# J. L. Smith.

## Water Wheel.

No. 2,383. Patented Dec. 10, 1841.

Fig. 2.

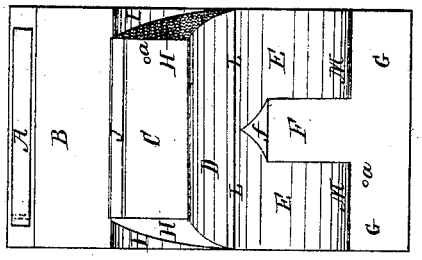



Fig. 5.

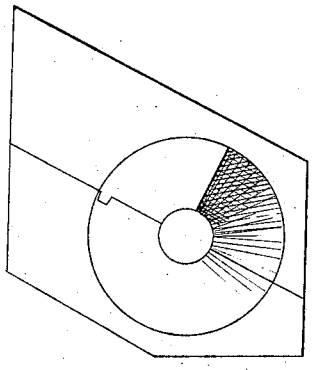


Fig. 1.

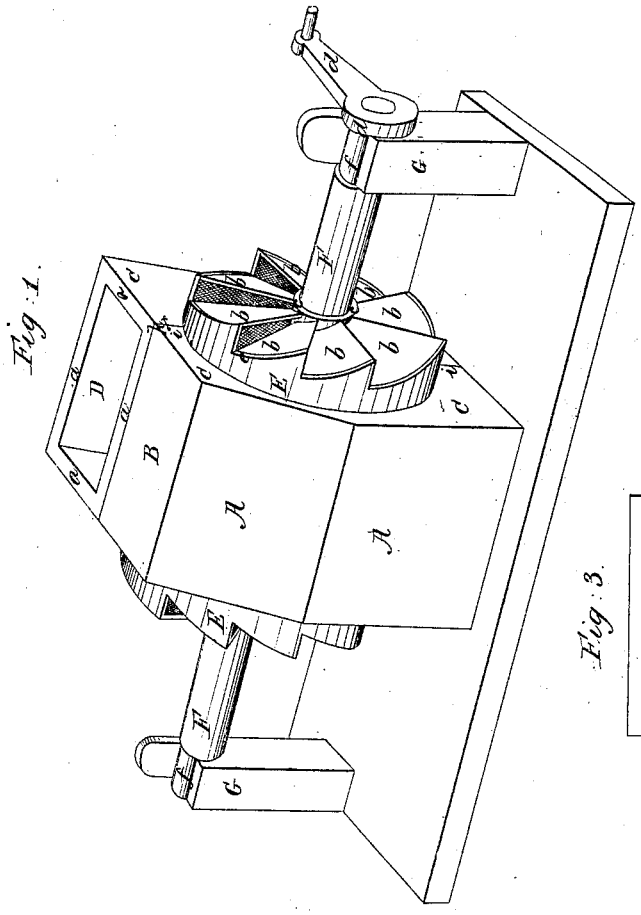



Fig. 4.

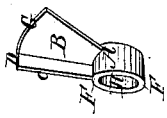
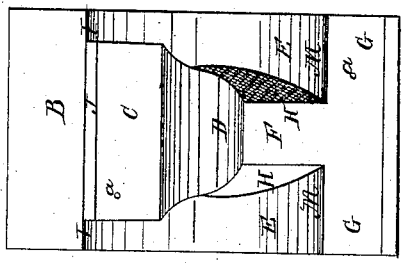



Fig. 3.



# UNITED STATES PATENT OFFICE.

JOHN L. SMITH, OF SALINA, NEW YORK.

## IMPROVEMENT IN THE CONSTRUCTION OF WATER-WHEELS.

Specification forming part of Letters Patent No. **2,383**, dated December 10, 1841.

*To all whom it may concern:*

Be it known that I, JOHN L. SMITH, of the village of Salina, in the county of Onondaga and State of New York, have invented a new and useful Improvement on a Water-Wheel and in the Construction of the Trunk and Tunnel Through which the Water is Applied to the Wheels, which improvement I call "Smith's Improved Patent-Action Water-Wheel;" and I hereby declare that the following is a full, clear, and exact description of the improvement and of the operation of the same, and also clearly and exactly specifies what I claim as my own original invention and discovery, reference being had to the annexed drawings, making a part of this specification, in which—

Figure 1 is an external perspective view of the the machine when put up and ready for operation, exhibiting the connection of the wheels with the trunk. Fig. 2 represents the lower section of the trunk and gives a view of the interior construction thereof. Fig. 3 represents the upper or outer section of the trunk and gives a view of the interior construction thereof. Fig. 4 represents the core or hub of the wheel, through which the shaft passes, and one of the buckets attached thereto; Fig. 5, a side view, the wheel being removed.

Fig. 1 is particularly explained as follows: Letters A represent the exterior of the upper section of the trunk of the front surface thereof; letter B, the upper surface of such upper section. The upper and lower sections are divided by the line marked *j j*, passing through the center of the shaft F, forming with the plane of the bed or horizon an angle of forty-five degrees. Letters C represent the sides of the upper or outer and lower or interior section. Letter D represents the mouth of the tunnel or trunk into which the scroll is formed and into which the water passes before falling upon the wheels. The trunk is composed of four pieces of timber, two of which framed together form one of its sections, out of which the tunnel and chamber or conductor are excavated or cut. The size of the timbers will depend entirely upon the column of water to be used, and the sections, if necessary, may also be framed from three or more timbers. Letters E represent the surface or periphery of the wheels; letters *e*, the exterior or scalloped edge, and *b* the buckets. The whole wheel is to be made of cast-iron, together with the buckets and cove, and cast entire, the size of the wheel varying with the head and volume of water designed to be used. The drawing represents it on a scale of about one-eighth of an inch to an inch, the size of a wheel to be used with a head of eight feet water. Letters H on the dark grounds between the buckets *b* represent the depression or recess of the buckets as they appear from an external view of the wheels. Letters F represent the shaft passing through the cores of the wheels, and is designed to be of solid cast-iron and should be cast with shoulders terminating at the inner edge of the coves, so as to prevent the wheels from coming in contact with the trunk. The wheels are to be keyed upon the shaft in any of the usual modes. Letters *f* represent the bearing of the shaft resting on pillow-blocks G, on which the shaft revolves. Letters *d* represent the arm or crank to which the machinery to be worked is connected by a pitman. The shaft should always be of sufficient length to leave a space of at least twelve inches between the wheels and the pillow-blocks for the free escape of the water. Letter *h* represents an iron hook, by means of which the two sections are fastened together with staples. They may, however, be fastened together in any convenient manner.

Fig. 2 represents the lower section of the trunk, and is particularly described as follows: Letters A represent the mouth of the trunk, represented by letter D in Fig. 1. Fig. 2 is projected horizontally, exposing the interior construction of the lower or interior section of the trunk. The tunnel A is excavated from the timbers forming the lower or interior section. Letters J represent a raised projection or tongue running through the solid part of the trunk at the line *i i* when united, being raised from an inch to an inch and a half above the plane B, and being about two inches wide, thus giving greater strength to the rim of the tunnel, and by means of a corresponding groove in the upper section, (marked J, Fig. 3,) into which the said tongue passes, holds the two sections of the trunk more firmly together. Letter C is another plane surface, being on the same line and angle with plane B, and of a diminished width in consequence of the cuttings made to

form the spiral conductors hereinafter described, and through which the water operating on the machinery is thrown. Letters H represent the convex surfaces or swelling portions of a portion of the body-timbers of the trunk, from which portion the spiral conductor is formed. Letters H form the upper parts or termination of said spiral conductors or chambers, the chambers or cavities represented by letter I on the dark ground being narrowed down and diminished in width by the convex surfaces H. Letters *a* are pins of wood or dowels rising two or three inches above and at right angles to the planes *c* and *a* and entering into corresponding cavities at letters *a* in Fig. 3. Letter D represents a portion of a cylindrical cavity cut through the center of the whole trunk on the line *i i* in Fig. 1, for the passage of the shaft of the wheels marked P in Fig. 1. This section will always vary in its diameter with the diameter of the shaft which turns therein. Letters L represent the termination of the lower part of the tunnel, which is very slightly contracted between the points A and L, and the column of water passing into the tunnel at A falls unbroken until it reaches the point L, where it is there divided by the diminished end or termination of the spiral cove in the chamber, which termination is described as follows: Letter *f* represents a part of the cylindrical section cut through the trunk for the passage of the shaft, and this section is concentric with the circle formed by the periphery of the wheels and with the circular chamber which has a radius equal to the radius of the circle described by the end of the buckets. The elevation of this section *f* above the bed of the circular chamber on the scale of projection one-eighth of an inch to an inch is eight inches. The letter F represents the same elevation of the section and forms with *f* a projection of the end of the wedge or core of the body-timbers. This core or wedge extends from the section cut for the body of the shaft to the bed of the cylindrical chamber or spiral chamber and increases in thickness in the precise proportion in which the width of the chamber is diminished. This spiral cove extends from F, Fig. 2, to F in Fig. 4, increasing in width, as represented by letters H and by the cylindrical section D, corresponding to section D in Fig. No. 2, and having its greatest width at *c*, Fig. No. 3. From *c*, Fig. 3, this wedge is continued to section *c*, Fig. 2, and terminates at *f* and L on that figure. Letters E and M represent the bed of the chambers through which the water passes. Letters G represent the lower part of the timbers of the trunk.

In Fig. 3 letters G represent the bottom or lower portion of the timbers of the trunk corresponding to letters G in Fig. 2. *a* represents the apertures or cavities corresponding to the pins *a* in Fig. 2. Letters M represent the bed of the spiral chamber or conductor of the water. E represents the same chamber continued to I in same figure. G represents a part of the timbers of the trunk, corresponding with *c* in Fig. 2. J is the groove corresponding to the tongue J in Fig. 2. B is a part of the trunk-timbers corresponding to B in Fig. 2.

In Fig. 4, letters A represent the periphery of the cove of the wheel F, the exterior edge of the cove H, the passage for the shaft B, a part of the bucket attached to the cove of the wheel, and the plane of such part B forming an angle of one hundred and fifteen or one hundred and twenty degress with the flange *c* of the bucket. *c* represents the flange of the bucket from the cove to the periphery or edge. D G represents the external edge of the bucket and flange, over which the rim of the wheel passes. The number of buckets attached to the wheel depends entirely upon the size of the wheel, a wheel of two feet diameter requiring eight buckets, and the part represented by B should never be over sixteen or seventeen inches in width at the rim of the wheel. The thickness of the cove and of the buckets depends also upon the size of the wheels, varying also in width according to the width of the wheel. The column of water passing into the tunnel D passes unbroken to the point *f*, at which point it is divided by the spiral cove H and thrown into contact with the planes of the flanges of the buckets running in right lines across the inner rim of the wheels, as represented in Fig. 4, and its egress is prevented by the said flange of the bucket till the wheel revolves the width of the flanges B, when it passes off over the inclined plane of the bucket B through the passages H. The passage of the water is from the points L through the chambers E to M, thence through M to E and I, and from thence through I, at which parts it escapes, as above described, at H, the pressure of the water continually increasing from the point of the scroll, or at *f* to I, by the diminishing size of the spiral chambers or conductors. By dividing the water at the point *f* near or below the line of the center of the shaft, instead of at a point near the mouth of the tunnel, nearly all air and gas are prevented from entering with the water, the power of which is thus unbroken until it reaches the point where it is applied.

The wheel is made of cast-iron in one piece, as before stated, and is fixed to a horizontal shaft and turns with it vertically. It resembles two concentric cylinders of different diameters, the inner one, being much smaller than the outer one, having inclined plane buckets with flanges placed around in the space between said cylinders, so as not to lap over each other, as in many wheels, and arranged so as to leave spaces or issues between said buckets sufficiently large for the water to escape after having acted upon them. The inner cylinder forms what is usually termed the "hub" and is slipped on the horizontal shaft, and is fixed permanently thereto. The

other cylinder corresponds with that part of a water-wheel which is termed the "rim," and is notched or cut away on the outer edge in the manner of the crown or balance wheel of a clock, so as to enlarge the outlets for the escape of the water. The buckets are inclined planes wider at one end than at the other, the small end being on the periphery of the hub and the wider end against the inside of the rim extending along the sloped side of the notch, and the flange being on a line radiating from the hub to the rim and the shaft and extending from the angle of the notches to the inner edge of the rim, the casting of the wheel at the angle or junction of the bucket or flange being thicker than in any other part of the bucket. In the arrangement here described there are two wheels constructed alike and fixed to the same shaft face to face on each side of the trunk with the inlets to the wheels placed against the side openings or outlets of the trunk or scrolls. The water is admitted into the trunk at D, and is divided by the thin edge or point of the scroll at the point *f*, so as to direct the water laterally and horizontally to the right and left into both wheels simultaneously, on which it acts by first striking against the flanges, and then by escaping over the surfaces of the inclined planes of the buckets, turning the wheels around in a contrary direction to the escape of the water.

By means of dividing the trunk into sections in the manner before described by a line forming an angle of forty-five degrees with the horizon and constructing the tunnel entirely in the lower or interior section the upper section can be removed for repairs or to remove obstructions without interfering in any way with the flume, and with less help and delay than if constructed in any other manner.

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

The mode of constructing the bucket as set forth—namely, by forming it with a flange on the inner face of the wheel extending from the hub or center to the circular scalloped rim and attaching its outer edge to the said scalloped rim, all as before described.

JOHN L. SMITH.

Witnesses:
H. L. MEADE,
GEORGE ROGERS.