W. A. CORNBROOKS.

RELIEF MECHANISM FOR PRESSURE EXERTING MACHINES.

APPLICATION FILED JUNE 4, 1907.

914,799.

Patented Mar. 9, 1909.

3 SHEETS—SHEET 1.

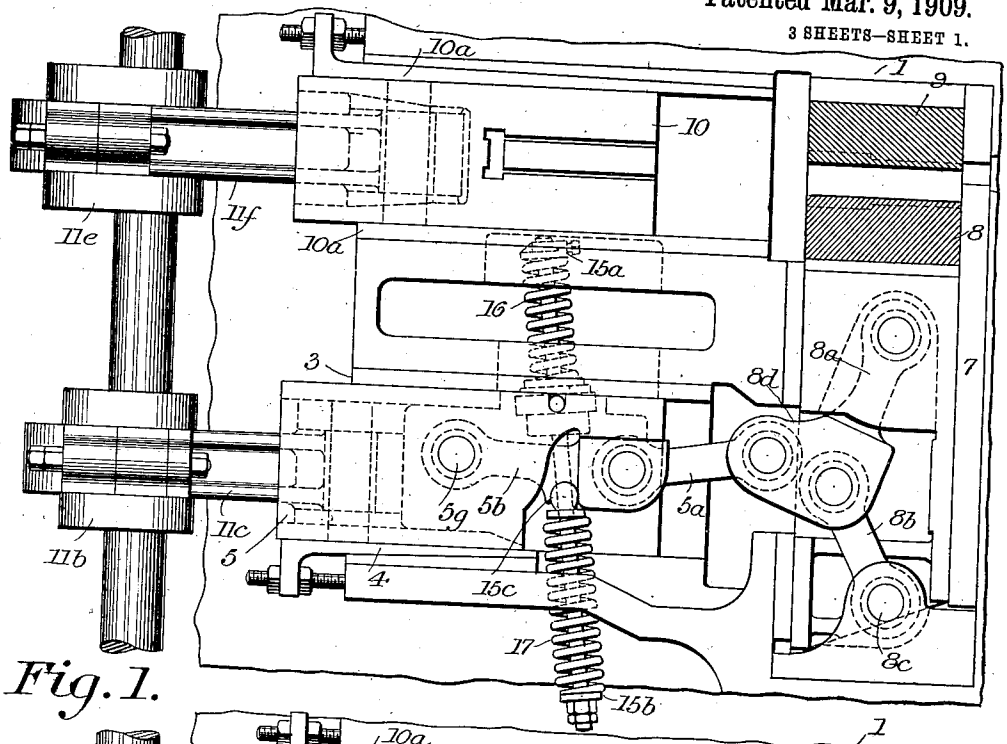


Fig. 1.

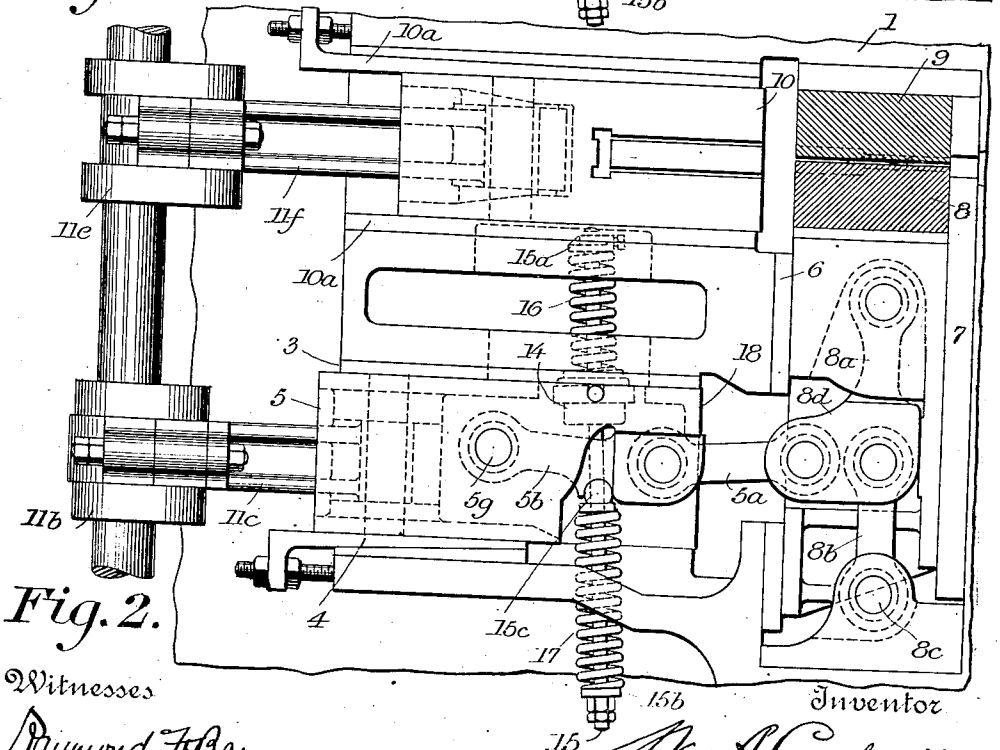


Fig. 2.

Witnesses

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Fig. 3.

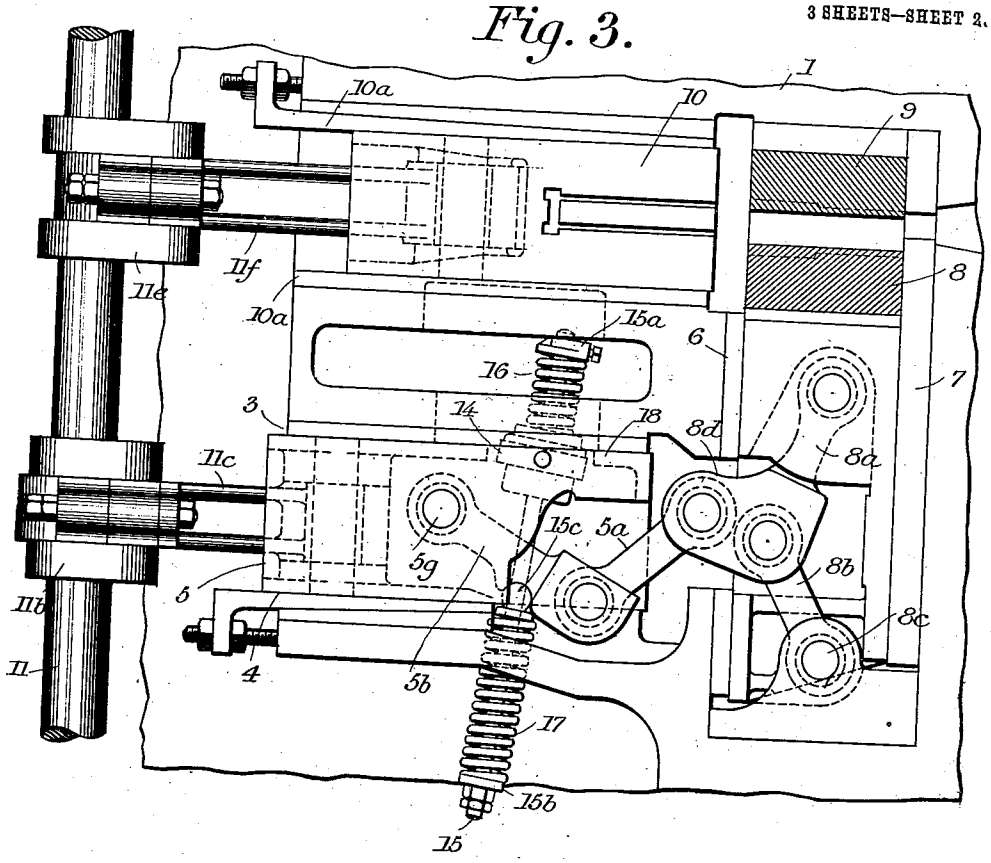
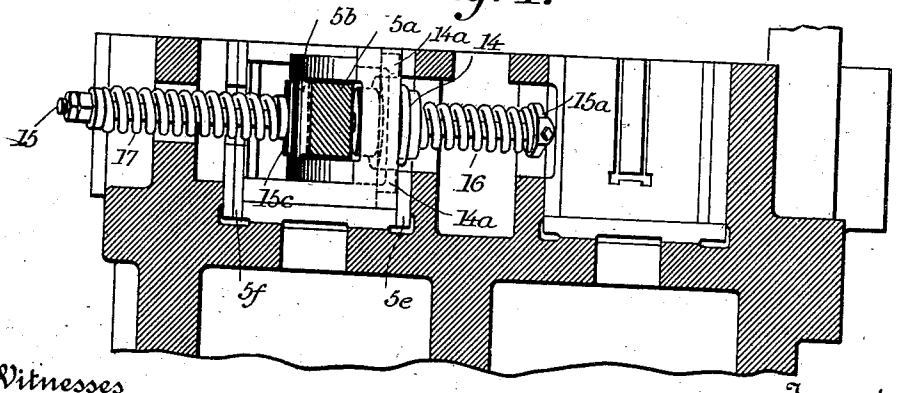


Fig. 4.



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3 SHEETS—SHEET 3.

Fig. 5.

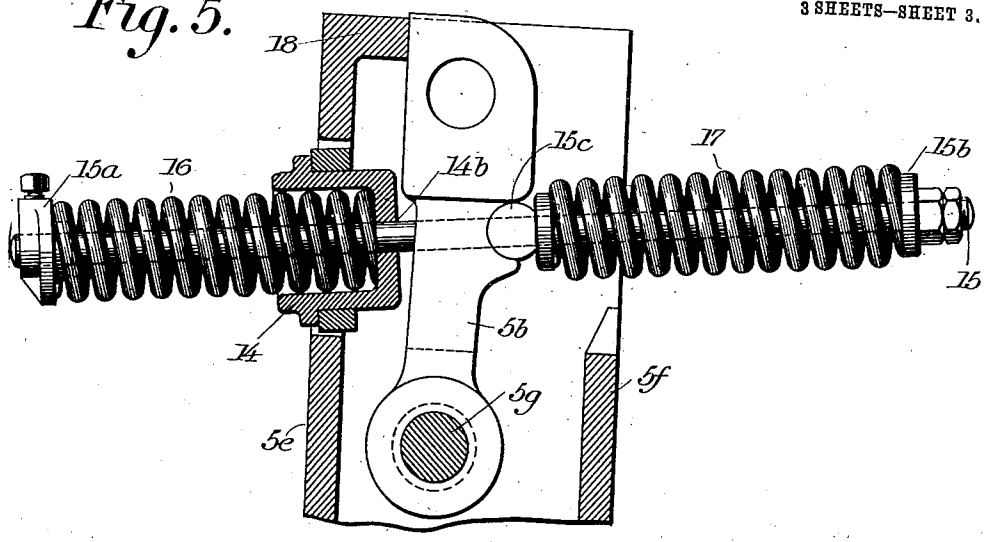


Fig. 6.

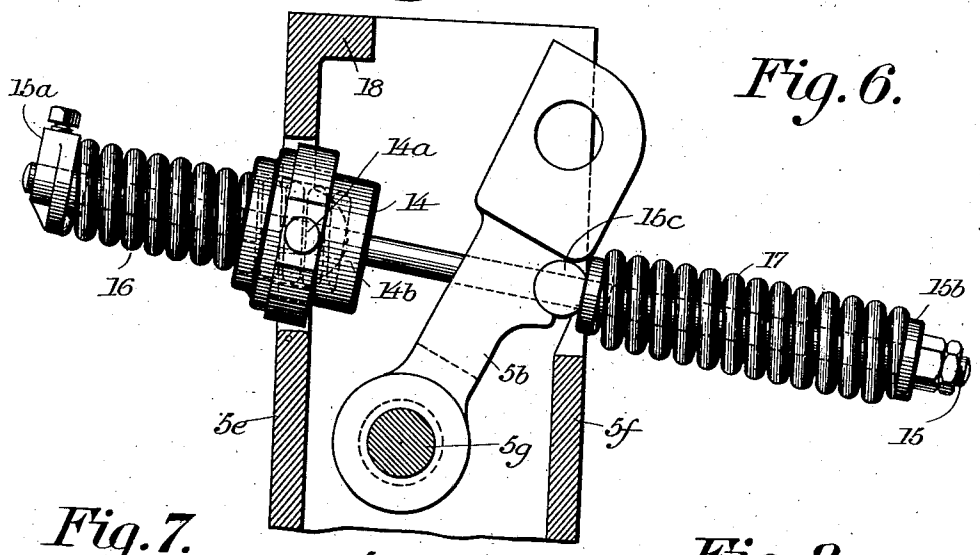


Fig. 7.

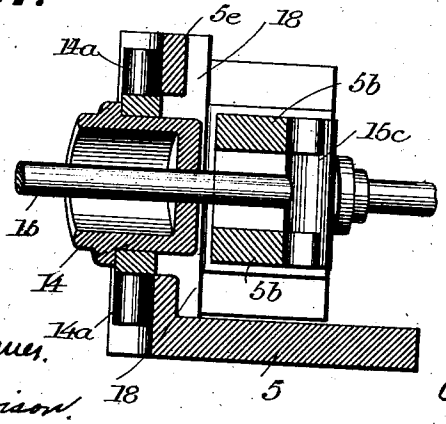
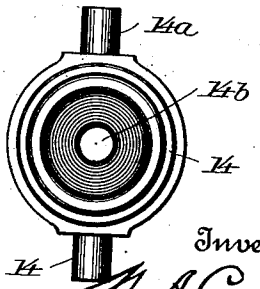


Fig. 8.



Witnesses

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UNITED STATES PATENT OFFICE.

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RELIEF MECHANISM FOR PRESSURE-EXERTING MACHINES.

No. 914,799. Specification of Letters Patent. Patented March 9, 1909.

Application filed June 4, 1907. Serial No. 377,194.

To all whom it may concern:

Be it known that I, WILLIAM A. CORNBROOKS, of Moline, county of Rock Island, and State of Illinois, have invented a new and useful Improvement in Relief Mechanism for Pressure-Exerting Machines, of which the following is a specification.

This invention relates to power-actuated pressure exerting machines, and has reference more particularly to machines for upsetting, forging, or otherwise shaping metal, in which machines a gripping die or slide to hold the work, coöperates with an upsetting or forming slide or die, in such manner that the blank or work acted on is given the desired shape or form.

The invention is directed to the actuating devices for the gripping die, and the invention consists in an improved construction of said actuating devices, whereby in the event of the gripping die encountering an abnormal obstruction, such for instance as a misplaced blank in the die cavity, or an excess of material, etc., the actuating devices will give or yield in such manner as to relieve the gripping die of its actuating pressure ;whereby breakage of or injury to the parts of the machine is prevented.

In the specific embodiment of my invention, the power driven means actuates the operating slide which is connected with the gripping die by two pairs of connected toggle levers, in such manner that the gripping die will be caused to reciprocate in a path at right angles to the movement of the operating slide, and to the toggle lever which is connected with the operating slide, is applied a spring-relief mechanism, in the form of two coöperating springs, disposed on opposite sides respectively of said toggle lever, and so arranged relatively to each other and to the lever, that the springs in tending to expand, will extend the links and cause them to impart motion from the operating slide to the gripping die, which springs however, will permit the toggle lever to yield in the event of the gripping die meeting with an abnormal obstruction, thereby placing the springs under compression.

The invention consists also in the details of construction and combination of parts hereinafter described and claimed.

In the accompanying drawings:—Figure 1 is a top plan view of an upsetting machine having my invention embodied therein, the parts being in the position they occupy at the beginning of the stroke of the operating slide. Fig. 2 is a similar view with the parts in the position they occupy at the end of the stroke. Fig. 3 is a similar view, showing the toggle links as they appear when they yield and place the springs under compression, in the event of some abnormal obstruction preventing the gripping die from completing its stroke. Fig. 4 is a transverse sectional elevation taken through the longitudinal axis of the pressure springs. Figs. 5 and 6 are enlarged sectional plan views showing the operating slide, one of the links of the primary toggle, and the pressure springs in their different positions. Fig. 7 is a horizontal sectional plan view through the rocking cup in which one of the pressure springs is seated, and through the adjacent parts, said spring being removed. Fig. 8 is a plan view of the cup removed.

Referring to the drawings:—1 represents a suitable bed-frame adapted to give support to the operative parts of the mechanism. This bed-frame is provided with longitudinally extending vertical guides 3 and 4, between which an operating slide 5 reciprocates. The frame is also provided with transversely extending vertical guides 6 and 7, between which a gripping die or slide 8 reciprocates. This die in its advance movement is adapted to grip the work or blank against a fixed die 9, so that it may be acted on by an upsetting or forging die 10, reciprocating longitudinally of the frame between longitudinally extending guides 10^a.

The gripping die 8 has jointed to it a link 8^a, which is jointed to a link 8^b, which is in turn jointed to the frame, as at 8^c, these two links 8^a and 8^b constituting a toggle lever, which when its links are extended as shown in Fig. 2, will advance the die, and which when the links form an angle with each other, as shown in Figs. 1 and 3, will retract the die.

The end of link 8^a is provided with a lateral extension 8^d, to which is jointed one end of a link 5^a, which is jointed at its opposite end to one end of a link 5^b, which latter is in turn jointed at its opposite end to the operating slide 5, the links 5^a and 5^b constituting a toggle lever which forms an operative connection between the operating slide and the gripping die, through the medium of the interposed toggle lever first described, by

means of which connecting mechanism the gripping die will be caused to advance and retreat as the operating slide is correspondingly moved.

For convenience of description, I will refer to the toggle lever which is connected with the operating slide, as the "primary" toggle lever, and that which is connected with the gripping die as the "secondary" toggle lever.

The operating slide may be actuated by any appropriate means, but I prefer to employ for this purpose a transverse driving shaft 11, mounted in bearings 11^a in the bed-frame and rotated from any suitable source of power, the shaft being provided with a crank 11^b connected by pitman 11^c with the operating slide. For the purpose of operating the upsetting die 10 with a reciprocating motion, a second crank 11^e is provided, connected by pitman 11^f with the upsetting slide 10.

The operating slide 5 comprises upper and lower horizontal parallel plates 5^c and 5^d, connected together at opposite sides by vertical plates 5^e and 5^f, the toggle link 5^b, before alluded to, being jointed between the upper and lower plates on a vertical pivot pin 5^g.

As shown more particularly in Figs. 7, 8 and 9, the vertical connecting plate 5^e of the operating slide is formed with an opening which receives a cup or casing 14, provided on diametrically opposite sides with trunnions 14^a, seated in open vertical alining slots or sockets in the edges of the plates 5^c and 5^d of the slide, whereby the cup is supported so that it may rock on a vertical axis.

The bottom of the cup is provided with a hole 14^b, through which is extended a horizontal rod 15, which rod extends also through a horizontal opening 14^c in the link 5^b and terminates at its ends some distance beyond the sides of the operating slide. The rod is encircled at one end by a spiral spring 16, having its inner end seated in the rocking cup 14, and having its outer end bearing against a head 15^a fixed to the end of the rod. At its other end, the rod is encircled by a second spiral spring 17, bearing at its outer end against a head 15^b, fixed to the end of the rod, and bearing at its inner end against a washer or slide 15^c, having a rounded inner surface seated so as to rock in a corresponding socket in the side of the link 5^b. These springs in their tendency to expand, will draw the link 5^b laterally so as to extend the primary toggle as indicated in Figs. 1 and 2, to its active position, the spring 16, by bearing on head 15^a, pulling the rod 15 in the same direction as that which the other spring tends to push the link 5^b, with the result that both springs operate in the same direction on the link, and act to hold it yieldingly in its extended operative position. The extension of the links of the toggle is, however, determined and controlled by a stop lug 18, carried by the operating slide in position to be engaged by the link 5^a when the latter is extended, the relation of the stop to the link being such that the toggle will be so held by the springs that the axis connecting links 5^a and 5^b will be slightly to one side of a line drawn through axis 5^g, and that connecting link 5^a with extension 8^d, with the result that if the operating slide meets with a resistance in its advance, due to an obstruction to the movement of the gripping die, the links 5^a and 5^b of the primary toggle will overcome the tendency of the springs to hold them extended, and will assume the position shown in Fig. 3, thereby placing the springs under compression. The tension of the springs is such that they will normally hold the links extended against such pressure as is necessary to be imparted to the gripping die in performing its proper functions in gripping the work under treatment, but not against an abnormal resistance, such as would be caused by the work being misplaced, or an excess of material, or similar abnormal conditions. In such an event, the primary toggle will yield, and although the operating slide will continue to advance and complete its stroke, the gripping die will come to rest and then be retracted, owing to the lateral pressure exerted by link 5^a on the extension 8^d of the secondary toggle, as the operating slide continues to advance, as shown in Fig. 3, this lateral pressure causing the links of the secondary toggle to assume angular relations to each other and retract the die.

By the provision of the two coöperating relief springs, applied as described, the requisite degree of flexibility is obtained, and at the same time the necessary strength is secured, without the springs being of undue length, which would be the case if but one spring were employed. By reason of this fact, the action of the springs is more uniform, and better fitted to meet the varying conditions in the operation of the machine, as regards the character of the work, and other conditions encountered in actual practice.

Having thus described my invention, what I claim is:—

1. In a machine of the type described, the combination of a reciprocating pressure exerting member, a reciprocating operating member therefor, operative connections between the two members including a toggle lever, coöperating springs arranged one each on opposite sides of the toggle lever and acting coöperatively to hold the same yieldingly extended, and means connecting said springs and causing them both to act in the same direction on said toggle lever.

2. In a machine of the type described, the combination of a reciprocating operating

slide, a transversely reciprocating pressure applying slide, operative connections between said slides comprising primary and secondary toggle levers connected together and connected to said slides, a spring acting on one side of the primary toggle lever and tending to extend it, a second spring arranged at the opposite side of the toggle lever and acting respectively against the slide and in the direction of action of the first spring, and coöperating with the latter in tending to hold the toggle extended, and means connecting said springs and causing them both to act in the same direction on said toggle lever.

3. In a machine of the type described, the combination of an operating slide, a transversely movable pressure exerting slide, operative connections between the two slides comprising a primary toggle lever connected with the operating slide, and a secondary toggle lever connected with the pressure exerting slide and with the primary toggle lever, a rod extending transversely of the movement of the operating slide and provided on opposite ends with heads, a spiral spring encircling the rod at one side of the primary toggle lever and bearing at its outer end against the head on the rod, and at its inner end against the operating slide, and a second spring encircling the rod at the opposite side of the toggle lever and bearing at its outer end against the head on the rod, and at its inner end against the toggle lever.

4. In a machine of the type described, the combination of an operating slide, a transversely reciprocating pressure exerting slide, operative connections between said slides comprising a longitudinally arranged primary toggle lever consisting of links 5^a and 5^b, and a transversely arranged secondary toggle lever connected with the link 5^a, a spring supporting rod extending transversely of the link 5^b and through the same, heads on the opposite ends of said rod, a spiral spring encircling the rod at one side of the toggle lever with its outer end bearing against the head and its inner end bearing against the operating slide, and a second spring encircling the rod at the opposite side of the link with its outer end bearing against the head on the rod, and its inner end acting against the link.

5. In a machine of the type described, the combination of a reciprocating operating member, a reciprocating pressure exerting member, operative connections between the two including a toggle lever connected with the operating member, a spring relief mechanism for the toggle lever, said mechanism comprising two coöperating springs arranged respectively on opposite sides of the toggle lever, and tending by their expansion to hold the toggle lever yieldingly extended, and means connecting said springs and causing them to act in the same direction on the toggle lever.

6. In a machine of the type described, the combination of an operating slide, a pressure exerting member, operative connections between the two including toggle links 5^a and 5^b, the latter being jointed to the operating slide, and the former being operatively connected with the pressure exerting member, and the link 5^b having an opening therethrough, a spring-bearing or cup provided with trunnions seated in sockets in the slide so as to rock, said cup having an opening through its bottom, a rod extending through said cup and through the opening in the link 5^b and terminating at its ends at the opposite sides of said link, heads on the ends of said rod, a spiral spring encircling the rod with its inner end seated in the spring cup or bearing and its outer end bearing on the head on the end of the rod, and a second spiral spring encircling the rod at the opposite side of the link with its outer end bearing against the head on the rod, and its inner end acting against the link.

In testimony whereof I hereunto set my hand this 24th day of April, 1907, in the presence of two attesting witnesses.

WILLIAM A. CORNBROOKS.

Witnesses:

HARRY AINSWORTH,

C. W. FISKE.