

No. 715,559.

D. A. DECROW.
MOTOR ENGINE.

(Application filed Oct. 19, 1900.)

Patented Dec. 9, 1902.

(No Model.)

6 Sheets—Sheet 1.

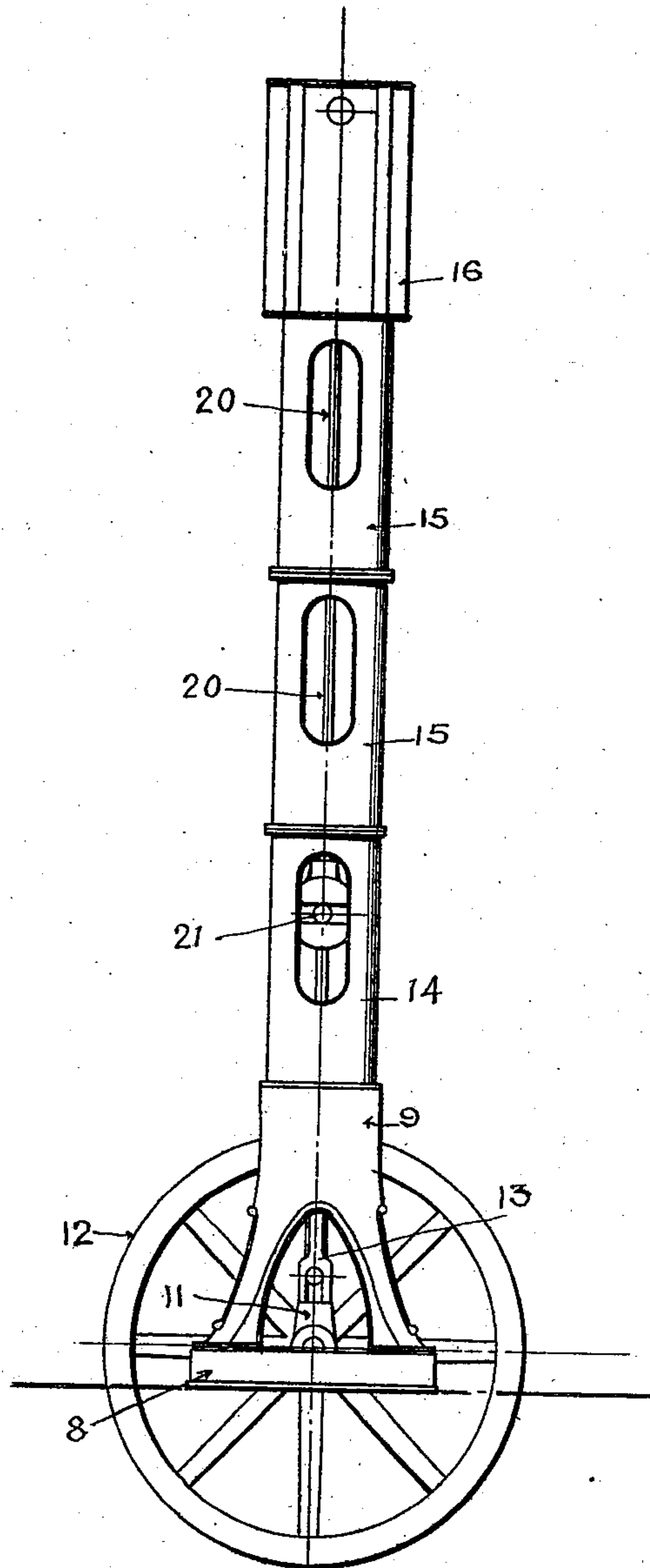


Fig. 1.

WITNESSES.

J. H. Niles.
J. C. Gribel.

INVENTOR

David A. Decrow
BY Joseph R. Reger
ATTORNEYS.

No. 715,559.

Patented Dec. 9, 1902.

D. A. DECROW.
MOTOR ENGINE.

(Application filed Oct. 19, 1900.)

(No Model.)

6 Sheets—Sheet 2.

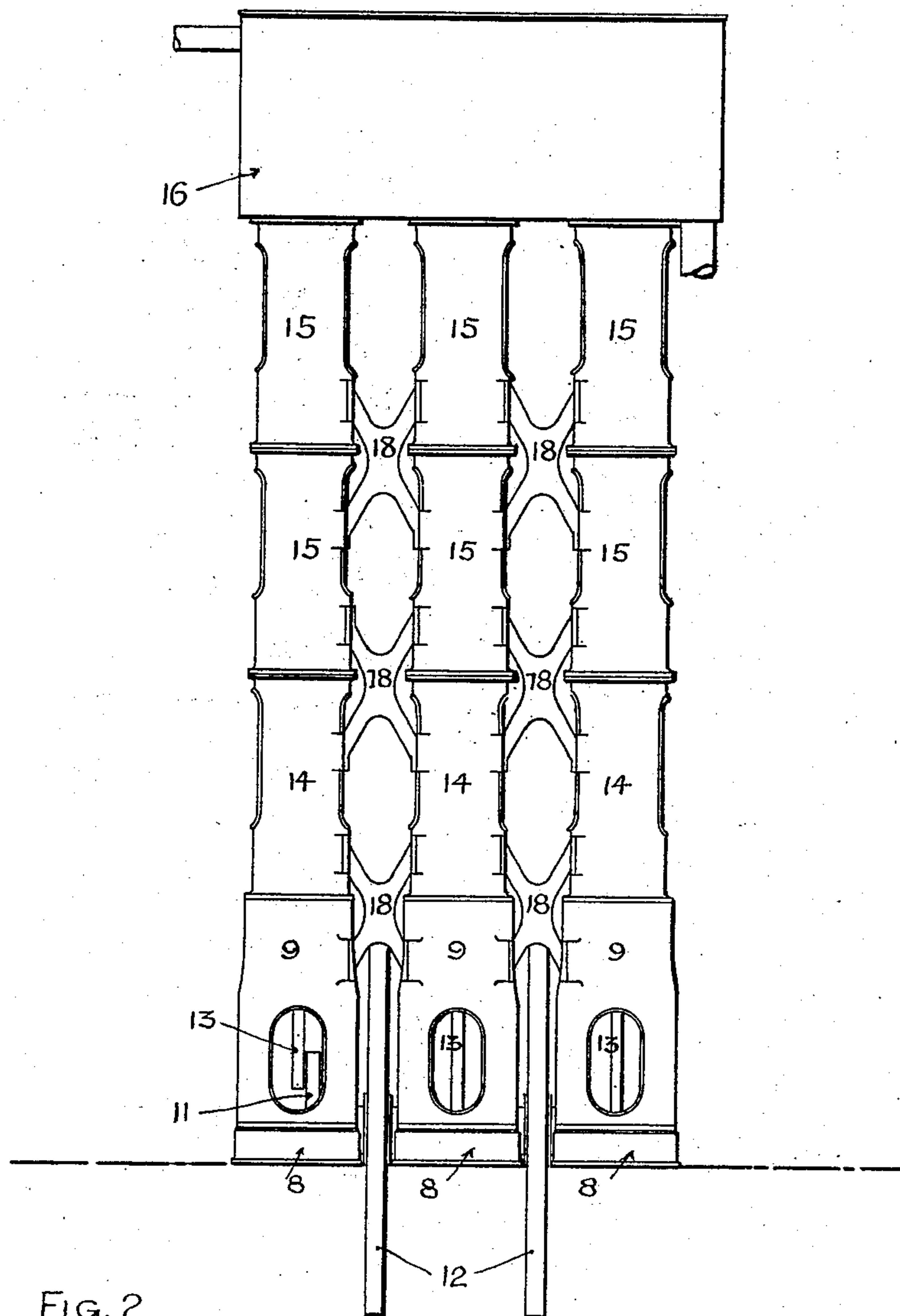


FIG. 2.

WITNESSES.

J. H. Niles.
G. B. Gribel.

INVENTOR.

David A. Decrow
BY *James H. Regener*
ATTORNEYS

No. 715,559.

Patented Dec. 9, 1902.

D. A. DECROW.
MOTOR ENGINE.

(Application filed Oct. 19, 1900.)

(No Model.)

6 Sheets—Sheet 3.

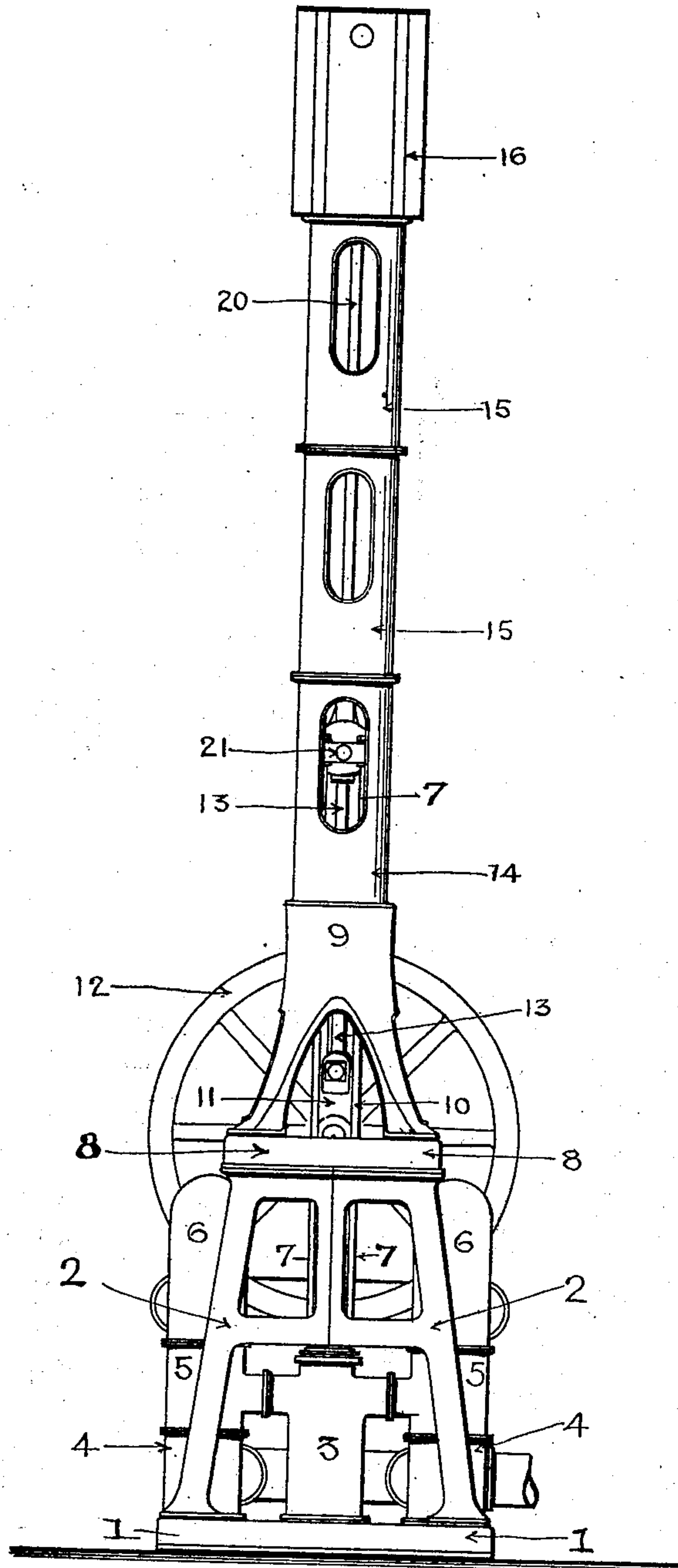


FIG 3.

WITNESSES.

J. H. Niles
G. C. Gribble

INVENTOR.

David A. Decrow
BY *James C. Cagener*
ATTORNEYS.

No. 715,559.

Patented Dec. 9, 1902.

D. A. DECROW.
MOTOR ENGINE.

(Application filed Oct. 19, 1900.)

(No Model.)

6 Sheets—Sheet 4.

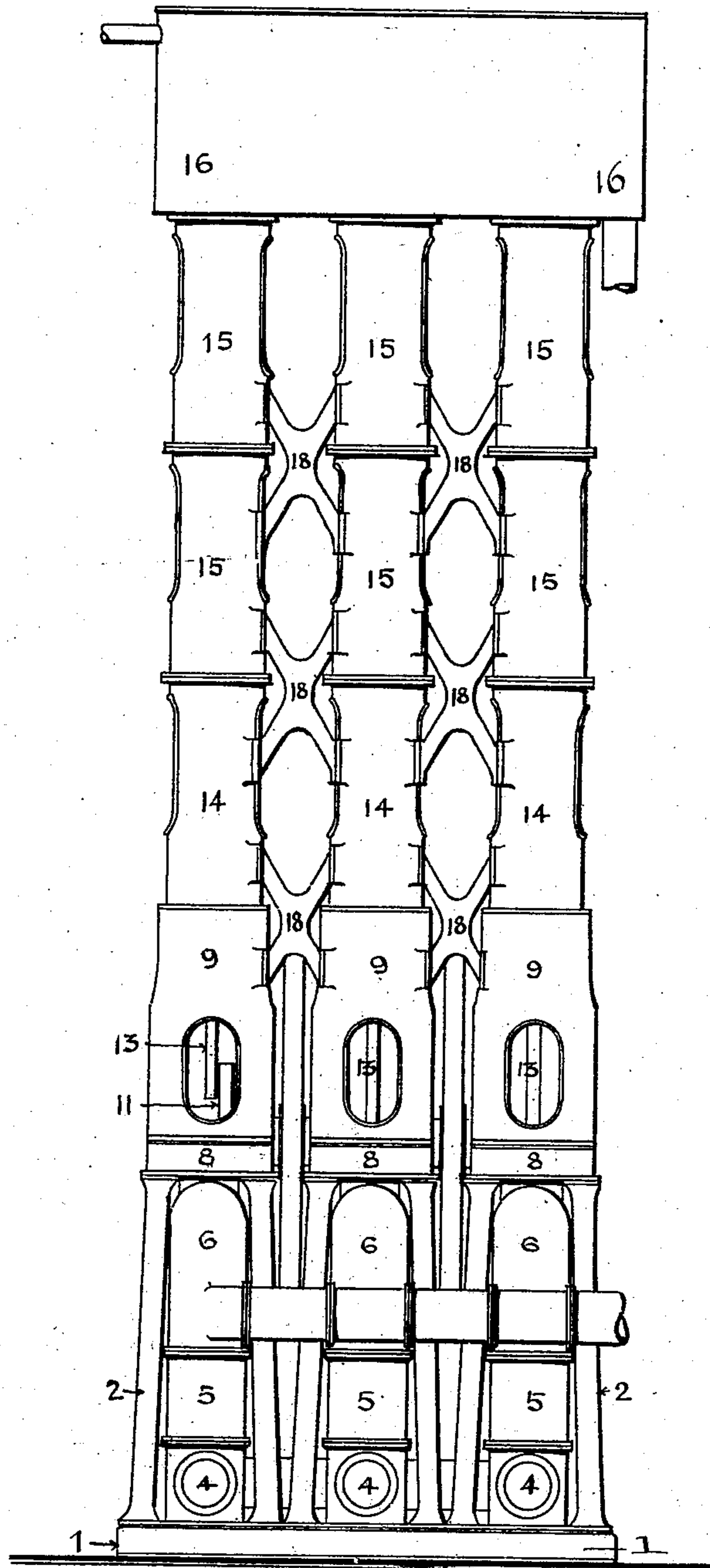


FIG: 4

WITNESSES.

J. H. Niles.
J. B. Gibel.

INVENTOR.

David A. Decrow

BY *Joseph Regener*
ATTORNEYS.

No. 715,559.

Patented Dec. 9, 1902.

D. A. DECROW.

MOTOR ENGINE.

(Application filed Oct. 19, 1900.)

(No Model.)

6 Sheets—Sheet 5.

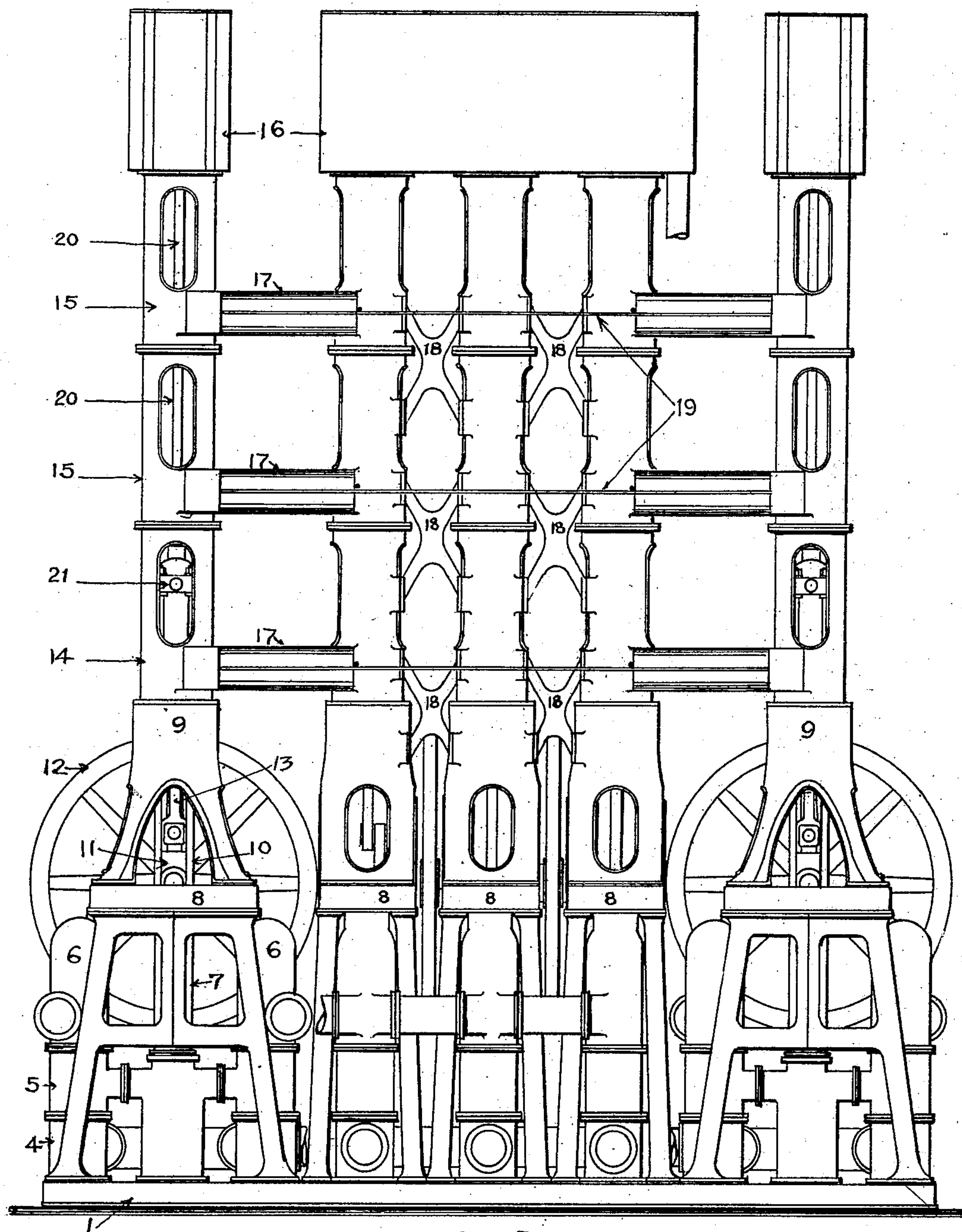


FIG. 5.

WITNESSES:

J. H. Niles.
G. B. Gibel.

INVENTOR.

David A. Decrow
BY Lowell Regener
ATTORNEYS.

No. 715,559.

Patented Dec. 9, 1902.

D. A. DECROW.
MOTOR ENGINE.

(Application filed Oct. 19, 1900.)

(No Model.)

6 Sheets—Sheet 6.

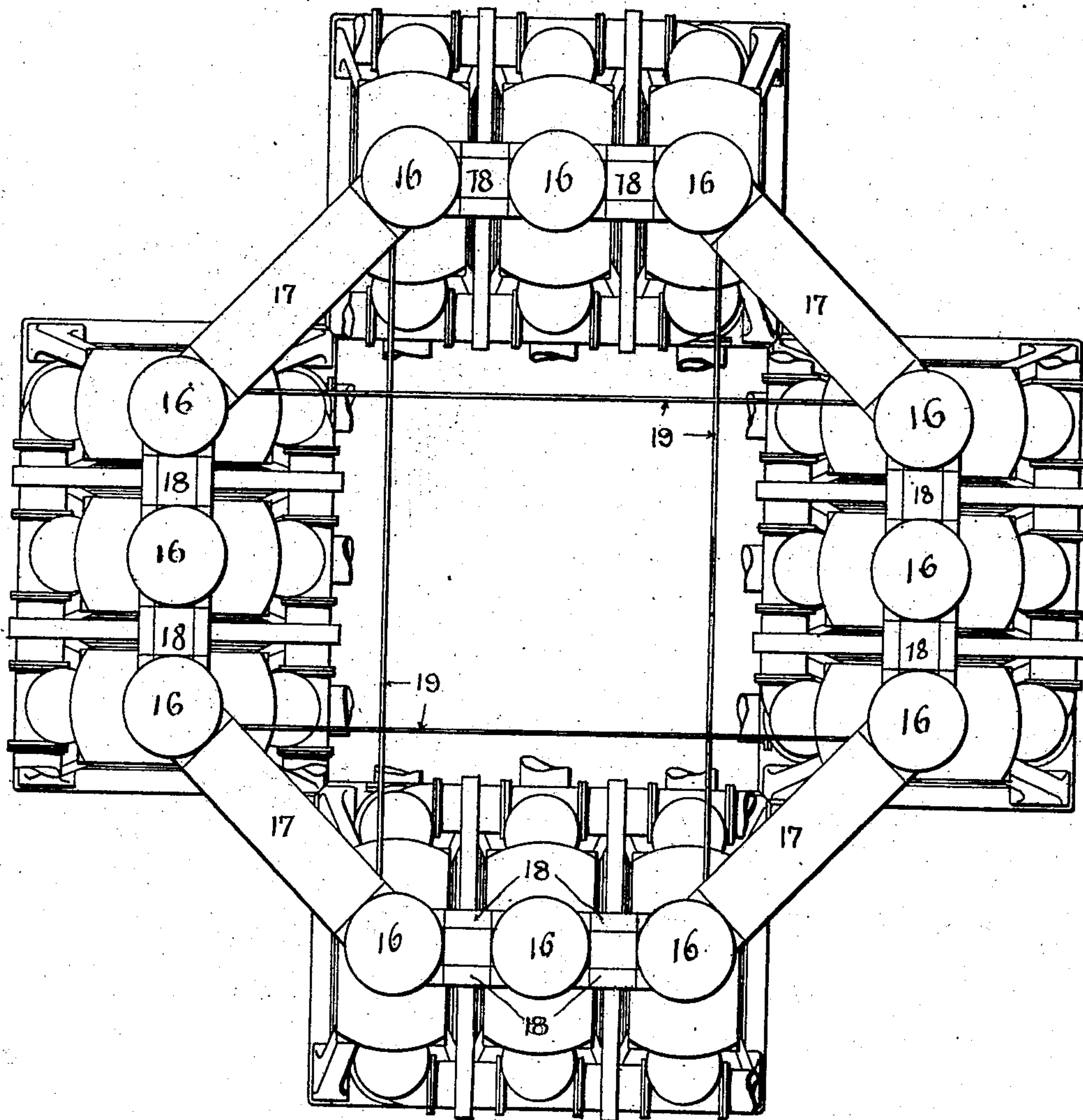


FIG. 6

WITNESSES

J. H. Niles.
G. B. Gibel.

INVENTOR

David A. Decrow
BY *James H. Raegner*
ATTORNEYS

UNITED STATES PATENT OFFICE.

DAVID A. DECROW, OF LOCKPORT, NEW YORK, ASSIGNOR OF ONE-HALF TO
THE HOLLY MANUFACTURING COMPANY, OF LOCKPORT, NEW YORK, A
CORPORATION OF NEW YORK.

MOTOR-ENGINE.

SPECIFICATION forming part of Letters Patent No. 715,559, dated December 9, 1902.

Application filed October 19, 1900. Serial No. 33,540. (No model.)

To all whom it may concern:

Be it known that I, DAVID A. DECROW, a citizen of the United States, residing in Lockport, in the county of Niagara and State of New York, have invented certain new and useful Improvements in Motor-Engines, of which the following is a specification.

This invention relates to vertical engines particularly adapted for pumping-engines, in which the motor cylinder or cylinders are supported at a high elevation above the pumping cylinder or cylinders or other mechanism driven thereby.

In steam pumping-engines it frequently happens that the pumping-cylinder needs to be located near the water-level of the source of supply and the motor-cylinders on the same structure without lateral support at a point high above said level. For instance, in a waterworks of a city located on a bluff above the river from which the supply is derived it was found necessary to locate the pumping-cylinders at the bottom of a pit nearly one hundred feet deep and the motor-cylinders on the same frame structure above the top of said pit without support from the walls thereof. In a vertical crank and fly-wheel pumping-engine as heretofore constructed the motor-cylinders have been located as close to the crank-shaft as required by good construction in the dimensioning of the connecting-rods, cross-heads, cranks, and other connections or parts, or when the motor-cylinders were located at a greater distance above the crank-shaft in cases when it was necessary to depart from such dimensions it has been done by employing connecting-rods of unusual length between the cranks and cross-heads. The latter arrangement carries the point or points of application of the side strains due to the movements and inclined thrusts of the connecting-rods and cross-heads to a greater distance above the crank-shaft than absolutely necessary and produces thereby vibrations which are difficult to obviate without excessively heavy framing or side support to adjacent objects not a part of the engine proper. To overcome these objections, I have located the crank-shaft, fly-

wheel, cross-heads, and the connecting-rods which connect the cross-heads with the cranks and operate at an angle tending to impart lateral stress to the frame as near as possible to the base of the machine away from the elevated cylinders, leaving the connecting-rods of usual length, elongating the piston-rods, and providing intermediate rod-guides on the extended vertical frame between the cylinders and the cross-heads for the piston-rods.

In the accompanying drawings, Figure 1 represents an end elevation of a motor-engine embodying my invention. Fig. 2 is a side elevation of the same, showing a plurality of cylinders, piston-rods, cross-heads, connecting-rods, and cranks attached to a common crank-shaft. Fig. 3 is an end elevation of a so-called "self-contained" vertical pumping-engine embodying the principles of my invention. Fig. 4 is a side elevation of the same, having a plurality of motor-cylinders; and Fig. 5 is a side elevation, and Fig. 6 a plan, of a plurality of self-contained pumping-engines embodying my invention and connected by lateral braces and tie-rods.

Similar numerals of reference indicate corresponding parts.

In the embodiment shown in Figs. 1 and 2 of the drawings a base 8 supports a series of superposed frames 9, 14, and 15, on top of which series is mounted a motor-cylinder 16. A crank-shaft 11 is also supported on the base 8 and provided with a crank or cranks 10 and with a fly-wheel or fly-wheels 12. The lower frame 9, mounted directly on the base 8, and the frame 14, mounted on the frame 9, constitute the main frame of the machine and may be constructed in separate or the same parts. The frame-section 14 or upper part of the main frame has cross-head guides 14^a, in which a cross-head 21 slides. A comparatively short connecting-rod 13 extends through the main frame and connects the crank 10 with the cross-head 21, and an elongated piston-rod 20 extends through the intermediate frames and connects the piston of the elevated motor-cylinder 16 with said cross-head. These intermediate frames are pref-

erably provided with guides for the elongated piston-rod.

The introduction of the intermediate frame or frames 15 between the main frame, which guides the cross-head, and the motor-cylinder permits the motor-cylinder 16 to be located at any desired height above the crank-shaft 11 without lengthening the connecting-rod 13 and without elevating the cross-head, and consequently avoids raising the point of application of the side strains on the frame structure.

When more than one set of cylinders, cross-heads, connecting-rods, and main and intermediate frames are employed, several sets of main and intermediate frames 9 or 14 and 15 are tied and braced together by lateral braces 18, as shown in Figs. 2 and 4.

In Figs. 3 and 4 is shown a so-called "self-contained" vertical pumping-engine in which the principles of my invention are embodied and which contains a plurality of motor-cylinders and pumps. Any number of motor-cylinders and pumps and other accessories may be used, and the same may be constructed in any relative size, type, or arrangement, as I do not restrict myself to any particular number of motor-cylinders or pumps nor to any special construction of the same. The pumps 3, valve-chambers, and domes 4, 5, and 6 are distributed between or around the frames 2 and are all supported on a suitable foundation 1. The engine base or bases 8, on which the engine or engines, as before described, are mounted, are supported by the frames 2 and also, if desired, by columns on the pumps 3. The pump-plunger 7 is connected to the cross-head 21 by plunger-rods 10. The main frames 14 and intermediate frames 15 are likewise tied together by the lateral braces 18. It is thus seen that by employing the principles of my invention the motor-cylinders 16 may be located at any desired height above the crank-shaft and pumps without raising the points of application of the side strains due to the action of the connecting-rods and cross-heads. Under some circumstances it may be desirable to dispense with the frames 2 and to support the engine-base 8 and its superstructure on masonry piers or in any other convenient manner, as it is not desired that the invention be restricted or limited to employment of any particular kind or style of a support for the engine or engines. In practice, however, it is preferable to employ a metallic supporting-frame of the form and style shown, so as to make the pumping-engine one of the so-called "self-contained" type.

In Figs. 5 and 6 is shown a plurality of self-contained vertical pumping-engines embodying the principles of my invention. Any number of vertical pumping-engines may be combined and may be made of any desired dimensions. In the drawings four sets of pumping-engines are shown. The intermediate frames 15 of the engines are firmly se-

cured together by lateral braces 18, and the adjacent intermediate frames of the different engines are again tied together by lateral braces 17, thus forming a very rigid construction and combination between the four sets of pumping-engines. Tie-rods 19 may be also employed, so as to add an additional degree of rigidity to the construction, especially when an initial strain is placed on all the braces, the braces 17 and 18 acting then as struts for taking up the compression and the tie-rods as tension-rods. The tie-rods 19 are not absolutely necessary and may be dispensed with.

It will be seen from the foregoing description that the motor-cylinders 16 in the pumping-engines may also be located at any desired height above the crank-shaft without altering the general construction of the engines, the main frames 14 carrying the guides for the cross-heads of the connecting-rods 13, while the motor-cylinders 16 are raised to any desired height by adding the intermediate frames 15 and lengthening the piston-rods 20.

In the pumping-engines shown it may be desirable to make the engine-bases 8 separate for each set of rods, cylinders, cranks, &c.; but it may also be possible to make said bases all in one piece, so as to increase the stability of the structure.

Vertical motor-engines embodying the principles of my invention may be employed for general purposes other than for pumping machinery and also any desired construction of pump be used in connection with the same, although I prefer to use the pump shown in the United States Letters Patent No. 620,644, granted to me on March 7, 1899; but I do not desire to limit or restrict myself in the employment of my invention to any particular kind or style of machinery or to any particular method of application.

Having thus described my invention, I claim as new and desire to secure by Letters Patent—

1. In a vertical motor-engine, the combination of an elongated upright frame structure, a crank-shaft supported at or near the base thereof and provided with a crank, cross-head guides disposed on said frame adjacent to said crank-shaft, a motor-cylinder disposed on said frame high above said crank-shaft, a low cross-head adapted to slide on said guides near the base, a relatively short connecting-rod between said low cross-head and crank, and an elongated piston-rod connecting the piston of the motor-cylinder with the cross-head.

2. In a vertical engine, the combination of an elongated upright frame structure, a crank-shaft supported at or near the base thereof and provided with a crank, cross-head guides disposed on said frame adjacent to said crank-shaft, a motor-cylinder disposed on said frame high above said crank-shaft, a low cross-head adapted to slide on said guides near the base, a relatively short connecting-rod between said low cross-head and crank, an intermediate

rod-guide on said frame between the motor-cylinder and cross-head, and an elongated piston-rod connecting the piston of the motor-cylinder with the cross-head and engaging said rod-guide.

3. In a vertical engine the combination of a composite frame structure comprising a base-section, a main frame-section supported on said base-section and provided with cross-head guides, an upper section for the motor-cylinder and an intermediate section between the cylinder-section and the main section and provided with a rod-guide, a crank-shaft supported on the base-section and provided with a crank, a motor-cylinder supported on the upper section, a cross-head adapted to slide on the guides of the main section, a relatively short connecting-rod between the cross-head and the crank, and an elongated piston-rod engaging the rod-guide of the intermediate section and connecting the piston of the elevated cylinder with the low cross-head.

4. In a motor-engine, the combination of a frame, a crank-shaft supported in bearings rigid with the said frame, a motor-cylinder rigid with the said frame, a piston-rod extending from the said cylinder to a length relatively great as compared with the length of the stroke, a cross-head therefor provided with guides rigid with the said frame and remote from the said cylinder, and a pitman connecting the said crank-shaft and cross-head and of a length relatively short as compared with the said piston-rod, whereby the

transverse forces at the cross-head are applied at points relatively near the crank-shaft and remote from the cylinder at all points in the stroke, for substantially the purposes set forth.

5. In a motor-engine, the combination of a frame, a crank-shaft supported in bearings rigid with the said frame, a motor-cylinder rigid with the said frame, a piston-rod extending from the said cylinder to a length relatively great as compared with the length of the stroke, a cross-head therefor provided with guides rigid with the said frame and remote from the said cylinder, and a pitman connecting the said crank-shaft and cross-head and of a length relatively short as compared with the said piston-rod, and a pump having its plunger in line with and connected to the said piston-rod, the pump-cylinder being located on the opposite side of the crank-shaft from the said motor-cylinder, whereby the transverse forces at the cross-head are applied at points relatively near the crank-shaft and remote from the cylinder at all points in the stroke, for substantially the purposes set forth.

In testimony that I claim the foregoing as my invention I have signed my name in presence of two subscribing witnesses.

DAVID A. DECROW.

Witnesses:

H. H. FLAGLER,
N. M. CLARK.