

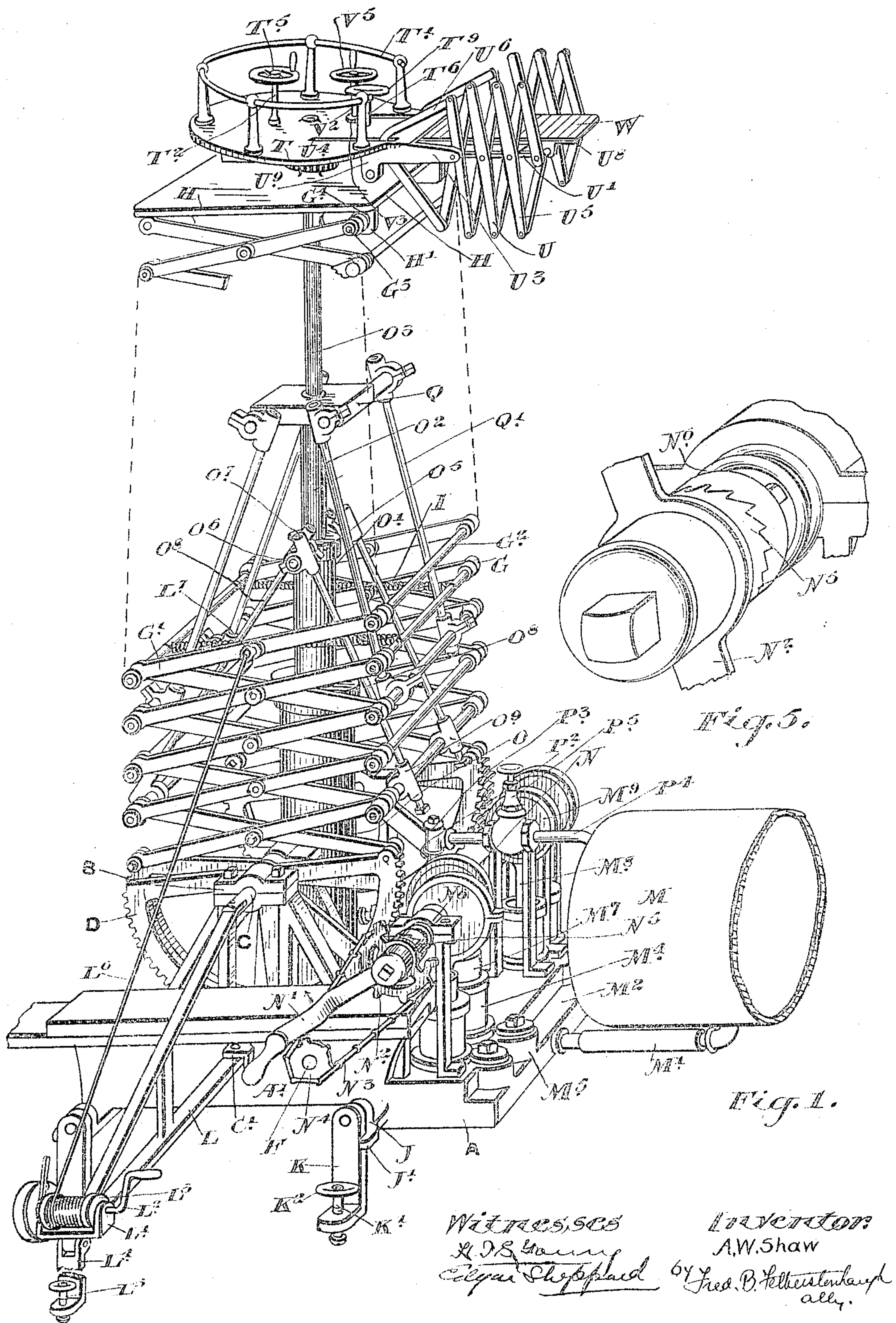
No. 818,304.

PATENTED APR. 17, 1906.

A. W. SHAW.
AERIAL LADDER.

APPLICATION FILED JUNE 2, 1905.

4 SHEETS—SHEET 1.



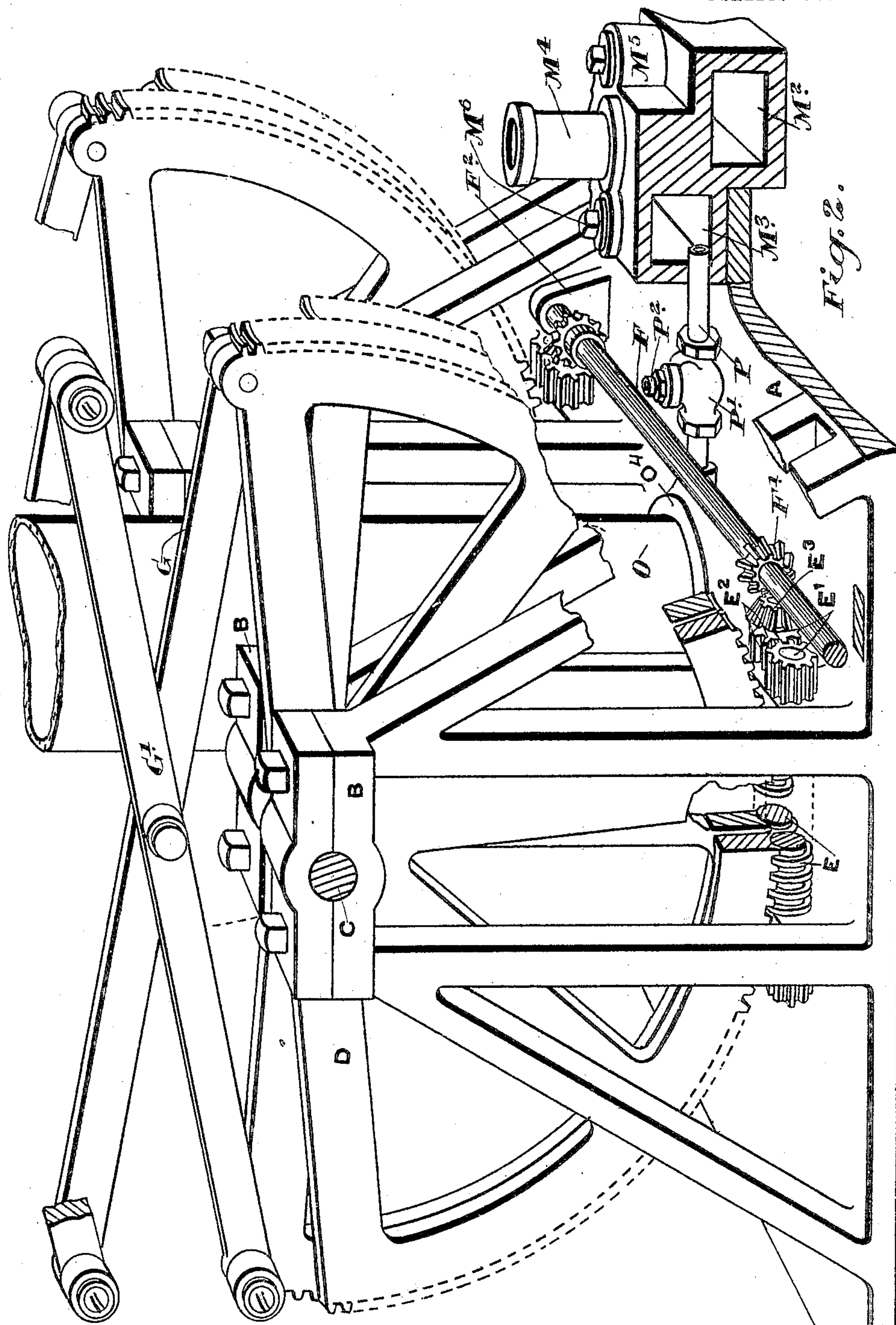
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4 SHEETS—SHEET 2.



Witnesses
H. J. S. Loring
Clyde H. Loring

Inventor:
A. W. Shaw.
by Fred B. Hestonkough
Attly.

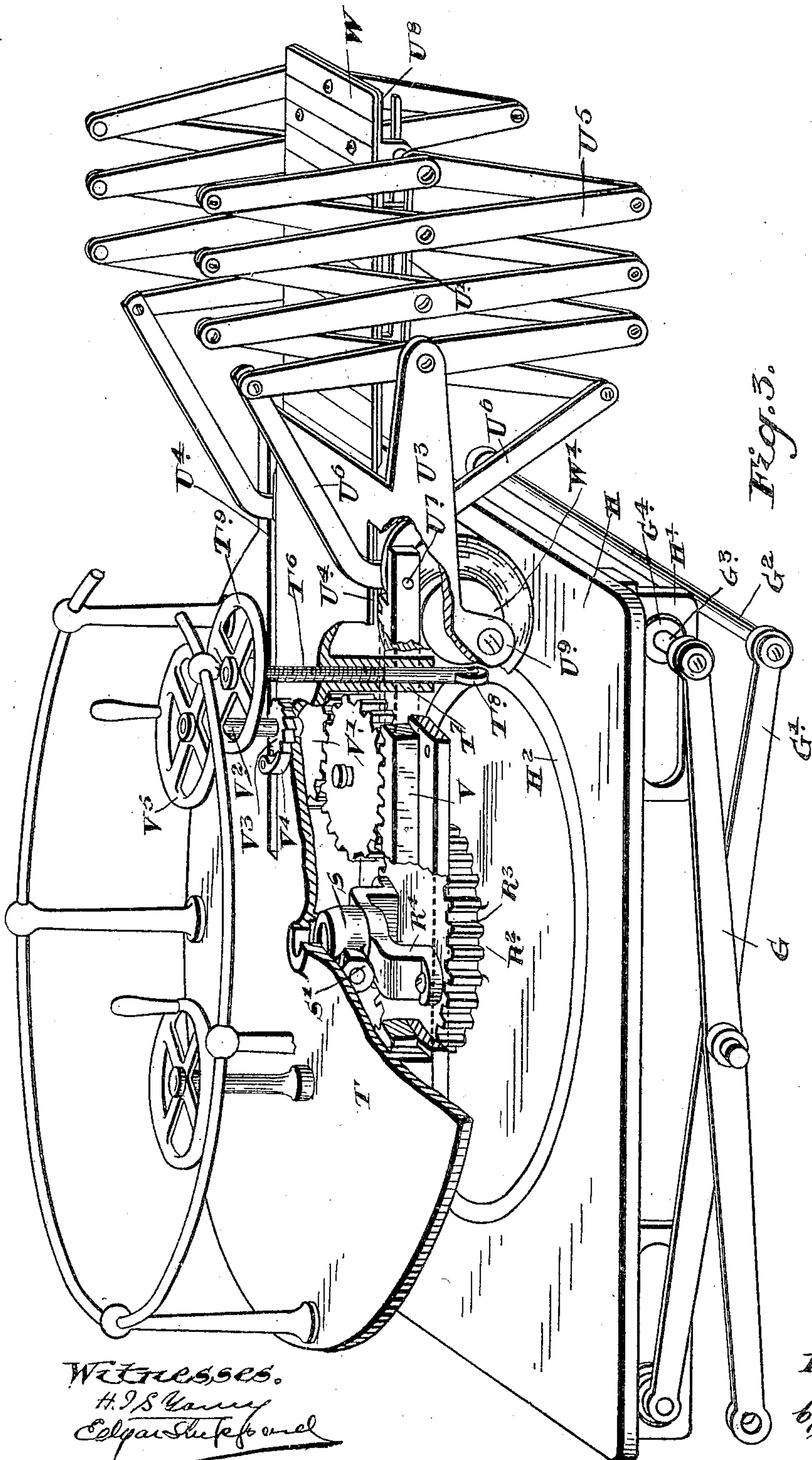
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4 SHEETS—SHEET 3.



Witnesses.

H. J. S. Kamey
Edgar S. Kamey

Inventor
A. W. Shaw
by J. B. Fetherday
att'y

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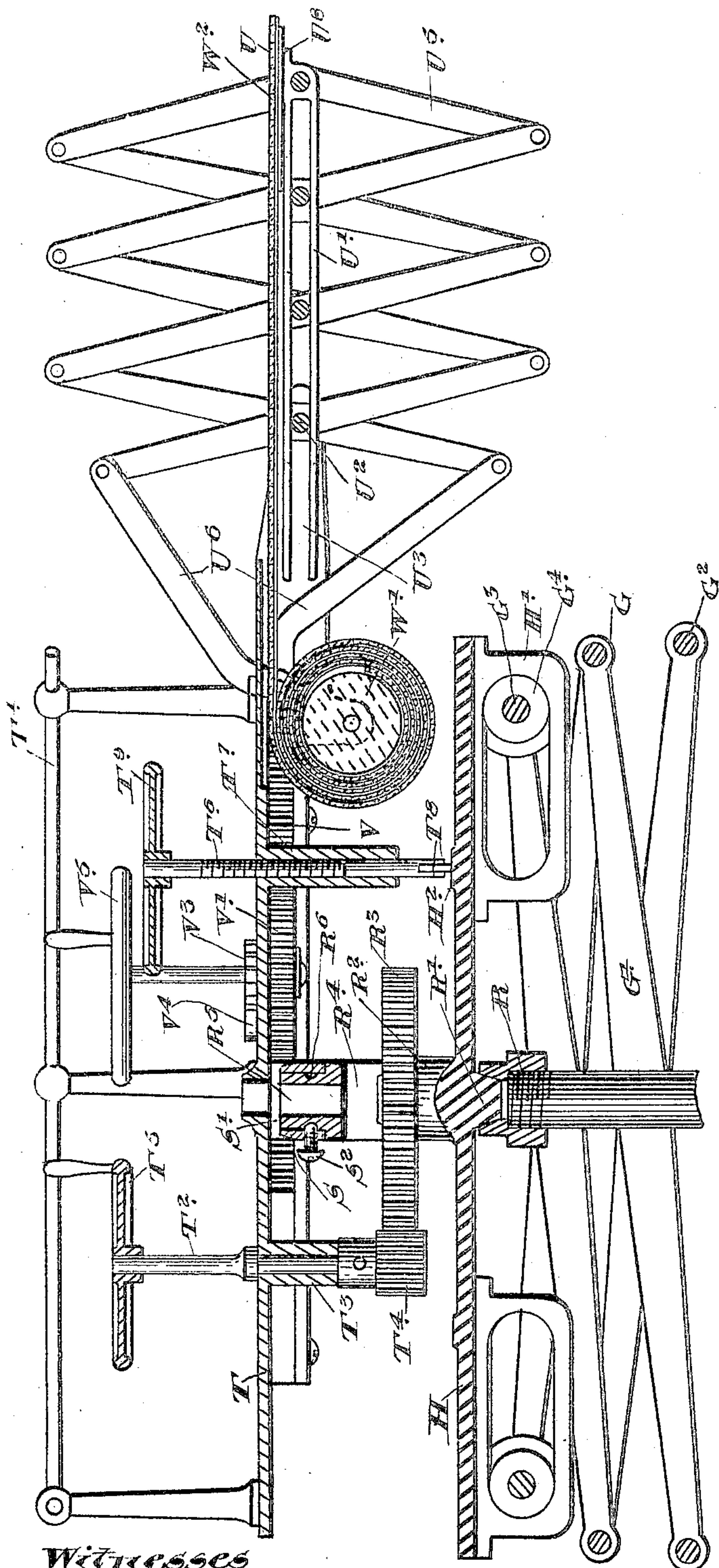


Fig. 4.

Witnesses
H. J. S. Young
Edgar A. Chappard

Inventor:
A. W. Shaw.
By J. B. Ketchum, atty.

UNITED STATES PATENT OFFICE.

ANGUS W. SHAW, OF TORONTO, CANADA, ASSIGNOR TO ROBERT FLEMING,
IN TRUST.

AERIAL LADDER.

No. 818,304.

Specification of Letters Patent.

Patented April 17, 1906.

Application filed June 2, 1905. Serial No. 263,444.

To all whom it may concern:

Be it known that I, ANGUS WILLIAM SHAW, of the city of Toronto, in the county of York, in the Province of Ontario, Canada, have invented certain new and useful Improvements in Aerial Ladders, of which the following is a specification.

My invention relates to improvements in aerial ladders or lifts; and the object of the invention is to construct a device of this class, which may be raised to any desired height expeditiously, and thereby in case of a fire enable it to be used as a fire-escape as well as a means for enabling the firemen to combat the fire by being able to reach the required height to utilize their hose, which may be also used as an elevator for conveying building materials or other articles to any desired height, and which may be used as an adjustable support for scaffoldings, whereby it may be raised and maintained at any desired height, and for various other uses which it is not necessary here to enumerate; and it consists, essentially, of a suitable base designed preferably to be located on a wagon, an expansible and collapsible standard comprising sides made up of cross-bars pivotally connected together at their centers and at the ends to cross-rods, a platform located at the upper end of the standard, an extensible bridge operable therefrom, suitable standards on the platform of the wagon provided with segmental worm-gears operated through worms and suitable gearing, and a central extensible telescopic standard, a suitable storage-tank, and fluid-pumps designed to inject the fluid, from the storage-tank into the standard, so as to raise the same, the parts being constructed and arranged in detail as hereinafter more particularly explained.

Figure 1 is a perspective view of my aerial ladder, partially broken away to exhibit the construction thereof. Fig. 2 is an enlarged perspective detail showing the segmental gears, which form part of the means for raising the ladder. Fig. 3 is an enlarged detail of the top platform and supplemental rotating platform, the latter being partially broken away. Fig. 4 is an enlarged vertical section through the upper portion of the ladder and top platform and extension-bridge. Fig. 5 is a detail showing the clutch on the end of the main operating-spindle.

In the drawings like letters of reference indicate corresponding parts in each figure.

A is the platform or base, which preferably forms part of a wagon and is swung low between the front and hind wheels in the U-shaped frame, which it is not necessary here to describe.

B B are a pair of standards, one pair being located on each side of the platform.

C is a shaft extending through bearings in the top of each pair of standards, and D D are segmental worm-gears substantially semi-circular and journaled on the shafts C.

E E are a pair of worms meshing with the segmental worm-wheels D D, such worms being secured on or forming part of suitable shafts E' E', and E² E² are gear-pinions secured on the ends of the shafts E' E' and meshing with each other. E³ is a bevel-gearpinion secured on the end of one of the shafts E'.

F is a cross-shaft which is provided with a bevel-pinion F' near each end thereof, which meshes with the bevel-gear E³. The shaft F is journaled in suitable bearings F², as indicated, and extends through one of the sides A' of the platform A.

G is the collapsible and expansible standard, comprising the series of cross-bars G', pivotally connected together at their center and at the ends to the pair beneath them by means of the cross-rods G², which extend through the ends of the bars, as indicated. The bottom ends of the lowermost pair of cross-bars are pivotally connected to the top of the opposite ends of the adjacently-placed worm-gears D D. The cross-bars are preferably gradually reduced in length from bottom to top, so as to form a tapered standard and the ends of the top cross-bars are connected to lugs H' of the top platform H.

I represents tension-springs connecting the rods G² together and normally exerting an inward pull on the rods G'; thereby tending to raise the ladder.

J is a bracket secured on each side of the base A and provided with a stop-lug J'.

K is a swinging-arm pivoted at the top in the bracket J and provided with a clamping-spindle K' at the lower right-angular turned end, such spindle being provided with a hand-wheel K², whereby it may be lowered so as to exert a pressure on the ground, and

thereby hold the base steady. The clamping-spindle K' and supporting parts are located on each side of the base A, and such clamping-spindle when it is desired to move the wagon may be raised and the arm K swung clear of the ground, being held up by any suitable means.

L is a brace, the ends of which are pivotally connected to the end of the shaft C and a bracket C', secured to the base A. The outer end of the brace L is formed with bearings L', in which is journaled the spindle L², carrying a reel L³.

L⁴ is an arm pivoted on a pin on the end of the brace L underneath the reel L³ and provided with a clamping-spindle L⁵, by which the end of the brace L may be steadied and the base A thereby also steadied and held normally in position. There is of course a brace L, with its accompanying parts, at each side of the base A. The reel A carries a chain or guy-wire, preferably a flexible guy-wire L⁶, which extends to an eyebolt L⁷ on the pivotal connection between the bars G'. The guy-wires L⁶ are designed to steady the aerial ladder as it rises, and the roller L³ is a spring-roller of somewhat the window-shade type, which allows of the wire to pass outwardly step by step, so that no matter at what point the aerial ladder may be raised to the guy-wires L⁶ will serve to hold it from swaying.

M is a reservoir for air, steam, or other fluid, and M' is a pipe leading from the reservoir M into the chamber M², formed in the base A.

M³ is another chamber located adjacent to the chamber M², and M⁴ represents the cylinders of a series of pumps which are located on the top of the casings of the chambers M² and M³.

M⁵ and M⁶ are the valve-casings, in which are located the valves of the pumps.

H⁷ represents the pistons of the pumps, which are connected by the piston-rods M⁸ to an ordinary eccentric M⁹ on the shaft N. The valves M⁵ and M⁶ serve as a means of controlling the communication between the chambers M² and M³.

N' is a crank-handle secured on the end of the shaft N. N² is a sprocket-wheel on the shaft N, such sprocket-wheel being connected by a sprocket-chain N³ through a sprocket-wheel N⁴ on the end of the cross or counter shaft F.

N⁵ is an ordinary ratchet-tooth clutch, one member of which is loose on the shaft N and forms part of the sprocket-wheel loose on the shaft, and the other member of which is secured to rotate with the shaft by a feather-key, is longitudinally adjustable thereon, and is normally held in engagement with the other member by a spring N⁶.

O is the bottom member of a telescopic standard, and O', O², and O³ are the other members, starting from the bottom. The

member O of the telescopic standard is securely held in the base.

P is a pipe leading from the chamber M³ to the base O⁴ of the telescopic standard.

P' is a T, secured intermediate of the length of the pipe P, and P² is a pipe extending upwardly from the T P' and having at the upper end a T P³, from which extends a pipe P⁴ to the reservoir.

P⁵ is a controlling valve, whereby when open the exhaust fluid may be allowed to escape back into the reservoir M.

It will of course be understood that the connections between the different members of the telescopic standard are properly packed, so as to prevent the escape of fluid.

At the top of the member O' I provide a head O⁵, having laterally-extending pins O⁶, on which are located the end brackets O⁷, through which extend the rods O⁸, which extend through and are secured in the brackets O⁹, pivotally swung on the rods G².

The member O² is provided with a head Q, which is connected by rods Q' to the rods G², similarly to the manner of connecting the head O⁵ to the rods G².

It will be noticed that the lugs H' are slotted lugs and that the top pins G³ are provided with rollers G⁴, which are designed to have inward and outward movement in the slotted lugs H', according as the aerial ladder is caused to ascend or descend. The top of the member O³ of the telescopic standard is screwed into a sleeve R, into which fits the central depending projection R', formed in the center of the bottom of the platform. An upwardly-extending projection R² carries on its reduced upper end a gear-wheel R³.

R⁴ is a chair which is secured to the top of the gear-wheel R³ and is provided with an upwardly-extending hollow boss R⁵, having a groove R⁶.

S is a sleeve which is pivoted on the diagonally-located lugs S', attached to or forming part of the supplemental platform T, and S² is a set-screw which extends through the sleeve S into the groove R⁶. It will thus be seen that the sleeve S will rotate on the hollow boss R⁵ and be held from displacement by the set-screw S².

The supplemental platform T is provided, preferably, with a railing T'.

T² is a spindle journaled in the bearing-boss T³, attached to or forming part of the supplemental platform T, and T⁴ is a pinion on the lower end of the spindle T². The upper end is provided with a suitable hand-wheel T⁵. It will now be seen that by means of the hand-wheel T⁵ the supplemental platform may be circularly adjusted or rotated on the top of the main or supporting platform H.

In order to form a support for the platform at the side on which is located the bridge U, I provide a screw-spindle T⁶, which extends

through a threaded boss T^7 , attached to or forming part of the platform and is provided at the lower end with a roller T^8 , which is designed to ride on a circular track H^2 on the platform.

T^9 is hand-wheel, whereby the spindle T^6 may be vertically adjusted, and thereby the supplemental platform T tilted on the lugs S' , so as to throw the bridge U to any desired slant.

The bridge U is formed of a series of slotted sliding bars U' , which are located in sets, one at each side of the bridge, and are supported on the cross-rods U^2 , the innermost one of which is held in the brackets U^3 , forming part of the supplemental platform T .

U^4 represents slots formed in the supplemental platform T and substantially on a line with the slotted bars U' .

U^5 represents a series of cross-bars pivotally connected together at the ends and at the center on the rods U^2 . These bars are of the same form as the ordinary extension-gate. The inner ends of the bars U^5 are connected by the bars U^6 to a pin U^7 at each side forming part of the rack V , the upper bars U^6 extending through the slots U^4 .

V' represents the pinions, which mesh with the racks and with each other, being suitably journaled at the bottom of the platform. The spindle V^2 of one of the pinions V' is provided with a ratchet-wheel V^3 , which is engaged by a coacting pawl V^4 . V^5 is the hand-wheel, located at the upper end of the spindle and designed to be utilized to turn the spindle, and thereby throw the racks inwardly and outwardly, and consequently extend or collapse the bridge.

The bottom of the bridge is formed of a series of slats W , connected to a flexible belt which extends around a roller W' at the inner end, such roller being journaled in the brackets U^9 and being a spring-actuated roller having a normal tendency to always pull the slatted floor W of the bridge inwardly. The outer end of the slatted floor W of the bridge is connected to a cross-plate U^8 , by which the outer slotted bars U' are connected.

It will now be seen that the platform T may be tilted to any desired extent, so that the extension-bridge may be raised to any desired angle, and thereby inserted in any window or door in a building, and that when the proper angle is reached the bridge may be thrown forward by the means which I have designed, so that a fireman may obtain entrance into the building through the window or otherwise.

When the desired work has been accomplished by the firemen or others, the bridge may be withdrawn by manipulating the hand-wheel V^5 , so that it may be collapsed into the position shown in the drawings.

In order to raise the platforms H and T to the desired height, the shaft N is rotated by means of the crank-handle N' or by a suitable

power means, if desired, and the pumps thereby set in motion, so as to force the fluid from the chambers M^2 and M^3 through a pipe P and up through the telescopic members O , O' , O^2 , and O^3 of the standard, thereby raising the standard and at the same time pulling upon the rods Q' and O^8 and the bars G^2 , thus tending to pull the bars inwardly. At the same time also motion is communicated to the shaft F by the means hereinbefore described, so that the worms E work on their respective segmental worm-gears D , throwing the ends connected to the bars G' upwardly, and thus tending to lengthen the space between the bars G' .

It will now be understood that my aerial ladder is raised not only by means of the fluid pumped into the telescopic standard, but also by the worm-gear, thus providing an effectual, steady, durable, and positive means of raising the aerial ladder to any desired height.

What I claim as my invention is—

1. The combination with the base and standards located thereon and the stud-shaft supported in the standards, of a pair of segmental worm-gears journaled on each stud-shaft, the expansible and collapsible standard comprising the crossed side bars and end connecting-rods, the ends of the lowermost bars of which are connected to the ends of the segmental worm-gears, and worm-shafts provided with worms suitably journaled in the base and engaging said worm-gears, and means for turning such worm-shafts as and for the purpose specified.

2. The combination with the base and standards located thereon and the stud-shaft supported in the standards, of a pair of segmental worm-gears journaled on each stud-shaft, the expansible and collapsible standard comprising the crossed side bars and end connecting-rods, the ends of the lowermost bars on one side being connected to one pair of segmental gears and the lowermost bars on the other side being connected to the other pair of segmental gears one bar being connected to each gear, and two pairs of worm-shafts provided with worms suitably journaled in the base and intermediate meshing-gears located on the ends of the worm-shafts, bevel-gears located on the end of one worm-shaft of each pair, a cross-shaft having bevel-gears meshing with the aforesaid bevel-gears and means for driving such cross-shaft as and for the purpose specified.

3. The combination with the base and the expansible and collapsible standard, of the braces extending laterally out from the base and being pivoted thereto, spring-actuated reels supported on the ends of the braces, the guys carried by such reels and extending up to the standards as and for the purpose specified.

4. The combination with the base and expansible and collapsible standard suitably

supported thereon, of the top platform, the telescopic standard secured to the base and connected at the top to the platform, means for actuating said expansible and collapsible standard and means for extending and contracting such telescopic standard as and for the purpose specified.

5. The combination with the base and expansible and collapsible standard suitably supported thereon, of the top platform, the telescopic standard secured to the base and connected at the top to the platform, means for actuating said expansible and collapsible standard and fluid-pressure means for extending and contracting such telescopic standard as and for the purpose specified.

6. The combination with the base and the expansible and collapsible standard comprising the two sets of oppositely-placed cross-bars and the rods connecting the two sets, and means connected to the bottom of the lower cross-bars for expanding and contracting the two sets, the telescopic standard and means for extending and contracting the same, of rods located within the collapsible standard and pivotally connected to the head of the intermediate length of the telescopic standard and to the connecting cross-rods of the collapsible and expansible standard as and for the purpose specified.

7. The combination with the expansible and collapsible standard comprising the sets of cross-bars connected together and means for expanding and contracting the same, of the extensible and contractible telescopic standard located within the aforesaid standard, a base for supporting both standards, a fluid-reservoir supported on the base, a main driving-shaft and fluid-pumps located on the base driven from such shaft and designed to pump the fluid from the reservoir into the telescopic standard, so as to extend the same as and for the purpose specified.

8. The combination with the expansible and collapsible standard comprising the sets of cross-bars connected together and means for expanding and contracting the same, of the extensible and contractible telescopic standard located within the aforesaid standard, a base for supporting both standards, a fluid-reservoir supported on the base, a main driving-shaft, and fluid-pumps located on the base, driven from such shaft, and designed to pump the fluid from the reservoir into the telescopic standard, so as to extend the same, and a suitable exhaust-pipe from the telescopic standard into the reservoir and a controlling-valve for such pipe as and for the purpose specified.

9. The combination with the main top platform and the supplemental platform supported on the same, of a bridge supported on the supplemental platform and provided with a slatted floor, and means at the inner

end for rolling up such floor when the bridge is being drawn in as specified.

10. In an aerial ladder, in combination a top platform, a supplemental platform supported centrally on the top platform, so that it may be rotated and tilted and a screw-spindle extending through a threaded sleeve attached to the supplemental platform and provided with a roller at the bottom designed to ride on a track on the platform, and a hand-wheel at the top as and for the purpose specified.

11. In an aerial ladder, the combination with the top platform suitably supported on the standard and provided with a central boss and gear-wheel secured to the same, of a chair secured to the top of the gear-wheel and provided with a central boss, a sleeve located on the reduced central boss of such chair and having a set-screw extending there-through into an annular groove in the boss, a supplemental platform having depending lugs pivotally connected to the sleeve, a spindle suitably journaled in the supplemental platform and provided with a pinion at one end meshing with the aforesaid gear-wheel and a hand-wheel at the opposite end as and for the purpose specified.

12. The combination with the base and expansible and collapsible standard comprising the two sets of oppositely-placed cross-bars and the rods connecting the two sets and means for raising such standard, of a telescopic tubular standard extending upwardly through the aforesaid standard and means for operatively connecting the tubes to the collapsible standard aforesaid and fluid means for raising and lowering the tubular standard as specified.

13. The combination with the main top platform and supplemental platform suitably supported upon the same, of the racks located in suitable guideways at the bottom of the supplemental platform, the gear-wheels meshing with the racks having their spindles suitably journaled in the supplemental platform and one of the spindles provided with turning means and the bridge comprising the two sets of cross-bars forming the sides and suitably connected together and to the ends of the racks, the cross-rods extending through the center of the cross-bars, the slotted side bars supported on the cross-rods and having a cross-plate connecting them together at the outside and a suitable floor for the bridge as and for the purpose specified.

14. The combination with the main top platform and supplemental platform suitably supported upon the same, of the racks located in suitable guideways at the bottom of the supplemental platform, the gear-wheels meshing with the racks having their spindles suitably journaled in the supplemental platform and one of the spindles provided with

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of the racks, the cross-rod extending through
5 the center of the cross-bars, the slotted side
bars supported on the cross-rods and having
a cross-plate connecting them together at the
outside, a slatted floor for the bridge secured
between the outer ends of the cross-bars form-

ing the sides and a spring-actuated roller is
journaled at the inner end of the bridge un-
der the supplemental platform designed to
carry the slatted floor of the bridge as and
for the purpose specified.

ANGUS W. SHAW.

Witnesses:

B. BOYD,

EDGAR SHEPPARD.