No. 615,475. Patented Dec. 6, 1898.

C. CARLSON.

STEAM FEED DEVICE FOR LOG CARRIAGES.

(Application filed Apr. 11, 1898.)

(No Model.) 4 Sheets—Sheet 1.

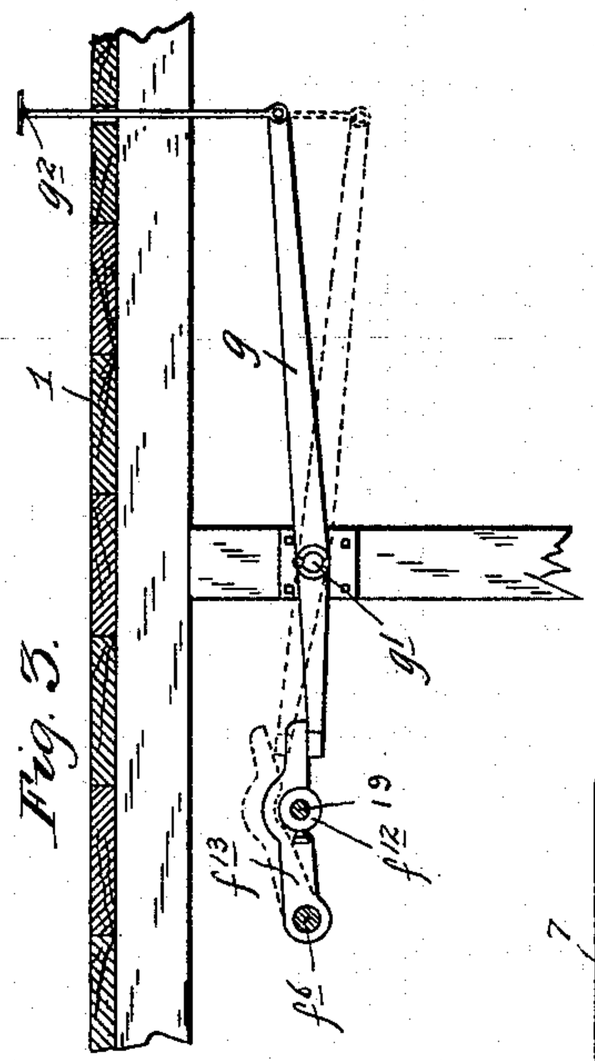

Fig. 3.

Fig. 1.

Fig. 2.

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Fig. 4.

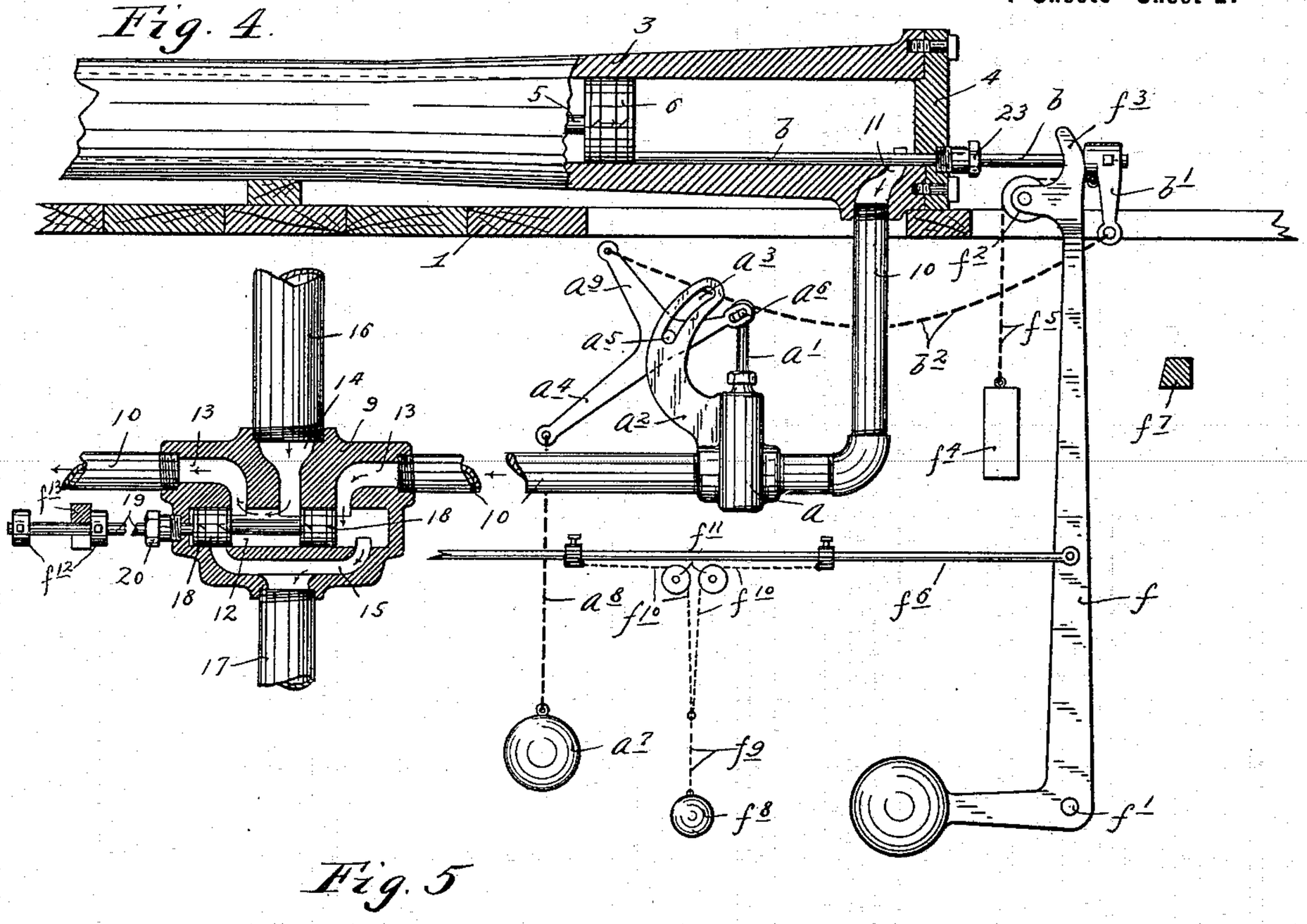

Fig. 5

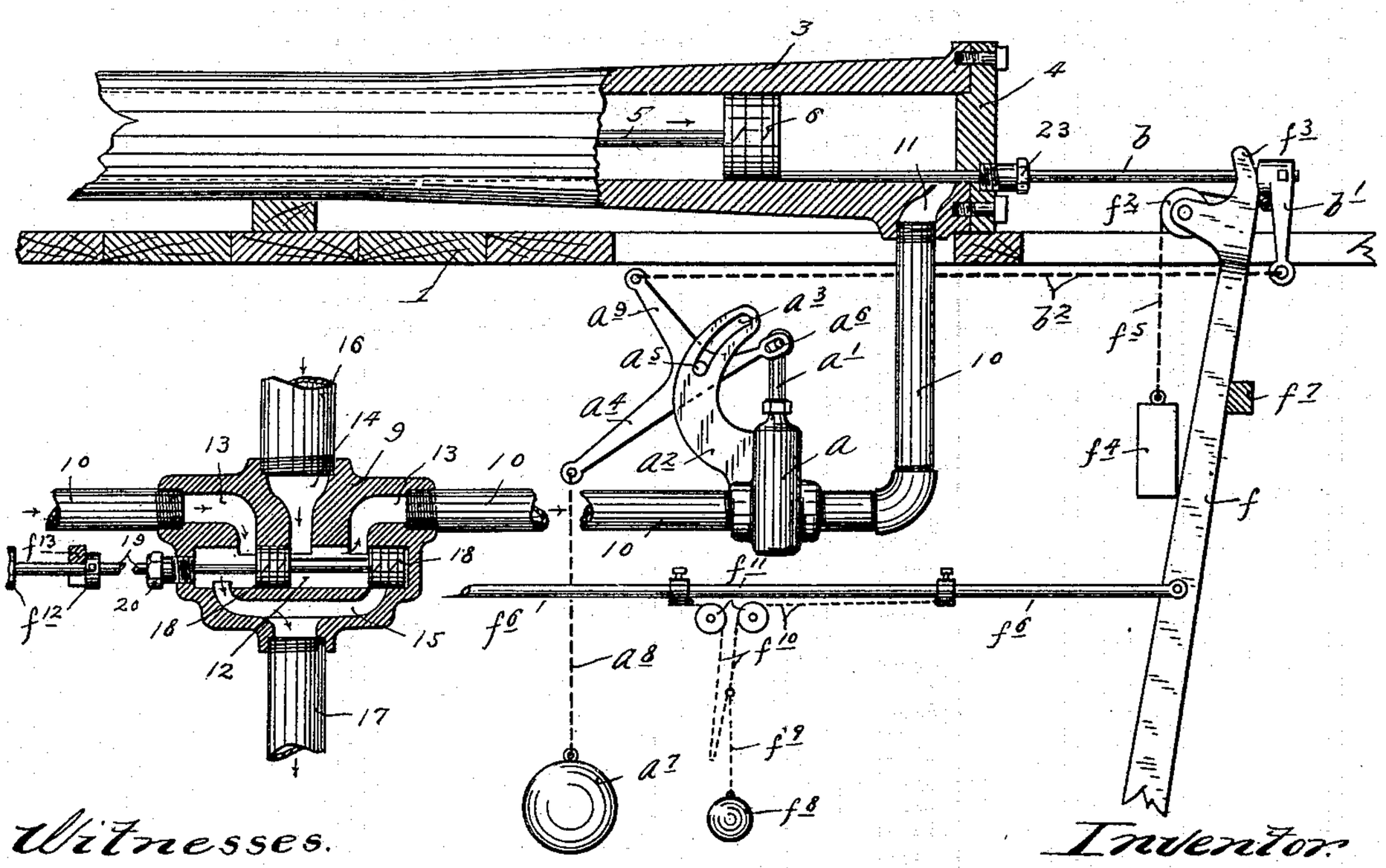

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Fig. 6.

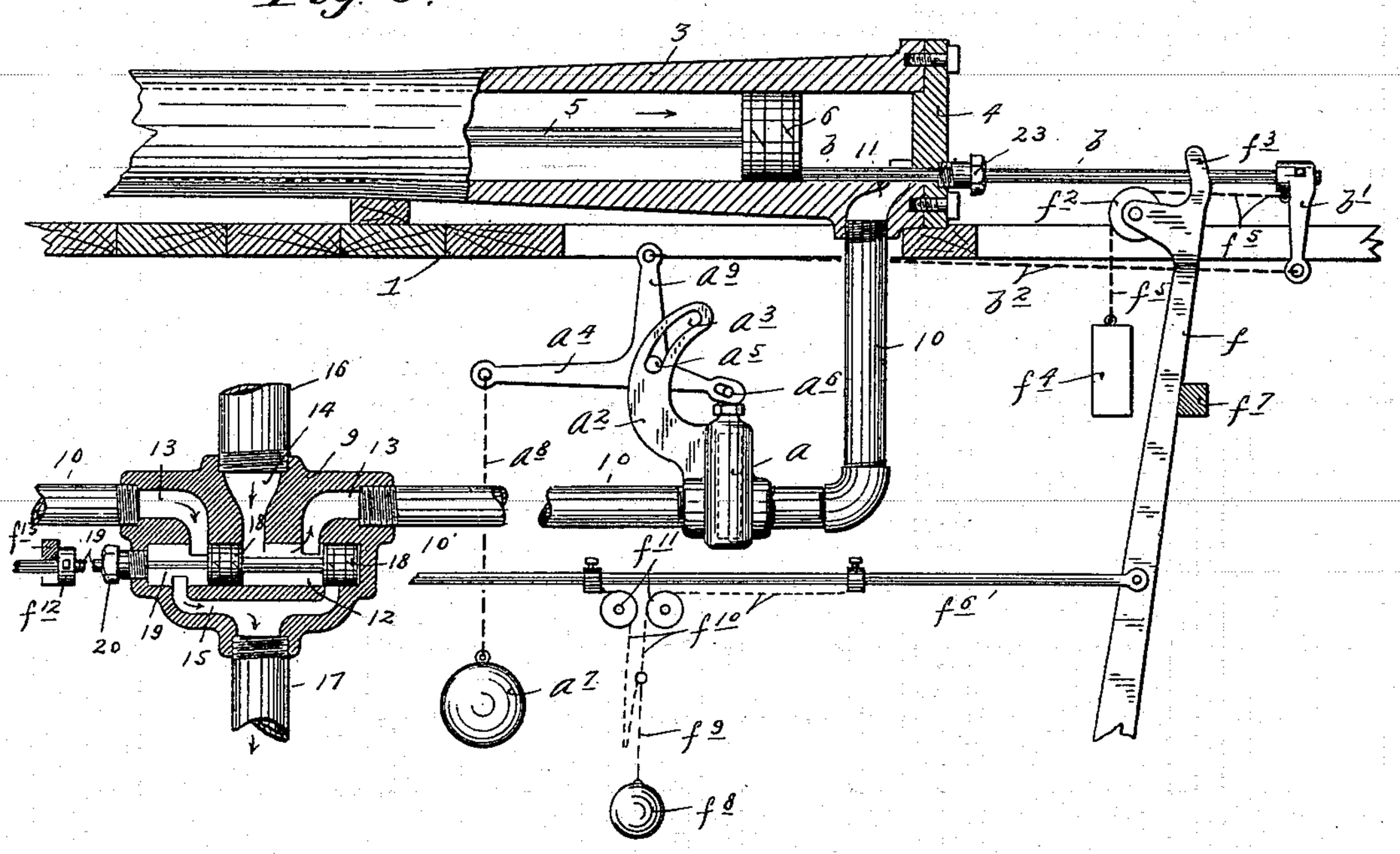


Fig. 7.

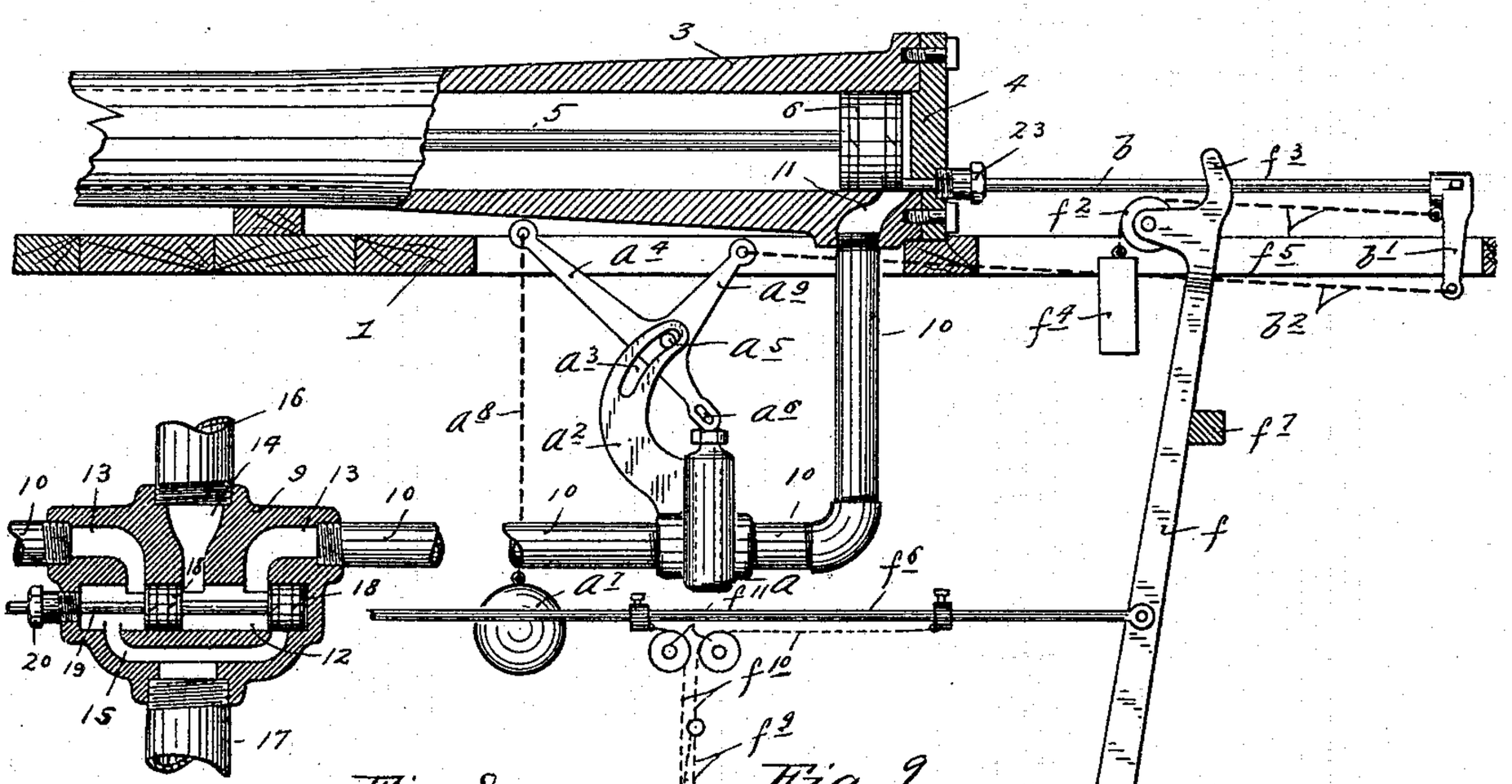


Fig. 8

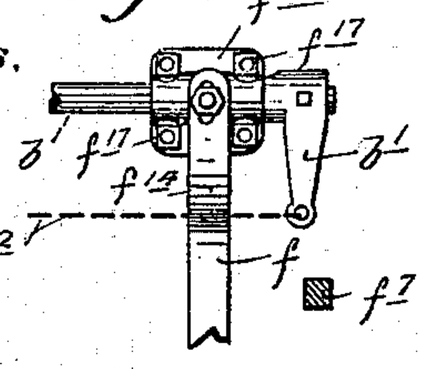
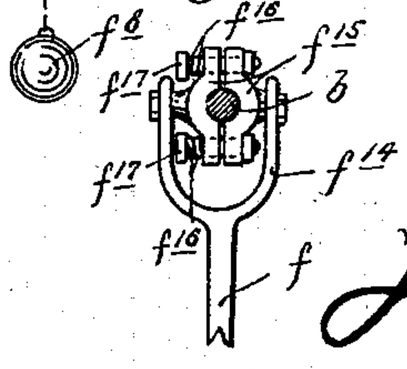


Fig. 9



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(No Model.) 4 Sheets—Sheet 4.

Fig. 10

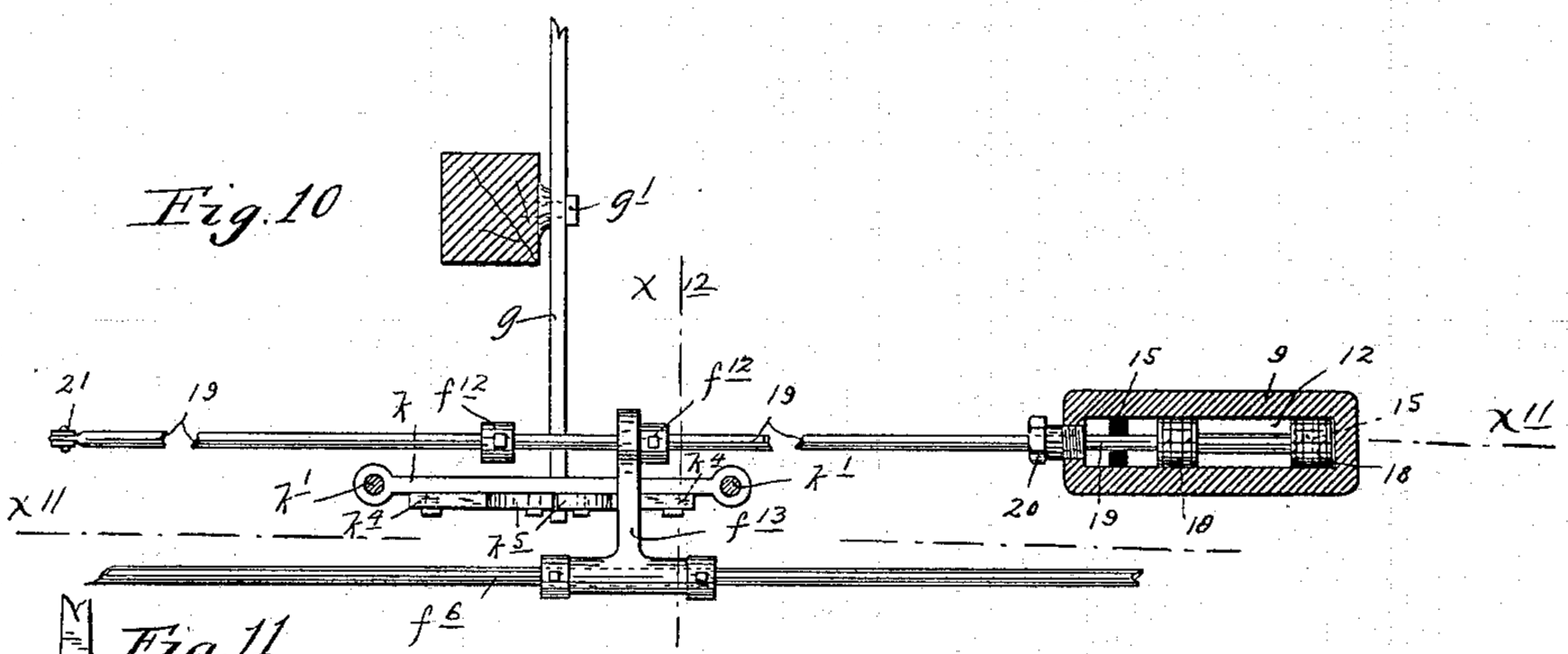


Fig. 11

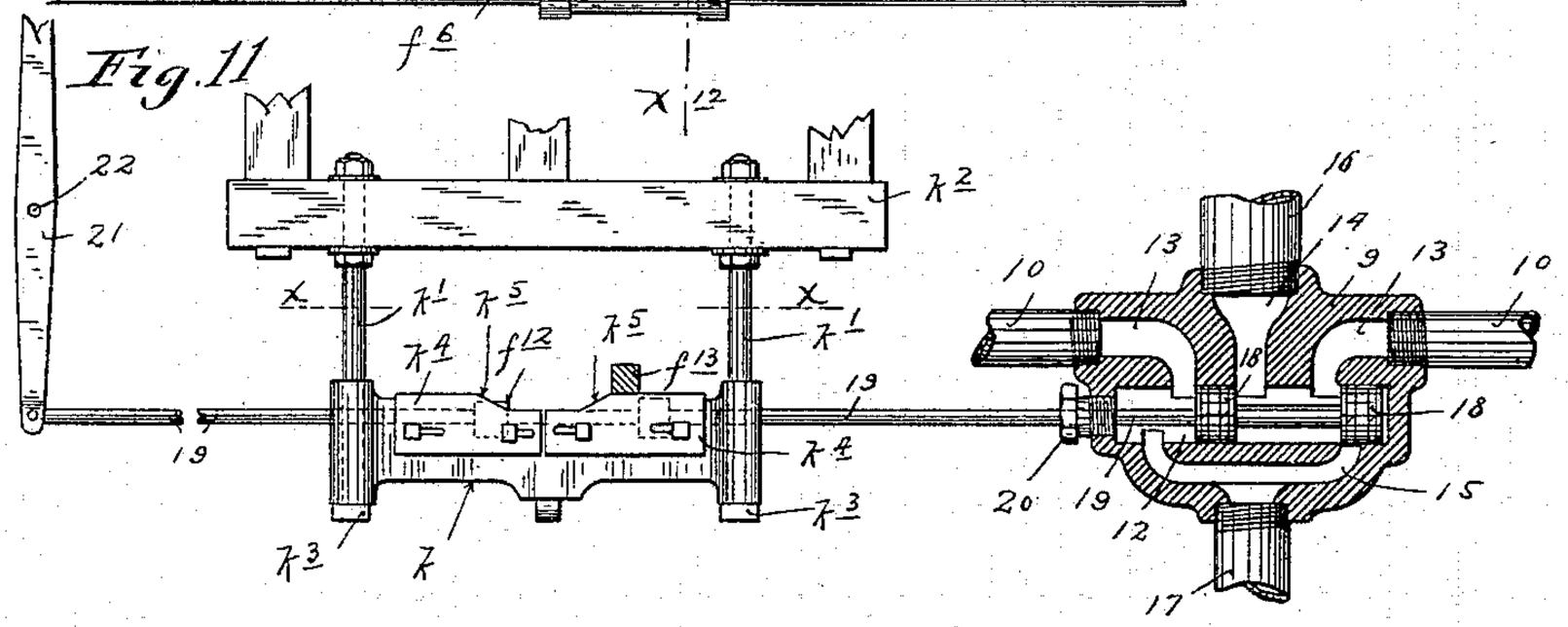
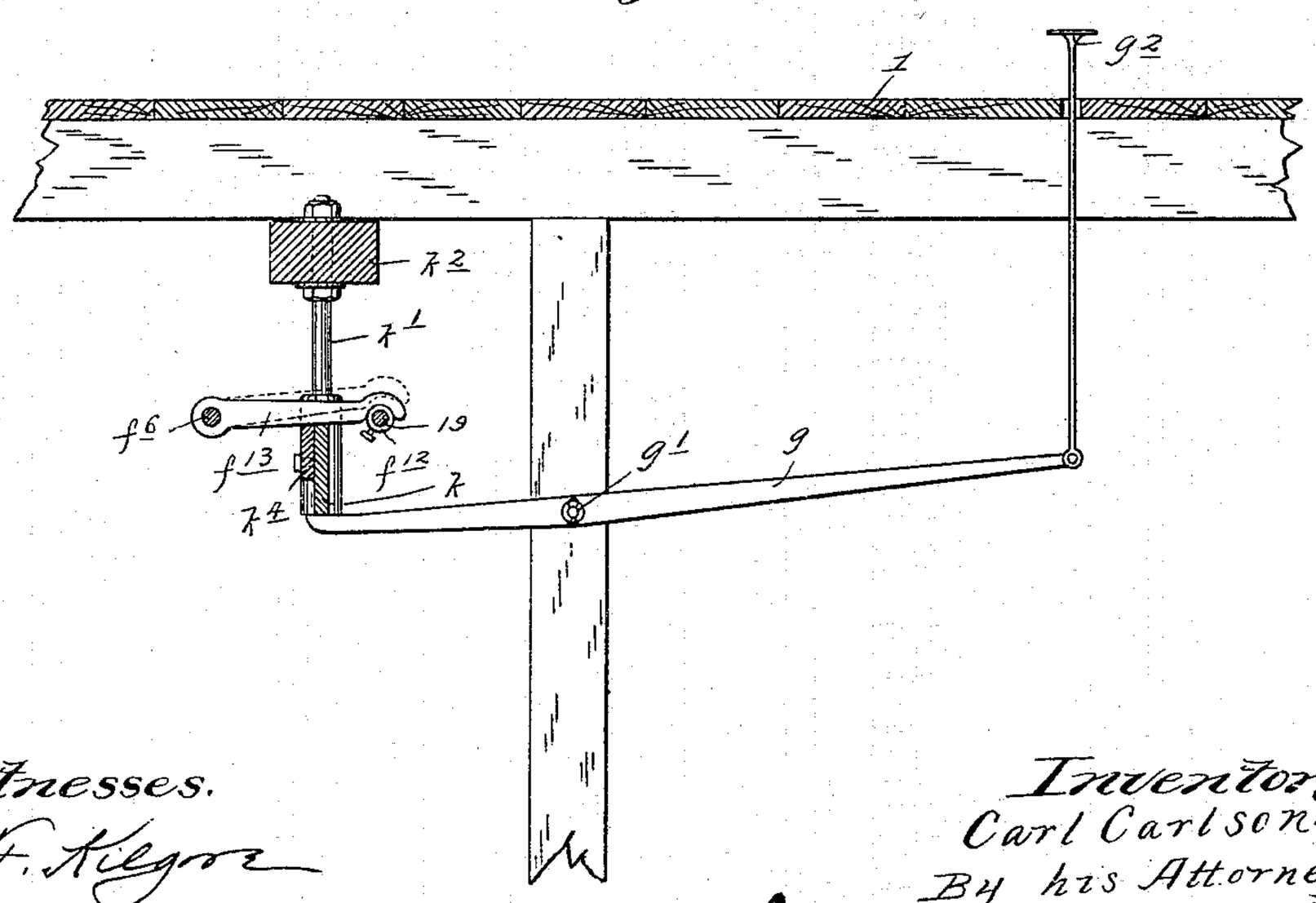


Fig. 12



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Inventor:
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UNITED STATES PATENT OFFICE.

CARL CARLSON, OF MINNEAPOLIS, MINNESOTA, ASSIGNOR OF TWO-THIRDS TO CHARLES J. HEDWALL AND CORNELIUS B. SHOVE, OF SAME PLACE.

STEAM-FEED DEVICE FOR LOG-CARRIAGES.

SPECIFICATION forming part of Letters Patent No. 615,475, dated December 6, 1898.

Application filed April 11, 1898. Serial No. 677,117. (No model.)

To all whom it may concern:

Be it known that I, CARL CARLSON, a citizen of the United States, residing at Minneapolis, in the county of Hennepin and State of Minnesota, have invented certain new and useful Improvements in Safety Steam-Feed Devices for Log-Carriages; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to steam-feed devices for sawmill log-carriages, and has for its object to provide a simple and efficient device for automatically limiting the extreme movements of the carriage and piston of the motor which drives the same, thereby preventing the carriage from running away and the piston from being run against the cylinder-heads.

To the ends above indicated my invention consists of the novel devices and combinations of devices hereinafter described, and defined in the claims.

The invention is illustrated in the accompanying drawings, wherein like characters indicate like parts throughout the several views.

Figure 1 is a view, partly in side elevation and partly in longitudinal vertical section, showing a log-carriage and its coöperating "steam-feed" or feed-motor with my improved safety appliance or valve-reversing device applied thereto. Fig. 2 is a horizontal section taken approximately on the line $x^2 x^2$ of Fig. 1. Fig. 3 is a transverse vertical section taken through a portion of the mechanism on the line $x^3 x^3$ of Fig. 2. Figs. 4, 5, 6, and 7 are detail views, partly in side elevation and partly in longitudinal vertical section, some parts being broken away, showing portions of the motor and my attachment or safety device, but illustrating different positions which the parts take. Figs. 8 and 9 are detail views, respectively in side and end elevation, illustrating a modified connection between the trip-lever and the trip-rod. Fig. 10 is a horizontal section corresponding to Fig. 2, but illustrating a slightly-modified construction. Fig. 11 is a longitudinal vertical section taken approximately on the irregular line $x^{11} x^{11}$ of Fig. 10, and Fig. 12 is a transverse vertical section taken approximately on line $x^{12} x^{12}$ of Fig. 10.

1 indicates the floor or platform of a sawmill.

2, 3, and 4 indicate the sectioned cylinder, and 5 6 indicate the piston of the long feed-motor or carriage-feed device. This cylinder is, as is usual, rigidly secured to the floor or platform 1.

7 indicates the log-carriage, which runs over a suitable track in the ordinary manner and is connected to the outer end of the piston-rod 5 by means of a depending bracket 8. The opposite ends of the cylinder are connected to a valve-casting 9 through pipes 10 and terminal ports 11. This valve casting or seat 9 is provided with a cylindrical valve-seat 12, into the upper portions of which ports 13 and 14 open and in the lower portion of which the opposite extremities of a discharge or exhaust passage 15 likewise open. The ports 13 constitute extensions of the pipe-sections 10. A live-steam-supply pipe 16 opens into the port 14, and an exhaust-pipe 17 opens from the central portion of the exhaust-passage 15. A double-headed cylindrical slide-valve 18 is mounted in the seat 12, with its stem 19 working through a stuffing-box 20. This valve-stem 19 is extended to a considerable distance, and its free end is connected to the lower end of a hand-lever 21, mounted on a fixed pivot 22 and operated in the ordinary manner to shift said valve 18 and through the coöperating ports in the valve seat or casting 9 to alternately open the opposite ends of the cylinder to live steam and to exhaust.

Each pipe-section 10 is provided with a valve seat or casting a, through the passage of which the steam or other motive fluid passes. The passages through the valve-castings a are normally open, but are adapted to be closed by sliding gate or cut-off valves a'.

a^2 indicates bracket projections from the valve-castings a, provided in their upper ends with segmental slots a^3.

a^4 indicates short levers provided with pins a^5, that work as fulcrums in the coöperating slots a^3. The outer ends of these levers a^4 are connected to the stems of the coöperat-

ing valves a' by slot-and-pin joints a^6, and weights a^7 are connected to the inner and lower ends of said levers, as shown, by means of flexible connections or chains a^8. The weights a^7, acting through said levers a^4, normally hold said valves a' in opened positions. The levers a^4 are provided with bell-crank extensions a^9 for a purpose which will presently appear.

Working through each cylinder-head 4, as shown, through stuffing-boxes 23 is a sliding trip-rod or plunger b, which is provided at its outer end with a depending bracket b', the lower end of which is connected to the cooperating extension a^9 of the lever a^4, which is located at that end of the machine by means of the chain or flexible connection b^2. In the normal position of the rod b the connection b^2 has considerable slack, as shown in Fig. 4.

Coöperating with each trip-rod b is a long trip-lever f, pivoted at f'. At its upper free end the levers f are provided with sheaves f^2 and with fingers or portions f^3, that normally engage the hubs of the coöperating brackets b' under the yielding tension of a weight f^4 on the lower end of a chain or flexible connection f^5, which runs over the sheave f^2 and is attached to said bracket b'. The two levers f are connected by a long rod f^6, and the outward movements of the same are limited by fixed stops f^7. The levers f and parts movable therewith are yieldingly held in normal positions, as shown, from the tension of a weight f^8, secured to the lower end of a chain or flexible connection f^9, having branches f^{10}, that run over guide-sheaves f^{11} and are attached to the rod f^6.

The valve stem or rod 19 of the reversing-valve 18 is provided with a pair of stop-collars f^{12}, that are spaced apart some little distance. The rod f^6 is provided with a pivoted trip-arm f^{13}, the intermediate portion of which normally works between and acts upon the stops f^{12} and the free end of which projects beyond said stops. g indicates a releasing-lever which is pivoted at g' to the frame or floor structure. One end of this lever g is connected to the depending stem of a foot-piece g^2, which projects above the floor, and the other end of said lever is provided with a laterally-extended portion g^3, which underlies the free end of the trip-arm f^{13} in all of its possible positions.

Operation: The operation of the mechanism above described is as follows: When the foot-piece g^2 is stepped upon, the trip-arm f^{13} will be thrown into an inoperative position, and in this case the reversing-valve 18 may be moved by means of the hand-lever 21 and the feed-motor controlled at will and in the ordinary manner. However, when the said foot-piece is left in its normal position the trip-arm f^{13} will coöperate with the stop-collars f^{12} on the valve-stem 19 and the operation of the valve 18 will be controlled automatically. For example, suppose the piston 5 6 and the carriage 7 to be moving toward the right or as indicated by arrows marked on Fig. 1. When the said piston has reached a point, say, within three feet of the cylinder-head, it will come into engagement with the inner end of the trip-rod b and will thereafter carry the same with it toward the right or toward the right-hand cylinder-head 4. Approximately the first foot of movement of the trip-rod b toward the right will move the trip-levers f, trip-rod f^6, and trip-arm f^{13}, and the final portion of this first foot of movement of said trip-rod b will bring the trip-arm f^{13} into engagement with the right-hand collar f^{12} on the valve-stem 19, and thus force the reversing-valve 18 from its previous position (shown in Fig. 4) into the position shown in Fig. 5. By tracing the passages through the valve-casting 9 and connections it will now be seen that the live steam or other motive fluid will be directed into the right-hand end of the cylinder and will act in opposition to the movement of the piston and log-carriage and at the same time will cut off the live steam from the left-hand end of the cylinder, so that the propelling force of the fluid will for the time being be interrupted or stopped. At the limit of this first foot of movement of the trip-rod b the right-hand trip-lever f will be thrown into engagement with a fixed stop f^7 and its movement will be stopped thereby. The position of the parts at the limit of this first foot of movement is illustrated in Fig. 5, by reference to which it will be noted that the flexible connection b^2 has now been pulled taut. Approximately the next foot of movement of the piston and trip-rod will act upon the gate or cut-off valve a' through the connection b^2 and lever a^4 a^9 and will close the said valve, so that the steam or motive fluid will be positively confined in the right-hand end of the cylinder, and will thus be caused to act as a cushion to stop the movement of the piston and log-carriage. This action or feature of cutting off or closing the passage to and from the cylinder is very important, for while the boiler-pressure of the steam will be sufficient to materially lessen the speed of the piston and carriage it will in many cases be insufficient to completely stop their movements, and under the compressing action of the piston the steam or fluid in the end of the cylinder will soon be compressed to a higher pressure than the boiler-pressure and would then be forced out of the cylinder were it not for this cut-off or stop valve or some device which in a broad sense would be its equivalent. Attention is called to the fact that in this movement of the lever a^4 a^9 in closing the valve a' the weight a^7 holds the fulcrum-pin a^5 at the bottom of the segmental slot a^3. The position of the parts at the limit of this second foot of movement of the trip-rod b is illustrated in Fig. 6, by reference to which it will be noted that the bracket b' has been separated from the free end f^3 of the coöperating trip-lever f^6.

It is possible for the piston and log-carriage to move approximately another foot after the gate or cut-off valve a' is closed against the high tension but cushioned action of the confined steam or fluid; but it will seldom if ever move to the limit of this possible movement. The limit of this possible movement is illustrated in Fig. 7, by reference to which it will be noted that the fulcrum-pin a^5 of the lever a^4 has been moved upward in the slot a^3 and the bracket b' has been moved on still farther away from the free end f^3 of the cooperating trip-lever f.

By the above actions the piston and log-carriage will be brought to a stop or standstill within the limits of a very short movement, but by such an increasing cushion action that no jar will be perceptible. As soon as the piston and carriage are brought to a standstill the highly-compressed steam or motive fluid in the right end of the cylinder will become effective to give the same their initial return movement toward the left. The first foot of return movement under the action of the highly-compressed air will restore the parts to the positions illustrated in Fig. 6, and the initial portion of the next step of movement will permit the weight a^7 to open the gate or cut-off valve a'. Live steam will now be again admitted into the right end of the cylinder and will become effective to drive the piston and log-carriage to the other limit of its stroke or to the left-hand end of the cylinder.

The stops f^{12} on the valve-stem 19 are spaced apart far enough so that the valve 18 may be reversed by means of the hand-lever 21 without moving the rod f^6 or trip-arm f^{13}. With the adjustments above assumed said stops f^{12} are so related to the trip-arm f^{13} that the return movements of the trip-levers f and rod or connection f^6 will not move the reversing valve from the position shown in Figs. 5, 6, and 7. The said reversing-valve 18 will be automatically returned to the position shown in Fig. 4 when the piston 5 6 reaches a point at the left-hand end of the cylinder corresponding to the position shown in Fig. 5.

By adjusting the stop-collars f^{12} somewhat closer together the return movement of the parts from the position shown in Fig. 5 to the position shown in Fig. 6 will cause the trip-arm f^{13} to strike the left-hand collar f^{12}, and thereby give the reversing-valve 18 a half-step of return movement toward the left and bring it to an intermediate position, in which it will close both of the ports 13. This, as is evident, will cut off live steam from both ends of the cylinder and bring the piston and carriage to a stop. In this case it will require the use of the hand-lever to again start the carriage, but the actions indicated will be accomplished automatically.

It is obvious from the foregoing that the action of the steam or motive fluid on the piston of the carriage-motor will be automatically reversed as said piston approaches the limits of its strokes and that a positive cushioned action is also effected. Either one of these features, even if used alone, would give very beneficial results, but for reasons already clearly indicated a much superior action is obtained by the coöperation in succession of the two features.

The great necessity for a safety device or attachment such as I have provided will be readily appreciated by all persons familiar with the ordinary actions of log-carriages as used in sawmills, and hence a few examples will illustrate the point as well as many. In the first place it is evident that with the ordinary hand device the utmost care and an extreme nicety of calculation by the operator of the hand-lever or device for controlling the reversing-valve is required, for while the piston-head must be run very close to the heads of the cylinder it must never be permitted to strike the same. Hence it so frequently happens that the carriage is run too far, thereby breaking the machinery and often injuring the operator and workmen. Again, if one of the saws should happen to be broken or thrown off of their pulleys, as frequently happens, the operator will be compelled to quickly leave his post, thus leaving the carriage uncontrolled to run away and break things up generally.

With my improved safety device or attachment, as is evident, the movements of the carriage will be automatically controlled or stopped in case of such an accident.

It may be noted that the end sections 3 of the cylinder are gradually thickened or increased in strength in the direction of the cylinder-heads. This gives the required increased strength at points where the pressure will be greatest under the compression in the cushioned action on the piston.

Figs. 8 and 9 illustrate a modified construction of the connection between the trip-rod b and the trip-lever f. In this construction the upper end of said lever f is bifurcated at f^{14} and is provided with a pivotally-connected two-part clamp f^{15}, the sections of which work on the trip-rod b and are spring-pressed into frictional engagement therewith by springs f^{16} on studs f^{17}. In this construction the head f^{15} slips under frictional engagement on the trip-rod b.

In Figs. 10, 11, and 12 a modified construction of the device for throwing the trip-arm f^{13} out of action is illustrated. In this construction the free end of the releasing-lever g engages the intermediate and under portion of a vertically-movable plate or bar k, the ends of which are provided with bearings that work upon a pair of depending guide-rods k', the upper ends of which are rigidly secured to a fixed bracket or frame-section k^2. Heads or enlargements k^3 on the lower ends of the guide-rods k' limit the downward movement of the plate or bar k. On the plate or bar k is adjustably secured a pair of cam-blocks k^4, having cam-surfaces k^5, which are inclined in

opposite directions and operate on the trip-arm f^{13} under reverse movements of the rod f^6. With this construction the movement of the rod f^6 toward the right, as above described in connection with the construction shown in Figs. 1 to 7, inclusive, the trip-arm f^{13} will first act on the right-hand stop-collar f^{12} and shift the reversing-valve into the position shown in Figs. 5, 6, 7, and 11 and then will be cammed into an inoperative position, as shown in said Fig. 11. In this inoperative position of the trip-arm f^{13} the reversing-valve may be moved by the use of the hand-lever 21. The initial return movement of the rod f^6 will carry the trip-arm f^{13} down the incline k^5 to the lowest portion of the block, will then throw said arm into contact with the left-hand stop-collar f^{12}, thereby causing it to move the reversing-valve back into the position indicated in Fig. 4, and immediately after this has been accomplished the cam portion k^5 of the left-hand block k^4 will cam said arm f^{13} again upward and hold the same in an inoperative position, so that the reversing-valve may be freely operated by its hand-lever. This cam-trip thus serves to automatically let in steam to that end of the cylinder toward which the piston, after having been stopped by the cushion device above described, will tend to rebound under the expansion of the highly-compressed steam or fluid confined in the cushion end of the cylinder.

From the foregoing description and statements made it is thought to be obvious that my invention is capable of a very wide range of modification, and hence it will of course be understood that I do not limit myself to the details of construction illustrated in the accompanying drawings.

The expression "a cut-off valve movable to close the exhaust-passage from the cylinder," as used in the claims, is used in a sense broad enough to cover a modification of the specific construction shown, wherein the reversing-valve itself is provided with sufficient lead or lap to perform the function indicated. While a single reversing-valve has been illustrated, it will be understood that any operative modification or substitute construction might be employed.

What I claim, and desire to secure by Letters Patent of the United States, is as follows:

1. The combination with a fluid-pressure feed-motor and carriage driven thereby, of a cut-off valve movable to close an exhaust passage or opening from the cylinder, and a device operating independent of the feed-valve mechanism of said motor, for closing said shut-off valve to form a cushion in the cylinder of said motor, substantially as described.

2. The combination with a reciprocating fluid-pressure motor, and carriage driven thereby, of a cut-off valve movable to close the exhaust-passage from the cylinder, and a valve-controller operating automatically to close said valve and cut off the exhaust, when the said piston closely approaches the limit of its stroke, substantially as described.

3. The combination with a reciprocating fluid-pressure motor and carriage driven thereby, of a cut-off valve in one exhaust-passage from the cylinder of said motor, and an automatic valve-controller, actuated by the piston of said motor and operating to close said cut-off valve, when said piston closely approaches the limit of its stroke, substantially as described.

4. The combination with a straight-line fluid-pressure motor and carriage driven thereby, of a cut-off valve in one exhaust-passage from the cylinder of said motor, and automatic valve-controlling mechanism, operating, primarily, to reverse the action of the motive fluid on the piston of said motor, and secondarily, to close said cut-off valve and form a closed cushion in said cylinder, substantially as described.

5. The combination with a reciprocating straight-line fluid-pressure motor and carriage driven thereby, of cut-off valves in the exhaust-passages from the opposite ends of the cylinder of said motor, and automatic valve-controlling mechanism actuated by the piston of said motor, and operating, primarily, to reverse the action of the motive fluid on said piston, and secondarily, to close said cut-off valves, substantially as described.

6. The combination with a reciprocating straight-line fluid-motor and carriage driven thereby, of automatic valve-controlling mechanism, comprising a trip-rod working through one cylinder-head, and a yielding connection between the same and the reversing valve or valves of said motor, said parts operating substantially as described.

7. The combination with a reciprocating fluid-pressure feed-motor and carriage driven thereby, of automatic valve-controlling mechanism, comprising a trip-rod working through one cylinder-head, a trip-lever connected to the reversing valve or valves of said motor, and a weight and flexible connection yieldingly holding said trip-lever for movement with said trip-rod, substantially as described.

8. The combination with a reciprocating fluid-pressure motor and carriage driven thereby, of a cut-off valve movable to close one exhaust-passage from the cylinder, comprising the gate-valve a', the bell-crank lever, with shifting fulcrum, the weight normally holding said fulcrum down, the trip-rod working through one cylinder-head, and a connection between said trip-rod and said bell-crank lever, substantially as described.

9. The combination with a reciprocating fluid-pressure motor, and carriage driven thereby, of a cut-off valve in one exhaust-passage from the cylinder of the motor, an automatic valve-controlling mechanism, actuated by the piston or part moved thereby and provided with yieldingly-connected parts, whereby it operates, primarily, to reverse the

action of the motive fluid on said piston, and, secondarily, to close said cut-off valve, and then to permit further movement of said piston without destroying the set positions of said cut-off valve or the reversing-valve of said motor, substantially as described.

10. The combination with a reciprocating fluid-pressure motor and carriage driven thereby, which motor has a passage that serves both for the admission of live steam and for the exhaust, of a cut-off valve in said passage, and valve-controlling mechanism operating primarily, to reverse the action of the motive fluid on the piston of said motor, and secondarily, to close said cut-off valve, substantially as described.

11. The combination with a carriage, of a coöperating cylinder and piston, one fixed and the other movable with respect to said carriage, a cut-off valve movable to close an exhaust-opening from said cylinder, and automatic connections actuated by the piston or part moved thereby, and operating to close said cut-off valve to form a cushion within said cylinder, substantially as described.

12. The combination with a straight-line motor and carriage driven thereby, of a hand-operated device connected to the reversing-valve of said motor, and controlling mechanism operating to reverse said reversing-valve, when the piston closely approaches the limits of its stroke, and a releasing device for rendering said automatic valve-controlling mechanism inoperative, at will, substantially as described.

13. The combination with a reciprocating fluid-pressure motor and carriage driven thereby, of automatic valve-controlling mechanism operating to reverse the reversing-valve of said motor, when the piston thereof closely approaches the limits of its stroke, and a releasing device operating automatically to again reverse the reversing-valve and render said valve-controlling mechanism inoperative, under the initial return movement of said piston and carriage, substantially as described.

In testimony whereof I affix my signature in presence of two witnesses.

CARL CARLSON.

Witnesses:
BESSIE B. NELSON,
F. D. MERCHANT.