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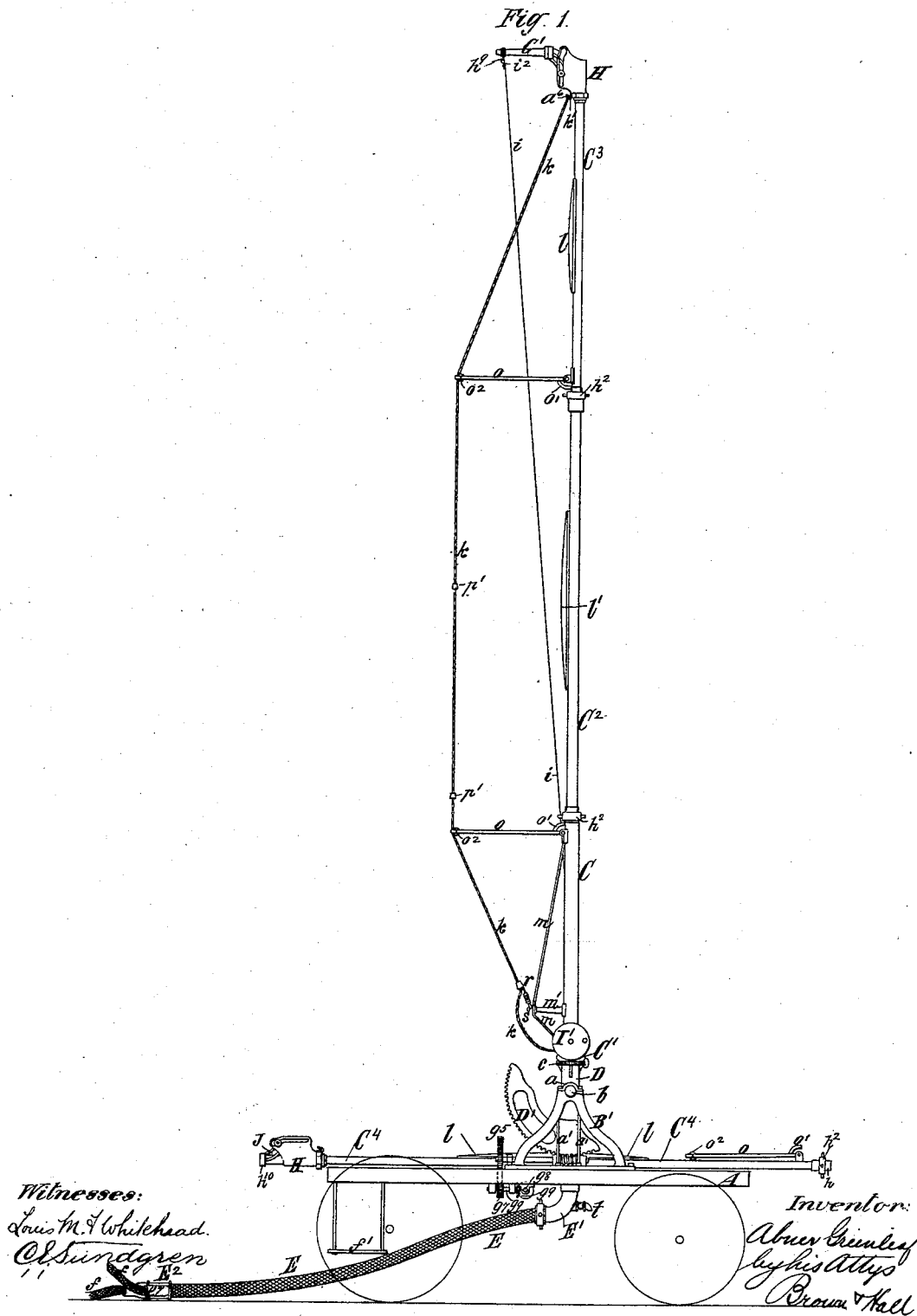
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A. GREENLEAF.

FIRE EXTINGUISHING APPARATUS.

No. 347,593.

Patented Aug. 17, 1886.



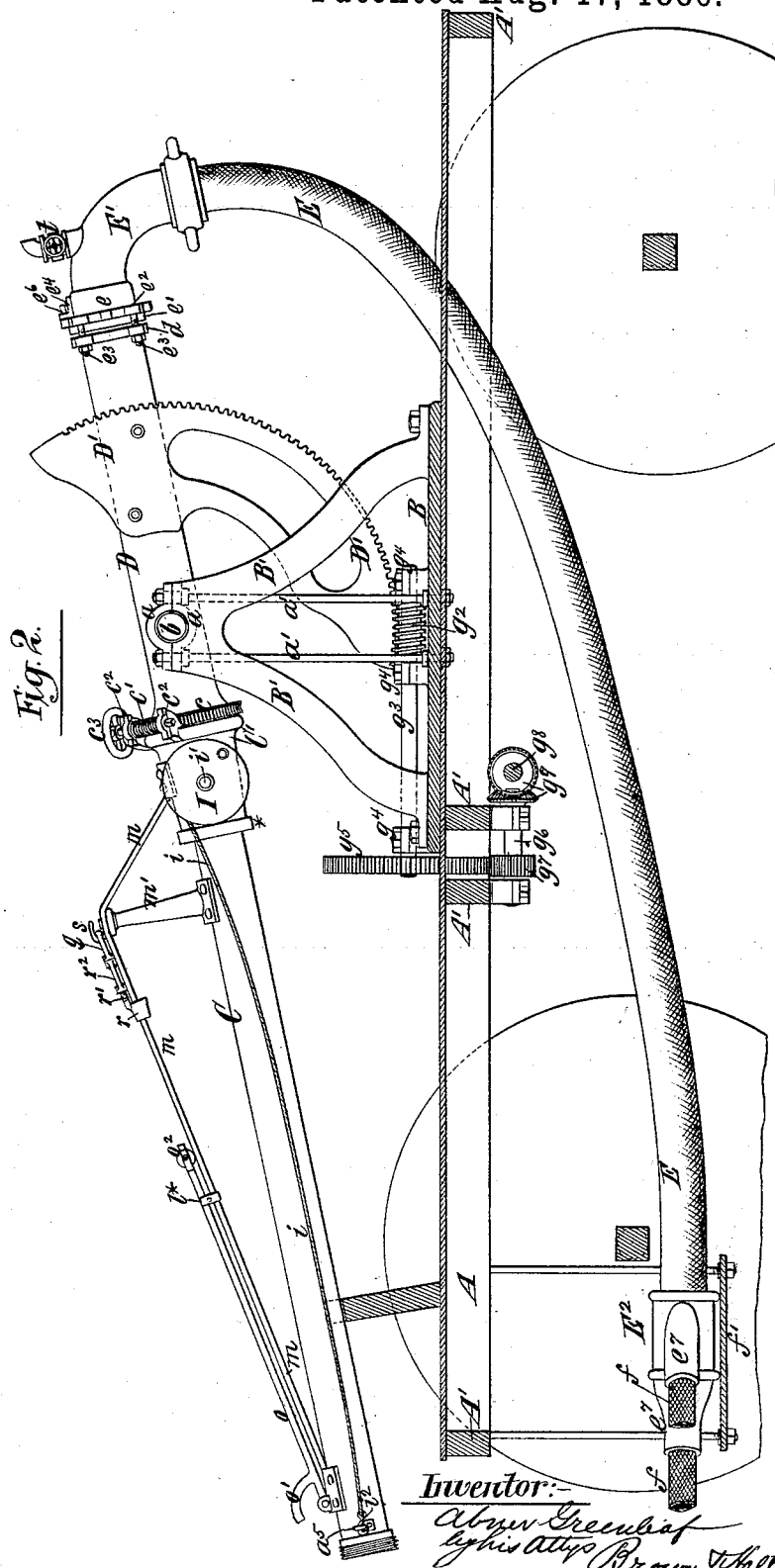
(No Model.)

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A. GREENLEAF.
FIRE EXTINGUISHING APPARATUS.

No. 347,593.

Patented Aug. 17, 1886.



Witnesses:-

Louis M. Whitehead.

C. Sundgren

Inventor:-

Abram Greenleaf
by his Atty Brown & Hall

(No Model.)

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A. GREENLEAF.
FIRE EXTINGUISHING APPARATUS.

No. 347,593.

Patented Aug. 17, 1886.

Fig. 3.

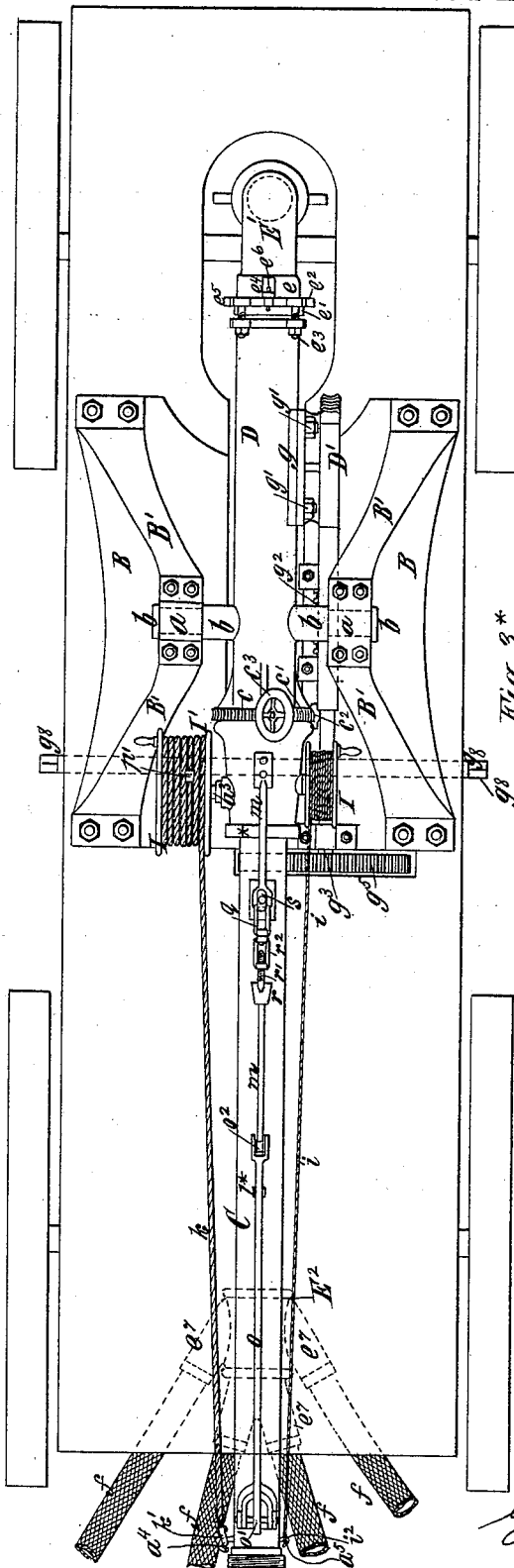
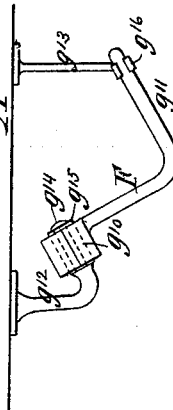


Fig. 3*.



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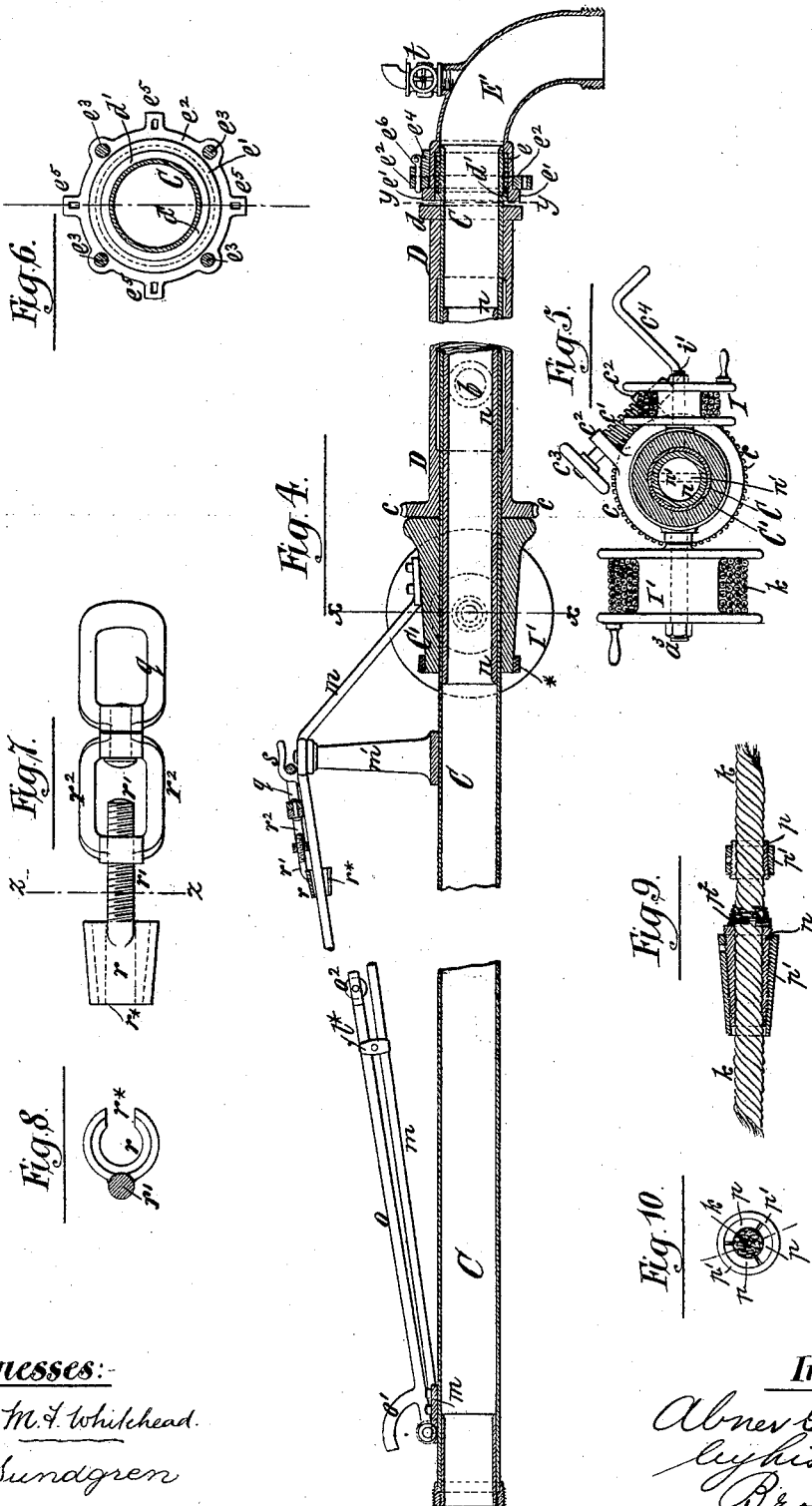
(No Model.)

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A. GREENLEAF.
FIRE EXTINGUISHING APPARATUS.

No. 347,593.

Patented Aug. 17, 1886.



Witnesses:

Louis M. F. Whitehead.

Ch. Sundgren

Inventor:

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(No Model.)

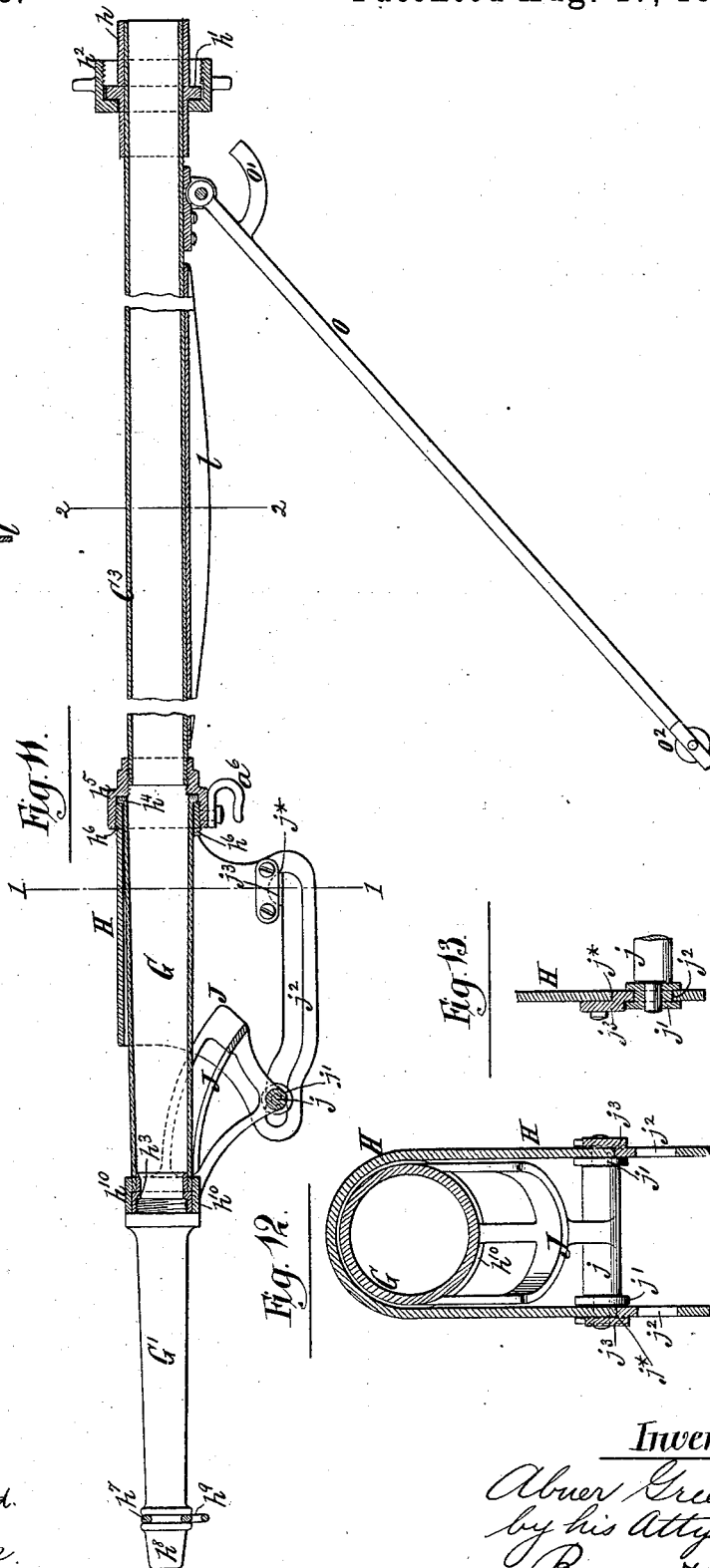
5 Sheets—Sheet 5.

A. GREENLEAF.
FIRE EXTINGUISHING APPARATUS.

No. 347,593.

Patented Aug. 17, 1886.

Fig. 14.



Witnesses:—

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Inventor:—

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Brown & Hall

UNITED STATES PATENT OFFICE.

ABNER GREENLEAF, OF BALTIMORE, MARYLAND, ASSIGNOR TO THE FIRE EXTINGUISHER MANUFACTURING COMPANY, OF NEW YORK, N. Y.

FIRE-EXTINGUISHING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 347,593, dated August 17, 1886.

Application filed March 18, 1884. Serial No. 124,623. (No model.)

To all whom it may concern:

Be it known that I, ABNER GREENLEAF, of the city of Baltimore, in the State of Maryland, have invented a new and useful Improvement in Fire-Extinguishing Apparatus, of which the following is a specification.

My invention relates, principally, to fire extinguishing apparatus similar to that shown in Letters Patent No. 226,919, granted April 27, 1880, to John B. Logan and Abner Greenleaf, in which are employed a main pipe or pipe-section, which is fitted within and capable of turning in a sleeve provided with trunnions, whereon it may swing in a vertical plane, the trunnions being supported in bearings on a wheeled truck. When not in use, this main pipe or section, with its supporting sleeve, is in a nearly-horizontal position, and upon the truck are carried suitable supplemental sections of pipe, which are adapted to be coupled with the main section to form a pipe of variable length. One apparatus will carry upon its truck, for example, a section of somewhat smaller diameter than the main section, and two still smaller sections of different length, each provided at the end with a flexible top section, to which a hose-nozzle may be coupled. By coupling the intermediate section with the main section, and one or other of the sections of smaller diameter with the intermediate section, a column of variable height may be produced, according to the length of the section of smaller diameter which is used. When the apparatus is to be used, the supplemental sections of pipe are coupled to the main section, and a removable external stay, consisting of a wire rope or cable of proper fixed length, is extended and put under tension on the exterior of the coupled pipe. The pipe is then raised to a perpendicular position by means of suitable gearing. A supply-hose is connected with the inlet end of the pipe. The flexible top section is then depressed by a depending cord, to give the stream discharged from the nozzle the desired direction in a vertical plane, and the pipe may be then turned about its axis to give the stream any co-ordinate direction in a horizontal plane.

In apparatus of the kind above described, as heretofore constructed, the several sections

of pipe are coupled and then raised, and after being so raised one or more lines of hose from one or more fire-engines are connected with the inlet or lower end of the pipe; but as this cannot be done readily until the sections of pipe are connected and the whole pipe raised there is a loss of time, which is often of great moment.

One object of my invention is to provide for getting the apparatus into actual operation in shorter time after arrival at a fire by enabling the one or more lines of hose coming to the front, rear, or either side of the apparatus to be coupled ready for operation without waiting for the elevation of the pipe. In using apparatus of this kind, especially as the stream approaches a horizontal direction, the strain upon the pipe due to the reaction of the stream delivered from the nozzle at the top is very great, and the force being exerted at the end of a long pipe, the latter requires to be very strongly stayed.

A further object of my invention is to impart greater strength to the pipe than can be afforded by a removable rope or cable stay which strengthens the sections collectively; and to this end I provide each or any of the pipe-sections with permanent stays which are individually complete as to a single section, and which are additional to the removable stay. The struts of the removable rope stay, being located near the couplings of the sections, relieve the pipe of strain at these points, and the permanent stays are therefore so applied as to strengthen the sections between the couplings.

A further object of my invention is to stay and strengthen the pipe in places where the external permanent stay cannot be made effective; and to this end I secure in the pipe at such place or places a tubular brace or longitudinal partition, which imparts additional stiffness to the pipe.

A further object of my invention is to provide for making four different heights of pipe by the use of a single intermediate section and two upper sections, and for a correspondingly greater number of different heights by the use of each additional section beyond the three. This I accomplish by making the male and

female ends of the pipes which may be coupled respectively interchangeable, so that the sections may be used in different combinations.

Heretofore it has been necessary to use a stay-rope for each different height of pipe, and a further object of my invention is to enable one rope to serve for all the different heights of pipe. I accomplish this by securing to the single rope at different points in its length, corresponding to the various heights of pipe produced by different combinations of the sections, a number of stops, any one of which may be readily secured in a rope-clutch connected with the pipe, and the rope is carried upon a reel or windlass which is mounted upon an axis projecting transversely to the pipe, so that the reel will be carried round with the pipe when the latter is turned. In apparatus of this class the sleeve, mounted on trunnions, and in which the pipe turns, has an attached segment-gear, with which engages a worm or screw, the axis of which is lengthwise of the truck.

A further object of the invention is to enable the worm to be operated by a shaft extending across the truck, and to either or both ends of which a hand crank or cranks may be applied.

A further object of the invention is to brace or stay the trunnion-bearings, so that there will be no possibility of the segment-gear becoming disengaged from the worm which operates it when the pipe is in operation and under strain, or while it is in a horizontal position and before elevating it.

In the accompanying drawings, Figure 1 is an elevation of an apparatus embodying my invention, the main pipe or pipe-section being elevated ready for operation. Fig. 2 is a vertical section, on a larger scale, in a plane lengthwise of the truck, the pipe being lowered. Fig. 3 is a plan on the same scale as Fig. 2, the pipe being lowered. Fig. 3* is a side view of a portion of the truck with the crank-supports. Fig. 4 is a longitudinal section of the main pipe or pipe-section on a still larger scale. Fig. 5 is a transverse section of the column on the dotted line *xx*, Fig. 4, also including an exterior view of windlasses on the column, showing in section the ropes wound thereon. Fig. 6 is a similar section on the dotted line *yy*, Fig. 4, upon a larger scale. Fig. 7 is a view of the rope-clutch upon a still larger scale. Fig. 8 is a transverse section on the dotted line *zz*, Fig. 7. Fig. 9 represents a portion of the stay-rope and a sectional view of one of its stops on the same scale as Figs. 7 and 8. Fig. 10 is an end view of the rope-stop. Fig. 11 is a longitudinal section of one of the smaller sections of pipe with its flexible top section and nozzle attached. Fig. 12 is a transverse section on the dotted line 11, Fig. 11, and on a much larger scale. Fig. 13 is a detail sectional view hereinafter referred to; and Fig. 14 is a transverse section on the dotted line 22, Fig. 11.

Similar letters of reference designate corresponding parts in all the figures.

In all figures of the drawings only such parts of the truck are shown as are necessary to illustrate the position of the operating parts of the apparatus, and the truck may be of any suitable construction.

A designates the longitudinal sills and A' cross sills of the truck-frame, whereon is mounted a bed-plate, B. Upon the bed-plate are erected side frames, B', which support bearings *a*, wherein are mounted trunnions *b*.

C designates the main pipe or pipe-section, which is in this example of my invention fitted within a sleeve, D, on which the trunnions *b* are formed, or to which they are attached, and said sleeve fits the pipe snugly for a distance from its ends, and between its ends it is chambered out. It will therefore be understood that while the sleeve D, and with it the pipe C, may be swung in a vertical plane, the pipe may be turned about its axis in the sleeve.

On the pipe C, above the sleeve D, is a heavy collar, C', which may be of cast-iron shrunk on the pipe and strengthened on its smaller end by a wrought-iron band, *. This collar forms in effect an integral and rigid part of the pipe, as shown in Fig. 4, and is immovable thereon. The upper end of the sleeve D forms a bearing, which supports the pipe through its collar C' against downward movement when elevated, and on the end of the sleeve which is adjacent to the collar C' is formed or secured a worm-wheel, *e*, with which engages a worm or screw, *e'*, supported in bearings *e''* on the collar C', and capable of being turned by a hand-wheel, *e'''*, or by a crank, *e'''*, both of which are best shown in Fig. 5.

To the lower or inlet end of the main pipe or section C is permanently connected a section of flexible hose, E, of proper size, and in this example of my invention the hose is connected with said pipe through the medium of an elbow, E', which is itself directly connected with the pipe, and to which the hose is permanently coupled at one end. It is desirable that the elbow should be capable of turning relatively to the pipe C and sleeve D, so that the hose E may be led or directed to the front, rear, or either side of the truck, and it is furthermore very desirable that provision should be afforded for turning the pipe C about its axis without disturbing the elbow, in whatever position it may be fixed.

I will now describe how the connection is made, referring particularly to Figs. 4 and 6. At the lower end of the sleeve D is a flange, *d*, and the end of the pipe C which projects beyond this flange has at a little distance from its end a fixed collar, *d'*. The elbow E' is constructed with a stuffing-box, *e*, which receives the fixed collar *d'* on the pipe and that portion of the pipe which projects beyond the collar, and which has a flange, *e'*, at its top.

Around the elbow, just back of flange e' , is loosely fitted a ring or flange, e'' , within which the elbow may turn, and this loose ring or flange e'' is connected by bolts e^3 with the flange d at the lower end of the trunnion-sleeve D. By tightening up the bolts e^3 the elbow E' will be drawn up on the pipe C, and by the fixed pipe-collar d' packing in the stuffing-box e will be compressed to form a tight joint between the pipe and elbow. The bolts e^3 prevent the loose ring e'' from turning relatively to the sleeve D, but the connection described permits of the pipe C being turned about its axis, and also permits of the elbow being turned relatively to the pipe, the flange e' being small enough to turn within the circle of the bolts e^3 .

In order to prevent the elbow from turning when the pipe is turned by frictional engagement therewith, I provide a slotted lug or ear, e^4 , fixed on its exterior, and on the loose ring e'' (which cannot turn) are four similar slotted lugs or ears, e^5 . When the elbow is turned to present it toward the front, rear, or either side of the truck, the lug or ear e^4 will always be opposite one of the lugs or ears e^5 , and by slipping a key, e^6 , through them the elbow will be locked against turning, however much the pipe is turned. The section E of hose is permanently coupled at one end to the elbow, and at its opposite end is or may be permanently coupled a Siamese connection, E' , having two, three, four, or more branches, e^7 , with which as many lines of hose f may be connected. In Figs. 2 and 3 four branches, e^7 , are shown. When not in use, the Siamese connection E' is or may be supported on a shelf, f' , at the rear of the truck.

The pipe C and sleeve D may be very conveniently swung in a vertical plane by the mechanism shown in Figs. 2 and 3, which I will now describe. At the side of the sleeve D is cast a strong bracket or webbed face, g , to which a worm segment-gear, D' , is securely attached by bolts g' , and preferably also by steady-pins. This segment-gear is concentric with the trunnions b , and is operated by a worm, g^2 , upon a shaft, g^3 , which is supported in bearings g^4 on the bed-plate B.

When the several sections of pipe hereinafter described are coupled to the main pipe C and to each other, and also when the pipe is elevated, the strain upon the trunnions is great, and in order to afford additional security against the segment D' lifting out of gear with the worm g^2 , I connect each trunnion-bearing a by one or more bolts, a' , directly with the bed plate B. These bolts may be shouldered, and the nuts applied to their upper ends will secure the caps of the bearings.

Upon the worm-shaft g^3 is a spur-wheel, g^5 , and below the truck-floor and in bearings attached to the cross-sills A' of the truck is an intermediate shaft, g^6 , which carries a pinion, g^7 , gearing with the wheel g^5 , and is itself geared with a cross-shaft, g^8 , by bevel-wheels g^9 , as best shown in Figs. 2 and 3. This cross-

shaft g^8 is squared at the ends, and may be turned to elevate or depress the sleeve and pipe D C by a hand-crank applied to one or each end.

In Fig. 3* I have shown a hand-crank, F, which may be used to turn the shaft g^8 , and supports therefor, which are very desirable. The crank F has a square or polygonal eye, g^{10} , and a handle, g^{11} , and it is supported by two hangers, g^{12} g^{13} , from the longitudinal truck-sill A of the truck. The hanger g^{12} has a pin or pintle, g^{14} , on which is loosely fitted a square or polygonal sleeve or block, g^{15} , and the hanger g^{13} has a tulip spring holder or clasp, g^{16} , wherein the handle g^{11} is held, as shown in Fig. 3*. When it is desired to use the crank, it is swung outward to free its handle, the block g^{15} turning to permit of this, and then raised off the block g^{15} .

The apparatus may be provided with any desired number of supplemental sections of pipe in addition to the main section C. I have here represented three supplemental sections, C^2 C^3 C^4 , all of which are shown in Fig. 1, the two former being coupled ready for use, and the latter, C^4 , being upon the truck. By coupling either of the pipe-sections C^3 C^4 to the section C^2 two different heights of pipe can be obtained, and by coupling either of the sections C^3 C^4 directly with the main section C without the section C^2 , two other heights of pipe can be obtained. In order to enable the sections of pipe to be coupled in different combinations, I make the male and female ends of the sections, respectively, interchangeable, so that the lower or inner end of either section C^3 C^4 may be coupled directly with the end of the main section C or with the end of the intermediate section, C^2 . The outer end of the main section C and intermediate section, C^2 , have male threads, which are of equal size, although the section C^2 is the smaller of the two, and on the exterior of each section C^3 C^4 , at its inner end, is fixed an external sleeve, h , (see Fig. 11,) which is of a size to snugly enter the end of either the main section C or the intermediate section, C^2 , and which has a flange, h' , against which the coupling-nut h^2 bears.

At the outer end of each section C^3 (see Fig. 11) is a flexible top section, G, provided at the outer end with a coupling-piece, h^3 , to which is connected a nozzle, G' , of the proper size, and the inner end of the flexible section G has a flange, h^4 , which fits in a socket in the coupling-piece h^3 , and is therein secured by a bush or collar, h^5 , screwed into said coupling-piece and formed integral with a hood, H, of U-shaped transverse section, as shown in the large view, Fig. 12. At the outer end of the nozzle G' is a loose ring or band, h^7 , which is held between the tip h^6 of the nozzle and the main portion thereof, and which has an eye, h^8 , to which a rope or cord, i , may be attached for depressing the nozzle. This cord or rope i , which may be of wire, is coiled upon a small reel or windlass, I, journaled on a stud, i' ,

which projects from the collar C' on the pipe C, and at the outer end said cord *i* has a hook, *i*², which is to be engaged with the eye *h*³ when the pipe-sections are coupled. By drawing
 5 on the cord *i* the nozzle G' will be depressed, and in connection therewith I employ a former, J, which is shown in Figs. 11 and 12, and which consists of a curved or arc shaped skeleton
 10 frame, which is approximately semicircular in transverse section at one end, as shown in Fig. 12. The former J has at one end a collar or band, *h*¹⁰, which surrounds and holds the coupling-piece *h*³ at the junction of the nozzle G' and flexible top section, G. The former J
 15 is provided with a fulcrum piece or pintle, *j*, on which are fitted double-flanged rollers *j*¹, which run in slots *j*² in the two sides of the hood H, and when the cord *i* is pulled down the nozzle is depressed toward or below the
 20 horizontal, as shown in Fig. 1, the journals of the curved former J running back in the slots *j*², and the former serving to support the flexible section and preserve its proper curve and prevent buckling. The rollers *j*¹ are not se-
 25 cured on the pivots of the fulcrum-piece *j* in any way, but they are prevented from slipping off by their flanges.

To provide for readily placing these double-flanged rollers in place, I form the slots *j*² with
 30 enlargements *j*³ at their back ends. Blocks *j*³ are removably secured to the hood to fill these enlargements after the rollers are placed in the slots and upon the pintle or fulcrum-piece *j*, and then the edge of the block *j*³ will
 35 form one wall of the slot, as shown in Fig. 13, and the roller can run past it without escaping from the slot.

The section C' (shown lying on the truck in Fig. 1) and any other top sections which may
 40 be employed are severally provided with a flexible section, G, hood H, and former J, all as described with reference to Fig. 11.

When the several pipe-sections are coupled together, and before being elevated, the long
 45 pipe needs some support to sustain it, and when elevated and in use the pipe is subjected to great strain from the reaction of the discharge.

To stiffen the sections collectively, I employ
 50 a removable stay consisting of a wire rope or cable, *k*, and to stiffen the sections individually I employ on one or each section a permanent stay complete as to that section. Both
 55 stays are always applied on that side on which the stream is delivered.

On each section C² C³, I have shown a permanent brace, *l*, consisting of a piece of T-iron having its base brazed to the exterior of
 60 the pipe, as best shown in Figs. 11 and 14, and as also seen in Fig. 1, and on the intermediate section, C², is a similar permanent brace, *l'*, as shown in Fig. 1.

On the main pipe or section C, I have shown a permanent stay, *m*, which consists of a rod
 65 secured at one end near the outer end of the pipe C, and at the other end to the collar C',

which forms a part of the pipe, as before stated. This stay passes over a permanent or rigid strut, *m'*, extending from the pipe C. The permanent stay *m* is necessarily entirely
 70 above the sleeve D, and hence the pipe C is not braced where it enters the sleeve. To strengthen it at this point, where an external stay cannot be made effective, I insert and se-
 75 cure an internal brace, *n*, in the pipe. I have shown in Figs. 4 and 5 a tube fitting tightly in and brazed or otherwise permanently se-
 80 cured to the pipe C, and extending from a point above the lower end of the stay *m* to a point below the upper end of the sleeve D.

In lieu of the tubular internal brace, *n*, I may employ a partition-plate secured longitudi-
 85 nally in the pipe and extending across the pipe in the plane of strain due to the reaction of the stream issuing from the nozzle, as shown
 by dotted lines at *n'* in Fig. 5.

At or near the outer end of the pipe C is hinged a strut, *o*, which may be turned down
 upon the stay *m*, as shown in Fig. 4, where it will be held against accidental displacement
 90 by a tulip spring-clasp, *l*^{*}, from which it may be readily detached and swung outward when desired for use. At the pivoted end of the strut *o* is a forked stop, *o'*, whereby there
 95 is formed a tripod base when the strut is swung to a position perpendicular to the pipe, and at the outer end thereof is a small pulley-
 support, *o*², for the rope-stay K to pass over. Near the inner end of each section C² C' is a
 100 similar hinged strut, *o o' o*², which is shown most clearly in Fig. 11.

On the side of the collar C' opposite to the windlass or reel I is a larger reel, *l*¹, on which
 is wound the removable rope-stay K, and which is journaled on a pin or stud, *a*². At the
 105 free end of this rope is an eye, K', and when the apparatus is not in use the rope is drawn out sufficiently to place this eye on a hook, *a*¹, at the end of the section C, as shown in Fig. 3.

I have before stated that with the pipe-sections shown four heights of column may be
 110 produced, and to enable the rope-stay K to serve for all heights I secure upon it four stops, at distances from the end K' corresponding to the several heights, and I employ
 115 a rope-clutch, with which may be engaged any one of these stops.

The rope-stop is shown in Figs. 9 and 10, and the rope-clutch is best shown in Figs. 7
 and 8. This stop consists, essentially, of an
 120 inner sleeve, *p*, composed of longitudinal sections, as shown in Fig. 10, and having its inner surface spirally grooved to fit the strands of the rope K. The said sleeve is externally
 tapered and screw-threaded, and *p'* designates
 125 a nut, the interior of which is tapped to fit the sleeve, and which may be turned by means of a wrench, it being provided with radial
 holes or otherwise suitably constructed for that purpose. By screwing up the nut the sec-
 130 tions of the sleeve *p* are compressed upon the rope. To afford additional security against

the stop slipping, I enlarge the rope behind the stop with wire p^2 , which is passed under and over the strands, so as to form a protuberance thereon, as shown in Fig. 9, and behind this wire I may place a second and shorter stop, also composed of a sectional tapered sleeve, p , and a nut, p' , screwed thereon, as shown in Fig. 9, the taper of the sectional sleeve being reversed.

The rope-clutch shown in Figs. 7 and 8 consists of an eye, q , a socket or clutch piece, r , having a screw-threaded shank or stem, r' , and a turn-buckle, r^2 , one end of which receives the shank or stem r' , and the other end of which has a swivel-connection with the eye q . The clutch-piece r is slotted at one side, r^* , wide enough to receive the rope K , and after the rope has been so slipped into the clutch-piece in front of any one of the stops a strain upon the rope will hold the stop tightly in engagement with the clutch-piece. I have shown the nut p' of the stop as externally conical, and the clutch-piece r as having its interior correspondingly conical. As here represented, the eye q of the rope-clutch may be engaged with a hook, s , on the stay m , and when not in use may be slipped onto the stay and there held, as shown in Fig. 4; but the hook s might be placed on the collar C' , or in any other desired locality. When not in use, the hook i^2 at the end of the cord i is engaged with a hook, a^5 , at the outer end of the pipe C , as shown in Figs. 2 and 3.

When the apparatus arrives at a fire, the desired sections—say $C^2 C^3$ —are coupled to the pipe C , the rope stay K is drawn out from the windlass I' , and its eye K' placed on a hook, a^6 , located at the end of the section C^3 , and shown in Fig. 11. The rope-clutch r is then lifted from the stay m , the proper stop, p' , is engaged therewith, and the hinged struts o on the pipe C and the section C^3 are swung up to put tension on the rope stay. The hook i^2 of the cord i is then engaged with the eye h^2 at the tip of the nozzle G' , and by power applied to the cross-shaft g^2 at one or both ends the stayed pipe is elevated. At the same time the flexible hose E , with the Siamese connection E^2 , is led to either side or the front of the truck, or allowed to remain at the rear, and while elevating the pipe the several lines of hose f may be coupled with the branches of the Siamese connection E^2 , in order that the apparatus may be at once put to work when the pipe reaches a perpendicular position. By operating the worm or screw c' the pipe will be turned in the sleeve, and as both the removable rope stay K and the permanent stays lm move with the pipe the stays are always on the side of the pipe at which the stream is discharged, as shown in Fig. 1. By drawing down on the cord i the nozzle G' may be depressed toward and below the horizontal position, as desired.

It is advantageous to have the worm or screw c' carried around with the pipe C , be-

cause the operator always then maintains the same position relatively to the nozzle G' , the windlass I , and the worm c' .

In the elbow E' is a discharge or outlet valve, t , whereby the water may be discharged from the pipe when the use of the apparatus is discontinued.

I am aware of United States Letters Patent No. 232,495, granted September 21, 1880, which show a system of short pipe-sections and elbows swiveled thereto, for connecting a fire-engine with a hydrant; and I am also aware that it is not new to permanently and rigidly connect an elbow with the lower end of a sleeve in which the lower pipe-section of a water-tower is swiveled. I do not, therefore, here claim as of my invention what I have above referred to as old. My pipe, the sleeve in which it is swiveled, and the elbow permanently connected with the sleeve and pipe form a new and useful combination of parts. It is desirable to have the elbow swiveled relatively to the sleeve, so that a supply-hose from an engine may be led to either side or end of the truck, and the elbow turned to enable connection between them to be made. It is furthermore desirable that the elbow be swiveled to the pipe, so that the turning of either the pipe or elbow will not affect the other.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. In a fire-extinguishing apparatus, the combination, with a truck-frame and an upper frame supported thereon and provided with trunnion-bearings, of a sleeve mounted on trunnions in said bearings to swing in a vertical plane, a pipe swiveled in said sleeve, gearing for raising and lowering the sleeve and pipe, and an elbow permanently connected with the inlet end of the pipe and swiveled relatively to both the pipe and sleeve, substantially as herein described.

2. In a fire-extinguishing apparatus, the combination, with a truck-frame and an upper frame supported thereon and comprising trunnion-bearings, of a sleeve mounted on trunnions to swing in a vertical plane, a pipe swiveled in the sleeve, gearing for raising and lowering the sleeve and pipe, and an elbow permanently connected with the lower end of the sleeve and receiving within it the inlet end of the pipe, whereby it is connected also with the pipe, substantially as herein described.

3. In a fire-extinguishing apparatus the combination, with a truck-frame and an upper frame comprising trunnion-bearings, of a sleeve mounted on trunnions to swing in a vertical plane, a pipe swiveled in the sleeve, gearing for raising and lowering the sleeve and pipe, an elbow permanently connected with the inlet end of the pipe and swiveled relatively to the pipe and sleeve, and a section of flexible hose permanently connected with said elbow, substantially as herein described.

4. In a fire-extinguishing apparatus, the combination, with a sleeve mounted on trun-

nions to swing in a vertical plane, and a pipe swiveled in the sleeve, of an elbow connected with the inlet end of the pipe and swiveled relatively to both the sleeve and pipe, a section of flexible hose permanently connected at one end with the elbow, and a Siamese connection permanently coupled to the other end of the hose, substantially as herein described.

5. In a fire-extinguishing apparatus, the combination, with a swiveled pipe mounted upon trunnions to swing in a vertical plane, of a swiveled elbow permanently connected with the inlet end of said pipe, and a key for locking said elbow in different positions to which it may be turned, substantially as herein described.

6. The combination of the sleeve D, mounted on trunnions and having at its end the flange d , the pipe C, swiveled in said sleeve and having the collar d' at its inlet end, the elbow E' , having a stuffing-box receiving the end of the pipe and its collar d' , and bolts e^3 , passing through the flange on said sleeve and serving to draw the elbow upon the pipe, substantially as herein described.

7. The combination of the sleeve D and its flange d , the pipe C and its collar d' , the elbow E' , with its stuffing-box and flange e' , the flange or ring e^2 , loosely surrounding the elbow, and bolts e^3 , extending between the flange d and ring e^2 , substantially as herein described.

8. The combination of the sleeve D, provided with the flange d , the pipe C, provided with the collar d' , the elbow E' , with its stuffing-box and its flange e' , and provided with the lug or ear e^4 , the flange or ring e^2 , loosely surrounding the elbow and provided with lugs or ears e^5 , the bolts e^3 , extending between the flanges d e^2 , and the locking-key e^6 , connecting the lugs or ears e^4 e^5 , substantially as herein described.

9. In a fire-extinguishing apparatus, the combination, with a non-rotary sleeve mounted on trunnions to swing in a vertical plane and a swiveled pipe fitted therein, of a worm-wheel fixed on said non-rotary sleeve, and a worm or screw mounted in bearings upon the turning pipe and engaging with said wheel, whereby said worm or screw, by engaging with the non-rotary wheel, turns the pipe and is carried with the pipe as it turns, substantially as herein described.

10. In a fire-extinguishing apparatus, the combination, with a sleeve provided with trunnions to swing in a vertical plane and a pipe swiveled within said sleeve, of the stay m , external to the pipe and connected at both its ends to the pipe above the sleeve and an internal brace secured within that portion of the pipe which is within the sleeve, substantially as herein described.

11. The combination, with the trunnioned sleeve D and the swiveled pipe C, fitted therein, of the stay m , applied to said pipe above the sleeve, and an internal brace secured in the pipe and extending from a point above the

lower end of the stay to a point below the upper end of the sleeve, substantially as herein described.

12. In a fire-extinguishing apparatus, the combination, with a pipe of variable length composed of sections and serving to deliver a stream from a nozzle at its top, of a rope-clutch connected with the pipe, and a removable stay for strengthening said pipe, consisting of a rope adapted to be connected at one end near one end of the pipe, and provided at different points in its length with stops for engagement with said clutch, whereby a single rope is made to serve for different lengths of pipe resulting from a change of its sections, substantially as herein described.

13. In a fire-extinguishing apparatus, the combination, with a pipe of variable length composed of sections and serving to deliver a stream from a nozzle at its top, of a rope-clutch connected with the pipe and a removable stay for strengthening said pipe, consisting of a rope to be connected at one end near one end of the pipe, and provided at different points in its length with stops for engaging with said clutch, each stop consisting of a sectional sleeve, p , the inner surface of which is grooved to fit the rope, and the outer surface of which is conical and threaded, and a nut tapped to fit the sleeve, and serving, when turned, to compress the sections on the rope, substantially as herein described.

14. In a fire-extinguishing apparatus, the combination, with a pipe of variable length composed of sections and serving to deliver a stream from a nozzle at its top, of a rope-clutch connected with the pipe and consisting of a turn-buckle, r^2 , and a slotted clutch-piece or socket, r , having a screw-threaded shank, r' , fitting the turn-buckle, and a removable stay for strengthening said pipe, consisting of a rope to be connected at one end near one end of the pipe and provided at different points in its length with stops for engaging with said clutch, each stop consisting of a sectional sleeve, p , the inner surface of which is grooved to fit the rope, and the outer surface of which is conical and threaded, and a nut tapped to fit the sleeve, and serving, when turned, to compress the sections on the rope, substantially as herein described.

15. The combination, in a fire-extinguishing apparatus, of a main pipe-section supported by trunnions and a number of pipe-sections of different diameters provided with male and female ends, which may be coupled and which are respectively interchangeable, whereby provision is afforded for using any or all of the last-mentioned sections in different combinations with the main section, in order to produce a column of variable height, substantially as herein described.

16. In a fire-extinguishing apparatus, the combination, with a truck and a pipe mounted on trunnions to swing in a plane lengthwise of the truck, of the segment-gear D', connected

with the pipe, a worm and worm-shaft, $g^2 g^3$, engaging with said segment and extending lengthwise of the truck, a shaft, g^8 , extending transversely across the truck at right angles with the shaft g^3 , and having at each end provision for attaching a hand-crank, and gearing connecting the shafts $g^3 g^8$, substantially as herein described.

17. In a fire-extinguishing apparatus, the combination, with the pipe C, mounted on trunnions b , to swing in a vertical plane, of the side frames, B' , containing bearings a for the trunnions, and having their lower portions spread laterally in opposite directions to give

them stability, the horizontal bed-plate B, 15 which is rigidly fixed to the truck-frame and on which the frames B' are rigidly secured, a gear-segment, D' , connected with the pipe, the worm g^2 , journaled in bearings on the bed-plate, and stay-bolts a' , of wrought metal, extending from the trunnion-bearings a directly downward to the bed-plate, and serving to hold the gear segment and worm in strong engagement, substantially as herein described. 20

ABNER GREENLEAF.

Witnesses:

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