(No Model.)

2 Sheets—Sheet 1.

N. YAGN.

HYDRAULIC MOTOR.

No. 308,544. Patented Nov. 25, 1884.

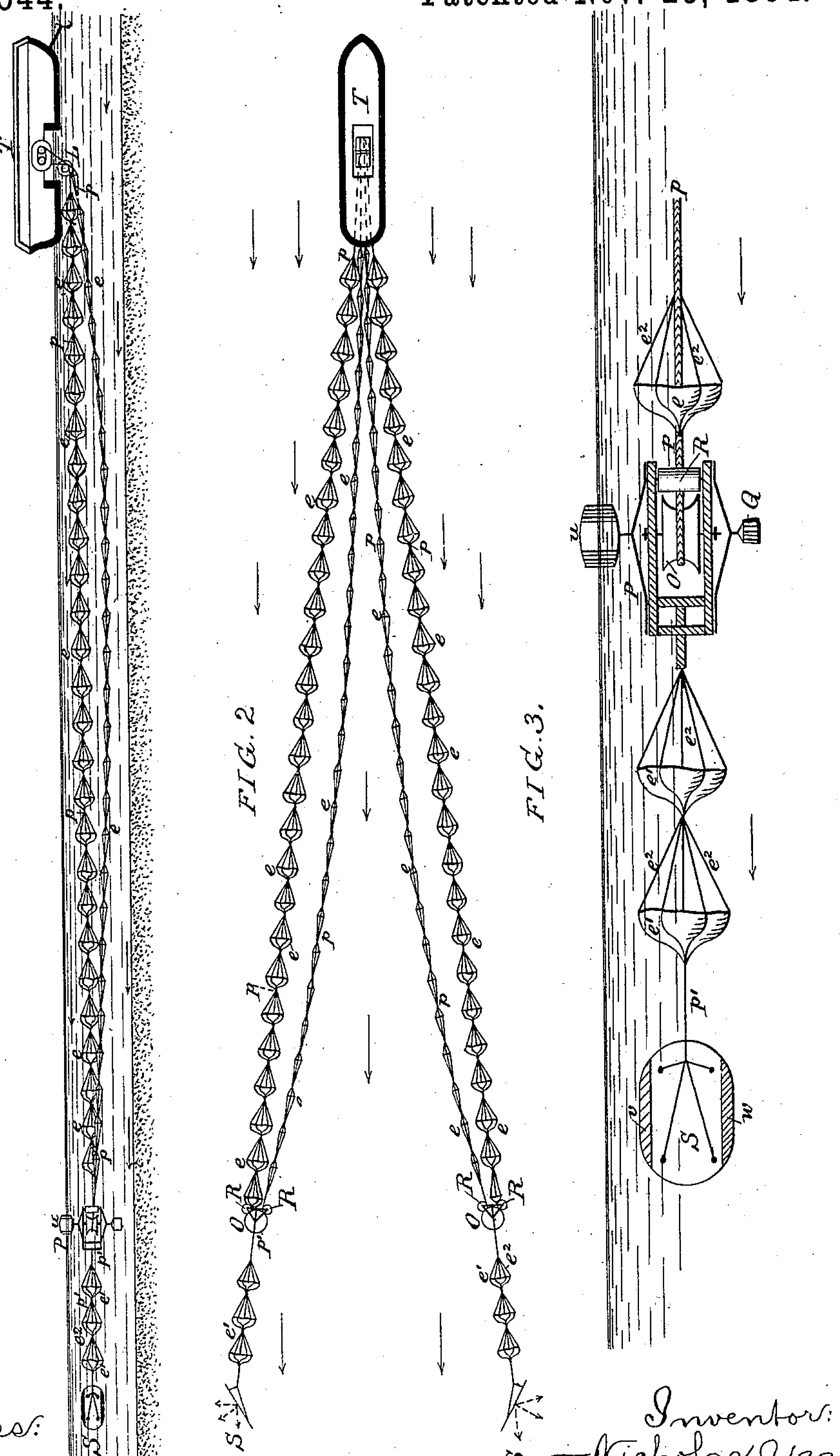

FIG. 1

FIG. 2

FIG. 3.

Witnesses:
Harry Drury
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N. PETERS. Photo-Lithographer. Washington, D. C.

(No Model.) 2 Sheets—Sheet 2.

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FIG. 4

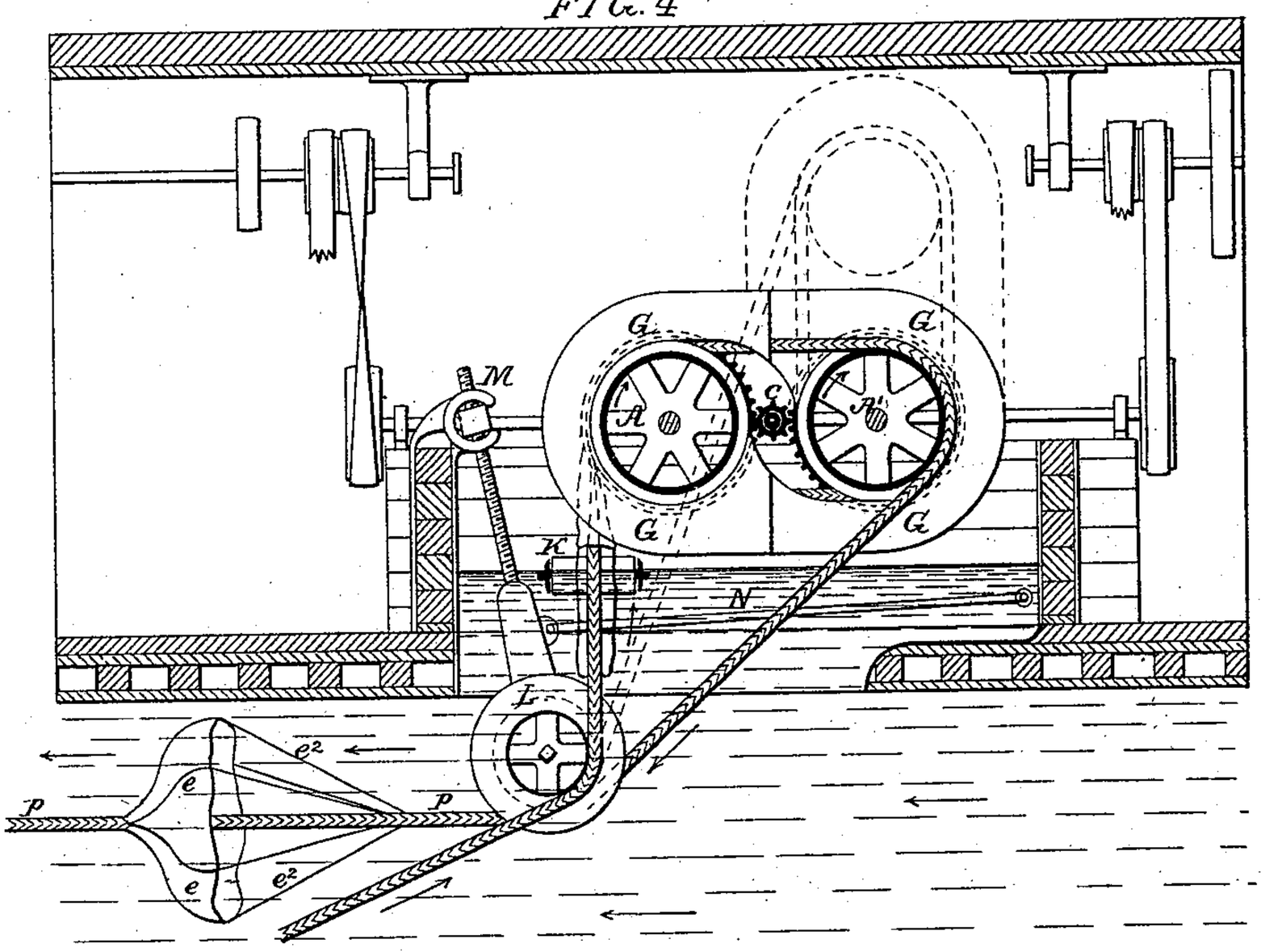
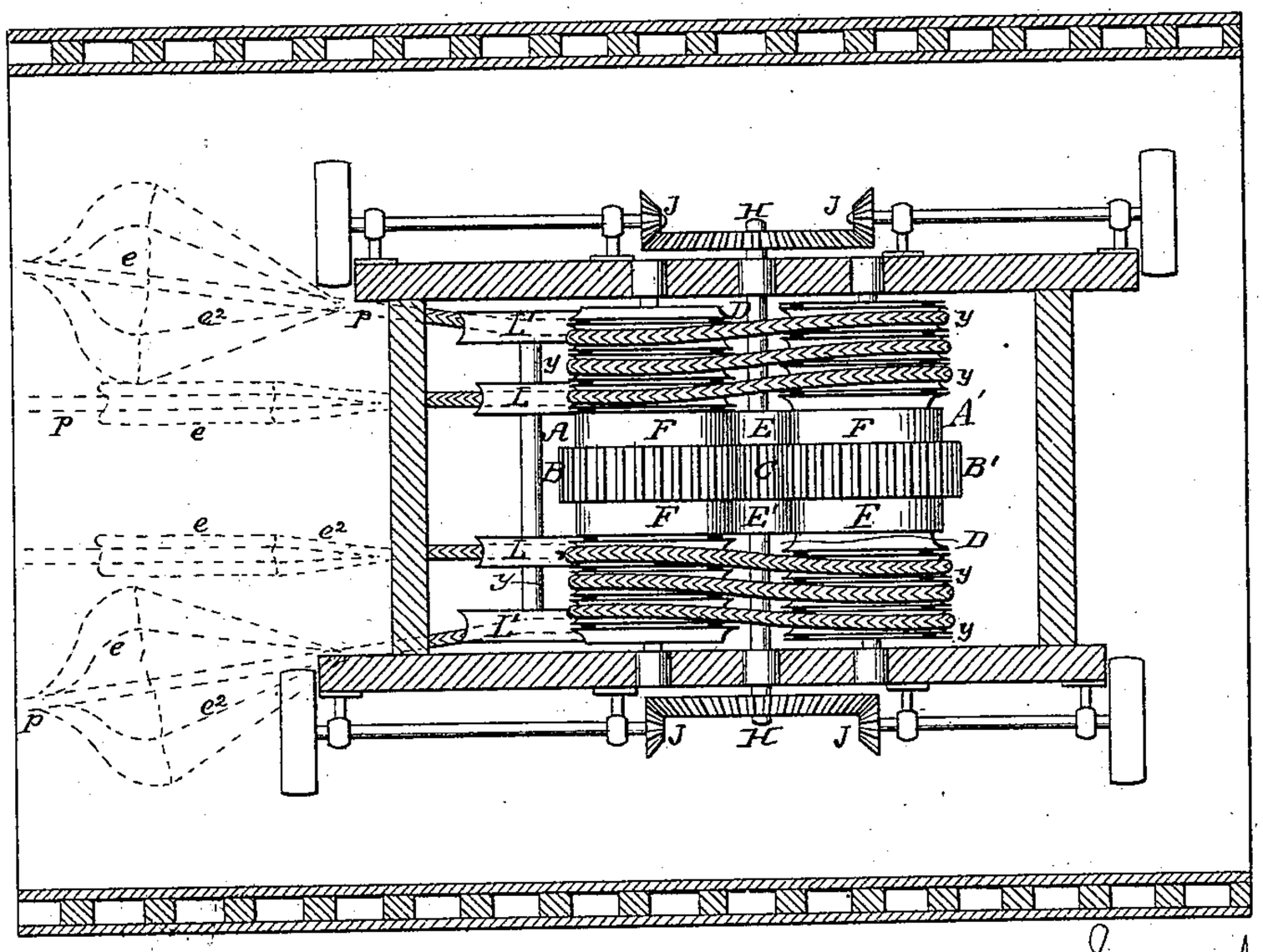


FIG. 5.



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UNITED STATES PATENT OFFICE.

NICHOLAS YAGN, OF ST. PETERSBURG, RUSSIA.

HYDRAULIC MOTOR.

SPECIFICATION forming part of Letters Patent No. 308,544, dated November 25, 1884.

Application filed June 14, 1883. (No model.) Patented in England March 20, 1883, No 1,464; in France May 2, 1883, No. 162,919; in Germany May 9, 1883, No. 25,332; in Italy June 30, 1883, No. 15,475; in Belgium July 3, 1883, No. 61,912; in Spain August 25, 1883, No. 4,421, and in Canada November 2, 1883, No. 17,998.

To all whom it may concern:

Be it known that I, NICHOLAS YAGN, a subject of the Czar of Russia, and residing in St. Petersburg, Russia, have invented certain Improvements in Hydraulic Motors, of which the following is a specification.

My invention consists of certain improvements in the construction of the hydraulic motor for which I obtained Letters Patent of the United States No. 273,930, dated March 3, 1883, as more fully described and claimed hereinafter. These improvements are shown in the annexed drawings, whereof—

Figure 1 represents a side view of a parachute-hydromotor with two endless ropes; Fig. 2, a top view of the same; Fig. 3, a side view of the swimming tension and steering apparatus; Fig. 4, a vertical section of the power-transmission mechanism, and Fig. 5 a sectional plan view of the same.

Similar letters refer to similar parts throughout the several views.

T, Fig. 1, is a floating vessel, and *t* her anchor-cable fixing the vessel at a convenient place of the river. In the bottom of the vessel is an opening or well surrounded by a bordering in the shape of a well-frame, which supports by its top part the power-transmission apparatus fixed thereon, as shown in Figs. 4 and 5. This apparatus consists of two drums, A and A′, placed horizontally and parallel to each other. When two endless parachute or bucket ropes are employed, as is done in the present case, the drums are at each end provided with grooves *y y y*, Fig. 5, to receive the parachute or bucket ropes *p p*. On the drum A′ these grooves are made half a groove width farther from the middle (*i. e.*, from the toothed wheel B′) than on the drum A, (from the toothed wheel B,) for the purpose of making the ropes *p p*, when passing from the drum A to the drum A′ and back, to wind round these drums in a helical direction.

For preventing the flexible parts of the sail-cloth parachutes *e* and their staying-cords *e″* from escaping from the groove they are to occupy, and from getting into the neighboring groove, the ribs between each two neighboring grooves can be provided with narrow and not very deep incisions, for inserting thin and conveniently-shaped guards of sheet metal *g*, Fig. 4. These guard-sheets form partitions separating the grooves from each other, and serving to produce a regular winding in helical direction of the ropes *p p*, with their parachutes or buckets *e e e*, on the drums A and A′. Both drums A and A′ have at their middles toothed wheels B and B′, gearing with a toothed pinion, C. The axes of the drums A and A′ and of the pinion C turn on bearings fixed on one common frame.

On either side of the pinion C are two rollers, E and E′, set on the axis D, and serving to keep the drums in their proper distance from each other and relieve the bearings of their axes from too great a side strain. These rollers bear against the cylindrical surfaces F F of the drums A and A′. The bevel-wheels H H and I I serve for transmitting the motion and power.

L L and L′ L′ are guide-pulleys for the parachute or bucket ropes *p p*. At their normal position these guide-pulleys are placed below the bottom of the vessel; but, if desired, they can be drawn into the opening of the vessel by means of the screw M. The stay-rod N serves to keep in the required position the guide-pulleys L undergoing a side strain from the tension of the ropes *p* in the direction of the current.

As shown by Figs. 4 and 5, the endless ropes *p p*, with their collapsed parachutes or buckets *e e*, returning against the current, being led from below over the guide-pulleys L, ascend, pass each between a pair of small rollers, K, placed horizontally and having for their object to properly flatten down the parachutes. Hereupon they enter into the grooves *y y* of the drum A next to the toothed pinion B. From this drum the parachute-ropes pass in a helical direction to the drum A′, winding round the same on one side, and return from below, likewise in a helical direction, to the drum A, hence pass again to the drum A′, and so on, corresponding to the number of grooves made in the drums. The endless ropes *p p*, on their return against the current, thus traveling in helical direction around the drums A and A′, and leaving the grooves *y y* at the extreme end of the drum A′, pass to their respective guide-

pulleys L′ L′, and descend down the current, carried along by the action of the flowing water on the parachutes or buckets *e e*, which are distended by the action of the current. It is evident that the friction between the endless parachute or bucket ropes *p p*, continually driven by the force of the current and the grooves *y y*, impart to the drums A and A′ a rotary motion, which, by means of the toothed wheels B and B′, is transmitted to the pinion C, and, further, through the bevel-wheels H and I and pulleys, or in any other convenient manner, to any desired point. This contrivance can be arranged in such manner that the drums A and A′, together with the pinion C, can be lifted, as indicated by dotted lines in Fig. 4, in order to facilitate inspecting and repairing the transmission mechanism and the parachute or bucket ropes. Of course the transmission can be provided with a brake for stopping the motion.

In Figs. 1 and 2 we see that when the parachute or bucket ropes *p p* have left the vessel T and entered in the flowing water, then on one-half of the ropes the parachutes or buckets *e e*, made of sail-cloth and fastened to the ropes, and provided with staying-cords *e″ e″*, fastened, likewise, to the parachute-ropes, and preventing the parachutes turning over, are blown up or distended by the pressure of the water. By the same pressure the ropes themselves are likewise constantly kept stretched.

At the extreme end down the current each of the endless parachute or bucket ropes *p p* goes round a pulley, O, Fig. 3, carried in a framing. P, which is held suspended in the water by a float, U. The frame P is maintained in its vertical position by a weight, Q, attached to its bottom. The top part of this frame is connected by a cord with the float U. The length of this cord depends on the depth at which the pulley is to be maintained under water. The rope *p*, traveling round the turning-pulley O, passes between two rollers, R, applied to the fore part of the frame P. These rollers have for their object to prevent the rope's leaving the pulley, especially when the frame P is removed to another part of the river. To the hind end of this frame is attached a comparatively short rope, *p′*, provided with a corresponding number of parachutes or buckets, *e′*. The parachutes *e′*, with their staying-cords *e″*, do not differ from the parachutes *e*. The length of the rope *p′* and the number of the parachutes *e′* are to be adapted to the length of the endless parachute or bucket rope *p* and the speed of current. By the action of the current upon the parachutes or buckets *e′* the frame P, with the pulley O, is drawn downstream with sufficient force to keep the endless parachute or bucket rope *p* constantly stretched. To the end of the said short rope *p′* a flat rudder-board, S, is attached in such manner that it assumes an oblique position to the direction of the rope.

In order to maintain the rudder-board S in a vertical position, the same is provided with a weight at *w*, (for instance, lead weights,) and to keep it afloat it is provided with cork-wood at *v;* or it can be provided also with a float. The current acting upon the rudder-board S, placed in an oblique position, tends to move it sidewise, and thereby to hold the endless parachute or bucket rope *p* at a slight angle to the direction of the current. In consequence hereof the distended parachutes of one-half of the endless rope *p* will undergo a more effectual pressure of the current than if they were all in one line with the current. When, as in the present case, two endless parachute or bucket ropes are employed, their rudder-boards S are placed in opposite angular position, Fig. 2, and thus will keep the two parachute or bucket ropes *p* separated from each other and prevent them from becoming entangled. It is easily understood that all the parachutes or buckets *e* on one half of the ropes *p*, turned with their mouths against the current, are distended by the pressure or impulse of the water and carried along with a certain force in the direction of the stream, while the parachutes of the other half, being directed against the current with their heads, will collapse and offer hardly any resistance to the current. Thus is produced an uninterrupted motion of the endless parachute or bucket ropes *p* round the pulleys or drums placed at their opposite extremities, thus obtaining a considerable mechanical working-power from the flowing water. The quantity of this power is in direct proportion to the speed of the current, the number and length of parachute-ropes, and the dimensions of the parachutes or buckets. The mechanical working-power thus gained by the described parachute-hydromotor can evidently be transmitted and used in different manners. Instead of placing the power-transmitting mechanism on a vessel, T, Figs. 1 and 2, and making the pulley O floating free, they can be placed in a stationary structure, as shown. This arrangement, even with the use of very long ropes constantly kept stretched by the force of the current, removes all fear that they might interfere with navigation, because when placed at great depth they are out of contact, and at lesser depth they easily yield to every pressure. Besides, the whole contrivance is easily shifted from one place of the river to another.

The power obtained by the parachute-hydromotor can evidently be used for a great variety of purposes—as, for instance, driving dynamo-electric machines, for transmission of power to a distance on land, for dredging and deepening the beds of water-ways, &c.

I claim as my invention—

1. The combination, in a hydraulic motor, of a structure carrying pulleys or drums, and endless parachute-ropes passing over said pulleys or drums, with two independent floating frames, also carrying pulleys for said

ropes, and inclined rudders connected to the floating frames to keep them apart, substantially as set forth.

2. The combination, in a hydraulic motor, of a structure carrying pulleys or drums, and an endless parachute-rope passing over said pulleys or drums, with a floating frame provided with a pulley to support the floating loop of the parachute-rope, and pair of rollers R, substantially as and for the purpose set forth.

3. The combination, in a hydraulic motor, of a structure carrying pulleys or drums, and an endless parachute-rope passing over said pulleys or drums, with a floating frame, P, carrying a pulley for the loop of the said rope, a vertical inclined rudder, S, and a connecting-rope, also having parachutes, all substantially as specified.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

NICHOLAS YAGN.

Witnesses:

ROBT. M. HOOPER,

JEAN-BAPTISTE ROLLAND.