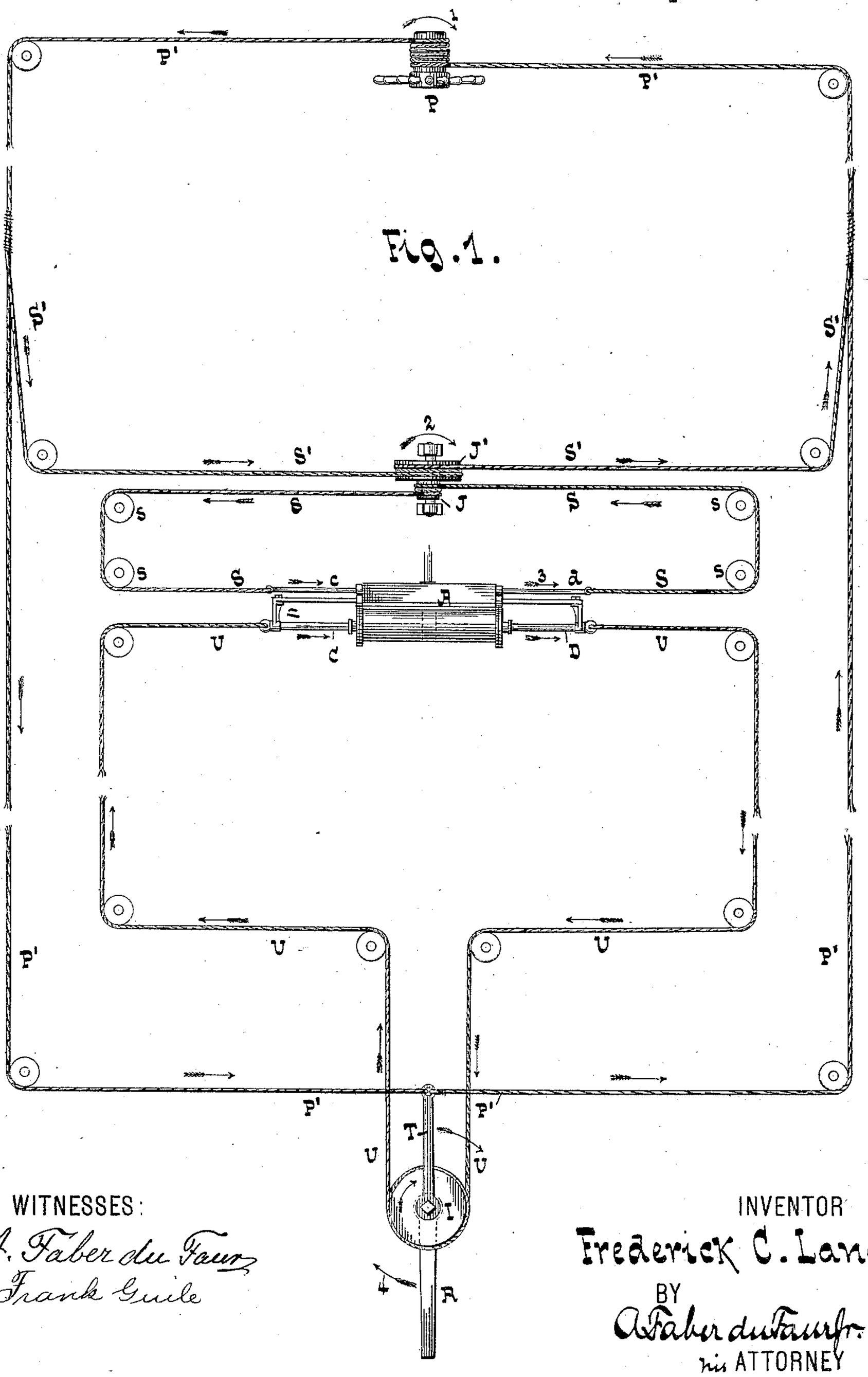
(No Model.) 3 Sheets—Sheet 1.

F. C. LANG.

POWER STEERING APPARATUS.

No. 426,538. Patented Apr. 29, 1890.

Fig. 1.



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(No Model.)

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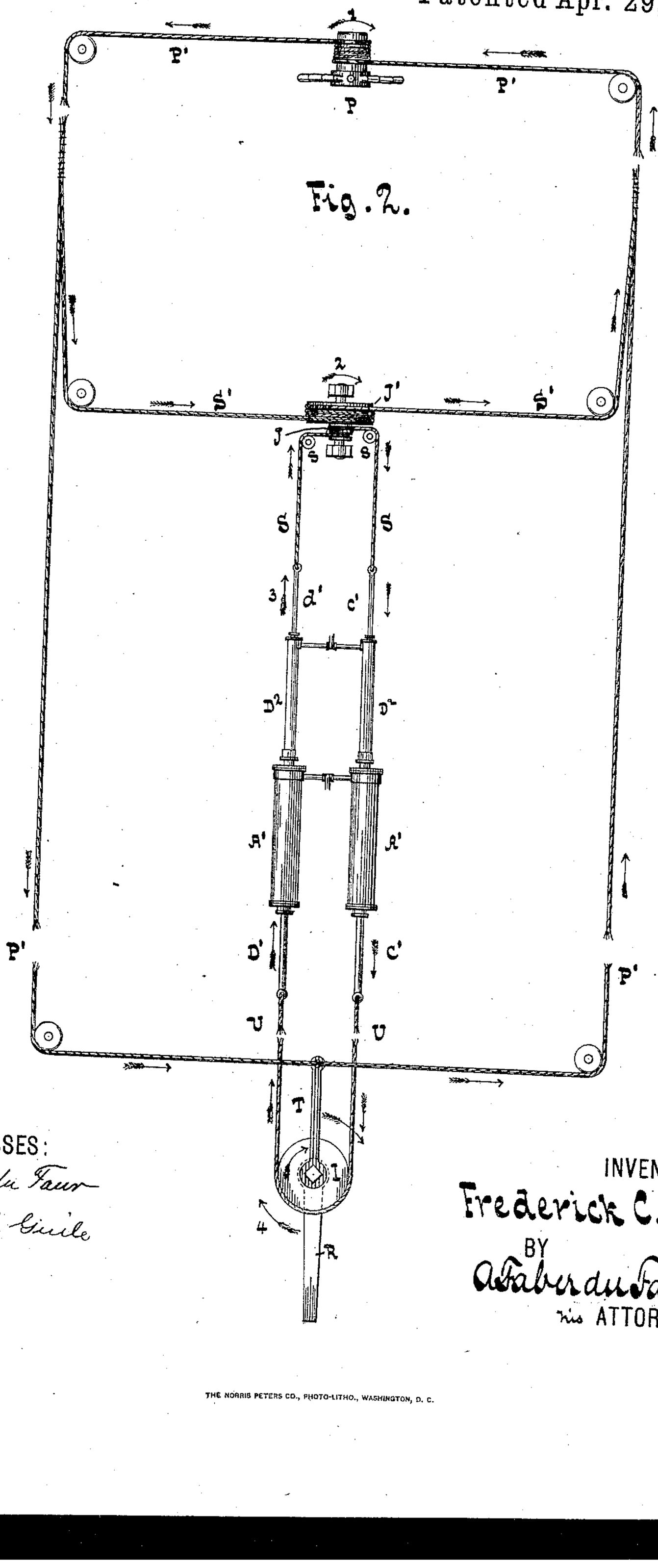
Fig. 2.



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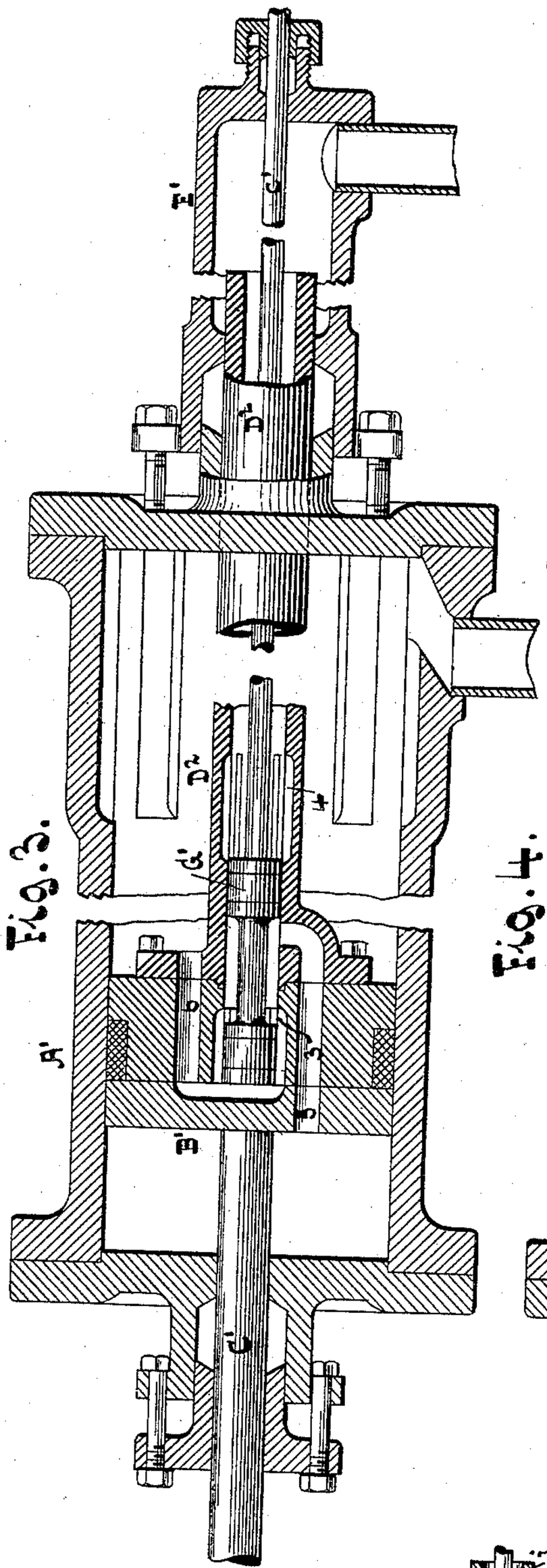

Fig. 3.

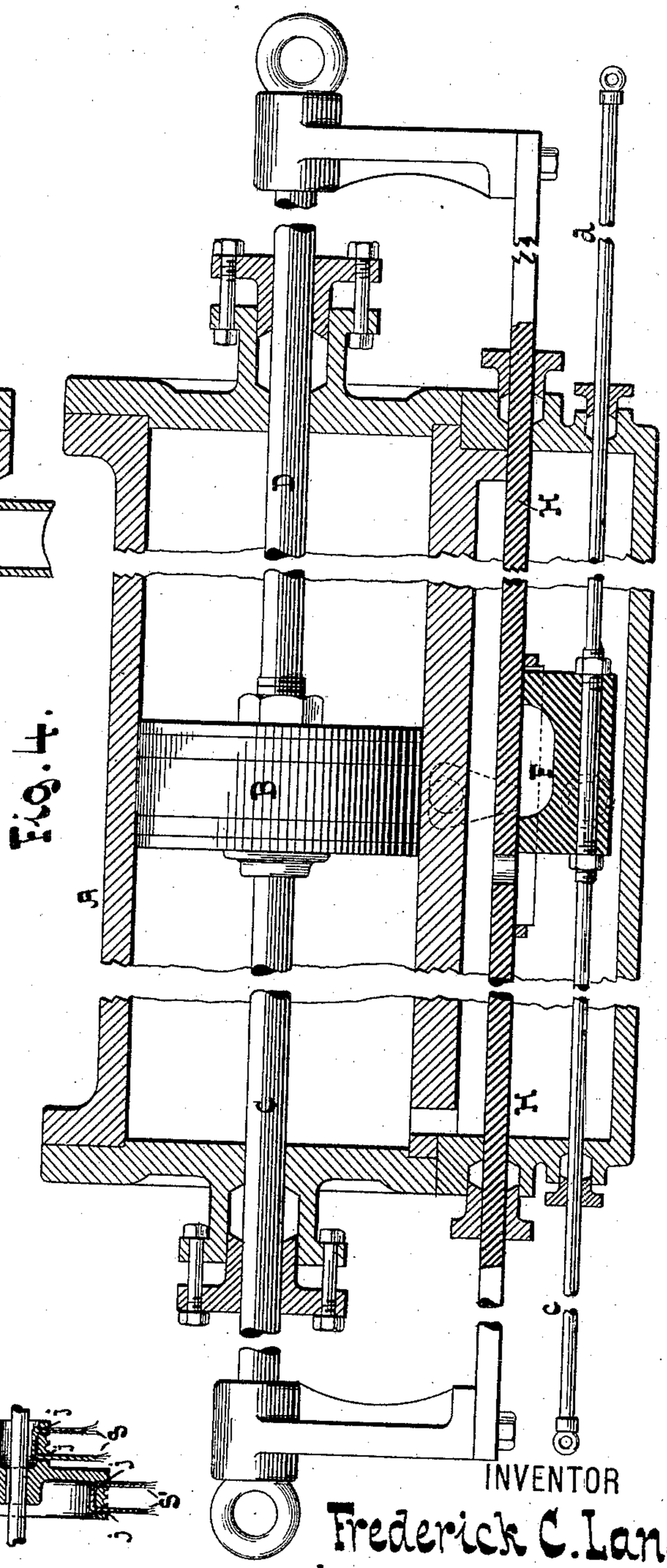

Fig. 4.

Fig. 5.

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UNITED STATES PATENT OFFICE.

FREDERICK C. LANG, OF HOBOKEN, NEW JERSEY.

POWER STEERING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 426,538, dated April 29, 1890.

Application filed July 26, 1889. Serial No. 319,136. (No model.)

To all whom it may concern:

Be it known that I, FREDERICK C. LANG, a citizen of the United States, and a resident of Hoboken, in the county of Hudson and State of New Jersey, have invented a new and useful Improvement in Power Steering Apparatus, of which the following is a specification.

My invention has reference to improvements in power steering apparatus; and it consists, essentially, in interpolating in the ordinary hand steering-gear an engine having its valve connected with the ropes from the pilot-wheel and its piston with the rudder, all being so arranged that the hand steering-gear remains the same as before in all its details, while the engine furnishes the requisite power and follows the movements of the hand steering-gear. In addition to this, in case of accident to the engine or parts appertaining thereto the hand steering-gear remains operative.

In the accompanying drawings, Figure 1 represents a plan view of the general arrangement of the parts according to my invention, a double-acting engine being employed to furnish the power. Fig. 2 is a similar view showing two single-acting engines or cylinders employed to the same end. Fig. 3 is a longitudinal section of one of the cylinders of Fig. 2, said figure being drawn to a larger scale than the preceding figures. Fig. 4 is a similar section of the engine shown in Fig. 1, drawn to the same scale as Fig. 3. Fig. 5 is a cross-section of a detail part.

Similar letters indicate corresponding parts.

In the drawings, referring at present to Fig. 1, the letter P designates the pilot-wheel; R is the rudder, T the tiller, and P′ P′ are the ropes or chains leading from the pilot-wheel to the tiller, all constructed and arranged as usual in hand steering-gears. Within this hand steering-gear I interpolate an engine A of a suitable construction and connect the valve-stems *c d* thereof with the ropes P′ P′ from the pilot-wheel at points intermediate between the latter and the tiller, peferably at points nearer to the pilot-wheel than to the tiller. The piston-rods C D of the engine are connected to the rudder, preferably to a drum I, mounted rigidly upon the rudder-post.

In the example illustrated in Fig. 1 I make use of a double-acting engine in which the piston is adapted to follow the stroke of the valve in either direction, and to reduce the length of the strokes of said piston I make use of a reducing cone or drum J J′, the smaller wheel J being connected to the valve-rods *c d* by a rope S S, secured to and wound about the same and connected to the said valve-rods, said rope passing over suitable guide-pulleys *s s*. The larger wheel J′ is connected with the ropes P′ P′ from the pilot-wheel by a rope S′ S′, secured to and wound about said wheel and having its ends secured to the said wheel-ropes. The piston-rods C D are connected with the rudder by means of a rope U U, secured to and wound about the drum I on the rudder-post. In this example I have shown the radius of the drum I to be about one-third the length of the tiller T. Consequently the wheels J J′ of the cone must bear the same ratio to each other, in order that the ultimate movement of the rudder induced by the power steering-gear will be the same as would result from the hand steering-gear.

In Fig. 2 I use an engine comprising in its structure two single-acting cylinders for supplying power. The general arrangement and connections are the same in this case as before, and can be readily understood without further description.

The engine made use of in Fig. 1, (see Fig. 4,) for which I have filed an application for Letters Patent of the United States, said application bearing date April 15, 1889, Serial No. 305,079, consists, essentially, of a cylinder containing a piston B, having two piston-rods C D, to which piston is connected a sliding valve-seat H, upon which can travel a valve F, having two valve-stems *c d*, the whole being so arranged that when the valve F is moved in either direction the piston follows it and has its stroke determined by the length of the stroke of said valve.

The engine made use of in Fig. 2, (see Fig. 3,) for which I have filed an application for Letters Patent of the United States, said application being dated March 13, 1889, Serial No. 303,138, consists of two single-acting cylinders A′, each provided with a piston B′, having a rod C′ or D′ extending from one side thereof and a tubular valve-chest D^2 from the other side, which valve-chest extends

into a steam-chamber E′. The piston is provided with suitable ports 5 and 6 for the passage of live and exhaust steam. In the valve-chest D^2 is a piston-valve G′, governing suitable by-ways 3 and 4 in the same and having a stem c' projecting through the steam-chamber E, the whole being so constructed that when the valve is moved in one direction the piston follows it, the length of the stroke of the piston being determined by the length of the stroke of the valve.

The general operation of the apparatus is now as follows, reference being had to Fig. 1: If the pilot-wheel is turned in the direction of arrow 1, Fig. 1, the cone J J′ is turned in the direction of arrow 2, causing the valve to be drawn in the direction of arrow 3. The piston, following the stroke of the valve, causes the rudder to be turned in the direction of arrow 4. It will be seen that the ropes or chains P′ P′ from the pilot-wheel to the rudder tend to turn the latter in the same direction as the power apparatus. In practice the ropes or chains P′ P′ are permitted to hang somewhat slack, in order that the valve of the power apparatus will be moved to a limited extent on its seat before the rudder is turned by the hand steering-gear, so that the requisite power is furnished by the engine. To secure the ropes or chains to the reducing-cone J J′, Fig. 5, I form two openings *j j* in each of the same and pass the ends of the rope through said openings and then wind or coil the ropes or chains about the periphery of the wheels before securing the same to the valve-rods of the engines, the wheels being provided with spiral grooves to receive the ropes.

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

1. A steering apparatus consisting of a distinct hand steering-gear and an interpolated power steering apparatus, the engine having its valve connected with the hand steering-gear and its piston with the rudder, substantially as and for the purpose set forth.

2. A steering apparatus consisting of a distinct hand steering-gear and an interpolated power steering apparatus having the valve of its engine connected with the ropes or chains from the pilot-wheel and its piston with the rudder, substantially as and for the purpose set forth.

3. A steering apparatus consisting of a distinct hand steering-gear and an interpolated engine having its valve connected to the pilot-wheel through an intermediate device for reducing its movement and its piston connected with the rudder at a proportionate leverage with respect to the tiller, substantially as and for the purpose set forth.

In testimony that I claim the foregoing as my invention I have signed my name, in presence of two witnesses, this 24th day of July, 1889.

FREDERICK C. LANG.

Witnesses:
A. FABER DU FAUR, Jr.,
FRANK GUILE.