

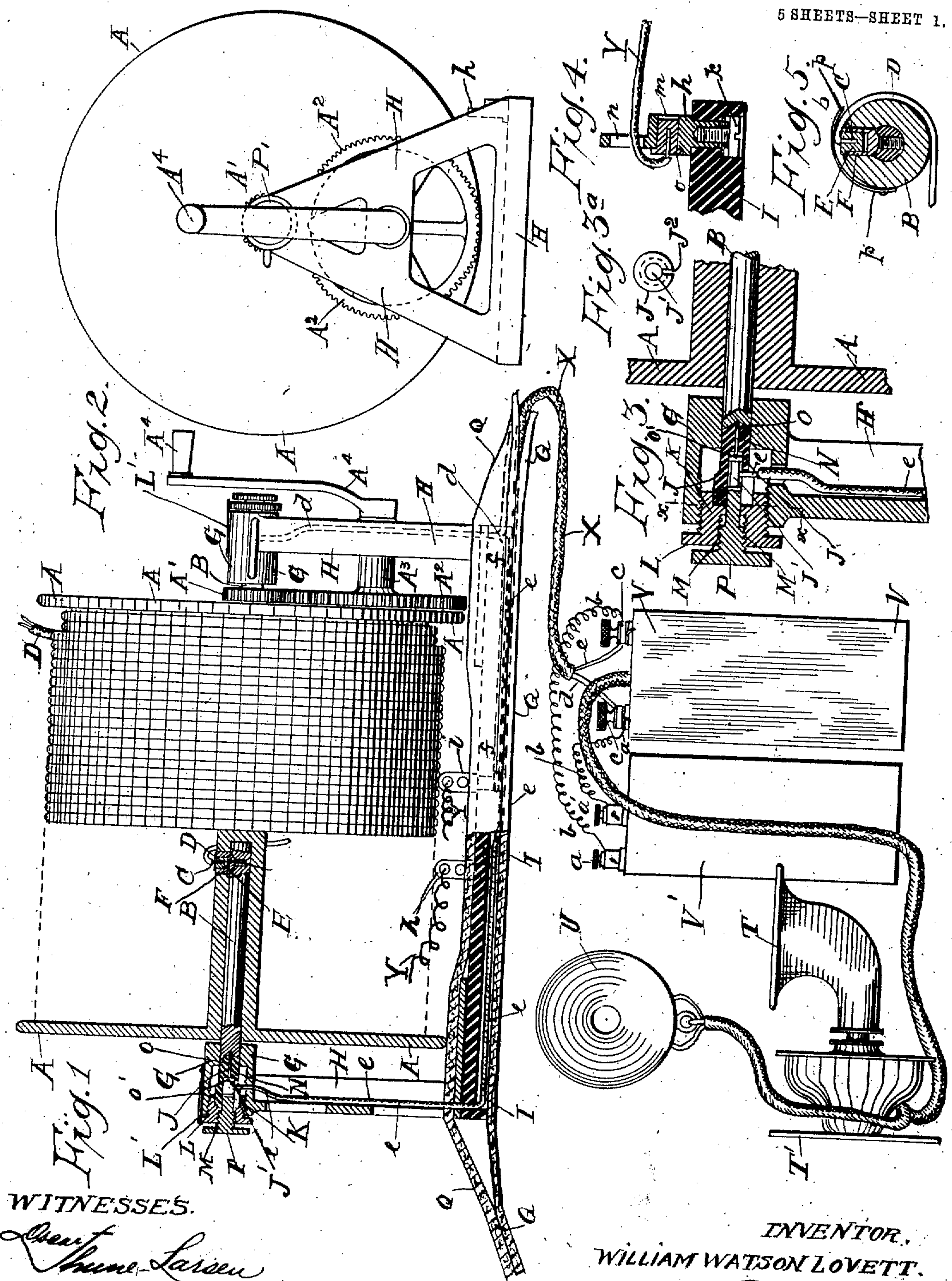
No. 858,611.

PATENTED JULY 2, 1907.

W. W. LOVETT.
ELECTRICAL SIGNALING APPARATUS.

APPLICATION FILED NOV. 12, 1906.

5 SHEETS—SHEET 1.



WITNESSES.

Olaf Thune-Larsen

Ida M. Daskin

INVENTOR.

WILLIAM WATSON LOVETT.

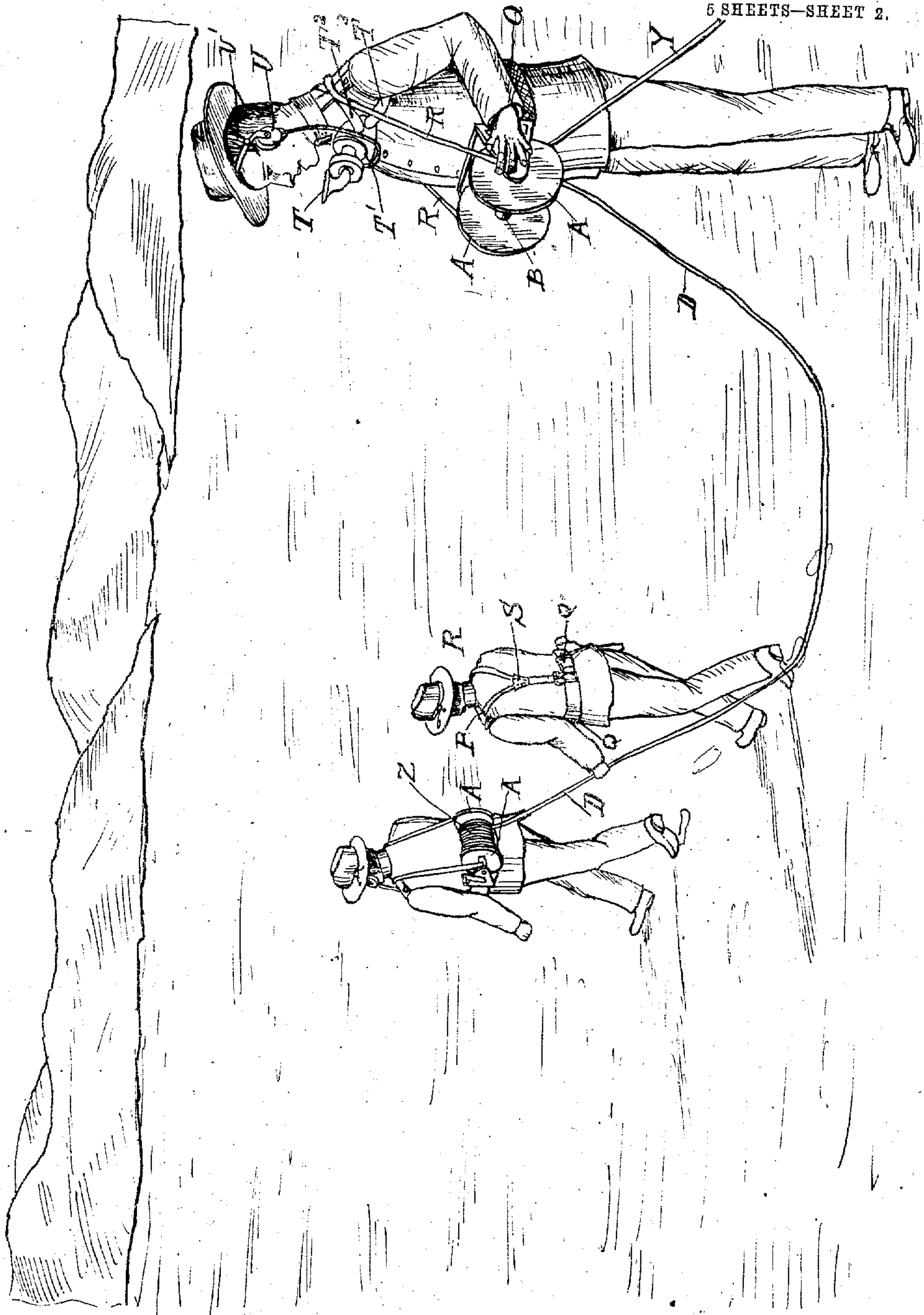
BY *John Day*
ATTORNEY

W. W. LOVETT.
ELECTRICAL SIGNALING APPARATUS.

APPLICATION FILED NOV. 12, 1906.

5 SHEETS—SHEET 2.

Fig. 6.



WITNESSES

*Robert
Hume-Larsen
Ida M. Daskam*

INVENTOR.

WILLIAM WATSON LOVETT

BY *St. John Day*
ATTORNEY.

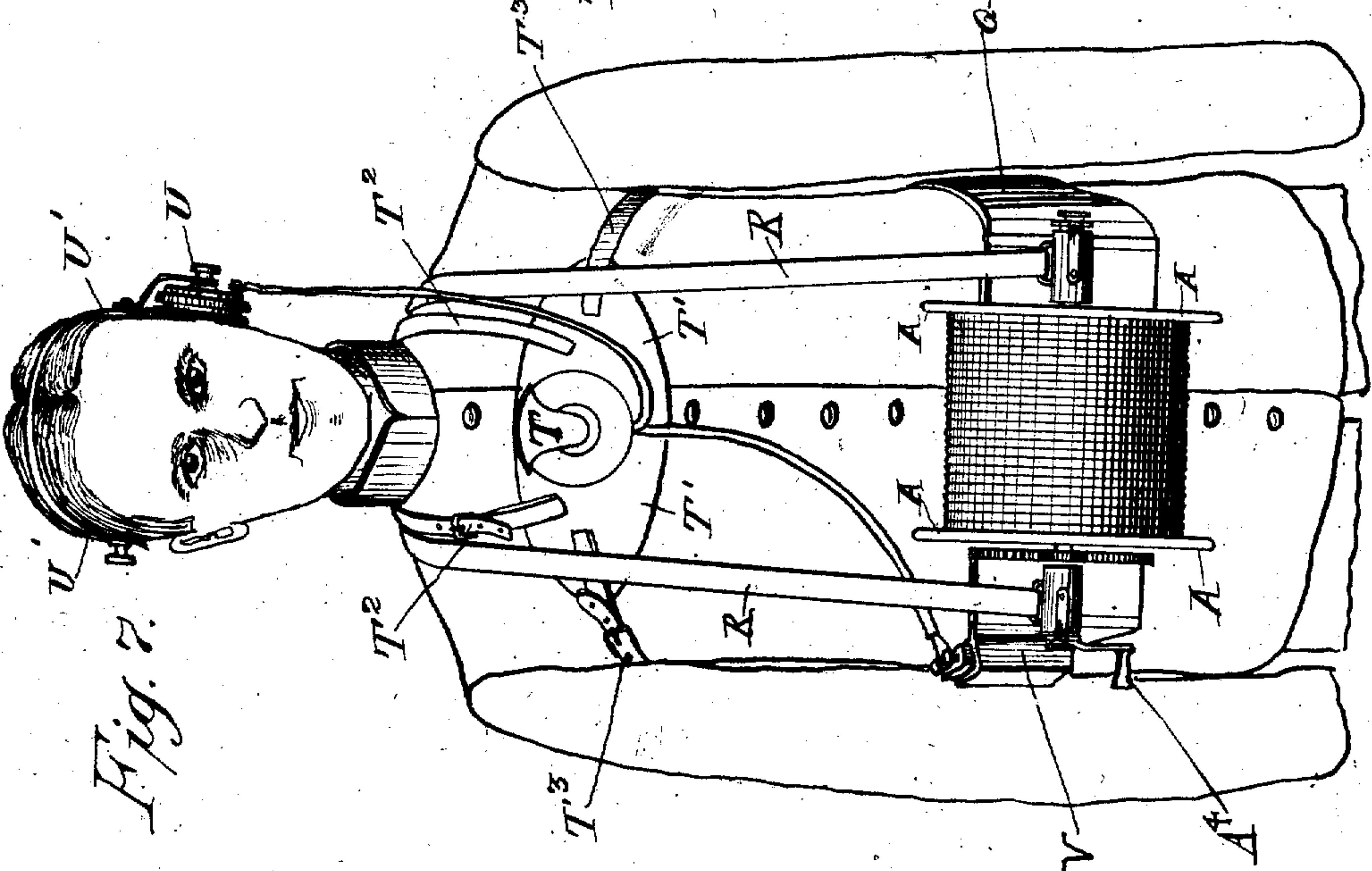
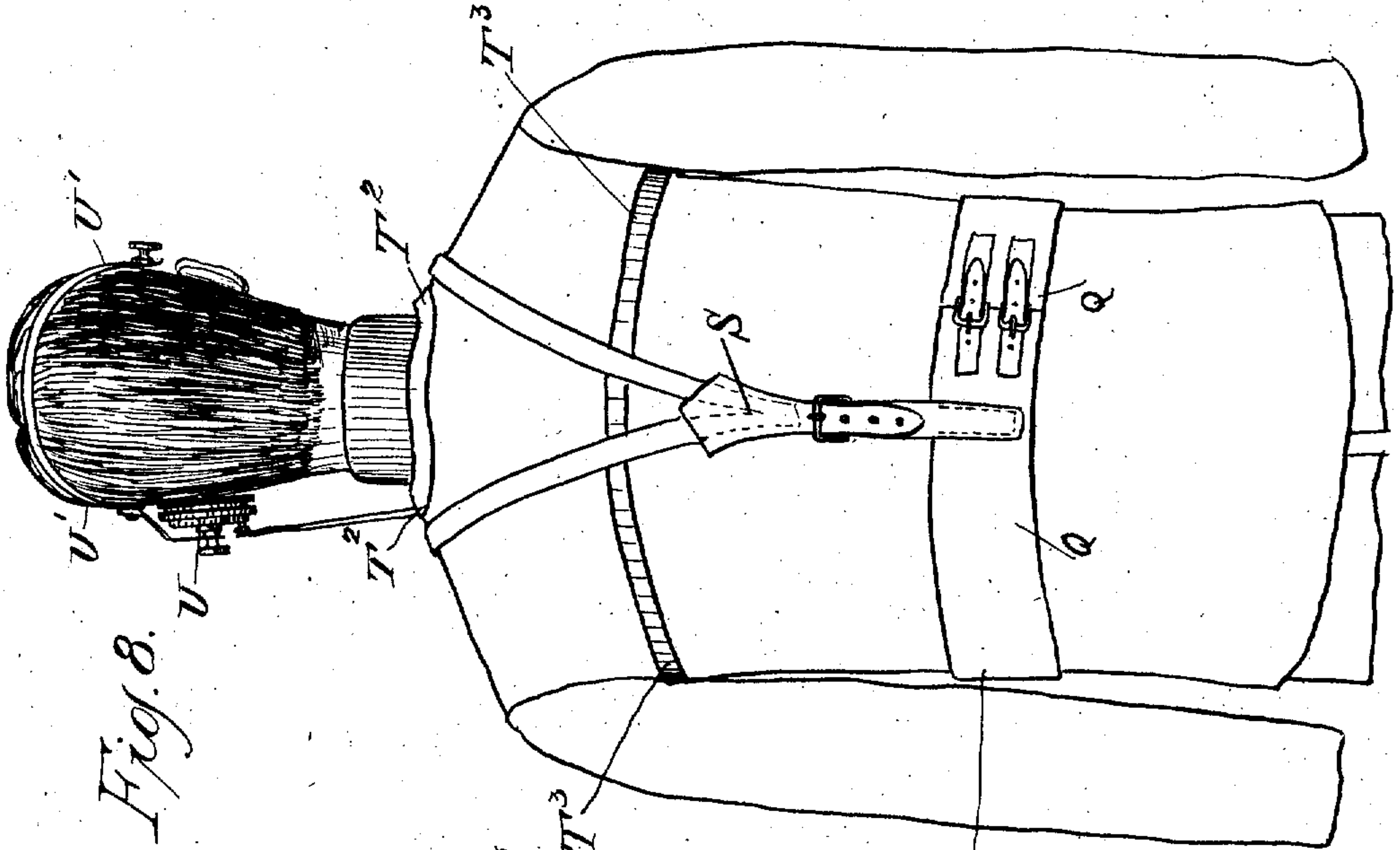
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5 SHEETS—SHEET 3.



WITNESSES.

Deer +
Thune-Lawson
Ida M. Daskam

INVENTOR
WILLIAM WATSON LOVETT.

BY *John Day*
ATTORNEY.

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5 SHEETS—SHEET 4.

Fig. 9.

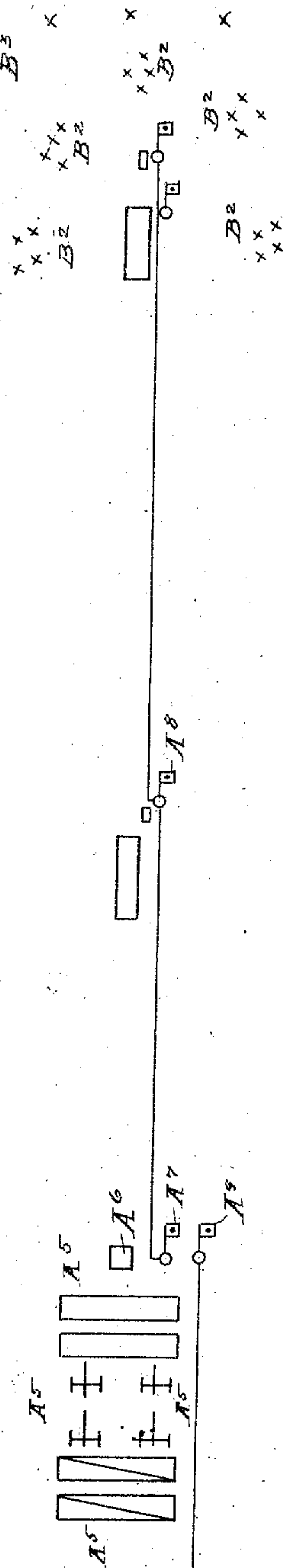
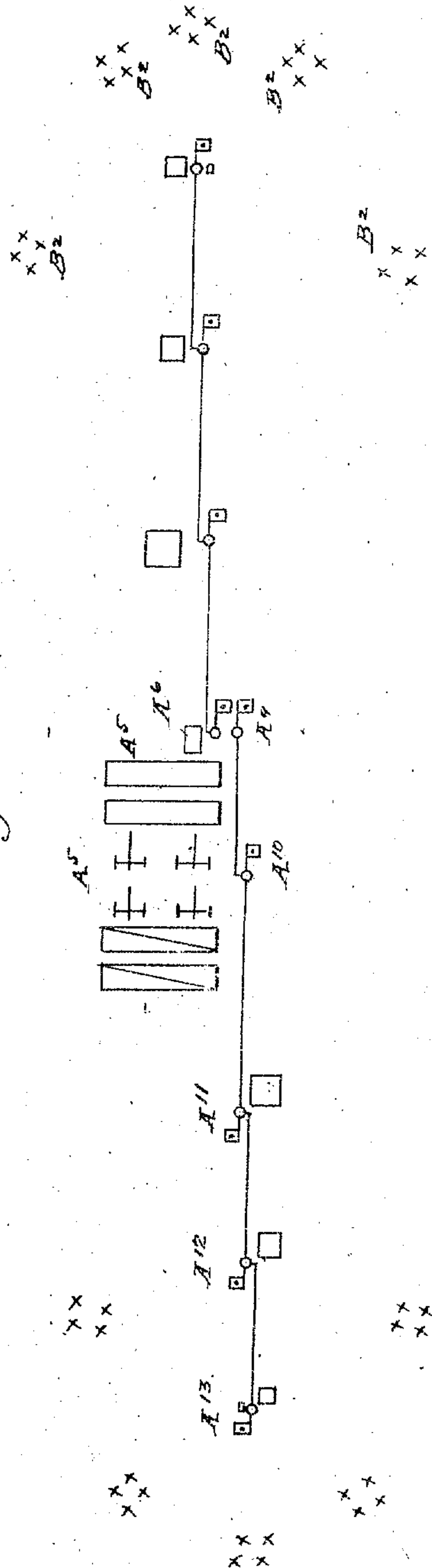


Fig. 10.



WITNESSES.

Geart
Thine-Lane
Ida M. Daskin

INVENTOR

WILLIAM WATSON LOVETT.

BY *St. John Day*
ATTORNEY.

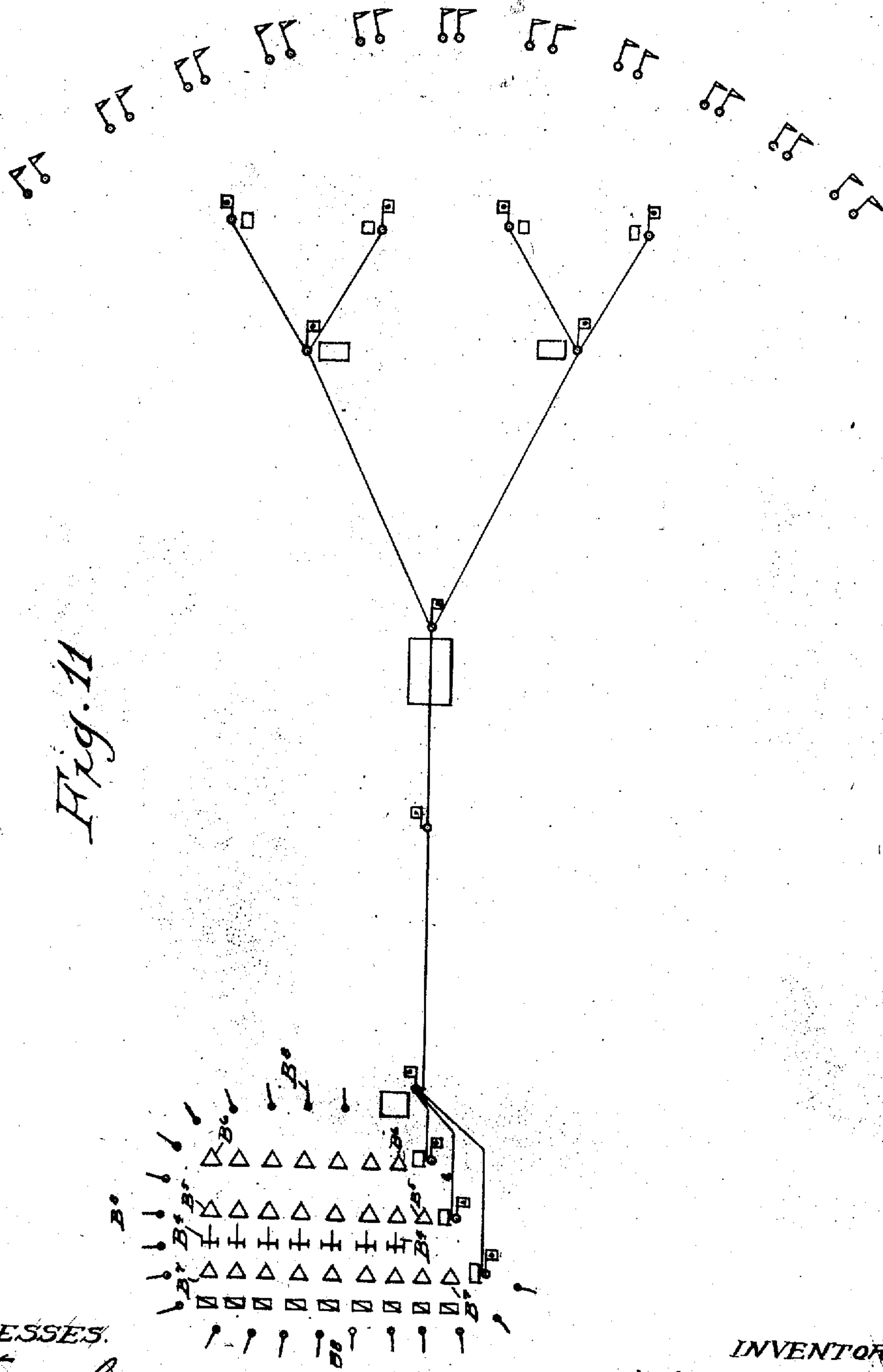
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W. W. LOVETT.
ELECTRICAL SIGNALING APPARATUS.
APPLICATION FILED NOV. 12, 1906.

6 SHEETS—SHEET 5.

Fig. 11



WITNESSES.

Chas. L. Lamm
Ida M. Dickson

INVENTOR.

WILLIAM WATSON LOVETT.

BY *St. John Day*
ATTORNEY.

UNITED STATES PATENT OFFICE.

WILLIAM WATSON LOVETT, OF LOS ANGELES, CALIFORNIA.

ELECTRICAL SIGNALING APPARATUS.

No. 858,611.

Specification of Letters Patent.

Patented July 2, 1907

Application filed November 12, 1906. Serial No. 343,148.

To all whom it may concern:

Be it known that I, WILLIAM WATSON LOVETT, of the city of Los Angeles, in the county of Los Angeles and State of California, have invented an Electrical Signaling Apparatus Especially Adapted for Military Purposes, of which the following is a full, clear, and exact specification, reference being had to the annexed drawings, and to the figures and letters marked thereon.

This invention consists of an electrical apparatus to be used in a military field for several purposes, which are now set forth, as follows:

The objects to be attained by my invention are several, and consist; 1st. To connect the advance and rear guards of a marching column of soldiers to the said marching column, in such manner that oral or speech communication may be carried on when required between the advance guard and the marching column, and the rear guard and the marching column, respectively. 2nd. To effect communication between a military camp or bivouac, their outposts and the scouts, and reconnoitering officers by means of what are in effect movable stations established outside the outposts, where reports can be sent and orders received in the shortest possible time. 3rd. To render unnecessary the employment of regular telegraph operators and electricians, by providing any soldier with a communicating apparatus, which he can use in part as a telephone, and which owing to its simplicity he can maintain in perfect operative adjustment and working order. 4th. To eliminate the uncertainty, and in many cases the impossibility of obtaining a "ground," when my electrical communicating apparatus is employed, in dry and untimbered country. 5th. To provide for the different movable stations being in continual communication with each other even while moving from and returning to their several positions. 6th. To effect economy in the wire used for electrical communication between the operative parts of the apparatus, as according to my present invention all of the cable used is recovered, whereas in the present method of signaling in a military field, much of the wire so used is lost. 7th. To effect economy in the time occupied in operating signaling apparatus, because of the light weight and simplicity of the apparatus constituting my invention, enabling the apparatus to be easily handled. 8th. To effect the wiring of a temporary camp, and in such manner avoiding the use of the cumbersome telephone exchange hitherto employed for such purpose. 9th. To effect communication between the shore and naval forces operating in adjacent country. 10th. To connect with the commanding officer of an advance or column, or other body of soldiers, the different batteries and bodies of troops during battle.

With the view of carrying out the aforesaid objects of my invention, I have invented and use the apparatus

hereinafter described and illustrated upon the annexed sheets of drawings, of which Figure 1, is a view of the reel portion of the apparatus constituting my said invention, the righthand part of the apparatus being shown in plan with a portion of the cable wound thereon, while the left hand part of the apparatus is shown in horizontal section in the plane of the axis of the reel, this figure also showing part of the telephone, the induction coil, and the battery connected with the induction coil by means of an impedance coil, the battery being in parallel. Fig. 2, is an elevation of the righthand end of the reel portion of my apparatus, and corresponding with Fig. 1. Fig. 3, is a vertical section on an enlarged scale of the left hand bearing of the reel shown at Figs. 1, 6, and 7, and illustrating the insulated connection in one end of the cable with one of the halves of the metallic axis of the reel. Fig. 3*, is an end elevation of the outer end of the insulating plug shown on line x, x, Fig. 3. Fig. 4, is a section on an enlarged scale of one of the binding posts in the bottom or foundation part of the apparatus, all as hereinafter fully described. Fig. 5, is a transverse section on an enlarged scale of one of the connections of the inner ends of the cables to the two half axes of the reel. Fig. 6, shows the signaling apparatus as in use in the field, one signaller with an empty reel strapped on to the front of his body as he would be standing for instance with the commanding officer, or at a station in advance, in the rear or laterally; another man with a reel unwinding cable, situated at the back of his body, and as walking away from the signaller and commanding officer, with his assistant also walking behind him, and showing the device constituting my invention as paying out cable from the reel. Fig. 7, is a front view of a signaller showing the front part of the apparatus constituting my invention, and the mode or means of attaching it to the body of the wearer or carrier thereof, that is to say, the signaller. Fig. 8, is a rear view corresponding to Fig. 7, showing the rear part of the straps and connections whereby the apparatus is supported at the back of the body of the wearer when the reel is worn at the front as shown in Fig. 7. Fig. 9, is a diagram illustrating communication by means of my invention of a marching, or it may be a stationary column, with an advance guard as hereinafter described. Fig. 10, is a diagram illustrating communication by means of my invention of a marching column or stationary body of soldiers with both advance and rear guards. Fig. 11, is a diagrammatical view illustrating outpost communication with a camp or bivouac, as effected by means of my invention as hereinafter described.

The device which I use to carry out the objects of my invention consists of a reel or winding roller A, Figs. 1, 2, 6, and 7, to each of the halves B, of the metallic axle of which, one of the terminals C, of the conductor or cable D, is connected by means of self-releasing con-

nectors E, held in sockets F, each of which sockets F, is connected with one of the halves of the metallic axle B, by being screwed therein as hereinafter described. Upon the reel A, the conductor D, is carried when wound up, and is contained as shown more particularly at Fig. 1. The bearings G, upon or within which the outer ends of the half axles B, of the reel A, are carried, are supported by metallic brackets H, insulated from each other by being fastened to a plate of fiber I, Fig. 1 extending the entire length of the bottom. These bearings G, are (for practical use in a military field equipment) about one and one half inches long, and one inch in diameter. The end of each metallic half axle B, Figs. 1, and 3, which projects from the side of the reel A, enters into the bearing G, about half an inch, the axle B, being preferably half an inch in diameter, thus making a bearing of equal length and diameter. The outer end of each half axle B, is counter-sunk conically about three thirty seconds of an inch, as shown at Figs. 1, and 3. Into each bearing G, is fitted a round piece of insulating fiber J, Figs. 1, and 3, in such a manner as to make contact with the end of each half axle B, having the conical recess as shown in the drawings. This insulating fiber J, is held in place by a collar K, about one quarter of an inch in length, and of about one half of an inch in diameter, which is a continuation inwards of the screw cap L. The outer end of the bearing G, is bored out to about three quarters of an inch in diameter, and into this outer end is fitted the screw cap L, by means of a screw thread, so that the cap L, can from time to time be adjusted in the outer end of each bearing G. The inner end of the cap L, is recessed and constitutes the part K, hereinbefore referred to, to hold therein the outer end of the piece of insulating fiber J. Any slight lateral or endwise motion of the reel is controlled by the adjustment of this screw cap L, at each of the bearings G, as is obvious.

A flat spring L', fastened to each bearing G, presses upon the outer end of each cap L, and holds the cap from being rotated, by the spring entering into the spaces between the milled teeth upon this part of each cap L.

A hole M is bored through the cap L, and fiber J, to within a short distance from the conically recessed end of the axle B, and in that part of the fiber J, nearest to the conical end of the axle B, the hole is made smaller, for example about the size of a No. 58 wire drill, as shown at N, Figs. 1, and 3. Through this small hole is introduced a sharp pointed steel needle O, with a circular disk of metal O', at its head as shown at Figs. 1, and 3. This disk of metal is about one quarter of an inch in diameter, and has a small hole, too small to be seen in the drawings, passing through it to the needle and through the fiber at right angles to the axis thereof, for the purpose of attaching the end of the conductor e, passed through the hollow of the bracket H, as shown at Figs. 1, and 3, of the drawings. This needle O, passing through the small hole in the end of the insulating fiber J, bears upon the exact center or apex of the conical recess in the metallic axis B, against which it is adjusted by means of the set screw P, in the head of the screw cap L, the end of which screw P, bears against the metallic disk O', at the outer end of the needle O. The needle O, and its connections are stationary and therefore do not rotate. The object of the construction of

this last specified part of the apparatus constituting my invention, is to provide a durable stationary metallic point at the center of a revolving circle, of minimum diameter, at which point of such a revolving circle, there is little or no friction, consequently little or no motion, and in this way perfect electrical contact or connection is made practically between said needle O, and each half axle B, without wear or tear.

The connection of the conductors d, and e, with the needles O, O', is effected by passing the end of the wires d, and e, into the disk of metal O', contained within the insulating fiber J, at the outer end of the needle O. A slot J², as more particularly shown at Fig. 3^a, is cut in the piece of insulating fiber J, to admit of the block J', and the end e, of the conductor to be passed into the insulating fiber J, endwise as shown at Figs. 1, and 3.

The apparatus hereinbefore described when it is desired to wind up the cable thereon, as shown by the righthand figure in Fig. 6, of the drawings, is suspended on the person performing the act of winding up in the manner now to be described. The insulating fiber base I, of the device being inclosed in a leather covering Q, Figs. 1, and 6, is strapped around the body of the carrier of the device as shown at the righthand end of Fig. 6, and its weight is partly carried by the straps R, R, which pass over the shoulders shown in the middle figure in Fig. 6, and down to a bifurcated connection S, from which a vertical strap leads to and connects by a buckle or its equivalent with the strap Q.

Upon one of the half axles B, of the reel A, there is mounted a spur pinion A', Figs. 1, and 2, with which gears a corresponding spur wheel A², carried upon the inner end of the axle A², held in the end framing H. At the outer end of the axle A², of the spur wheel A², there is a crank handle A³, which on being rotated by the man carrying the machine causes a quick rotation of the reel A, and therefore winds up on the reel A, any paid out cable. When the man carrying the apparatus is in the position of paying out cable as is shown by the man at the lefthand end of Fig. 6, then the location of the reel and its connections upon the body of the man is reversed, that is to say, in place of the reel and its connected parts being in the front of the man's body as in the figure of a man at the righthand end of Fig. 6, it is placed at the back of the man's body, but the strap connections on the man's body while reversed are in the same relative positions to the reel and its connections. When the cable D, is being unwound or paid out from the reel A, as is shown by the man at the lefthand end of Fig. 6, an attendant follows him as is also shown in the middle figure of a man in that drawing. By preference the cable D, being paid out passes through the hand of this attendant for the obvious reason of care being exercised that no kinks or unsound places are in the cable. If kinks or breaks of any kind are in the cable they are detected by reason of the touch or contact of the attendant's hand, and repaired instantly by the attendant.

To the cable winding and unwinding apparatus which has been hereinbefore described, there is attached a complete telephonic apparatus also worn by the carrier of the reel for winding on and unwinding or paying out the cable of the apparatus. The telephonic part of the apparatus is illustrated at Figs. 1, 6, 7, and 8, and it consists of a mouthpiece or transmitter T, of

ordinary construction and therefore in itself not constituting part of my invention, carried upon the strap T', suspended around the neck of the wearer by the buckle and straps T², T², and fastened around the body of the wearer by the straps T³, T³, all as shown at Figs. 6, 7, and 8, of the annexed drawings. The receiver of the telephonic part of the apparatus is marked U, also of ordinary construction, and is carried by adjustable cross springs U', U', which are adapted to fit the head of the user of the apparatus, and of such construction as is well understood for carrying upon the head of the user during any desired length of time while telephonic communication is to be held, auditory apparatus such as a telephone receiver pressed with the requisite closeness against one of the ears of the user, and supported with the requisite adjustment of the springs U', U', against the ear of the person. In the lower strap Q, of the apparatus, sufficient receptacle space is provided for containing the induction coil V, and an impedance coil, Figs. 1, and 7, and the exciting battery V', which is placed in circuit in parallel, for operating the induction coil and telephonic part of the apparatus, all as next to be described.

The electric current which passes through the circuit of the apparatus constituting my invention, and through the telephonic part of the entire apparatus, is generated by the battery within the casing V', Fig. 1. The terminals and binding posts a, and a', of which, are connected by wires b, b, to the binding posts, c, c', of the induction coil contained within the casing V, and from which binding posts c, c' the two halves of the circuit marked d, and e, Fig. 1, respectively, and wrapped as insulated cable X, lead to the needle points O, each in contact with its corresponding division of the metallic half axle B, B. As shown at Fig. 1, of the drawings, the course of each division d, and e, of the electrical circuit, partly contained within the insulating covering X, and thence proceeding through the apparatus, is marked by the same letters d, and e, respectively, throughout their several directions within the framework and insulated base I, of the apparatus to the needle points O, O, the course of the current thence being through each half axle B, and thence to the connectors E, in the sockets F, one only of which connectors and sockets E, and F, respectively, is shown at Fig. 1.

The inner ends of each of the conductors or cable D, are in permanent electrical contact or union with the two half axles B, by means of the plugs E, and sockets F, as hereinbefore set forth. Two other wires or divisions of the cable D, marked f, and g, respectively, lead from the divisions of the cable d, and e, contained within the insulator X, to the terminals h, and i, to the lower part of each of which an insulated lead from each division d, and e, is electrically connected. One of these terminals is shown enlarged in section at Fig. 4, and is of the construction hereinafter described. To these binding posts or terminals h, and i, the outer ends of the conductors within the cable D, wound on the forward reel Z, carried by the advance signman shown at the lefthand side of Fig. 6, are connected, so that continuous electrical circuit, that is to say, telephonic communication is maintained between the commanding officer of the camp or marching column of an army and the advance signman. Each such advance

signman who carries a reel A, and its mechanical and electrical equipment hereinbefore described, also carries the same kind of telephonic receiver and transmitter, all of which being in constant electrical connection with the commanding officer can always receive commands transmitted through the line by the commanding officer, while the commanding officer, and officers or men at the stations on the line between the advance signman and the commanding officer, can always hear whatever information is being reported from the telephone of the advance guard to the commanding officer. In this manner and by means of the apparatus constituting my invention, and the several electrical connections thereof from reeling apparatus to reeling apparatus, whereby each telephone is connected to all the other telephones in or by an advance or rear guard of a camp or marching column of soldiers, the intelligence obtained by the advance guard either alone or in association with scouts and videttes as is well understood, is distributed along every line connecting an advance, rear, or lateral guard with a camp, or marching body of an army, and every officer or man at each of the stations on every such line of telephonic connection is telephonically instructed both by the commanding officer of the camp as well as by the commander of either the advance, rear or lateral guards, and is thereby enabled to act as the commanding officer's or other commander's instructions may direct.

In Fig. 6, the cable Y, is the conductor or part of the circuit leading to the commanding officer's station with the camp, or marching column, of an army of soldiers, and is fully paid out from the reel A, of the winding and unwinding apparatus carried by the man at the righthand end of Fig. 6. So soon as the cable is completely unwound from the reel A, then the plugs E, with which the ends of the cable D, are provided, are immediately pulled out of the sockets F, connecting with the half axles B, and then are by this man's attendant, so soon as the reel has been removed from the back to the front of the man at the righthand end of Fig. 6, placed in the two binding posts h, and i, Fig. 1, one of which posts is shown in enlarged vertical section at Fig. 4. The placing of the plugs E, in the binding posts h, and i, is clearly illustrated at Fig. 4, and is hereinafter fully described. Simultaneously with the placing of the plugs E, constituting the ends of the two divisions of the conductor or circuit contained within the cable Y, Figs. 4, and 6, in the binding posts h, and i, of the apparatus carried by the man at the righthand end of Fig. 6, the attendant of the man carrying the next length of cable D, wound or reeled upon the apparatus carried at his back, for example, the man at the lefthand end of Fig. 6, places the plugs E, on the rear or outward ends of the wires of the cables D, into the sockets F, in the half axles of the empty reel now carried at the front of the man at the righthand end of Fig. 6, and this man by making three or four turns of his reel A, thereby binds the outer terminals of the cable D, into electrical circuit with the cable Y, leading directly to the commanding officer, or other station, on the line of the advance, rear, or lateral guards. Then the man at the lefthand part of Fig. 6, walks forward and unwinds the cable D, from the reel A, carried by him until the whole of the cable D, is unreeling or paid off from the reel A, when the inner terminals E, of the cable D, become disconnected from

the sockets F, in the axle of the reel A, and are respectively connected with the binding posts *h*, and *i*, of this man's reeling device by this time brought from his back to his front, and the outer ends of the wire of the man carrying the next reel of cable are inserted into the sockets F, in the half axle B, of this device, the outer ends of the wire carried by the next reel of cable are inserted into the sockets F, in the half axle B, of this device, the outer ends of the wires of the next section of cable wound a few turns thereon, when this next reel man moves forwards unwinding his cable, and repeating with his attendant the other operations or functions hereinbefore described with reference to the man and divisions of the apparatus shown upon the annexed drawings, and already described with reference to the righthand man in Fig. 6.

The cable Y, leads rearwards and is connected either directly with the telephone of the commanding officer, with a marching column or stationary body, or bivouac of soldiers, or there may be as many of such divisions of cable Y, between the marching column or stationary body or bivouac of soldiers and the signalman represented at the righthand of Fig. 6, as the distance over which the signal service is spread, may require.

The terminals *h*, and *i*, shown on a small scale at Fig. 1, and on the enlarged scale at Fig. 4, consist of a brass pillar *h*, fastened into the insulated foundation I, of the apparatus, by means of the screw *k*. The pillar-portion *j*, has in it two horizontal holes *m*, and *n*, as shown at Fig. 4, and each end of the cable Y, is fastened into the plug E, the same plug indeed, which is shown fastened into the socket F, Figs. 1, and 3. The plugs E, fit snugly into the lower hole *m*, of each of the pillars *h*. The upper hole *n*, of the pillar *h*, is of a diameter large enough to admit of the plug E, and the adjacent part of the cable Y, being passed through it, so as to admit of the plug E, after having been passed through the hole *n*, being pulled into the hole *m*, as shown at Fig. 4, until the plug E, has made the requisite snug seat and contact with the metal of the pillar *h*, by means of a series of these terminals set in the insulated base I, of the reel, any number of telephonic lines may be radiated from one reel or station being all in communication with one another. From this construction it will be obvious that any pull or strain upon the cable Y, will only pull the plug E, more tightly and closely into its hole *m*, in the pillar *h*, while whenever necessary to disconnect the cable Y, from the terminal pillar *h*, this is readily effected by pushing the rear portion of the cable Y, backwards by hand, when the plug E, is also pushed out of the hole *m*, and drawn outwards through the hole *n*, so as to separate it from the hole *m*, in the terminal pillar *h*. By means of this construction of terminals the time occupied in loosening and unloosening an ordinary screw terminal is dispensed with.

At that part of the apparatus, whereat the inner ends of the cable D, are connected with each of the halves of the axle B, that division of the cable or circuit which corresponds with each half of the metallic axle B, is fastened into the cylindrical metallic plug E, more especially shown on a larger scale at Fig. 5. This plug E, fits into a metallic socket F, screwed into and therefore making metallic connection with each half axle B, as hereinbefore described, and when the parts are thus engaged as shown at Figs. 1, and 3, the reel part of the

apparatus is always ready for winding on to the reel a section of cable. To prevent the plug E, from falling out or becoming disconnected from its socket F, at the time of commencing to wind a section of cable on to the axle of the reel A, a thong of leather or analogous flexible material *p*, is fastened by a screw, nail, or rivet, on to the wooden reel A, and is of sufficient length to lap over the portion of the cable D, which is engaged with the plug E. So soon as one or more turns of the reel have been made, the flexible thong *p*, is maintained permanently in place upon the axle of the reel A, and thereby electrical connection of the cable D, with each half axle B, is maintained during the winding up of the cable on the reel A, until the cable is full.

It will be observed that in the preceding parts of this specification I have described my invention as adapted for use by infantry, but when it is to be used by cavalry, then I attach the reel and its mechanical and electrical equipments to the saddles of the horses upon which the signalmen ride. When so used for the purpose of unwinding or paying out the cable, I attach the reel and its equipments to the rear end of the saddle, and when used for winding up or reeling on cable, then I attach the reel and its equipments to the front of the saddles of the horses upon which the signalmen ride, and I make the disconnections of the unwound or paid out lengths of cable when any one of these have become disconnected from the reel from off which it has unwound to the binding posts of that reel's frame, and connecting the outer ends of the cable of the next signalman's reel with the sockets communicating with the half axles with the empty reel in the same manner which has been already described with reference to the device when used by infantry.

In the diagram Fig. 9, is represented a marching column consisting of four guns covered by infantry and supported by cavalry marked A¹. The square A², in front represents the commanding officer's position, and A³, the position of the first signalman, he being close enough to the commanding officer to receive his commands audibly, and then to transmit them to and through my apparatus carried upon or by a second signalman A⁴, whence the connection is made to the next signalman which may be either an intermediate signalman or the signalman of the advance party B², beyond which are the scouts B³. The station marked A⁵, in this figure, represents the signalman of the rear guard and near the commanding officer. When the rear guard is operating in conjunction with the advance guard, this is shown or completely indicated by the military diagram Fig. 10.

With reference to the operation of my apparatus with and by a rear guard, I here explain that it is the reverse of what has already been hereinbefore described with reference to the using of my apparatus with signalmen going forward with an advance guard, that is to say, that instead of the signalmen of a rear guard unwinding cable from the reels and apparatus of my invention carried by them, whereby they are telephonically connected with the commanding officer of a marching column or other body of soldiers, the rear guard winds up cable as it goes forward at the distances behind the marching body, determined by and commanded by the commanding officer with the marching body, whose orders or instructions are telephoned through the sta-

tions represented by the signalmen marked A⁹, A¹⁰, A¹¹, A¹², and A¹³, to the support of the rear guard shown in Fig. 10; the rearmost signalman winding up cable as he goes forward and when he has reached the next signalman, disconnecting his cable, when he takes his position at the head of the marching column.

The diagram Fig. 11, is a military diagram representing a camp or bivouac in telephonic communication with its outpost by signalmen carrying the cable and reeling apparatus constituting my invention, and in which diagram the artillery is marked B⁴, artillery men's tents B⁵, infantry B⁶, cavalry B⁷, and sentinels B⁸.

It will be obvious to persons having knowledge of the system of signaling in a military field hitherto in use, that many advantages and economies and great saving of time are effected by the apparatus which constitutes my present invention as herein described.

One of the chief advantages of my apparatus over all existing signaling apparatus, consists in the fact that the entire weight of the apparatus as carried by signalmen amounts to about fourteen pounds per man, and not to more than fourteen pounds, which weight includes one mile or one thousand seven hundred and sixty yards of the cable which I use, it being a water proof cable, and made of as small a diameter as is consistent with the container of the requisite copper wires for the conductors, and providing the necessary thickness of insulation to protect it while being used in the manner described in the preceding parts of this specification. The aforesaid weight also includes the reel and all its connections, together with the framing in which the reel is carried, the plate of insulated fiber constituting the base of the reel apparatus, and the straps whereby it is fastened to the body of the signalman. Besides these parts of the apparatus the aforesaid weight also includes the weight of the exciting battery and that of the induction coil and their respective containers. In cases when it is required to use a longer length of cable than one mile to each reel of the apparatus, then the apparatus is constructed to contain a reel large enough to carry any longer length of cable required. In such cases my apparatus becomes too heavy to be carried on a man's body, and in such case I place it upon a cart or reel wagon drawn by horses or other animals, but in all other respects the details of the construction of the apparatus are the same as those hereinbefore described.

With the view of preventing any error in the working of my apparatus, arising through accidentally connecting the ends of the sections of cable to the non-electrically corresponding sockets F, in the half axes B, and to the non-electrically corresponding binding posts k, and i, in any required number of pairs of such binding posts, such for example as one pair, two, three or more pairs thereof, I not only make the plugs E, of two differently sized so as to fit accurately into the two correspondingly different size sockets F, and into the correspondingly different size holes m, in the said binding posts k, and i,—whereby it becomes impossible to place one of the large plugs E, into one of the small sockets F, or to maintain one of the small plugs E, in one of the large sockets F,—but I render the possibility of time being wasted from any such attempt or occasion of such accidental displacement, in addition to making the plugs E, and the sockets F, of two different sizes

respectively, by coloring the sockets F, and plugs E, two different colors, it being explained, that the plugs E, and the corresponding sockets F, and adjoining pieces of wire are of the same color, the same being colored respectively red and blue, and the heads of the plugs E, respectively red and blue, while the heads of the outside portions of the sockets F, are similarly colored red and blue.

Although I have hereinbefore described the outer ends of the half axes B, as being carried in metallic bearings G, of the framework of the device constituting my invention, yet as the leather straps R, R, connected to the metal of the bearings G, are in wet weather exposed to moisture, and indeed, become moist, whereby the tendency would arise to short circuit the battery in the casing B¹, I whenever desiring to prevent short circuiting, introduce a bushing of insulating material within the bearings G, whereby I prevent electrical connection between the half axes B, and the metal bearings G.

I claim as my invention.

1. The signaling apparatus consisting of a reel of insulating material, in the axis of which are contained two half axes of metal, the inner ends of which are insulated from each other, to which inner ends the terminals of the length of cable wound on the reel are connected to and automatically disconnected from, means for connecting the disconnected ends of a part or section of cable to the reeling apparatus of the signalman carrying the next full reel, the bearings of the reel of insulating material, the separate insulating material within the bearings, means for adjusting the reel longitudinally in its bearings, and adjusting the contact of the needle points with the conical sockets of the half axes, the electrical connections between the needles and the binding posts, the circuit connecting the divided circuits within the axes to an induction coil, and the exciting battery, the induction coil, the impedance coil and the exciting battery all operating electrically the apparatus constituting my said invention, also the telephone connected therewith, the insulating base to which the bearings of the reel are connected and within which the electrical connections between the needles and the binding posts are carried, the crank handle and gear for rotating the reel, the whole being carried by two belts, one surrounding the body of the signalman, and the other belt suspending part of the weight of the apparatus over the back of the shoulders of the signalman, substantially as hereinbefore set forth.

2. The reel with two half axes having their inner ends insulated, the sockets for making electrical connections with the inner ends of a length or section of cable for entering into the aforesaid sockets, and the thongs or shields for covering and protecting the inner ends of the cable as it is wound up on the reel, substantially as set forth.

3. The bearings, the conical recess in the outer ends of each half axle, the needles whose pointed ends engage concentrically and electrically with the conical recesses in the outer ends of these axes, the insulation of the needles and axes from the bearings, the metal connection of the needles to the electrical circuit, the binding posts, all operating substantially as hereinbefore described.

4. The plugs at the terminals of each end of the cable length, each pair of these plugs being of different diameters and fitting into two sockets of similar difference of diameters, one such socket being in each metallic half axle of the reel, the heads of the said plugs, and the ends of the sockets being colored different colors, so as to always indicate which sockets the said plugs are to be respectively entered in, the arrangement being such that the plugs at the terminals of a cable length disengage automatically from the sockets in the half axes instantly that each cable length has become unwound, substantially as hereinbefore described.

5. The binding posts consisting of metallic studs fastened into the insulating base of the reel carrying frame of my signaling apparatus, each such binding post consisting of an upright piece of metal fastened into the
5 insulating base, having two holes transverse to the length of the binding post, the upper hole in each binding post being large enough to admit of the entire plug at each of the terminals of the cable, being passed there-through, and thence into the smaller hole in each binding post wherein it makes the connection in the socket
10 proper thereto, the said binding post being preferably

colored correspondingly with the plugs, all in the manner and for the purposes substantially as hereinbefore described.

In testimony whereof, I have hereunto set my hand 15 and seal, at the city of Los Angeles, aforesaid, in the presence of two subscribing witnesses.

WILLIAM WATSON LOVETT. [L. S.]

Witnesses:

ST. JOHN DAY,

CHARLES T. SUTTON.