F. C. STEIDLE.

TELESCOPING TOWER.

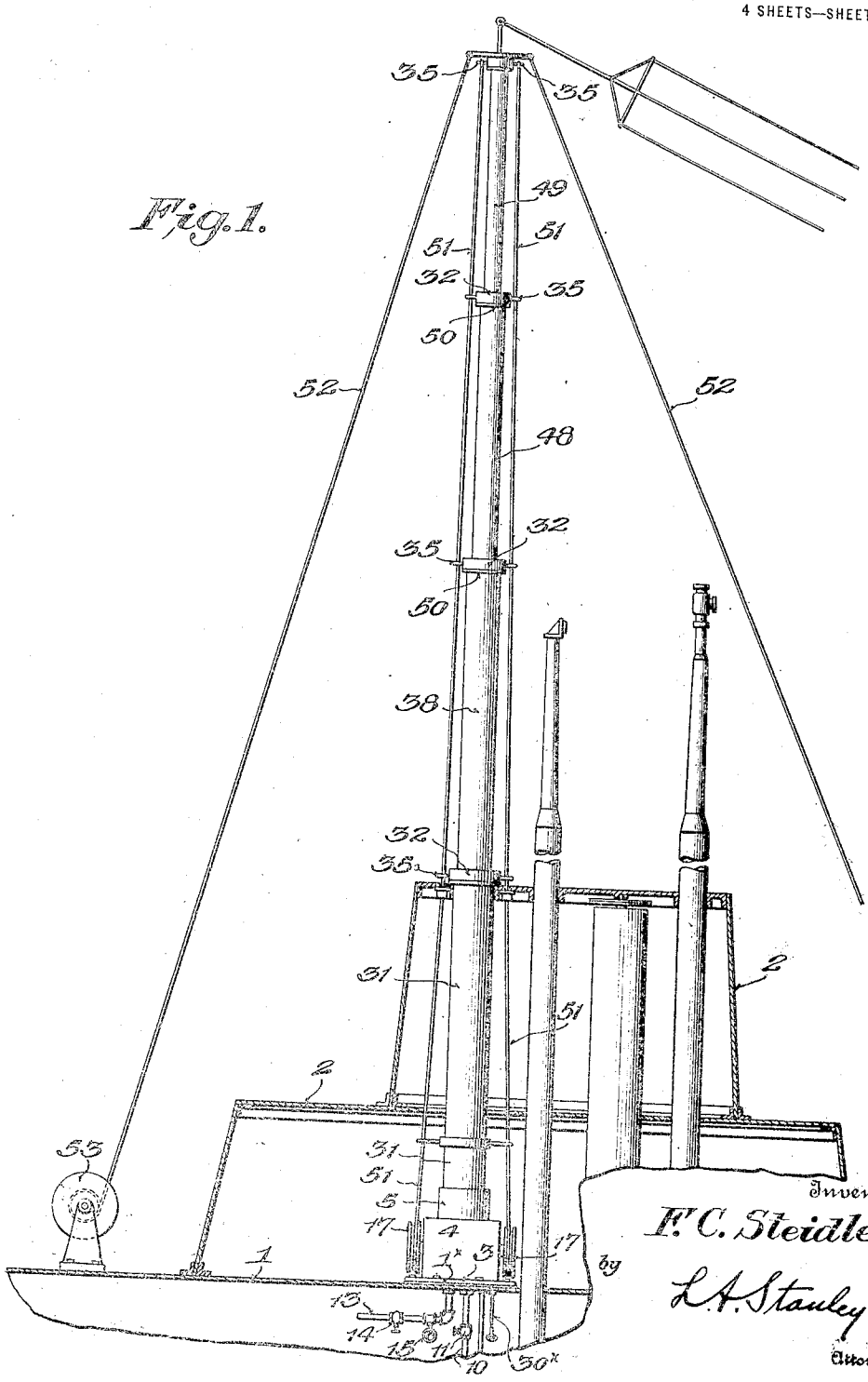
APPLICATION FILED APR. 24, 1918.

1,325,053.

Patented Dec. 16, 1919.

4 SHEETS—SHEET 1.

Fig. 1.



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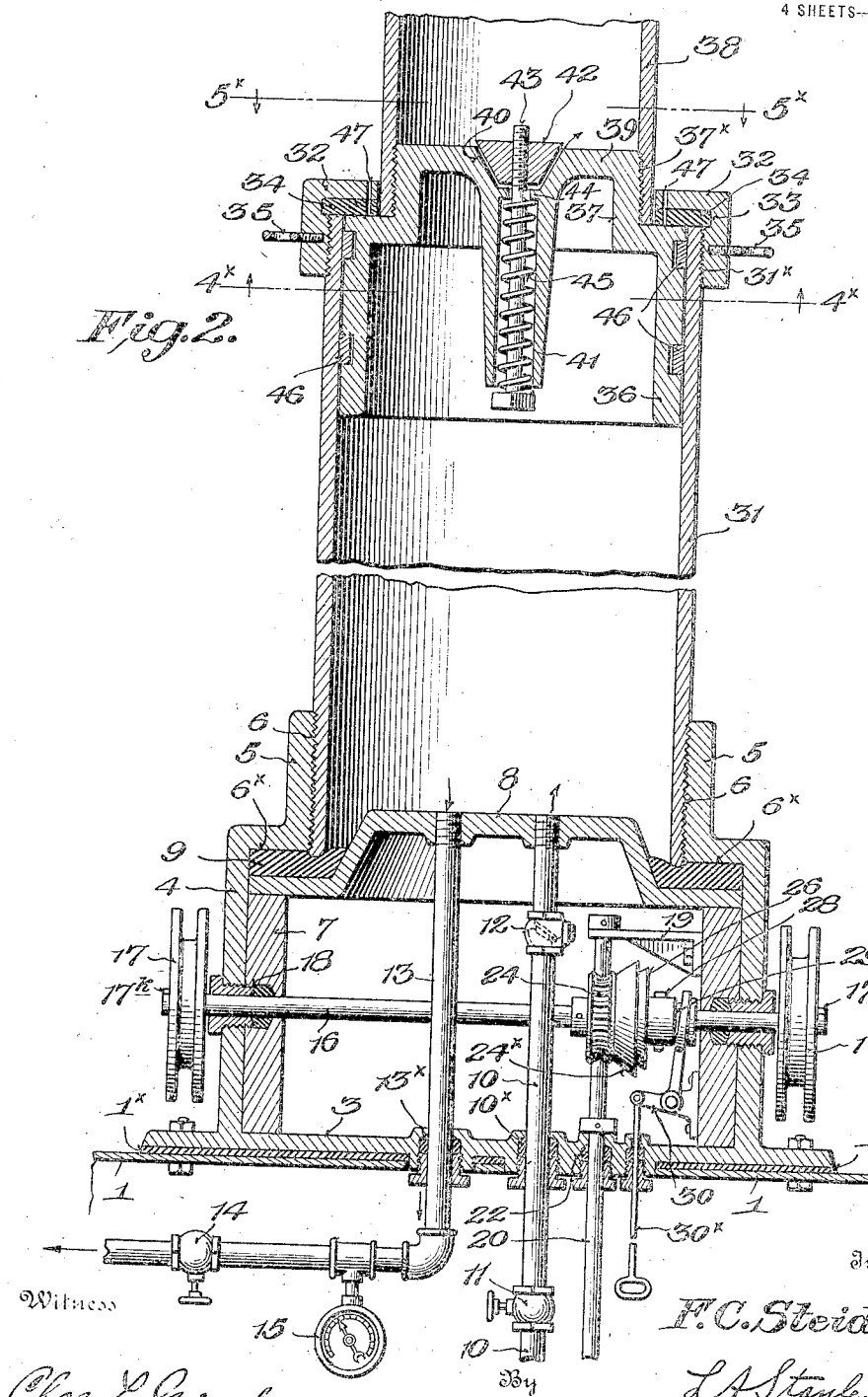
4 SHEETS—SHEET 2.

Fig. 2.



Witness

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4 SHEETS—SHEET 3.

Fig. 3.

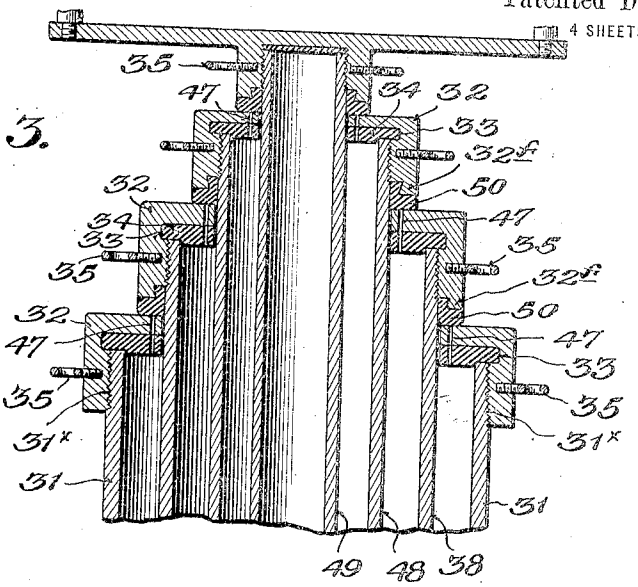


Fig. 4.

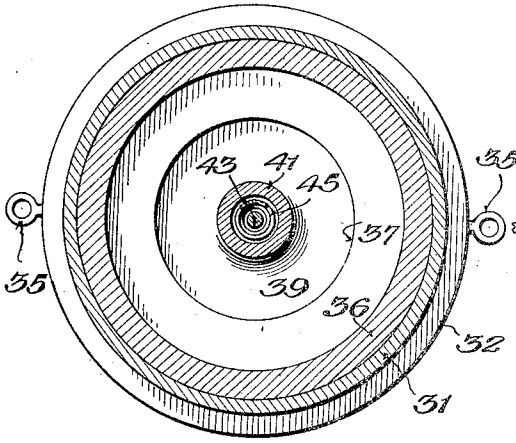
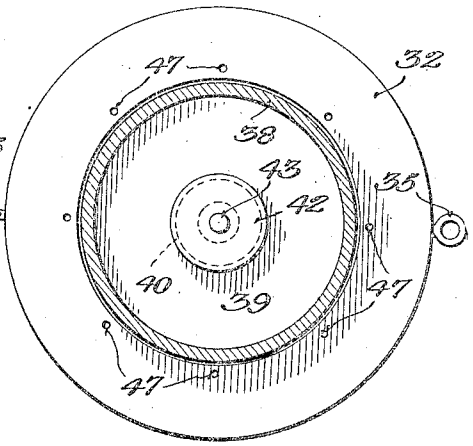


Fig. 5.



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4 SHEETS—SHEET 4.

Fig. 6.

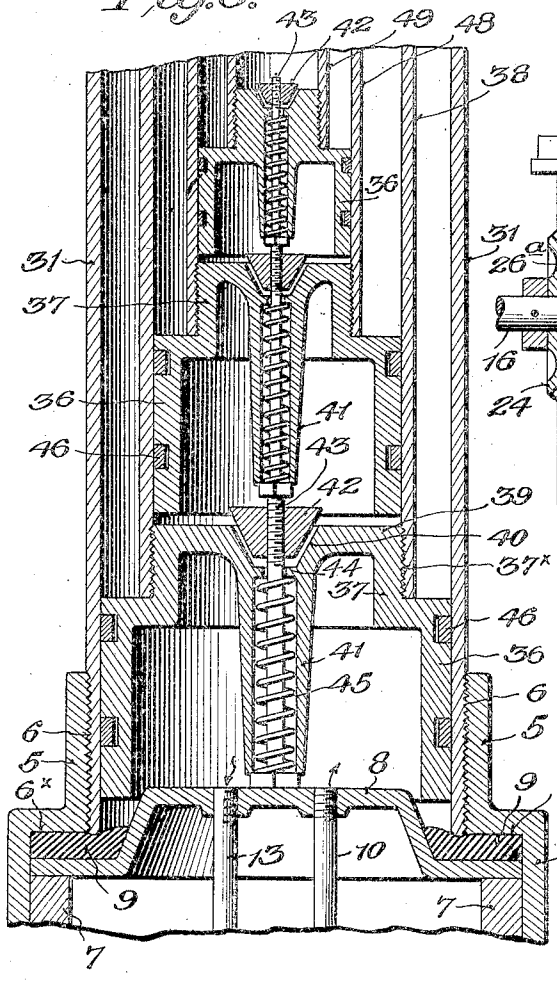


Fig. 7.

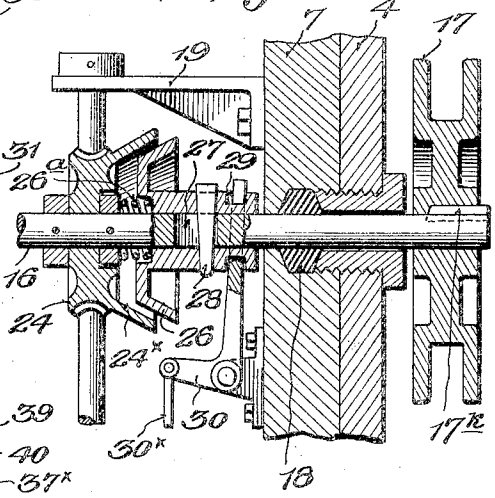
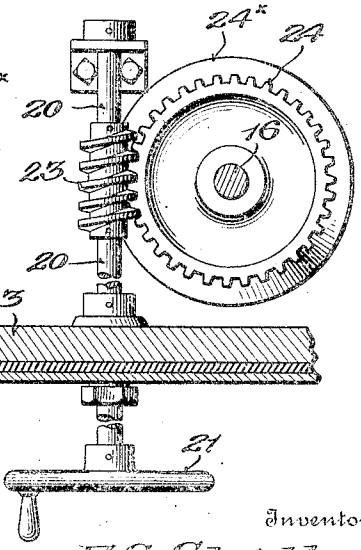


Fig. 8.



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UNITED STATES PATENT OFFICE.

FRED C. STEIDLE, OF MILAN, MICHIGAN.

TELESCOPING TOWER.

1,325,053. Specification of Letters Patent. Patented Dec. 16, 1919.

Application filed April 24, 1918. Serial No. 230,435.

To all whom it may concern:

Be it known that I, FRED C. STEIDLE, a citizen of the United States, residing at Milan, in the county of Washtenaw and State of Michigan, have invented certain new and useful Improvements in Telescoping Towers, of which the following is a specification.

My invention relates to improvements in extension towers or masts, and it consists in the combinations, constructions and arrangements herein described and claimed.

An object of my invention is to provide a telescopic mast or tower which is operated by pneumatic means, and in which the various sections are raised, beginning with the bottom section and ending with the top.

A further object of my invention is to provide an extension mast in which the various sections are rendered water tight in both extended or telescoped position, so that the mast may be used in connection with a submarine for wireless signaling as well as in connection with military automobiles for signal work, such as a look-out tower.

A further object of my invention is to provide novel means including a special form of plunger valve for each section, whereby the sections are elevated in succession and may be lowered in the same order; that is to say, the lower section is lowered first and then the succeeding sections, to the top.

Other objects of my invention will appear in the following specification and the novel features of the invention will be particularly pointed out in the appended claims.

My invention is illustrated in the accompanying drawings which form a part of this application and in which,

Figure 1 is a side elevation of the mast in its extended position, as applied to a submarine, portions of the latter being shown in section;

Fig. 2 is a sectional detailed view of a portion of the lower part of the mast;

Fig. 3 is a detailed section of a portion of the upper part of the mast when the latter is in its collapsed position;

Fig. 4 is a section along the line 4^{x}—4^{x} of Fig. 2;

Fig. 5 is a section along the line 5^{x}—5^{x} of Fig. 2;

Fig. 6 is a vertical section through a portion of the mast showing the lower ends of the sections when the mast is collapsed;

Fig. 7 is a sectional view of the clutch;

Fig. 8 is a sectional view at right angles to Fig. 7.

The mast may be used in connection with any suitable support and for any suitable purpose. In the drawings it is shown for submarine use. The main deck of the submarine is shown at 1, the packing between the base of the tower and the deck at 1^{x}, and the superstructure at 2. Secured to the deck 1 is a base portion having a bottom 3 and integral cylindrical walls 4. At the upper end of the walls 4 is an integral reduced portion 5 which is threaded at 6 as shown in the drawings. Disposed within the walls 4 and contiguous thereto is a reinforcing ring 7. Between the upper end of the reinforcing ring and the shoulder 6^{x}, formed by the reduced portion 6, is a plate 8, this plate being dish-shaped as shown in the drawing and forming a partition between the base portion and the bottom section of the mast. A resilient gasket 9 is disposed between the edges of the plate 8 and the shoulder 6^{x}.

Arranged to pass through the base 3 is an air or steam inlet pipe 10. This pipe is threaded into the plate 8, as shown in the drawings, and is provided with a control valve 11 and also with a check valve 12. The lower end of the pipe 10 is designed to communicate with a suitable source of compressed air or steam (not shown). A second pipe 13 is also threaded into the plate 8 and passes through the base 3. This pipe is provided with a control valve 14 and with a pressure gage 15. Adjustable packing glands 10^{x} and 13^{x} are provided for the pipes 10 and 13, respectively.

Extending through the walls 4 of the support and through the reinforcing ring 7 is a shaft 16 which bears at each end a reel 17. This shaft is also provided with packing glands 18 so as to make the device water tight while permitting the rotation of the shaft 16. A bracket 19 forms a bearing member for a shaft 20 which extends through the base 3 and is provided at its lower end with a wheel 21 by means of which the shaft can be turned, a packing gland 22 being provided for rendering the device watertight. The shaft 20 bears the worm 23 which is arranged to engage a worm gear 24, the latter being mounted to revolve freely on the shaft 16, one side of said gear being dish-shaped as shown at

24x and forming a cone clutch member. It will be obvious that when the handle 21 is turned the clutch member 24 is rotated.

Coöperating with the clutch member 24 is a slidable clutch member 26 which is frustum shaped and which is slidable along the shaft 16. The shaft 16 is slotted as shown at 27 and the hub of the clutch member 26 is provided with a pin 28 which is guided in the slot 27 and which thus permits longitudinal movement of the clutch member 26 while it provides rotary movement of the shaft 16 when the clutch member 26 is turned. In Fig. 7 it will be seen that the hub of the clutch member 26 is provided with a groove 29 in which is disposed a yoke at the end of the bell crank lever 30 which has an operating handle or rod 30x. When the latter is pulled downwardly the clutch member 26 is brought into operative engagement with the clutch member 24x thus transmitting the movement of the worm gear 24 to the shaft 16. The pulleys 17 are secured to the shaft 16 to rotate therewith by means of keys 17x or in any other suitable manner.

Screwed to the threaded portion 6 of the base is the bottom section 31. This consists preferably of a cylinder which is threaded at its top as shown at 31x to receive the threaded portion of a ring or cap 32. The latter, it will be observed, has an annular recess 33 into which the outer portion of a gasket 34 fits. This gasket 34 is arranged to extend beyond the upper end of the cylindrical member 31 and to be held by the latter against the under side of the ring 32. On opposite sides of the ring are disposed eye-bolts 35 whose purpose will be explained later.

Each of the telescopic sections is provided with a plunger valve. A description of one of these plunger valves will suffice for all since they are precisely the same in construction. In Fig. 2 it will be noted that the plunger consists of a cylindrical body portion 36 having a reduced integral portion 37 threaded at 37x to receive the adjacent upper section 38. The reduced portion 37 has an integral top 39 which is provided with a conical valve seat 40. The top 39 is provided with downwardly extending sleeve or socket 41. A valve 42 of conical shape is secured at the end of a bolt 43, the bolt being threaded into the valve so as to turn freely with respect thereto when desired. The socket 41 is provided with an integral shoulder 44, against which one end of a coiled spring 45 bears, the opposite end bearing against the head of the bolt 43. This construction permits a regulation of the tension of the valve, since by turning the bolt, more or less pressure is exerted by the spring to give more or less tension. The body portion 36 of the plunger valve is designed to fit snugly and at the same time to slide freely on the interior of the cylinder 31, but in order that there should be no leakage of air I provide the rings 46. As many rings may be provided as are necessary to form an air tight plunger, the number depending upon the size of the parts. Openings 47 are provided which pass through the ring or cap 32 and through the gasket 34, the purpose of these openings being to permit the air which is between the sections of the tower, to escape as the plunger is moving upward and thus allows the plunger to seat properly against the gasket 34, avoiding air cushion and sealing air tight. It will be observed in this connection that Fig. 2 shows the plunger in its uppermost position.

Referring now to Figs. 3 and 6, it will be seen that the various sections of the mast may be collapsed or telescoped. The rings 32 which are associated with the upper ends of the cylinders, such as those shown at 38, 48 and 49, are provided with flanges 32x for holding rubber gaskets 50 which surround their respective cylinders and which when the device is collapsed, overlie the air vents 47.

As will be seen from Fig. 6, the plunger of the cylinder 31 bears the cylinder 38. The plunger of the cylinder 38 bears the cylinder 48 and so on. In the drawings I have shown four of these cylinders, forming four sections of the mast or tower, but it will be understood that as many as are necessary might be used without departing from the spirit or the scope of the invention. It will be seen that the plunger secured to the bottom of the last or top section is just a straight plunger without a valve, as no air is to pass at any time. The uppermost cylinder section which in the present instance is the section 49 may bear a platform, or aerials or any suitable device.

Referring now to Fig. 1, I have shown therein pull-wires 51, these wires being secured to the eye-bolts 35 of the uppermost mast section 49. From thence they pass downwardly through the eye-bolts 35 to the section 48 and through the eye-bolts of the other sections pulling on a straight line or each section being drawn directly into the one below it, being secured to the reels 17, said wires being adjusted to the proper length to be fully taken up when the tower is extended. Other guy-wires such as those shown at 52 (see Fig. 1), may also be used and these wires are preferably wound on spring drums such as that shown at 53, Fig. 1, these drums being carried by any suitable support such as the deck of the submarine and placed in the various positions or directions in which the wire is drawn.

From the foregoing description of the various parts of the device the operation thereof may be readily understood. We will as-

sume that the tower or mast is collapsed. The various sections will then be in the position shown in Figs. 3 and 6. In Fig. 6 it will be seen that the valves 42 of the various sections are open. The valve of the section 31 rests on the plate 8 while the succeeding valves are held in open position by their contact with the valve stems beneath them.

When it is desired to elevate the tower or mast, the valve 11 is opened and the compressed air or steam is admitted through the pipe 10 directly into the interior of the plunger valve 36, and the free flow of air pressure through the large inlet pipe 10 causes the plunger 36 to rise. The instant this plunger is moved, its valve 42 will be closed because the spring has been adjusted at such tension that it will close. The plunger valve moves upwardly until the shoulder on the plunger is seated tightly against the backing ring or gasket 34, making the first or lower point air tight. When this occurs the air pressure becomes great enough to force open valve 42 so as to admit air past the valve to raise the plunger valve in the next section 38. In the same manner the succeeding sections are extended one at a time. The air in the space between two adjacent sections, as for instance, the sections 31 and 38, escapes through the vent holes 47 as the plunger valve 36 is carried upward and this prevents the formation of an air cushion and allows the plunger valve to seat properly as shown. In the meantime the pull wires 51 have been playing out, due to the fact that the reels 17 are free to move, the clutch being disengaged when tension is exerted on the cables. The guy wires 52 unwind from the spring drums 53.

When the mast or tower has been extended so that there is no further movement the fact will be indicated by a rise of pressure in the pressure gage so that the control valve 11 may be turned to prevent further entrance of air.

In collapsing the tower, the valve 14 is opened and the weight of the mast causes the latter to move the plunger of the cylinder 31 downwardly as fast as the air escapes. This, of course, can be regulated. When the cylinder 38 has reached its lowermost position then the valve 42 of the cylinder 31 will have engaged the plate 8, (see Fig. 6), thus automatically opening the valve and permitting the air within the cylinder 38 to escape past the valve. The plunger of the cylinder 38 will now begin to move downwardly and will carry with it those sections which are supported by it. When it reaches its lowermost position the end of the valve stem *i. e.* the head of the bolt will engage the stem of the valve immediately below it and will force the valve to open so as to permit the air to pass out from the interior of the next upper section. Thus the action continues until all of the sections have been collapsed in the manner shown in Figs. 3 and 6.

While the sections are being collapsed, the guy wires 52 are being wound up by means of the spring drums 53 and the cables 51 are being re-wound on the reels 17 by the use of the worm drive and the clutch on the shaft 16. When the valve 14 is opened to allow air to pass from the tower, the rod 30^x is pulled downwardly which shifts the clutch member 26 into engagement with the clutch member 24, so that when the shaft 16 is revolved by means of the worm gearing the tower sections will be positively collapsed. The power for propelling the shaft 16 to rewind the pull cables 51 may be hand power or any other suitable means on the submarine. By means of the clutch any suitable power can be used with no danger of breaking the cables as the operator in holding down the control rod 30^x can throw the clutch in or out at will and can bring to bear more or less pressure locking the clutch tightly or loosely as the cable is taken up and thus controlling the movement of the tower sections at will. It will be observed that the worm gearing forms a powerful means for rotating the reels, so that the sections may be positively forced downwardly in the manner described, the pull wires 51 acting, in this instance, as cables for positively collapsing the sections and drawing each section directly into the next larger section.

Normally the clutch members 26 and 24^x are held out of engagement by means of the spring 26^a, but may be brought into engagement as stated by pulling down on the handle 30^x. When the handle is released, the spring forces the clutch members apart.

The use of pneumatic means for elevating and lowering the tower obviates the dangers of sudden movement since the control valves can be manipulated so as to raise or lower them as fast or as slowly as desired, and as a whole the tower will positively extend and collapse regardless of any climatic conditions or on an angle or inclined position.

I claim:—

1. An extension tower or mast comprising a plurality of telescopic sections, plungers disposed within certain of said sections, each of said plungers being provided with a spring-pressed valve for normally cutting off communication between adjacent sections, the plunger of one section being secured to and supporting the adjacent upper section, pneumatic means for causing the movement of said plungers and the sections to which they are secured whereby the mast may be extended, cables secured to the uppermost section, guide means carried by the other sections for receiving the cable and means for positively winding in the cable

when the mast is being collapsed, said last-named means comprising a clutch, a shaft, a reel carried by the shaft for receiving the cable and a worm gearing for rotating the shaft by means of the said clutch.

2. An extension tower or mast comprising a plurality of telescopic sections, plungers disposed within certain of said sections, each of said plungers being provided with a spring-pressed valve for normally cutting off communication between adjacent sections, the plunger of one section being secured to and supporting the adjacent upper section, pneumatic means for causing the movement of said plungers and the sections to which they are secured whereby the mast may be extended, cables secured to the uppermost section, guide means carried by the other sections for receiving the cable and means for positively winding in the cable when the mast is collapsed, said last-named means comprising a clutch, a shaft, a reel carried by the shaft for receiving the cable and a worm gearing for rotating the clutch and the shaft.

3. An extension tower or mast comprising a base having a threaded portion, a tower section screwed to said threaded portion, a cap for said tower section provided with a central opening and vent holes which avoid the formation of air cushions, a plunger for said section having a threaded portion, a second tower section secured to said threaded portion and arranged to extend through the central opening in the cap, a valve seat carried by said plunger, a valve and spring means for holding said valve normally to said seat and means for adjusting the tension of the spring.

4. An extension tower or mast comprising a base having a threaded portion, a tower section screwed to said threaded portion, a cap for said tower section provided with a central opening and vent holes, a plunger for said section having a threaded portion, a second tower section secured to said threaded portion and arranged to extend through the central opening in the cap, a valve seat carried by said plunger, a valve and spring means for holding said valve normally to said seat, means for adjusting the tension of the spring and a gasket carried by said cap and arranged to be engaged by a portion of said plunger, said cap and said gasket having a series of vent openings for permitting the escape of air between the sections.

5. An extension tower or mast comprising a plurality of telescopic sections each section comprising a cylinder, a cap for certain of said sections said cap having a central opening arranged to receive the adjacent section, a plunger disposed in certain of said sections and being secured to the adjacent section, said plunger having a centrally disposed valve seat, a valve, a valve stem adjustably secured to said valve and being provided with a head, a spring arranged to bear on a portion of the plunger at one end and upon said head at the other end and extensions carried by the plunger and arranged to engage said head for limiting the movement of the valve.

6. An extension tower or mast comprising a plurality of telescopic sections each section comprising a cylinder, a cap for certain of said sections said cap having vent holes and a central opening arranged to receive the adjacent section, a plunger disposed in certain of said sections and being secured to the adjacent section, said plunger having a centrally disposed valve seat, a valve, a valve stem adjustably secured to said valve and being provided with a head, a spring arranged to bear on a portion of the plunger at one end and upon said head at the other end extensions carried by the plunger and arranged to engage said head for limiting the movement of the valve, means for admitting compressed air or steam into the interior of the section containing the plunger and means for withdrawing the air therefrom.

In testimony whereof I have affixed my signature.

FRED C. STEIDLE.