E. BUSS.

HYDRAULIC MOTOR.

No. 183,900. Patented Oct. 31, 1876.

Fig. 4.

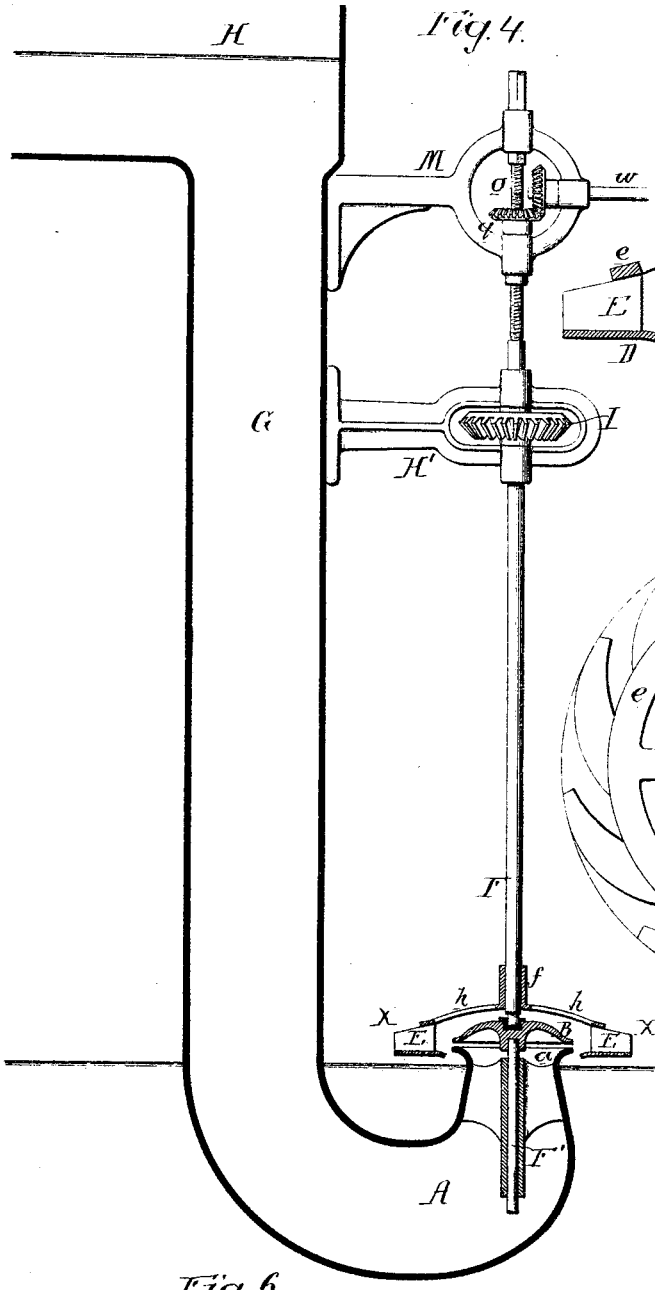



Fig. 1

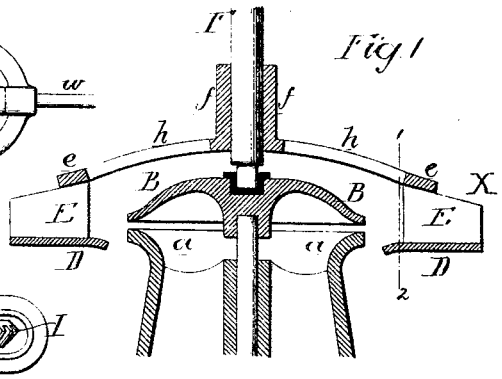



Fig. 2.

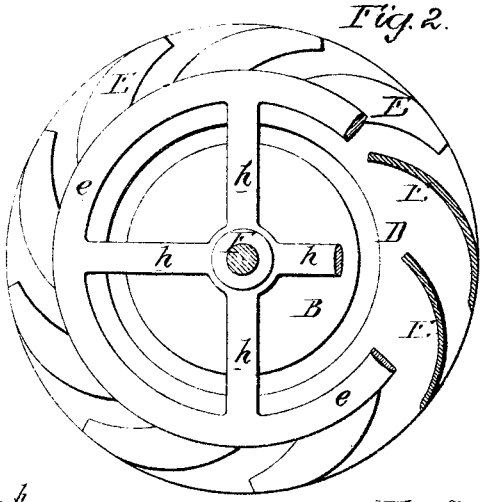



Fig. 3.

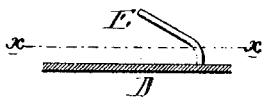
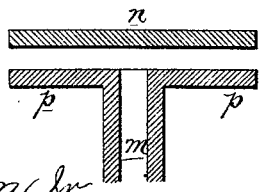
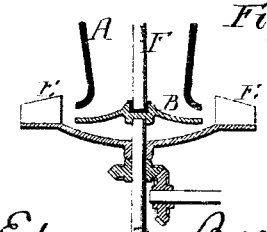



Fig 6




Witnesses
Henry Bowson Jr
Harry Smith

Fig. 5.




Edward Buss
by his Atty's
Howson and Son

# UNITED STATES PATENT OFFICE.

EDWARD BUSS, OF MAGDEBURG, GERMANY.

## IMPROVEMENT IN HYDRAULIC MOTORS.

Specification forming part of Letters Patent No. **183,900**, dated October 31, 1876; application filed October 12, 1876.

*To all whom it may concern:*

Be it known that I, EDWARD BUSS, of Magdeburg, Germany, have invented an Improved Hydraulic Motor, of which the following is a specification:

The main object of my invention is to construct an effective and economical hydraulic motor by combining a wheel having exposed vanes or buckets with a discharge-outlet, from which a continuous annular stream of water is projected across an unobstructed space against the said vanes or buckets.

In the accompanying drawing, Figure 1 is a vertical section of my improved wheel; Fig. 2, a plan view of the same; Fig. 3, an edge view on the line 1 2, Fig. 1; Fig. 4, a view of the wheel drawn to a reduced scale, and shown in connection with the fore-bay, discharge-pipe, and gearing; and Fig. 5 illustrates a modification of my invention.

The general character of my invention will be best understood by reference to Figs. 1, 2, and 3, in which A is the discharge-pipe, communicating with the fore-bay of a mill-race or other water-supply, this pipe terminating in a circular flaring mouth, *a*, which, in connection with the circular plate B, causes the water to be discharged in a comparatively thin annular and horizontal stream.

X is the wheel proper, consisting of an annular plate, D, to which are secured a series of vanes or buckets, E, the latter being connected by a ring, *e*, and this ring, by arms *h*, to the hub *f* on the wheel-shaft F.

There is an intervening unobstructed space between the annular outlet for the water and the vanes, and across this space the annular stream of water is projected against the vanes, which the water strikes at about the dotted line *x x*, Fig. 3, a short distance above the plate D of the wheel.

The vanes are curved to about the shape shown in Fig. 2, or some such form as will insure the best effects with the smallest amount of water. The vanes are also curved or inclined from top to bottom; or, by preference, each vane is vertical for a short distance above the plate D, and then inclined or curved, as shown in Fig. 3, this shape preventing the water which strikes the lower or vertical portions of the vanes from taking an upward course on striking the vanes.

I prefer the above mode of carrying out my invention; but, as will be shown hereafter, it can be embodied in different modifications.

It will be seen from the above description that my invention cannot be classed among ordinary turbine wheels, which are modifications of the well-known Barker mill, and the power of which is proportionate to the hydrostatic pressure due to the height of vertical column and to the volume of the water, which is always under atmospheric pressure until it leaves the wheel, ordinary turbines having guides for directing the water to the buckets of the wheel and flood-gates to regulate this supply.

In my wheel, on the contrary, the power is proportionate to the volume and square of the velocity of the annular stream of water discharged from the outlet across the unobstructed annular space against the wheel, the vanes of which are also exposed. It differs also from another class of horizontal wheels, in which the water is directed inward through a system of curved guiding-channels against the exposed buckets of a wheel. It also differs from that rare class of pressure-wheels in which the water is directed without guides against inclosed buckets, the spaces between which are always filled with water.

The absence of guiding-channels for directing the water to the vanes is a prominent feature of my improved wheel, and constitutes the main difference between it and ordinary turbines.

It is the employment of these guiding-channels and regulating-gates in connection with turbines which detracts seriously from the effective power of the water; hence it is believed that a greater percentage of the power of water can be obtained by discharging a continuous annular stream across an unobstructed space and at greater velocity against the exposed vanes of a wheel than by directing a similar volume of water through closed channels to the passages between the buckets of a turbine.

It may be remarked here that the water on leaving the wheel has lost its velocity, the

water simply falling from the wheel; and in this respect, also, my invention differs from that class of turbines in which the water retains velocity on leaving the wheels.

Independently of this, my improvement permits that simplicity and economy in construction which cannot be attained in the manufacture of ordinary turbine wheels.

The circular plate B should be adjustable to and from the mouth of the discharge-pipe, and this adjustment should accord with the supply of water and with the desired speed of the wheel, and with the duty which the wheel has to perform.

There will always be a proper velocity of the water, under the effect of which the wheel will operate to the best advantage, and which will insure a maximum of power with a minimum expenditure of water.

While the adjustment of the plate B may be accomplished by hand, I prefer to make the plate and shaft of such a weight, or to so weight either or both, that the plate will act as an automatic valve. This weight must be made to so accord with the average supply of water, and with the area of the plate, that a change in the supply will effect a proper change in the outlet, with the view of maintaining as uniform a velocity of the water as possible.

When the plate B is thus weighted so as to form an automatic valve, care should be taken to avoid the effect discovered by Clement des Ormes, of forcing a fluid through a vertical pipe, *m*, Fig. 6, against a flat disk, *n*, the pipe having a flange, *p*, corresponding with the disk. The effect is a tendency of the disk to seek the flange in spite of the pressure from below, and consequently to interfere with the free passage of the fluid between the disk and flange. The flatter the disk and flange are the greater will be this tendency, which I obviate by making the mouth of the discharge-pipe and the plate above of the shape substantially as shown in the drawing.

In the view, Fig. 4, the wheel is drawn to a reduced scale, and shown in connection with a pipe or passage, G, communicating with the fore-bay H. A shaft, F′, is secured to a hub on the under side of the plate B, and this shaft is either secured to or permitted to turn in a bearing in the pipe A below the mouth *a*, the plate being at liberty to turn or not, for it has in the top an independent bearing for the lower end of the shaft F, the latter having its upper bearing in a bracket, H′, secured to the pipe G, or to any other fixed object, and the shaft passing through and sliding in the hub of a bevel or other wheel, I, but turning with the latter, and the power being transmitted through this and other gearing to any desired point.

When the water in the fore-bay is so much above its proper level as to tend to raise the plate B to an inordinate altitude, said plate may be depressed through the medium of a screw-spindle, *o*, adapted to the threaded interior of the hub of a bevel-wheel, *q*, which turns in a fixed bucket, M, the spindle being prevented from rotating, so that on turning the shaft *w*, a bevel-wheel on which gears into the wheel *q*, the screw-spindle will be depressed, and, bearing on the upper end of the shaft F, will depress the latter and lower the plate B. This operation may be accomplished through the medium of the well-known governor, an excess of speed of which, due to increased speed of the wheel, will throw the shaft *w*, which at all other times is stationary, into gear with driving mechanism, the said shaft *w* ceasing to turn when the wheel resumes its normal speed.

This plan should be adopted in cases where there is an opportunity for storing the surplus water for future use.

As before remarked, there are different modes of carrying my invention into effect.

One modification readily understood without explanation is illustrated in Fig. 5, and other modified forms of construction will readily suggest themselves to those practically familiar with this branch of hydraulic engineering. It may be remarked, however, that the plan shown in Figs. 1, 2, and 3 has the advantage of economy and simplicity as regards construction.

I claim as my invention—

1. The combination of a wheel having vanes with a pipe or passage having an annular outlet, from which an annular stream of water is forced across an unobstructed space against the vanes, all substantially as set forth.

2. The combination of the discharge-pipe and its annular outlet with a wheel having exposed vanes, inclined or curved, as described, for preventing the upward tendency of the water as it strikes the vanes.

3. The combination of the discharge-pipe and its mouth *a*, the adjustable plate B, and wheel X.

4. The combination of the wheel X, the discharge-pipe A, and plate B, loaded or weighted, substantially in the manner and for the purpose described.

5. The combination of the shaft F and its vaned wheel with the plate B, situated above the mouth of the discharge-pipe, and having a bearing for the lower end of the mill-shaft.

6. The within-described wheel X, composed of the plate D, exposed vanes E, ring *e*, arms *h*, and hub *f*.

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

EDWARD BUSS.

Witnesses:

HENRY HOWSON, Jr.,

HARRY SMITH.