July 21, 1931. A. H. MAYNARD 1,815,066

STAPLING MACHINE

Filed Jan. 28, 1930 2 Sheets-Sheet 1

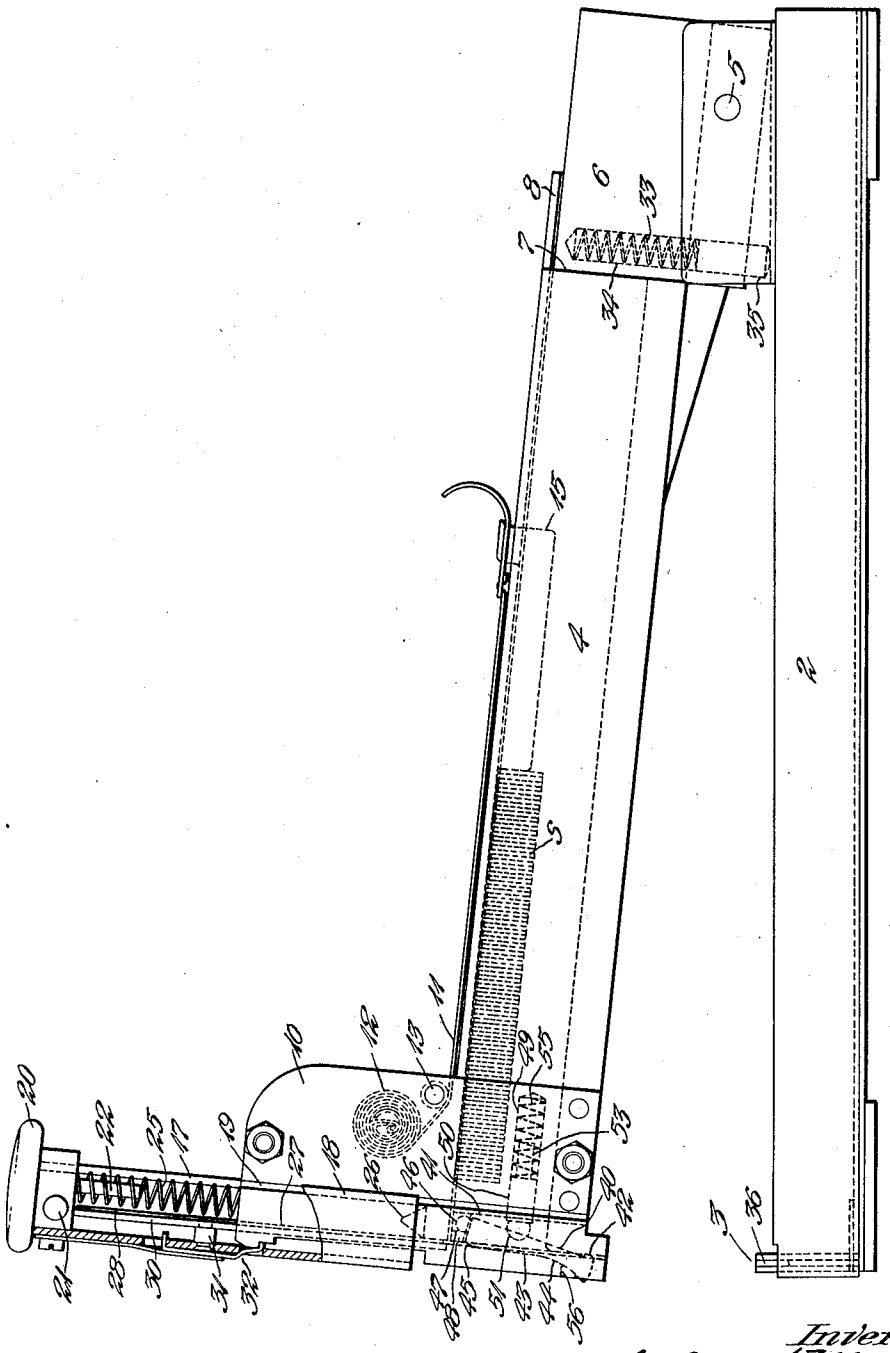


Fig. 1.

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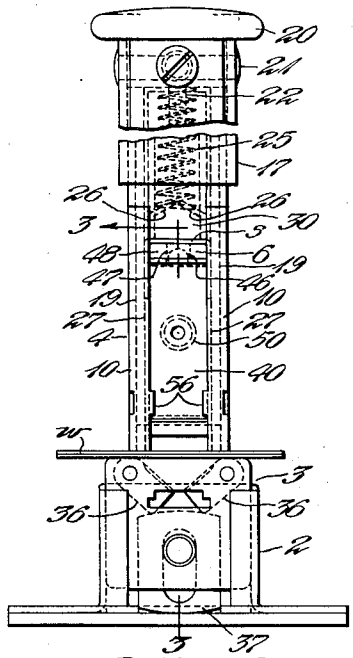


Fig. 2.

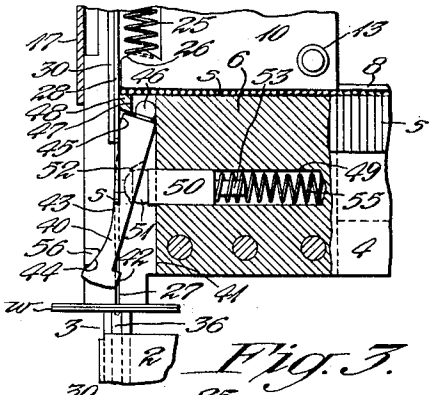


Fig. 3.

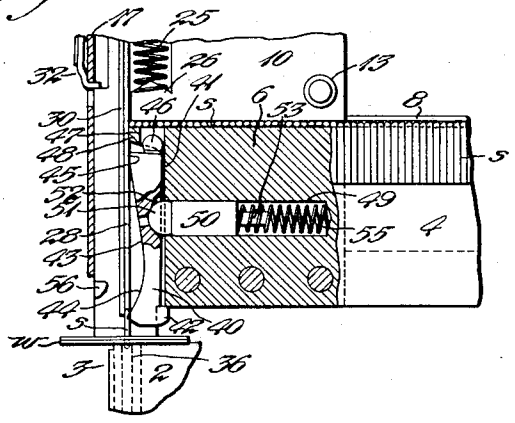


Fig. 4.

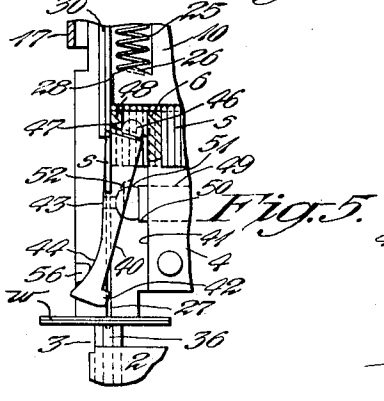


Fig. 5.

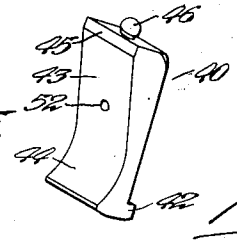


Fig. 6.

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Patented July 21, 1931

1,815,066

UNITED STATES PATENT OFFICE

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STAPLING MACHINE

Application filed January 28, 1930. Serial No. 424,052.

This invention relates to improvements in stapling-machines, wire-stitchers and kindred devices used for inserting staples in attaching sheets of paper, binding the leaves of signatures, and for other like purposes.

One object of the invention is to provide an improved construction of staple-supporter for holding and guiding the staple previous to and during its insertion into the work.

Another object of the invention is to provide a staple-supporter whereon the staple is sustained in raised position to prevent the feeding of another staple until the first one has been driven into the work.

Another object of the invention is to provide a staple-supporter for holding the staple against the driver throughout substantially the full stroke of the latter to insure that it is properly driven into the work without bending or buckling.

Another object of the invention is to provide a novel and improved mounting for the staple-supporter which adaptes it to yield more easily under the force of the staple-driver as the staple is driven into the work to thus present a minimum of resistance to the action of the stapling-means.

Further objects of the improvement are set forth in the following specification which describes a preferred form of construction of the invention, by way of example, as illustrated by the accompanying drawings. In the drawings:

Fig. 1 is a view in side elevation of a conventional type of stapling-machine illustrating the present improved staple-supporter as applied to use thereon;

Fig. 2 is a front elevation of the machine showing the stapling-arm depressed against the work and the staple-driver in raised position to adapt it to be operated to insert a staple;

Fig. 3 is an enlarged detailed view of the forward portion of the stapling-arm, shown in section on line 3—3 of Fig. 2, with the staple-supporter illustrated in normal position at the beginning of the downward stroke of the driver;

Fig. 4 is a similar view showing the staple-supporter in position near the completion of the stroke of the staple-driver;

Fig. 5 is a similar view showing the staple-driver in raised position with the staple held on the supporter; and

Fig. 6 is a perspective view of the improved staple-supporter.

The present improved staple-supporter is adapted for use with practically all types of wire-stitchers and stapling-machines and, as herein illustrated, it is applied to a hand-operated device similar to that shown in Letters Patent No. 1,780,530 granted Nov. 4, 1930, upon an application filed in my name.

As shown in Fig. 1 of the drawings the present stapling-machine comprises a horizontal base 2 carrying clincher-devices 3 at its forward end and surmounted by a stapling-arm 4 pivoted or hinged to the rearward end of the base at 5. The stapling-arm 4 contains a staple-core 6 in the form of a rectangular bar, across the top of which the staples *s* are straddled; sheet-metal strips 7 being attached to the sides of the core and folded across its top at 8 to retain the staples in place thereon. Riveted or otherwise secured to the sides of the stapling-arm 4 at its forward end are opposite parallel, vertical plates 10 which provide a housing or head for enclosing the stapling-mechanism to be later described.

A flat spring 11 is coiled into a volute at 12 and supported between the sides of the plates 10 with its free end extending rearwardly beneath a roller 13. The rearward extremity of the spring 11 is attached to a staple-pusher 15 which slides along the top of the staple-core 6 to successively feed the staples forward into position to be driven into the work; the construction and arrangement of these parts being as usually provided in machines of the present type.

Embracing the forward portion of the plates 10 is a hollow staple-plunger 17 formed from a folded strip of sheet-metal and provided with inwardly projecting runners 18 which slide in vertical grooves 19 on the sides of the plates. Seated in the top of the hollow plunger 17 is a knob or presser-cap 20 secured in place by a cross-pin or rivet

21. Depending from the bottom of the knob 20 is a pin 22 projecting through the upper coils of a helical spring 25, the lower end of which is supported on prongs or abutments 26 extending inwardly from the side-plates 10.

The side-plates 10 are formed on their inner faces with vertical grooves 27 which receive projecting fins or splines 28 on the edges of the staple-driver 30, whereby to slidably support the latter between the plates. The upper end of the staple-driver 30 bears against the under side of the presser-knob 20 and is secured to the front portion of the plunger 17 by means of a stud or rivet 31. The staples *s* are fed off from the forward end of the staple-core 6 into the grooves 27 to present them beneath the driver 30 which, when the plunger 17 is pushed downwardly against the resistance of its spring 25, causes the staples to be driven down through the grooves and into the work in the manner as later more fully explained. The plunger 17 is provided on its forward side with latching-devices, indicated generally at 32, which operate in the manner as described in my Letters Patent No. 1,780,530 above referred to whereby to prevent the staple-driver from being returned to first position unless or until the staple being operated upon has been inserted clear through the work.

The staple-arm 4 is maintained in elevated position above the base 2 as shown in Fig. 1, to provide for inserting the work under the stapling-head, by means of a spring 33. The spring 33 is held in a bore 34 on the under-side of the staple-core 6 and acts against a slidable plunger 35 which bears on the top of the base 2. The spring 33 is weaker or of less tension than the plunger-spring 25 so that when pressure is applied to the knob 20 the stapling-arm 4 will be pressed down to bring the stapling-head against the work before the plunger 17 starts to move downwardly.

The clincher-device comprises a pair of pivoted clinchers 36, illustrated in Fig. 2, arranged to be operated from a vertically sliding plate 37 to swing them upwardly to bend over the legs of the staple and clinch them against the work as the staple-driver completes the driving action. These parts are fully illustrated and described in the patent hereinbefore referred to and therefore need no further explanation.

Referring now to Figs. 3 to 6 of the drawings, the present improved staple-supporter consists of a substantially rectangularly-shaped member 40 which is pivotally mounted between the side-plates 10 within a recess 41 at the front of the staple-core 6. The rearward side of the supporter 40 has a substantially flat surface with an offset shoulder 42 at the bottom adapted to latch beneath the bottom forward edge of the staple-core 6. The supporter 40 is cut away on its front face at 43, being inclined rearwardly throughout the greater portion of its length and then curved outwardly at 44. At the top of the beveled or inclined face 43 is a narrow flat face 45 extending parallel with the plane of the rearward side of the supporter.

Projecting from the center of the top of the supporter 40 is a mushroom-shaped stud 46 having a substantially semi-spherical head which forms a pivot bearing for the supporter. The rounded head of the stud 46 projects into a cylindrical hole or opening 47 in an overhanging portion 48 of the staple-core 6, the hole being of slightly larger diameter than that of the stud so that the latter is allowed to oscillate or play therein.

Slidable in a horizontal bore 49 at the forward end of the staple-core 6 is a plunger 50 having a semispherical head 51 which engages within a beveled concavity or recess 52 in the rear face of the supporter 40. The plunger 50 has a rearwardly projecting stem 53 enclosed by the coils of a helical spring 55 which is pocketed in the bore 49, the spring tending to press the plunger outwardly to cause it to rock the staple-supporter 40 forwardly in the manner as illustrated in Figs. 3 and 5 of the drawings.

A pair of opposite lugs 56 project inwardly from the sides of the plates 10 near the bottom edges thereof, being rounded on their inner faces to adapt them to engage against the curved front face of the supporter 40 to limit its forward swinging motion, the upper end of the supporter being held against the pressure of the plunger 50 by its stud 46 bearing against the forward side of the hole or opening 47. The staple-supporter 40 is normally held pressed forward by the plunger 50 in the position illustrated in Figs. 1 and 5 of the drawings. In this position the upper flatted face 45 of the supporter extends obliquely across the grooves 27 in which the staples slide and thus prevents the staple from dropping down in the grooves after it has been fed off from the end of the core 6. The method of operation of the complete device is as next explained.

The stapling-machine is supplied with staples *s* placed in straddled relationship along the top of the core 6 with the staple-pusher 15 pressing against the rearmost staple in the series under the action of its spring 11. With the parts of the machine in the position as illustrated in Fig. 1, the whole series of staples will be slid forward with the foremost one fed off from the end of the core 6 into the grooves 27; the staple-driver 30 being raised to a position with its lower edge above the top of the core under the action of the spring 25 on the plunger 17. The staple-supporter 40 is held in its forward position under the action of the spring-

pressed plunger 50, and should the foremost or first-fed staple have a tendency to drop down in the grooves 27 its cross-bar or head will be caught on the flatted face 45 of the supporter to hold it suspended in the manner illustrated in Fig. 5. The staple *s* will thus be prevented from dropping down in the staple grooves to such an extent as to permit another staple to be fed off from the end of the staple-core 6. Consequently, not more than one staple can be fed into driving position at a time so that the chance of the machine becoming clogged is overcome.

The work to be stapled, indicated at *w* in Figs. 2 to 5, is placed across the clincher-device, represented at 3, and the operator then presses down on the knob 20 to swing the arm 4 downwardly until the lower edges of the plates 10 of the stapling-head bar against the top of the work. Continued pressure on the knob 20 will then act to depress the plunger 17 on the head to slide the driver 30 downwardly in the groves 27.

As the bottom edge of the driver 30 impinges against the top of the staple *s* suspended on the supporter 40 it will push the staple downwardly in the grooves 27 and the supporter will be forced back out of the way. At the first action of the driver on the staple held by the supporter the upper end of the latter will be moved bodily rearwardly to bring its inclined face 43 into approximate alinement with the rearward face of the driver 30, the stud 46 on the supporter being displaced rearwardly or moved back against the rearward wall of the opening 47 in which it is held, see Fig. 3. As the driver 30 continues its downward stroke its forward edge rides down the inclined face 43 of the supporter 40 and wedges it back with its upper end pivoting on the stud 46. Due to the easy incline of the face 43, and owing to the fact that the upper portion of the supporter 40 has been displaced rearwardly, the movement of the driver is resisted only to a very slight extent, the force of the plunger-spring 55 being divided between the top and bottom of the supporter to further reduce the resistance.

As the staple-driver 30 approaches the end of its downward stroke the staple *s* being operated upon rides onto the curved face 44 of the supporter 40 and the retractive movement of the latter is quickened. That is to say, as the edge of the staple-driver rides against the curved portion 44 of the supporter it will force the latter rearwardly with a quicker action, but the resistance to the stroke of the driver is not increased to any appreciable extent because the leverage of the supporter acting against the plunger 50 becomes greater. Stated briefly, as the point of engagement of the staple-driver with the front face of the supporter 40 recedes from the pivot point of the latter the leverage becomes greater and, therefore, the resistance to the stroke of the driver is reduced. Eventually, as the legs of the staple are driven through the work and the head of the staple approaches the ends of the grooves 27 the supporter 40 is forced back to entirely release the staple to adapt it to be set in the work.

As the staple-driver 30 finishes its descent the clinchers 36 are brought into action through the operation of instrumentalities as described in the patent hereinbefore referred to; the clinchers being moved upwardly to bend the legs of the staple inwardly and clinch them against the under side of the work. It will be understood that during the stapling operation the descent of the staple-driver 30 across the end of the staple-core 6 prevents the feeding of a new staple into position to be operated upon. After the stapling operation is completed the spring 25 acts on the plunger 17 to withdraw the staple-driver 30 and as the latter slides upwardly in the grooves 27 the staple-supporter 40 is rocked outwardly to follow its ascent. As the lower edge of the staple-driver 30 is raised above the top of the staple-core 6 the staple-pusher 15 feeds the next foremost staple in the series forward into the grooves 27, and if the fed staple has a tendency to drop down in the grooves it will be caught upon and sustained by the flatted face 45 of the supporter 40 which projects obliquely across the grooves. The parts of the device will thus be returned to the position shown in Fig. 1 in preparation for another operation of setting the staple in the work in the manner as before explained.

Through the above described functioning of the parts the machine is adapted to be operated continuously to successively apply staples to the work with the staple-supporter acting to prevent the fed staple from dropping down in the grooves 27 to permit the feeding of a new staple into driving position.

The present improved supporter also provides against driving one staple on top of another and further insures against the staples being bent or buckled during the driving action. That is to say, the staple is supported throughout the full length of its descent under the action of the driver until its legs are pierced through the work and brought into contact with the clinchers which bend them over to clinch the staple in place.

As another feature of the present improvement, the staple-supporter is so constructed and mounted as to cause it to present only a slight degree of resistance to the descent of the driver, thereby rendering the whole machine easier of action so that there is less liability of its being improperly or incompletely operated in applying the staples to the work.

While the improved device is herein de-

scribed and illustrated as embodied in a preferred form of construction, it is to be understood that modifications may be made in the structure and arrangement of its parts without departing from the spirit or scope of the invention. Therefore, without limiting myself in this respect, I claim:—

1. In a device of the type specified, the combination of a reciprocable staple-driver, means for successively feeding staples into position beneath the driver, and a staple-supporter pivotally mounted to extend across the path of the driver whereby to engage the staple to hold it in elevated position, said supporter being mounted at its upper end to adapt it to be bodily displaced rearwardly with respect to the driver and to then swing on its pivot as the driver descends along its forward face.

2. In a device of the type specified, the combination of a reciprocable staple-driver, means for supporting a series of staples at the rear of the driver, means for successively feeding the staples into position beneath the driver, a staple-supporter pivotally mounted at its upper end to adapt it to be bodily displaced rearwardly of the staple-driver and having an inclined forward face against which the driver acts during its descent to rock the supporter on its pivot, and resilient means for normally pressing said staple-supporter forwardly into position beneath the driver.

3. In a device of the type specified, the combination of a staple-core for supporting a series of staples, a staple-driver reciprocable across the end of the core, means for feeding the staples forwardly on the core to deliver them one at a time beneath the staple-driver, a staple-supporter pivoted at the forward end of the core to adapt it to rock outwardly beneath the driver, said supporter having an upper inclined forward face terminating in an arcuately concaved portion at its lower end, and resilient means for rocking the supporter to normally maintain its upper inclined face biased across the path of the staple-driver.

4. In a stapling-machine, the combination of an arm for supporting a series of staples, a stapling-head at the forward end of the arm provided with opposite grooves for receiving the staples fed off from the arm, a staple-driver reciprocable in the grooves of the head, means for feeding the staples along the arm to successively deliver them into the grooves in the stapling-head, a staple-supporter pivoted within the stapling-head at the forward end of the stapling-arm and provided with an upper inclined forward face terminating in an arcuate lower portion, and resilient means for tilting the supporter on its pivot to normally maintain its upper forward face inclined at a relatively slight angle across the grooves in which the staple-driver slides.

5. In a stapling-machine, the combination of a stapling-head having opposite grooves for receiving staples, means for successively feeding staples into said grooves, a staple-driver reciprocable in said grooves, a staple-supporter provided with a relatively short flat face at its top and an inclined forward face extending downwardly therefrom and terminating in a concaved portion, means for pivotally mounting said staple-supporter at the rear of the grooves in the stapling-head, and resilient means for tilting said staple-supporter into position with its upper flat face extending obliquely across the grooves to adapt a staple to be suspended thereon in line with the grooves and with the inclined face of the supporter at a slight angle to the grooves whereby when the staple-driver descends to drive the staple the latter will follow along the supporter to be sustained thereby beneath the driver without offering appreciable resistance to the stroke thereof.

6. In a stapling-machine, the combination of a stapling-head having grooves for receiving the staples to be driven into the work, means for successively feeding staples into the grooves, a staple-driver reciprocable in said grooves, a staple-supporter having a front flat face curving forwardly toward its lower end, means for pivotally mounting the staple-supporter to adapt its upper end to be moved bodily and rearwardly with respect to the grooves in the stapling-head, and resiliently-operated means acting against the staple-supporter to normally force its upper end forward across the staple grooves whereby the staple-driver in its descent will move it bodily rearwardly and then act against the flat face of the supporter to rock the latter on its pivot as the staple descends in the grooves.

7. In a stapling-machine, the combination of a reciprocable staple-driver, means for successively feeding staples into position beneath the staple-driver, a staple-supporter pivotally mounted at the rear of the driver and formed with a forward flat face on its upper portion adapted to be engaged by the driver during its descent, resilient means for rocking the supporter forwardly, and means for limiting the movement of the supporter to maintain its forward face inclined at a slight angle across the path of the driver to adapt it to suspend the staple being driven against the lower edge of the driver throughout the descent of the latter.

8. In a stapling-machine, the combination of a staple-core for holding staples, a staple-driver reciprocable across the core, means for feeding the staples one at a time from the core into position beneath the driver, a staple-supporter having a forward flat face adapted to be engaged by the bottom of the driver during its descent to drive the staple into the work, means for pivoting the staple-sup-

porter to adapt its upper end to move rearwardly with respect to the driver and to permit its lower end to swing forwardly across the path of the driver, and resiliently-operated means for normally maintaining the supporter with its upper end in forward position and its front face inclined across the path of the driver.

9. In a stapling-machine, the combination of a stapling-head having opposite grooves for receiving staples, a staple-driver slidable in said grooves, means for feeding staples into the grooves in position beneath the driver, a staple-supporter having a relatively short flat face at its upper end, an inclined front face extending downwardly therefrom and curved outwardly at its lower end, means for pivotally supporting the upper end of the staple-supporter to adapt it to be moved bodily rearwardly with respect to the staple-driver, and resiliently-operated means acting against the rearward side of the staple-supporter to project the latter forward with its upper face inclined at an abrupt angle across the staple-receiving grooves and with its front face inclined at a lesser angle to the grooves.

10. In a stapling-machine, the combination of a staple-core across which the staples are straddled, a staple-driver reciprocable across the end of the staple-core, means for feeding the staples along the core to successively deliver them into position beneath the staple-driver, a socket opening at the forward end of the staple-core, a staple-supporter having a spherically-shaped stud received within the opening at the end of the core and of lesser diameter than the opening to adapt it to move rearwardly with respect to the staple-driver, a plunger reciprocable in the core and bearing against the rearward side of the staple-supporter, a spring for sliding the plunger to carry the upper end of the staple-supporter forward and acting to tilt its lower end into position with its forward face inclined across the path of the staple-driver, and means for limiting the forward swinging movement of the staple-supporter.

In testimony whereof I hereunto affix my signature.

ARTHUR H. MAYNARD.