(No Model.) 2 Sheets—Sheet 1.

G. SCHUHMANN.

VALVE FOR ENGINES.

No. 334,089. Patented Jan. 12, 1886.

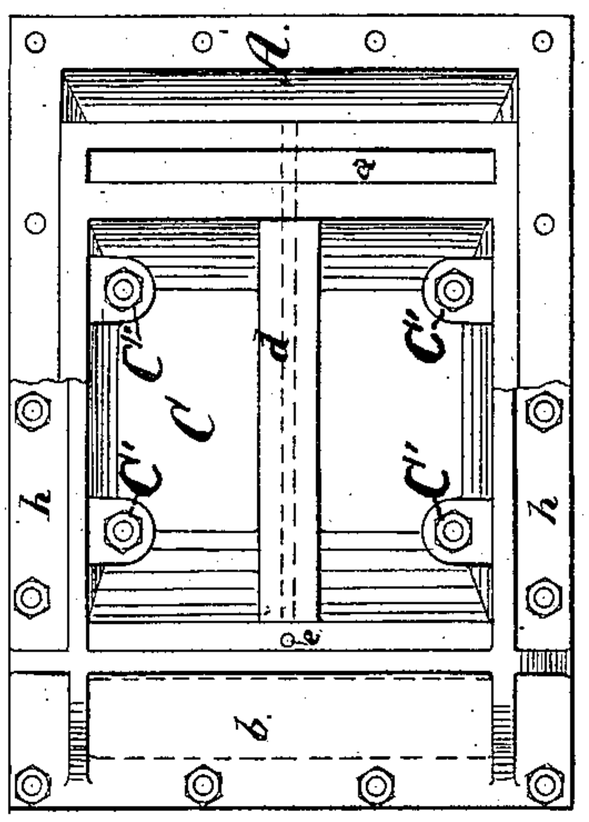

Fig. 1.

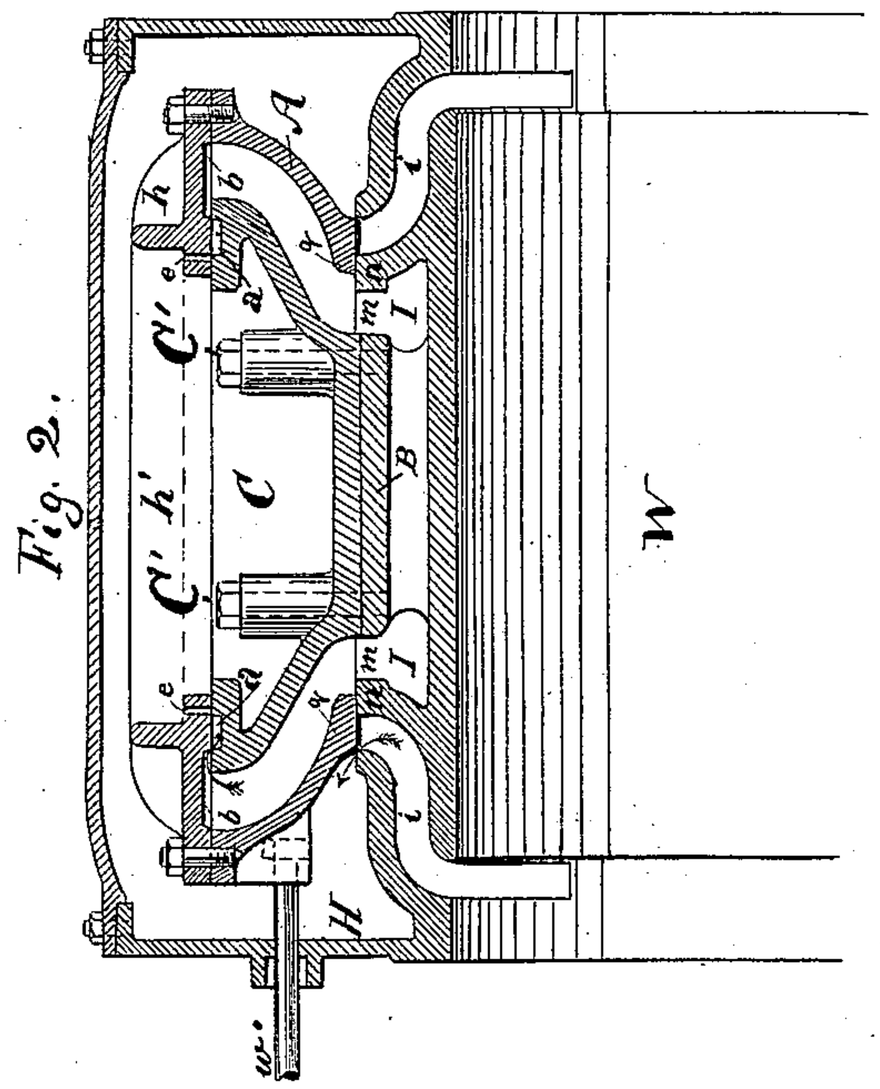

Fig. 2.

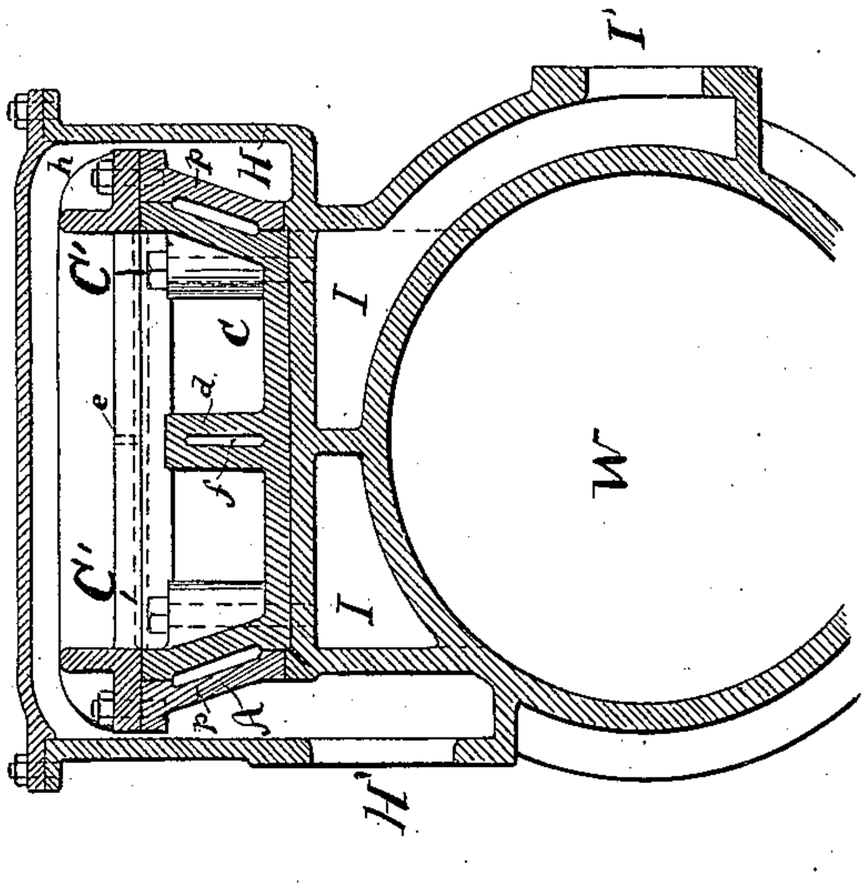

Fig. 3.

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(No Model.) 2 Sheets—Sheet 2.

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Fig. 4.

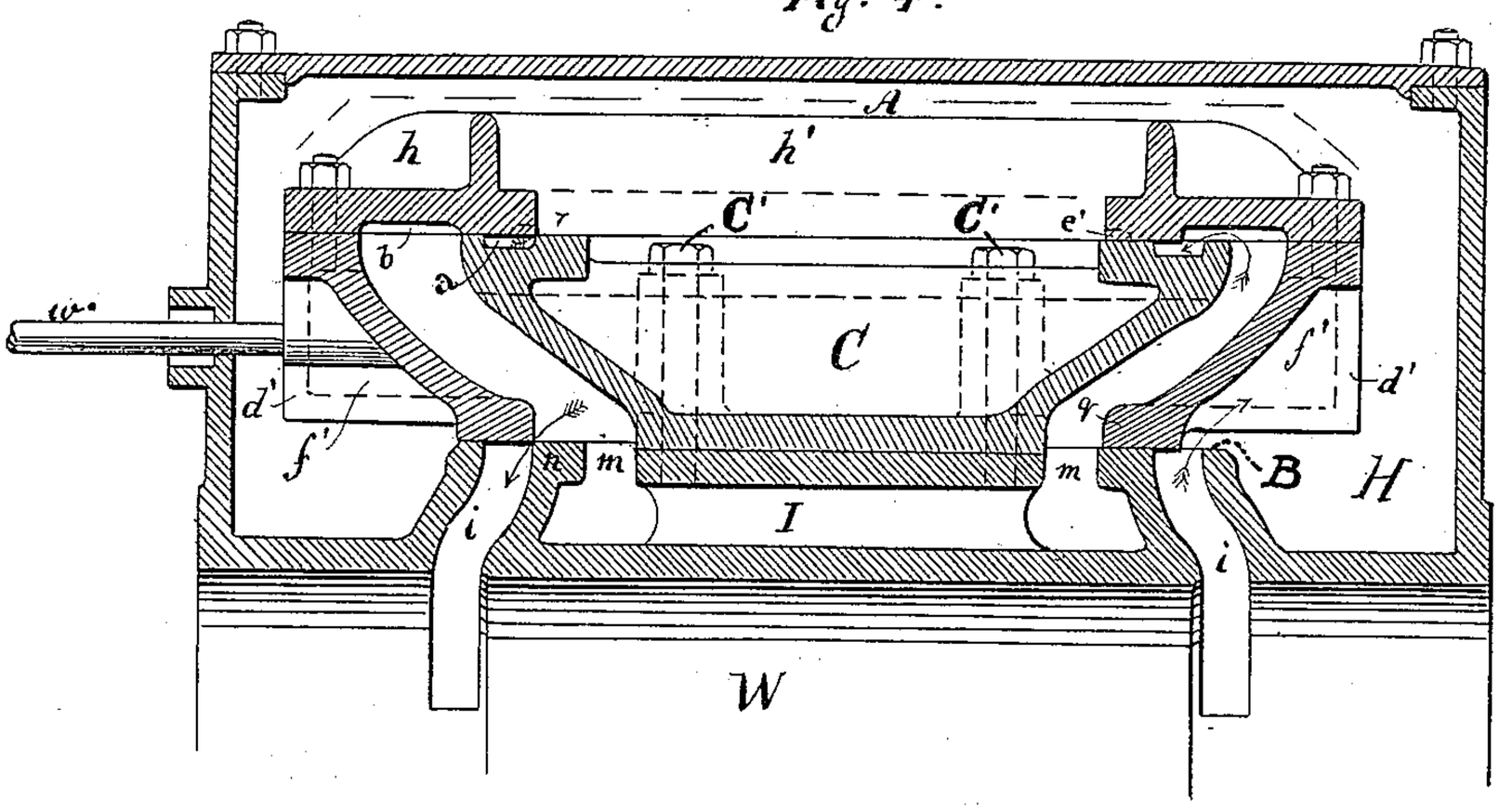
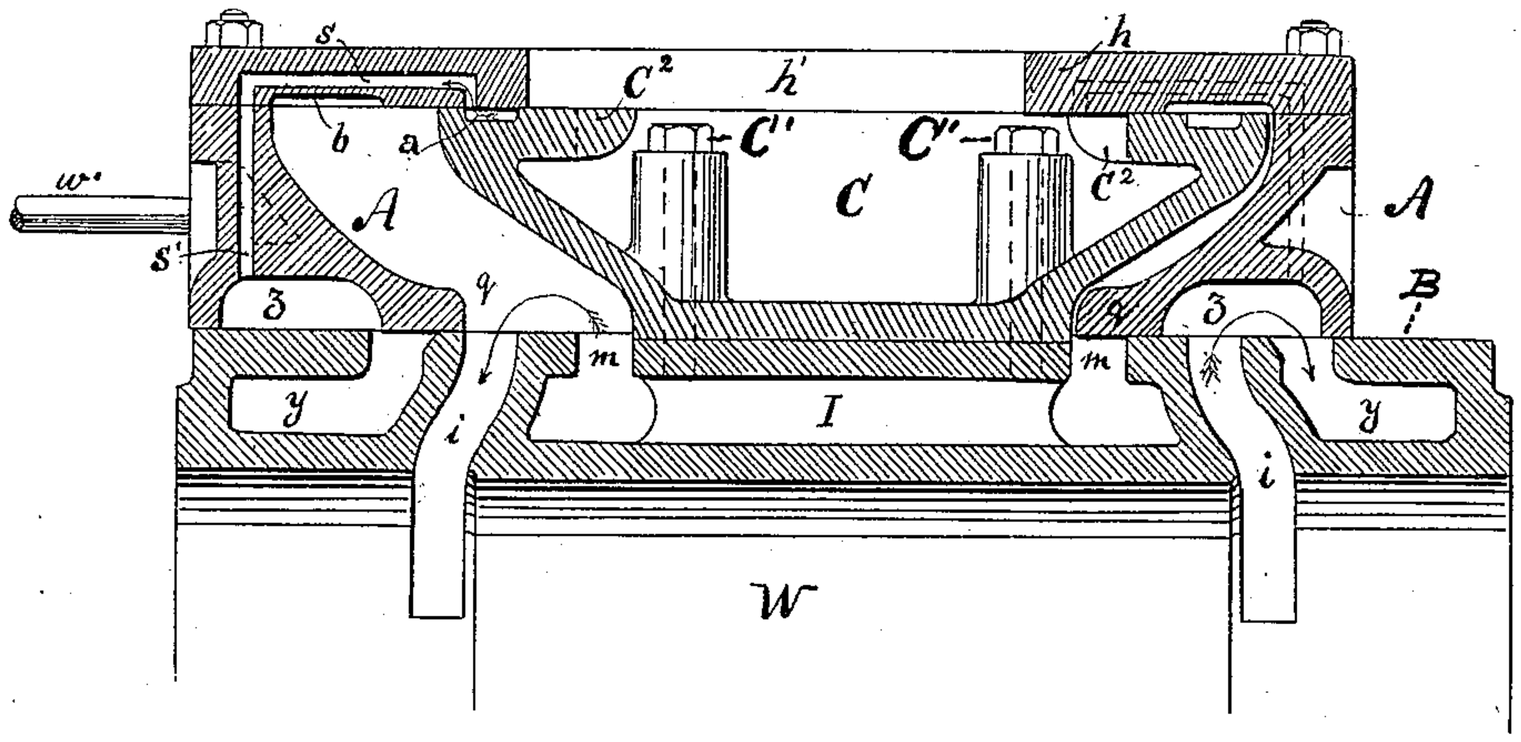


Fig. 5.



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UNITED STATES PATENT OFFICE.

GEORGE SCHUHMANN, OF READING, PENNSYLVANIA.

VALVE FOR ENGINES.

SPECIFICATION forming part of Letters Patent No. 334,089, dated January 12, 1886.

Application filed October 24, 1885. Serial No. 180,791. (No model.)

To all whom it may concern:

Be it known that I, GEORGE SCHUHMANN, a citizen of the United States, resident at the city of Reading, county of Berks, State of Pennsylvania, have invented a new and useful Improvement in Valves for Engines, of which the following is a specification.

This invention relates more particularly to slide-valves, and is an improvement upon Patent No. 315,844, of April 14, 1885, granted to myself.

The object of the improvement is to secure a more perfect balance than was attainable by said patent, and to adapt the valve to both locomotive and marine service by providing for a more equable expansion and contraction of the valve and a more uniform wear of the same.

The drawings herewith, in which like parts are represented by similar reference-letters, fully set forth the improvement, in which—

Figure 1 is a plan of the valve with part of the cover-plate removed therefrom. Fig. 2 represents in longitudinal vertical section the valve in its central position, the stationary distance-piece, and a portion of the cylinder. Fig. 3 is a transverse sectional elevation of the same parts. Fig. 4 represents the valve in longitudinal sectional elevation in the act of passing steam into the left-hand port and exhausting from the cylinder through the right-hand port into the valve-chest. Fig. 5 represents in longitudinal sectional elevation a valve of my improved construction arranged to be operated without a valve chest inclosure.

To enable an expert to make a ready comparison between my former patent (as referred to above) and my present improvement, I retain the same letters of reference for the prominent features of the same—

A representing the valve; B, the valve-seat; C, the distance-piece, which is secured to the cylinder by bolts C′, tapped into the valve-seat.

h is the cover-plate, which forms a part of the valve; *h′*, an opening through said cover.

p p represent the sides of the valve; *q q*, internally-projecting plates riding upon the valve-seat of the cylinder.

I is a steam-chamber formed in the shell of the cylinder W, and in communication with the steam-supply by a suitable inlet, I′, and with the interior of the valve by ports *m m*. Ports *i i* lead from the seat to the interior of the cylinder, and are separated from the ports *m m* by bridges *n n*; H, the exhaust-chest; W, the cylinder, and *w′* the spindle of the valve; H′, exhaust-outlet.

In constructing the valve the distance-piece C must be so proportioned that when live steam is passed into either of the ports *i i* the valve A shall not tilt up, but, as during the running of the engine the ports *i i* are alternately filled with live steam and exhaust-steam, the valve will be pressed hard to its seat at the exhausting end and partially lifted at the end of the same when the steam is passing by the port *i* into the cylinder, thus causing unnecessary friction and uneven wear. Now, in order to remedy this defect of my former patent, I construct in the top face of the distance-piece C cavities or recesses *a a*, (one near each end,) of about the same area as the ports *i i*. I also put ports, cavities, or recesses *b b* in the cover-plate *h* of the valve, and have them so arranged that at the moment the valve A arrives into a position that will permit the steam to exhaust from the port *i* into the chest H live steam will at the same moment enter the cavity *a* from the recess *b*, as shown in Fig. 2, or vice versa, as shown in Fig. 4.

When using the valve in connection with a link-motion or other form of variable cut-off where the exhaust closes early in the stroke, (locomotive practice, for example,) the exhaust-steam is compressed prior to the re-entering of live steam, causing the pressure in the closed or wire-drawn port to rise, while the cavity or recess *a* is still filled with live steam. Now, in order to counteract this upward-acting force and prevent the valve from being lifted from or forced off of its seat, I place small leak or relief holes *e e* or gutters *e′ e′* in the cover-plate *h*, and so located that as soon as compression begins in the port *i* the leak or relief hole *e* or gutter *e′* will allow the live steam in the cavity *a* to escape gradually therefrom, the leak or relief to be of such

size, and so arranged relative to the area of the port and normal speed of the engine, that the pressure of the steam in the cavity *a* will fall at about the same ratio as the pressure in the port *i* increases. These leak or relief openings may be either small holes *e*, as shown in Figs. 1 and 2, or small gutters *e'*, as shown in Fig. 4.

In order to counteract the lifting tendencies of the particles of steam that find their way between the rubbing surfaces, and in order to have the valve bear with an equal pressure all over its wearing-surfaces, the sides *p p* of the valve project inward, as shown in Fig. 3, thereby increasing the area of surface to be acted upon for retaining pressure upon said sides.

It will be noticed that the top face of the distance-piece C forms, practically, an exact duplicate of the valve-seat upon the cylinder, thus insuring equal wear upon both faces. When this valve is made upon a large scale, (as for marine and blast engines,) it becomes necessary to stiffen the distance-piece by means of one or more strengthening-ribs, *d*. As these ribs are entirely surrounded by exhaust-steam, they will (when made solid) take a lower temperature, and consequently will expand less than the sides *p p* of the valve, which have live steam in contact with one side of the same. This will cause the distance-piece, when so constructed, to warp out of shape and cause leakage. To prevent this, I make said strengthening-ribs *d* hollow, by casting either a hole or a slot, *f*, therein, as shown in Fig. 3, permitting the live steam to circulate through them, thus imparting to the ribs the same temperature and expansion as to the sides *p p* of the valve.

Although the drawings show the valve A with live steam in its interior, while the valve-chest H contains only exhaust-steam, the valve will work equally as well if the live steam is introduced within the chest and the exhaust is passed through the interior of the valve. The only difference in construction required would be that the leak or relief openings *e* or *e'*, instead of communicating with the valve-chest H, will communicate with the cavities *b b* of the cover *h* instead. I prefer, however, to have the live steam operate within the interior of the valve, as it allows inspection of the same under working conditions, which is a vital point in the construction of balanced valves. A valve may appear perfectly tight when cold; but the heat of the steam will distort some parts and cause leakage, and if the valve is inclosed in a chest the leak cannot be located, and as the valve will return again to its normal condition when the chest is opened and the steam let out it is mere guesswork as to where to apply the scraper for correction.

In my improvement the lid of the exhaust-chest may be removed and the valve be inspected all around while under working pressure. The engine, in fact, may be run with the lid removed. The valve can therefore be fitted until all leakage disappears, and when tight it will remain so, as the wear upon both faces is in the same direction. One cannot wear without the other wearing just as much. By extending the valve-frame, as shown in Fig. 5, forming exhaust-cavities *z z* within the same, and placing exhaust ports and passages *y y* in the cylinder-shell beneath the valve, the exhaust-chest may be dispensed with; or a hot-air jacket may be substituted, and the refrigerating action of the exhaust-steam on the outside of the valve will be done away with.

Occasionally it may be necessary in very large valves to stiffen the ends and sides of the same. In such cases I add bracket-ribs *d' d'* of suitable form, casting them as an integral portion of the valve, and with a core, *f'*, cutting through the valve-shell upon the inside of the same, as shown in dotted lines in Fig. 4, whereby equal expansion is provided for, as with the distance-piece already described. In a valve of this character arranged to be used without a chest I make suitable relief-passages, *s*, in the cover *h*, and passages *s'* in the ends of the valve, the first communicating with the cavity *a* and passage *s'*, and the latter with the exhaust-cavity *z* of the valve. To prevent blowing through the relief-passages *s s'* when the valve is at the end of its travel, as shown in Fig. 5, I add narrow prolongations c^2 c^2 immediately below and in line with the end of passage *s*, which effectually cut off the escape of exhaust-steam outside of the valve.

Having shown the construction, use, and value of my improvement, I desire to claim as follows:

1. The combination of a double-seated box-like slide-valve with a stationary distance-piece provided with balance cavities or recesses *a a* in its upper face, substantially as shown, described, and for the purpose set forth.

2. In a double-seated slide-valve, as described, provided with a stationary distance-piece, the ports *b b* in the inner surface of the cover-plate of the valve, substantially as shown, and for the purpose specified.

3. In a double-seated valve, in sliding combination with a stationary distance-piece, as described, the leak or relief holes *e* or gutters *e'*, located in the cover-plate *h* of the valve, as shown, and substantially for the purpose set forth.

4. The combination of a double-seated slide-valve with a stationary distance-piece, C, provided with hollow or slotted strengthening-ribs *d*, as shown, described, and for the purpose specified.

5. In a double-seated rectangular slide-valve, as described, the valve-frame A, having inwardly-projecting sides *p p*, substantially as shown, and for the purpose set forth.

6. In a double-seated slide-valve, frame A,

having inwardly-projecting sides *p p* and outward-projecting hollow strengthening-ribs *d' d'*, as shown and described, in combination with a fixed distance-piece, C, substantially as and for the purpose specified.

7. The combination of a steam-cylinder and double-seated slide-valve with a stationary distance-piece, C, having its wearing-surface of the same form and area as the valve-face upon the cylinder, substantially as shown, described, and for the purpose specified.

8. The combination of a steam-cylinder having a steam-chamber, I, inlet I', ports *m*, and exhaust-passages *y* in the shell of the same, with a double-seated slide-valve provided with relief-passages *s s'*, exhaust-cavities *z*, and cavities *b*, said valve having a reciprocating movement over a fixed distance-piece, C, with prolongations c^2, substantially as and for the purpose set forth.

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Witnesses:
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JAMES R. KENNEY.