

July 3, 1934.

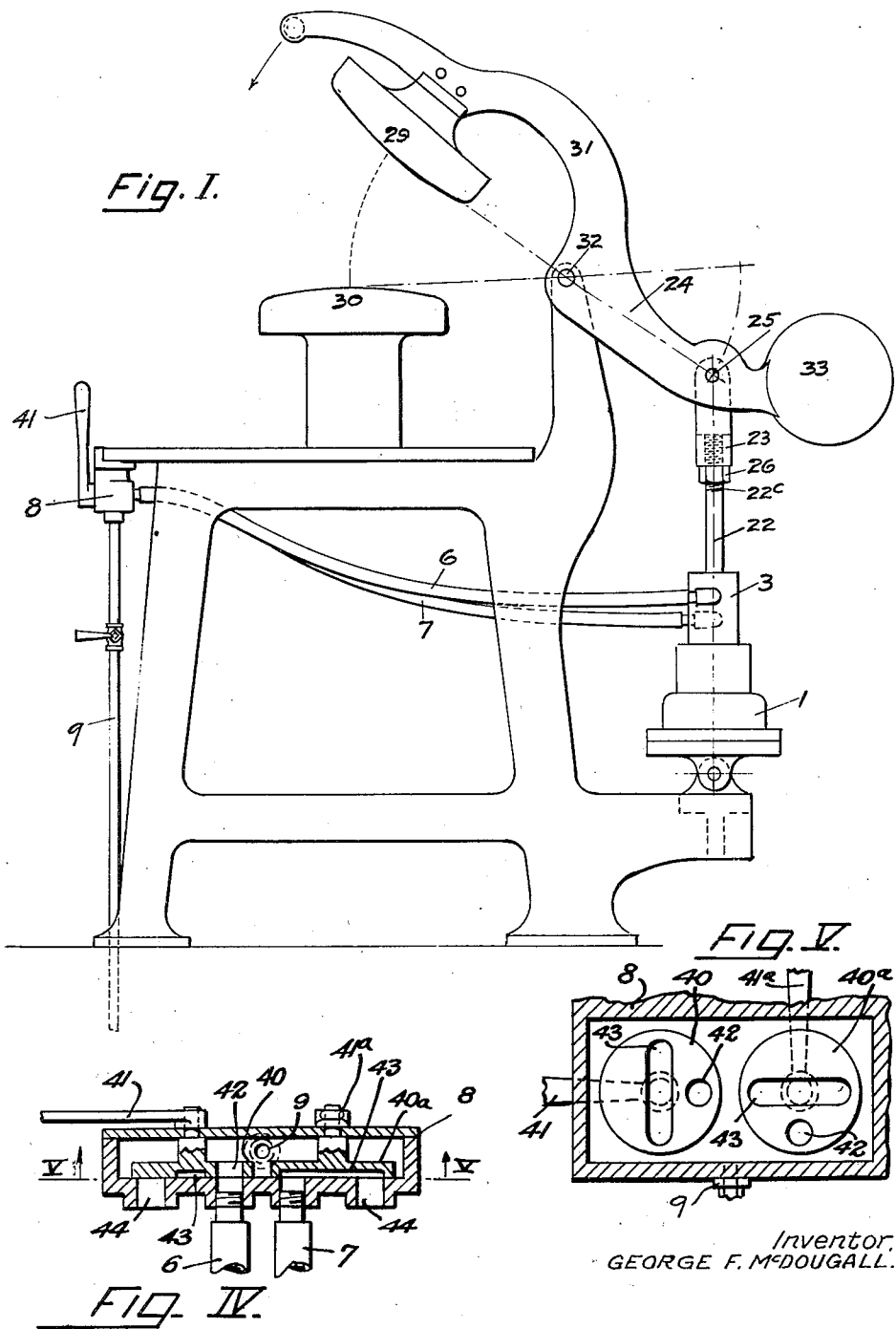
G. F. McDOUGALL

1,965,106

SAFETY MOTOR FOR PRESSING MACHINES

Filed Sept. 27, 1930

2 Sheets-Sheet 1



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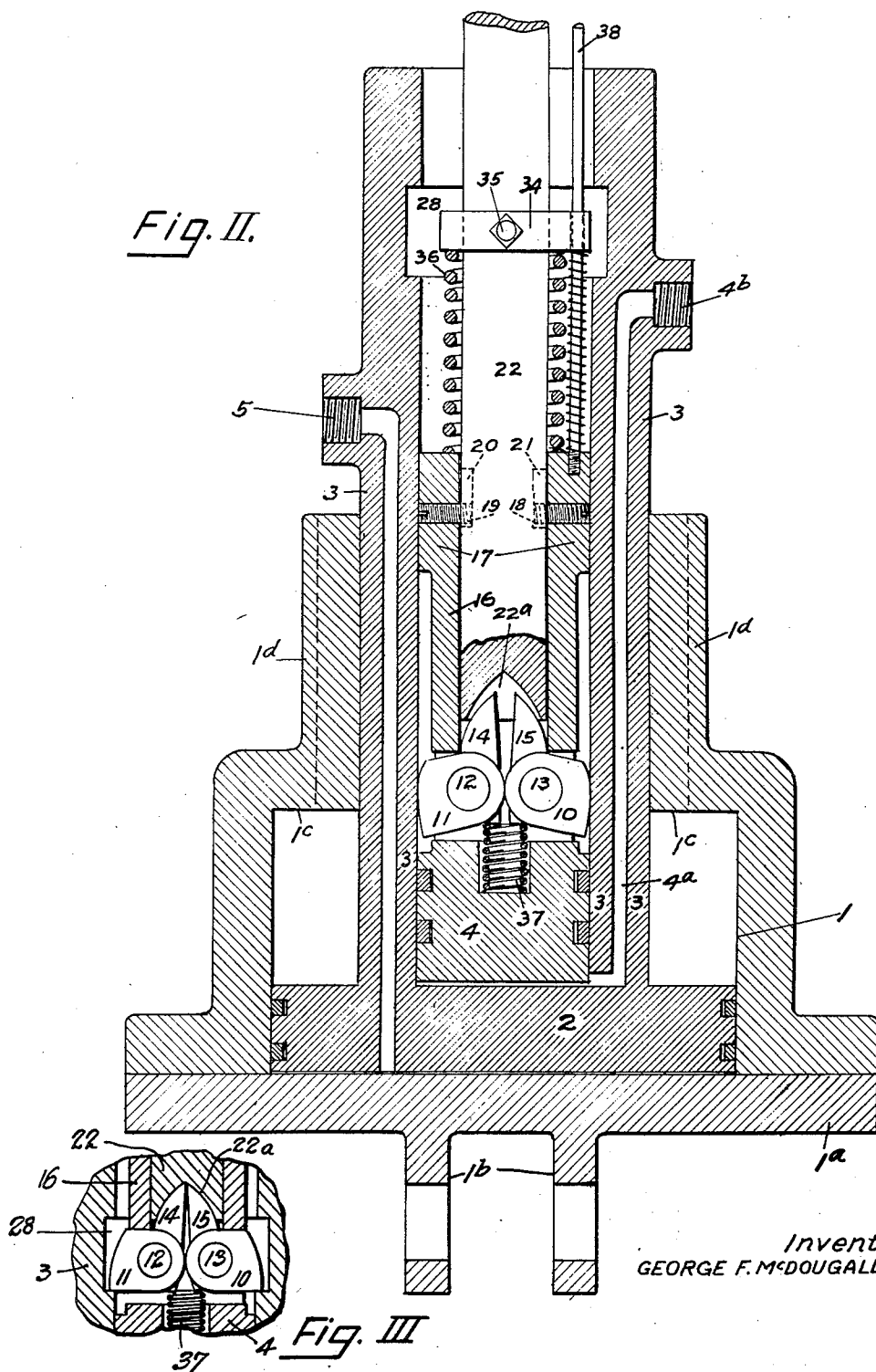
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2 Sheets-Sheet 2

Fig. II.



Inventor
GEORGE F. McDOUGALL.

UNITED STATES PATENT OFFICE

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SAFETY MOTOR FOR PRESSING MACHINES

George F. McDougall, Portland, Oreg.

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15 Claims. (Cl. 121—38)

The objects of my invention are to provide a motor for accomplishing the function of a pressing machine that will present a degree of safety to the machine and its operator not heretofore attainable.

Other devices for the purpose exist but all of them are believed to have a disadvantage that their purpose can be circumvented by accident or design and the operator of the machine and the machine itself exposed at least temporarily to the liability of injury.

Since inherent safety to the operator coupled with its ability to perform its proper functions is the prime requisite of a motor of this character, it is believed that the advance in the art is of substantial proportions.

With my new motor it is believed to be impossible to injure the operator of a machine or a machine itself on which it is installed by reason of the failure or displacement of a part.

I accomplish these and other objects which will appear in the subjoined specification and the claims annexed by the mechanism illustrated in the accompanying drawings and described in this specification.

Fig. I is a view of a machine diagrammatic in general character upon which my new motor has been installed.

Fig. II is a vertical section of a preferred form of my new motor which clearly indicates a method by which the objects of the invention can be attained.

Fig. III is a broken away view of that part of cylinder 3 in Fig. II around recess 28 and shows the position the latches 10 and 11, the fingers 14 and 15 and the surface 22a will assume under the influence of power application as hereinafter explained.

Fig. IV shows an operative way of constructing the control valve illustrated in Fig. I at 8; and Fig. V is a section of Fig. IV at V—V, Fig. IV.

The motor consists essentially, of a two stage device, having a cylinder 1 containing a piston 2 having a considerable area for exerting a final effect in operating a machine and a smaller cylinder, 3, containing a piston to fit 4 that is materially smaller in the area of its head than the first named piston 2 for the final effect. It will be noted that the cylinder 3 for the initial effect is formed in and made a part of the piston rod of the piston 2.

The cylinder 1 has a removable cylinder head 1a which has a pair of lugs 1b providing a convenient means for mounting the motor on a machine.

It will be noted that the cylinder 1 is comparatively short and that a very limited movement of the piston 2 therein is allowed by its length and that the piston 2 after traveling this short distance would strike on the top cylinder head 1c.

A contracted portion of the cylinder 1 is shown at 1d to serve as a guide for the cylinder 3 which is also the piston rod of the piston 2. A port 4b having a passage-way 4a is shown as a means for conveying pressure such as compressed air below the piston 4 for the purpose of inducing it to rise in the cylinder 3. A port 5 is also shown as providing means of ingress and egress for motivating fluids to operate the piston 2.

Both of these ports will be provided with conduits 6 and 7 and the flow of the motivating fluid will be controlled by a suitable valve or valves diagrammatically illustrated in Fig. I at 8; and the pipe 9 will serve to indicate a conduit for motivating fluid from any convenient source which is not shown.

Within the piston rod of the piston 4 and above the piston proper are shown two latches 10 and 11 mounted on pivots 12 and 13 and having formed thereon two curved fingers indicated by the numeral 14 on one and 15 on the other though they will be substantially alike.

A piston rod portion 16 is provided with a cross-head 17 made integral therewith. Two fastenings, 18 and 19 are provided in the crosshead portion and project into slots 20 and 21 which are formed in a push-rod 22 to retain the parts in assembled relationship. The lower portion of the push-rod 22 has a cone-shaped recess 22a adapted to cooperate with the curved fingers 14 and 15 when brought in contact therewith. The push-rod 22 is shown to have a terminus at the end opposite the cone shaped recess 22a that is threaded at 22c and adapted to be screwed into the socket 23 which in turn is attached to the press operating arm 24 by the pivot pin 25 and is adjustable in the socket 23 by means of a long thread and the lock nut 26.

In assembling, the machine adjustment at this point will be such that a movement of the piston 4 within the cylinder 3 equal to the distance from the horizontal center line of the pivots 12 and 13 to approximately the center of an annular recess 28 formed within the cylinder 3 will just bring the movable pressing element 29 in smooth contact with the fixed pressing element 30 it being understood that the operating arm 31 of the movable pressing element 29 being pivoted at 32 renders the movable element 29 freely movable toward and away from the fixed pressing

element 30 under the influence of the motor as a whole.

A counter-weight 33 is shown and should be of such mass that it will tend to move the attached parts including the parts of the motor to the position shown in the drawings without any considerable display of force, or jar, when no pressure above atmosphere exists in the motor.

A collar 34 is provided for the push-rod 22 and is shown to be adjustable thereon by sliding and fixing with the setscrew, 35. A spring 36 bears on the collar 34 in compression and on the cross-head 17 and is restrained from throwing the push-rod 22 except the restricted distance permitted by the fastenings 18 and 19 working within the slots 20 and 21. A compression spring 37 is shown placed so that its tendency to expand lengthwise will operate to restrain the latches 10 and 11 in their unlatched position as shown in Fig. II.

An index rod 38 is shown in Fig. II, the purpose of which will be later explained.

The construction of the control valve 8 is no part of my invention as numerous valves suitable for the purpose are well known to the art; neither is there anything new about the valve shown detailed in Fig. IV and Fig. V and it is explained that in these figures, 8 represents the valve casing, 9 represents the motive fluid supply, 41 represents a hand lever for operating the control valve 40 for the first stage of the motor, 41a represents a handle for controlling the valve 40a for the second stage of the motor, 6 and 7 represent the same conduits represented by the same numerals in Fig. I, 44 is an exhaust port and 42 is an intake port for both valves.

The valve, in each case, is a rotating disc 40 or 40a having a D slot 43, on the back thereof and so movable that the port 42 may be brought into registration say with conduit 6 in order to furnish motive power to the conduit 6 and by turning the handle of that valve through an approximately 90 degree angle the D will cause conduit 6 and port 44 to register, when the valve will be in exhaust position. Many forms of valves are suitable for the requirements and are well known in the art, hence it is thought that this disclosure is ample.

After executing the pressing movement and upon exhaust of the pressure from both cylinders the spring 36 will force the surface 22a out of contact with the fingers 14 and 15, whereupon under the influence of the spring 37, the latches 10 and 11, will assume the position they are shown to occupy in Fig. II; this movement being assisted by the downward gravitational movement of cylinder 3.

It will be noted that the movement of the latch member is a compound one, they are carried upward by their mounting and at the same time are forced outward by 22a, therefore the path will be a diagonal toward the recess 28. This requires that the high pressure motor represented by the piston 2 travel a short distance before it engages the latches 10 and 11 and obviously upon exhaust of all pressure from both cylinders the piston 2 will drop and permit the latches to retrace the route by which they entered the recess, thus releasing the device to drop into the position shown in Fig. II; which is its dormant one.

The operation of the device is as follows. Motivating fluid is first admitted to the port 4b and through the passage-way 4a and will cause the piston 4 to rise within the cylinder 3 until the movable pressing element 29 contacts with the

fixed pressing element 30 which will tend to stop the movement of the push-rod 22. Since no considerable force is required to move these two elements together no sensible compression of the spring 36 will take place until after the elements 29 and 30 have actually come in contact. After the contact is made force operating under the piston 4 will tend to compress the spring 36 and allow a relative longitudinal movement of the piston 4 and its attached parts with respect to the push-rod 22. This contacts the cone shaped recess 22a and the boundaries thereof with the curved fingers 14 and 15 and forces them toward each other rocking the latches, 10 and 11, of which they are made a part of the pivots, 12 and 13, and causes the said latches 10 and 11 by reason of their shape to extend out into the annular recess 28 whereupon the piston 4 and all the attached parts and including the push-rod 22 will be locked to the cylinder 3 and susceptible to influence of pressure admitted to the port 5 and tending to raise the piston 2 and a final pressing effect may be applied between the movable pressing element 29 and the fixed pressing element 30.

It will be understood that the piston 4 is of such power that it will not injure the operator's hand or arm if it be found between the fixed and movable elements 30 and 29 nor will it have power enough to occasion any serious discomfort; and the piston 4 by reason of such obstruction will be stopped and will not rise high enough for the latches 10 and 11 to become engaged with the annular recess, 28, and therefore application of the final force of the piston 2 with such an obstruction between the elements is impossible; and the two elements must come together without any obstruction between them other than cloth to be pressed in order that the latches may rise high enough within the cylinder 3 so that they may engage the annular recess 28 after which final pressure may be applied at will. The piston 2 and the cylinder 3 are prevented from rising due to internal friction of the piston 4 and its attached parts because the same power that tends to cause the piston 4 to rise produces an equal and opposite reaction on top of the piston 2.

Let us now consider the safety features heretofore alluded to. Since the push-rod 22 can only advance a distance that will allow the fixed element 30 to be contacted by the movable element 29 its movement is irrevocably fixed and while additional force may be applied no additional movement except that allowed by the resiliency of the elements 29 and 30 is possible. Should motivating fluid be prematurely admitted to the port 5 before the latching mechanism has functioned, the piston 2 will promptly rise until it is in contact with the cylinder head 1c and without any effect whatever on the push-rod 22 and the annular recess 28 will be out of reach of and impossible of engagement by the latches 10 and 11.

In such an eventuality the only possible remedy would be to exhaust all of the motivating fluid from both of the cylinders and start over again. Should the spring 36 become broken, or should the collar 34 be displaced by loosening the setscrew 35 and the spring 36 shall no longer function, then the piston 4 will rise on application of motivating force through port 4b and will operate as heretofore described up to the point of discharging the cylinders to restore normal conditions when it will be found that the latches 10 and 11 will not unlock and the spring 36 must then be restored before further operation of the motor can be accomplished.

Should the spring 37 or its equivalent, fail to function, a like condition will ensue, the latches 10 and 11 will lock once only but cannot be unlocked positively until spring 37 or its equivalent is restored.

The index rod 38 the lower end of which is attached to the crosshead 17 diagrammatically illustrates a means for operating a visible or audible indicator to announce to the operative the relative movement of the push-rod 22 with respect to the crosshead 17 to show when the latches 10 and 11 may be presumed to have engaged, thus permitting operation of the piston 2 and the resultant final pressing effect.

Should any jamming or binding result in a locking effect between the piston 4 and its attached parts and the cylinder 3 no harm can come of it to the operator because of the limited travel allowed the piston 2 by the cylinder 1 and the elements 29 and 30 cannot contact and there appears to be no possible means for operating this motor otherwise than in the proper cycle first described and no possible damage that could occur to it that would render its inherent safety features inoperable. If any part fails to function properly it will not operate at all.

Variations from the above described mechanism are possible without departing from the principle thereof and I therefore do not restrict myself to the precise construction shown, but what I claim as new and desire to secure by Letters Patent, is—

1. In a pressing machine, a pair of co-operating press elements, low pressure means for closing the elements together, high pressure means for applying final pressure that are initially disconnected from the press, latching means operable by said low pressure means effective to latch said high pressure means to effective connection with the press, means to render said latching means ineffective unless the press is closed and spring means for disengaging the latching means upon exhaust of pressure.

2. In a safety motor for a pressing machine, a press closing cylinder and piston motor, a push-rod for said piston to transmit movement thereof to a movable press element, spring means in series between said piston and said push-rod effective to allow relative movement of said piston with respect to said push-rod responsive to the encountering of a certain resistance by said push-rod, latching means operable by said relative movement, high pressure cylinder and piston means for said safety motor positioned to be latched in series with said press closing motor upon operation of said latching means and spring means for disengaging the latching means upon exhaust of all pressure.

3. In a pressing machine, a buck and a co-operating movable head, a low pressure means for moving the head into contact with the buck, high pressure means for applying pressure to the head and buck, means for rendering the action of the high pressure means ineffective except when latched in series with the low pressure means; latching means movable to engage the high and low pressure means in series under the influence of pressure supplied from the said low pressure means and means rendering the said latching means inoperative unless the head is in contact with the buck.

4. In a safety motor for a press having fixed and movable press heads, a press closing element for said motor, a pressing element for said motor, instrumentalities rendering the said pressing ele-

ment ineffective unless latched in series with the said closing element, latching means operable by the closing element by a further movement thereof and means responsive to the encountering of resistance between the press elements to effect such further movement.

5. In a pressing machine, a movable press arm, a small cylinder motor inter-connected with said arm, a large cylinder motor positioned to apply pressure to said arm, means for rendering the large cylinder motor ineffective except when latched to the small cylinder motor, latching means associated with the small cylinder motor and operable by additional movement thereof after closing the press effective to latch the large cylinder motor in operable relation to said press arm and said first means preventing the engagement of the latching means if the large cylinder motor has been actuated.

6. In a pressing machine, a buck and a co-operating movable head, a low pressure means for moving the head into contact with the buck, a high pressure means for applying pressure of the head upon the buck, means rendering the high pressure means ineffective except when latched in series with the low pressure means, latching means movable to engage the high and low pressure means in series by further movement of said low pressure means after moving the head into contact with the buck.

7. In a safety motor for a press comprising a low pressure expansible motor for closing the press and a high pressure expansible motor for applying heavy pressure to the press, the combination of a pushrod for the low pressure motor, a piston for the low pressure motor and a latch that is operated by relative movement between the said piston for the low pressure motor and the said pushrod to latch the said high pressure motor in series with the said low pressure motor.

8. In a safety motor for a press comprising a low pressure expansible motor for initially closing the press and a heavy pressure expansible motor for applying subsequent pressing force, the combination of a pushrod for the said low pressure motor, a piston for the said low pressure motor, a spring in series between the last named elements and a latch effective to latch the said heavy pressure motor in series with the low pressure motor upon a compression of the spring.

9. A safety motor for a press comprising an expansible press closing motor, an expansible pressing motor normally disconnected from the first named motor, a pneumatically operated latching device for latching the two motors together, means for preventing such latching before the press closing motor is fully expanded and spring means for disengaging the latching device upon the exhaust of pressure from both motors.

10. In a pressing machine, a pair of pressing jaws, low power pneumatic means for closing the jaws together, pneumatically operated latching means for latching the jaws in closed relation, pneumatic means for applying heavy pressure to the jaws through the last named means and spring means for disengaging the latches upon exhaust of all pressure.

11. In a safety motor for a press, two expansible motors in self-contained structure comprising a low power expansible motor for closing a press and a high power expansible motor for applying heavy pressure to a press that is normally disconnected from the first named motor and fluid pressure operated latching means for latching the

second motor to the first motor when said first motor has moved to expanded position and a recess for the latching means positioned to be out of registration with the latch before the low power motor has expanded to close the press.

12. A safety motor for a pressing machine having fixed and movable presser elements, characterized as being a two-stage expansible motor, a press closing stage operatively connected to the movable presser element, a pressing stage that is normally disengaged from the closing stage, latching means movable under the influence of pressure supplied from the closing stage that are effective to engage the said pressing stage to the closing stage and therethrough to an effective relationship to the press and means for preventing an engagement of the latches before the press is closed.

13. In a safety motor for a press having fixed and movable presser elements, a two-stage telescopic straight-line motor, the stages being cylinders with pistons movable therein, the first motor stage operatively connected to the press movable element, the second motor stage normally ineffective to apply pressing power to the press movable element and latching means responsive to a final movement of the closing piston after closing the press that is effective to connect the second motor stage in operative re-

lationship to the first motor stage, whereby power of the second motor stage is effectively connected to the press.

14. In a pressing machine a pair of pressing jaws, a low pressure means movable to close said jaws together, a high pressure means for exerting higher pressure upon said jaws, interlatching means to latch the low pressure means and high pressure means together and means dependent upon a further movement of the low pressure means after the jaws are closed thereby for moving the interlatching means into interlatching relation between said low pressure means and said high pressure means.

15. In a pressing machine, a pair of pressing jaws, a low pressure means movable to close said jaws together, a high pressure means for exerting higher pressure upon said jaws, interlatching means to latch the low pressure means to said high pressure means for unitary movement, and means dependent upon a further movement of said low pressure means after the jaws are closed thereby and upon the resistance to such further movement afforded by said closed jaws, to move said interlatching means into interlatching relation between said low pressure means and said high pressure means.

GEORGE F. McDOUGALL.

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