F. BENTLEY.

BRAIDER MECHANISM.

APPLICATION FILED MAR. 4, 1912.

1,154,964.

Patented Sept. 28, 1915.

Fig: 1.

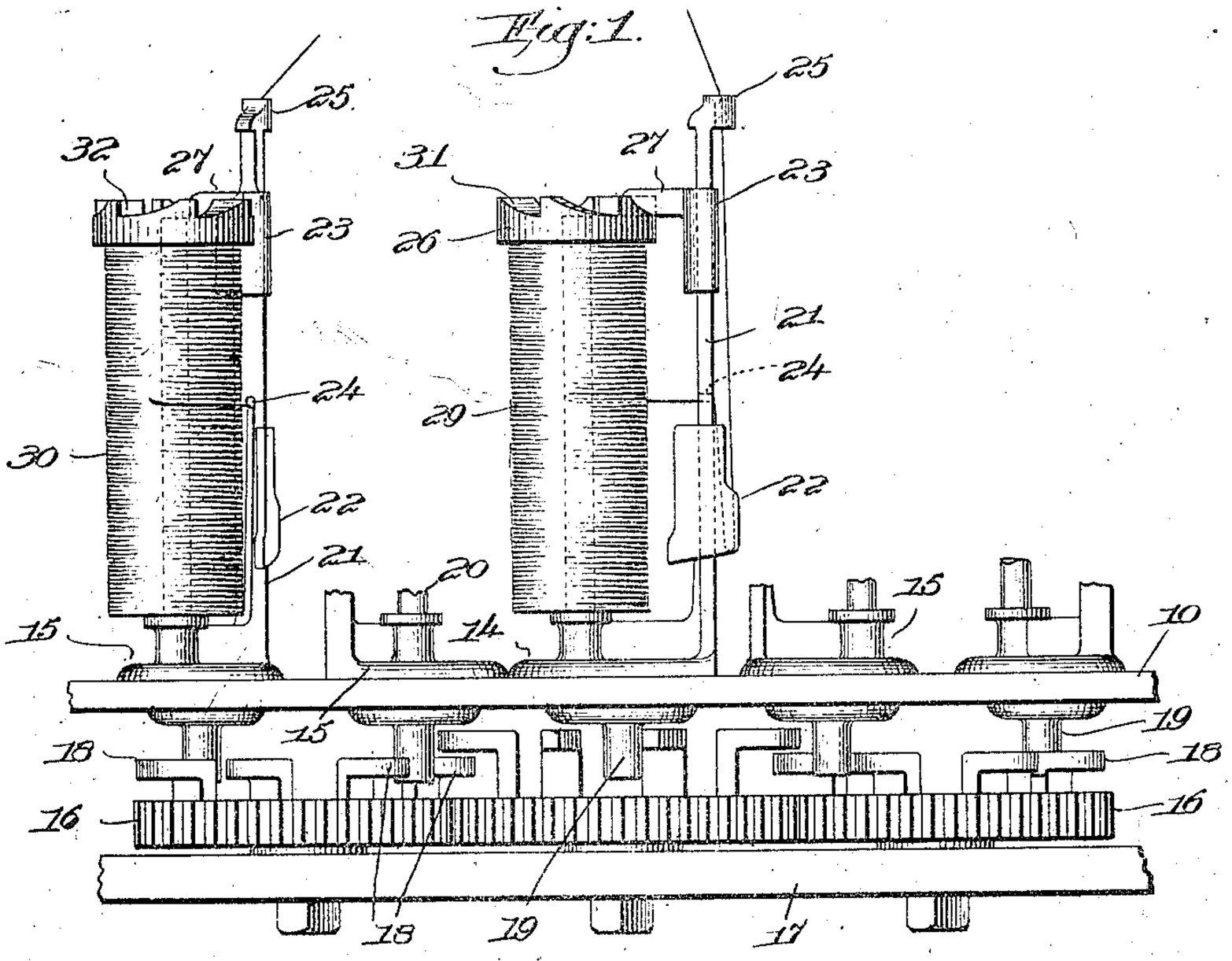
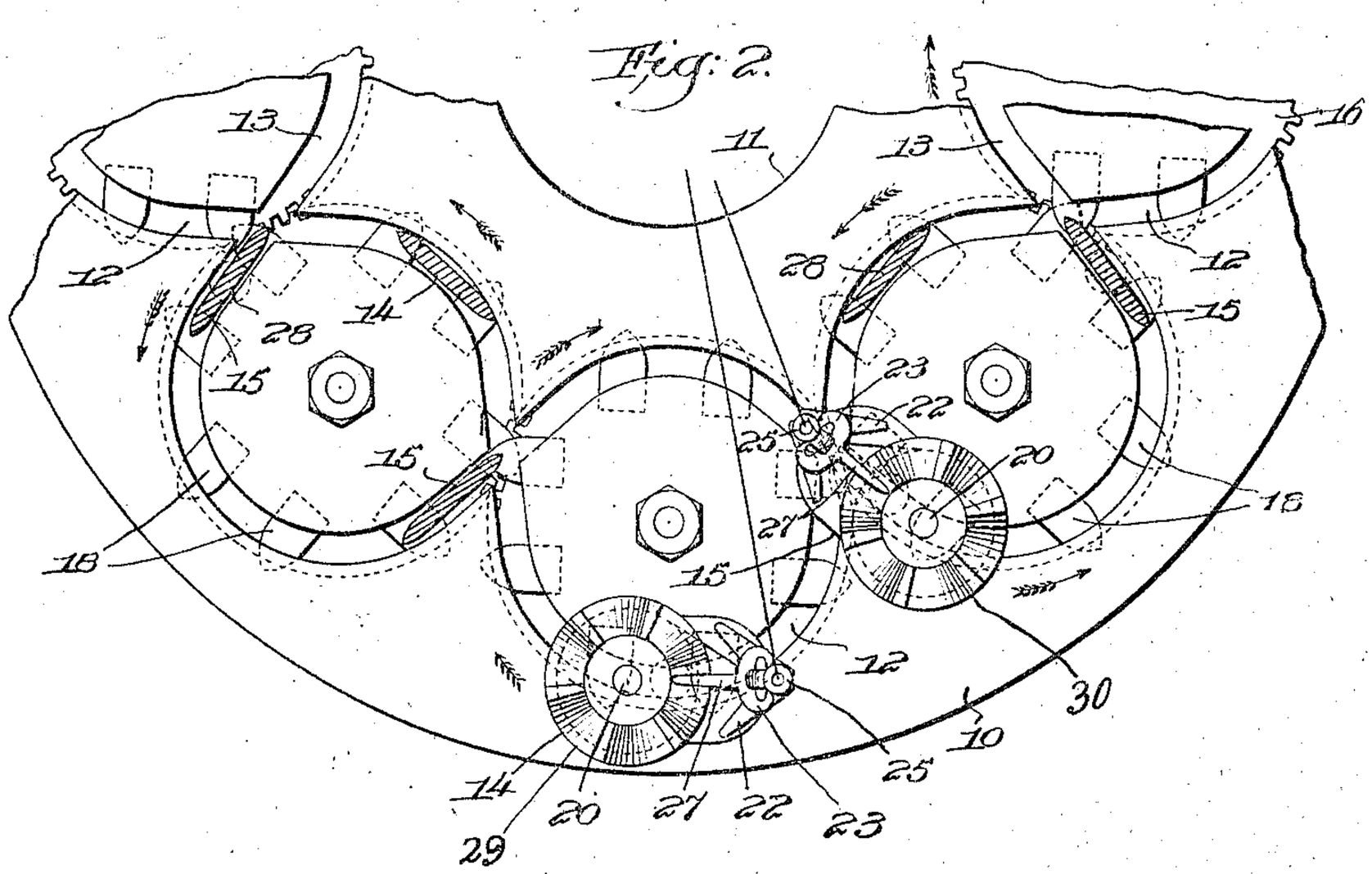


Fig: 2.



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UNITED STATES PATENT OFFICE.

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BRAIDER MECHANISM.

1,154,964. Specification of Letters Patent. Patented Sept. 28, 1915.

Application filed March 4, 1912. Serial No. 681,371.

To all whom it may concern:

Be it known that I, FRANK BENTLEY, a citizen of the United States, and resident of Watertown, county of Middlesex, State of Massachusetts, have invented an Improvement in Braider Mechanisms, of which the following description, in connection with the accompanying drawings, is a specification, like letters on the drawings representing like parts.

This invention relates to braiding machines adapted to braid a tubular textile covering, such as insulation on electric wires, of a type wherein the wire or the like to be covered is fed vertically through a central space, and two series of thread spools moving in opposite directions, in and out past each other in orbital paths around the wire, braid the thread thereon.

A principal object of the invention is to provide a construction and relative arrangement of parts wherein a greatly accelerated speed of operation over previous apparatus of this character is made possible, without breaking the thread, stopping of the machine, or other troubles which usually begin as soon as a certain speed is exceeded. This improved result is effected by a novel winding of the thread on the thread holders with a correspondingly modified arrangement of the ratchet crown or other tension control of the thread, whereby the tension on the thread of the two series of spools is made substantially uniform, and the unwinding of the spools at increased speed is rendered even and practical.

In previous apparatus of this character, so far as known to me, the thread on all the holders has been wound in the same direction, so that when these are mounted on the carriers, half of the holders turn on their carrier axes in the same direction that the carriers are revolved in their orbital paths, while the other half turn on their carrier axes in a direction opposite to that of the orbital movement of their carriers. This arrangement tends to put a materially greater strain on the thread which is unwinding from the series of spools which are rotating in the direction opposite to their direction of revolution, than is placed on the other series, for the reason that with every revolution there is a tendency in the former case to wind the thread on the bobbin one turn, in opposition to its unwinding movement, whereas in the latter case with the bobbins which turn on their axes in the same direction that they revolve, there is a tendency to unwind the spool one turn for each revolution. In other words, bearing in mind that the fixed center where the inner ends of the bobbin threads are fast and where the braiding takes place is not a point, but is a braiding column or core, usually tubular (as in braiding insulated cables), it follows that as a bobbin is carried around to the right a complete orbit it will have to give up an extent of its thread corresponding to the length of thread wound on said core and incorporated in the braiding operation of said complete orbit. Likewise, it follows that as another bobbin is carried around to the left a complete orbit it will have to give up the same extent of thread as the first bobbin, because we are supposing that they are both called upon to braid one complete orbit of travel. If, therefore, this were the entire problem, there would be no difference in tension between the two threads. However, it is not the entire problem. As the two threads of both bobbins are wound in the same direction, the winding of the thread of one bobbin, that traveling toward the right for instance, around the braiding core in the process of braiding, will pull hard on its bobbin and unwind said bobbin at a relatively high speed, whereas the same extent of braiding movement of the other thread winding around the core in the opposite direction, will not pull so hard on its bobbin, but will unwind its bobbin at a relatively less speed. This is because the thread on the left-moving bobbin is wound in the same direction as on the right-moving bobbin, being wound on the latter so as to pull on the forward or right hand side of the bobbin, and being wound on the left-moving bobbin so as to pull on the rear or right hand side of said bobbin. The feature of my invention now under discussion, obviates the foregoing unequal tension by providing simply that the threads of the respective bobbins shall be so wound that as the fixed ends of the threads, which are winding around the central core in the braiding operation, pull on their respective bobbins, the pull on all the bobbins, both right-moving and left-moving, shall be equal, *i. e.* shall be on the forward side of all of said bobbins, or shall be on the rear side of all of said bobbins.

For present purposes I do not restrict the winding to one of these in preference to the other, as I am attempting to point out the broad novelty of the invention. The main point is to have the pull of one thread the same as of another thread, by so winding the threads that with oppositely moving bobbins, the unwinding pull of the respective threads will be all on the forward side of the respective bobbins, or all on the rear side of the respective bobbins, as distinguished from the old way of having the pull of the threads of one set of bobbins on the forward side, and the pull of the other set of bobbins on the rear side. I will now explain a further element of the problem and an important feature of my invention.

In addition to the difficulties just noted, and perhaps other causes, the effect of centrifugal force as coöperating with the pull of the thread to rotate the bobbin on its axis, is believed to be an important element in the entire operation of such apparatus. As the bobbins are speeded up in their sinuous orbital path the effect of centrifugal force on one-half the bobbins being unwound in one direction, and on the other half of the bobbins being unwound in the same direction, while rotating in just the opposite orbital path from the first mentioned bobbins, normally tend to exert an unequal action on the thread of the two sets of bobbins. Further, since the usual thread escapement from the bobbins is in a series of rapid twitching movements, this tendency to retard the unwinding of one set of spools and to accelerate the unwinding of the other set and cause "spinning," makes the tightening and loosening impulse on the threads irregular and out of synchronism for the two sets of spools. These objections are obviated in the practice of my invention by winding half of the spools in one direction and the other half in the other direction, with the ratchet formations on the crowns of the spools or other escapement controlling means, likewise oppositely arranged for the two sets, and these two sets of spools are applied to the respective series of oppositely moving carriers, so that the turning of the thread holder on the carrier axis for each set is in the same direction as the orbital movement for that series of carriers, thus making the tightening and loosening impulses on the threads of the two sets of spools synchronous, and making the tension of the threads on both sets uniform, and permitting greatly increased speed and better work. The invention is herein shown applied to an old and well known form of braider mechanism, and it is therefore deemed necessary to only show a fragmentary portion of said mechanism, sufficient to illustrate the present invention.

Referring to the drawings, **Figure 1** is a fragmentary elevation, showing a portion of a braiding machine table with a number of carriers and thread holders and the operating mechanism therefor mounted thereon; and Fig. 2 is a fragmentary plan view of the machine, indicating somewhat diagrammatically by sectioned parts a large number of bobbin carriers, so as to convey more readily the scheme of operation, and showing in plan view two bobbins wound to operate according to my invention.

The usual circular top plate of the braiding machine is indicated at 10, this being cut out centrally, as seen at 11, to leave a space for the vertical feed of the wire which is to be braided. This plate has the usual pair of tortuous intersecting guide channels 12, 13 extending therearound, each channel having a set of carriers guided therein, several of those in the channel 12 being designated 14, and those in the channel 13 being designated 15, the two series being moved through their respective channels in opposite directions, as is usual. The means for effecting this movement is shown conventionally by the intermeshing gears 16, mounted on a lower plate support 17, and having upwardly extending horns 18, engaging with pins 19 depending from the carriers, in a manner well known in this type of apparatus. The carriers, which may be of any preferred form, are shown as provided with usual upstanding arbors or spindles 20 to receive the thread holders, and with stems 21 extending up alongside thereof, on which lower tension weights 22 and upper pawl carrying weights 23 are mounted to slide freely. These stems may be provided at intermediate points with thread eyes 24, and with thread guiding passages 25 at their upper extremities. The thread holders may be of any preferred form, those shown having the usual top crowns 26, provided with ratchet formations for engagement with the pawl stops 27 carried by the top weights 23. It is to be observed that the "heart" or shoe of the carriers, as seen in secti at 28, is elongated in the direction of the channel, so that each carrier with its thread guiding stem is turned in accordance with the direction of the channel, the thread guiding stems 21 always being behind the thread spools.

In accordance with my invention, one half of the spools are wound in one direction and the other half in the other direction, the ratchet formations on the crowns 26, or equivalent escapement control, being correspondingly formed, and the bobbins are placed on the respective arbors 20 of the two oppositely moving sets of crowns, so that preferably the bobbins of each set turn on their axes 20 in giving off the thread in the same direction that the orbital movement of the carriers tends to unwind the same, notwithstanding that half of the car-

riers have their orbital movement in one direction and the other half in the other direction. Thus, in Fig. 1, a bobbin 29 in the channel 12 is winding off its thread from the side opposite the observer, the direction of orbital movement of this bobbin and its carrier being to the left in the part of its path shown, while the bobbin 30, the carrier of which is in the channel 13, is unwinding from the side toward the observer, Fig. 1, the carrier of this bobbin moving ultimately to the right although actually toward the left in the part of its path shown in Fig. 1. Stated in other words, and viewing more particularly Fig. 2, it will be observed that both bobbins are so wound that the threads leave their bobbins on the side toward the braiding center. This insures the sought-for evenness or uniformity of tension. In the old way, both bobbins would have been wound alike, so that the thread of one would leave its bobbin on the side away from the center, and the thread of the other would leave its bobbin on the side toward the center, with a corresponding variation of tension.

It will be observed that the ratchet formations 31, 32 have the stop shoulders thereon facing in opposite directions, corresponding to the direction of the thread winding, so that each is adapted to properly coöperate with its pawl stop. In this way the orbital movements of both sets of carriers tend to unwind the thread from the spools in like degree, and hence the escapement actions will operate in both sets similarly. Thus, the tension on all the threads is rendered substantially uniform, spinning of the spools during unwinding is practically eliminated, resulting in a more even operation with a capacity for greatly increased speed, and also in a more even braid, since there is no tendency to twist the braid as would be the case if it were produced by an excess of tension in one direction as with the old arrangement and method of operation. In use, the two sets of oppositely wound spools may be distinguished by any suitable conspicuous marking, for instance, the crown ends (when at the top) of one set may be colored differently from the other set, so that there will be no difficulty in identifying the spools with each winding and placing them on the proper carriers. These crown ends or escapements are sometimes at the bottom or underneath the bobbins. It has been found that in practice this opposite winding of the two sets of spools enables the machine to be speeded up from fifteen to thirty per cent. more than has heretofore been possible, without thread breaking or other troubles which have heretofore resulted beyond a certain limit of speed.

While there is set forth herein what are believed to be the correct theory of this increased speed capacity with the reverse thread windings, I am not prepared to say that the reasons given are the only ones which make the improved arrangement set forth capable of the substantial accelerated speed in operation, of which it has been found capable by actual trial and use, and I therefore desire to cover my improved arrangement, irrespective of and without limitation as to what may be the correct theory of operation.

In order to protect my invention fully, I claim herein the method of handling the thread as well as the mechanism arranged so to operate.

Having described my invention, what I claim as new and desire to secure by Letters Patent is:

1. A braiding machine, comprising two sets of thread holders mounted for relative movement in opposite orbital directions, with reference to the central braiding column or core around which their threads are braided, means on said thread holders to prevent their rotation in respective non-orbital directions, said means permitting rotation of each thread holder in the same direction as its orbital movement, and means coöperating with said holders for exerting tension on thread unwound therefrom, whereby the unwinding of thread from said holders during the braiding operation exerts a substantially uniform tension.

2. A braiding machine, comprising two sets of carriers mounted for movement in opposite directions in intersecting closed tortuous orbits, about the central braiding columns or cores around which the threads are braided, thread holders rotatably mounted on each of said carriers, said holders and said carriers having provision for unwinding to feed the thread out for braiding under tension on said columns, each set being arranged so that the unwinding direction of thread holder rotation is in the same direction as the orbital movement of its carrier.

3. A braiding machine, comprising two sets of carriers mounted for movement in intersecting tortuous orbital circuits in opposite directions, thread holders mounted for rotation on each of said carriers, and coöperative escapement means on said holders and said carriers for intermittently feeding out the thread as required during the braiding, the retarding means on the thread holders for said two sets of carriers facing in opposite directions and the escapement means coöperative therewith being correspondingly formed to permit the opposite rotation of the thread holders for unwinding in the same direction as their orbital movement.

4. A braiding machine, comprising two sets of thread holders mounted for orbital

movement in opposite directions in thread braiding relation, to the central braiding column or core around which the threads are braided; and each of said holders also mounted for rotation on its own axis in the same direction as its orbital movement.

5. A braiding machine, comprising two sets of thread holders movable in opposite orbital directions about the central braiding column or core around which their threads are braided, said holders and their coöperating mechanism being constructed and arranged to have an unwinding axial movement of all said thread holders in the same direction with reference to their orbital movement, so that one set of holders will have an unwinding axial movement opposite from that of the other set of holders.

6. The herein described method of operating a braiding machine, consisting of giving one set of bobbins a right hand wind and giving the other set of bobbins a left hand wind, and then performing the braiding operation by moving said two sets of bobbins in opposite orbital paths, whereby the unwinding of both sets of bobbins takes place with the same relative axial movement with reference to the orbital direction of movement thereof.

7. The herein described method of operating a braiding machine, consisting of providing two sets of bobbins wound with thread in opposite directions respectively, and then advancing said two sets of bobbins in the opposite directions around the braiding center to bring a thread pull on the forward side of each bobbin and pull the thread from that side of the bobbin which is toward said braiding center.

In testimony whereof, I have signed my name to this specification, in the presence of two subscribing witnesses.

FRANK BENTLEY.

Witnesses:
ALBERT E. DAVIDSON,
BETHUEL G. ADAMS.