(No Model.) 3 Sheets—Sheet 1.

G. A. TUERK.

WATER MOTOR.

No. 348,504. Patented Aug. 31, 1886.

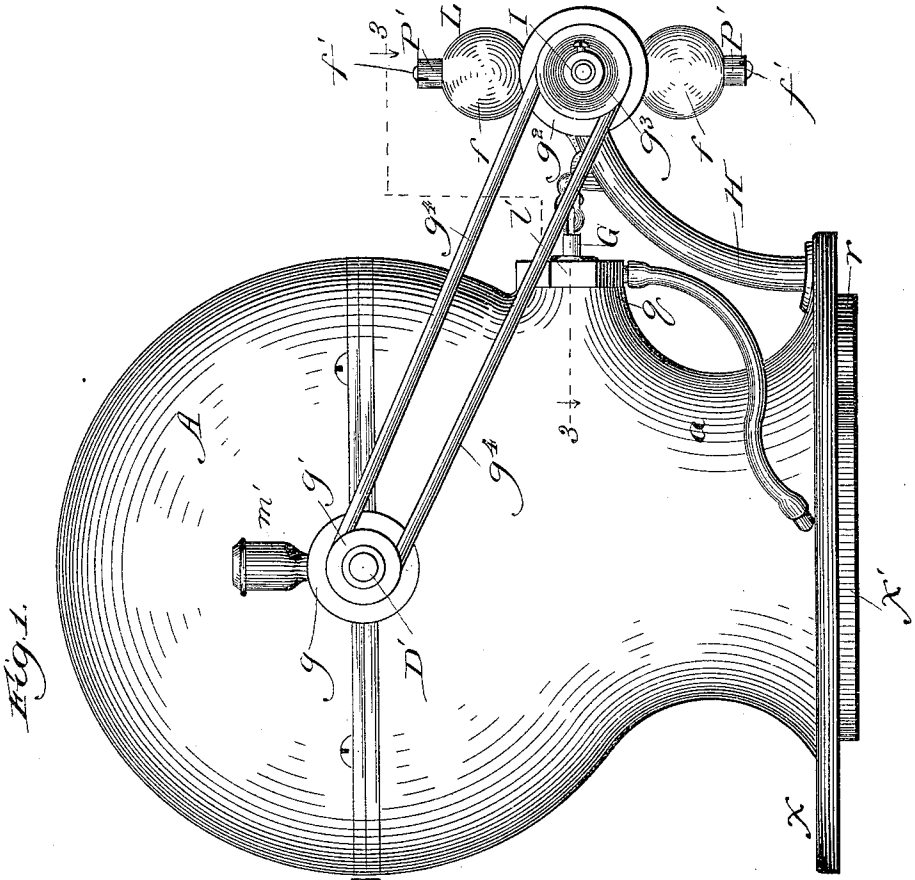

Fig. 1.

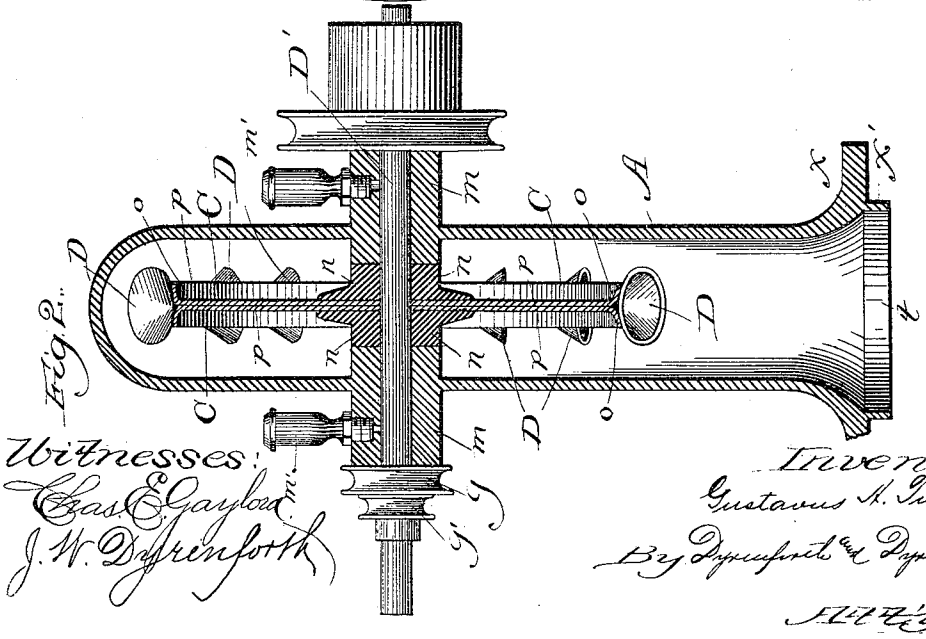

Fig. 2.

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Fig. 3.

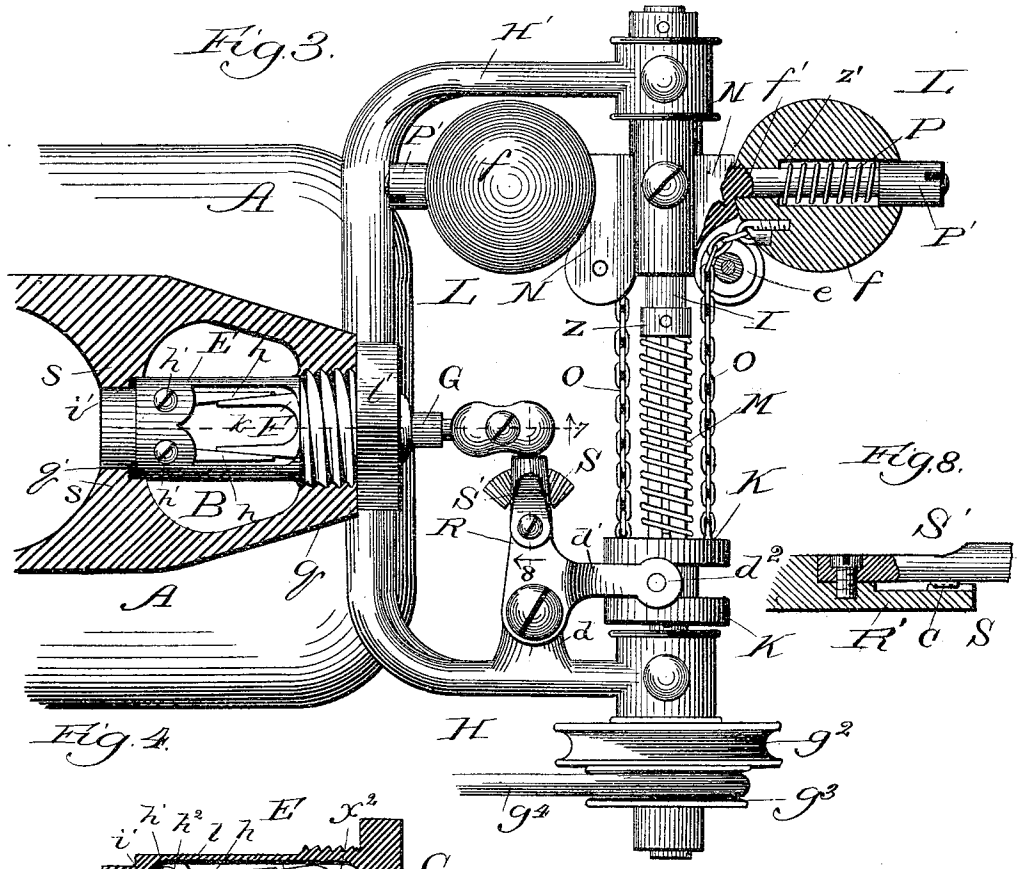


Fig. 8.

Fig. 4.

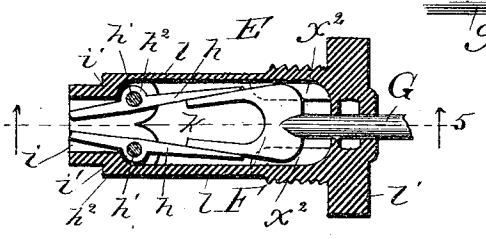


Fig. 5.

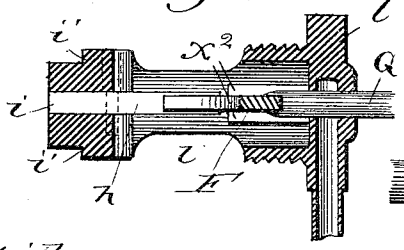


Fig. 6.

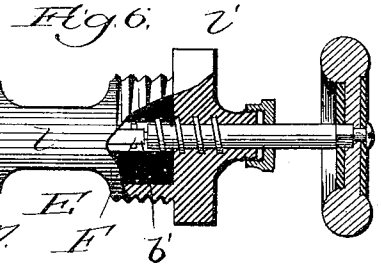
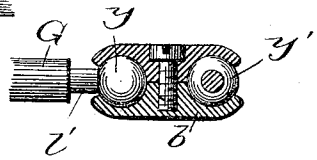


Fig. 7.



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(No Model.) 3 Sheets—Sheet 3.

G. A. TUERK.

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Fig. 9.

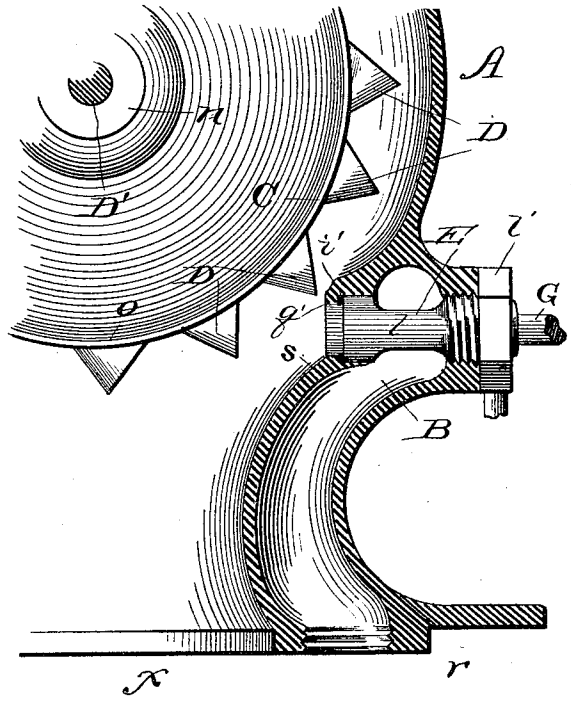


Fig. 10.

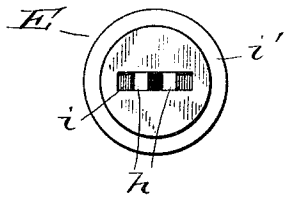
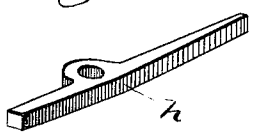


Fig. 11.



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UNITED STATES PATENT OFFICE.

GUSTAVUS A. TUERK, OF CHICAGO, ILLINOIS.

WATER-MOTOR.

SPECIFICATION forming part of Letters Patent No. 348,504, dated August 31, 1886.

Application filed March 5, 1886. Serial No. 194,129. (No model.)

To all whom it may concern:

Be it known that I, GUSTAVUS A. TUERK, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Water-Motors; and I hereby declare the following to be a full, clear, and exact description of the same.

My improvement relates to the class of motors which depend for their driving power upon the force of the pressure of the water-supply in cities and other places where the water is supplied through mains and delivered at hydrants, and which are commonly used for actuating printing-presses, the bellows of church-organs, sewing-machines, and the like.

Water-motors of the class to which my improvement relates comprise, as the essential features, a case provided with a water-inlet and a discharge opening, and containing a wheel having on its periphery buckets against which the supply-stream plays, filling them, whereby the weight of the water is utilized in addition to its pressure, to rotate the wheel, the discharge taking place during the rotation of the wheel from the buckets through the discharge opening; and also a governor mechanism to regulate the bulk of the driving-stream, and consequently its pressure, in accordance with the speed of rotation required and the amount of resistance to be overcome in the work to be done.

My improvement contains the features above enumerated, though, as will hereinafter appear, I provide means for controlling the driving power by hand instead of governor mechanism.

My invention consists in the general as well as in the particular construction of the valve device through which the water-power for driving the motor is controlled; and it also consists in certain details of construction and combinations of parts of the water-motor, all as hereinafter more fully set forth.

Referring to the drawings, Figure 1 is a side elevation of my improved motor; Fig. 2, a central transverse section of the same; Fig. 3, a broken view, partly in section, taken on the line 3 3 of Fig. 1; Fig. 4, a longitudinal section of the valve device operated by the governor; Fig. 5, a section taken on the line 5 5 of Fig. 4; Fig. 6, a modification of the valve device, partly in section; Fig. 7, a sectional view of a ball-joint connection, taken on the line 7 7 of Fig. 3; Fig. 8, a similar view of my improved valve-adjusting mechanism; Fig. 9, a broken sectional view of the motor, to illustrate clearly the inlet-chamber and inlet-opening leading thereto; Fig. 10, an end view of the valve device, and Fig. 11 a perspective view of a detail.

A is the case, of common form and construction, having the discharge-opening *t* at its lower end, where it is surrounded by a lateral flange, *x*, and a vertical flange, *x'*, which afford the seat, and provided with a chamber, B, formed by a web, *s*, which separates it from the interior of the case, and into the bottom of which an internally-threaded opening, *r*, leads, affording the inlet-opening at which the connection is made with the water-supply. At a desired point upon the case, on its narrower part, a flange, *q*, is cast, the opening in which leads into the chamber B, is screw-threaded and coincides with an opening, *q'*, in the web *s*, leading into the part of the case which contains the wheel C.

The construction of the wheel C will be understood by reference to Fig. 2. It comprises two thin metal (preferably tin) disks, *p*, having their peripheries bent in opposite directions to form flanges *o*, which disks are secured flatwise together and held by means of a hub, *n*, formed in two parts—one on each side of the wheel—being placed between the bearings *m*, cast with the case A, and upon which suitable oil-cups, *m'*, are provided. The driving-shaft D' revolves in its bearings *m* with the wheel, and passes through the disks *p* and hub *n*. The diverging flanges *o* afford upon the periphery of the wheel a seat for the buckets D, funnel-shaped and shallow, and which are secured in place (preferably about an inch apart) by soldering, or in any other suitable manner.

E is a valve for controlling the stream which plays against the wheel C, and is operated (preferably automatically for the purpose) by the governor mechanism, all as hereinafter particularly described. The valve E comprises a cylindrical shell, *l*, having a perforated head, *l'*, and threaded, as shown, adjacent to the

head, a portion of the cylinder being removed from opposite sides toward its center, to afford a transverse opening, *k*, through it, and the end thereof being solid and slotted centrally and transversely to produce a rectangular opening, *i*. Toward its inner end the shell *l* is provided externally with a shoulder, *i'*. The valve E is inserted into the hollow flange *q* and through the opening *q'*, at which it is stopped by the shoulder *i'*, and it is firmly screwed in position, whereby the opening *k* is caused to face the incoming stream of water through the opening *r* and chamber B, which water must thus pass through the valve E before reaching the wheel C.

The means of opening and closing and controlling the size of the opening *i* comprise fingers *h*, of a form to fit closely against the sides of the slot *i* by being of a cross-section toward their forward ends equal or nearly equal to the transverse diameter of the slot, and these fingers taper on their adjacent or inner surfaces toward their rear extremities, and are pivotally attached in position by means of screws *h'*, passing through eyes h^2 on the fingers into the solid portion of the cylinder *l* toward its forward end. The size of the opening or slot *i*, by way of which the water-supply gains access to the wheel C, is increased or diminished or entirely closed by spreading apart the forward ends of the fingers or causing them to approach each other, which operations are effected by moving the fingers in directions the opposite to those desired for their forward ends at the tapering extremities behind the pivotal points, and the close fit of the fingers at their pivotal points with relation to the wall of the cylinder *l*, is such as to preclude, without packing, the passage of water elsewhere than between the adjacent faces of the fingers. The pressure of the stream tends to maintain the orifice *i*, between the fingers *h*, open for its passage, and the closing thereof is effected by the action of the governor, hereinafter described, by means of the wedge F, sliding in guides x^2, and extending between the tapered ends of the fingers *h*, and secured upon the end of a piston rod or stem, G, having a ball, *y*, at its extremity, and extending through the head *l'* into the cylinder *l*. Diverging arms H H' extend upward and backward from the flange *x*, and afford bearings for a rotary governor-shaft, I, carrying toward one projecting extremity pulleys g^2 g^3, to be connected, respectively, by means of a suitable belt, g^4, with pulleys *g g'* on the corresponding projecting end of the driving-shaft D', the relative sizes of the pulleys being such as are commonly provided in devices of the present kind. The opposite projecting end of the shaft D' carries pulleys, as shown, to receive the belt through the medium of which the power of the motor is transmitted. The shaft I carries, to revolve with it, between the arms H H' and adjacent to the arm H, a recessed or grooved and longitudinally-sliding collar, K, and adjacent to the arm H' the governor L, a spiral spring, M, which surrounds the shaft, intervening between the governor and the collar K, being held between the latter and a collar, *z*. The governor comprises balls *f* upon the ends of a transverse rod or rods, *f'*, threaded toward the extremities, and extending from a casting, N, secured upon the shaft and carrying pulleys *e*, over which pass chains or belts O, connected each at one end to the collar K, and at the opposite end to a ball, *f*. The opening in each ball *f*, through which the rod *f'* passes, is enlarged toward its outer ends to afford a shoulder, *z'*, and make room for a spiral spring, P, surrounding the rod *f'*, and having its seat against the shoulder *z'*, and to receive a nut, P', forming the means for confining the spring P at its outer end, and for preventing the separation of a ball, *f*, from the rod, owing to the stop provided by the shoulder *z'*. The arm H has a lug, *d*, on its inner side, to which is pivotally secured a casting, R, having arms *d'* to embrace diametrically the collar K at the groove thereon, which arms carry toward their extremities pins d^2, to enter the groove, thereby affording means for actuating the piston rod or stem G, which is connected with the casting R, as hereinafter described, by the sliding movement of the collar K, produced by the action of the governor owing to the connection O. The casting R is further provided with an extension, R', Fig. 8, carrying at its extremity a segmental rack, S, and upon this extension a lever, S', is adjustably secured toward one end, the opposite end being provided with a ball, *y'*, Fig. 7, and the lever carrying on its under surface a tooth, *e*, Fig. 8, to engage with the rack S and permit the initial setting of the valve E for any given pressure and work to be done, from which the variation in bulk of the driving power produced by the governor takes place, the piston rod or stem G being connected with the lever S' by means of clamps *b*, Fig. 7, held together by a central screw, as shown, and provided with the sockets toward their opposite extremities, which receive the balls *y y'* at the adjacent ends of the piston rod or stem G and lever S', and afford thereby a ball-joint or pivotal connection. A rubber tube, *a*, is connected at one end with the head *l'*, and communicates through the latter with the chamber B, and at its opposite end with the discharge-opening *t*, serving to carry off the drip.

The operation of the mechanism thus described is as follows: The connection with the water-supply at the hydrant having been made at the inlet *r*, and the piston rod or stem G being adjusted by means of the toothed lever S' and rack S to cause the wedge F to gage the opening *i* between the fingers *h*, according to the normal pressure of the water-supply and the amount of work to be done, the water is turned on, passing in a continuous stream through the chamber B and valve E

by way of the opening *i*, which the pressure of water between the fingers *h* tends to maintain open, and strikes against the buckets D, thereby rotating the wheel C. Owing to the large surface presented by each bucket and the comparatively small surface on the periphery of the wheel the water discharges from the buckets very freely and without being impeded by the periphery through the waste-opening *t*. With the rotation of the wheel the governor L operates through the medium of the connection O to draw toward it the sliding collar K, thereby turning the casting R upon its pivot and forcing the piston rod or stem G and wedge F inward, thus spreading the tapered ends of the fingers *h* and decreasing the size of the opening *i* until the size of the stream becomes inadequate, when the decrease of speed in the wheel's rotation, and consequently collapsing effect upon the governor, causes the collar, by the resilience of the spring M, to slide back, thereby turning the casting R in the opposite direction on its pivotal point and drawing out the piston rod or stem G and wedge F, thus permitting the pressure of the stream to spread the opening *i* and allow the passage of a larger stream.

The general operation of the governor mechanism being similar to that of other governor mechanisms no further description than the foregoing is necessary to render mine readily understood. The springs P are only auxiliary to the spring M; but I prefer to use them together, as shown, since thereby the elasticity of the parts is more widespread in the device and the latter is hence smoother in its operation.

The modification shown in Fig. 6 is designed for use where no governor mechanism is provided. It permits the control of the valve E by hand by turning the handle T on the stem G, which is coarsely threaded to screw in and out of the head *l'* and connected with the wedge F by means of a swivel-joint, *b'*.

I do not in the present application claim, separately, in the water-motor, the water-wheel constructed as shown and herein described, as I intend that it shall form the subject of a separate application for Letters Patent; nor is the mechanism herein shown and referred to as the "governor" mechanism, claimed otherwise than in combination with novel features of the motor, as it is considered in itself, in the main, to be old.

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

1. In a water-motor, the combination, with the wheel, of a valve, E, comprising a shell in the water-inlet passage and open to admit the water, pivotal fingers extending through the discharge-opening of the shell, a sliding wedge between the fingers, a piston rod or stem to which the wedge is connected, and means, substantially as described, for controlling and actuating the piston rod or stem, substantially as and for the purpose set forth.

2. In a water-motor, the combination, with the wheel, of a valve, E, comprising a cylindrical shell screwed into the case of the motor to extend across the water-inlet chamber and solid and slotted toward its discharge end, and having open sides to admit the water, pivotal fingers *h* in the shell extending through the slot, a guided sliding wedge, F, a piston rod or stem, G, to which the wedge is connected, and means, substantially as described, for controlling and actuating the piston-rod, substantially as and for the purpose set forth.

3. In a water-motor, the combination, with the wheel and valve E, having a piston rod or stem for controlling its discharge-opening, of a rack, S, a toothed lever, S', adjustably secured upon the rack and pivotally connected with the said piston rod or stem, and means, substantially as described, for controlling and actuating the piston-rod, substantially as and for the purpose set forth.

4. In a water-motor, the combination, with the driving shaft and wheel, of a valve, E, comprising a shell in the water-inlet passage and open to admit the water, pivotal fingers *h*, extending through the discharge-opening of the shell, a sliding wedge, F, between the fingers, a piston rod or stem, G, to which the wedge is connected, a rack, S, a toothed lever, S', adjustably secured upon the rack and pivotally connected with the piston rod or stem, and means, substantially as described, for controlling and actuating the piston rod or stem, substantially as and for the purpose set forth.

5. The combination, with a wheel, C, and valve E, for controlling the power exerted against the wheel to rotate it, of governor mechanism for controlling the valve, comprising a governor-shaft, I, suitably supported and connected with the wheel C, a sliding grooved collar, K, on the shaft, a casting, R, pivoted on the support of the governor-shaft, having a rack, S, a toothed lever, S', upon the rack, and pivotally connected with the valve-stem, arms *d'* upon the casting R, embracing the collar K, pins *d²* on the arms *d'* within the groove of the sliding collar, a governor, L, connected with the sliding collar, to slide the same toward it in its rotation by the divergence of the governor-balls, and a spring, against the resistance of which the sliding collar is moved, substantially as and for the purpose set forth.

6. In a water-motor, the combination, with the driving-shaft D' and wheel C, of a valve, E, comprising a cylindrical shell screwed into the case of the motor to extend across the water-inlet chamber and open to admit the water, pivotal fingers *h*, extending through the discharge-opening of the shell, a sliding wedge, F, between the fingers, and a stem, G, to which the wedge is connected, a governor-shaft, I, suitably supported and connected with the wheel C, a sliding grooved collar, K, upon the shaft I, a casting, R, pivoted on the support of the governor-shaft, having a rack,

S, a toothed lever, S′, upon the rack and pivotally connected with the stem G, arms d' upon the casting R, embracing the collar K, pins d^2 on the arms d' within the groove of the collar K, a governor, L, having its diverging balls f connected with the collar K by means of chains O, passing over pulleys e and movable upon rods P′, and containing confined springs P, and a spring, M, on the shaft I, the whole being constructed and arranged to operate substantially as and for the purpose set forth.

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In presence of—
HENRY HUDSON,
G. C. COOK.