10. A loom comprising the construction defined in claim 4, in which the frog actuator is in the form of a bell crank lever fulcrumed on the frame and in which an adjustable means is mounted in the arm of said lever to contact with the knock-off frog.

11. A loom comprising a lay, a crank shaft, stands pivoted on the lay, pitmen journalled on the cranks of the crank shaft and pivotally connected to the respective stands, a spring between each stand and the lay yieldable only upon the occurrence of an abnormal strain to permit relative movement of the stand and lay, a sliding frog on the loom frame, a dagger mounted on the lay and movable into position to move the frog, a brake mechanism for checking the rotation of the crank shaft operated upon the forward sliding movement of the frog, and means for simultaneously disconnecting the power from the crank shaft whereby, when the forward movement of the lay is stopped by the frog, the said springs first act to permit forward movement of the pitmen relatively to the lay and then re-act forcing the lay backward and also forcing the pitmen backward and thus rotating the crank shaft in a reverse direction against the action of the brake mechanism.

12. A loom comprising the construction defined in claim 11, together with means for adjusting the force with which the brake mechanism acts whereby the extent of backward movement of the lay and reverse rotation of the crank shaft is controlled by said adjusting means.

13. A loom comprising a lay, a crank shaft, connections between the crank shaft and lay including springs yieldable only upon the occurrence of an abnormal resistance to the movement of the lay, a sliding frog on the loom frame, a dagger mounted on the lay and movable into position to move the frog, a brake mechanism for checking the rotation of the crank shaft operated upon the sliding forward movement of the frog, and means for simultaneously disconnecting the power from the crank shaft whereby, when the forward movement of the lay is stopped by the frog, the said springs first act to permit forward rotation of the crank shaft and then re-act forcing the lay backward and rotating

the crank shaft in a reverse direction against the action of the brake mechanism.

14. A loom comprising the construction defined in claim 13, together with means for adjusting the force with which the brake mechanism acts whereby the extent of backward movement of the lay and reverse rotation of the crank shaft is controlled by said adjusting means.

15. A loom comprising a lay, a crank shaft, connections between the crank shaft and lay including springs yieldable only upon the occurrence of an abnormal resistance to the movement of the lay, a sliding frog on the loom frame, a dagger mounted on the lay and movable into position to move the frog, a brake mechanism including a brake shoe and a yielding connection from the brake shoe to the frog for checking the rotation of the crank shaft operated upon the sliding forward movement of the frog and means for simultaneously disconnecting the power from the crank shaft whereby, when the forward movement of the lay is stopped by the frog, the said springs first act to permit forward rotation of the crank shaft and then react forcing the lay backward and rotating the crank shaft in a reverse direction against the action of the brake mechanism.

16. A loom comprising the construction defined in claim 15, together with means for adjusting the force of the yielding connection between the brake shoe and frog, thereby to assist in controlling the extent of backward movement of the lay and reverse rotation of the crank shaft.

In testimony whereof, I have signed my name to this specification.

HARRY A. DAVIS.