

No. 649,292.

W. D. FORSYTH & E. T. BELL.

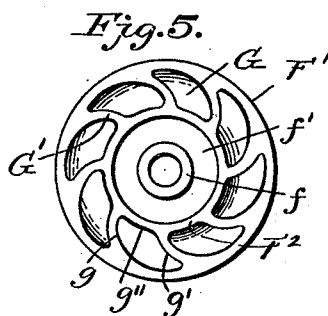
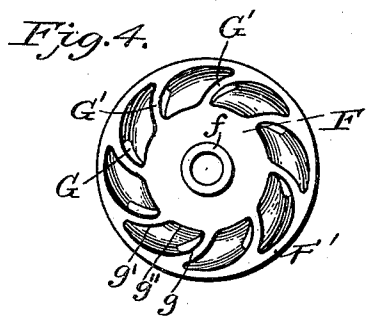
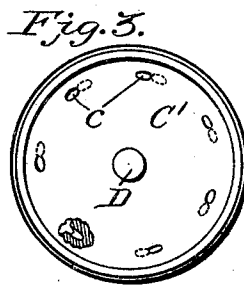
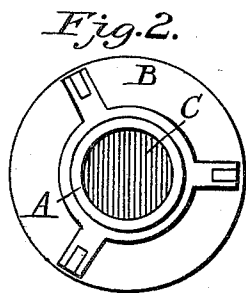
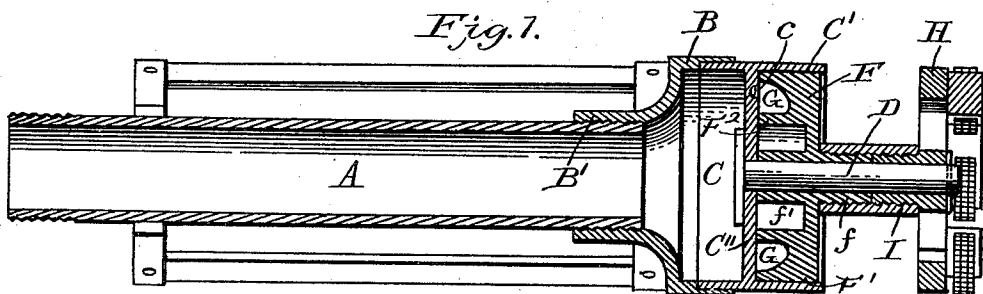
Patented May 8, 1900.

MOTOR.

(Application filed Sept. 6, 1898.)

(Model.)

2 Sheets—Sheet 1.



Witnesses

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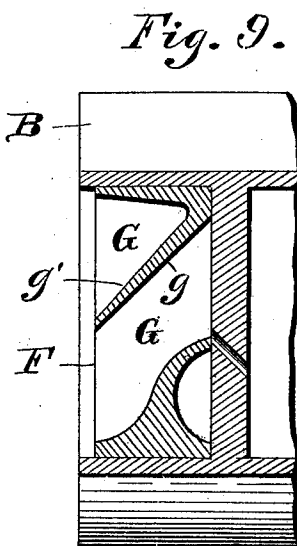
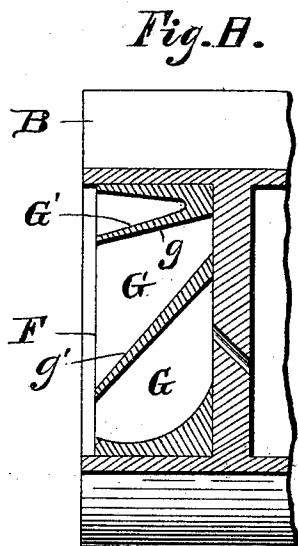
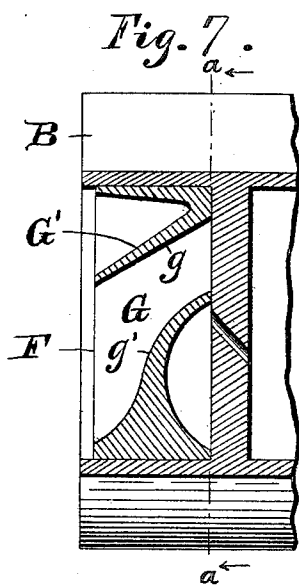
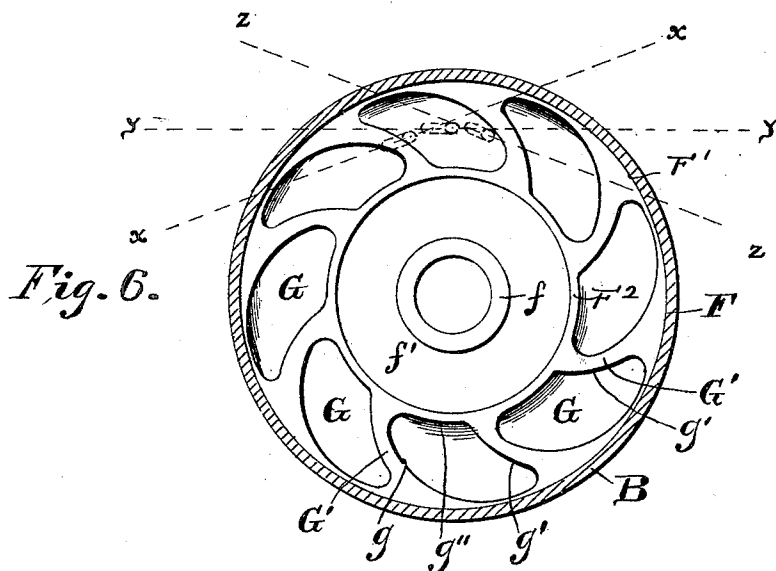
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MOTOR.

(Application filed Sept. 6, 1898.)

(Model.)

2 Sheets—Sheet 2.



WITNESSES

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INVENTORS

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UNITED STATES PATENT OFFICE.

WILBER D. FORSYTH AND ENOS T. BELL, OF PITTSBURG, PENNSYLVANIA,
ASSIGNORS TO THE UNION BOILER TUBE CLEANER COMPANY, OF SAME
PLACE.

MOTOR.

SPECIFICATION forming part of Letters Patent No. 649,292, dated May 8, 1900.

Original application filed January 14, 1898, Serial No. 666,695. Divided and this application filed September 6, 1898. Serial No. 690,309. (Model.)

To all whom it may concern:

Be it known that we, WILBER D. FORSYTH and ENOS T. BELL, citizens of the United States, and residents of Pittsburg, in the county of Allegheny and State of Pennsylvania, have invented certain new and useful Improvements in Motors; and we do 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, reference being had to the accompanying drawings, and to letters of reference marked thereon, which form a part of this specification.

Figure 1 of the drawings is a longitudinal section showing our invention as applied to a boiler-tube cleaner. Fig. 2 is an end view of the same. Fig. 3 is an end view of the case or shell with the motor-wheel removed. Figs. 4 and 5 are plan views of the motor-wheel, showing opposite sides thereof. Fig. 6 is an enlarged section through the casing on the line *a a* of Fig. 7, the position of one of the jet-apertures with relation to one of the water-passages at the commencement, middle, and end of the action of the jet upon the impact-wall thereof being indicated in dotted lines. Figs. 7, 8, and 9 are sections upon the lines *z z*, *y y*, and *x x*, respectively, of Fig. 6 and showing the angular relation of one of the jet-apertures with the impact-wall of one of the water-passages at the commencement, middle, and end of the action of the jet upon said wall.

This invention has relation to certain new and useful improvements in motor-wheels of that class which are operated by the impact of jets of water or other fluid and is designed to provide a wheel or motor which will utilize as nearly as may be the entire energy of the water which passes through it.

The invention is more particularly designed for use as a motor for actuating boiler-tube-cleaning devices of the character described and claimed in our pending application, Serial No. 666,695, filed January 14, 1898, of which the present application is a division.

The invention consists in a wheel or motor of the peculiar construction and combination

of parts, all as hereinafter described, and pointed out in the appended claims.

Referring to the accompanying drawings, the letter A designates a hollow shaft or tube.

B is a cylindrical shell which is firmly screwed or otherwise secured upon an end of the said shaft by means of a tubular extension B'. This shell contains therein a closed water-chamber C and an open water-chamber C', the forward wall of the former constituting the rear wall of the latter chamber and having therein a number of small oblique water-passages *c*.

D designates a spindle which is fixed centrally in the wall C' and which projects some distance beyond the forward end of the shell.

F designates the motor-wheel, which is fitted to turn loosely but snugly in the chamber C'. This wheel is formed with a central hub portion *f*, surrounded at its rear by an annular chamber *f'*, and has an annular peripheral space included between its cylindrical periphery F' and a cylindrical wall F², intermediate of its hub *f* and said periphery, having formed therein a series of spirally-arranged water-passages G, by means of spiral septa G', connecting said periphery and wall. These water-passages are of three-sided form and extend obliquely through the wheel, their walls being both curved and inclined, as shown. The passages G are of slightly-increasing area in cross-section from rear to front owing to the decrease in cross-sectional thickness of the partitions G'. The forward wall *g* of each passage is longer than the rear wall *g'* and inner wall *g''* and is of concave curvature, while the curvature of the walls *g'* and *g''* is convex, as shown, the curvature of the wall *g''* being cylindrical and having its axis coincident with the axis of the wheel.

H designates a boiler-tube-cleaner device, which in the device illustrated is driven by the motor. It is connected to the motor-wheel by a sleeve I.

Water is supplied to the chamber C under pressure through the hollow shaft or pipe and passing through the oblique apertures in the dividing-wall between the chambers C C'

enters the passages of the wheel, the partitions between which are of an inclination reverse to that of said apertures.

It will be noted that the inclined concave walls *g* of the water-passages *G* have such a curvature that they will present themselves to the impelling-jets at substantially the same angle thereto during the entire action of said jets thereupon, whereby the maximum impelling effect of such jets is utilized. The increasing area of the passages from their receiving to their discharge ends permits the more free escape of the water and prevents the wheel from becoming loaded or dragging around with it dead-water. This discharging action is also greatly facilitated by the curved convex formation of the walls *g'* *g''*.

It will be noted that in the wheel shown there are eight of the water-passages *G*, while there are only seven of the apertures *c*, and it is important in order to secure the best action of the wheel that the number of the apertures *c* shall always be one less than the number of passages *G*. The object of this is to give the wheel a certain amount of clearance by increasing the distance between said apertures, so that after a passage *G* has passed one of the said apertures it has time to clear itself of water before the succeeding aperture is uncovered. The actual effect in practice of this feature is very marked.

We are aware that it is not broadly new to provide a lesser number of jets than water-passages in a motor-wheel.

Having thus described our invention, what we claim as new, and desire to secure by Letters Patent, is—

1. The combination with a motor-casing, having the forward wall of its pressure-chamber formed with a series of oblique jet-apertures therethrough, of a motor-wheel having an annular peripheral space between its periphery and a wall intermediate of its hub and periphery, the spiral septa in said space connecting said periphery and wall, of an inclination reverse to the inclination of said apertures and forming spiral passages, having each a convex inner wall, a concave combined outer and forward impact-wall, and a convex rear wall connecting said first-named walls, substantially as specified.

2. The combination with a motor-casing,

having the forward wall of its pressure-chamber formed with a series of oblique jet-apertures therethrough, of a motor-wheel having the cylindrical periphery and the cylindrical wall intermediate of its hub and periphery, forming an annular peripheral space, the spiral septa in said space connecting said periphery and wall, of an inclination reverse to the inclination of said apertures, and forming spiral passages, having each a convex cylindrical inner wall having its axis coincident with the axis of the wheel, a concave combined outer and forward impact-wall, and a convex rear wall connecting said first-named walls, substantially as specified.

3. The combination with a motor-casing, having the forward wall of its pressure-chamber formed with a series of oblique jet-apertures therethrough, of a motor-wheel, having an annular peripheral space formed by its periphery and a wall intermediate of its hub and periphery, the spiral septa in said space connecting said periphery and wall, of an inclination reverse to the inclination of said apertures, of decreasing thickness from rear to front, and forming spiral passages, having a convex inner wall, a long concave combined outer and forward impact-wall, and a convex rear wall, connecting said first-named walls, and said passages being one less in number than said apertures, substantially as specified.

4. The combination with a motor-casing, having the forward wall of its pressure-chamber formed with a series of oblique jet-apertures therethrough, of a motor-wheel having an annular peripheral space between its periphery and a wall intermediate of its hub and periphery, the spiral septa in said space connecting said periphery and wall, of an inclination reverse to the inclination of said apertures, and forming spiral passages, having each a convex cylindrical inner wall, a long concave combined outer and forward wall, and a convex rear wall connecting said first-named walls, substantially as specified.

In testimony whereof we affix our signatures in presence of two witnesses.

WILBER D. FORSYTH.
ENOS T. BELL.

Witnesses:

A. T. ROWAND, Jr.,
C. E. HENDERSON.