

(No Model.)

2 Sheets—Sheet 1.

H. D. WILLIAMS.
IMPACT MOTOR.

No. 580,100.

Patented Apr. 6, 1897.

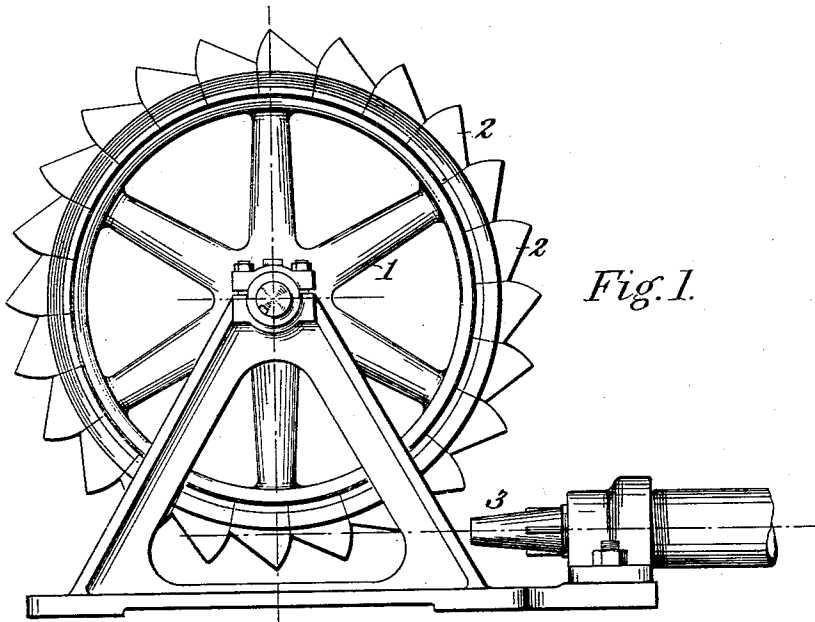
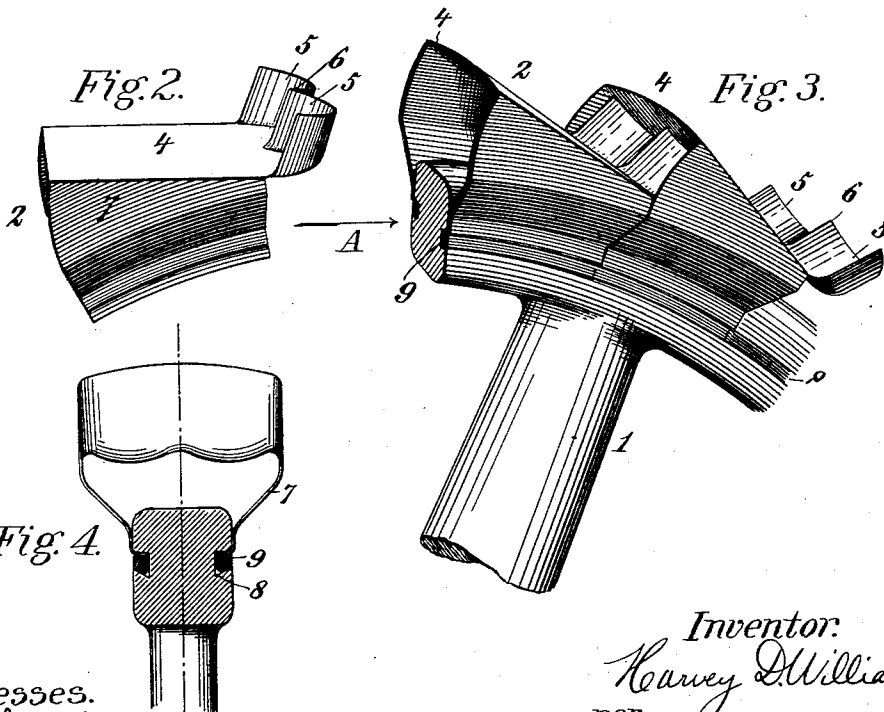


Fig. 1.



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Attorneys

(No Model.)

2 Sheets—Sheet 2.

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Fig. 5,

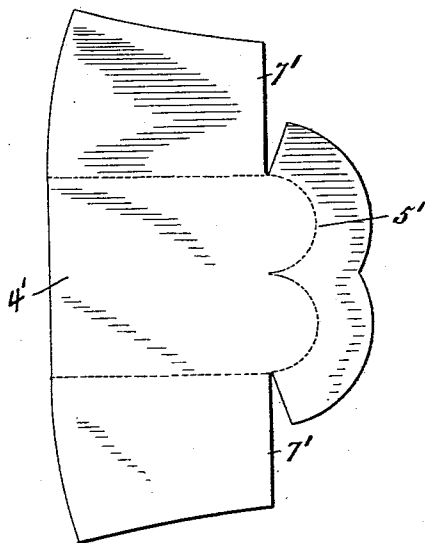


Fig. 6,

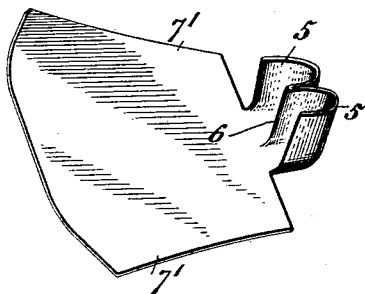
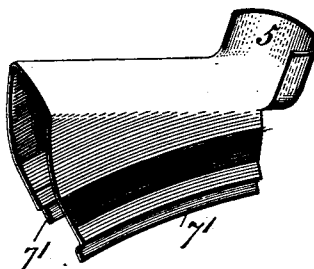


Fig. 7,



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UNITED STATES PATENT OFFICE.

HARVEY D. WILLIAMS, OF ITHACA, NEW YORK.

IMPACT-MOTOR.

SPECIFICATION forming part of Letters Patent No. 580,100, dated April 6, 1897.

Application filed March 14, 1896. Serial No. 583,179. (No model.)

To all whom it may concern:

Be it known that I, HARVEY D. WILLIAMS, a citizen of the United States, residing at Ithaca, in the county of Tompkins and State of New York, have invented certain new and useful Improvements in Impact-Motors; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to impact-motors in which the working fluid, such as water or steam, is projected in a jet into a succession of cup-shaped buckets movably mounted, as in Pelton wheels or motors and in steam-turbines; and my invention relates particularly to the buckets used in such impact-motors and to a sheet-metal bucket which may be struck up from a single piece of sheet metal into the shape desired for the buckets of motors of this class.

My invention consists in the novel form and construction of the buckets and in the novel means provided for holding these buckets in place.

Heretofore in motors of the class to which my invention relates cast buckets have usually been used, because heretofore there has been no method for striking up from sheet metal buckets of the correct theoretical shape. This is especially true of water wheels or motors of the Pelton type. In order to be most efficient, the buckets of motors of this type must have at their ends where the water impinges a rib or "wedge" so constructed as to divide the stream and avoid the collection of dead-water. It has been recognized that sheet-metal buckets, if of this form, would possess great advantages over cast-buckets, because sheet-metal buckets have smoother surfaces for the working fluid to pass over and sharper edges to divide the stream, are lighter, may be made perfectly uniform in size and weight, are manufactured much more easily and cheaply than are cast-buckets, and are not subject to dangerous internal stresses, as are cast-buckets, an objection which applies when the buckets are exposed to a comparatively high temperature, as in steam-turbines. Cast-buckets necessarily have rough surfaces and blunt edges, and these condi-

tions detract considerably from the efficiency of the motor. If the cast-buckets are of the correct shape, it is impossible to smooth their surfaces and sharpen their edges economically. For this reason many attempts have been made to devise methods for making sheet-metal buckets suitable for use in reaction-motors, but by the methods heretofore used for making sheet-metal buckets it has been impossible to produce buckets having the central rib or wedge for dividing the stream and preventing the collection of dead-water, and such buckets have for this reason been inefficient.

The objects of my invention are, first, to provide a sheet-metal bucket for impact-motors which shall have a more nearly correct form and a better surface and sharper edges than the buckets for such motors heretofore used; second, to provide a sheet-metal bucket so formed that it may be manufactured easily and cheaply by striking up from a single piece of sheet metal; third, to provide a bucket so constructed that it may be readily attached to the rim of the wheel or carrier, and, fourth, to make the bucket strong, durable, and easily secured and removed from the carrier. These objects are attained in the impact-motor bucket herein described, and illustrated in the drawings which accompany and form a part of this application, in which the same reference-numerals indicate the same or corresponding parts, and in which—

Figure 1 is an elevation of a Pelton water-wheel, one form of impact-motor to which my invention is applicable having buckets constructed in accordance with my invention, the case which usually surrounds wheels of this character being omitted. Fig. 2 is a perspective elevation of a bucket detached from the wheel. Fig. 3 is a perspective elevation of a portion of the wheel with two of the buckets thereon. Fig. 4 is an end view of a bucket mounted upon the wheel, a portion of which is shown in section, the view being taken from the left of Fig. 3. Fig. 5 shows the blank from which the bucket is formed as it is when first stamped from the sheet metal. Fig. 6 shows this blank after the end flap has been bent upward and concaved to form the end of the bucket, and Fig. 7 is an

elevation of a complete bucket with a semi-circular concaved piece.

In the drawings, 1 is the movable carrier, usually, as in this case, a wheel revolubly
5 mounted, and having upon its rim or periphery a series of buckets 2 2, which are in line with the nozzle 3, by which a jet of water is projected into the buckets successively. As is shown in the detail view, Fig. 2, each bucket
10 consists of a main portion or floor 4, the end of which is bent upward nearly at right angles to the floor 4 and is formed into two concavities 5 5, which are separated by a central rib 6. Portions of the metal at the sides of the
15 floor 4 are bent downward so as to form side pieces 7 7, which fit over the rim of the wheel 1. In order that the rim may be no wider than is necessary, while still retaining the desired width of bucket, the side pieces 7 may not be
20 bent downward, but inward, as is shown in Figs. 2, 3, and 4. The lower edges of the side pieces are bent inwardly to enter slots 8 in the rim of the wheel, so that the buckets may be held in place upon the rim of the wheel.
25 These lower edges of the side pieces 7 are at such an angle with the floor 4 that when the bucket is in place upon the wheel 1 the floor 4 will be coincident with or parallel to a line which is tangent to the periphery of the wheel
30 1 at a point somewhat beyond the upturned end of the bucket. The edges of the side pieces 7 of the buckets are held in place by a retaining-ring 9, preferably of soft metal, which is forced into the groove 8 after the
35 lower edges of the side pieces 7 are in place therein and holds these edges in place. If by any chance one of the buckets becomes loose, it may be tightened in place by forcing the rings 9 still farther inward by hammering.
40 As is shown in Fig. 3, the buckets overlap, the front or upturned end of one bucket lying within the rear open end of the next adjacent bucket, the floor 4 of each bucket forming a roof which covers the concavities
45 5 5 in the upturned end of the next adjacent bucket, and therefore serves to complete the bucket-cavity. The side pieces 7 7 of each bucket may also extend somewhat beyond the upturned end of the next adjacent bucket,
50 as is shown in Fig. 3, thus extending somewhat the sides of the bucket-cavity.

It is not essential that the end of the bucket have two concavities separated by a central rib 6, as is shown in Fig. 2. The bucket with
55 two concavities is the most efficient and the preferable form for Pelton wheel-buckets, as the stream of water is divided, when it strikes the bucket, by the central rib, passing through both concavities and out at the sides thereof
60 equally. This rib or "wedge," as it is sometimes termed, prevents the collection of dead-water in the bucket and thus greatly increases the efficiency of the bucket; but buckets are sometimes used which do not have the central
65 rib, the stream of water striking the bucket either at the center or at one side. In this case the end of the bucket will be substantially a

semicircle. The form of bucket without the central rib 6 is also the preferred form for
steam-turbines. It is illustrated in Fig. 7. 70

In forming my buckets a blank of the shape shown in Fig. 5 is first stamped from sheet metal by a suitable die. As first formed the blank has at its front end a projection or
75 flap 5', which, when the bucket is completed, forms the end of the bucket, and two side flaps 7' 7', which, when the bucket is completed, form the sides of the bucket. The central portion of the blank 4' constitutes the floor 4 of the bucket when completed. While
80 the bucket is in this condition, those edges which are to intersect the stream of water or other working fluid may be sharpened by grinding, filing, or other similar process to the sharpness of a knife, if desired. This
85 may be done easily and cheaply while the blank is flat. The front flap 5' of the blank is then bent upward at an angle to the main portion of the blank by means of suitable dies, the flap being concaved and the central
90 rib 6 being formed therein, if it is provided with a central rib, giving the blank the form shown in Fig. 6. The side flaps 7' 7' are then bent downward and their ends turned inward in the proper manner, thus giving the bucket
95 its final form.

The buckets are placed successively upon the rim of the wheel 1, their sides entering the grooves 9, and the front end of each bucket being placed within the rear open end
100 of the next adjacent bucket, after which the retaining-rings 9 are placed within the grooves 8 and hammered home to hold the buckets in place. By removing a section of each ring it is an easy matter to remove any of the buckets
105 from the wheel. The buckets so formed retain accurately the shape given to them by the dies, and this shape may be exactly or very close to the form shown by theory to be the most efficient. They are light, strong,
110 and of uniform size and weight. Also, the smooth surface of the sheet metal permits the water to pass through the buckets with the minimum of surface friction, while the sharpness of the edges which intersect the stream
115 of water, which is made possible by the manner in which the buckets are formed, also increases the efficiency of the buckets materially.

Having thus completely described my invention, what I claim, and desire to secure by Letters Patent, is—

1. A bucket for impact-motors, struck up from a single piece of sheet metal, and having a main portion forming the floor of the bucket,
125 an end portion bent upward at an angle to the floor and concaved, and side pieces bent downward to embrace the rim of the carrier, by which the bucket may be attached to the carrier, substantially as described. 130

2. A bucket for impact-motors struck up from a single piece of sheet metal, and having a main portion forming the floor of the bucket, an end portion bent upward at an an-

gle to the floor and having formed in it two concavities separated by a central rib, and side pieces bent downward to embrace the rim of the carrier, by which the bucket may be attached to the carrier, substantially as described.

3. In an impact-motor, the combination, with a movably-mounted carrier, adapted to support a succession of buckets, of a series of overlapping buckets mounted upon and secured to said carrier, each struck up from a single piece of sheet metal and consisting of a main portion or floor, an end portion bent upward at an angle to the floor, and side pieces bent downward, the floor and side portions of each bucket overlapping the upturned end of the next adjacent bucket and completing the bucket-cavity thereof, substantially as described.

4. In an impact-motor, the combination, with a movably-mounted carrier, adapted to support a succession of buckets, of a series of overlapping buckets mounted upon and secured to said carrier, each struck up from a single piece of sheet metal and consisting of a main portion or floor, an end portion bent upward at an angle to the floor and creased centrally so as to form in said end portion two concavities separated by a central rib, and side pieces bent downward, the floor and side portions of each bucket overlapping the upturned end of the next adjacent bucket and completing the bucket-cavity thereof, substantially as described.

5. In an impact-motor, the combination, with a movably-mounted carrier, adapted to support a succession of buckets, of a series of overlapping buckets mounted upon said carrier, each struck up from a single piece of sheet metal, and consisting of a main portion or floor, an end portion bent upward at an

angle to the floor, and side pieces bent downward to embrace the rim of the carrier and so to support the bucket, the floor and side portions of each bucket overlapping the upturned end of the next adjacent bucket and completing the bucket-cavity thereof, substantially as described.

6. In an impact-motor, the combination, with a movably-mounted carrier, adapted to support a succession of buckets, of a series of overlapping buckets mounted upon said carrier, each struck up from a single piece of sheet metal, and consisting of a main portion or floor, an end portion bent upward at an angle to the floor and concaved, and side pieces bent downward to embrace the rim of the carrier and so to support the bucket, the floor of each bucket overlapping the upturned end of the next adjacent bucket and forming a roof therefor, substantially as described.

7. In an impact-motor, the combination, with a movably-mounted carrier, adapted to support a succession of buckets, and having in its rim grooves with which the sides of the buckets may interlock for the purpose of holding the buckets in place, of a series of buckets mounted upon said carrier, each struck up from a single piece of sheet metal, and consisting of a main portion or floor, an end portion bent upward at an angle to the floor and concaved, and side pieces bent downward to embrace the rim of the carrier and having projecting ribs adapted to enter the said grooves in the carrier, whereby the buckets are held in place, substantially as described.

In testimony whereof I affix my signature in presence of two witnesses.

HARVEY D. WILLIAMS.

Witnesses:

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W. STRUNK, Jr.