3 Sheets. Sheet 1.

L. W. Spencer,

Plug Tobacco Mach.

No. 106,883. Patented Aug. 30. 1870.

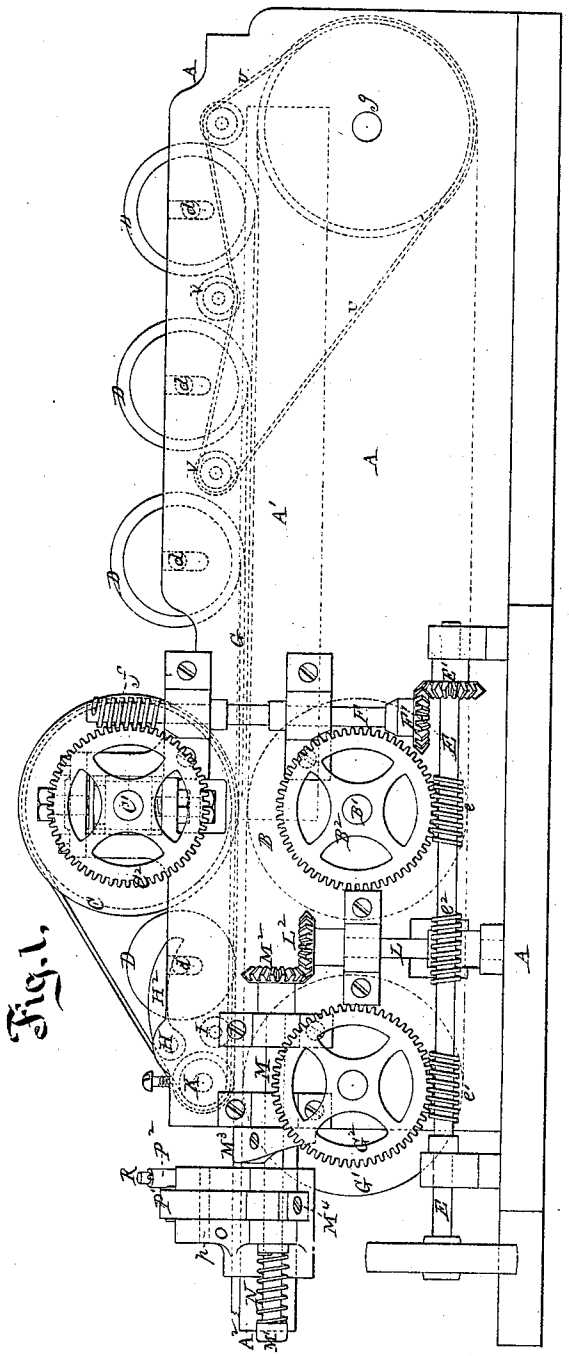


Fig. 1.

Witnesses. A. Hoermann. Wm. C. Dey

Inventor. L. W. Spencer by his attys C. A. Stetson

N. PETERS, PHOTO-LITHOGRAPHER, WASHINGTON, D. C.

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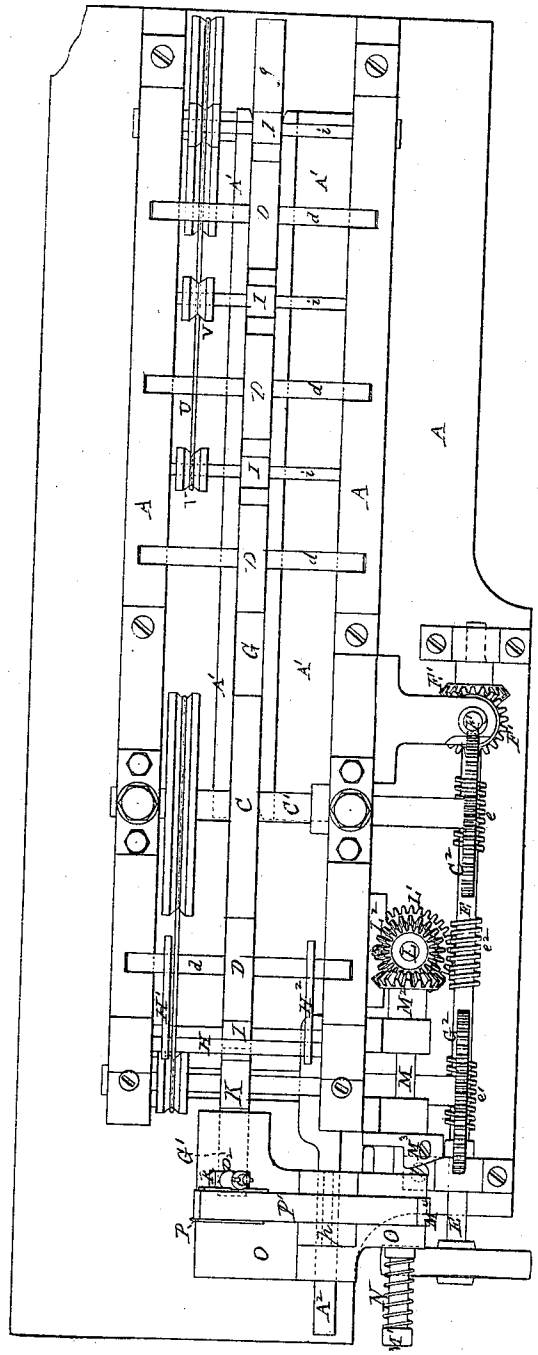
3 Sheets, Sheet 2.

Plug Tobacco Mach.

No. 106,883.

Patented Aug. 30. 1870.

Fig. 2.



Witnesses,

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3 Sheets. Sheet. 3.

Plug Tobacco Mach.

No. 106883. Patented Aug 30. 1870.

Fig. 3.

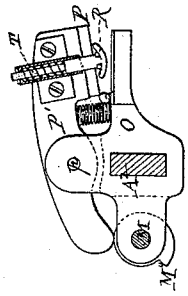


Fig. 3.

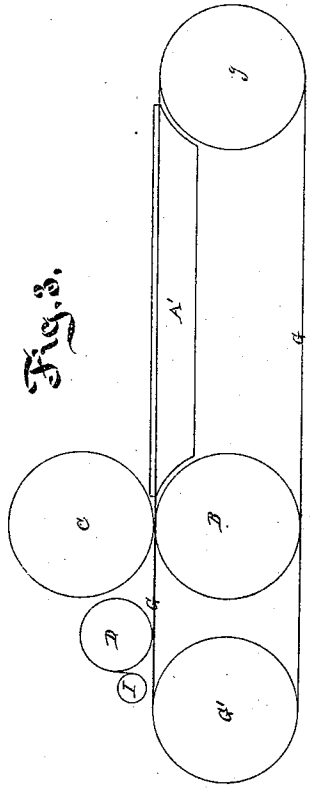
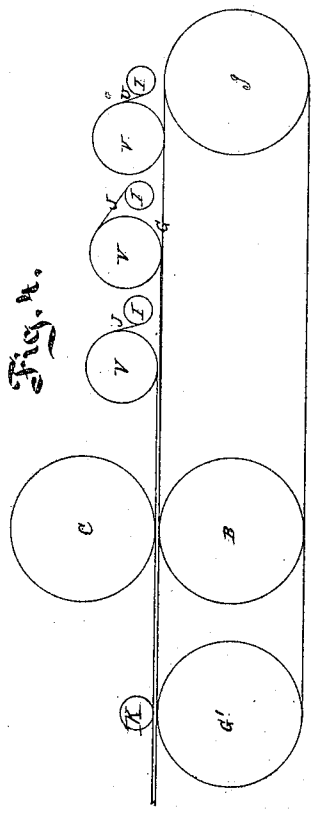


Fig. 4.



Witnesses,

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Inventor,

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UNITED STATES PATENT OFFICE.

LEWIS W. SPENCER, OF NEW YORK, N. Y., ASSIGNOR TO PETER LORILLARD, OF SAME PLACE.

IMPROVEMENT IN PLUG-TOBACCO MACHINES.

Specification forming part of Letters Patent No. **106,883**, dated August 30, 1870.

To all whom it may concern:

Be it known that I, LEWIS W. SPENCER, of the city and county of New York, in the State of New York, have invented certain new and useful Improvements in Machines for the Manufacturing of Plug-Tobacco; and I do hereby declare that the following is a full and exact description thereof.

I designate as "plug" all the varieties of tobacco which are densely compressed together, whatever may be their form or dimensions. It is universally common to make such tobacco of uniform thickness. My machine is adapted therefor, though it is possible, by suitable indentations in the wheels and appliances, to regulate their distribution to adapt it to produce swelled or other forms, which fashion or taste may require.

I will describe my machine as adapted to produce the ordinary plug-tobacco now in vogue, which, in its largest size, is about three inches wide, half an inch thick, and twelve inches long. I employ the principle which has been long approved in this and other branches of manufacture, of subjecting the material to pressure by passing it between rolls. The pressure thus induced is very severe, though not as long-continued as that induced by the screw, hydraulic, or other forms of flat presses. It allows the manufacture of strips of great length with machines of moderate size and weight.

I have invented an improvement in the form of the tobacco itself, which I propose to make the subject of another and separate patent. It is superior to the ordinary plug-tobacco, in being more evenly compressed throughout its entire thickness. It is induced by a previous compression of the material into independent thin layers, a little more than one-third, one-fourth, or other desired aliquot part of the thickness of the finished plug. My machine is more especially intended for the manufacture of such improved plug-tobacco; but some of these novel features may be used with advantage in the manufacture of other plug.

I will proceed to describe what I consider the best means of carrying out my invention, and will afterward designate the points which I believe to be new.

The accompanying drawing forms a part of this specification.

Figure 1 is a side elevation of the machine. It shows the parts which are exchangeable in position, and shows them in both positions. This will be made clear below. Fig. 2 is a plan view of the same. Fig. 3 is an outline diagram, showing the parts which are used, and in the positions they are made to assume while the tobacco is being compressed in thin layers preliminary to the applying of the latter together. Fig. 4 is a corresponding diagram, showing the parts and in the positions when the thin layers are applied together. Fig. 5 is a view of the knife, knife-carrier, stripper, carriage, and face-cam, with the springs employed in connection. It shows also a cross-section of the guide which extends out from the frame to support and guide the carriage, and a cross-section of the shaft which drives the knife.

Similar letters of reference indicate like parts in all the figures.

A is the fixed frame-work of the machine, which may be of iron or any other suitable material, preferably of cast-iron, especially at and about the compressing-rollers, where a great strain is experienced. B is the lower compressing-roll, and C the upper compressing-roll. Each has a large diameter relatively to the length of its working portion, and may be, perhaps, more properly denominated a "wheel;" but its function is that of a roll, to seize and gradually, smoothly, and powerfully compress the material which is drawn between it.

I have designated the shafts respectively B^1 C^1. They must be sufficiently thick to endure a considerable strain without appreciable springing or bending.

Stout worm-wheels B^2 C^2, fixed on the shafts B^1 C^1, are driven simultaneously by the worms *e f*, mounted and geared as represented. The worm *e* is on the shaft E, through which the power is received which actuates the entire machine. It may be turned by a belt from a steam-engine, or by any other suitable means, and while it actuates more directly the wheel B^2, and consequently the lower roll, B, it actuates, by means of the beveled gears E^1 F^1 and the shaft F, the worm *f*, which drives the up-

per roll, C, with a precisely corresponding motion. The means whereby the shaft E also imparts motion to the other members of the mechanism are indicated in the drawing, and will be described farther on.

The tobacco is introduced into the machine by being placed on an endless belt or feeding-apron, G, which passes through between the rolls B and C, traveling at the same rate as the surfaces of those rolls, and, consequently, presenting the tobacco at a corresponding rate. The tobacco is distributed upon the band G as evenly as may be by any of the approved methods, but much more thinly than usual.

The unavoidable irregularities in thickness at different points, due to want of perfection in the supplying of the material with absolute uniformity on the feeding-apron, are distributed by my method of duplication of the layers, and the result is greater evenness in the thickness of the plugs than by any previously known practice; but this is only one of several advantages due to my system.

When, as here assumed, I make the plug-tobacco of three separate layers, compressed together, I distribute only a little more than one-third the usual quantity on any given length of the band G, and the rolls B and C are set at a correspondingly small distance apart. The band or apron G runs over the pulleys G^1 and *g*. The pulley G^1 is the driving-pulley. It is actuated by the worm-wheel G^2, driven by the worm e^1, which is fixed on the shaft E, before described.

By proper attention in determining the ratio of the sizes and the pitch, very perfect uniformity in the motion of the surfaces of the rolls B and C and of the pulley G^1, and consequently of the band G, can be secured.

The pulley *g* is merely a stretching-pulley. Its bearings, like that of most of the shafts, may be provided with any ordinary means for adjustment, not only to maintain the truth of its position, but to move it axially in one direction or another, to adapt it to any contraction, or, what is more likely, any stretching, of the apron G.

The apron passes over a supporting-table, which forms a portion of the main frame. This table is represented by A^1, and extends nearly the whole of its distance, except where it is passing over pulleys.

There is represented a series of spools and rollers above the feeding-apron G, the function of which relates to the subsequent operations upon the tobacco, and will be explained below. It is sufficient for the present to observe that means are provided for readily removing these and their connections, and that this should be done when the tobacco is to be supplied.

The thin layer of compressed tobacco, destined to form one-third of the final finished plug, is coiled up on a roller, D, which rests upon the band G just in rear of the roll C. This roller D performs the function of a receiver, to receive material coiled around upon itself, and thus gradually increasing its diameter. The shaft or spindle *d* is consequently allowed to rise and sink, as required, in guides or grooves in the framing A, and when a sufficient quantity of the thin tobacco has been thus stored upon the periphery of this roll D, it is removed and a new one substituted. For convenience, I will designate these rollers D and their spindles *d* as simply rolls. They are, of course, introduced empty, and as they gradually accumulate the material, the shaft *d* rises. It is important to guide the roll during its operation, not only by holding in the grooves or guides to prevent its displacement, but also to hold it in a perfectly level position as it rises. This is effected by the curved levers or arms H^1 H^2, which are fixed firmly on the shaft H, mounted in the frame A, in the position represented, and free to revolve or to perform a partial revolution.

The arms H^1 H^2 rest upon the shaft or spindle *d*, and hold it gently down at each end. Neither end can rise more than the other without lifting its arm, and consequently lifting the corresponding arm from the opposite end. The gravity of both arms H^1 H^2, being thus concentrated upon the end which tends to lift the fastest, immediately brings it back to its proper position, and the result is a perfectly level position of the shaft *d*, and consequently a perfectly true position of the spool during the whole period of its filling. In case the arms H^1 H^2 are not made sufficiently heavy to effect this purpose with certainty, they may be weighted.

The plastic character of the moist and compressed tobacco makes it expedient to provide some efficient means against the chance of the several coils sticking together upon the spools, and refusing to properly unwind when required. I is a small spool, containing a long strip of muslin. When the spool is introduced and the tobacco is attached thereto to be wound up, the end of the strip of muslin is also attached, so that it winds around with it, and exterior to it. As the tobacco continues to accumulate by the slow revolution of the spool, the strip of muslin is drawn off from the spool I, and when a sufficient quantity of tobacco is stored on the roll D and the roll removed, the muslin remains between the several coils to aid in their easy uncoiling.

I esteem it preferable to predetermine the length of the strips of tobacco which are thus coiled upon the rolls D, and to provide pieces of muslin of exactly corresponding length. This avoids any necessity for breaking, cutting, or wasting the muslin, and the same may be used many times over.

It will be understood that such band or other parts of the machine may be washed, and that the rolls and other parts may be lubricated with dilute alcohol, or other suitable material.

The spools I, carrying the muslin, may be removed and replaced when desired.

I will designate the muslin strip by the let-

ter J, whenever it shall be necessary in the description of the subsequent operations.

It is not absolutely essential to the success of the other portions of the mechanism that the strips of muslin J shall be introduced from a spool placed in the position indicated by I. They may be delivered from a spool or other carrier upon the belt or apron G before it receives the tobacco, and it may thus be passed through the compressing-rolls and subjected, with the tobacco, to the powerful compression thereof, if it is for any reason preferred. It will in such case obviously apply much closer to the tobacco, and will be likely to stick with more force and involve more difficulty in its removal.

It will be understood that the rolls D and spools I, carrying the tobacco and the muslin, are stored away in a convenient position, and that the operation thus continues until a sufficient quantity has been produced to warrant a change of the machine into the condition necessary to effect the subsequent operation.

In the doubling and compressing together of the several thin layers, I make use of the several other parts represented in the figures, and not yet described.

I introduce three of the filled rolls D in the positions shown, so that they rest upon the band or apron G, in front of the compressing-rolls B C. The rolls B C being adjusted at the proper increased distance apart, and no spool I being supplied in the position where one was before employed behind the rolls, the machine is again worked, and the several thin layers or strips of compressed tobacco are delivered from the several rolls D upon the apron G, and laid one upon the other, so that they arrive between the compressing-rolls B C in three separate layers. The compression to which they are now subjected, being as great as, or, if necessary, considerably greater than, before, forces the several previously dense layers into intimate contact and firm union, and diminishes the thickness of each a little.

The densely-compacted and nearly homogeneous thick strip of tobacco issues from the rolls B C in a condition ready for cutting off into proper lengths, which is effected by peculiar mechanism, which I have provided and attached.

To diminish the chances of the tobacco being loosened up or displaced, or having its length improperly increased or diminished, on its passage from the rolls B C to the cutting-knife, I provide a governing-roll, K, which is mounted in the position represented and driven with a surface-speed exactly corresponding to that of the apron G.

The tobacco slowly and steadily moves past the governing-roll K and is received upon a reciprocating carriage, O, carrying a knife, P. This carriage alternately moves forward under the tobacco until it is close to the pulley G^1 and governing-roll K, and then moves backward with a velocity exactly corresponding to the continuous progressive movement of the tobacco. As it thus moves backward the knife descends and severs the tobacco. Then the knife rises, the carriage still moving backward at the same rate, and, after the knife is again lifted clear of the tobacco, the carriage again shifts its position forward under the tobacco, and thus receives a just sufficient length for the next plug. It thus measures and cuts off the tobacco continuously so long as the tobacco is properly supplied. This operation is effected by mechanism driven by the worm e^2. This worm operates the worm-wheel L^1 on the upright shaft L, and thus, through the beveled gear-wheels L^2 and M^2, turns the horizontal shaft M. This shaft is mounted outside the frame A and parallel to the motion of the tobacco. It is supported in bearings on the frame, and carries two cams—a side cam, M^3, and an eccentric or face cam, M^4. The latter cam is free to slide lengthwise of the cam M by means of a spline and feather.

The function of the side cam, M^3, is to move the carriage O, which extends out and encircles the shaft M each side of the cam M^4, as represented.

The side cam, M^3, gives this carriage its backward motion, which must be exactly measured, so as to coincide with the movement of the tobacco.

The return or forward motion may be more rapid and regular. It is effected by a spring, N, which is a spiral spring coiled around the shaft M, and finding its abutment in a flange, M^1, on its back end.

The function of the eccentric-cam M^4 is to operate the knife P, and also a stripper or holding-down piece, R, which has not before been referred to.

The knife is bolted firmly on a lever, P^1, turning on a center, *p*, supported on the carriage O, as represented.

The cam M^4 tilts this lever to depress the knife P, and when it is released by this cam the lever returns and holds the knife again in its elevated position by the force of a spring, Q.

The stripper R has a broad smooth face, slightly rounded, by preference, which is adapted to press on the upper surface of the plug, near the knife. It has a long shank, which runs in a guide fixed on the side of the lever P, and it is forced down with sufficient force by the action of a spiral spring, T, inclosed within the guide P^2, the force of which may be made adjustable by any convenient means, if found necessary.

The carriage O, with its appurtenances, being guided by an extension, A^2, from the frame A, moves quietly outward and back, and the knife smoothly cuts off the plug at each operation, while the tobacco adjacent is held by the stripper or holding-down piece R against the possibility of disturbance. To vary the length of the tobacco, it is necessary simply to correspondingly change the motions of the carriage O and of the knife P.

The length of traverse of the carriage O

need not be equal to the length of the plug. It is obviously impossible to make it exactly equal, because, however quickly the carriage O and its appurtenances are moved forward by the action of the spring N when released by the cam M^3, this movement will necessarily require a certain amount of time, during which the tobacco continues to move forward.

In practice, I allow a considerable movement of the tobacco across the carriage, not only during the return motion of the carriage O, but also during a period after its return, while it is allowed to remain in a state of rest near the governing-roll K.

When the proper period arrives the cam M^3 commences to move the carriage O backward at exactly the proper speed, and this motion is continued only during the period while the knife is descending and rising again.

To change the length of the tobacco I change the cam M^3, and also the gearing, so as to vary the rate of rotation of the shaft M.

I have in the figures represented the machine in both the conditions—that is, the condition in which it receives the properly moistened and prepared leaf-tobacco and compresses it into the dense layers, and the condition in which it applies and compresses these layers together to form the finished plug, and cuts off the same; but it will be obvious that in conducting a large manufactory the trouble of preparing a large quantity of rolls D and spools I, and storing them prior to a change of the machine, and the labor of changing and readjusting the several parts of the machine at short intervals, may be avoided by the use of two of my machines, one kept permanently in the condition for receiving the loose leaf and delivering it in thin dense layers, and the other permanently in the condition for receiving the dense layers and delivering as finished plug.

The plugs cut off by this means, smoothly and in exactly proper lengths, may be afterward treated in the ordinary manner, as above explained.

All the operations peculiar to my invention may be considered as concluded when the knife P has performed its function, and the densely-compressed plug has been pushed off or taken by hand or otherwise by the carriage O. I provide for the convenient storing of the strip of muslin during the unwinding of the tobacco from the spools in the duplicating process by causing it to be drawn off and wound upon empty spools I, introduced in the position indicated in Fig. 4. These are rotated by a round band, U, working upon grooved pulleys V, fitted temporarily on the spindles *i* of the said spools. The band tends to rotate the spool I with a velocity a little greater than the tobacco is unwound. This tends to draw the muslin tight and facilitate its removal from the tobacco in case it adheres. The provision for stripping also allows the proper tension to be maintained under all conditions of the spools I—that is, whether they are nearly full, or are freshly supplied with the strips of the muslin J. I propose to wind a great number of the strips J upon a single spool, I; but this is not material.

Many of the details of my machine may be varied within wide limits without sacrificing all the advantages of my invention. Some parts of the machine may be used with good effect in combination with other old and long-approved machinery.

I propose, especially, to modify the thickness and the material of the separating-layer J as shall be found expedient with practice with different kinds and different thicknesses of tobacco. I have used in my experiments ordinary unbleached and unsized muslin; but I propose to use rubber, gutta-percha, woven wire, thin sheet metal, or various cloths, felts, and compositions, as may be found expedient.

I do not in this application claim the method, in its broad and general sense, of treating tobacco by many rollings, and applying together the several products to form one plug; nor do I claim in this application the improved compound plug produced, these being made the subjects of other applications for patent filed simultaneously with this. I do not limit my entire invention either to the precise form of the parts, or to the combination of all the parts of the machine; but

I claim—

1. The carrier G, pressing means B C, roll D, and suitable guiding means for maintaining its parallel motion as the tobacco accumulates thereon, combined and arranged for joint operation, as herein specified.

2. The within-described means for applying together the tobacco from several separate rolls, D—that is to say, the arrangement of a series of two or more rolls, D D, so that they shall deliver in succession upon the single carrier A, in combination with means B C, or their equivalents, for compressing and firmly uniting the layers in a plug of the proper thickness, as specified.

3. In combination with the last above, drawing off the separating material J by means of spools I, driven by friction, as specified.

4. In combination with means for pressing the tobacco into a plug, a knife reciprocating backward and forward, moving at the same rate as the tobacco when traversing outward, and raised and depressed squarely, substantially in the manner and for the purposes herein set forth.

5. In combination, the operating-shaft M and means for raising and depressing the knife and the changeable cam M^3, with suitable changeable gearing for giving a variable traverse to vary the length of the plug, when arranged to operate, in combination with means B C, for pressing and delivering plug-tobacco, substantially in the manner and for the purposes herein set forth.

6. The stripper or holding-down piece R, arranged and operating, as represented, relatively to the knife P and carriage O, and to

the means B C for presenting the tobacco, as specified.

7. The governing-roll K, arranged and operating relatively to the compressing-rolls B C, carrying-apron G, and measuring and cutting means P Q and their connections, as and for the purposes specified.

In testimony whereof I have hereunto set my name in presence of two subscribing witnesses.

L. W. SPENCER.

Witnesses:
WM. C. DEY,
A. HOERMANN.