

Dec. 30, 1941.

G. H. WALKER

2,267,852

HYDRAULIC BRAKE OR DYNAMOMETER

Filed Oct. 18, 1939

4 Sheets-Sheet 1

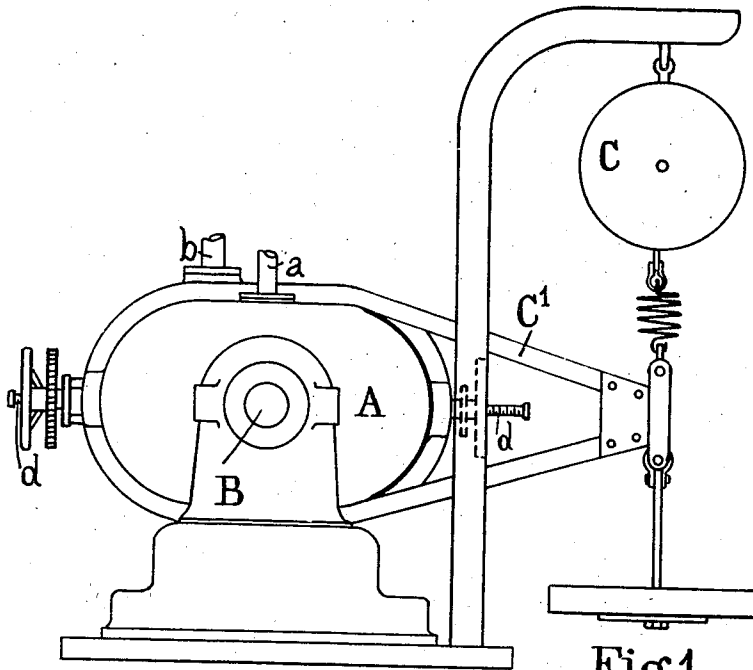


Fig. 1.

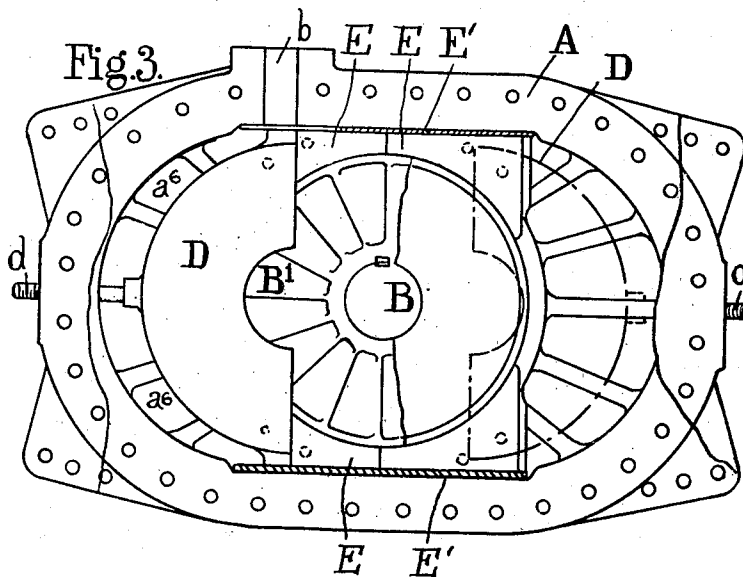


Fig. 3.

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4 Sheets-Sheet 2

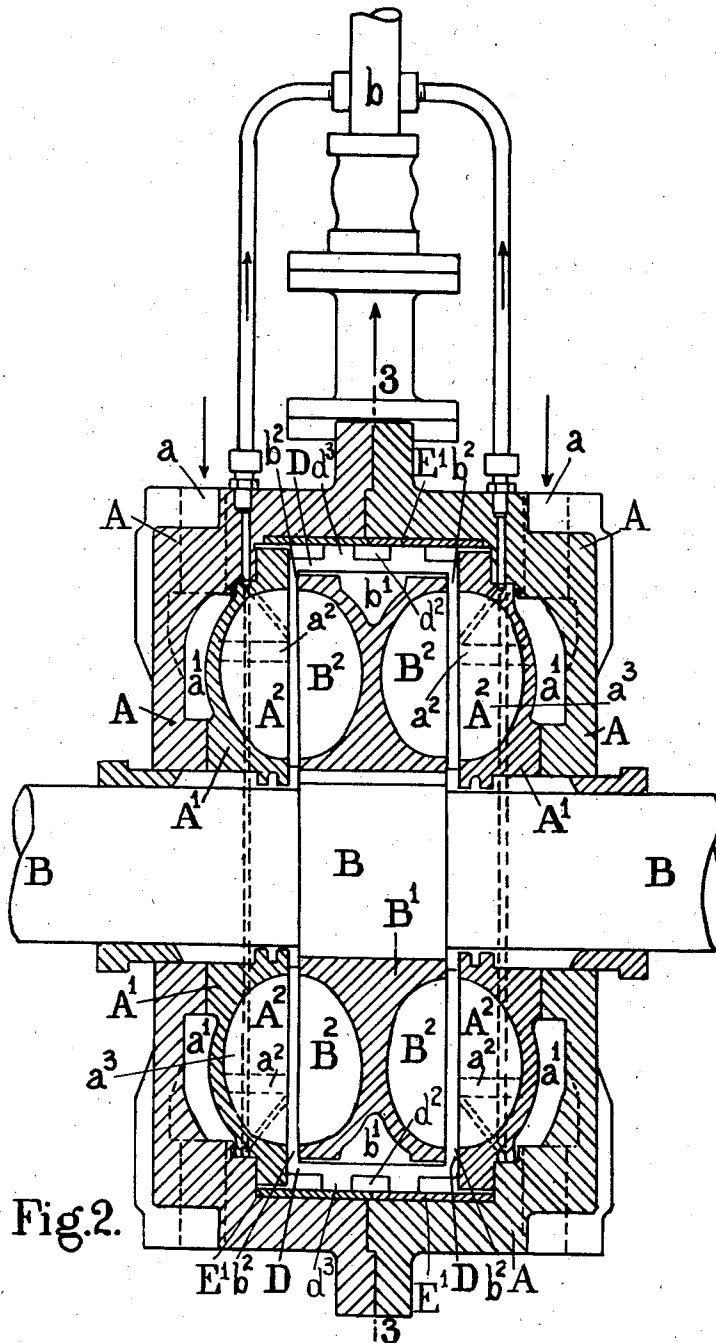


Fig. 2.

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4 Sheets-Sheet 3

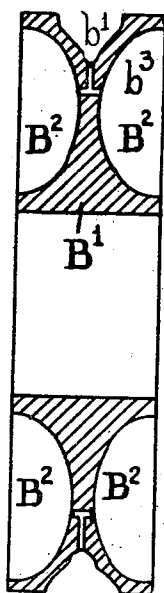


Fig. 7.

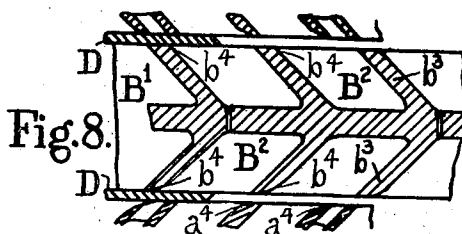


Fig. 8.

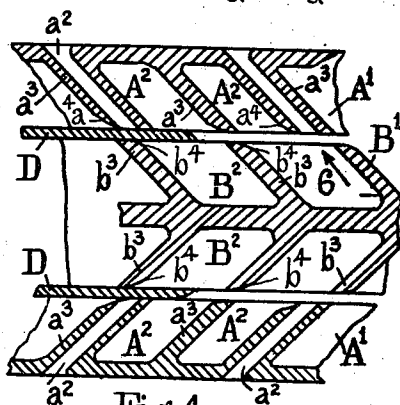


Fig. 4.



Fig. 6.

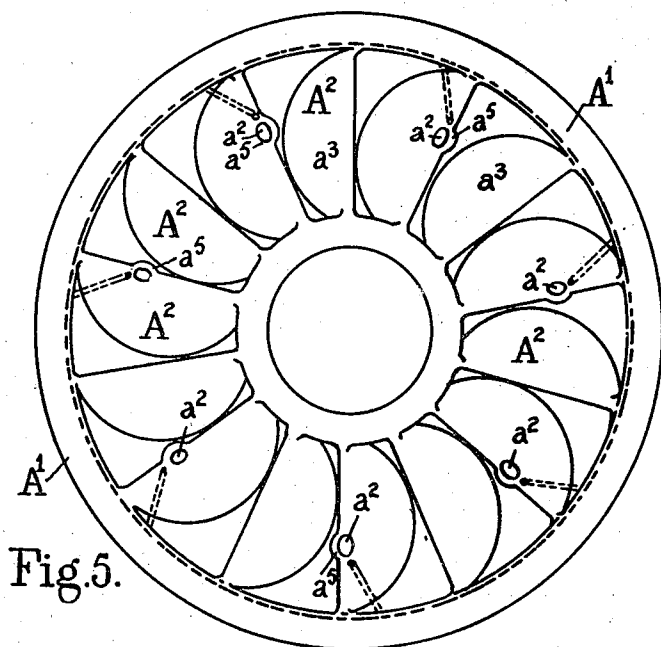


Fig. 5.

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4 Sheets-Sheet 4

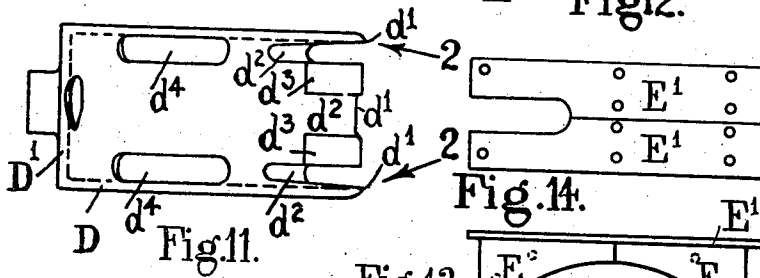
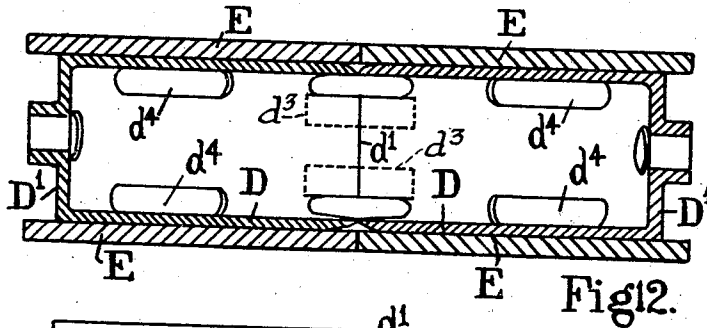
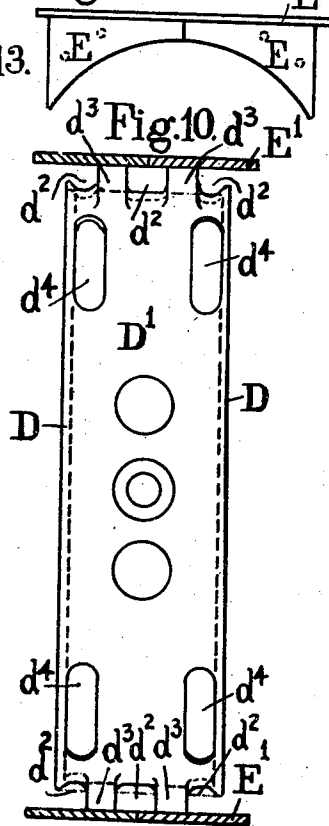
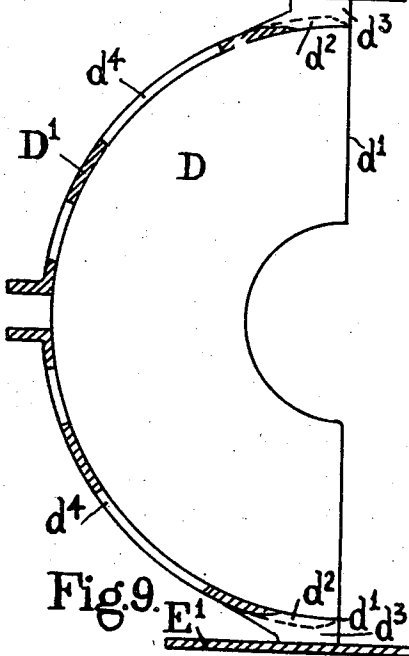


Fig. 13.



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UNITED STATES PATENT OFFICE

2,267,852

HYDRAULIC BRAKE OR DYNAMOMETER

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Application October 18, 1939, Serial No. 300,091
In France August 18, 1939

3 Claims. (Cl. 188—90)

This invention relates to improvements in hydraulic brakes and dynamometers of the type in which a vaned element mounted on a rotary shaft circulates water or other suitable liquid to and from a similar vaned element which is fixed in the casing of the apparatus.

It is well known that when dynamometers of this type are employed for testing or other purposes involving the destruction of considerable amounts of power, the relative velocity between the water and the apparatus is sufficiently high to endanger the life of the working parts by erosion or by erosion-corrosion and it is the object of the present invention to reduce damage to the working parts by avoiding, as far as possible, the creation of harmful eddies in the vicinity of the vulnerable parts of the dynamometer.

To attain this object according to the invention the parts of the dynamometer with which the working liquid comes into contact with a high velocity are so shaped that the liquid will flow over the surface thereof smoothly and without generating appreciable turbulence.

The invention is illustrated in the accompanying drawings and will be described with relation thereto. In these drawings:

Fig. 1 is a side view of a hydraulic dynamometer in which the power absorption is regulated by sluice gates.

Fig. 2 is a transverse section thereof.

Fig. 3 is a section on line 3—3 Fig. 2 showing the sluice gates which control the power of the apparatus in their open position.

Fig. 4 is a developed section of part of the rotating and non-rotating elements.

Fig. 5 is a face view of the vaned element affixed to the casing.

Fig. 6 is a view looking in the direction of the arrow 6 shown in Fig. 4.

Fig. 7 is a vertical section of a modified form of the rotating vaned element.

Fig. 8 is a developed section of a part thereof.

Fig. 9 is a vertical section of one of the sluice gates.

Fig. 10 is an end view thereof.

Fig. 11 is a plan thereof.

Fig. 12 is a plan of the two sluice gates in their closed position and showing in section the curtain plates between which they slide.

Fig. 13 is a detail face view of the curtain plates.

Fig. 14 is a detail view of the top plates in which the sluice gates slide.

The hydraulic dynamometer is of the usual type with a casing A to which is affixed the liners

A¹ in which the non-rotating vaned elements A² are formed and a rotating shaft B to which is affixed the rotor B¹ carrying the rotary vaned elements B². The casing A is mounted so as to be capable of a slight oscillating movement and is connected to the measuring and weighing apparatus C by the arm C¹. The water or other liquid is supplied through the inlets *a* connected to the annular space *a*¹ and passes to the co-acting vaned elements A², B² through channels *a*² in the vanes *a*³ of the member A². The water or liquid leaves the elements A², B² at the circumferential edge *b*² from which it passes to the annular chamber *b*¹ connected to the outlet *b*. The power which the dynamometer is capable of absorbing is regulated by the sluice gates D which slide between the two vaned elements A² and B², the screws *d* by which they are operated being geared together so that the two gates will be moved in or out in unison by a single operating handle.

In a dynamometer of the type to which the invention relates (which has been briefly described in the preceding paragraph) two of the points where erosion occurs are at the co-acting edges of the vanes *a*³ dividing the non-rotating element A² into a series of pockets and the edges of the vanes *b*³ similarly dividing the rotating elements B². According to the invention to minimise this erosion the edges of the vanes *b*³ of the rotating element B² are rounded or streamlined at *b*⁴ as shown in Fig. 4. This avoids the impact of a fast-flowing jet of water striking a flat surface of the vane *b*³ and enables the water to flow smoothly over the metal surfaces. Similarly the edges of the vanes *a*³ of the non-rotating element A² (these vanes being shaped to return the water to the pockets formed by the vanes *b*³ of the rotating element B² at a point near the shaft B) are rounded or streamlined at *a*⁴ as shown in Figs. 4 and 8. Some or all of the vanes *a*³ (usually alternate vanes) are formed with enlarged bosses *a*⁵ through which the water inlet channels *a*² are bored, and hitherto, the shape of such bosses has been such as to present a sudden obstruction to the flow of water, with the consequence that eddies are formed in the vicinity of the bosses, tending to promote erosion. According to the present invention to overcome these objections the bosses *a*⁵ are streamlined smoothly into the material of the vanes *a*³ as shown at *a*⁷ in Fig. 6 whereby the water will flow smoothly over the bosses without producing turbulence and consequent erosion.

Moreover the section of the sluice gates D in-

terposed between the vaned elements A^2 and B^2 , by which the power consumed is regulated, has hitherto been square with the face and the water impinging upon the flat faces of the gates becomes very turbulent leading to erosion of the gates particularly in the vicinity of the leading edges d^1 thereof. To overcome this according to the present invention as shown in Figs. 9 to 12 the leading edges d^1 of the sluice gates D are rounded on the outer side so that the jet of water when flowing from the rotor in the approximate direction of the arrows 2 is divided by the leading edge d^1 and flows smoothly over the metal surfaces. Furthermore instead of a flat surface of metal being presented to the water leaving the rotating element B^2 in an approximately tangential direction and at a high velocity openings d^2 are formed which permit the water to flow past the sluice gates into the space a^6 behind them which, being filled with water, receives the impact and dissipates it without harm. The weight of the sluice gates is carried upon rubbing faces d^3 near the middle of their width with the openings d^2 between and at each side of them.

The two sides of each sluice gate D are connected together by a band plate D^1 in which, according to the present invention, holes d^4 are formed near the sides so as to permit water escaping between the rotating element B^2 and the inner surface of the side plates of the sluice gates D to find its way into the water space a^6 .

Despite the above mentioned precautions to avoid turbulence, there still remains unavoidably a gap between the faces of the pair of sluice gates D , through which water leaving the rotor can impinge on the adjacent faces of the casing A . As the latter is generally made in cast iron, it is liable to damage by this impact, and to prevent this occurring protecting plates E , of a material highly resistant to erosion and corrosion, are mounted in recesses in the interior vertical walls of the casing to form liner elements and secured therein by screws which, after tightening, are pegged; or they may be fixed in any other suitable manner as shown in Figs. 3, 12 and 13. Similarly the plates E^1 of a material highly resistant to erosion or corrosion may be secured to the casing to form the guide surfaces for the sluice gates as shown in Figs. 2, 3, 9, 10, and 14. Similar plates may also be affixed to other parts of the casing to protect them against erosion.

Protecting sleeves of a material highly resist-

ant to erosion and corrosion may surround the rotor shaft B near the boss of the rotor B^1 and adjacent to the glands through which the shaft B projects. Plates or washers also of a material highly resistant to erosion or corrosion may also be used to surround the enlarged portion of the shaft on which the rotor B^1 is secured and the keyways in which the affixing keys are located.

Instead of sleeves plates or washers of corrosion resisting material being attached to these parts they may be sprayed or otherwise coated with a corrosion resisting material the object in either case being to protect them from attack by water.

What I claim as my invention and desire to protect by Letters Patent is:

1. A hydraulic dynamometer of the type referred having a pair of sluice gates sliding between the vaned elements for controlling the power capable of being absorbed by the dynamometer, said sluice gates being formed with rounded leading edges and having apertures therein for the passage of liquid to the space behind.

2. A hydraulic dynamometer of the type referred having a pair of sluice gates sliding between the vaned elements for controlling the power capable of being absorbed by the dynamometer, each of said sluice gates being formed with two side plates having rounded leading edges and having apertures therein for the passage of liquid to the space behind and a plate connecting the two side plates having apertures therein to permit any liquid escaping between the rotating element and the plate to find its way into the space behind the latter.

3. A hydraulic dynamometer of the type referred having a pair of sluice gates sliding between the vaned elements for controlling the power capable of being absorbed by the dynamometer, each of said sluice gates being formed with two side plates having rounded leading edges and having apertures therein for the passage of liquid to the space behind and a plate connecting the two side plates having apertures therein to permit any liquid escaping between the rotating element and the plate to find its way into the space behind the latter and plates of material highly resistant to corrosion and erosion secured to the casing adjacent to the gap between the pair of sluice gates.

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